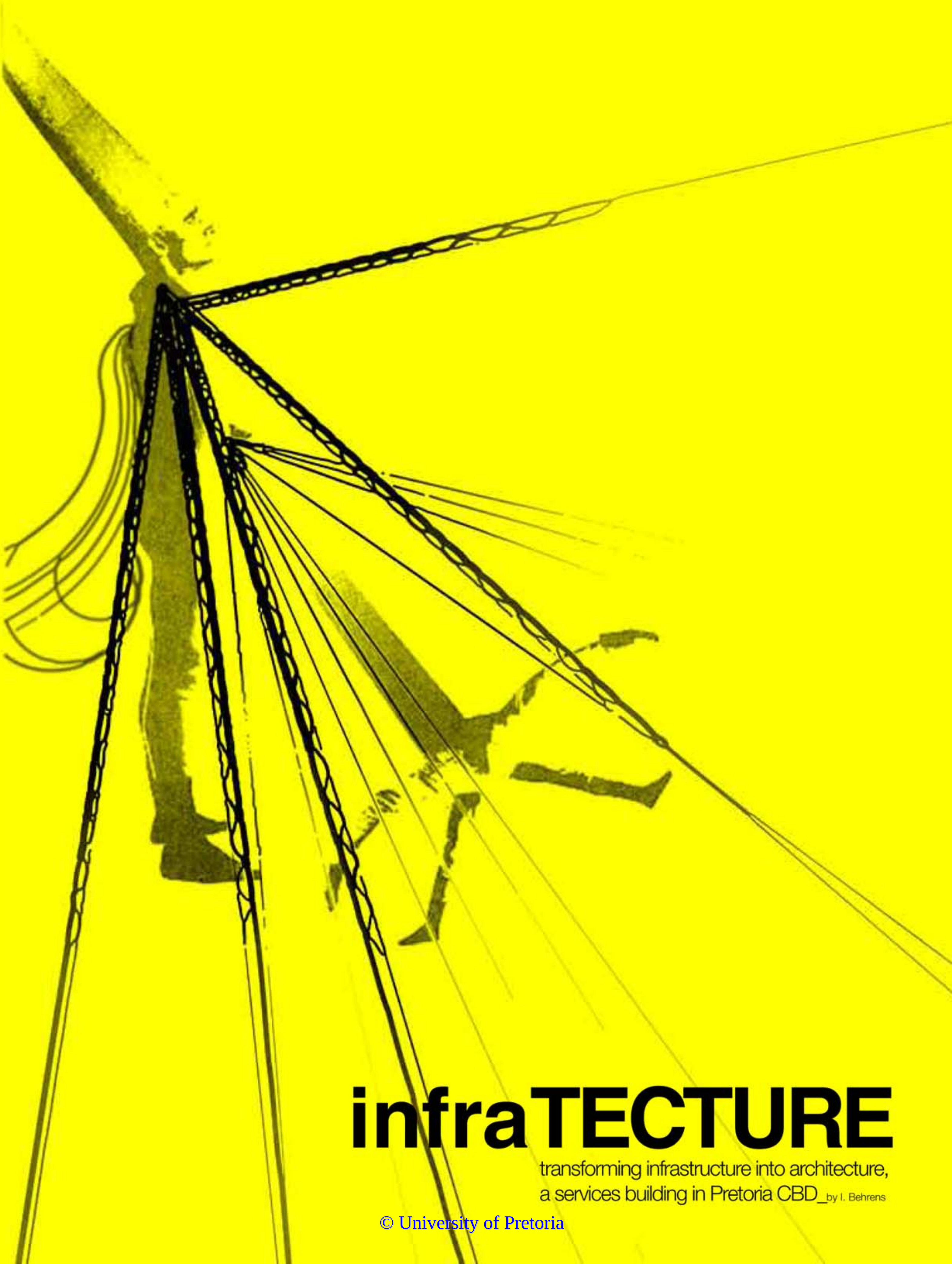

infraTECTURE

transforming infrastructure into architecture,
a services building in Pretoria CBD_by I. Behrens

[Figure 1_2.] Sky scape, a vertical extrusion of the street.

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Infratecture

by [Ilse Behrens] ilse2behrens@gmail.com

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Johan Nel Prinsloo

Submitted in part requirement for the Degree Master
in Architecture (Prof.) in the Faculty of Engineering,
Built Environment & Information Technology.

University of Pretoria: Department of Architecture. November 2010

[Dankie]

Ma, Pa en Jan julle het deurlopend my arms omhoog gehou. Aan my Vader al die prys en eer.

[Amen]

Johan.Derick.Arthur.Jan.Mias.Jaco.Wallace.Henry.Jacobus.PG.Neda.Izaan.Danie.Nadia.Tracy.Dusty.Andries.Konrad.Selma.Olga.Grant.Mia.Johan.Louise.Sune.Candice.Minette.Calayde.Janri.Nonku.Thanks.julle.dit.was.awesome.

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Programme — Supplementary **Infrastructural** building (amalgamation of functions; parkade, loading yard, cyclist facilities, commercial, energy supply, water supply, waste disposal & public-social spaces)

Site — **Pretoria CBD** North-east Block, Between Andries-, van der Walt-, Church- and Vermeulen str.

Client — **Tshwane Metro Municipality** in Public Private partnership

Theoretical Premises — Uniting **Urban infrastructure and sustainability** to irrigate urban cores

Main Research question — Can a **building be designed as part of infrastructure** to supply resources like water, electricity and waste removal not only for itself but for the surrounding existing urban fabric as well?

Architectural issue — Re-addressing the **nature of services** in Architecture, imagining infrastructure as architectural space

[Project Summary]

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[Figure 1_3] Potential farm

[Preface]

Driving past farms and small towns I am almost always charmed by the occasional wind-pump or remnants thereof. A wind-pump is a symbol of so many tales and trials. In many settlements the absence of a wind-pump would coincide with the absence of life.

The wind-pump is a constant reminder of man's dependence upon nature. This tall, feeble machine spins obediently to the moods of the wind, reaching deep into the earth to lure its cool clear water towards the rays of the sun. To the people in these settlements, the reality of their dependence stands tall in their backyards. Thus they are aware of the blades in the sky, turning or waiting, they are thankful for wind, rain and the sun, they know that these elements sustain their lives.

In the urban environment our water and electricity 'appear' from somewhere we are not familiar with. The moods and tides of nature is cured by the flick of a button or the draw of a curtain. We have no wind-pump to remind us when to slow down or well up. We have no idea that the wind has stopped blowing.

[Contents]

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[Abstract]

How does one appropriately design a selfsufficient building in the existing urban fabric without damaging historical urban centres? The role of architecture is to adapt, to not only serve and support people but, also to support its context and surrounding architectures. Thus a new typology needs to be created, by designing the architecture of 'giving'. By looking at how resources travel between and through buildings, one could start to re-address the nature of services within architecture, starting with the outer workings of infrastructure. Through experimenting with the potential of creating space & place as an architectural expression via the re-imaginative design of infrastructure, the existing urban fabric can be served in a sustaining manner. The design is of a services building housing a parkade for conventional and electrical cars and bicycles which generates its own energy, harvests and stores water for itself and surrounds, process waste and sewage and cycles on site resources.

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preparing the ground______[1]____________________[Introduction]______

____[1.1]__ ______ ___BACKGROUND_______

__[1. 2]________ ___PROBLEM STATEMENT________

__[1.3]________ HYPOTHESIS____

__[1.4]________ ____SUB PROBLEMS_______

__[1.5]________ ___AIMS AND OBJECTIVES_________

____[1.6]______ ___CLIENT____

__[1.7]_____ ___OUTLINE BRIEF______

__[1.8]_____ ___METHODOLOGY__

[1.1] BACKGROUND

Every two weeks the world grows in population the size of the city of Johannesburg which is approximately 4,0 million people. The metropolis of Tshwane currently has a population of 2.5 million people. With an annual growth rate of 5%, the population will be around 4.8 million in the year 2020. This will lead to almost double the current development, demand, usage and wastage (Tshwane municipality, 2009).

It is thus not hard to imagine that our continued survival depends on finding satisfactory and sustainable ways to house the expanding populace (something we are already struggling with), in settlements that consume fewer resources and have less destructive effects on the environment.

Where do we find this aid for survival? There is no recipe that will guarantee us better futures. But there is a way for us to start shifting the way we think, towards attempting a less destructive path. Our path needs to become sustainable, responsible and considerate.

"Sustainable development is not about completing a checklist of what you are 'achieving' or about planting shrubs and trees on every imaginable surface around us" (Ruano 1998: 10). Sustainability is about working together as communities towards the same goals, **matching means with needs,** thinking about what we use, how much we use and what contribution we are making even on a micro scale. In order to achieve these objectives, a great deal of responsibility and consideration is required of all the parties involved.

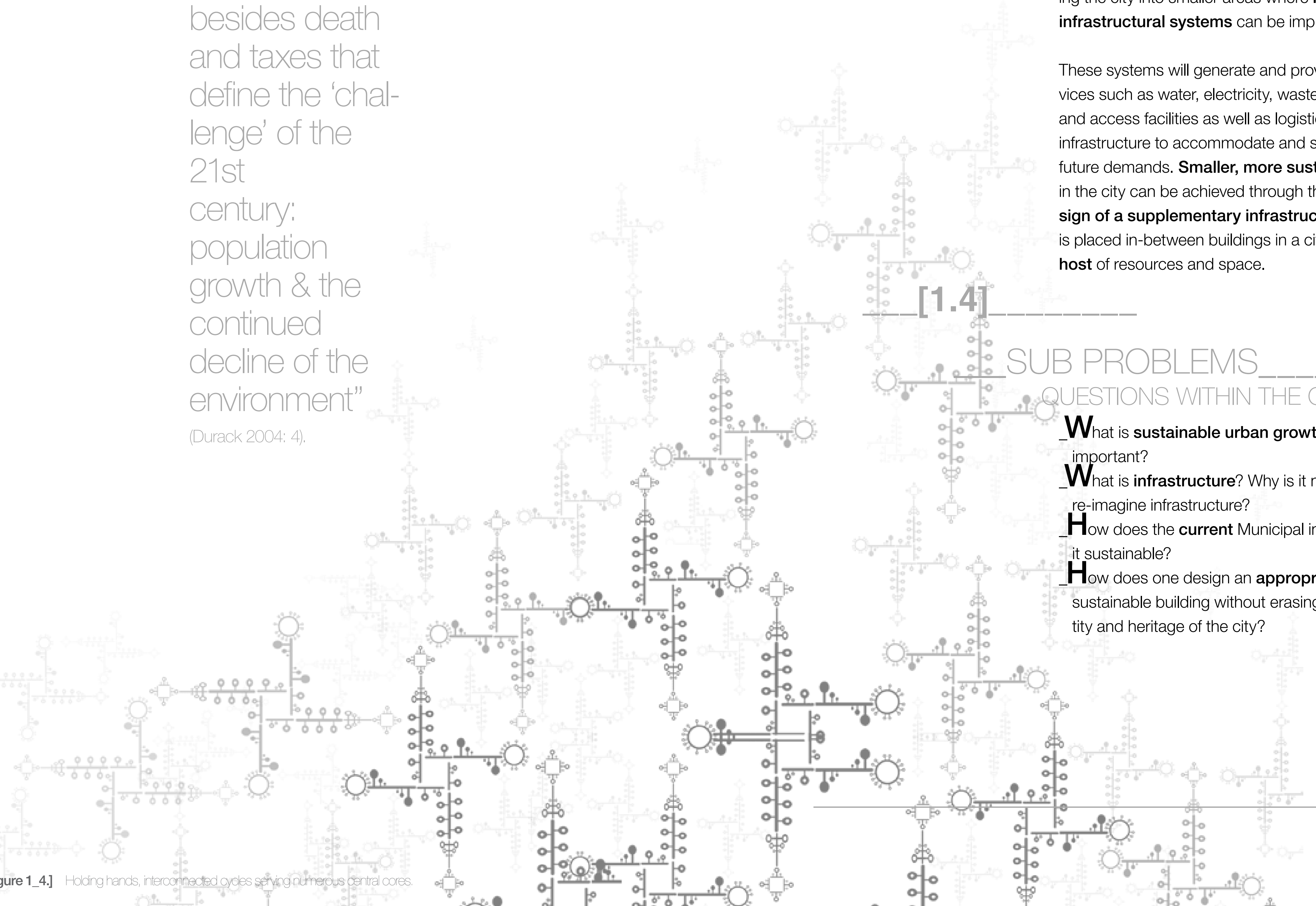
As communities, the areas which we inhabit, become the places where we have the most direct and immense impact and are thus where we can make the biggest change. Nobody knows what a sustainable human settlement looks like or how it functions. What we do know is that **urban areas are the main culprits** in the very serious environmental woes threatening the Earth. Cities already contribute to more than 75% of global pollution and use more than 70% of the energy consumed by humankind (Ruano 1998: 7).

Buildings and their inhabitants consume 60% of the resources extracted from the earth (Ruano 1998 : 7). Therefore looking at how **existing buildings, new buildings** and their surrounds function along with their users and demand, will be a good place to **start** attempting to bring down the effects of environmental damage caused by urban settlements. This is also valid and necessary for the future of The City of Tshwane.

"There are two certainties besides death and taxes that define the 'challenge' of the 21st century: population growth & the continued decline of the environment"

(Durack 2004: 4).

EXPAND SPAWN SPAN SPRAWL ALL EXPLODE EXPIRE



[Figure 1_4.] Holding hands, interconnected cycles serving numerous central cores.

[1.2] PROBLEM STATEMENT

QUESTION...

Can water, electricity, waste, access and movement infrastructure be **re-imagined as habitable space/place** on a localised scale (eg. a city block) to condense the cycle of resource supply, consumption and wastage within the **existing and growing urban structure?**

[1.3] HYPOTHESIS

IMAGINE...

Although our supply of resources are decreasing, the Tshwane Metro Municipality will, in years to come, still be able to provide services to the densly populated metropolis by dividing the city into smaller areas where **localised sustainable infrastructural systems** can be implemented.

These systems will generate and provide resources and services such as water, electricity, waste, sanitation, transport and access facilities as well as logistic, economic and social infrastructure to accommodate and sustain the current and future demands. **Smaller, more sustainable energy cycles** in the city can be achieved through the **re-imaginative design of a supplementary infrastructural building** which is placed in-between buildings in a city block and **acts as a host** of resources and space.

[1.4] SUB PROBLEMS

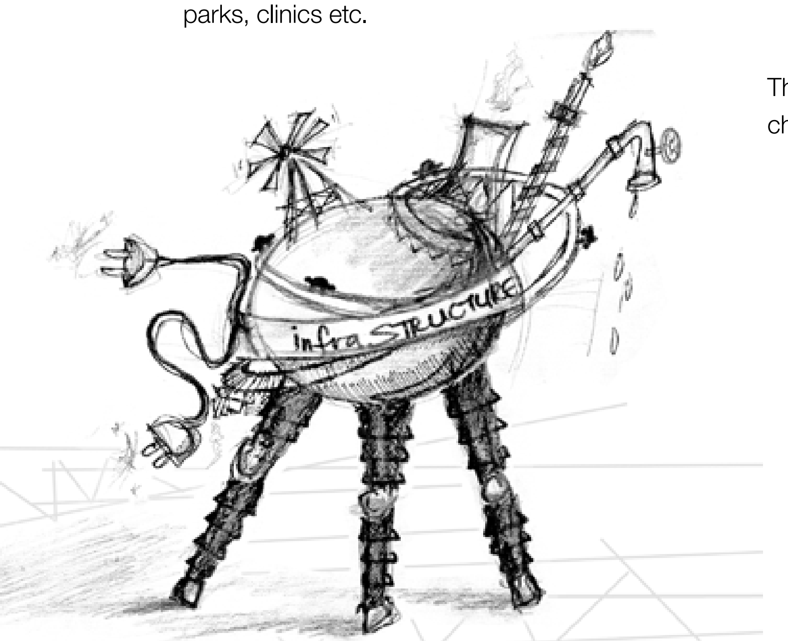
QUESTIONS WITHIN THE QUESTION...

_**W**hat is **sustainable urban growth**? Why is it important?
_**W**hat is **infrastructure**? Why is it necesary to re-imagine infrastructure?
_**H**ow does the **current** Municipal infrastructure work? Is it sustainable?
_**H**ow does one design an **appropriate language** for a sustainable building without erasing the character, identity and heritage of the city?

___[1.5]____
___AIMS AND OBJECTIVES_______________
THE SELF SUSTAINING CITY...

To dispel with the current wasteful infrastructural systems within our city, we can divide the city into smaller quadrants which can function with smaller systems. Thus resources can be recycled to create **'mini-Infrastructure'.** Within these divisions, areas can be grouped together to be connected to a 'host', which is either a building which has been adapted to serve as a 'Supplementary Infrastructural' building, or a new structure designed to accommodate the specific area's **current and future needs** (fig. 1_5)**.**

Although such a **structure** (architecturally designed or engineered) is then built in many **different areas**, the various scales of demand and other factors, such as amount of open space, would call for different ways of approaching the scenario. But in the end, the idea is to create a host structure which will serve the existing structures. This **structure** can potentially house functions and systems such as parking, communications systems, rain harvesting, purification systems and even electrical generator systems, all combined with other needs the area might have e.g. offices, housing parks, clinics etc.



[Figure 1_5.] 'The Infrastructure' inspired by 'Plug in City' by Archigram.

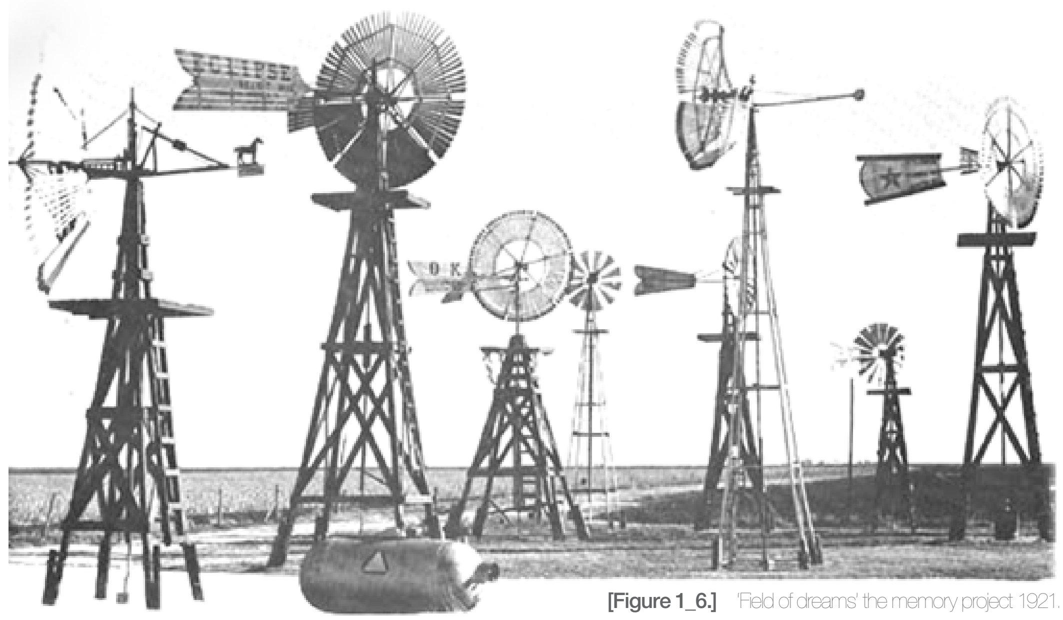
Though there are many possible outcomes, the aim is to challenge the following concepts:

_**Re-imagining** green infrastructure as a means to create space/ place.
_Addressing the sustainability of **existing** structures in the urban landscape.
_Experimentation with the idea of creating a structure which is **woven into the urban fabric** which can generate and supply resources and services on a local scale.
_Research the ability of contemporary sustainable technology and techniques to sustain **large quantities.**
_Attempt to **lessen** the current demand, usage and wastage of non-renewable resources supplied by infrastructure.

_____[1.6]_____
___CLIENT______________________
TSHWANE METRO MUNICIPALITY

In ten years time the municipality will still be responsible for providing the citizens of Tshwane with infrastructural services, but to what extent **will they be able to do so?** Will there be enough water coming from the Vaal dam? Will there be petrol/diesel for the trucks to remove waste from each building and transport it to landfill sites outside the city? Will the current sewerage system have the capacity to carry the load of an almost doubled population? Will there be enough coal left to generate electricity?

The idea is that the municipality as client will start funding small pilot projects in different areas either individually or in collaboration with other companies to experiment and attempt to make areas self sustaining and to lessen the demand on the overall demand on the overall supply and service system. If this initiative can then ideally be **implemented in more and more areas,** one could argue that eventually a **self sustaining city could be achieved.**



[Figure 1_6.] 'Field of dreams' the memory project 1921.

_____[1.7]___
___OUTLINE BRIEF______________________
DELIMITATIONS AND IDEALS

A site is selected by looking at an area in the **CBD** which is **diverse, dense and built up** (see discussion p. 59) with buildings which are **not sustainable and older than ten years**. A site with specific parameters defined as a 'block' is chosen to be the focus area. Although this is only a method to choose a site for this specific intervention, the initiative should be able to be implemented on any site.

The **site as a whole is regarded as the problem area** and will be integrated with the intervention. The intention is to design a structure with a programme dependent on site specific needs (in this case need of a servitude system combined with transport facilitation and access facilities) and in essence is designed to house and generate sustainable infrastructural services and not only sustain itself, but also the buildings around it to whichever extent it is possible.

The intervention is **linked** to the surrounding buildings and can also be attached to another host which is an existing building. The systems and generation of resources, as well as harvesting and processing thereof, is not limited to the confines of the intervention and can also use the surfaces, facades, areas and spaces of the surrounding buildings for these purposes.

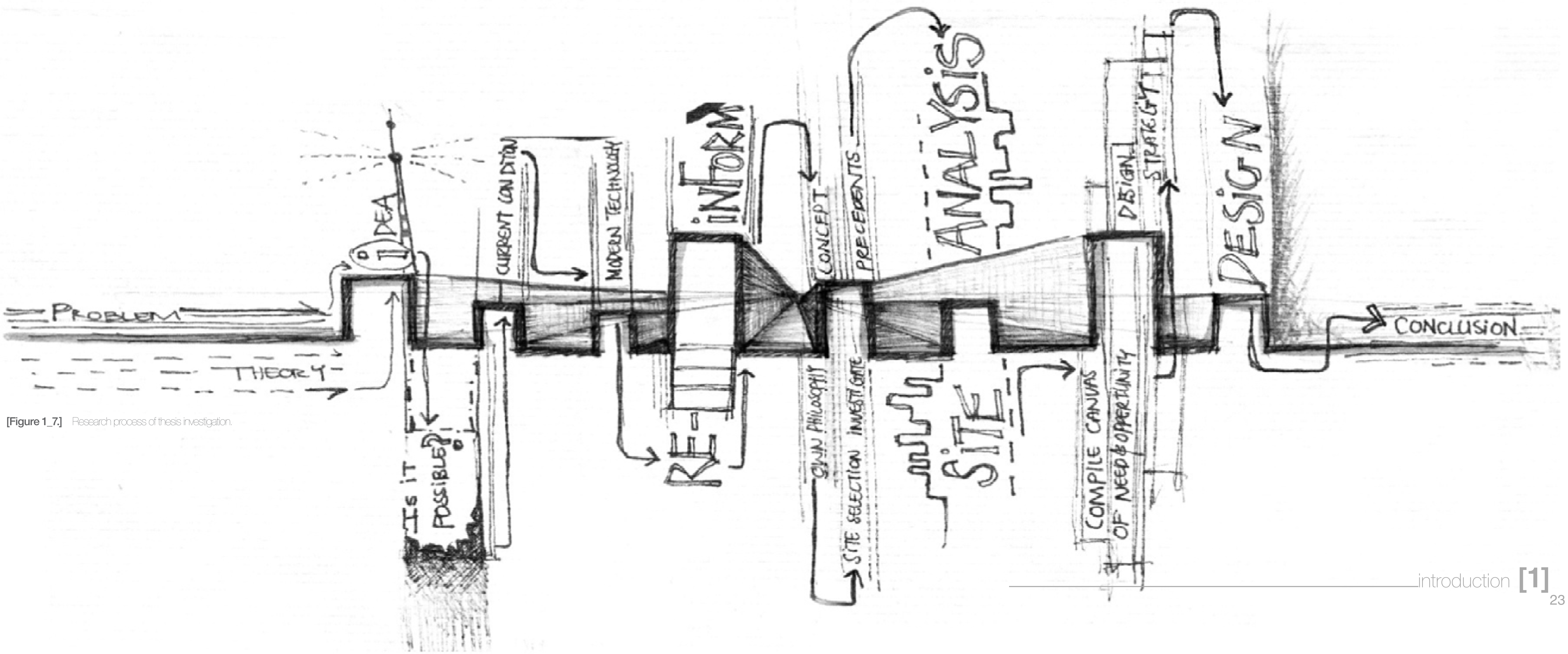
___[1.8]___ ___METHODOLOGY___

UNDERSTANDING THE PROBLEM

In order to understand the problem and to design an appropriate solution, theories concerning urban growth, systems, infrastructure and sustainability are to be studied and utilised. Three specific theories are investigated; **Eco Urbanism, Infrastructure Architecture and Hi-Tech architecture.**

All these theories look at system design at different scales and scopes and are appropriate as they address the realities of working within an existing structure of different layers and systems in the most economic, sufficient and sustainable ways.

The design and analysis process will be based on a **'Grounded' theory** approach. Site information and context will be major influences. The **available technologies** will also be a main factor on the project's scale and abilities. See figure 1_7 below as an indication of research process.



[Figure 1_7.] Research process of thesis investigation.

a system of thoughts composed of ideas________[2]__________[Theoretical Discourse]____

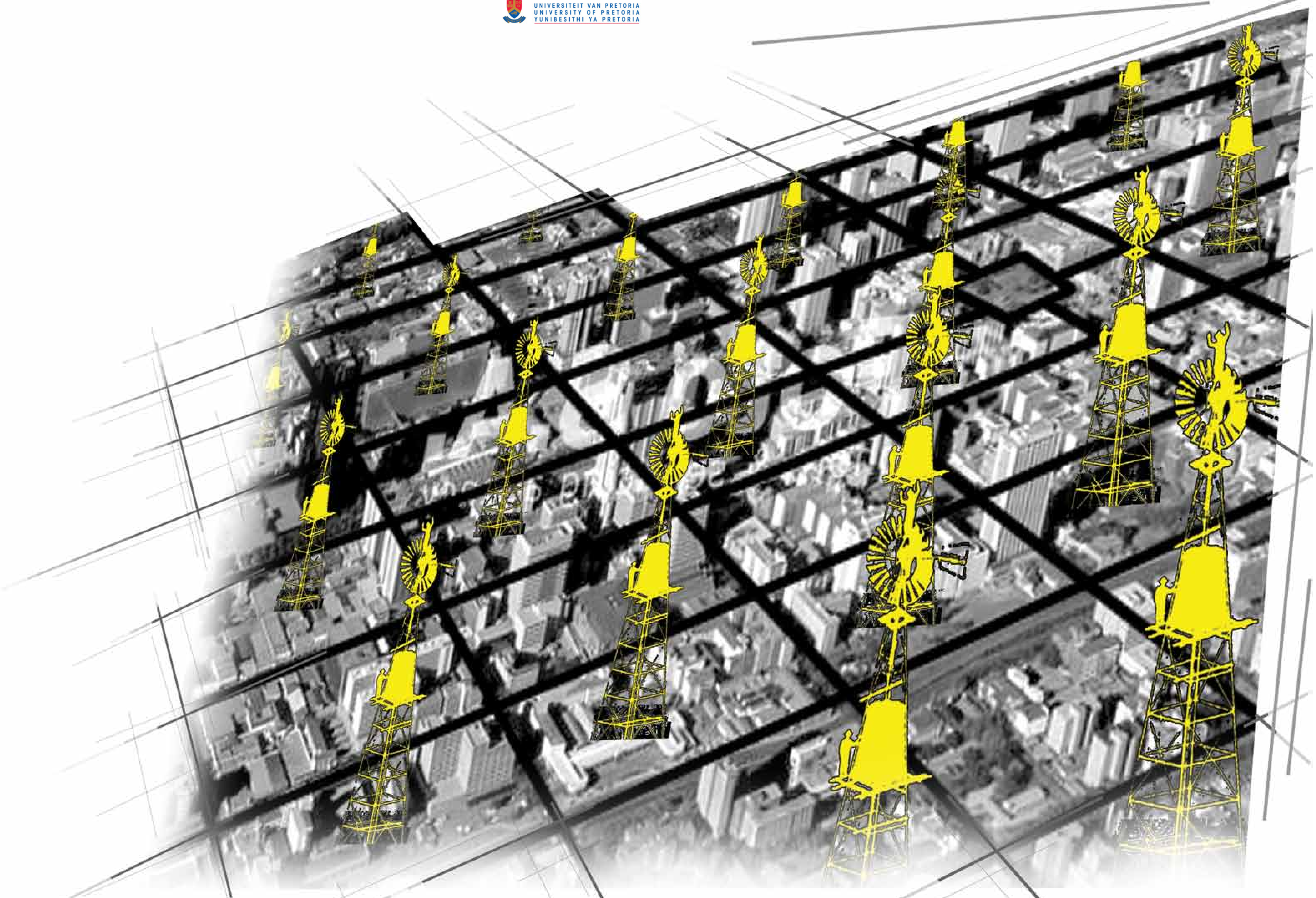
____[2.1]______
___URBAN SUSTAINABILITY______

____[2.2]_______
___URBAN INFRASTRUCTURE_____

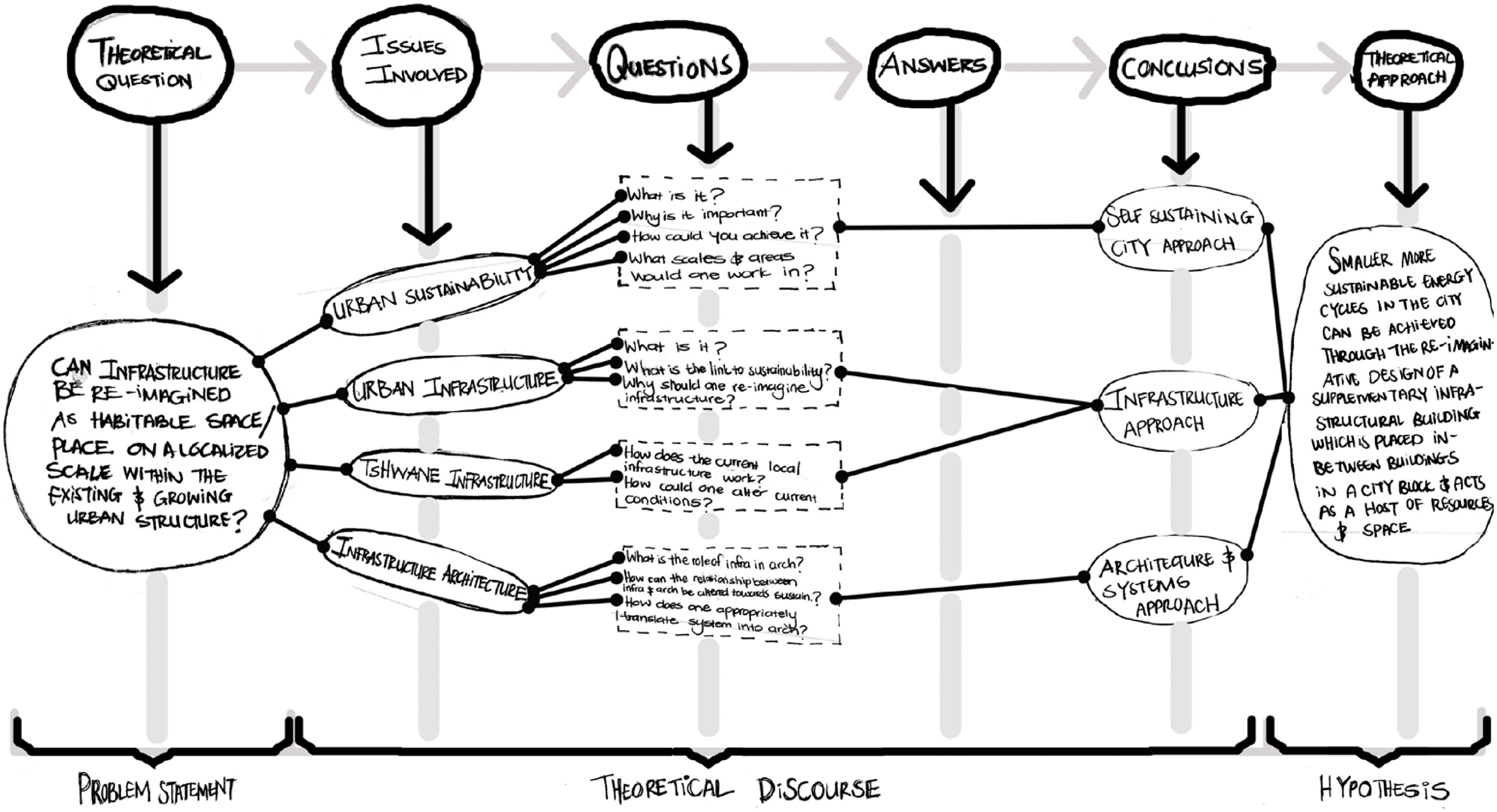
____[2.3]_______
___TSHWANE INFRASTRUCTURE________

____[2.4]_______
___INFRASTRUCTURE ARCHITECTURE________

____[2.5]_______
___CHAPTER CONCLUSION________



[Figure 2_1.] The Infra-Landscape.


THEORETICAL QUESTION
ISSUES INVOLVED
QUESTIONS
ANSWERS
CONCLUSIONS
THEORETICAL APPROACH
CAN INFRASTRUCTURE BE RE-IMAGINED AS HABITABLE SPACE/ PLACE ON A LOCALIZED SCALE WITHIN THE EXISTING & GROWING URBAN STRUCTURE?
URBAN SUSTAINABILITY
URBAN INFRASTRUCTURE
TSHWANE INFRASTRUCTURE
INFRASTRUCTURE ARCHITECTURE
What is it?
Why is it important?
How could you achieve it?
What scales & areas would one work in?
What is it?
What is the link to sustainability?
Why should one re-imagine infrastructure?
How does the current local infrastructure work?
How could one alter current conditions?
What is the role of infra in arch?
How can the relationship between infra & arch be altered towards sustain.?
How does one appropriately translate system into arch?
SELF SUSTAINING CITY APPROACH
INFRASTRUCTURE APPROACH
ARCHITECTURE & SYSTEMS APPROACH
SMALLER MORE SUSTAINABLE ENERGY CYCLES IN THE CITY CAN BE ACHIEVED THROUGH THE RE-IMAGINATIVE DESIGN OF A SUPPLEMENTARY INFRASTRUCTURAL BUILDING WHICH IS PLACED IN-BETWEEN BUILDINGS IN A CITY BLOCK & ACTS AS A HOST OF RESOURCES & SPACE
PROBLEM STATEMENT
THEORETICAL DISCOURSE
HYPOTHESIS

[2.1] URBAN SUSTAINABILITY
WHAT IS IT?

Throughout the ages civilization has had many **threats** against which they had to construct **defence** within human settlements. Urban settlements have been designed in such a manner to deal with **animals, wars and crime** in order to protect and **fortify communities.**

In the 21st century the situation has changed, there are no more impending wars or rogue animals threatening our settlements. Our new enemy is **climate change.**

Globally, climate change is causing increasing destruction in everyday life, natural disasters are claiming millions of lives, creating food shortages and the extinction of species to name but a few catastrophes (Roaf 2005: 2).

Climate change is caused by a layer of **greenhouse gasses** (mostly a high concentration of carbon) in the atmosphere, **trapping the earth's heat,** resultantly **negatively** (that is for us humans at least) affecting climatic behaviour (Roaf 2005: 3).

How should a city be **fortified** against the effects of climate change? What should our communities do? What is our defence to ensure our future generations' survival and prosperity? In the 21st century our fortification is **sustainability.**

The role of sustainability is to transform settlements into self sufficient communities to lower carbon emissions, minimise resource demand and use, and to create an integral **support system** between these elements (Roaf 2005: 6).

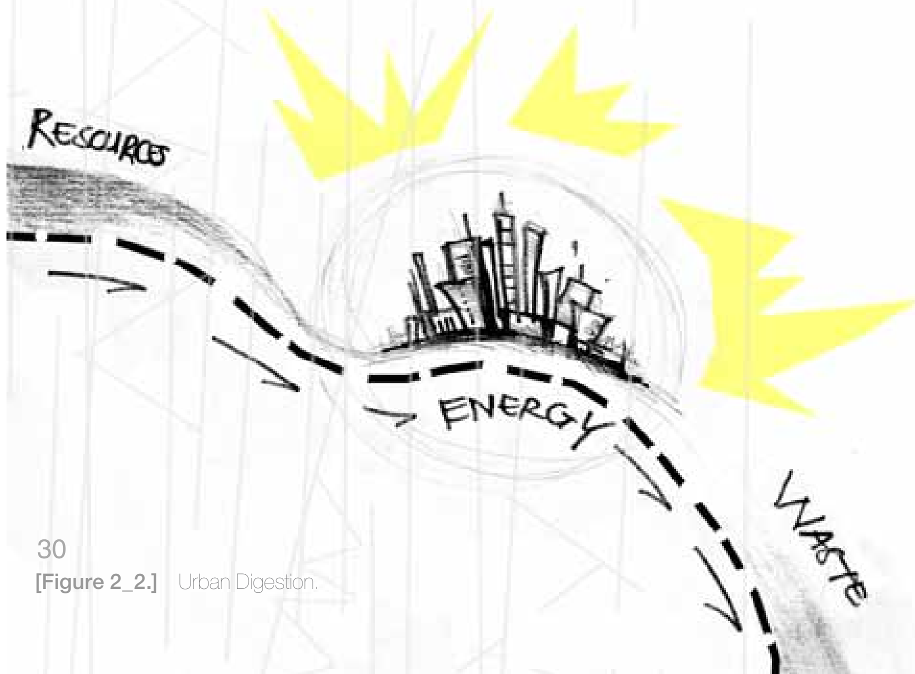
Sustainable urban development is; "a **process of change** in the built environment which fosters economic development while conserving resources and promoting the health of the individual, the community and the ecosystem" (Richardson 1989).

What is a sustainable settlement? Some people say that small European towns in the Middle Ages, or prehistoric hamlets for instance, were 'sustainable'. Both models, however, were based on the same **unsustainable** paradigm: resources were extracted from the environment, while waste was thrown back (fig. 2_2) (Ruano 1998 : 7).

Haughton (1994: 23) states that;

"A sustainable city is "one in which its people and businesses continuously endeavour to improve their natural, built and cultural environments at neighbourhood and regional levels, whilst working in ways which always support the goal of global sustainable development."

Thus the transformation towards a self sustaining city involves creating an urban setting where the resources which the city uses to keep going like fuels, food, water, electricity, communication distributors, transport systems, and even media is **produced by the city itself, used by the city and recycled again.** Therefore the resources cycle through the city instead of sourcing expensive resources with high embodied energy from other far away places outside the city.



[Figure 2_2.] Urban Digestion.

SUSTAINABILITY OF THE BUILT ENVIRONMENT

So what **role** should the built environment play in this? In a global context the built environment is said to be responsible for about **50% of carbon emissions** and 70% if we include transportation associated with mobility within the built environment (Jones 2009 : 1).

One can divide the built environment into three categories; **new buildings, existing buildings and supporting infrastructures** (for transport, water/sewage, waste and energy supply) (fig. 2_3). Probably the easiest sector to deal with first is new buildings. As new buildings are likely to be around for some time it is important that they perform well in relation to CO^2 emissions (Jones 2009 : 2).

Many governments worldwide are developing policies to reduce carbon emissions. In Wales, the regional government has set a target for all new buildings to be **zero carbon** by 2011. The definition of a zero carbon building in its simplest form is that it **has a reduced energy demand for thermal energy and power and that the supply is from renewable energy sources, integrated into the building or nearby.**

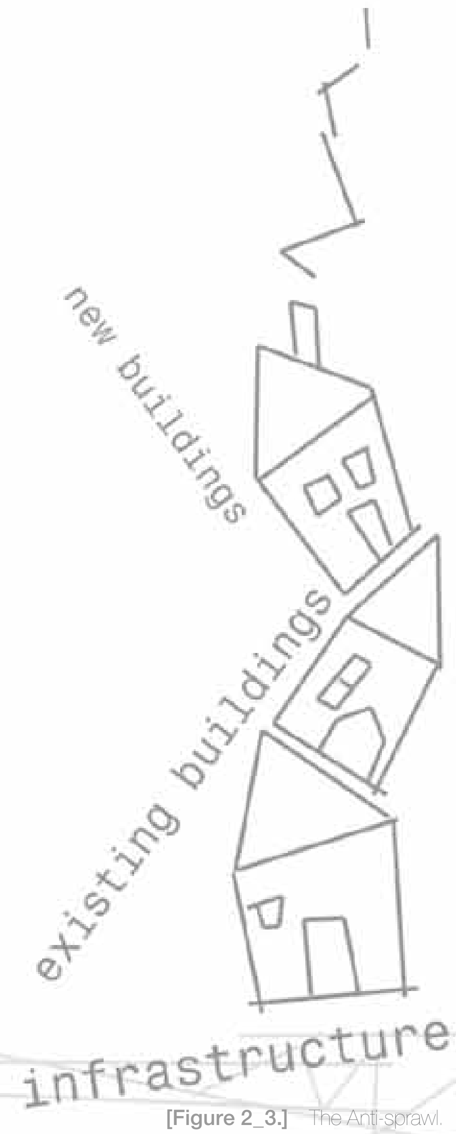
It does not normally mean green energy from large-scale grid supply, such as wind. These integrated renewable energy **systems include solar, thermal, photo voltaic, wind and biomass** (Jones 2009 : 3).

Although attention to new buildings is crucial to a zero carbon future, it is not going to reduce emissions, it will only reduce the rate of increase. The main problem area is the emissions associated with the **existing building stock.** This is **more difficult to deal with** through regulation, especially at urban scale where most emissions occur.

Many buildings are also "hard to treat" in terms of making them more energy efficient and in integrating renewable energy systems. Energy efficiency measures can be applied, but the **cost may be too much for many people.** It is therefore likely that **existing buildings will apply appropriate energy efficiency measures and then their energy supply must be de-carbonised at a community or grid scale** (Jones 2009 : 3).

Our **infrastructures** also have associated emissions, from **transportation, water/sewage and waste.** We must look for **reduced demand** and efficient and effective supply through **local central systems.** However, many of our grid based systems are difficult to change and work in this field may take longer.

We must ensure that when creating master plans for new developments, they should look at carbon emission reductions. **Systems that can be integrated at a reasonable extra cost for significant energy and waste reductions and the utilisation of renewables such as bio-fuels should be incorporated wherever possible** (Jones 2009 : 3).



[Figure 2_3.] The Anti-sprawl.

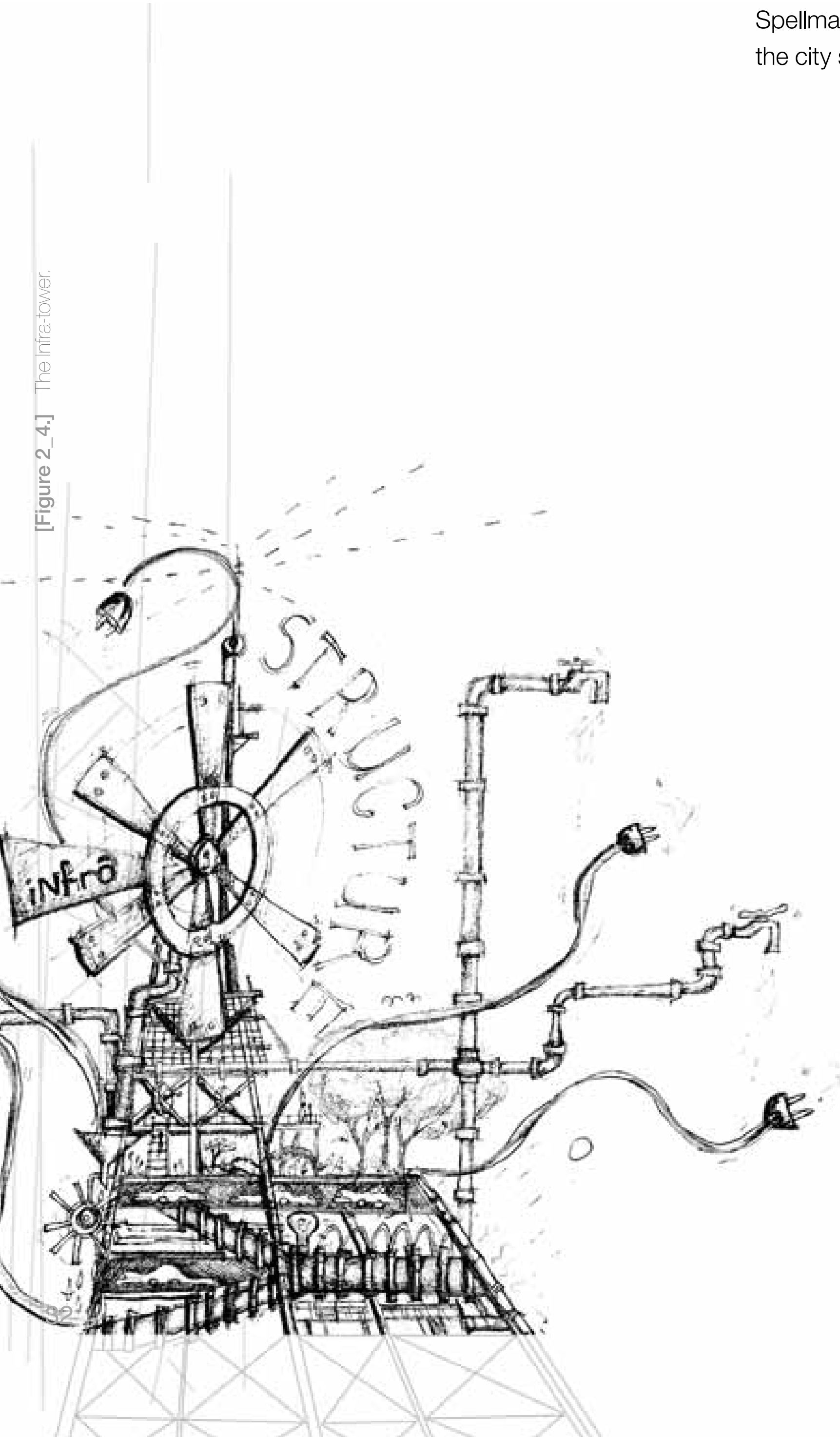
___HOW COULD THIS BE ACHIEVED?

The city should be sustaining its own life. Resources, infrastructure and structures should be serving a **larger contribution to society than just being transportation vessels, shelters and products of demand** – these elements should be used for **reproduction, recycling and interventions of renewal and growth** to save costs on sourcing what the city needs from miles away (Roaf 2005 : 23).

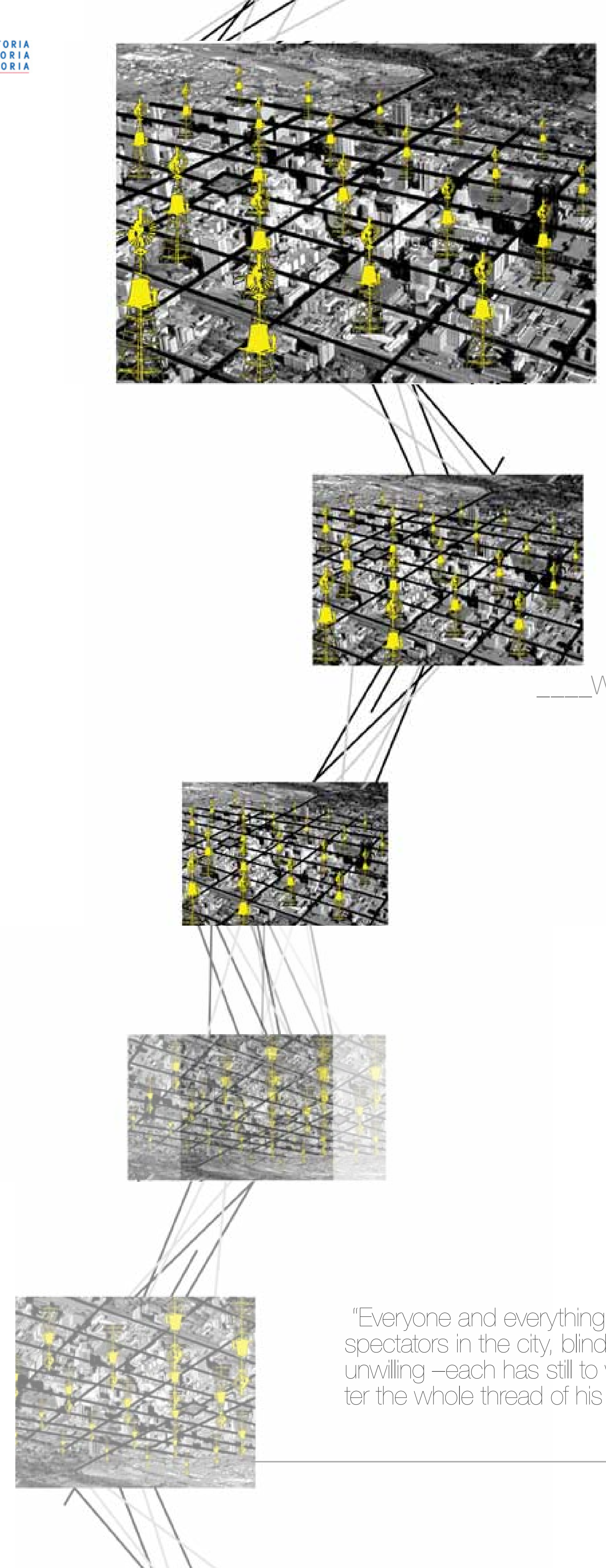
Catherine Spellman, editor of 'Re-envisioning Landscape/ Architecture' states that the very landscape of the urban environment is in actual fact **life sustaining** and that it should not be treated as a two dimensional surface which is lived upon but rather that **landscape is the infrastructure to which all other infrastructures are answerable** (fig. 2_4) (2003 : 66).

Thus the city should be able to harvest and produce its own resources from the **urban landscape** if it is utilised correctly. Spellman is of the opinion that in order for this to be possible the city should be regarded in a different manner, envisioning:

_ **networks** not boundaries
_ **relationships and connections** not isolated objects
_ **interdependence** not independence or dependence
_**natural and social communities** not just individuals
_**transparency or translucency** not opacity
_**flux or flow** not stasis
_**permeability** not walls
_**mobility** not permanence
_**relinquishing control**, not dominating nature
_**catalysts, armatures, frameworks, punctuation marks,** not final products, master plans or utopias (Spellman 2003: 232).



[Figure 2_4.] The infra-tower.

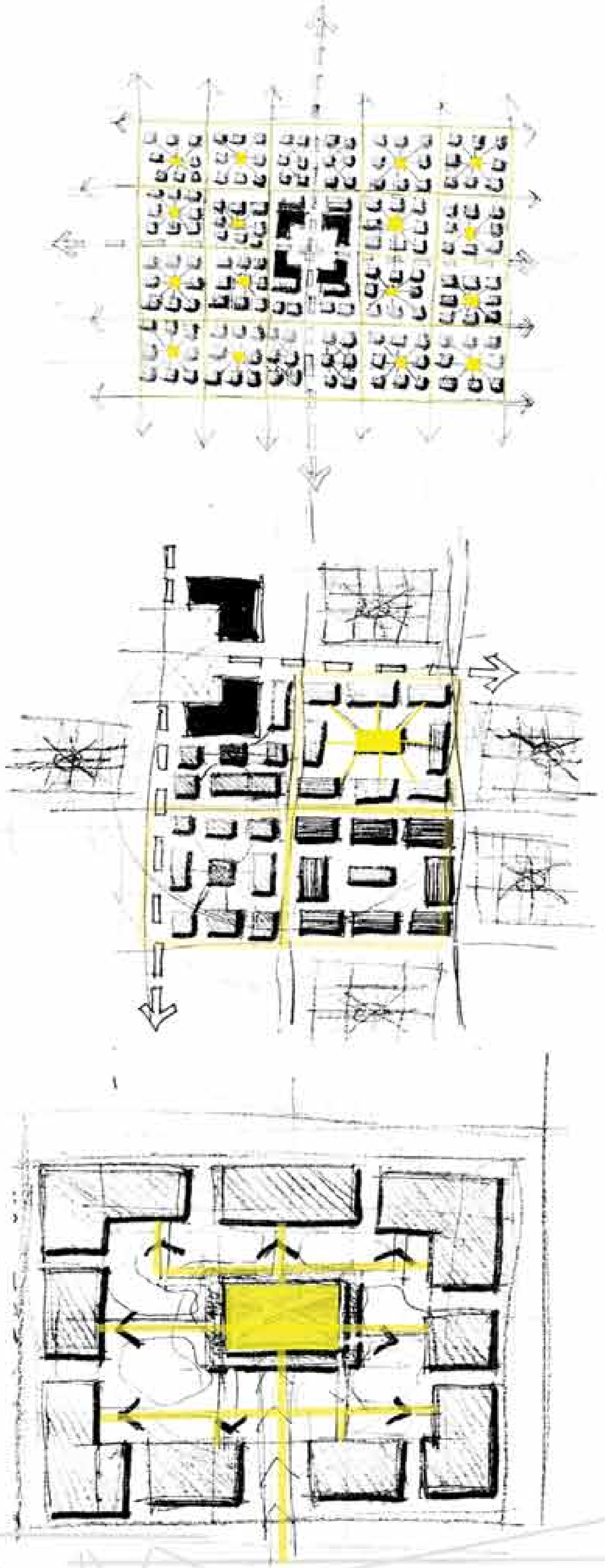


____WHAT SCALES & AREAS WOULD ONE FOCUS ON?

According to Michael Ruano, author of 'Eco Urbanism', the development of multidimensional sustainable human communities happens within harmonious and balanced built environments, by firstly starting to **localise resource use**, we should start looking at what we can **recycle on a local scale** within the city instead of bringing new things from outside the city. This can be approached by recycling resources and applying smaller **systems in smaller areas** which are linked but are on a more practical, manageable and human scale (Ruano 1998: 10).

Part of a sustainable approach is that in the cities, people have to tie together and start functioning as **sustainable communities,** the scale of community formation is governed by **contact,** people join as groups with other people whom they have something in common with (like living in the same area) and even more so if they are familiar to each other (like frequent passersby between buildings and streets) thus a city block can very easily start functioning as a community (Community scale, 2006).

"Everyone and everything is intertwined in the city, there are no more spectators in the city, blind or seeing, inven-tive or unthinking, joyous or unwilling –each has still to weave in, ill or well, and for worse if not for better the whole thread of his life" (Geddes 1968 : xxiv).



[Figure 2_5.] Host Growth. Illustration of how the infratecture is imposed on all city blocks to create a self sustaining city.

____CONCLUSIONS

_Sustainability is urban settlement's fortification tool for future development and survival.

_Sustainability is about a support system between people, resources and the environment.

_Change should start happening on a community scale.

_A sustainable city produces, uses and recycles its own resources.

_New buildings should be zero carbon buildings, thus it has reduced energy demand and uses energy from a renewable source.

_Existing buildings' energy supply need to be de-carbonised at community or grid scale.

_Must reduce demand and have efficient effective supply of infrastructure services(transport, water/sewage and waste) at a local central system scale.

_Infrastructure should be serving renewal and growth and should not just be acting as a vessel of transport, shelter and products of demand.

_The urban landscape should be regarded differently in order to sustain the city.

_Scales of interventions should be tangible, human contact scale.

[2.2] URBAN INFRASTRUCTURE

WHAT IS IT?

Infrastructure is the basic physical and organisational structures needed for the **operation of a society** or enterprise, the **basic, underlying framework or features of a system or organization.** The term typically refers to the technical structures that support a society, such as roads, cables, wires, pipes, bridges, canals, reservoirs and sewers that support economy and society.

Infrastructure development and management are important in urban and rural areas at the **local**, state, regional, national or international levels (University of Colorado, 2000).

From a **sustainability** stance however, the investigation will be limited to those infrastructural services concerned with the **usage and wastage of non-renewable energies** which each respective building needs; **water supply, electricity supply, sanitation services and waste removal, as well as user needs like access, movement systems, social space, legibility and thresholds.**

WHAT IS THE LINK TO SUSTAINABILITY?

From the understanding that our resources are non-renewable the **consumption and production thereof needs to be addressed**, thus **looking at the systems which supply, resource generation and harvesting thereof in order to provide and produce resources in a more sustainable manner** would be good place to start.

The **link between the production, processing, usage and wastage of resources is the infrastructure** which produces and supplies as well as deals with the waste. If one considers infrastructure as the tool which enables consumption, could it not then also be considered as the tool which controls consumption?

WHY SHOULD ONE RE-IMAGINE INFRASTRUCTURE?

Our current infrastructure **needs to change** because it is **not functioning as a sustainable system,** whilst one which relies on a number of **non-renewable energies**. The question is how do we go about this change? It is not sufficient to just change the system of service to meet new criteria, but the **user is free to continue to use and waste as they did before,** disregarding the inevitable crisis.

Thus changing the system in a imaginative manner not only solves the problem, but **captures the attention of the user,** creates an awareness, draws the user in and stirs the way they adapt themselves to these new conditions.

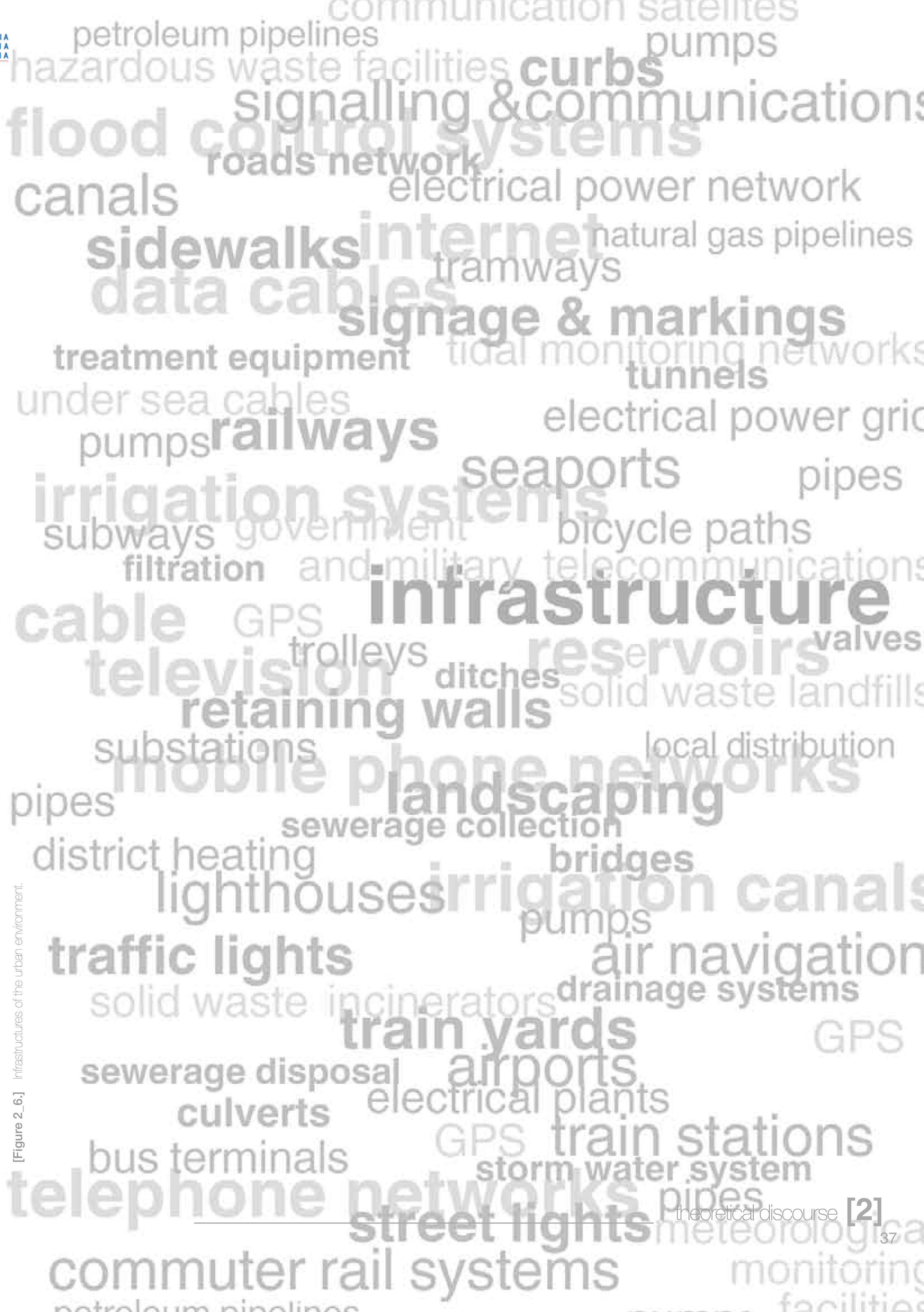
Thus a re-imaginative application of infrastructure has the **potential to bring about behavioural change.** A lot of creative and alternative possibilities are missed because of the **pragmatic engineering of infrastructural design** in the Urban Landscape.

Ecological and functional processes in the urban environment have been separated from design, instead of natural phenomena such as erosion, succession or water cycles being used to generate, the design of the landscape infrastructure has become the negating party. **We need infrastructure that goes beyond technical considerations,** to embrace ecological sustainability and with a **connection to place, context and culture.**

As in most Urban settlements, the infrastructural grid is the **core of the city's shape and space giving elements** and thus the **core of the city's transformation opportunities** of becoming an integrated urban landscape (Waldheim 2006 : 165).

Developing infrastructure's **potential as public spaces**, which carry an aesthetic expression of their own, has plenty of potential to **transform pragmatic necessities into urban amenities**. It is exactly along these margins where public space can unfold its neglected potential as a space of diversity, because public space is a spatial conception, a phantasmagoria, regardless of its functioning as urban public space or public space defined by landscape.

It is **capable of an 'in-between' state, of tolerating a clash** and it provides contemporary urbanism a presence as a fragile state of **superimposition.** The ambiguity of public space between the poles of mobility and locality, and its disability to allocate itself to one or the other, and as well its disability to achieve reconciliation or compensation among the two poles and to escape the 'in-between' state, makes it an archetype for the phantasmagoric view of the 'urban' city (Hauck 2010).



[Figure 2_6.] Infrastructures of the urban environment.

"…urban centres are relative intensifications of processes that stretch across the Earth's surface…"

(Waldheim 2006 : 78)

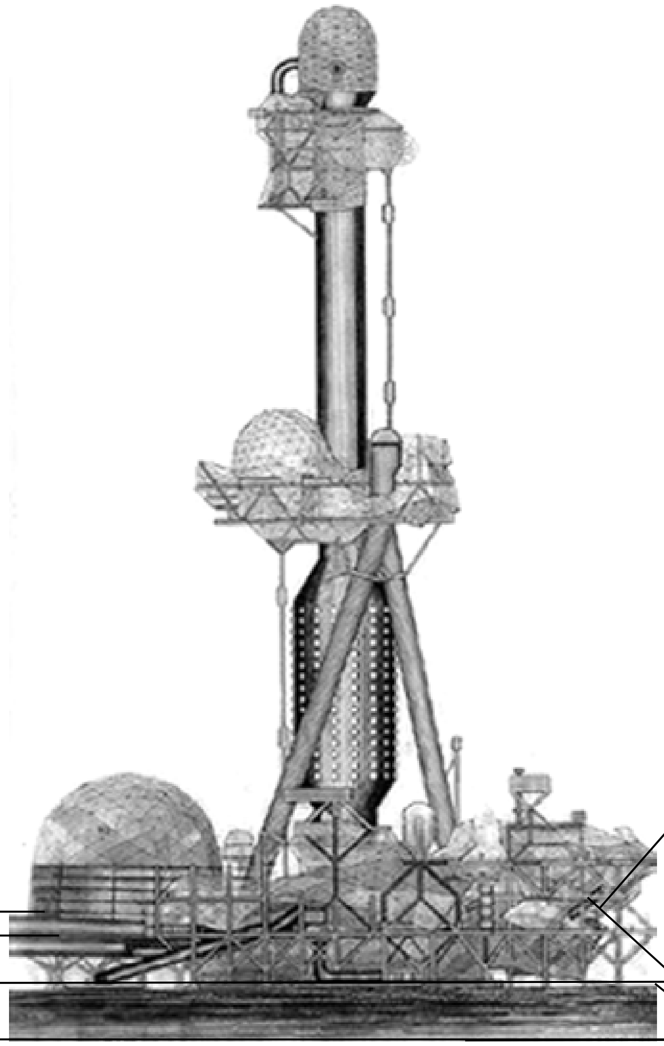
___CONCLUSIONS

_Infrastructure is the basic underlying framework of a system of organization.

_This study will be focused on the infrastructures which create direct links to architecture; water/sewage, waste, electricity and transport.

_Infrastructure is the tool which could control consumption.

_Re-imagining infrastructure has the potential to bring about behavioural change as well as the potential to act as public space in an 'in-between' state.



[Figure 2_7.] Serve City, Archigram,

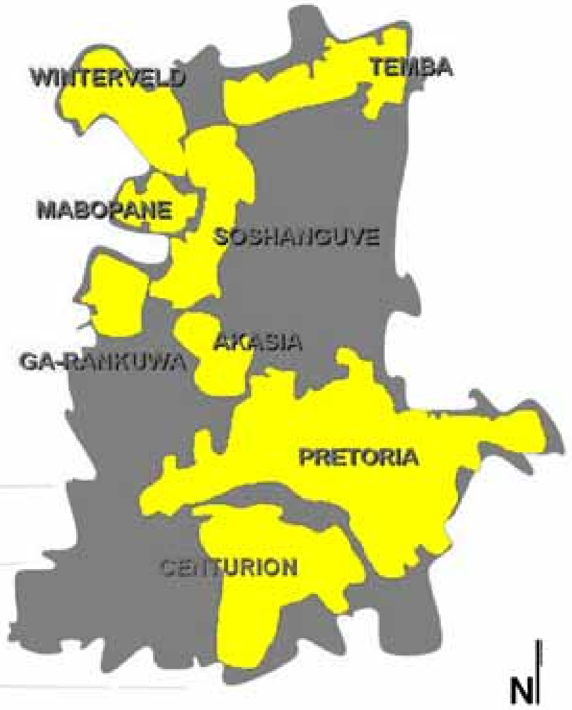
[2.3] ___TSHWANE INFRASTRUCTURE___

HOW DOES THE LOCAL INFRASTRUCTURE CURRENTLY WORK?

Globally vast networks **connect** users in almost every building with more or less **distant** power stations, sewerage works, reservoirs, transport grids and global communication systems. Enormous regional, national and international networks and **powerful institutes have been constructed to suck resources into and extract waste from cities,** and to exchange communication from predominantly urban centres across the world (Graham 2001: 13).

Tshwane Metro Municipality currently serves **2.2 million people** from 76 municipal wards, including Centurion, Crocodile river, Pretoria, Akasia, Soshanguve, Ga-Rankuwa, Mabopane, Winterveld, Temba, Hammanskraal, Mamelodi and Atteridgeville. Municipal services including **health care services, housing, environmental management, public spaces, refuse removal, water treatment, street-scape services, roads, storm water, waste management, agriculture, town planning, water and electricity supply** are offered by the local municipality (Tshwane 2004: 5).

The 'Tshwane State of the Environment Report 2004' declared that population growth and urbanisation can lead to **greater pressure on environmental resources and the capacity of the infrastructural system** (Tshwane 2004 : 13). Research was performed on the current municipal services of **electricity and water supply and sewage and waste removal**, via interviews held with individuals working for Tshwane Metro Municipality in the respective departments. Here follow the findings:



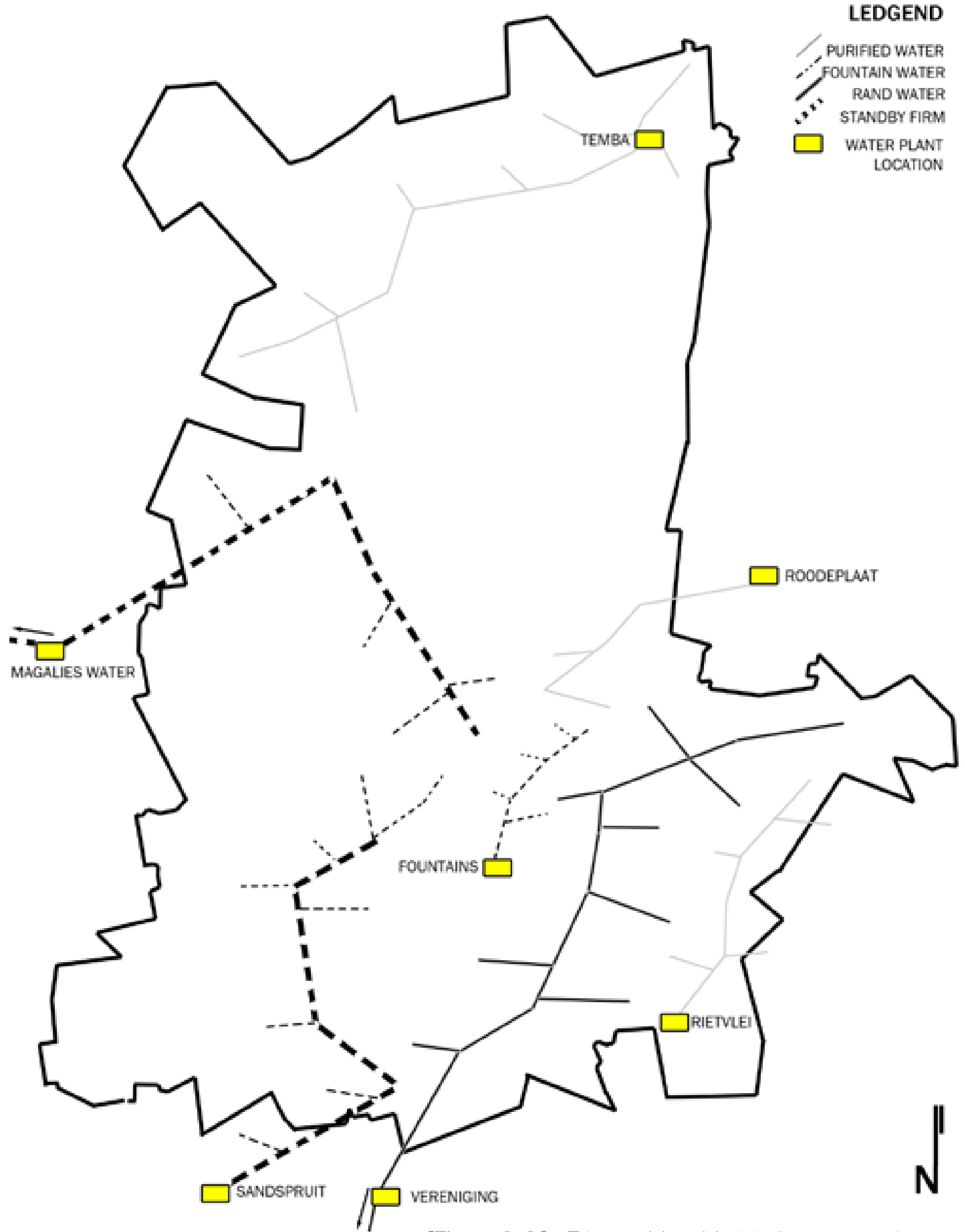
[Figure 2_8.] Tshwane service area.

__WATER SUPPLY

Water demand from especially the residential sector is ever **increasing,** an annual increase of **55%** was recorded in 2003. Water demand projections have been based on the Rand Water historic water demand trend that takes notice of water demand management (Water Situation Assessment Model).

It was estimated that the current demand of 574 Mℓ a day would increase to approximately 800 Mℓ a day by 2020, which represents **an increase of 40%, or an average annual increase of 2,1%** (Tshwane 2004 : 96).

TSHWANE WATER SUPPLY & DISTRIBUTION



[Figure 2_9.] Tshwane Metro Municipality water supply map.

Interview: Mr. Diederick J. Lues, Water conservation Manager, Tshwane Metro Municipality Department of Water Affairs.

1. Where does Tshwane's water come from?

87% comes from Rand Water (Vaal dam)
8% From springs and boreholes
5% from the Rietvlei water treatment plant

There are three boreholes at Fountains Valley which supply part of the 8% water which come from springs and boreholes. Rietvlei dam in combination with Roodeplaat dam and Themba supply purified water via the Rietvlei puricifation plant. Part of the 87% which comes from the Vaaldam is also supported by two standby firms, Magalies Water and Article 21 company, Sandspruit Works, which supply the far North areas of Tshwane with water.

2. Does the water get purified/treated and where?

Rand Water purifies the water from the Vaal dam at Vereeniging. Roodeplaat, Rietvlei and Themba's water is treated at the respective plants. Sandspruit works and Magalies water is purified at source as is the fountains water.

3. What is the cost per unit? What is a unit?

1 unit = 1000 L = R11
Kilo = 1000
Mega = 1000 000
The price works at an increase scale and industrial and residential tariffs differ, in rural areas the 1st 5 kilo liters is free.

INDUSTRIAL	RESIDENTIAL
0 – 10 Kilo Liter = R 9-02	0 – 6 Kilo Liter = R 4-27
10 – 100 Kilo Liter = R 8-55	7 – 12 Kilo Liter = R 6-10
100 - > Kilo Liter = R 7-97	13 - 18 Kilo Liter = R 8-00
	19 - 24 Kilo Liter = R9-25
	25 – 30 Kilo Liter = R10-57
	31 – 42 Kilo Liter = R11-44
	43 – 72 Kilo Liter = R12-24
	72 - > Kilo Liter = R13-10

4. How much water does Tshwane consume per day?

710 Mega liters per day

5. Will our water supply be enough for the next ten years?

It depends on the rain, we cannot predict what the rainfall would be in the next ten years. Right now we have no water restrictions and we purchase 'limitless' supply from Rand Water.

6. Would it impact the department much if more people started to collect and supply their own water?

At the moment the impact is very small, if any, but in the end if less people purchase municipal water it would just mean we have less funding for municipal projects. We do not work for a profit all the money goes into maintenance and projects, so if there is less income we will have less or smaller projects.

7. If all the water in the Vaaldam was finished in ten years, because of population growth and climate change what would the municipality do?

We will try other alternatives, making use of more boreholes, purification of sewerage water like in Namibia and try other sources/ other dams and if it is an immediate crisis we will move large tankers with water into neighbourhoods and people will receive water rations (Lues 2010).

____CONCLUSIONS

_Water demand especially from the residential sector is annually increasing by 2.1% per anum and will be double the current amount in 2020.

_Most (87%) of Tshwane is dependent on water from the Vaal dam.

_Tshwane is currently purchasing 'limitless' water supply and the interviewee has no idea whether the future climatic conditions will cause water shortages.

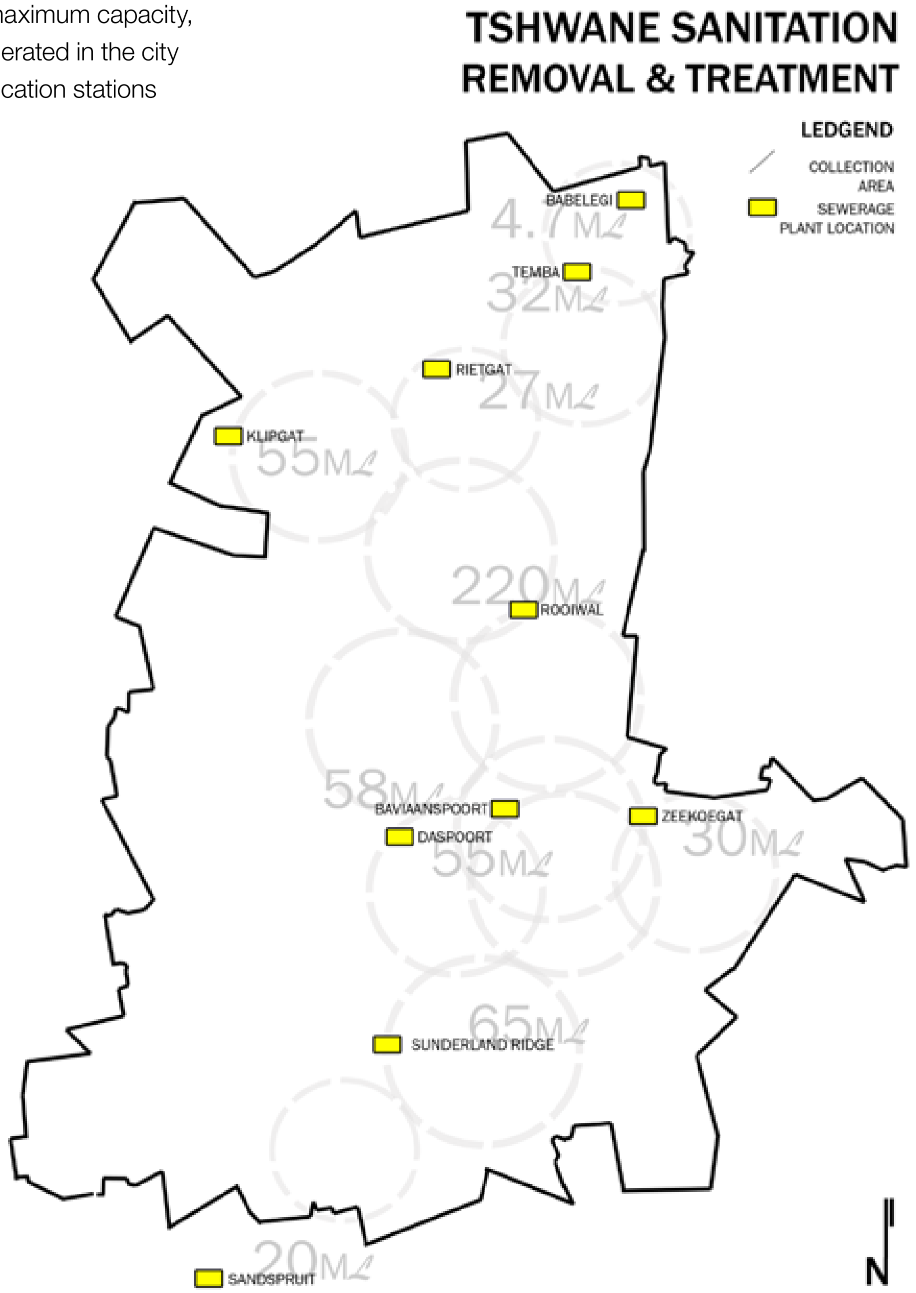
_If more people privately start collecting their own water, the municipality will have less funding for maintenance and projects, thus privatisation in water supply might risk the municipality's ability to maintain the current supply.

_The Department of Water Affairs does not really have a realistic strategy to provide water for the future in case of water shortages.

____SANITATION SERVICES

The waste-water system, similar to the water system, consists of a **bulk system** and an internal system. Both these systems are the property of the CTMM. Waste water is discharged to **ten waste-water care works through approximately 290 km of bulk outfall sewers.** The bulk system is generally in good order with spare capacity available. However, some sections of the system have reached **maximum** capacity and will need to be upgraded soon (Tshwane 2004 : 45).

In the city, there are two purification stations that currently operate above their maximum capacity, namely Sunderland Ridge, with a total of 1,33% above its maximum capacity (about 600 kℓ per day), and Zeekoegat, with a total of 24,33% above its maximum capacity (about 7,3 Mℓ per day). **In total, the city generates 355,9 Mℓ of effluent waste water per day.** Of this, a total of 7,9 Mℓ is above the maximum capacity, which means that 2,22% of the effluent generated in the city is above the maximum capacity of the purification stations (Tshwane 2004 : 45).



[Figure 2_10.] TTshwhane Metro Municipal Sewage service area.
Digital image by Author, 2 April 2010.

Interview: Mrs. Dorcas Monageng, Functional Head, Tshwane Metro Municipality Department of Sanitation Management.

1. Where does Tshwane's sewerage go to?

There are currently 12 sewerage treatment plants which all have different capacity. As new area extensions are built, new sewerage plants are built to serve them:

_Sandspruit	-	20 Mega liters per day
_Klipgat	-	55 Mega liters per day
_Rietgat	-	27 Mega liters per day
_Zeekoegat	-	30 Mega liters per day
_Baviaanspoort	-	58 Mega liters per day
_Rooiwal (3 works)	-	220Mega liters per day
_Sunderland Ridge	-	65 Mega liters per day
_Babelegi	-	4.7 Mega liters per day
_Daspoort	-	55 Mega liters per day
_Temba	-	32 Mega liters per day

2. Does all the sewerage go to sewerage plants?

Yes, there is nowhere else for the sewerage to go, and no other use for it, very few people have French drain systems.

3. What happens to the sewerage at the plants?

We clean the water according to minimum requirements, we take out harmful materials (solids bigger than 25mm) and chemicals and then the water is pumped into the rivers. The solids are dried out and burned in an incinerator, the incinerator uses methane gas which is produced in the anaerobic digesters.

The sludge from the anaerobic digesters is pumped into drying beds where it is left to dry out, the dried out sludge is used by the parks department to make compost for their gardens. The water is sent through a biofilter where organisms digest the organic matter then the micro organisms (harmful bacteria) is killed with either UV or chlorine gas. The water is then clean enough to be received in the public streams.

4. Where does Tshwane's treated water go?

The rivers flow north-west towards the Brits area, the water is not drinkable but not harmful (Monageng 2010).

____CONCLUSIONS

_22% of Tshwane's effluent waste is above maximum capacity, thus the processed waste is either not cleaned properly before being placed into the rivers because it is being rushed through the system, or there is an overflow situation at some of the plants.

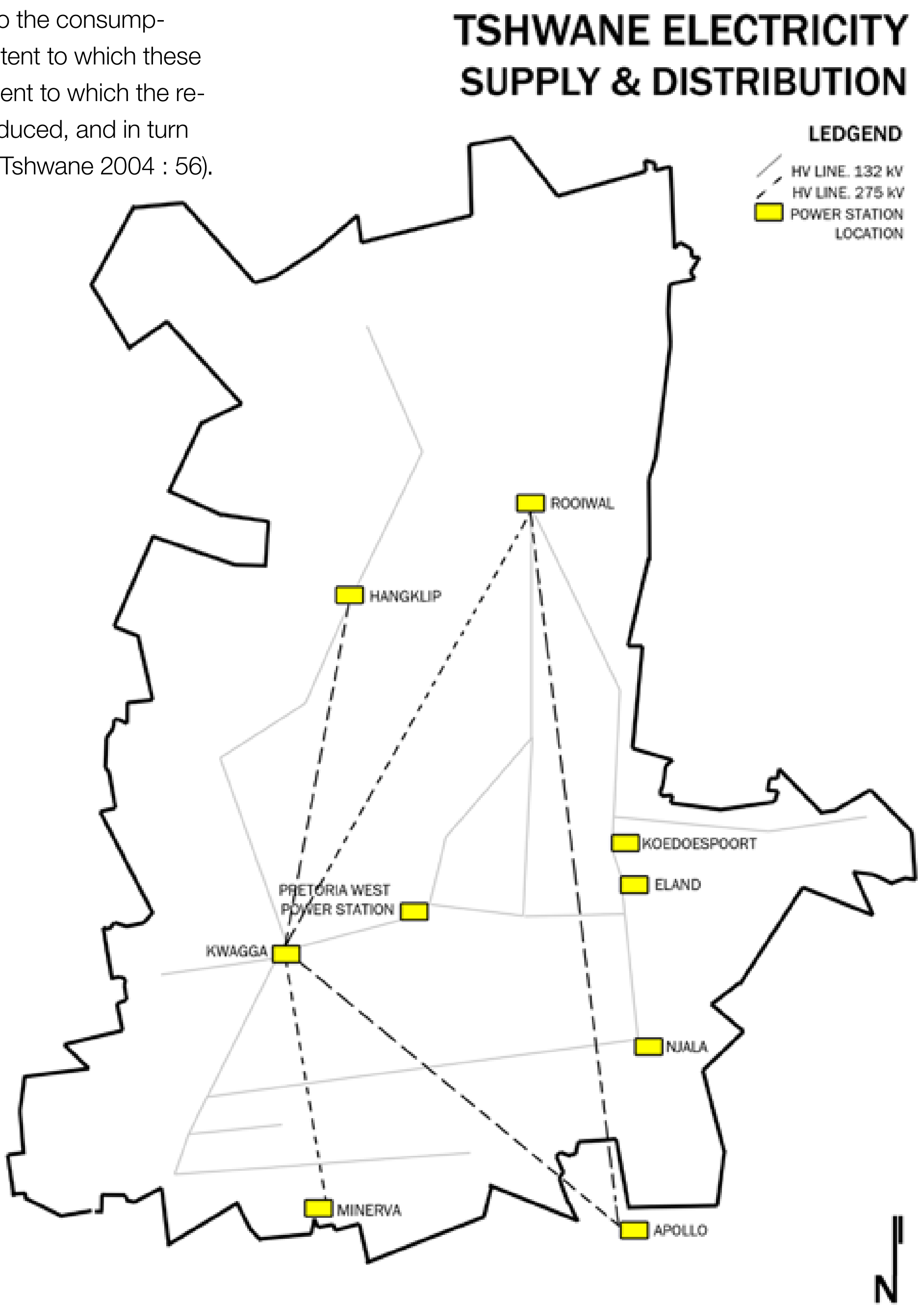
_Purification plants only purifies water to minimum requirements, it is not placed back into the system again, thus the maximum potential of the water is not reached. The water does not reach the user again, the process is stopped halfway through.

_Water from purification plants is placed back into rivers but is not drinkable, thus rivers which feed rural areas are transporting undrinkable water from the cities which can cause health risks.

ENERGY SERVICES

Electricity is the main form of energy used in the Tshwane metropolitan area. The area has a well-defined electricity infrastructure that makes it easy for consumers to use. Legislation prescribes that proclaimed stands must be supplied with electricity service points. Consumers are charged for this service even if they are not connected to it. They can use **another energy source only as a secondary source for heating or cooking.** Electricity is suitable for lighting and electric appliances.

Electricity is sourced from **Eskom and from two power stations** owned by the CTMM. As these two power stations are under the direct control of the Municipality, it can ensure that the generating process adheres to strict environmental standards. During the transfer process from the place where the energy is generated and distributed to the consumption points, **energy losses** occur. The extent to which these losses can be curbed determines the extent to which the required energy to be generated can be reduced, and in turn the negative impact on the environment (Tshwane 2004 : 56).



[Figure 2_11.] Tshwhane Metro Municipal Electrical service area.

Interview: Mr. Willie Naude, Electrical distribution manager, Tshwane Metro Municipality Department of Energy supply and distribution.

1. Where does Tshwane's electricity come from?

Tshwane Metro Municipality purchases electricity from Pretoria West power station, Rooiwal power station, and 3 Eskom import stations; Kwaga, Njala and Koedoespoort stations which respectively receive electricity from Kaborabassa (the hydro electricity plant in Mosambique) which gives electricity to Appolo power station and Appolo gives electricity to Njala power station and Minerva power station gives electricity to the Kwaga plant.

2. How is the electricity made?

The electricity at Kaborabassa is made with hydro electricity technology but all the other plants still burn coal to make electricity.

Electricity is made and put into the main grid at 275 kilovolt (1000 volt), it is then transformed to 132 kilovolt at large substations to be supplied to industrial areas and again transformed by mini substations to smaller grid cyclical systems for residential areas at 11 kilovolt. One 11 kilovolt grid can supply 50 – 60 houses with electricity.

3. How much does the electricity cost per unit? How much is a unit?

I unit = 1 kilowatt hour = R1 (new 2010 tariff)

4. What is Tshwane's daily electricity consumption?

1300 Megawatt

5. If there was a way that Tshwane municipality could supply electricity for smaller areas which can be generated in these areas would this alternative be considered?

No, it would be too expensive and a safety risk (Naude 2010).

CONCLUSIONS

_Energy losses occur during transfer between the place of production and user, thus the less distance between user and source- the less losses will occur.

_Most of the energy supplied to Tshwane is produced with coal, coal is a nonrenewable resource which causes pollution during production and will not be as freely available in the future. Thus we are dependent on a finite system.

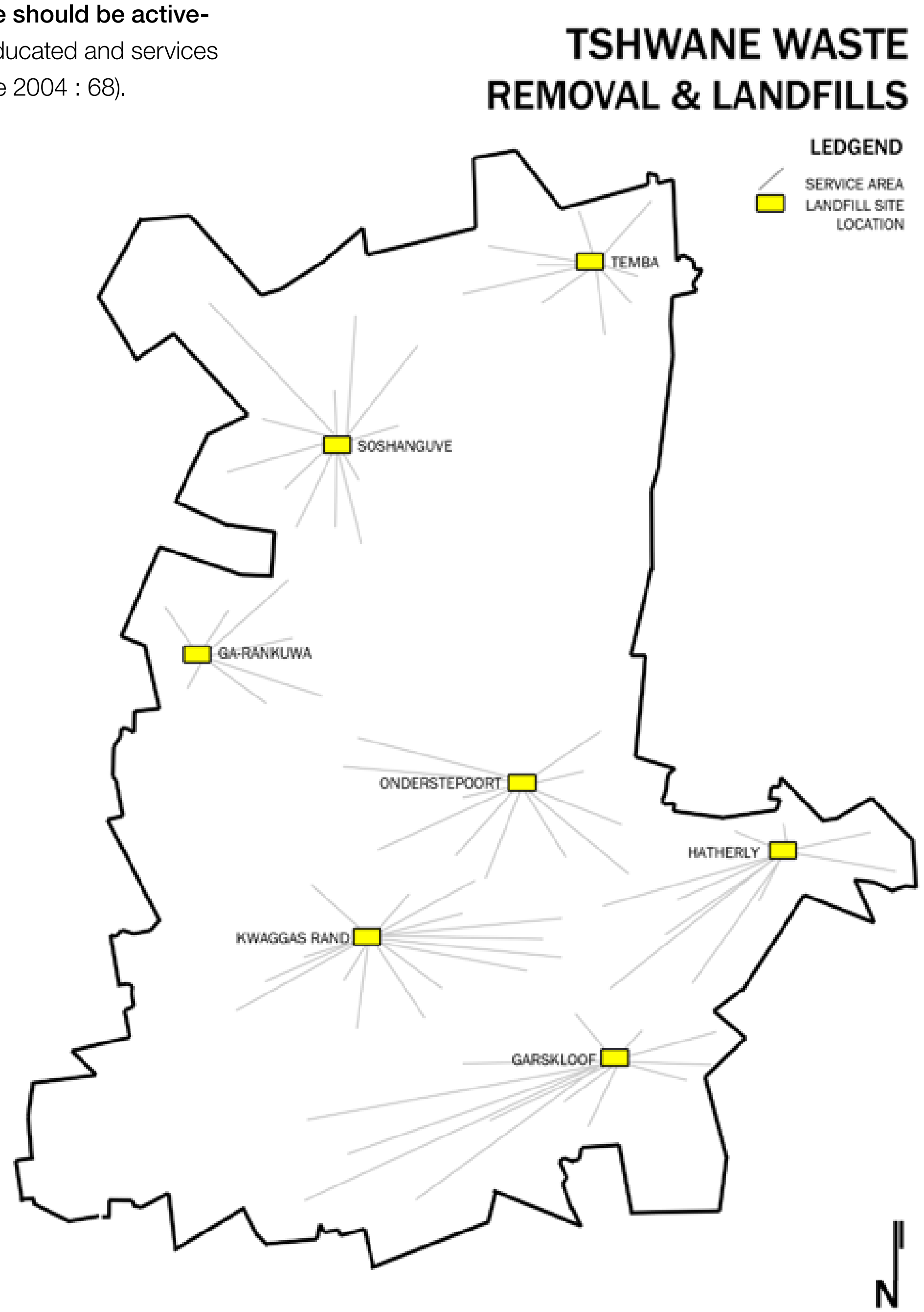
_Smaller electricity supply cycles and generation is seen as a safety risk, thus if energy is generated and supplied within communities there needs to be strict safety precautions and regulations.

_ Tshwane has no current strategy to replace non-renewable resource use to produce energy.

____WASTE REMOVAL SERVICES

Waste disposed of at the CTMM's landfill sites amounts to about 2 242 000 m³ a year. Cover material used amounts to about 559 000 m³. Only 22 387 m³ **(1%) of the waste is being recycled.** Tshwane has 11 landfill sites and a number of garden-refuse sites where **more than a million tons of solid waste is dumped each year.** Inadequate sites in the formerly disadvantaged areas have either been phased out or replaced, or have been extensively upgraded.

The high quantity of waste generated per capita in Tshwane (1, 07 tons per capita per annum) leads to **pressures on water, air and land quality.** (Comparison with other cities/ countries: Thailand (0,23 tons per capita per annum, Singapore 0,7, Suret City in India 0,2 and Ireland 0,57) The problem is further aggravated by extensive illegal dumping and littering. **The principle of reduce/re-use/recycle should be actively promoted.** Communities should be educated and services expanded to un-serviced areas (Tshwane 2004 : 68).



[Figure 2_12.] Tshwhane Metro Municipal Waste removal service area.

Interview: Mr. Frans Dekker

1. Where does Tshwane's waste go?

It is transported daily to either of Tshwane's seven Landfill terrains;

_Kwaggas Rand
_Onderstepoort
_Ga-rankuwa
_Soshanguve
_Temba
_Hatherly
_Garskloof (only garden waste)

2. What do they do with the waste?

There is no specific formal recycle programme, waste gets dumped on specific heaps at the landfill sites, individuals sort through the waste for recyclables before the municipal trucks remove them or just as it gets dumped at the landfill sites. The waste is left to dry out, compacted and then buried on the landfill site.

3. How many trucks go out to collect waste every day?

There are different types of waste collection, there is special order collection which is usually for industries, then there is daily collection at places like restaurants, malls and hospitals and then there is residential waste removal once a week for each area. But our entire fleet consists of about 180 vehicles.

4. How many petrol is used by these trucks per day?

The trucks use about 2.5L per kilometer, and each truck travels about 75km per day so 187.5 L per truck X 180 = 33750 L for the entire fleet per day.

5. If there was a way that waste could be dealt with on site would the municipality consider this alternative?

There is currently already a 'Waste minimization plan' which just needs to be approved and implemented but is taking very long because of political reasons. It is basically based on a recycling system which focuses on 'separation at source'. (Dekker 2010)

____CONCLUSIONS

_Currently 1% of the annual waste is being recycled, thus there is a lot of lost potential in our local landfill sites.

_Bulk waste produced per annum is placing pressure on water, air and land quality, even exceeding amounts which countries like Thailand and Ireland produce.

_180 waste removal vehicles drive around every day using 33 750L of petrol whilst picking up the metro's wastes, thus adding to pollution via the transportation thereof.

_A 'separation at source' recycling strategy is in process of being implemented, thus future change in the waste system will take place in how buildings and collection is currently functioning.

____HOW CAN ONE ALTER THE CURRENT CONDITIONS?

One can investigate the current **production** of resources and try to **make the processes more sustainable:** water purification, sewerage treatment, electricity generation and waste dumps are usually supplied from big industrial plants outside the city. **If the plant operates on a more sustainable manner** (eg. replacing a coal generated electricity plant with a nuclear plant) one could argue that the problem is solved, but the resources then still needs to travel all the way in and out of the city thus still using a lot of energy to reach the user.

Another proposal would be to **adapt the user**, making every individual recycle their waste, collect rain water, cycle and purify sewerage, use methane gas, solar power or little futuristic nuclear power generators and sustain their own needs, but the question would be, would **everyone** do this? **Does everyone have the access to money or technology to do this?** Would you find some opportunist trying to make money out of people by selling off their energy? Even the privatisation of energy and water supply would make it even **more difficult to acquire.** This could cause **economically strong areas** to become little utopias and other **underprivileged areas to struggle just to generate their minimum requirements** and will probably not bother doing anything other with their waste then create their own local dump site. **Retrofitting** every single existing building, putting water tanks and harvesting surfaces for water and solar power on every imaginable surface (something which could look quite horrible but in a few instances has been executed tastefully), maybe even incinerating waste and recycling grey water is a very popular option. This also involves **renovating/altering buildings** for better cross ventilation and natural lighting to **cut back on energy usage,** replacing toilets, shower heads and taps as well to save water.

Although this has already been done to some buildings, it involves a lot of **money** and initiative from the owners of buildings which, if not under law, **might never happen to the majority of existing buildings.** This is currently our most **realistic** approach towards making buildings more sustainable and, while it is a very isolated solution focused on making **individual** buildings sustainable within an **unsustainable urban landscape – this is what current technology allows**. Again privatised buildings are upgraded as 'sustainable' and the rest is left to depend on the inevitable diminishing resource services.

Then there is the option to **bring the cycle to the site**, to divide the overall production, harvesting and treatment system into **smaller systems.** Numerous smaller systems which are linked to neighbouring systems provides more manageable almost object-like scale systems which decreases the stress on a giant overall system and also reduces the consequences of malfunctioning (Marley 2003). Instead of being dependant on a distant system core which functions as a massive centralised system, **smaller localized on site infrastructural systems** are applied to serve the buildings. A centralised system cannot adapt to the smaller scale changes in the city but smaller systems **allow flexibility,** adaptability and growth more easily.

We can divide the city into smaller quadrants which can function with smaller systems of which some are connected to the whole while others serve smaller areas and systems. Thus resources can be recycled to create 'mini-Infrastructure'. Within these divisions, areas can be grouped together to be connected to a **'host'** which can be conceptualised as a 'Supplementary Infrastructural' building designed to accommodate the specific area's current and future resource needs.

____CONCLUSIONS

_The production method and choice of resources could be changed towards more sustainable means.

_One could downscale the cycle to such extent that every individual is responsible for the production and gathering of their own resources.

_Every single building could be retrofitted and renovated if we have the available funds.

_One could bring resource generation to the site.

[Figure 2_13.] TRetro-fitting Pretoria towards sustainability

[2.4] INFRASTRUCTURE ARCHITECTURE

WHAT IS THE ROLE OF INFRASTRUCTURE REGARDING ARCHITECTURE?

Architecture and infrastructure are **codependent**. Architecture cannot exist without infrastructure and infrastructure would not exist without architecture. Infrastructural veins stretches across the globe to serve cities where population demand pulls resources from far away to sustain the urban fabric.

As densities grow, the **urban footprint expands** and infrastructure follows. When addressing the sustainability of the existing fabric and re-imagining the **relationship** between architecture and infrastructure, which currently is not a very sustainable liaison, one first needs to understand the relationship between architecture and infrastructure.

Infrastructure can be seen as the way in which architecture **connects** to the resources, systems, economies and ecologies around it. According to Jacob, contemporary architecture is like an iceberg. That's to say most of it is **hidden below** a datum. Below this, there is a mass of stuff that **keeps the visible peak afloat.** The invisible part of this iceberg-architecture-metaphor - by far the largest - is a strange mixture of the practical and the conceptual. Down here is a **submerged structure,** a kind of armature of engineering and culture that gives architecture its **shape.**

Like a patient on a life support machine, architecture is **sustained** by the wires and tubes that are plugged into it. But where one stops and the other starts is increasingly difficult to determine. **Infrastructure and architecture bleed into one another** (Jacob 2009).

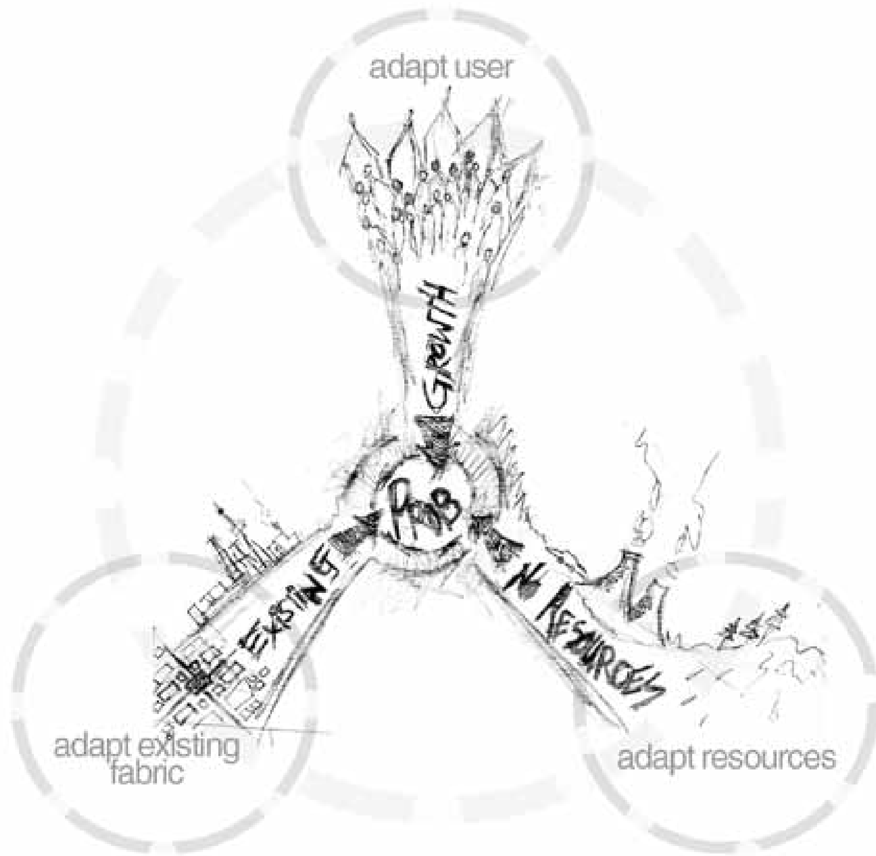
[Figure 2_14.] Deep Machine

HOW CAN THE RELATIONSHIP BETWEEN INFRASTRUCTURE AND ARCHITECTURE BE ALTERED TOWARDS MORE SUSTAINABLE MEANS?

From a sustainable approach we endeavour to meet means with needs, thus the possibility and opportunity of not just a new space (if needed) with the help of the system would eliminate the need to go and construct a new separate space as well. Dealing with infrastructural spaces in an urban context always has to involve dealing with their perimeters as well. Infrastructures, with the political-technical aim of supplying energy, resources, access and mobility to a certain space, do not structure it evenly, but create **spaces of centrality** and subsequently spaces that have a more lateral character.

If the margins of these political-technically conceived space configurations are permeable and accessible – hence they allow a public acquisition of the commodities or services the infrastructural space is supplying – they generate public spaces and activate spaces **in-between** the infrastructural component and its environment. This adds to the **economic sustainability** of a project, saving cost and construction material and energy by building one project instead of two.

Thus architecture cannot just remain architecture and infrastructure cannot just remain infrastructure. The systems of space, energy, movement and support becomes **shared facilities which supports and complements each other.** Why should we create a wall and place energy inside if we could have an energy wall? Why should we have a tank in the ground if the grid could be the tank? The **weave of systems into architecture** can take up a whole new meaning.



[Figure 2_15.] System cycling and connecting

Second, altering architecture so that it does not **need** as much resources as it normally demands from infrastructure - this implies how much it uses, what and how it uses it. By changing the way resources which infrastructure supplies to architecture is **generated**, more sustainable means can also be achieved through minimising the amount of energy used and pollution caused. Then also changing the non-renewable resources **to renewable resources which can be recycled on site or even within architecture** would make an enormous difference. Supporting **community sustainability** by promoting **interdependence, shared facilities and creating small scale centralised facilities within the architectural realm.**

HOW DOES ONE APPROPRIATELY TRANSLATE INFRASTRUCTURAL SYSTEMS INTO ARCHITECTURE?

Infrastructure is **absent** from architectural representations in the urban context and architectural media. In its planning, it tends to be **hidden** below ground, behind earthworks, walls and fences. It is discreetly routed to **minimise its visual presence** in the landscape. Infrastructure acts as a kind of uninhibited version of architecture - uncivilised, unsocialised, inarticulate, yet driven with a primal urge to **create structures of unprecedented scale** and ambition. It realises the most extreme architectural fantasies that our conscious thinking would not permit (Hauck 2009).

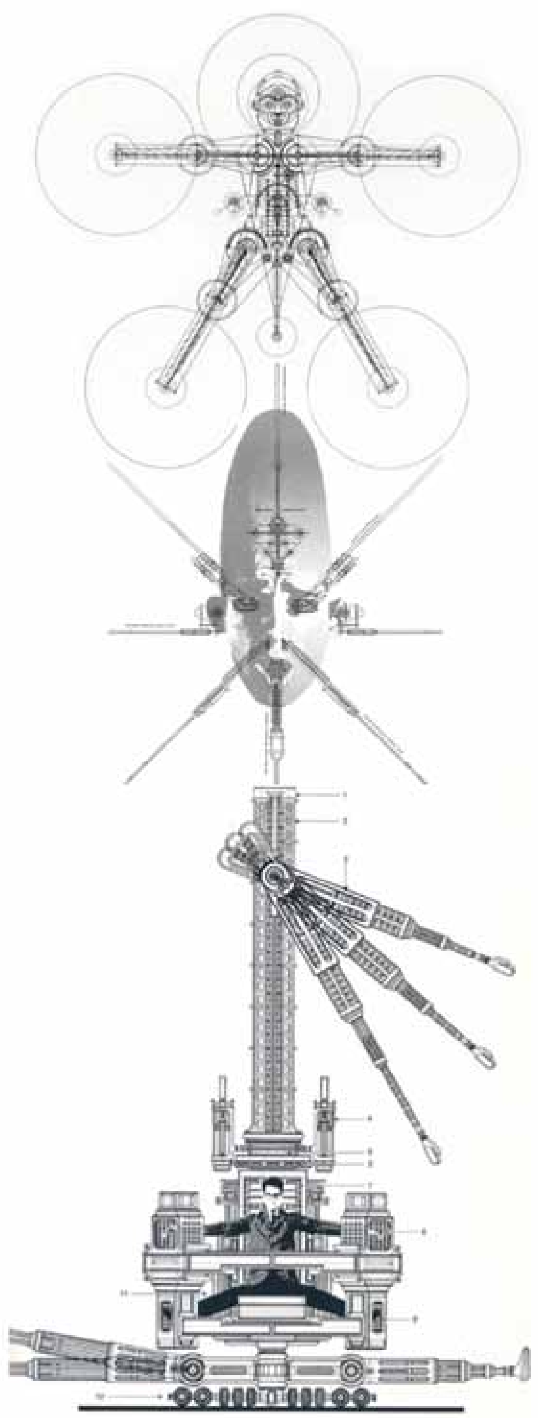
High Tech architecture applied the **aesthetic of infrastructure to architecture** and it grew out of a set of ideas explored by Reyner Banham which argued for an architecture of **mechanic qualities** - exemplified by gadgets and gismos - in 'Architecture of the Second Machine Age'. Inspired by the industrial revolution, these ideas provided the structure that **Archigram** later carried on in their visions of ultra **mechanised environmental architecture**, and these in turn led to the imagery of engineering and infrastructure becoming part of architectural language. But the process of aestheticisation sheds the real **significance** of infrastructural networks. If we were to reassess a contemporary relationship between architecture and infrastructure, we might set out in the opposite direction. Rather than import the aesthetics of machine/ infrastructure to architecture, we might **export architectural thinking to infrastructure** (Jacob 2009).

Marshal McLuhan suggested that we might understand media infrastructure as an **extension of our bodily selves.** He suggested, for example, that communication technologies are extensions of our own nervous systems - that radio is an extension of our hearing, TV an extension of our vision. If McLuhan is right, perhaps all infrastructure might be thought of as an extension of our bodily make up. Hauck states that **perhaps these networks of pipes and cables are a mapping of our own biology onto geology - a globally scaled anthropomorphic projection** (Hauck 2009).

In this way, we could imagine the Pompidou or Lloyds buildings unravelled and **strung out across the ground,** into trenches below the sea, across borders and linking continents. But imagine not just their physical fabric but their **culture and extended architectural heritage** wrapped up in these buildings forming a linear construction that strings out a narrative of abstract ideas over topography, across borders and through regions: Rogers, Archigram, Banham, Pevsner, the Bauhaus, Arts and Crafts and so on in mile after mile of unwound architectural ideology as infrastructure (Jacob 2009). **Consolidating, recontextualising and expanding the cultural under standing of infrastructure is more than appropriate in an age of mega-projects.**

When envisioning these infrastructural systems as architecture, one should note that we have gone beyond the paradigm when the **boundaries of architecture, and architectural thinking, stop at the building skin.** Design thinking comprises far more than the accommodation of function or even the skilful manipulation of data: it encompasses the **ability to be visionary and to contribute to urban livability**, especially through the creation of a new generation of public works.

Thus the system does not work from the outside in, the system physically is the outside and the inside. A new urbanist theory termed 'Landscape Urbanism' argues that landscape, rather than architecture, is more capable of organizing the city and enhancing the urban experience. The theory states that the 'landscape' consists of a series of man made and natural systems and networks which stretches across the globe. The Urban Landscape is an intersection point where a concentration of these systems and networks occur, it consists of physical and metaphysical 'structures' as well as the actions, spaces and rituals for which they are built to serve within the 'Scape' (Waldheim 2006: 40).



[Figure 2_16.] TFrançois Dallegret, Cosmic Opera Suit ,1962.

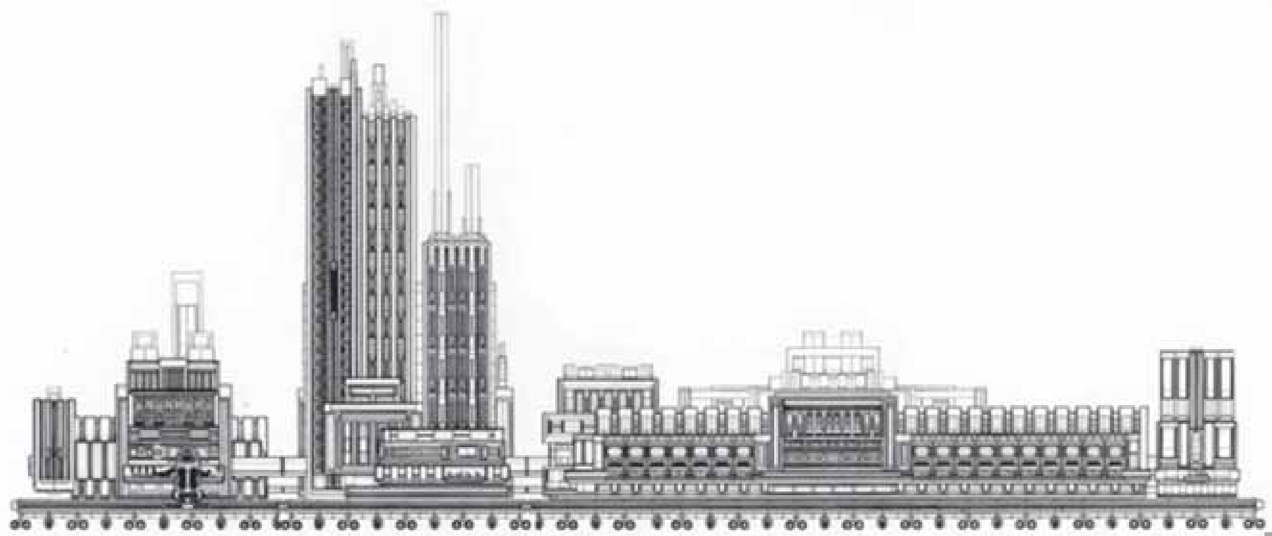
_____WHAT IS SYSTEMS ARCHITECTURE?

"A systems architecture is the conceptual design that defines the structure and/or behaviour of a system. An architecture description is a formal description of a system, organized in a way that supports reasoning about the structural properties of the system. It defines the system components or building blocks and provides a plan from which products can be procured, and systems developed, that will work together to implement the overall system". (Marley 2003)

No generally established definition of which aspects constitute a system architecture, exists. Various groups define it in different ways, including:

_ The **basic organization** of a system, represented in its **components**, their relationships to each other and the environment, and the ideologies governing its design and development.
_ It is a combination of the design architectures with **resources** and their life cycle processes.
_ An interpretation of a system in which there is a **mapping of functionality onto surfaces** (the spatial values) and the functional values onto components, a mapping of the software architecture onto the hardware architecture.
_ An assigned **arrangement** of physical elements which provides the design solution for a consumer resource or life-cycle process intended to satisfy the prerequisites of the functional architecture (Marley 2003).

"Systems architecture can best be thought of as a representation of an existent (or to be created) system, and the process and discipline for effectively implementing the design(s) for such a system" (Marley 2003).



[Figure 2_17.] François Dallegret, Relation-public-omatic,1963.

____CONCLUSIONS

_A system needs to be organised in a certain practical manner which gives a set of restrictions, structure or structura properties to the architecture.

_When a system has been laid out, it provides a plan from which development can sprout in numerous determined locations.

_The system deals with components, resources and characters which has specific life cycles which needs to enter and exit, and in some instances, re-enter.

_Human interaction takes place with these systems because of its relationship with architecture.

_A system is arranged to satisfy the function of the architecture.

_The system produces the architecture whilst the architecture justifies the system's presence.

_Numerous smaller systems which are linked to neighbouring systems provide more manageable almost object-like scale systems which decreases the stress on a giant overall system and also reduces the consequences of malfunctioning.

[Figure 2_18.] Feats

____[2.5]____CHAPTER CONCLUSION

SEWING THE BITS TOGETHER

The aim of the project is to **create a host structure which serves the existing urban fabric** as an infrastructure of place, space, resources and services. Ultimately the host should contribute to the perpetual life and quality of the area in order to create a sustainable community and built environment.

In order to achieve a sustainable project, a support system between people, resources and the built environment should be established. This can be achieved by **using the built environment to 'generate' resources** for the community whilst serving as a public entity on an everyday based human scale.

To start off, the foundation of the project is infrastructure. Infrastructure is defined as the basic underlying framework of a system of organization. **Thus it is necessary to plan and calculate the required infrastructural systems' layout and design so that this can serve as the plan structure from which the rest of the project can grow.**

For the host structure to function optimally, it is placed in an 'in-between' condition in a block core in order to reach all the involved user buildings efficiently. As stated, this should be an imaginative endeavour which serves the block as public space and brings about behavioural change.

After investigating the current municipal services system, the following should be considered:

_ On-site **water harvesting should be implemented** for use. The local municipality has no backup plan for future water shortages.

_ As many of the municipal sewage purification plants are currently over their daily capacity it would be better to **treat sewage on site.**

_ Because the municipal electricity is produced with non-renewable resources and energy losses do occur during transferral, it would be better to **generate electricity on site with the help of renewable resources.**

_ It is already encouraged by Tshwane Metro Municipality that waste should be recycled and processed on-site. Thus **generating, recycling and digestive systems integrated with the design is required.**

The organizational system of infrastructure creates the architecture whilst the architecture justifies the system's presence. The building as an infrastructure serves as an extension of the landscape and thus an extension of the public realm.

investigating layers______[3]_________________[Contextualizing]______

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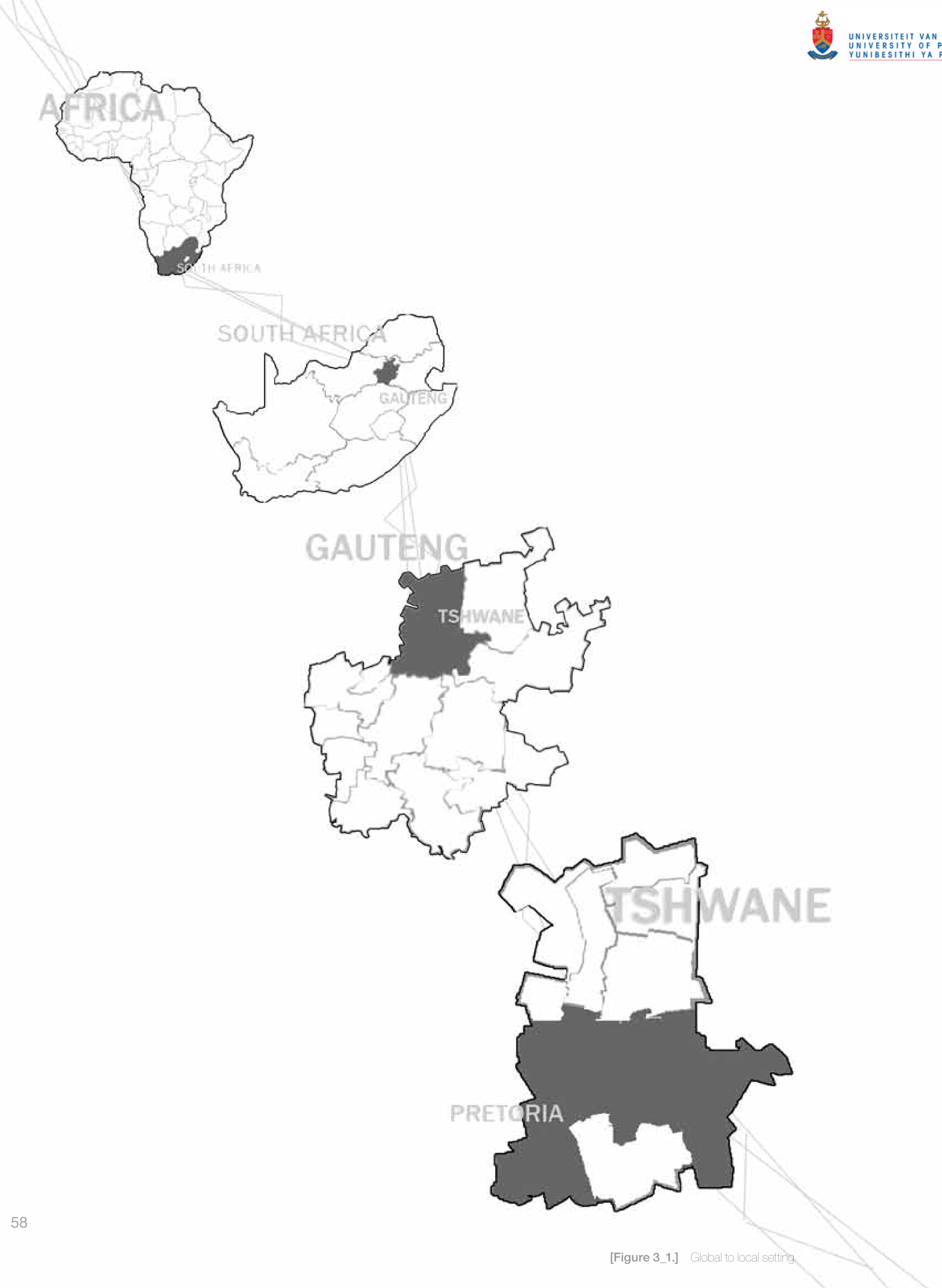


[Figure 3_1.] Global to local setting

[3.1] SITE SELECTION

METHOD

The site was selected through a method of mapping certain criteria within the Pretoria **CBD.** The resultant information was then layered to determine where an optimal location for the project would be.

Although this is only a method to choose a site for this specific intervention, the initiative should be able to be implemented on any urban site. The **site as a whole is regarded as the problem area** and will be integrated with the intervention.

FOCUS

As the argument states, the focus is on aged, existing urban fabric which was not necessarily built with sustainability in mind. Thus in order to validate the experimental context of the intervention, four conditions were selected as **layers of complexity encompassing a 'typical' urban setting** . These four conditions are:

_Area classified as **opportunity and risk** area.
_**High density** built up area.
_**Aged fabric,** built prior to 2000.
_Diversity in block programme and users.

CONDITION MAPPING

CBD :

The Pretoria CBD is chosen as focus area because of several conditions which occur within this dense environment, most of the **energy supplied to Tshwane** is used by the city core because of the **density** (Ruano 1998 : 7), it is predicted that the current density will **double in ten years time** (Tshwane municipality 2009) thus the CBD's energy usage will double.

A city block:

When arguing that more **local smaller systems** is 'the way to go', a **sustainable scale** should be questioned to set parameters to the choice of site and intervention. As the argument states, it goes against the principles of a sustainable approach to harvest and produce resources **far-away** and then use a lot of energy to transport them over large distances to reach the user. Thus the smaller the distance, the smaller the cycle, the less obstructions, the better the efficiency.

The ideal would be if the intervention could be in **direct contact** with each building it serves for **maximum efficiency** (Marley 2003). Thus placing an intervention **in-between** a number of buildings which it supports would amount to a city block scale (or at least a portion thereof). In the Pretoria CBD the city blocks are **large** (240m x 150m) compared to the Johannesburg CBD (150m x 150m) which makes it more difficult to deal with the overall size and capacity of the block.

Another issue which should be considered is that part of a sustainable approach is that people in cities have to tie together and start functioning as **sustainable communities**. The scale of community formation is governed by **contact**, people join together as groups with other people whom they have something in common with (e.g. living in the same area) and even more so if they are familiar to each other (like **frequent passersby between buildings** and streets). A city block can thus easily start functioning as a community (Community scale, 2006).

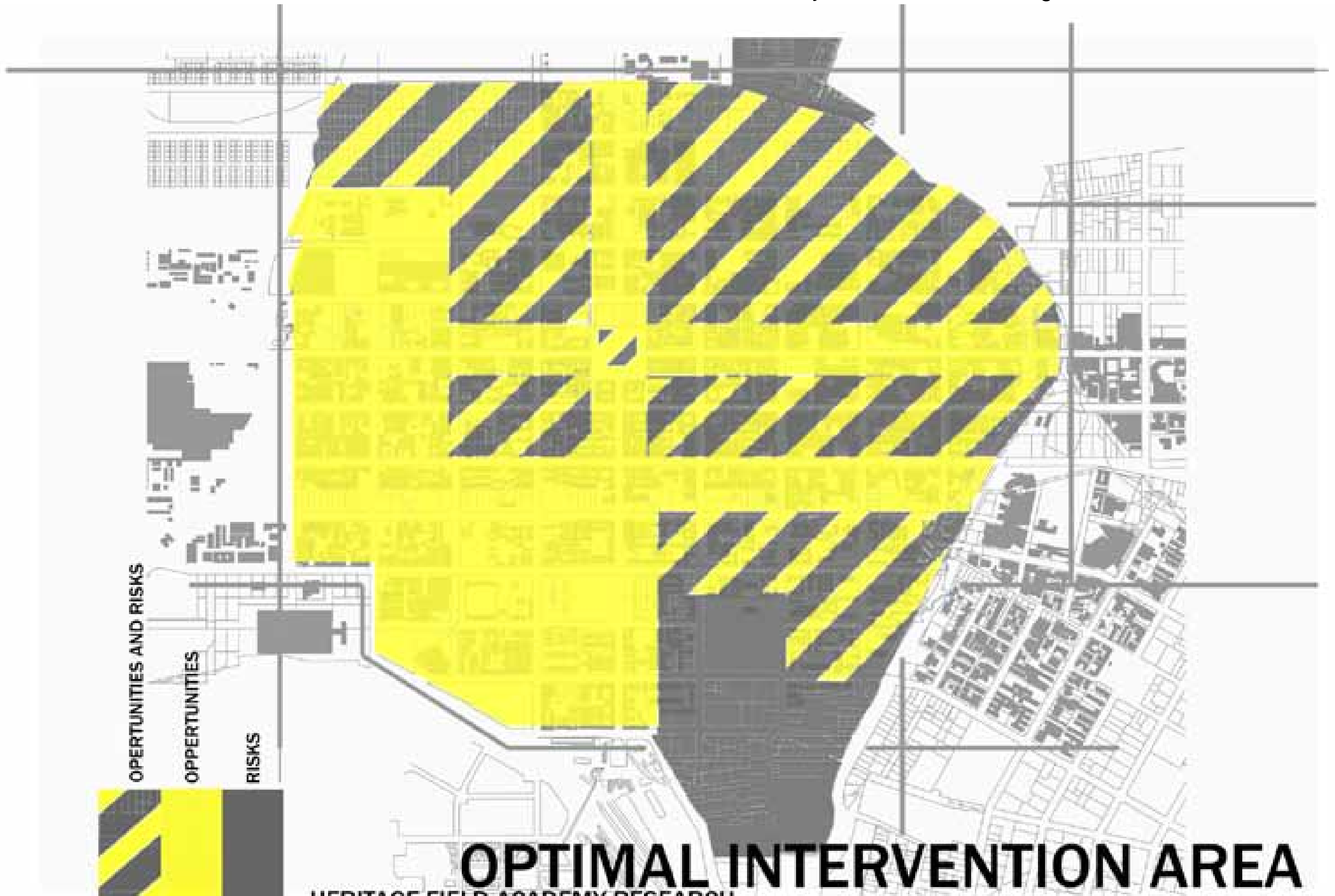
A city block would also be able to have a **high enough density** to justify the construction of the proposed intervention which on a smaller scale might be unfeasible and on a larger scale difficult to meet the demands of the high amount of users.

'Opportunity and risk' area:

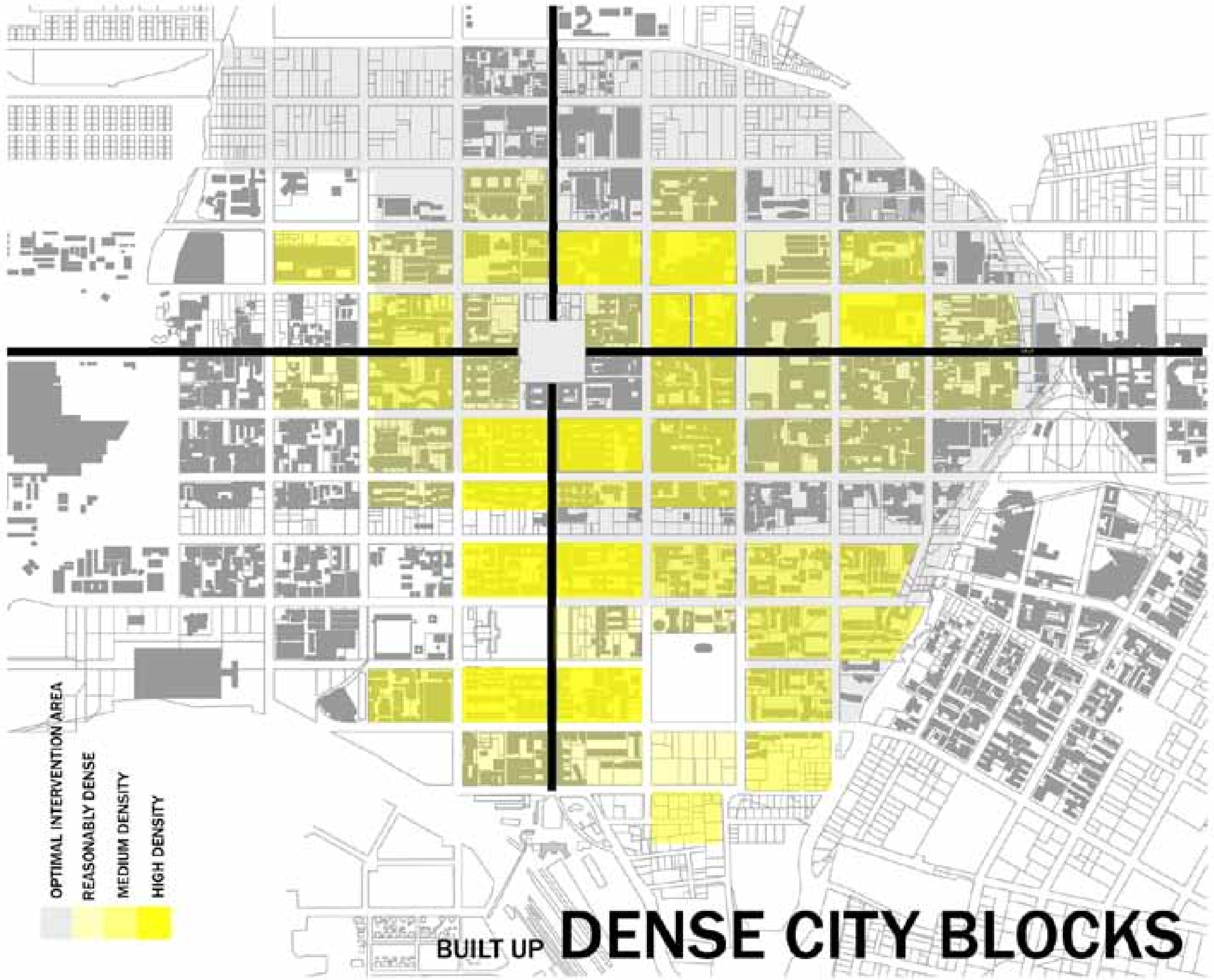
In 2009 a group of architecture students from the University of Pretoria did an in-depth investigation of the Pretoria CBD as part of a **'Heritage field Academy project'** (University of Pretoria 2009) in partnership with the University of Delft. During this investigation a SWOT (strengths, weaknesses, opportunities and threats) analysis of the CBD concluded that are three distinct areas within the Pretoria CBD namely:

- **_areas of opportunity**
- **_areas of risk**
- **_areas of risk and opportunity**

The area of 'Risk and Opportunity' (fig. 3_2) was chosen as the focus area for site selection as this would be an area rich with diversity, contrast and challenges.



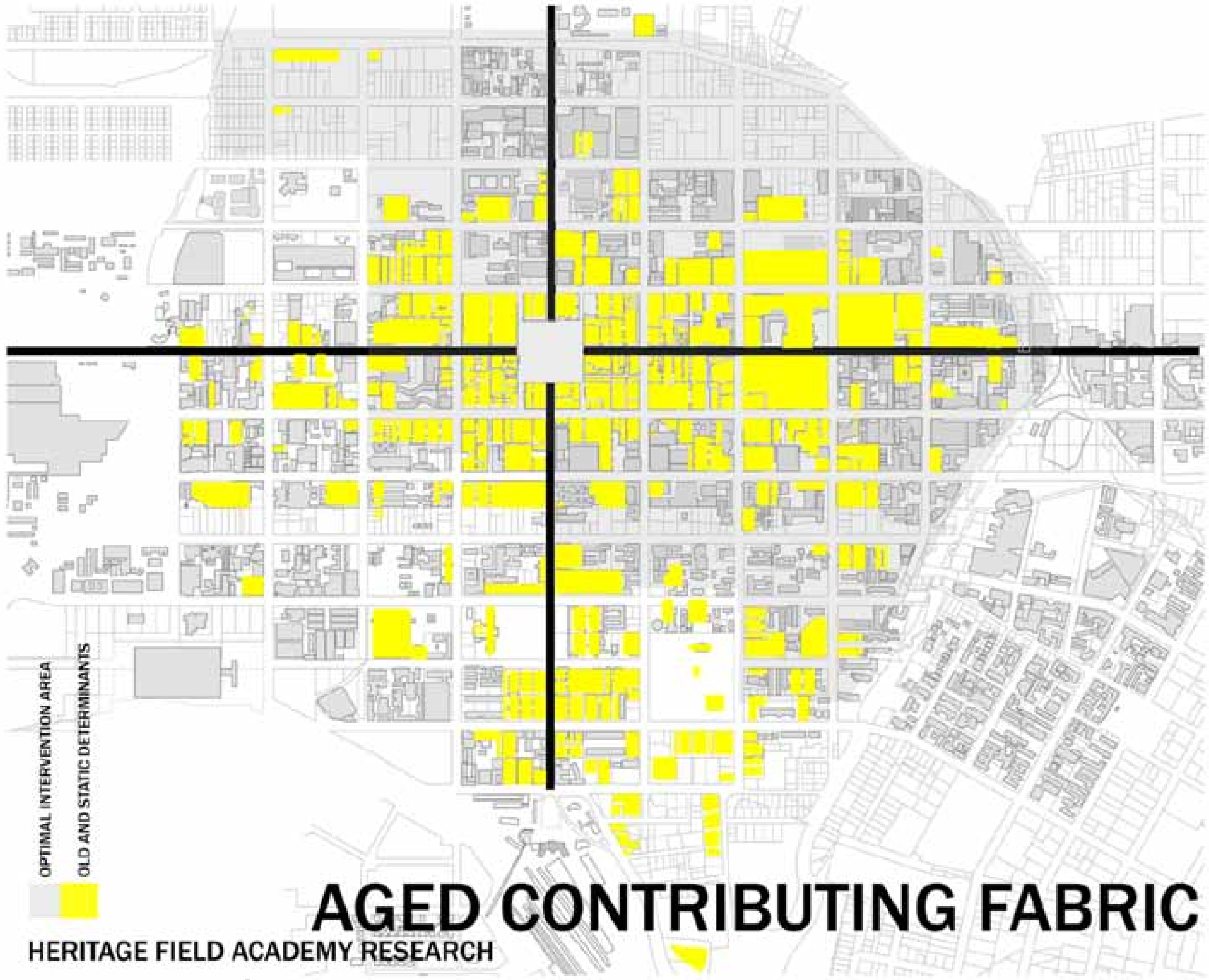
[Figure 3_2.] Optimal intervention area - Heritage Field Academy



[Figure 3_3.] Densely built up fabric.

High density urban fabric:

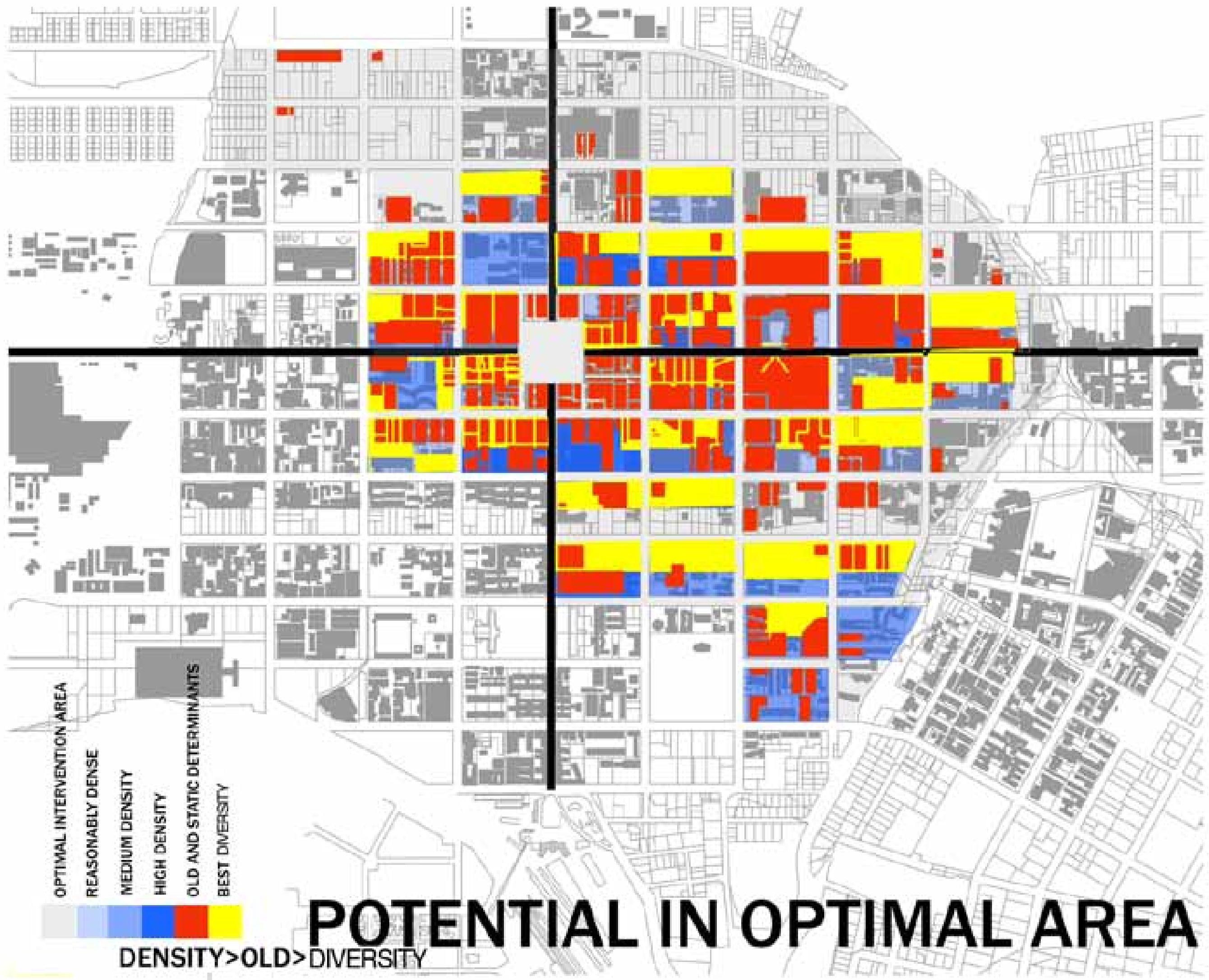
Within the city core **different intensities of need, usage and wastage** occur which differs from building to building in the flux of density. Thus dealing with **large inputs and outputs** should be addressed – something which on a residential scale might be much easier to solve.



[Figure 3_4.] Aged Contributing fabric

Aged fabric:

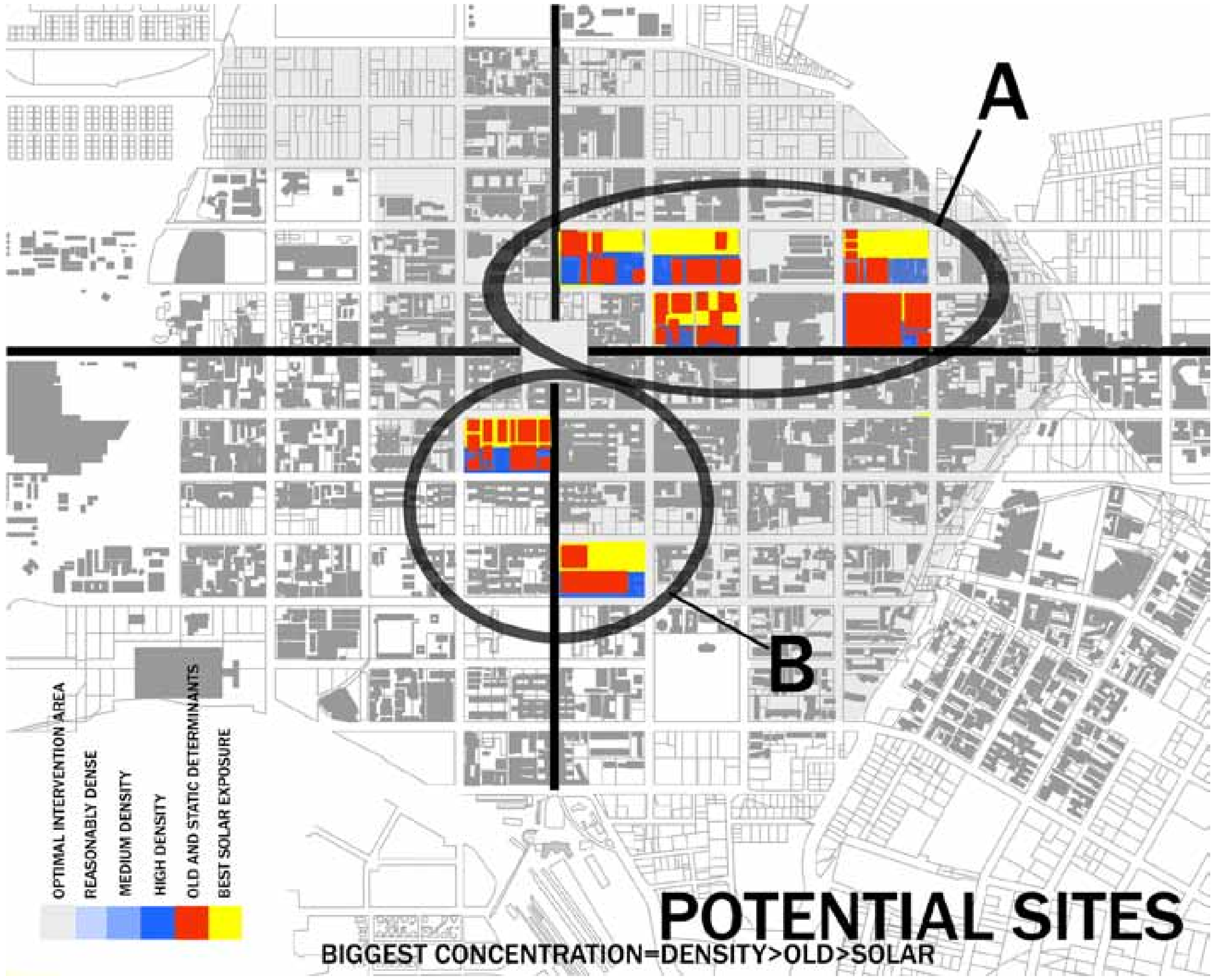
As the **existing** fabric of the CBD is much older and **more rigid** than newer developments outside the CBD, **adaptation** of these buildings and their systems are necessary, but will be a different approach than to refit a newer building.



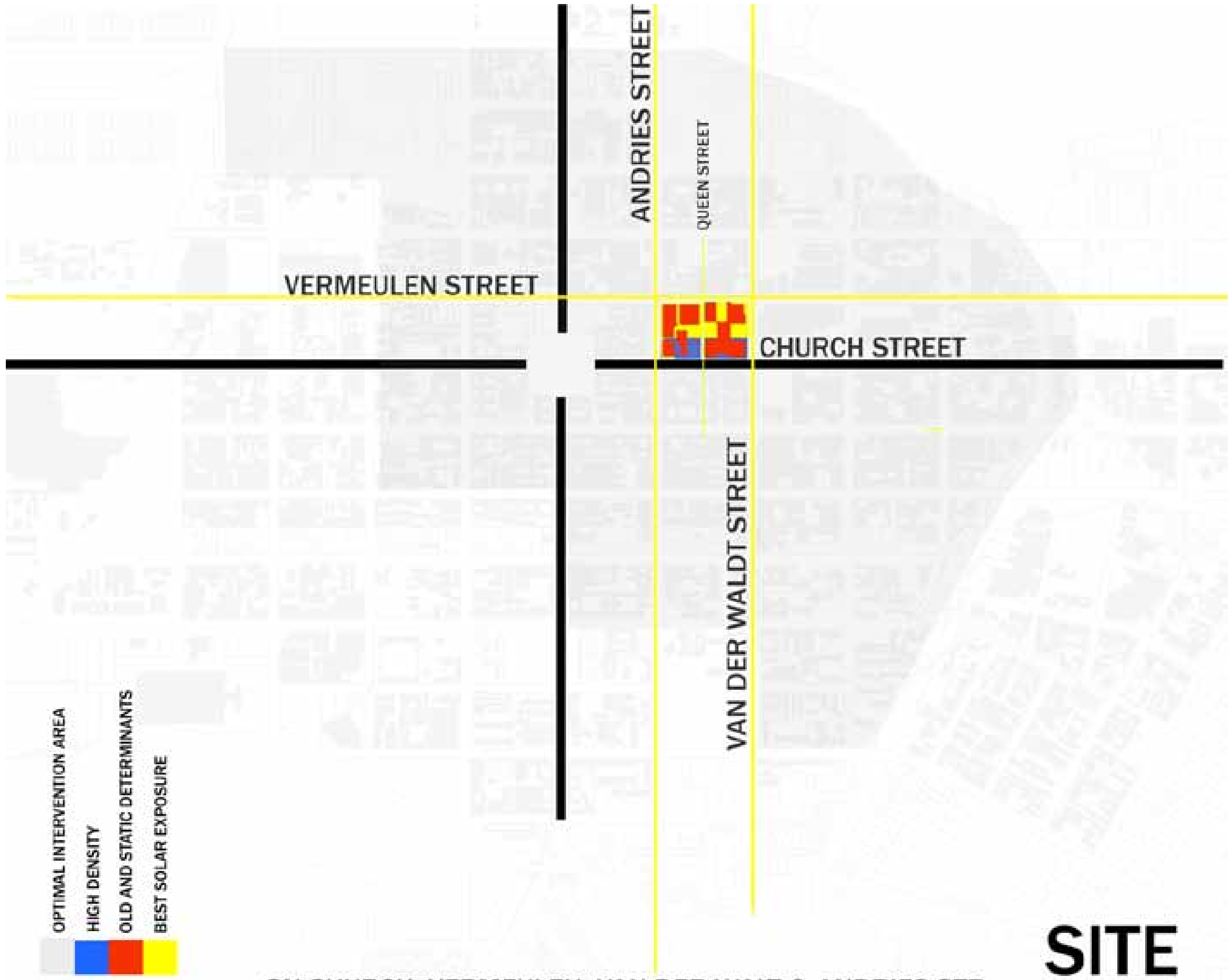
[Figure 3_5.] Data overlay

Diversity:

As cities evolve programmes and areas **mix and change** with time, city cores are an **amalgamation** of functions knitted tightly together. Different programmes, users and **flux** result in **different demands and usage.** Sites which consist of a wide range of diverse programmes for example religious institutions, public amenities, governmental departments, educational facilities, housing, commerce and offices are mapped.



[Figure 3_6.] Highest concentration of data overlay



[Figure 3_7.] Chosen site

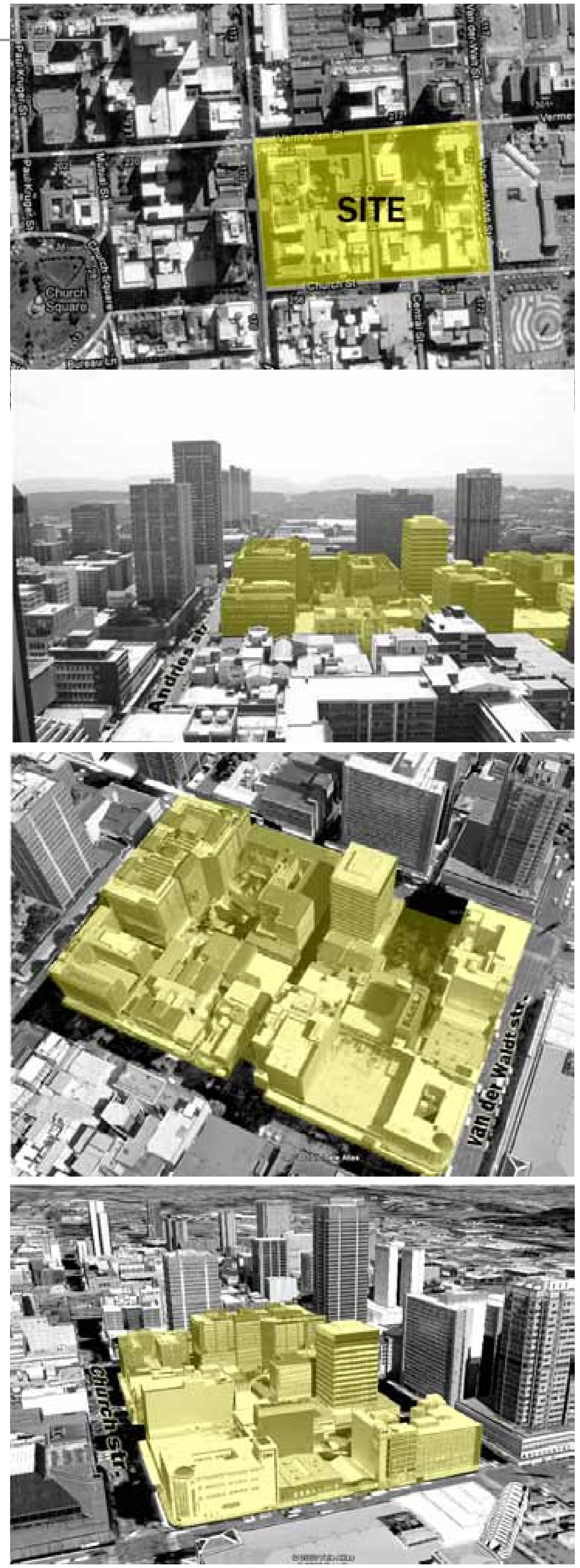
[Figure 3_8.] Aerial photo of chosen site.

SITE INTRODUCTION

LOCATION & DESCRIPTION

The site is located in the **Pretoria central CBD** east of Church square and north of the pedestrianised portion of **Church street.** With Vermeulen street on the north, the block is framed by Andries street on the west and van der Walt street on the east. The block is in a **high density urban setting** which is the old central part of the CBD. The area has high traffic volumes and mostly function as a **business and commercial zone.**

The site is a destination for Muslims coming to Queen Street Mosque, for shoppers going to Shoprite Checkers and many workers occupying the offices. The site is relatively **cluttered and dense** after years of additions and changes. A large portion of the site is owned by Shoprite who made huge delivery zones which results as **abrupt voids in public spaces**. Although the site is relatively aged and dense, its **diversity** is one of its main strengths and overall potential.



[Figure 3_9.] 3D Views of site in city context.

[Figure 3_10.] Aerial Photo of site.

___STATEMENT OF SIGNIFICANCE

This earns its significance from **Queen Street** named after the Queen's Hotel. This narrow artery originally cut through two city blocks to create direct access from Church Street to Proes Street (Ploeger 1989: 54). The northern part of Queen Street was eventually closed down but the southern part remains intact with a few of the original small scale buildings still operating.

On the south west corner of the block is the **Bank of the Netherlands** designed by Sir Norman Eaton and A. L Meiring in 1953. Eaton's dedication can be seen in the well executed contextual response and endeavour to create a building which is 'African' even to the extent of asking Alexis Preller for assistance, making this building a significant cultural heritage contribution in Pretoria (le Roux 1992: 7). This seven storey building is constructed with small custom made face bricks, steel frame windows deeply set back and framed by vertical brick fins. The ground floor is a white plinth level on which the rest of the building 'floats', a roof garden for the workers and the caretaker's quarters is on the south wing of the building. The ground floor entrance windows and doors are made with bronze and there is a public water fountain on the south east corner of the building.

Another significant but mysterious building is the **Queen Street Mosque,** built in 1928. The mosque has a copper dome roof, pressed steel ceilings, white plastered walls and wood frame windows with stained glass. The mosque is a good example of the Transvaal mosque typology in an urban context, it is an architectural landmark of historic and cultural importance (le Roux 1992: 38). In 1983 de Bruyn Park (named after one of Pretoria's wealthiest businessman in the 1980s) was built with a 'U' shaped footprint around Queen Street Mosque. According to Achass Suluima Alqufuf the janitor of the mosque, the construction of the building was part of an apartheid action commissioned to 'hide' the mosque from the public (Alqufuf 2010).

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Within Queen Street only two buildings are remnant from the original scale and spirit of the street. The oldest of the two buildings is '**Grossberg Traders and Military Outfitters'** (fig. 3_15). The building was originally constructed in 1906 as a house, the building was adapted to operate as many different businesses throughout the years, including a church, a bakery, a restaurant, a gymnasium and offices for real-estate agents (Grossberg 2010). The building is long, one storey (with a two storey addition to the back of the site) saddle roof structure, masonry walls and has large exposed timber trusses.

The other remaining building was originally the **Van Schaiks Stationary shop** (fig. 3_16) built in 1910, the building is currently operating as **Wanjacheng clothing store**. The building has a cape-dutch gable on the street edge side which has been covered with corrugated steel cladding to prevent pigeons (which Mr. Grossberg regularly feeds) from making a mess on the clients and the façade. The building has a concrete frame structure with masonry infill and a corrugated steel saddle roof.

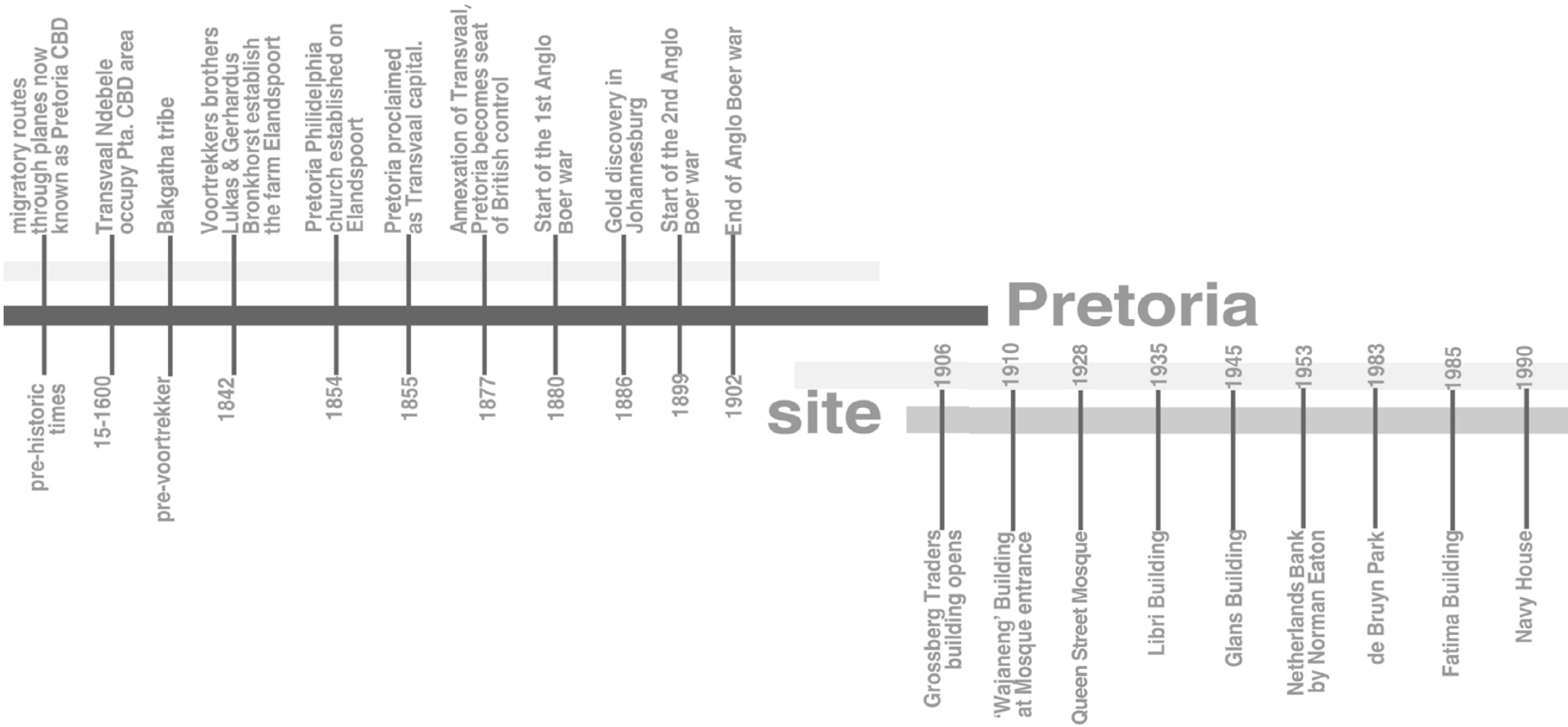
Both these buildings are ± a hundred years old and although they are protected by SAHRA, their contribution to the urban fabric is negligible and their life span is nearing an end. **It would be better to transform the two structures into an integrated public space proposal than to keep them in their current deteriorating state.**

[Figure 3_11.] View of Queen street in the early afternoon.
[Figure 3_12.] View of the Bank of the Netherlands, cornet of Church- and Andries Street.
[Figure 3_13.] View of Queen Street Mosque.
[Figure 3_14.] Significant places key.
[Figure 3_15.] View of Grossberg Traders.
[Figure 3_16.] View of Wanjacheng.

___SITE HISTORY

As a fraction of the Central portion of Pretoria, the site was once part of the farm Elandspoort established in 1842 (de Jong 1988: 62).

As the graph below indicates, many of the buildings on site are even as old as 100 years and more. The graph shows the development of Pretoria up until the time the site started developing and the eventual progress on site as time passed.



___CONTRIBUTION

Buildings older then 60 years are classified as heritage buildings and are protected by SAHRA (indicated in yellow in fig. 3_17). Orange indicates renovated and new buildings – round about 15 years old.

Contributory fabric is indicated with blue and insignificant, demolishable and non-contributory fabric is indicated in red.

[Figure 3_17.] Significance. Illustrates where the weaknesses lie concerning contributory fabric.The block core has deteriorated because it has no street frontage and thus development didn't take place here.

[Figure 3_18.] Filtered fabric. Illustrates that if the weak, insignificant, deteriorating or non-contributory buildings are cleared out, there would be a large open core where development can start taking place, working from the inside out.

Building programmes and usage

- N1 De Bruyn Park Building - Occupied by STATS SA, Offices and commercial
- N2 Regend Place - Occupied by The Department of Sport and Recreation, Offices and commercial.
- N3 Navy House, Owned by City Properties, Education and commercial
- E1 Fatima Centre, Commercial ground floor, 3 floors offices, 3 floors accommodation.
- E2 FashionWorld, Commercial
- E3 Shoprite centre, Commercial
- S1 Salam Forum Building, Masters of the North High Court
- S2 Glans Building, Mogul Property Investments, Commercial
- S3 King Pie, Commercial
- S4 Camper Canoe, Commercial, Sports wear shop
- S5 Libri building, Commercial and residential
- S6 Mr. Price, Commercial
- S7 Bank Towers, Norman Eaton Bldg. Bank and offices
- Q1 Shoprite, Storage and delivery
- Q2 Grossberg Civil and military outfitters, Commercial
- Q3 Al Shukran Investments, Commercial
- Q4 Wanjacheng, Commercial
- Q5 Sanjiv Investments, Commercial
- Q6 Yang Chang galore, Commercial
- Q7 Filkem Towers, Offices and commercial
- C1 Queen Street Mosque
- C2 Shoprite, Commercial

PLAN KEY

- Surrounding Buildings
- Buildings on site
- Demolishable buildings

[Figure 3_19.] Site plan communicating building functions.

INTERVIEWS

TALKING TO THE USER

There are 24 buildings in total on site. Interviews were held with **users** of each building, mostly to gain **technical data** but also to get an idea of the user's **perception** of the area and how they use it and what their needs are. Here follows some interesting facts and comments made during the interviews:

_**Winston Malebye,** Managing Security Officer at Regend place, currently occupied by the Department of Sports and Recreation commented in his interview that the building's manual access has been changed to **electronic access** in preparation for the 2010 World Cup.

This access system is also installed in many other buildings on site as this area has a **high security and crime risk.** This new system causes a number of access problems especially during flux entry and exit times of the day. His comment was that the access system would have to be **redesigned** in order for the building to function efficiently (Malebye 2010).

_**Pieter Moalusi**, a student at the Africa College of Excellence in the Navy House Building, commented that the building in which they are schooled is in actual fact an ordinary apartment block and **lacks basic facilities for an educational institution**. His main comment was there is **'nowhere to spend time'** as students in their break time are not allowed to leave the building, they stay inside all day (Moalusi 2010).

_**Mohammad Kumar**, janitor of the Fatima Centre is very **positive** about the area and said his favourite thing about living there is that **everything he needs is so close** he can just **walk** all over the place. Even the building Mohammad works and lives in is so diverse; it has a commercial ground floor, three floors offices and three floors apartments-the only one of two apartment blocks on site (Kumar 2010).

_**Ashraf Docrat**, manager of Fashion World, commented that the area is good for business because of the **high concentration of people.** But he says that he constantly has to complain to the municipality because of the **unpleasant smell in the street**. He says that the fruit and vegetable vendors who operate outside on the sidewalk, throw all of their rotten goods into the storm water drains on the edges of the street (Docrat 2010).

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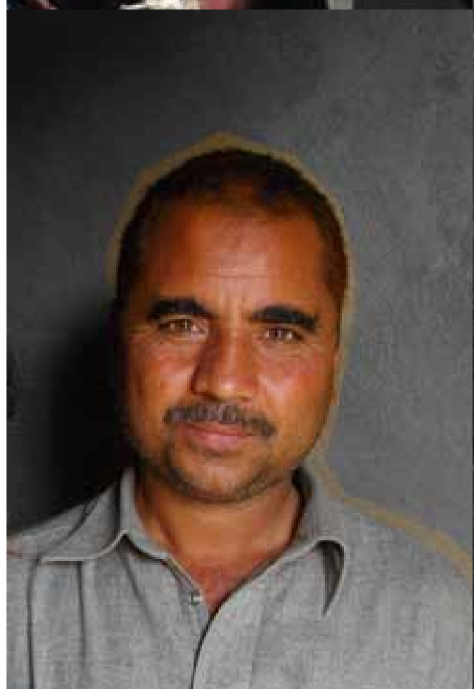

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_**Yusuf Dockrat**, Shop Owner of Mogul Property investments says that 'this area is wonderful, it has a **rich history** and it is **close to the Mosque**. But I would not make so many inner-city buildings residential as the developers are currently doing because the **CBD infrastructure** was not designed for it, it is messing the city up' (Dockrat 2010).

_**Jack Grossberg**, owner of Grossberg Military Outfitters and Camp Gear Traders, likes the area so much that his business has been there for a **104 years**, started by his farther Steven Grossberg in 1906. Since he has been around all these years his comment on the change in the area was that there are **a lot more people** than what there used to be and since some of the streets have been pedestrianised and others made one-ways, **access has become a big problem** for shop owners and shoppers. He also commented that **parking** is a big problem in the area and every day is a battle to park and get to his shop (Grossberg 2010).

_**Jithen Govind**, owner of Sanjiv investments states that he likes the fact that the streets are **pedestrianised**, it is very pleasant to walk around. But he is of opinion that the area's **servitude system** is not very efficient, because delivery trucks park in Queen street to deliver goods to various businesses and are constantly blocking shop entrances (Govind 2010).

_**Achass Suluima Alqufuf**, janitor of the Queen street Mosque, shared the mosque's plans to **extend** their premises by building an extra wing for the women's mosque on the southern side of the building. He stated that the mosque no longer has to be **enclosed** (as the situation was during the apartheid years, according to him) so 'the time has come for them to **widen their doors'** .

[Figure 3_20.] Winston Malebye, Managing Security Officer.
[Figure 3_21.] Pieter Moalusi, student.
[Figure 3_22.] Mohammad Kumar, janitor.
[Figure 3_23.] Jack Grossberg, shop owner.
[Figure 3_24.] Jithen Govind, shop owner.
[Figure 3_25.] Achass Suluima Alqufuf, janitor.

___CONCLUSIONS

_Safe access to buildings is a problem.

_The area needs recreational/ public space.

_The site has very little 24 hour surveillance because of limited residences.

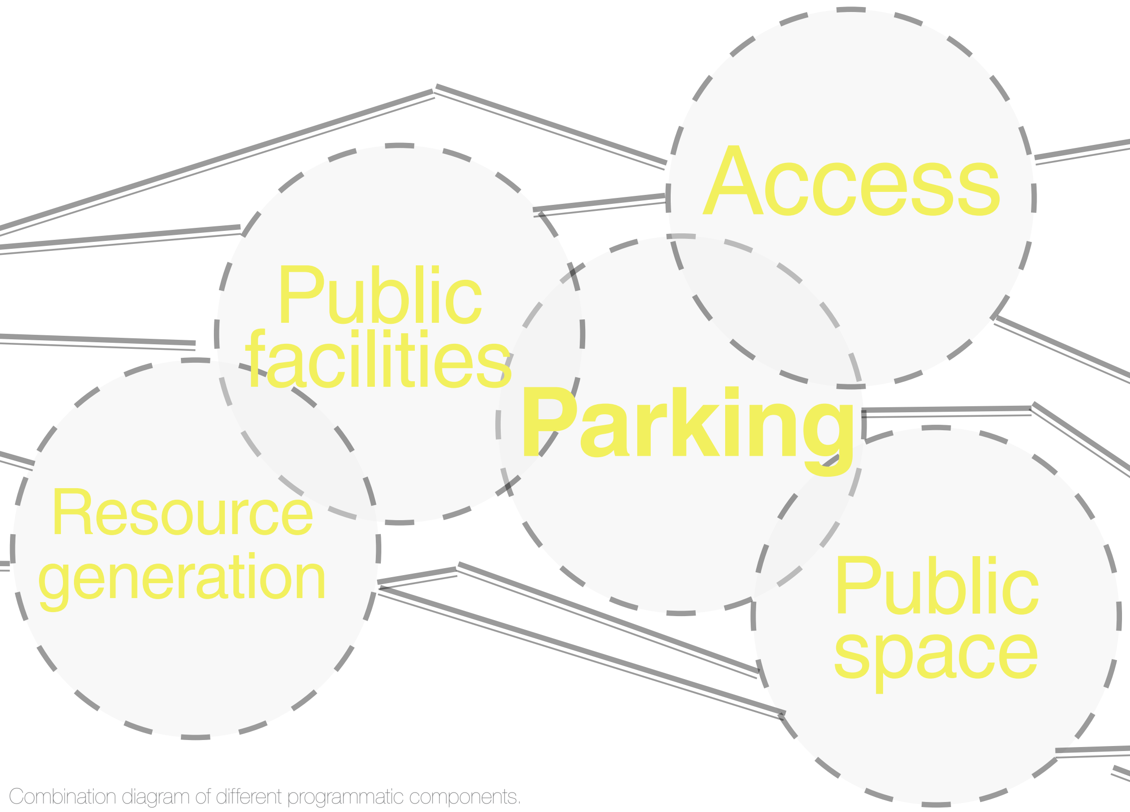
_Informal trade is congesting and polluting the area.

_There is not enough on-site parking for occupants and customers.

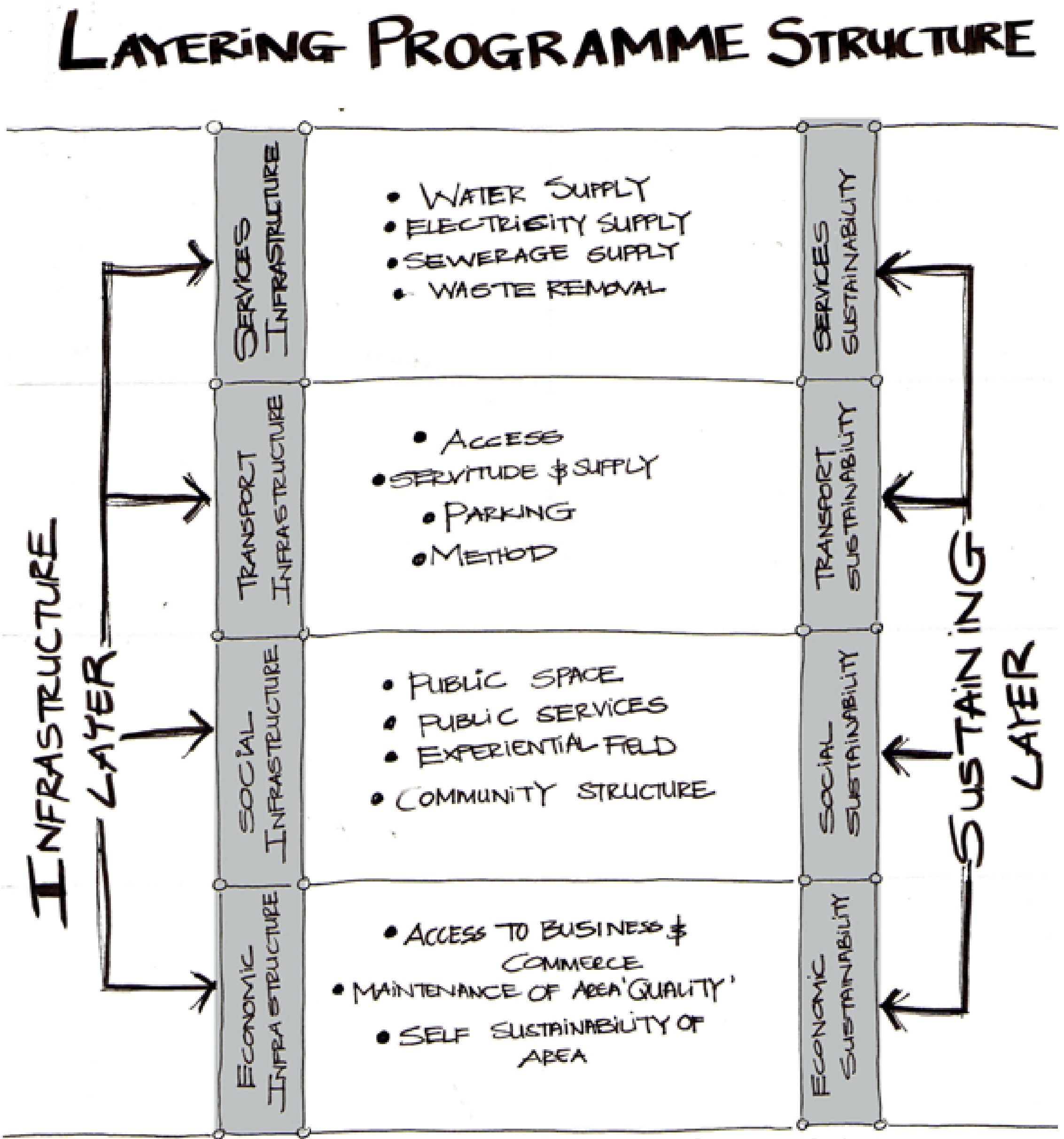
_The site's servitude system congests the streets and inhibits the already limited public spaces.

_The mosque would like to become more visible and expand their facilities.

_ Above stated needs becomes part of the block infrastructure and ultimately starts to give definition to the project programme.



[Figure 3_26.] Combination diagram of different programmatic components.



[Figure 3_27.] Components of Infrastructural and sustainable programming grouped and layered in order to function together.

[3.4]

___SITE ANALYSIS___

___CLIMATE

NOTE: All climatic data is cited as presented by Dieter Holm in his book A Manual for Energy Conscious design. (Holm 1996 : 68 – 67)

Tshwane location :

25,8° to 30,7° East and 22,0° to 25,9° South

Description of zone climate:

Distinct rainy and dry seasons exist with a large daily temperature variation and strong solar radiation. Humidity levels are moderate.

Temperature:

The maximum diurnal variation occurs in July.
The average monthly diurnal variation is 13K.

Humidity:

The average humidity level is 59%.

Solar:

Vertical sun angle at 12:00 solar time:

Solstice: 64,23°
Winter: 40,73°

Temperature:

Summer temperatures extend approximately 3K above the comfort zone. Winter temperatures extend to approximately 15K below the comfort zone.

_Maximum average summer temperatures: 28.6°C

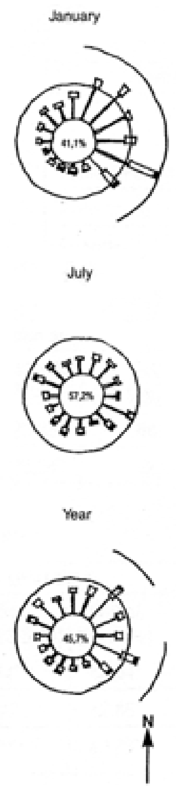
_Minimum average winter temperatures: 4.5°C

Average monthly rainfall (mm):

Jan.	136
Feb.	75
Mar.	82
Apr.	51
May	13
Jun.	7
Jul.	3
Aug.	6
Sep.	22
Oct.	71
Nov.	98
Dec.	110
Ave.	56.17

Wind:

Summer winds are predominantly east-north-easterly to east south-easterly . Winter winds are predominantly south-westerly with a fair amount originating from the north –east.



____CONCLUSIONS

_ In this climatic zone rain is an asset to take advantage of and the dry season is a disadvantage. Thus planning and provision should be made to harvest rain water for on-site use to counter the demand of the dry season.

_ Buildings in this climatic zone are exposed to extreme heat and cold and should thus be designed to compensate in temperature flux but still act as energy efficient buildings.

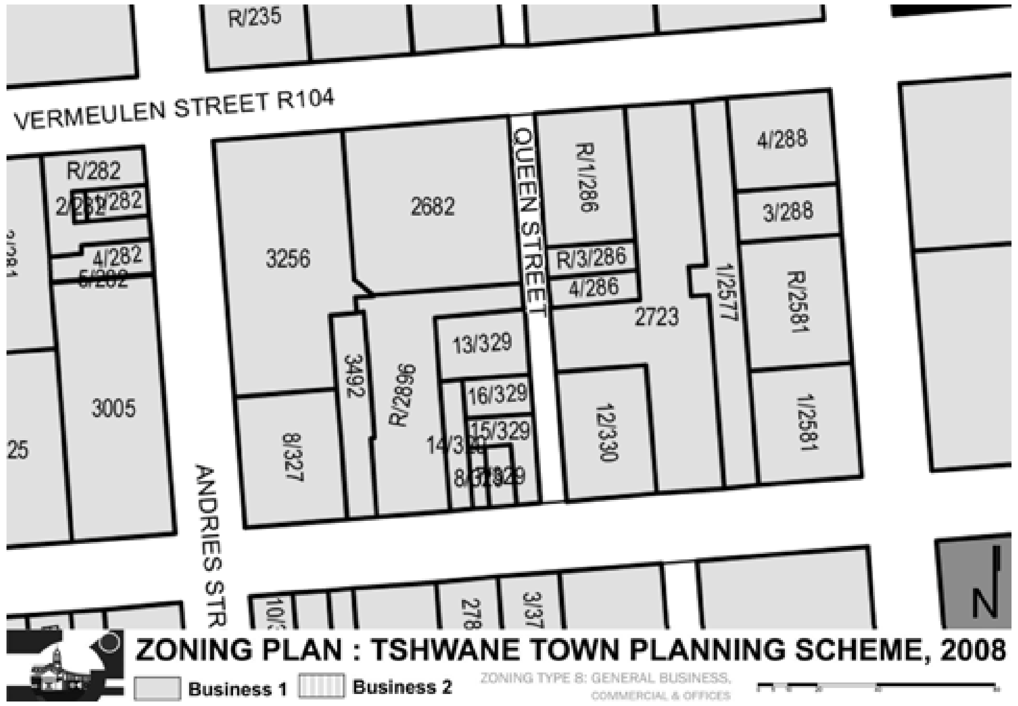
_ The shading devices should be designed according to the summer and winter solstice to keep out sun in the summer but let in sun in the winter.

_ The prevailing wind directions should be taken into account in the planning of the building orientation for maximum cross ventilation. Tshwane also does not have extreme constant winds blowing throughout the seasons. Thus using turbines for wind power would not be a feasible option for energy production.

______ZONING

The zoning document states that the whole block is zoned as **'General Business'** which includes commercial and offices. This is indeed the dominant programmes on site, but there is also a wide diversity of services, institutions, departments and housing.

For this specific zoning purpose, the Tshwane Town Planning Scheme 2008 specifies in Schedule 10 that **parking garage facilities are permitted on site**, providing it has clear, organised, visual and safe entry and exit points.



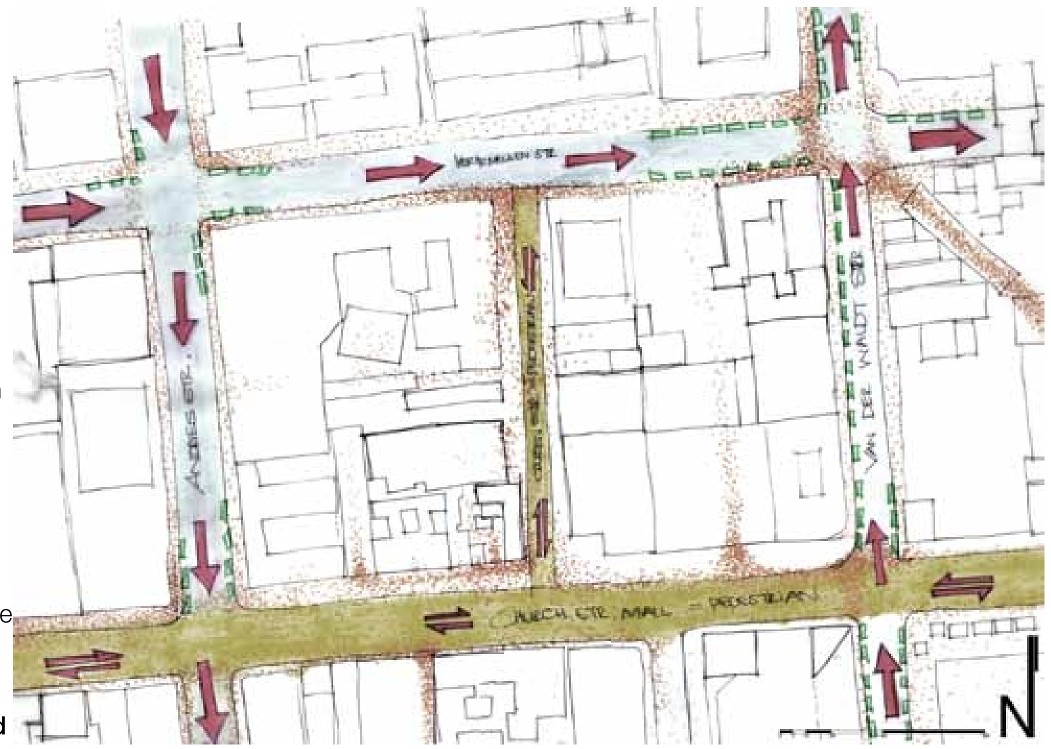
[Figure 3_28.] Zoning plan of focus area.

______MOVEMENT ON SITE

The area as a whole has a very **high concentration of pedestrians**. Many pedestrians walk along Queen Street taking shortcut towards the taxis in Vermeulen street. On both the eastern corners of the site pedestrians, taxis and vendors congest the street corners.

The Shoprite, which is one of the reasons why so many pedestrians are in this area, has entrances on both the northern and southern sides which creates another **'passage' through the site parallel to Queen street.** Many of the pedestrians use public transport, taxis in van der Walt and Vermeulen and busses in Church Square provide cross circulation on people all day long.

The pedestrians in this area keep moving, there is nowhere to sit and relax except in Church Square, thus **people journey through and around the site but never stay long.**



[Figure 3_29.] Pedestrian circulation plan.

___OWNERSHIP

The site ownership can almost be divided into four distinct quarters; Shoprite Checkers owns a large portion of the site indicated in yellow.

The south African Government owns another large portion of the site indicated in blue, as well as City Properties who owns another quarter indicated in orange. The rest of the site indicated in red is privately owned.

[Figure 3_30.] Ownership diagram of the individual buildings on site.

___PUBLIC PRIVATE SPACE

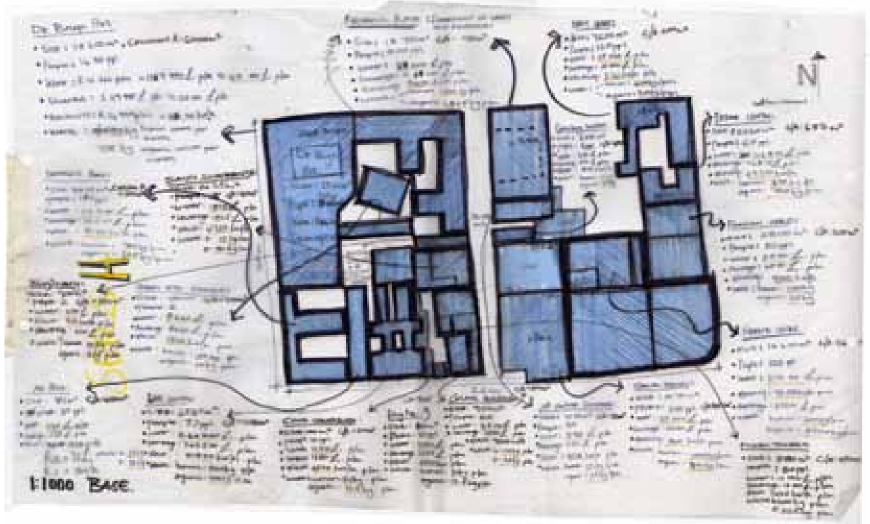
[Figure 3_31.] Spatial hierarchy diagram of the individual spaces on site.

___SERVICES

[Figure 3_32.] Existing Municipal services diagram.

___TECHNICAL DATA

The on-site technical data is needed to calculate what the resource consumption currently is and **how much the 'Infrastructure' for the site must produce in order to sustain the site.** After investigating every building's surface area, occupancy and in some instances their water and electricity bill, the on-site consumption was calculated.



[Figure 3_33.] Each building's technical data calculations.

_ Total buildings on site:	**24**
_ Total rentable space:	**106 420m²**
_Total occupancy (9:00 – 17:00):	**2 680 people**
_Total water usage:	**663 140L p/m**
_Total electricity usage:	**334 600 kW/h p/m**
_ Total effluent waste:	**663 140L p/m**
_ Total organic waste:	**7 345 kg p/m**
_ Total inorganic (recyclable) waste:	**17 855 kg p/m**

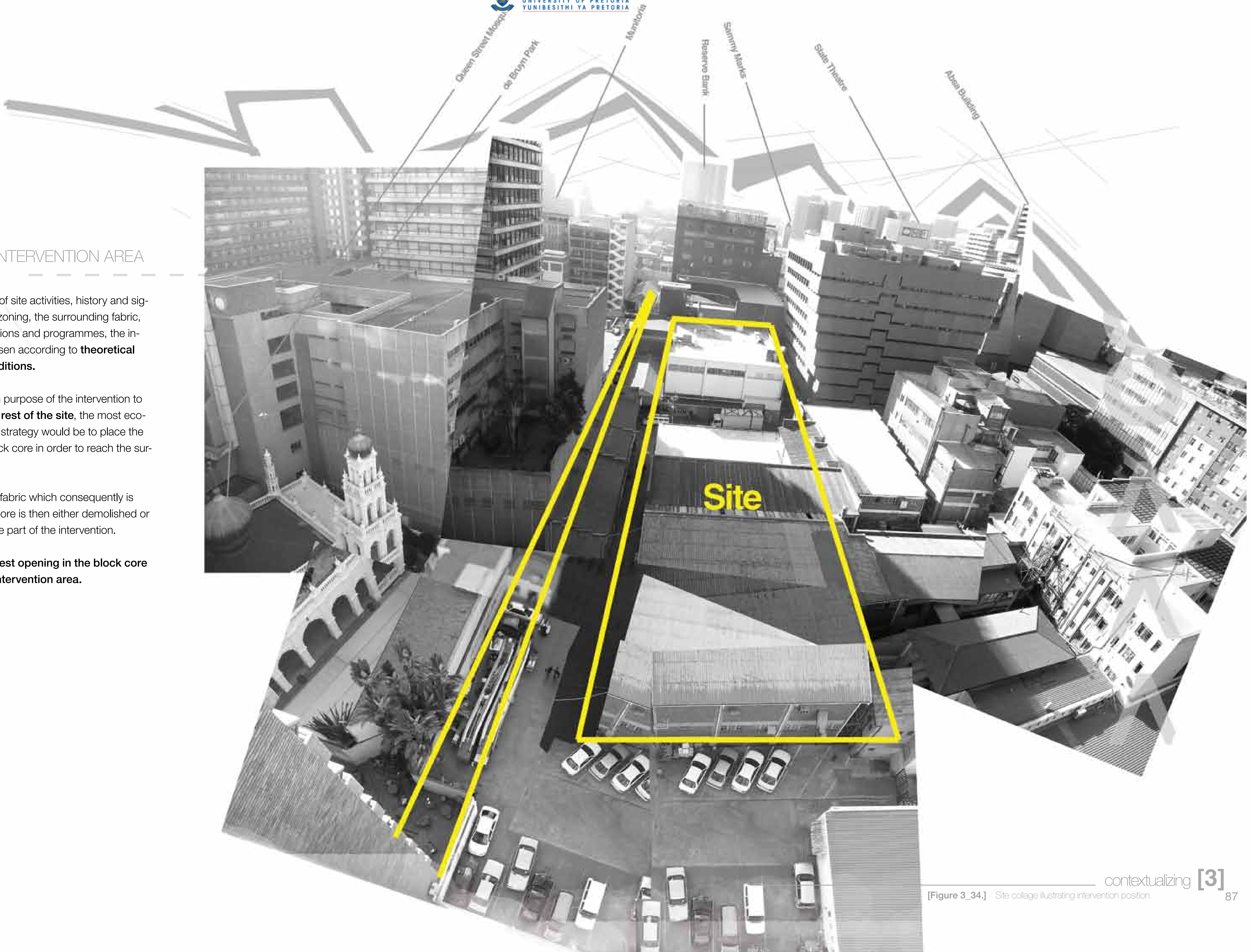
___INTERVENTION AREA

After doing analysis of site activities, history and significance, resources, zoning, the surrounding fabric, needs, climatic conditions and programmes, the intervention area is chosen according to **theoretical criteria and site conditions.**

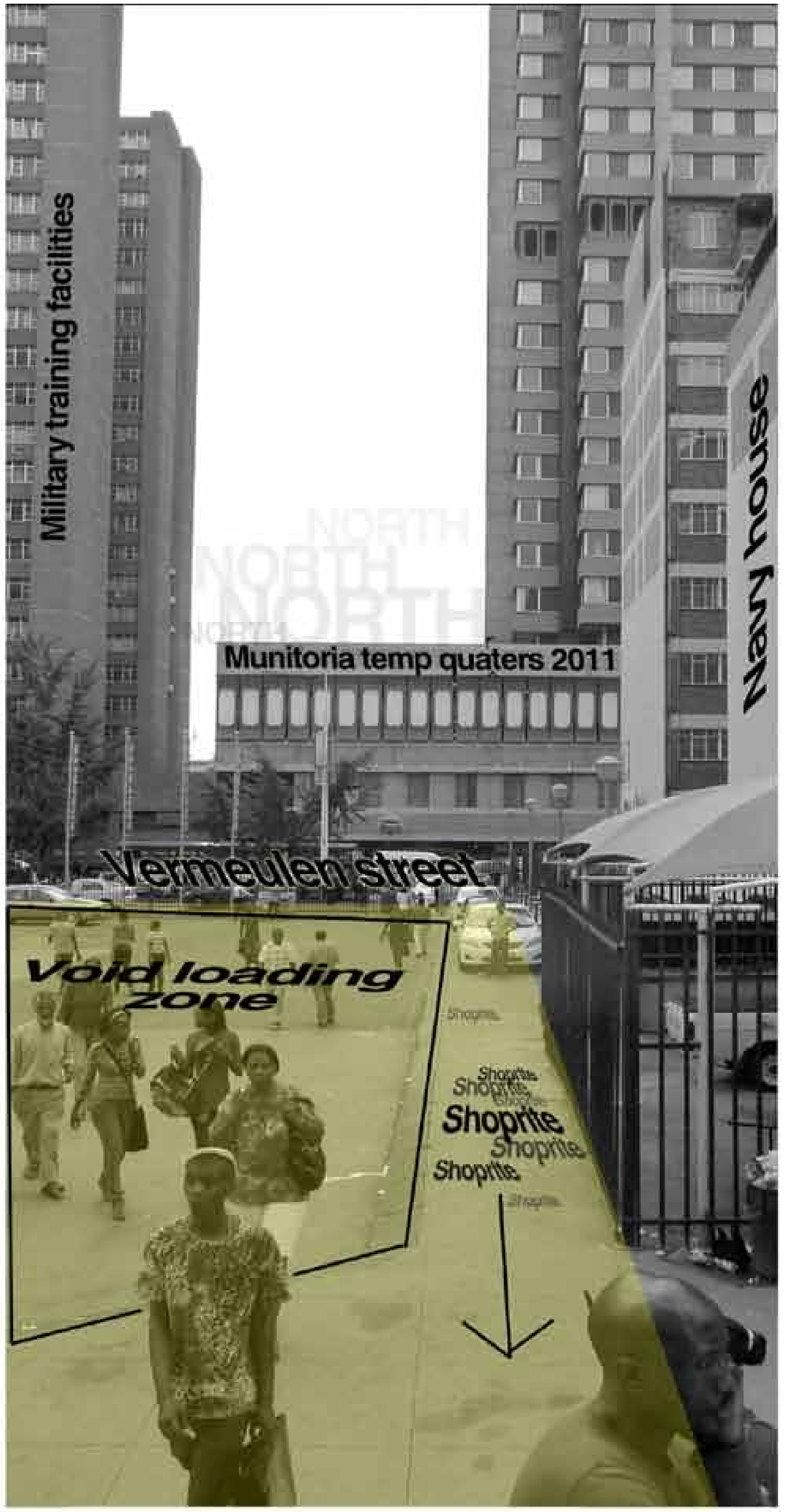
Because it is the main purpose of the intervention to **act as a host for the rest of the site**, the most economical and practical strategy would be to place the intervention in the block core in order to reach the surrounding buildings.

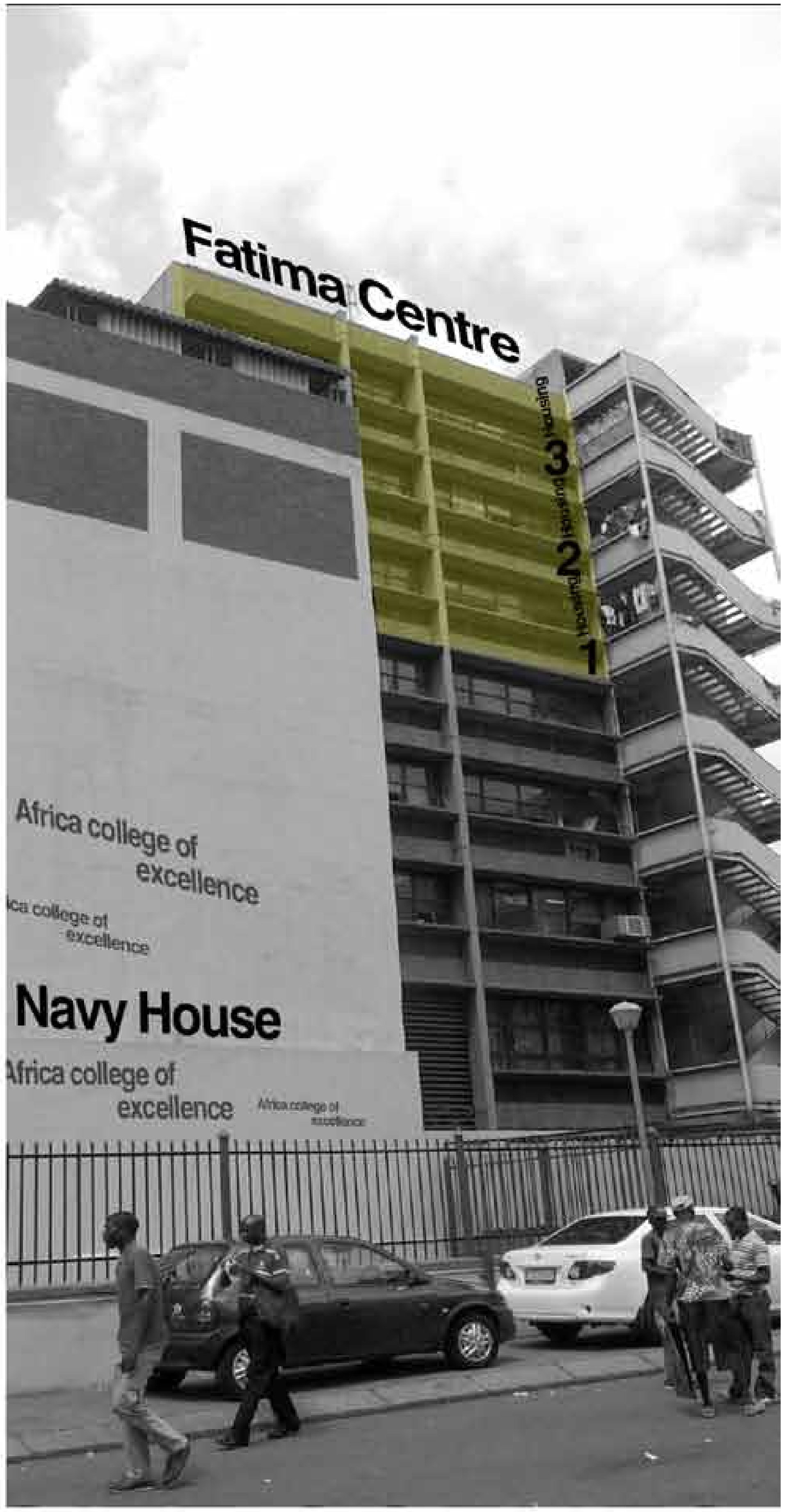
The non-contributory fabric which consequently is situated in the block core is then either demolished or redesigned to become part of the intervention.

Thus a linear east-west opening in the block core is identified as the intervention area.



[Figure 3_34.] Site collage illustrating intervention position.

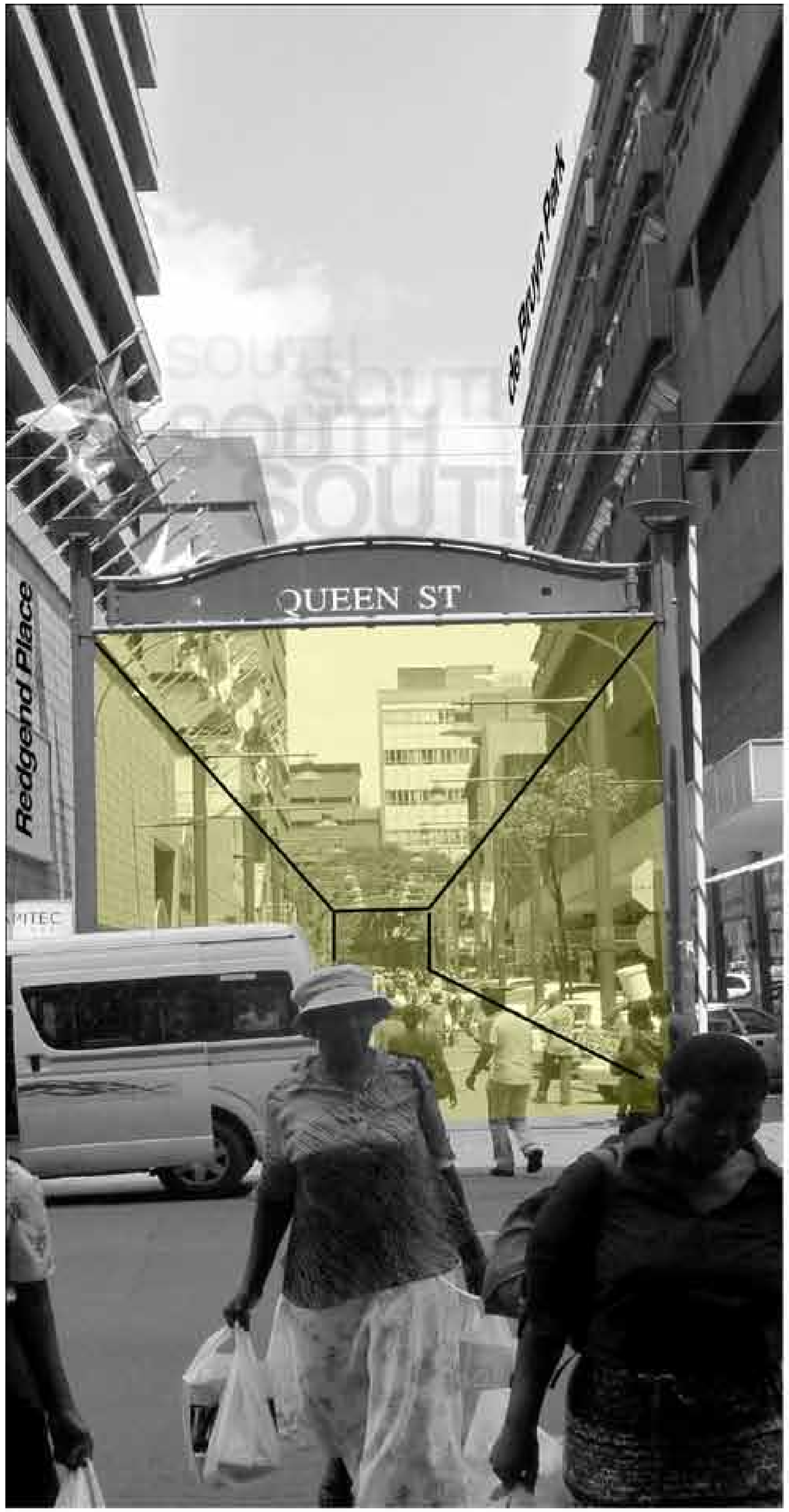


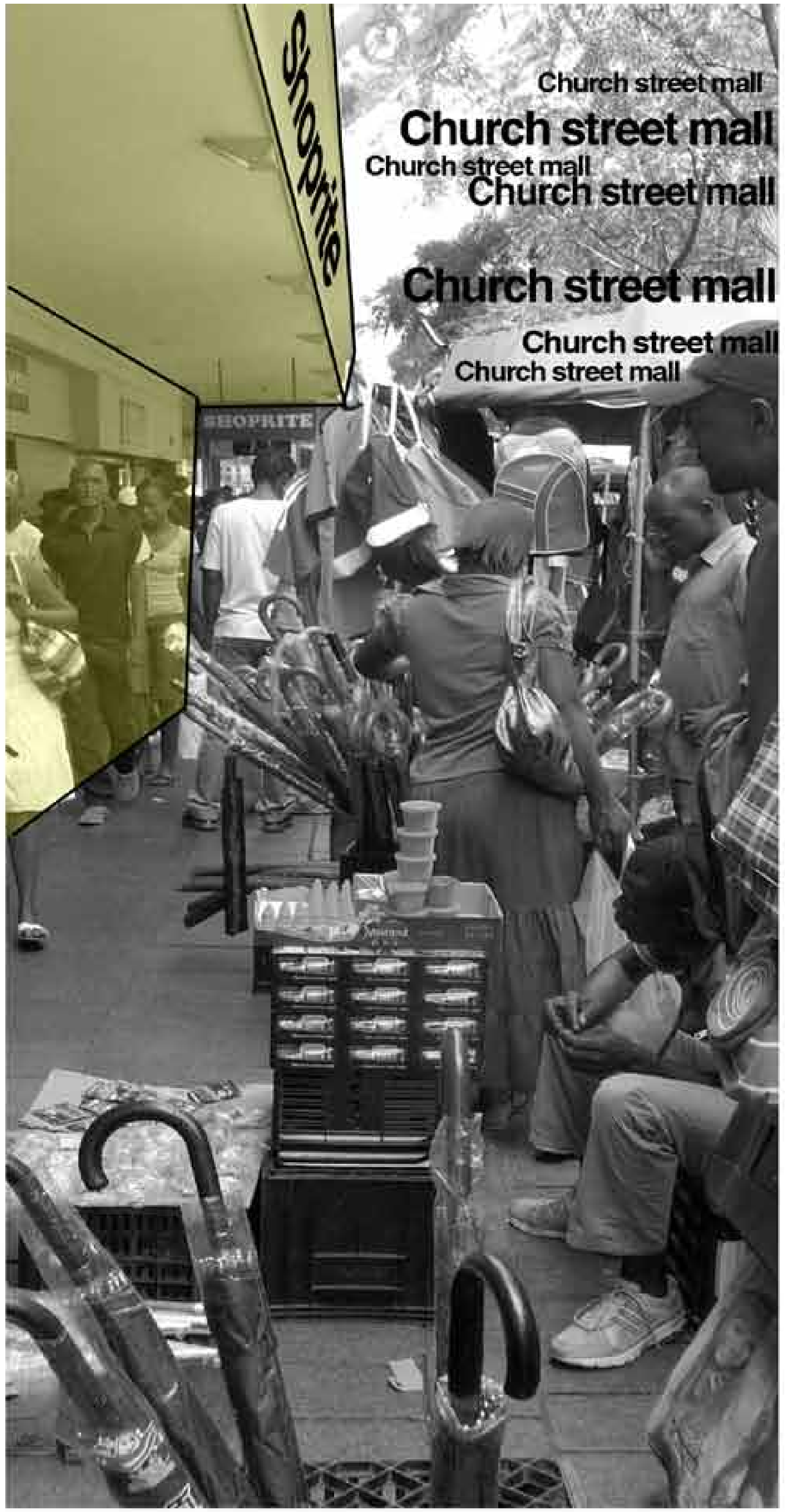


SITE SCENES

ACTIVITIES, PEOPLE AND PLACES

[Figure 3_35.] Site photos illustrating activities on and around site.





SITE SCENES

ACTIVITIES, PEOPLE AND PLACES

[Figure 3_36.] Site photos illustrating activities on and around site.

SITE SCENES

ACTIVITIES, PEOPLE AND PLACES

contextualizing [3]

[Figure 3_37.] Site photos illustrating activities on and around site.

BCe1 FRAMEWORK Group framework
URBAN COMPLEXITY

In response to the failure of the Modern Movement to **affect social change** and the 'inhuman' urban environments it created, a new paradigm of **diversity and disorder** became the focus of urban design. Jane Jacobs was one of the first writers to celebrate the 'real' city.

A wave of theory concerning the expression of **complexity in the urban environment** followed, eg. 'Collage city' (Rowe) and 'Complexity and Contradiction' (Denise Scott Brown and Robert Venturi). Works such as 'The Image of the City' (Kevin Lynch) provided a new way of working with the city and was the first step towards the attempted **recreation of diversity in urban environments.**

More recently there has been a tendency to recall the **role of architecture**, both as **generator and defining element,** within the urban environment. The contemporary approaches to urban issues critically considers the three-dimensional space of the city, as well as accepting the need for picturesque composition as one element of the overall composition of the city, a 'holistic interaction of aesthetics, politics and finance' (Powell, K).

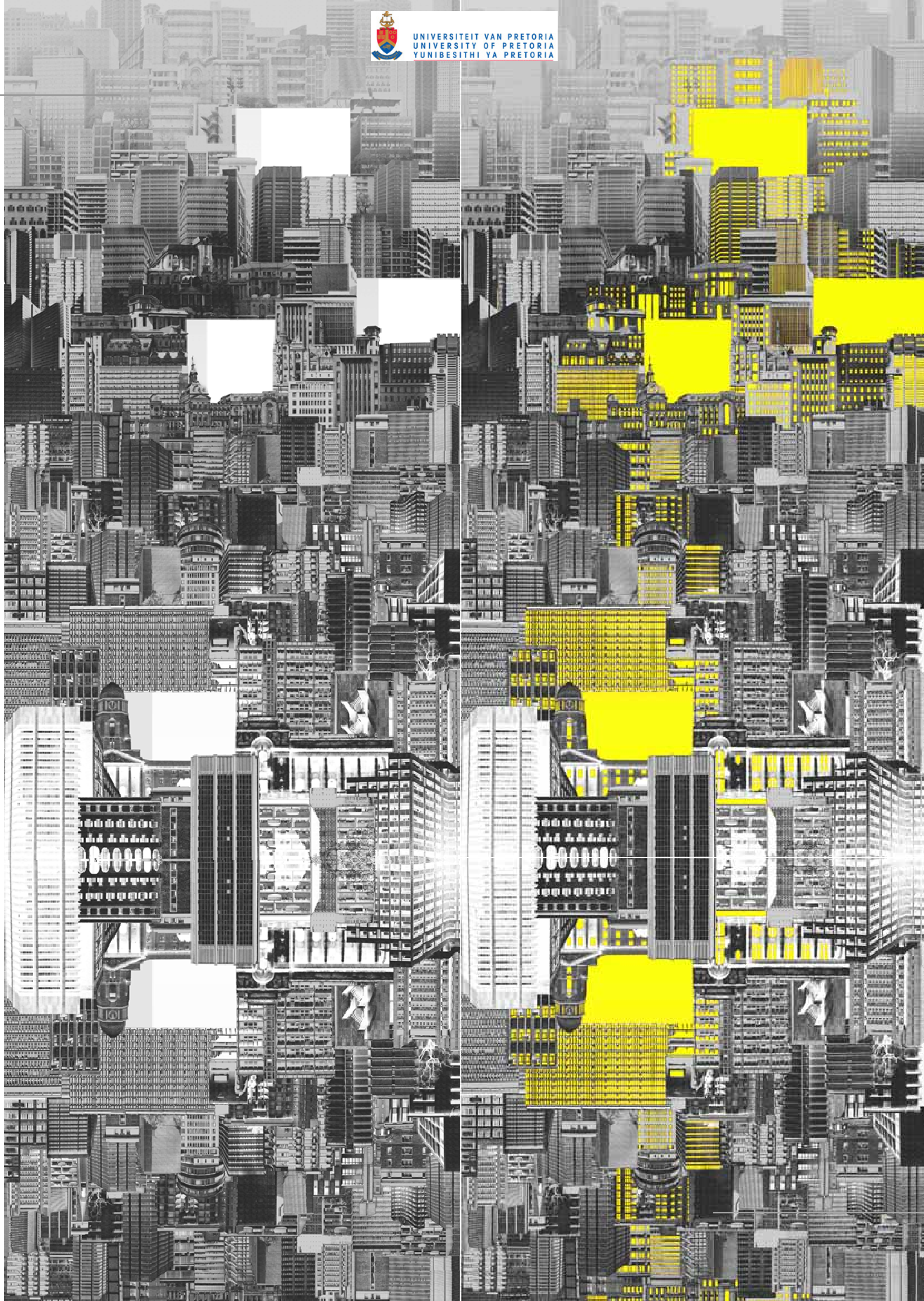
At the same time, there is an increasing despair concerning the **lack of ability of urban theory to date to construct or contribute to deal with the true complexity of the city.** Urban design often seems unable to create the richness, variety and diversity of that is now considered to be the ideal urban environment.

A PROBLEM IN THREE PARTS

When attempting to identify a problem statement in the context of urban complexity, it is crucial to understand that **no urban issue stands in isolation.** It would, however, be impossible to consider and unravel, in one attempt, the complete complexity of all things urban.

The identification of a problem statement therefore becomes a matter of **prioritising** that which one can change or, at the very least, attempt to affect in one attempt. The following issues have been identified:

- lack of capital city **identity**
- **ill-defined space**, overwhelming mix of meaningless information, non informative, unstructured
- mostly privatised built fabric with **abrupt thresholds**, little / no active interaction with space



[Figure 3_38.] iUrban voids - the non-experience

A CAPITAL APPROACH

Within the current approach to the creation of frameworks, there is a lack of understanding and a disregard for the **functioning of space on a human scale.** Local complexity and **experience** of space is not interrogated. The proposed interventions therefore do not address these issues and are unable to contribute towards a constructive urban vision.

We acknowledge that it is not possible to build urban complexity with one spatial intervention. Therefore we want to **invert** our approach in order rather to determine those fixed elements that will essentially contribute to form the **base upon which urban diversity can grow.** These elements may include spaces of social, cultural, political or economic importance.

THE EXPERIENTIAL FIELD

Diversity cannot be created in **undefined** space, nor can it be created by a piece of architecture in **isolation.** It is the **relationship** between the space and the architecture, as well as the relationship between various elements of architecture or places with social, cultural, economic, or political significance, that creates **tension and fields of possibility** within which experiential space can develop.

Our framework is about the **relationship, the coexistence, and the threshold.** It is not about generating a prescriptive guideline for intervention at city or block level. The approach is that various architectures and physical interventions can still **contribute to the creation of the experiential field.**

THE EXPERIENTIAL SPACE

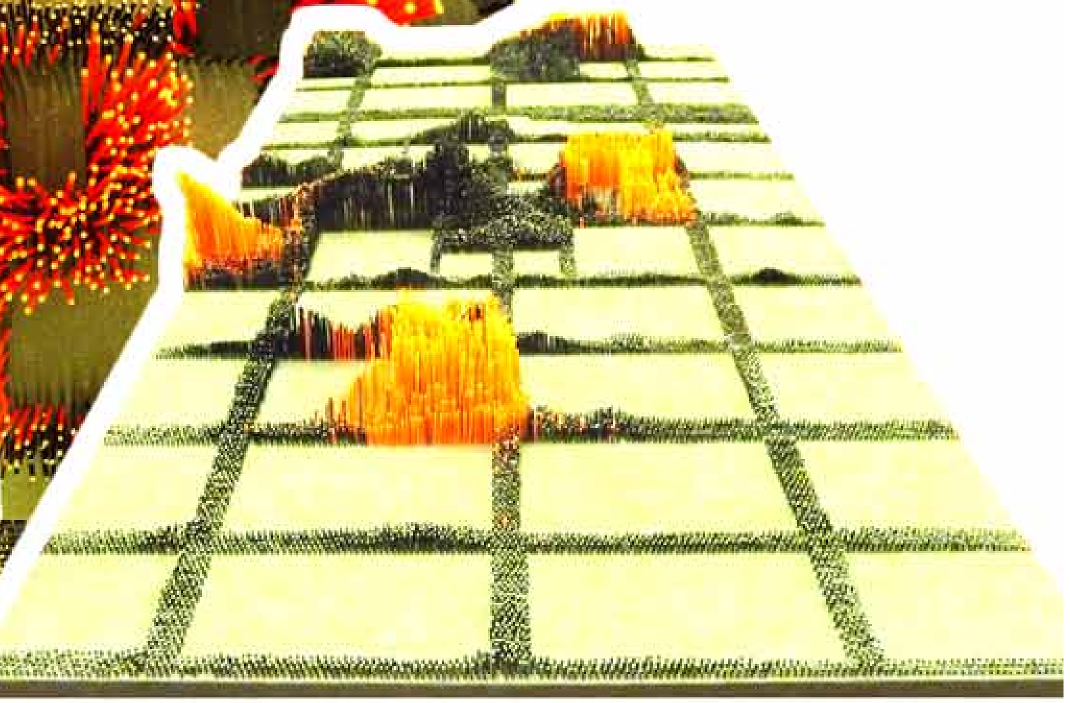
The system is created around **points of importance or significance** (social, cultural, economic, political) between which **movement tensions** develop. This tension creates the basis for the potential **development** of an experiential field.

Experiential space is **multi-faceted**; it includes elements such as enclosure, hierarchy, threshold, definition, meaning and symbol. Experiential space is sensory (perceptual) and may involve elements such as sound, colour and texture. It is rich with social, cultural and economic meaning and evokes **emotional involvement and response.**

Different combinations of perceptual / sensory elements, program and definitions of space will read as **different space** experiences and will lead to **different uses** of space. All of these elements will contribute to the **legibility** of spaces and ultimately to the **intelligibility** of the city.

The experiential field is **directly influenced by the urban fabric** within which it is contained. Although a number of elements have an influence on the **perception** of the experiential field, the most important element is the **threshold.** The threshold stands in **contrast with the boundary.** The boundary merely **defines and separates** the private and public realms. The threshold **defines public space, contributes to the formation, richness and understanding of the experiential field and forms a transition space linking the private and public realms.**

The threshold acts as a **joint or stitch**, underlining the importance of communication and interaction between the private and public realms. The term 'join' denotes a physical **space connecting two parts of a system but also indicates an action.** The threshold is a **meeting space** providing the potential for social interaction, activity and movement. The threshold is **not a fixed space** with a fixed character. It consists of a number of combinations of a number of elements, all contributing to the **sensory richness of the experiential field**. If two or three elements change in a certain combination, it becomes an indication of a certain type of spatial experience.

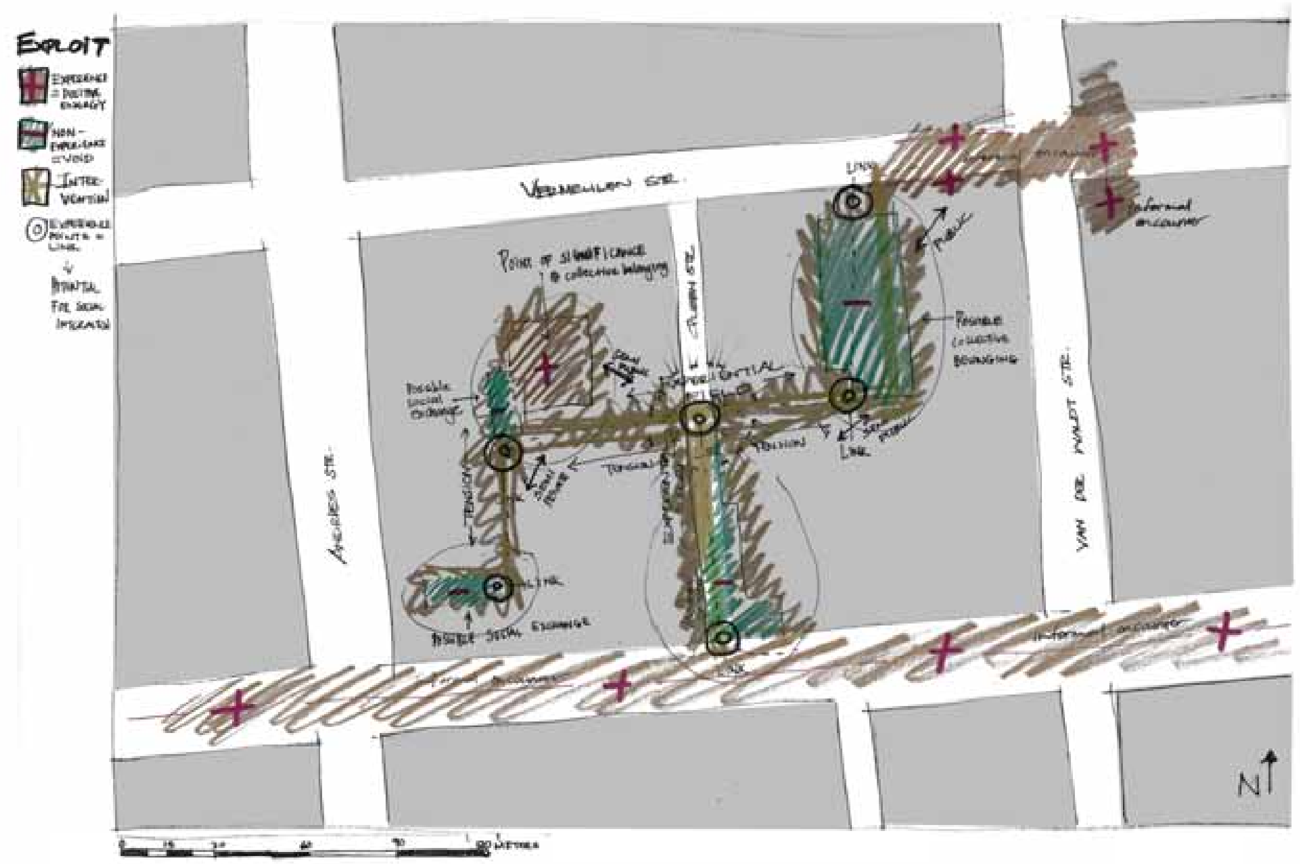


For example: the reading of a red light district would manifest through elements such as neon signs, closed doors and little overt social interaction, whereas an entertainment area would become legible through a combination of open doors, more muted signage, tables on street with overt interaction, certain smells and conversational sound.

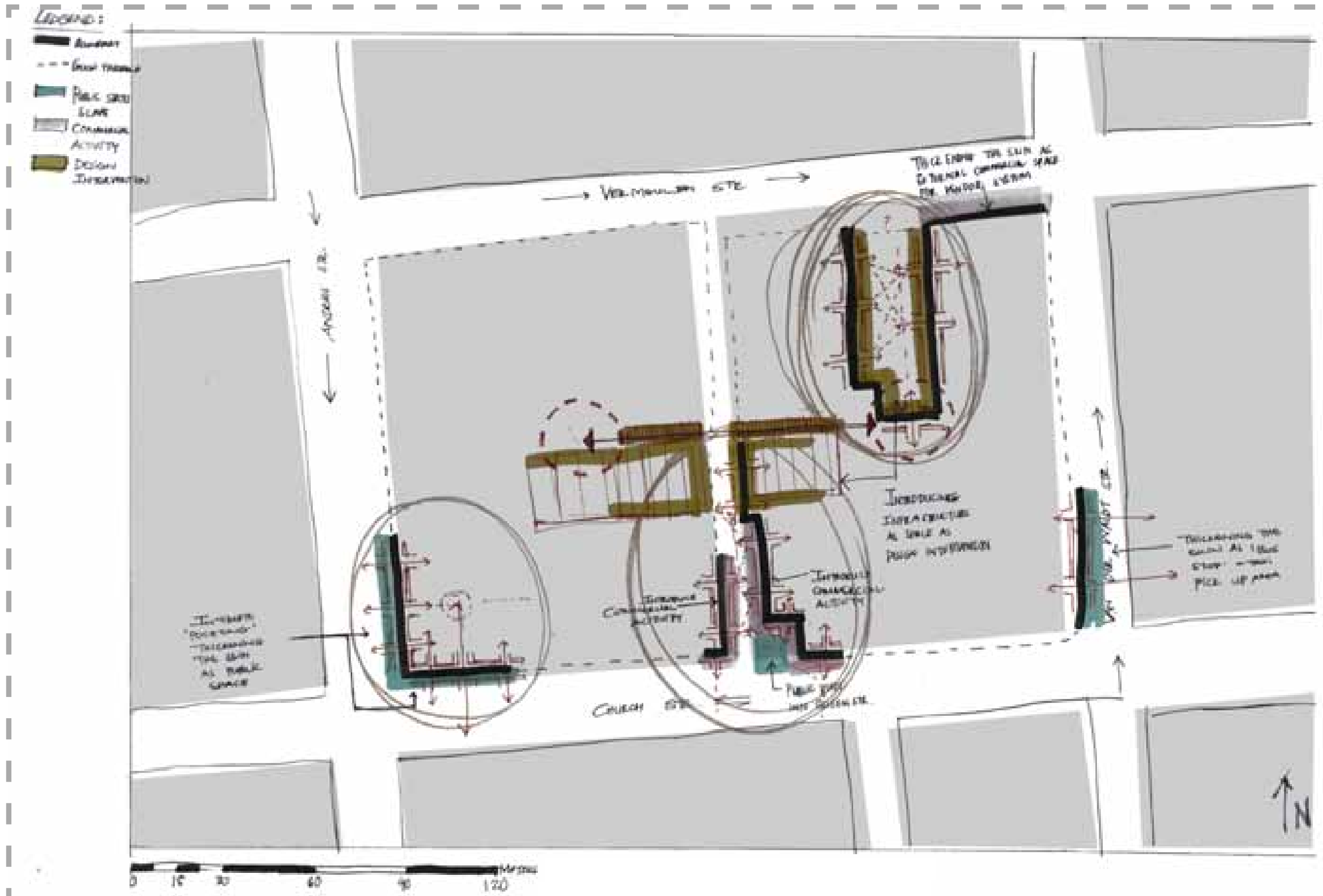
[Figure 3_39.] The aim of the framework is to **exploit the city as a field of possibility** within which **tension and dialogue between points of significance can develop into an experiential field.** The city currently contains a number of well-used points of significance, but the experiential fields between these points are often inadequately developed.

Through the **potential development of additional points of significance,** as well as **treatment of threshold spaces** within the tensions between these points, the experiential field will be further developed.

[Figure 3_40.] Group Framework Model, the experiential field is represented as a space between the buildings. The level of positive experience is represented by the height of the vertical elements. The higher the elements are, the more experiential space, the lower the elements, the less the experience. The red elements represent the group interventions.



[Figure 3_41.] Site positive and negative threshold spaces.



[Figure 3_42.] Focus areas for void intervention.

arranging volumetric systems______ _[4]__________[Programme & Accommodation]_____

____[4.1]_______ ___PROGRAMME ASSEMBLY___________

____[4.2]_______ ___PROGRAMME EXPLORATION__________

____[4.3]_______ ___ACCOMMODATION ASSEMBLY__________

____[4.4]_______ ___VOLUMETRIC ASSEMBLY__________

PROGRAMME ASSEMBLY

INTRODUCTION

Because of the project's unconventional nature, the building's programme cannot just be assembled by looking at a precedent or two, checking the National Building Standards and working out a standard accommodation schedule. First of all the **available technologies and on-site requirements** need to be calculated and investigated in order to establish to which extent the site can be serviced by the Infratecture. What systems are needed, how should they be applied and what other programmatic spaces are needed to manage the Infratecture?

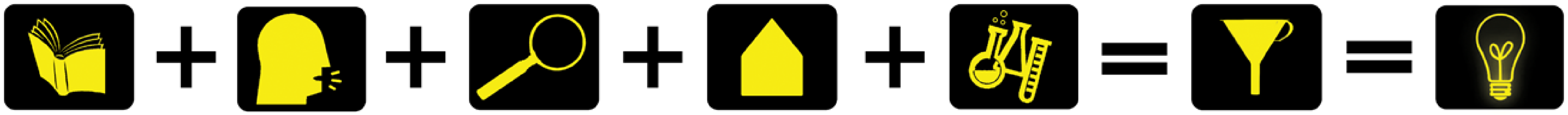
Then the public infrastructure of the building needs to be determined. Thus what are the public facilities, how would the parkade work and **how would one integrate the spaces with the infrastructural systems?** In order to find out what is needed and what is **possible**, product research, technical analysis and a series of precedent studies were done to inform the project programme assembly. The research was organised under the following headings:

- _ **Energy supply**
- _ **Water harvesting**
- _ **Effluent waste management**
- _ **Recyclable waste management**
- _ **Organic waste management**

INVESTIGATING AVAILABLE TECHNOLOGIES

As previously stated, the project is focused on serving the site with resources, more specifically; **water, electricity, solid and effluent waste management.** It is the aim to do so in the most sustainable manner, integrating the systems in the project structure, cycling and harvesting the resources on site to whichever extent it is possible.

Thus for every resource management system one needs to know what the capacity should be, what system is needed to manage the resources and **what one can ultimately achieve with current technology**. An investigation was done on each topic to find the most appropriate management strategy.



____ENERGY SUPPLY_____

The on site energy usage is 334 600 kW/h per month, but with current power saving strategies and technologies a building's power usage can be reduced by 15% (Eskom Demand Side Management 2008 : 1). Thus, the on-site energy requirements should be about **284 410 kW/h per month**. Current available sustainable energy generating technologies are:

- _ Solar water heaters
- _ Solar photovoltaics
- _ Hydro-electricity
- _ Tidal power
- _ Wind energy
- _ Geothermal energy
- _ Methane gas harvesting
- _ Nuclear energy

Solar water heaters and solar photovoltaics only **need surface area and sun exposure** to generate energy, the bigger surface area that is used (thus the more panels) the more energy can be generated. Hydroelectricity needs **large volumes of water at extremely high pressure** and is only feasible if these volumes are available. Tidal power is generated by waves, thus one needs to be by the sea. Wind energy requires **strong and constant** winds which we do not have in Pretoria.

Geothermal energy is harvested from heat stored in rock in volcanically active plate margins which also does not occur in Pretoria. Methane gas is **highly explosive** and would present a health and safety risk in the urban setting. Nuclear energy is generated through a very hazardous process and it would be a **safety risk** to operate in a dense urban area (Boyle 1996 : vii).

Thus the only available, economical and practical energy generation technologies are **solar water heaters and solar photovoltaics**. If one considers photovoltaics, the nearest cell supplier is Solar Metrics Ltd. in Johannesburg, Gauteng.

Solar Metrics uses **small cell modules to build custom panels,** but also has a range of standard prefabricated panels. According to their product data, **a 1m²** (1580mm x 808mm x 35mm) **panel generates 0.925kWh per day** (for an average **5 hour sun exposure**) at the optimal angle of 30° north facing. Because the energy produced is used in an off-grid application 28% of the efficiency is lost, to counter this loss 28% more panels are needed. Thus to supply the entire site's energy via photovoltaics, a simple calculation needs to be done:

Entire site's energy requirements:

	= 284 410 kW/h per month
1 panel	= 0.925 kW/h per day X 30 days
	= 27.75 kW/h per month
	= 284 410 / 27.75
	= 10 249 panels.

Thus **10 249m² surface area is needed** to generate the entire site's energy. This is **one third of the site's surface area** and would cost about **R50 million.** Although one could hypothetically attempt to cover a third of the site in photovoltaic panels it would not be possible to do so with a singular central intervention. The technology of alternative energy production is still in an early development stage and although many brilliant advances have been made, large scale energy production remains a mountain yet to be conquered. Unless perhaps thousands of m² is set aside outside the city for a large photovoltaic energy plant.

Thus, unfortunately, it would **not be feasible** to attempt to supply alternative energy to the existing structures on site. One can however integrate photovoltaic energy harvesting into the intervention's design to at least generate the building's own energy. A few precedents were consulted to look at the possibilities of **integrated photovoltaic design**.

precedents

Alternative energy harvesting in the high density urban context.

the lighthouse

2010 eVolo skyscraper competition

location: Dubai, 2007

architect/s: Atkins

project: The Lighthouse is another innovative green skyscraper to be constructed in Dubai. For energy generation, it will have three enormous 225 kilowatt wind turbines (29 meters in diameter), and 4000 photovoltaic panels on the south facing façade. To optimize performance and operational periods, the turbines have windward directional wind vanes. The 400-meter office tower aspires to reduce its total energy consumption by up to 65% and water consumption by up to 40%. According to Atkins, this unique building, with a total construction area of 140,000 sq m, will become a working prototype for low carbon towers within the region and a model for more sustainable developments in the future (Thomas 2007).

solasis light tower

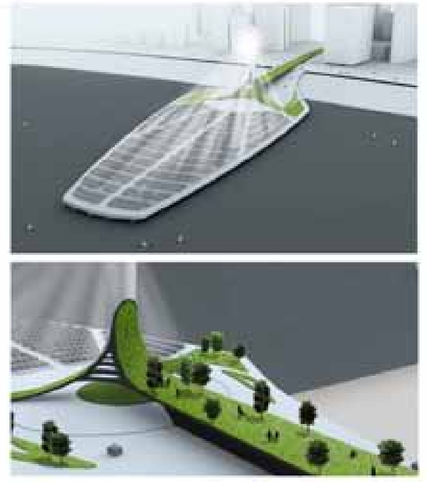
solar parking lot

the future does much more than park cars

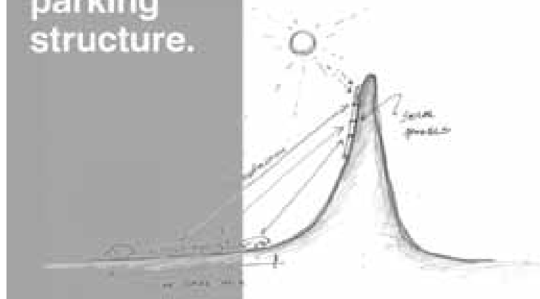
location: Design comp, 2010

architect/s: Designboom, Nissan

project: This renewable energy generating parking lot actually uses the cars' windshields to shine sun onto a solar power concentrating tower adding valuable juice to the grid. Cars are parked so that their windshields and hoods face the solar receptor at the front of the parking lot. The designers, Klaud Wasiak and Yongbang Ho focused the concept around the Nissan Qashqai which has mesh made up of photovoltaics and mirrors on the windshield and roof. When parked, the mirrors activate and track the sun and re-direct the beams of light to the solar concentrating power tower. Drivers of cars who park in this offshore parking lot can hop on an underground metro line that will bring them to the city core. Or they may choose to cut through the above-ground park and get exercise by walking into the city (Meinhold 2009).



Using solar energy to charge electric cars in a parking structure.



____WATER HARVESTING_____

The on-site potable water requirements are 663 140L per month. If current water saving technology is implemented on the existing buildings, the water requirements would be 20% less (Tshwane 2004 : 76) thus the site would need 530 512L per month. The best way to harvest rain water on site is to collect water off roofs and tank it. The water needs to be filtered for impurities which might be on the roofs and treated with chlorine to be drinkable. 40% of the water used can also be cycled as grey water which is then used for black water and irrigation purposes (Tshwane 2004 : 78). Thus 40% of the potable water is used for grey water purposes. The total usage is then **318 308L per month.**

If every roof on site is used for water harvesting and one calculates the average monthly rainfall on the **total roof area which is 26 034m²**, there will be an adequate surplus amount to provide enough water for the whole year if the water is collected in a 900KL tank (refer to table below). This implies that it **will be possible for the intervention to provide enough water for the rest of the site.** The following precedents were consulted to investigate how water purification and harvesting was integrated into architectural interventions.

Rain water collection												
Month	DES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV
Rainfall	0.108	0.135	0.076	0.079	0.054	0.013	0.007	0.003	0.005	0.02	0.007	0.01
Water collected kL	2389.932	2987.415	1681.804	1748.191	1194.966	287.677	154.903	66.387	110.645	442.58	154.903	221.29
Water used kL	318	318	318	318	318	318	318	318	318	318	318	318
Surplus water kL	2071.932	4741.347	6105.151	7535.342	8412.308	8381.985	8218.888	7967.275	7759.92	7884.5	7721.403	7624.693
Total collected Kl	2071.932	4741.347	6105.151	7535.342	8412.308	8381.985	8218.888	7967.275	7759.92	7884.5	7721.403	7624.693
Tank size	900	900	900	900	900	900	900	900	900	900	900	900
Water collected kL	2071.932	2669.415	1363.804	1430.191	876.966	-30.323	-163.097	-251.613	-207.355	124.58	-163.097	-96.71
Total collected kL	900	900	900	900	900	869.677	706.58	454.967	247.612	372.192	209.095	112.385

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precedents

Alternative water harvesting in the high density urban context.

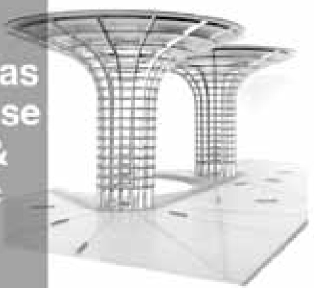
capture the H₂O

2010 eVolo Skyscraper Competition

location: New York, 2010

architect/s: H3AR

project: A skyscraper is comprised of a system of gutters to catch as much rainfall as possible. The water captured and processed by the building may be used for flushing toilets, feeding washing machines, watering plants, cleaning floors and other domestic applications. The water collected with the skyscraper will supply 85liters pp of rain water to meet the daily needs of the inhabitants (each user averages a daily consumption of about 150 liters). This is achieved by the development of the skin treatment to make the building transform into a cohesive rain collecting machine. The gutters on the external surfaces of the building capture rainfall flowing down the building. The rainfall is then transmitted to floors and its surplus is stored in a reservoir under the building (Cilento 2010).



Using a reservoir as a mixed use building & economic aid.

watertower

skyscraper for Sudan

location: Sudan, 2010

architect/s: Hugon Kowalski

project: In 2007 an underground lake in the region of Darfur, Sudan was discovered. The lake is the 10th biggest lake in the world (31, 000 m2). A building that allows access to underground water through the application of water pumps was proposed. The form of the building was inspired by a water tower and also by the symbol of the African savanna – the baobab. The building houses water pumps, a treatment plant and also a hospital, a school and a food storage center. This building is meant to provoke economical development but also to stimulate cultural exchange and the coexistence of the three different religions and languages in Sudan. Two water circulation processes would be in place. The first set of extracted water is meant to heat or cool the building, and is accessible to the users. Second set of extracted water is used for the building itself (i.e. kitchen, toilets) (Sebastian 2010).

____EFFLUENT WASTE MANAGEMENT_____

The site produces **663 140L of effluent wasteper month**. Effluent waste is a source of **rich minerals and gasses** which can be used for heat, gas and compost production. It can be processed via

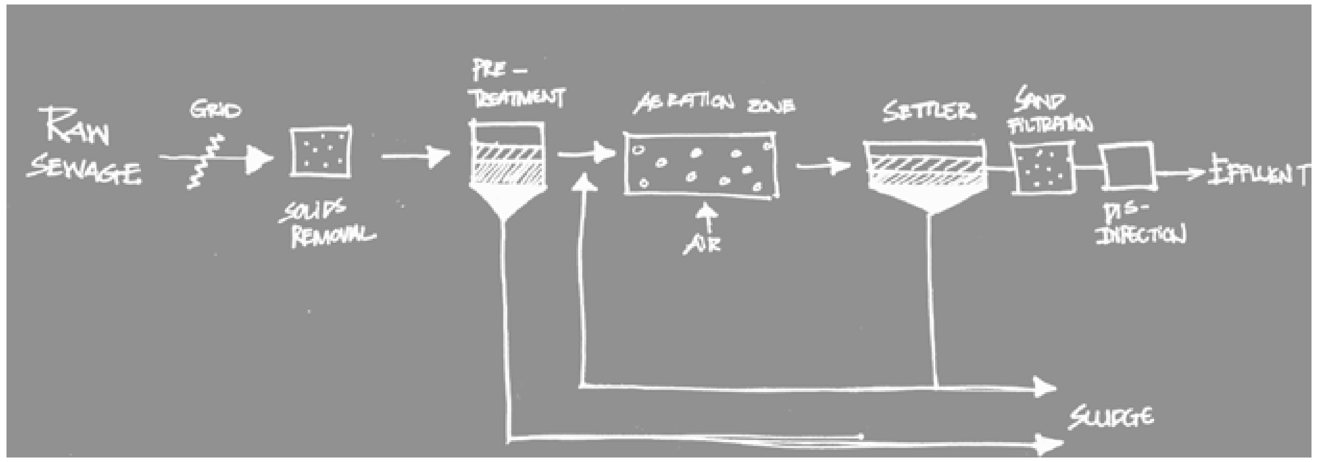
- **_ sewage treatment plants**
- **_ wetlands**
- **_ septic tanks**
- **_ methane digesters**
- **_ membrane bioreactors (MBR)**.

Sewage treatment plants take up large tracks of land, do not smell very nice and are a health hazard and need large and expensive equipment. A wetland big enough to treat the entire site's sewage would be bigger than the entire site and would smell unpleasant. Septic tanks are only fit for small scale use and require a lot of maintenance to keep them in good functioning condition.

Methane digesters are highly flammable and thus pose a health and safety risk. A membrane bio reactor is a patented machine which can process large amounts of sewage and produce fertile sludge and grey water as by products.

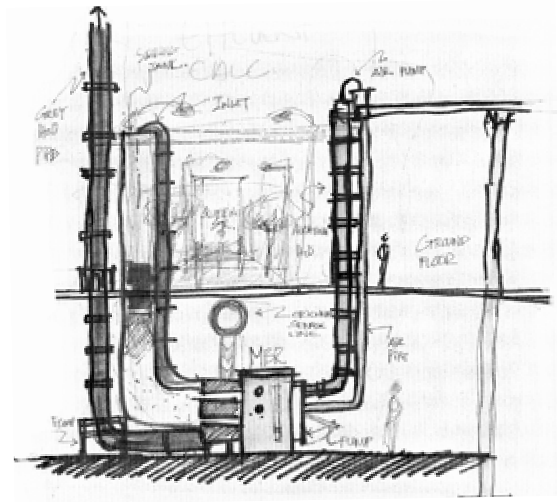
The most practical and compact method to process effluent waste would be to integrate a MBR system into the building's design, which plugs into the existing sewer system.

MBR manufacturers Wock Oliver Limited supply different MBR systems which can be bought as a prefabricated product or a custom site specific product. The VOK MBR (2.5 m x 2 m x 2.2 m) would typically be used to process 800 000ℓ of effluent waste per month and would be the applicable product for on-site requirements.



[Figure 4_1.] Membrane bio-reactor process diagram. Sketch by Author, 22 March 2010.

[Figure 4_2.] Wock Oliver model VOK MBR 2.5m X 2m X 2.2m, will be suitable for on site needs.



[Figure 4_3.] MBR under Queen street with extruded process.

Advantages

_**Reduced plant footprint** as secondary clarifiers and tertiary filtration are eliminated, thus the system can fit into small rooms inside buildings, or as applied in boats, making the machine handling more user friendly and easy to install and transport.

_Footprint can be further reduced because other process units (digesters or UV disinfection and aeration basin volume) can also be eliminated/ minimized, in this case **aeration is maximised as an aesthetic and communicative part of the process**.

_**Long sludge age**, hence low sludge production, thus the sludge can be tanked on-site and removed systematically.

_Produces a MF/UF quality effluent **suitable for reuse applications like flushing WCs and irrigatio**n, some of the machines used in boats can even produce clean enough water to drink.

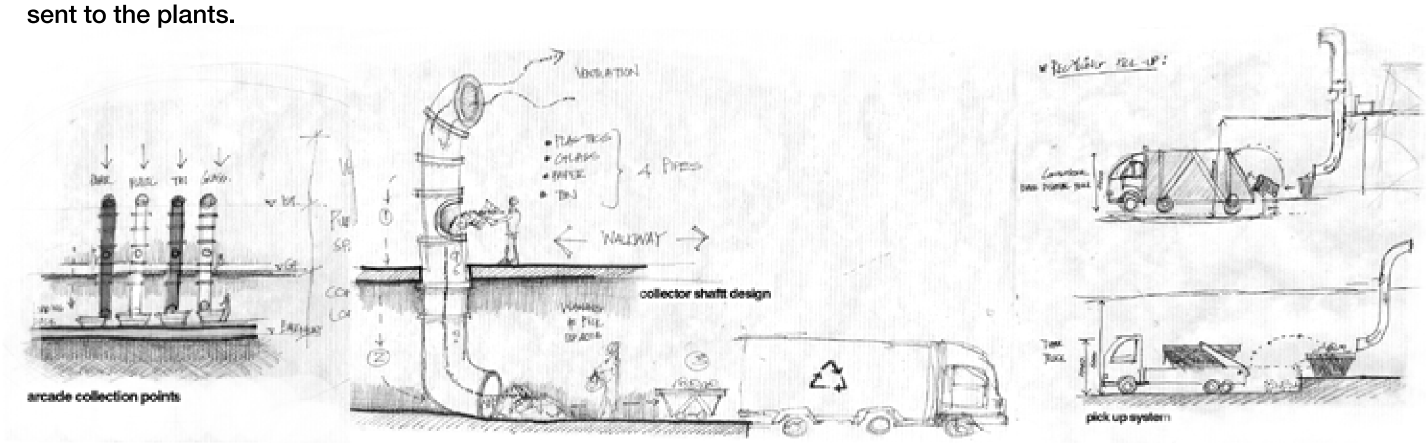
_Reduced sludge de-watering cost because of an advanced filtering system.

Application

+ Municipal wastewater for high quality outlet water
+ For recycling systems
+ Wastewater from numerous industrial sources such as paper mills, beverage ingredient processors, slaughter houses, food processors, chemical plants, tank truck cleaning operations, etc

____RECYCLABLE WASTE MANAGEMENT_____

The on-site recyclable waste production is **17 855kg per month**. Recyclable waste: paper, glass, tin and plastic needs to be collected, separated and sent to recycle plants. It is not feasible to implement recycling processing systems like melting plastics on-site, it is hazardous and not energy efficient to have many little plants than one large plant. Thus the recyclable wastes are **collected and sent to the plants.**



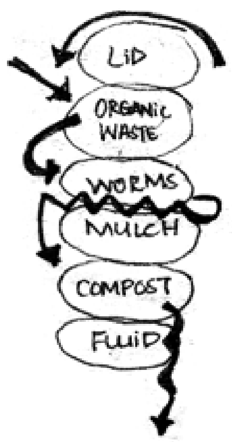
[Figure 4_4.] Recycle waste management system in basement.

____ORGANIC WASTE MANAGEMENT_____

The site produces **7 345 kg organic waste per month**. Organic waste is a **rich source of minerals and gas** which can be used for heat and compost production. Organic waste can be processed by using:

- **Composting**
- **Methane digesters**
- **Incinerators**
- **Earthworm composting**

Composting is a slow, smelly and spacious process which one would not necessarily want to combine with public spaces. Methane digesters are highly flammable and are thus a health and safety risk. Incinerators use energy and resources to burn materials which often causes harmful fumes and gasses into the atmosphere.



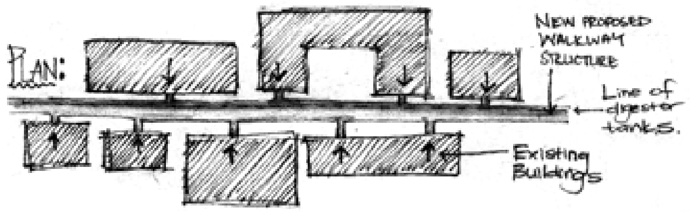
[Figure 4_5.] Vertical earthworm composting process.

Earthworm composting needs management but is compact, smell free and produces compost much faster than regular composting. Thus the most practical and compact method to process organic waste would be to integrate earthworm digesters in the intervention which can produce compost for on-site use as well as leachate for further cultivation.

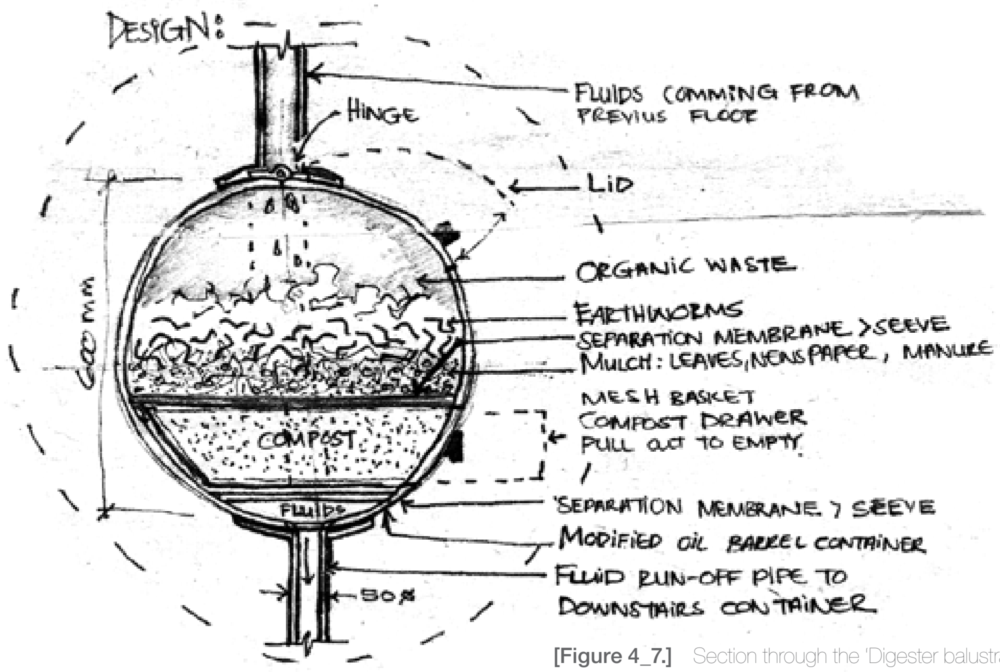
Basic earthworm composting as described by the diagram above is a process where organic mater is fed to earthworms in a secure container. The earthworms eat the organic matter and in the process produce two very valuable by-products. **The liquid produced by the worms is called 'leachate', it has a high nutritional value and can be diluted 1/11 to be used as a growth supplement for plants.**

The solids produced by the worms also has a high nutritional value and is used as compost to boost plant growth. In the diagram figure 4_5 a strategy is formulated to illustrate how worm composting digesters can be combined with the circulation routes between the buildings in order to reach the user more efficiently.

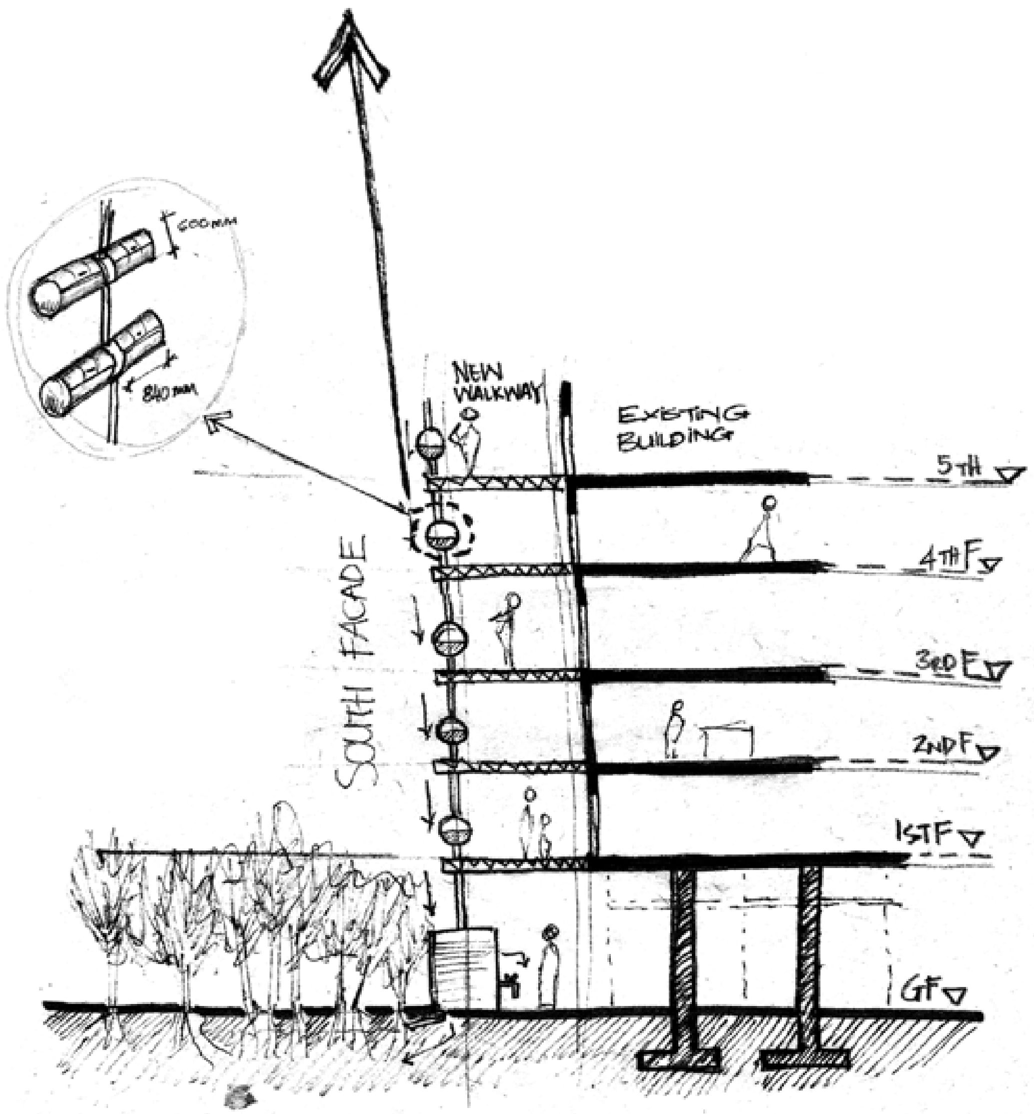
The worm digesters are designed to be integrated with walkways on circulation routes and are intended to act as part of a balustrade system and planter design as well as acting as refuse bins for the organic waste as illustrated in figure 4_6.



[Figure 4_6.] Route between buildings where digesters can be placed.



[Figure 4_7.] Section through the 'Digester balustrade bin'.



[Figure 4_8.] Digester on different levels connected to each other.

The intervention's public facilities are determined by the needs of the users (as discussed in the interviews in chapter 3) and as a response to the site analysis. The needs that were identified are:

- **_ Public recreational space**
- **_ Organised vending**
- **_ Secure access to buildings**
- **_ More parking facilities**
- **_ Better organised loading facilities**
- **_ Cyclist facilities**
- **_ Public restrooms**

The core mass of the building is the parkade. The lack of public transport is one of the main culprits in urban sustainability, so why should one encourage the use of cars by creating facilities for them? First ignoring a problem does not make it better or disappear, maybe the best way to create awareness and start making a difference is targeting the source of the problem.

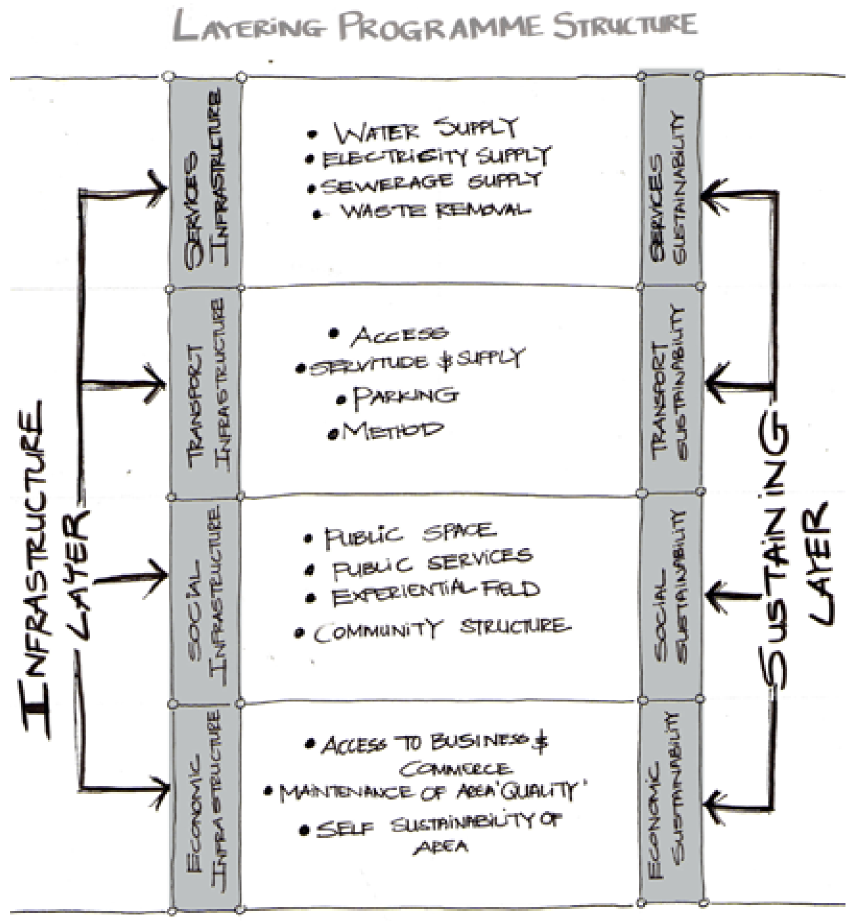
Second, the areas with good economic development are those with good access. People would rather go to Menlyn for shopping than the CBD because there is organised, accessible and safe parking.

Third, development of alternative energy sources to replace the use of fossil fuels in cars has increased in the last 20 years. Even in South Africa the first electrical car named 'Joule' , envisioned by a company called Optimal Energy, designed by Keith Helfet (designer of the iconic Jaguar XJ-220 supercar - which was for a time the world's fastest car). The first Joule cars will be in showrooms in September 2010.

Sustainable methods of travel are thus encouraged, the pakade will have electric car charging ports (one could make drivers of normal cars pay for parking and the electrical cars can park and charge for free), cyclist parking and public transport facilities to encourage the use of 'greener' transportation. The following precedent illustrates similar intentions to combine an urban regeneration project with infrastructure and public facilities.

After determining the required programmatic systems the assembly of the different components in the programme structure is compiled of different layers of hierarchy which ultimately works together as a **'services' building**. The greater part of the building is a parkade which facilitates the other services and enables the manifestation of the symbiotic relationship with the existing

Fig. 4_9 illustrates the different relationships and layers within the intervention programme and fig. X illustrates the functional hierarchy of the different systems. Thus both the diagrams describe how the **infrastructural components coexist to serve one central purpose while maintaining the existing structures and needs on site.**



[Figure 4_9.] Hierarchy of spaces and functions sprouting from parkade structure.

[Figure 4_10.] Grouping infrastuctural and sustaining functions.

____PARKING STRUCTURES_____

The challenge of housing a maximum number of cars in a well-designed space is one of the most overlooked aspects of twentieth-century architecture, and yet it has attracted an array of architects throughout the history of its development. From Louis Kahn to Rem Koolhaas, from Paul Rudolph to Zaha Hadid to Kengo Kuma, architects have used the parking garage to experiment with ideas about materiality, form and structure.

The parking structure has captured the imagination of novelists, photographers and film makers, and yet it remains peripheral to our culture, best understood as a forbidding fictional setting or as an often **imposing, silent building that we encounter on the way to work or shop**. We think of these places as dynamic but secret, where the rules do not apply, mysterious, inhumane, born out of an extreme obligation to the car.

J.B. Jackson describes the evolution of the domestic garage by defining the role of the car at the beginning of the twentieth century as that of a **'pleasure vehicle and a toy, costly, exciting and of extraordinary elegance'** (in Henley 2007: 8). Initially the expeditionary nature of motoring was a pastime and an end in itself. This and the low numbers of automobiles limited the impact of the static (parked) vehicle in the city. **But when the vehicle became a tool rather than a toy, the need to park in mass arose.**

Only a few parking structures existed before the 1920's: Auguste Perret's garage in the rue de Ponthieu (1905) in Paris, Marshall & Fox's Chicago Automobile Club (1907), and Marvin & Davis's garage for Palmer & Singer in New York (1908). This generation of buildings had appropriated the warehouse idiom, and indeed Jackson noted that the word 'garage' is derived from the French word for 'storage space', i.e. 'warehouse' (in Henley 2007 : 8).

In the 1990's the carpark made a return as a practical solution to the congested city, particularly in Europe. A new more technically perfect and **mischievous architecture of planes, ramps, spirals, folds and continuous landscapes surfaced.** The sincerity of the 1950's and the 1960's had been replaced by playfulness, or a search for the sublime. A few relevant precedents are consulted for inspiration and guidance.

[Figure 4_11.] Parkade precedent photographic essay collage.

multi-level parking

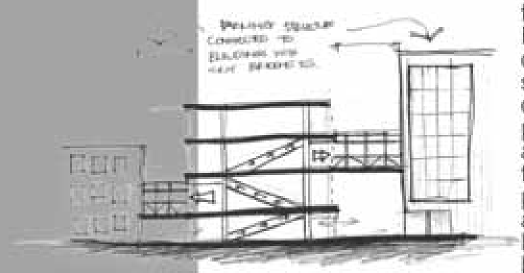
combining scatered parking spaces

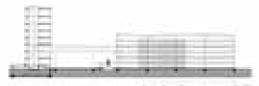
location: Linz, Austria, 2007

architect/s: x Architekten

project:

Due to the location in the city of Linz and restrictions on the premise boundaries, the Voestalpine steel company needs to pursue alternative growth strategies. An important method of achieving this is through the strategic concentration of facilities and processes on the premises. For this reason the idea developed to concentrate the existing scattered parking spaces, which use up a lot of space, to a centrally located car park. Strategically positioning the car park has proved to be a prototypical solution when considering transformational processes of industrial premises. Each level consists of an access and exit ramp as well as three lifts, one of which leads directly to the bus station. The surrounding office buildings can be directly connected to the upper levels of the car park via foot bridges.The daily route of drivers from car to workplace becomes shorter and more convenient and an optimal vertical distribution of the car park's usage is therefore encouraged (Saieh 2009).





Central service parking lot connected to surrounding buildings.

1111 Lincoln Road

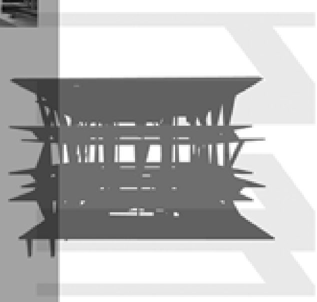
mixed use parkade

location: Miami,USA 2010

architect/s: Herzog & de Meuron

project:

Called 1111 Lincoln Road, the building incorporates 300 parking spaces. Eleven shops and three restaurants are located at ground level, with further shopping on the fifth floor and another restaurant on the roof. 1111 Lincoln Road represents the collaboration of renowned architects, landscape architects, artists and designers to create a unique shopping, dining, residential and parking experience for Miami's residents and visitors. Constructed of concrete and glass, 1111 Lincoln Road is described by architect Jacques Herzog as pure Miami Beach – "all muscle without cloth". Each level of the sculptural parking facility is filled with natural light, creating successively striking vistas of the city. At its base, the retail spaces offer unobstructed access to a new, transformed public space (Wennett 2010).



Pedestrian promenade combined with commercial strip and parking.

ACCOMMODATION ASSEMBLY

CALCULATING PROGRAMME AREAS

For each required space and system a number of regulations and volumetric requirements are provided as part of the practical organisation and assembly of form and function. Thus every required space is calculated to ensure it complies to National Building Standards and will be sufficient for the intended function.

Spaces which need to be calculated are:

_Parkade size
_Water tank size
_Photovoltaic surface area
_Loading zones
_Cyclist parkade
_Commercial zone
_Change rooms
_Waste management areas
_Management facilities

PARKADE SIZE

The Tshwane Town Planning Scheme 2008, Clause 28 (1) Table F (TTPS 2008 : 60), states that 1 parking bay is required for every:

_ 93m² of Flats
_ 37m² of Residential Buildings
_ 100m² of Offices
_ 100m² of a Bank
_ 100m² of an Industry
_ per classroom of a Place of instruction
_ per 5 seats of a Place of Worship
_ per 2 seats of a Place of Refreshment
_ 6 bays per 100m² of Commercial space.

There is a total of 830 bays available on site and a shortage of 900 bays needed according to Tshwane Town Planning Scheme. But pedestrianisation, increase in the cycle culture, public transport and surrounding public parkades need to be taken into account in order to make this a realistic number.

Traffic Engineer at the Faculty of Road Engineering and Public Transport, University of Pretoria, Professor Christo Venter was consulted on how to go about adjusting the amount of required parking spaces with regards to the respective influences mentioned above (Venter 2010). After he was advised, the following conclusive calculations were made.

900 bays are reduced by :

Sammy Marks parking	= 1179 bays >> 1200
Divide between 7 user blocks	= 1200 ÷ 7
	= 171 bays available.
State Theatre parking	= 1000 Bays
Divide between 7 user blocks	= 1000 ÷ 7
	= 142 bays available
	= 900 – (171 + 142)
Total	= 587 bays
Public Transport	= already calculated into town planning scheme.
Encouraged Cycle culture	= 16% residential bikers & pedestrians.
	= 37.
	= 15% office bikers & pedestrians.
	= 67.
	= 12% retail users bikers & pedestrians.
	= 42.
	= 587 – (37 + 67 + 42)
Total	= 441 bays
Mixed use cycle	= Fatima Centre & Libri Bldg. both residential.
	= 114 extra day bays
	= 441 – 114
Total	= 327 bays
Grand Total >>>>	**360 bays**
1 bay	**= 12.5m²**
	= 360 X 12.5m²
	=4500m²

Total amount of workers:

Entrance & boom	= 2ppl
Security	= 4ppl
Cleaning	= 2ppl
Pay points	= 2ppl
1 Charge worker per floor	= ±4ppl
Total	= 14ppl

____WATER TANK SIZE_____

As previously mentioned, average of **900KL potable water can be harvested and stored for on-site use.** The water is harvested from the existing roof areas only and not from the ground level surfaces because of various pollutants on the ground surface that would complicate the water treatment process.

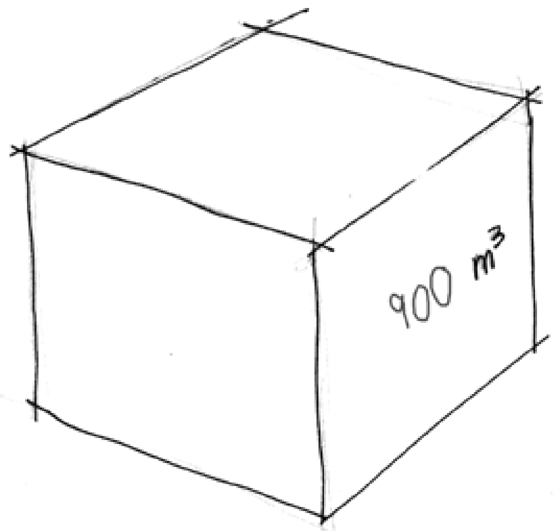
$1m^3$ = 1000L = 1KL
= 900 000 ÷ 1000
= $900m^3$

NB. A concrete tank must be **circular** in plan (cylindrical) in order to resist the horizontal force created under the pressure of the water.

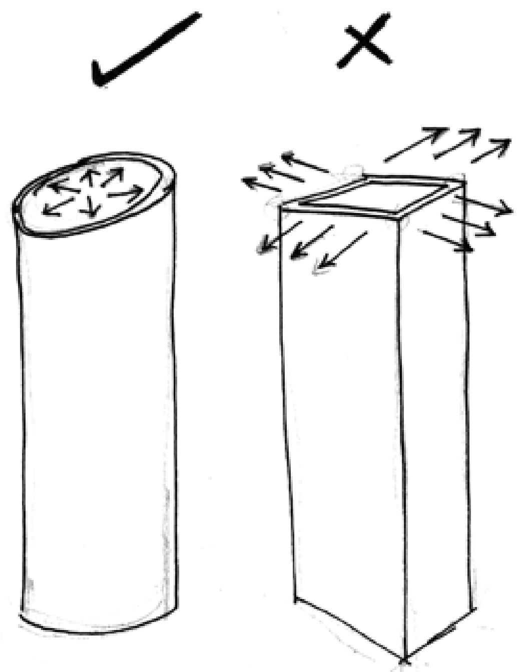
A steel tank may also be considered but will have to be divided in to smaller compartments because one big steel tank will also give way under the force of the water.

Total amount of workers:

Cleaning	= 1ppl
Collector	= 1ppl
Manager	= 1ppl
Total	= 3ppl



[Figure 4_12.] Volume of water mass.



[Figure 4_13.] Tank must be cylindrical.

____PHOTOVOLTAIC SURFACE AREA_____

Photovoltaic technology is not yet advanced enough to generate enough energy for the entire site. Thus the energy generated by photovoltaic panels will only be used to run the entire **building's lighting and the charging of electrical cars.**

According to Reinart Moraal, Electrical Engineer at solar cell dealers and design company Solar Metrics Africa, by the year 2020 aproximately 15% of all cars on the road will be electrical cars. Thus if the parkade has space for 360 cars, 54 cars will be electrical cars (Moraal 2010).
One car battery takes 8 hours to charge and will use 36kWh (R 26.00 as per current Eskom rates) but if the car charges during a business hour average of 5 hours only two thirds of the energy will be used thus 24kWh (Moraal 2010).

= 24 X 54
= 1 296 kWh
One $1m^2$ panel generates = 0.925 kWh per day
= 1 296 ÷ 0.925
= 1 401 panels
= **$1\ 401m^2$**

In order to run the entire building's lighting, the optimal lighting rates needs to be applied. The SABS 204-1 states that for a covered parking area 100 Lux is required per every $1m^2$ (SABS 2008 : 28). If, for example, standard Osram LUMILUX® T8 (L 58 W/840) fluorescent lamps are used for the parkade area, the 5200 lumen/m^2 lamps will use 58 Watt per hour. Thus to service the entire surface area of the building:

lux = Lumen/m^2
= (12.5 X 1 00) 300
= 375 000 / 5200
= 72 X 58 Watts
= **4.176kW/h**

If natural lighting is efficient enough during the day, the lights will be switched on for an average of 10 hours. If 2/3 of the building is completely empty during the night the lights will be switched off and thus only 1/3 will be on for 10 hours.

= (1/3) X 4.2 + (2/3) X 4.2
= 5.88 + 11.76
= 17.64 kW/h is required.
= 17.64 ÷ 0.925
= 20 pannels @ $1m^2$
= **$20m^2$**

Thus the total photovoltaic surface needed for lighting and charging of the car batteries are:

= 20 + 1 401
= **$1\ 421m^2$**

A battery bank is needed to store the energy for use.
1 battery bank = 1 battery = $1.1m^2$
= 54 batteries needed
= 54 X 1.1
= **$60m^2$**

Total amount of workers:

Cleaning	= 1ppl
Maintenance	= 1ppl
Manager	= 1ppl
Total	= 3ppl

____LOADING ZONES_____

Because of the traffic jams and congestion on site, alternative loading zone areas are proposed. These zones are incorporated with the super basement where the **goods can be safely off-loaded and directly transported into the appropriate storage spaces.**

New rentable storage space as well as loading zones are proposed to serve the main goods handling buildings as well as a general loading area for smaller goods services.

Requirements:

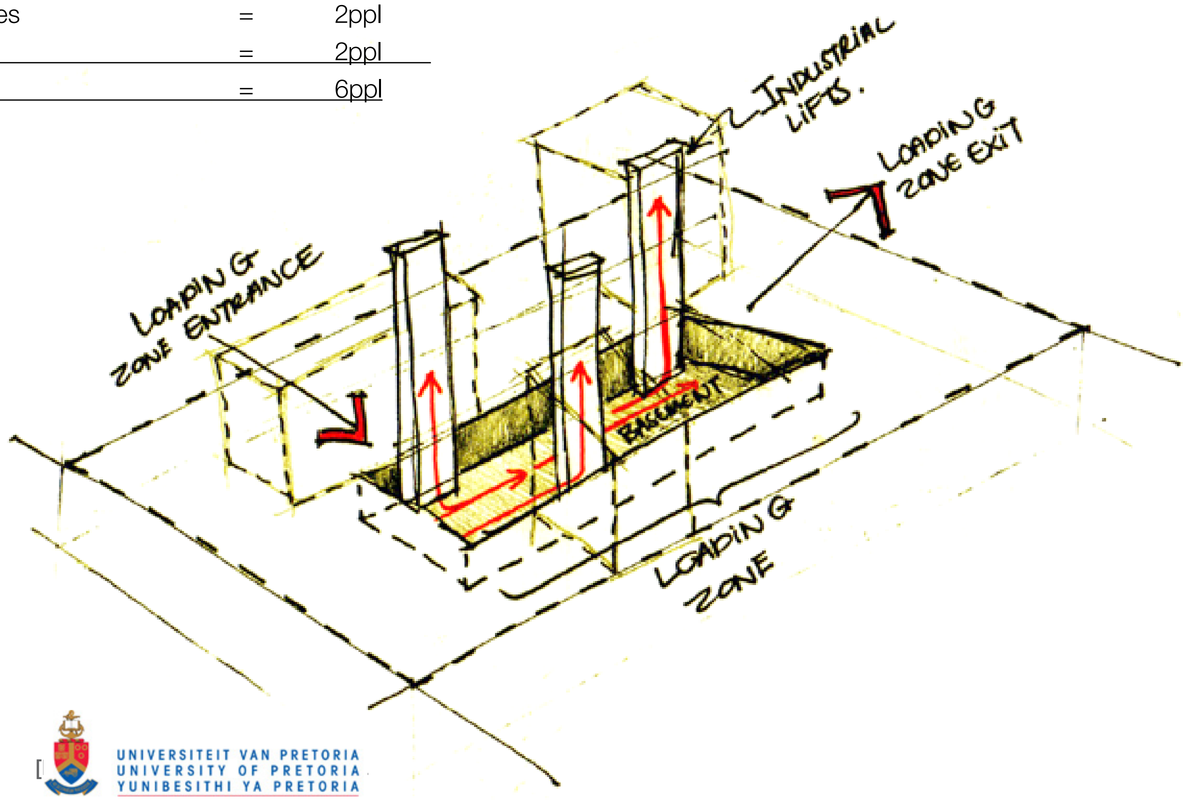
Loading dock width	=	3500mm
Road width for one way truck circulation	=	3500mm
Provisional space for truck length with back to dock	=	min. 14 000mm
Min. floor to ceiling height		=
4500mm		

Areas:

Four rentable storage rooms	=	4(100)
	=	400m^2
New Shoprite Storage	=	250m^2
Five new loading docks	=	5(32)
	=	160m^2
Total loading zone area	=	400 + 250 + 160
	=	**810m^2**

Total amount of workers:

Entry & exit security	=	2ppl
Manage offices	=	2ppl
Loading staff	=	2ppl
Total	=	6ppl



____CYCLIST PARKADE_____

Cyclist parking is provided as part of public facilities and to encourage a cycling culture. The facilities go hand in hand with public change rooms. If a bicycle is stored vertically it will need 0.5m^2 storage space.

300 Stands are needed to serve each building on site according to Green star rating regulations (Green Star 2008 : 173).

1 bay	=	0.5m^2
300 X 0.5	=	150m^2 parking space
Lanes (2 way lane)	=	3000mm
Bicycle service area:	=	25m^2
Total area required	=	150m^2+ 25m^2
	=	**175m^2**

Total amount of workers:

Entrance	=	1ppl
Security	=	2ppl
Cleaning	=	1ppl
Workshop	=	1ppl
Total	=	5ppl

____COMMERCIAL ZONE_____

Commercial activity on the ground floor is pulled onto the periphery of the central core, framing the square and activating the arcade. Commercial businesses which are incorporated into the design are planned to **further serve different aspects of the site's on site social needs**. These businesses include:

_ Bakery	=	250m^2	=	5 staff
_ Take away (2)	=	150m^2 (each)	=	10 staff
_ Tavern	=	140m^2	=	4 staff
_ Bookshop	=	100m^2	=	3 staff
_ Hair Salon	=	250m^2	=	5 staff
_ Joule Show room	=	900m^2	=	8 staff

Total commercial area	=	**1790m^2**
Total amount of workers	=	**35ppl**

____CHANGE ROOMS_____

Change rooms for cyclists, commuters and workers in the surrounding buildings are needed where people can store belongings and for **refreshment between commuting**. According to Green star rating regulations (Green Star 2008 : 173) the following requirements should be met:

28 total shower, basin, WC facilities needed
1 restroom footprint = 4.8m²
=28 X 4.8
= 134.4m² gross rest room area

168 total lockers needed
1 locker = 0.8m² (including dressing space)
=168 X 0.8
= 134m²

Total change room facilities = 134 + 134 = <u>268m²</u>
= 268 ÷ 2
= 134m²

Ladies = 134m²
Gents = 134m²

Total amount of workers:

<u>Cleaning</u>	<u>= 2ppl X 2</u>
Total	= 4ppl

____WASTE MANAGEMENT_____

Recycle area:

The recycle sorting and pick up area is connected to the loading zone in the basement, large pipes on ground floor which go all the way down to the basement act as **'bins' into which public can come and throw their recyclables.**

Total area needed for all 24 buildings:
= 326m² (as specified by Green star rating handbook)

Sorting space	=	Bin + area
	=	3 X 4m
	=	12m²
Loading space	=	Single dock
	=	3.5 X 3m
	=	10m² (X3)
Cleaning space	=	6m²
Pick up bins	=	1.2 x 1.3m
	=	1.56m² (X3)
Total space required	=	12 + 10(3) + 6 + 1.56(3)
	=	12 + 30 + 6 + 4.68
	=	52.68m²
	>>	**<u>53m²</u>**

Total amount of workers:

Cleaning = 1ppl
Collector = 1ppl
<u>Manager = 1ppl</u>
<u>Total = 3ppl</u>

Membrane bio-reactor:

Sewage	=	663 140L per month
Product	=	VOK MBR by Wock-Oliver
Capacity	=	29 062 L per day
Area needed	=	2.2 X 2 X 2.5
	=	**11m³**
Excess sludge	=	±30 kL per day
Filtered water	=	±30 kL per day

Total amount of workers:

Sludge removal	= 1ppl
Maintenance	= 1ppl
<u>Manager</u>	<u>= 1ppl</u>
<u>Total</u>	<u>= 3ppl</u>

Composting:

Organic waste & sludge	=	7 345 kg p/m
Volume needed	=	1kg waste
	=	2kg worms
	=	1m² X 0,5m tray
	=	**<u>0.5m³</u>**
2 digesters per building	=	25 X 2
	=	50 X 0.5
	=	**25m² (area)**

Total amount of workers:

Compost removal	= 1ppl
Maintenance	= 1ppl
<u>Manager</u>	<u>= 1ppl</u>
<u>Total</u>	<u>= 3ppl</u>

____MANAGEMENT FACILITIES___

Management offices are needed for the overall building management serving the individual systems and building maintenance. Offices are needed for the:

Facilities manager	=	25m²
Loading zone	=	25m²
Parkade management	=	25m²
Commercial & marketing management offices	=	25m²
Total offices needed	=	**100m²**

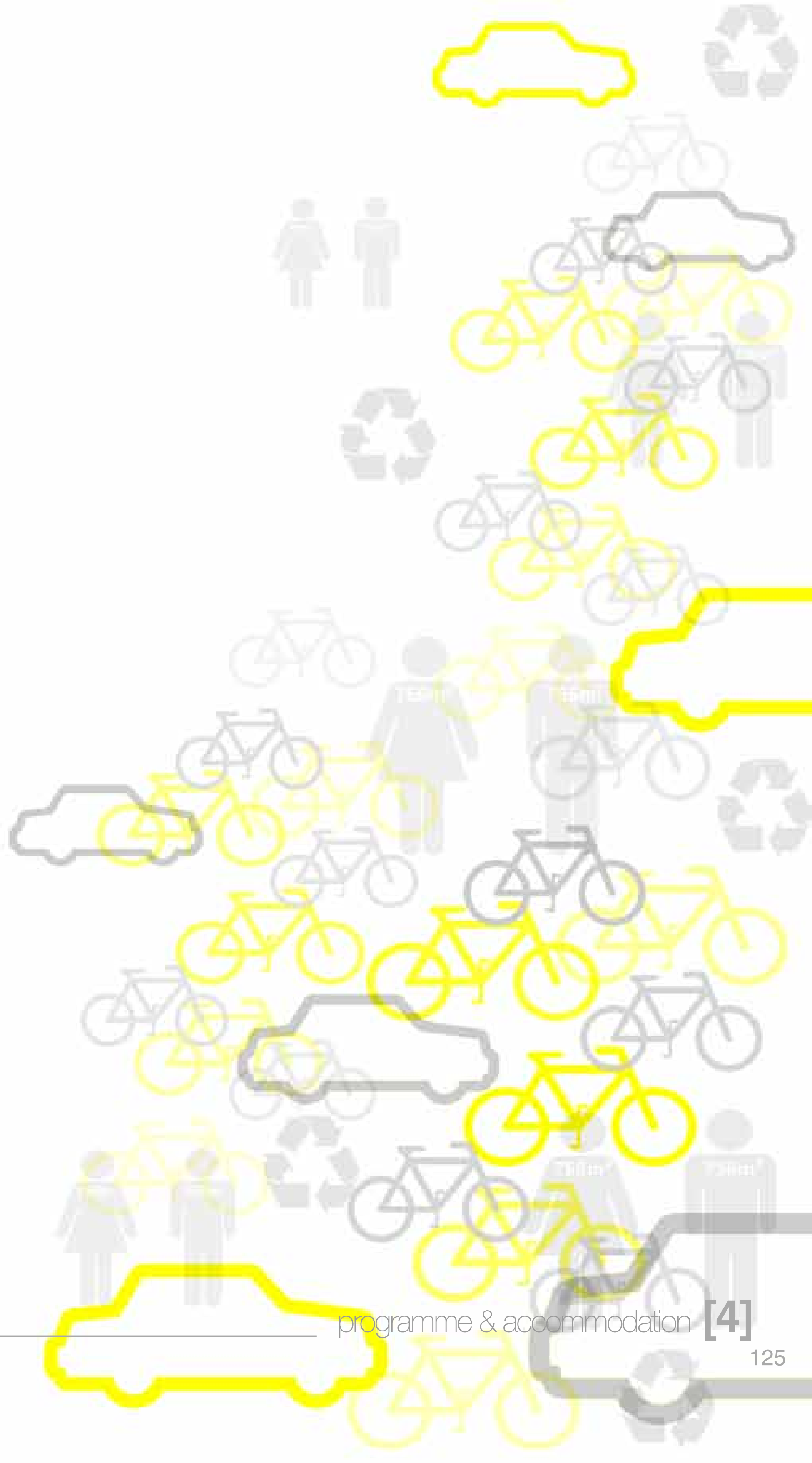
____SUMMARY: TOTAL AREA AND ACCOMMODATION___

Building total area:

Parkade	=	4500m²
Cyclist facilities	=	175m²
Change rooms	=	1512m²
Loading zone	=	810m²
Recycle area	=	53m²
Solar collection	=	60m² (battery bank only)
MBR	=	11m²
Commercial	=	1790m²
Management	=	100m²
Water tanks	=	150m² (excluding existing rooftops, only footprint area)
TOTAL	**=**	**18 322m²**

Total accommodation:

Parkade	=	14ppl
Cyclist facilities	=	5ppl
Change rooms	=	4ppl
Loading zone	=	6ppl
Recycle area	=	3ppl
Solar collection	=	3ppl
MBR	=	3ppl
Commercial	=	35ppl
Water tanks	=	3ppl
Composting	=	3ppl
TOTAL	**=**	**79ppl**



consumption design supply contribution

An investigation was done of the site's current usage and demand , as well as interviews with the users to determine what their needs are in the immediate area. After determining what the on-site waste produce, sanitary run-off, water usage and electricity consumption is, the alternative systems which could replace these infrastructural systems were explored.

Decided systems which aid and ultimately form the 'Infratecture' space are as follows;

- A rain water harvesting, chemical treatment and tanking system which provides water for the entire site.
- A Membrane Bio-reactor system which treats the entire site's sewage and produces gray water and sludge.
- A solid waste recycling and pick up system.
- An organic waste earth worm digester system combined with a vegetation system.
- A Photovoltaic solar screen system to provide energy for a portion of the intervention's electrical requirements.

The interviews held with the users revealed that on site problems included bad access systems to the buildings, lack of recreational public space and public change rooms, a congested servitude system and not enough parking. The project programme thus becomes a combination of these public and infrastructural needs. The inter-

SITE CONSUMPTION & REQUIREMENTS	INTERVENTION SUPPLY	% DELIVERED OF REQUIRED AMOUNT	DESIGN & SPATIAL CONTRIBUTION
WATER 320 kL p/m	TANKED ± 480 kL p/m	110%	> 3 X 300 kL TANKS > STRUCTURE BRACING > COOLING SPACES > FOUNTAINS > COLLECTION POINTS
ELECTRICITY 2 844 100 kWh p/m	1420m^2 PV PANELS 39 432 kWh p/m	5%	> ROOF STRUCTURE > NORTHERN SHADING > BALUSTRADE > SCREENING
SOLID WASTE 17 800 kg p/m	RECYCLING 17 800 kg p/m	100%	> RECYCLE TUBES > EDUCATIONAL / INFORM > FRAME ARCADE > CIRCULATION THRESHOLD
ORGANIC WASTE 7 300 kg p/m	50 DIGESTERS 7300 kg p/m	100%	> EARTH WORM DIGESTER > SEATING > PLANTERS > COMPOSTING > SCREENING
SEWAGE 663 kL p/m	MBR 800 kL p/m	120%	> MBR EXTRUDED SYSTEM > PRODUCE GREY WATER > PRODUCE SLUDGE > EDUCATE / INFORM > QS PORTAL
PARKING 360 BAYS	BASEMENT = 100 DESIGN = 180	75%	> SKY STREETS > VERTICAL CONNECTIONS > ALTERNATIVE ACCESS > FRAME RAMP

services building
services building
services building

[4.4] VOLUMETRIC ASSEMBLY

CALCULATING MASS

The available volume in the block core where some existing open spaces are optimised, buildings are demolished or buildings are incorporated with the project is **12 000m^3.** Thus the surface areas stated in the previous section need to be **organised vertically** to fit into the available space. In order to start visualising areas as volumes some typical heights need to be estimated. For the trucks to move with ease through the basement, the floor to ceiling height would be about 5000mm. The ground floor to ceiling height which is mostly commercial space is about 4000mm which is the approximate height of the existing building's ground floors. The rest of the typical floors would be at a floor to ceiling height of about 3000mm.

One parking bay takes up an area of 12.5m^2 (excluding structure). **160 of the total 360 parking bays area integrated into the super basement.** Thus the building mass only houses 200 bays, which is 2 500m^2. The parking space will be from the 4th floor upwards with a typical floor to ceiling height of 3m, thus the total parking volume would be 7 500m^3. The cyclist facilities would either be in one collective controlled space or be spread out along circulation routes on typical floors throughout the building. An area of 175m^2 would then give a volume of 525m^3.

The change rooms would either be split into two separate floors or one big rest room floor and would have a volume of (1 512m^2 X 3m) 4 536m^3. The loading zone is situated in the basement and would thus have a volume of (810m^2 X 5m) 4050m^3. The recycle area is situated in the basement and has a volume of 265m^3. The battery room for the photovoltaic solar energy collection has a volume of 180m^3. The MBR will be situated in the basement and will have a volume of 55m^3. The commercial area on the ground floor will have a volume of 7 160m^3.

The water tank is divided into 3 separate tanks which are connected to the surrounding roof tops and buildings. Each tank has a diameter of 8m and a footprint area of 50m^2 and is 34m high with an overall collective volume of 5 310m^3 . The management office will be scattered all over the site and will have an overall volume of 300m^3. The composting area and services distribution will be integrated with the circulation.

Thus the overall intervention mass will be a total of 28 881m^3. But the building mass will be a total of 18 171m^3.

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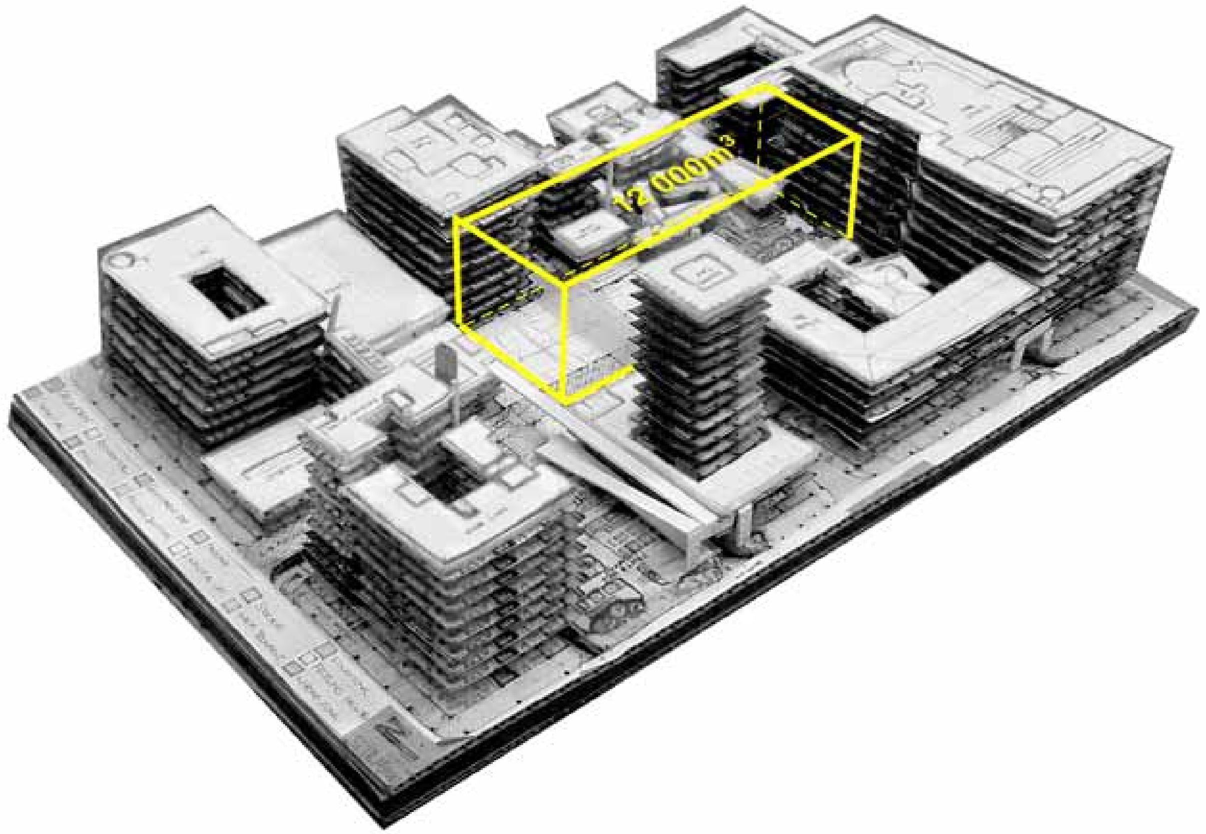
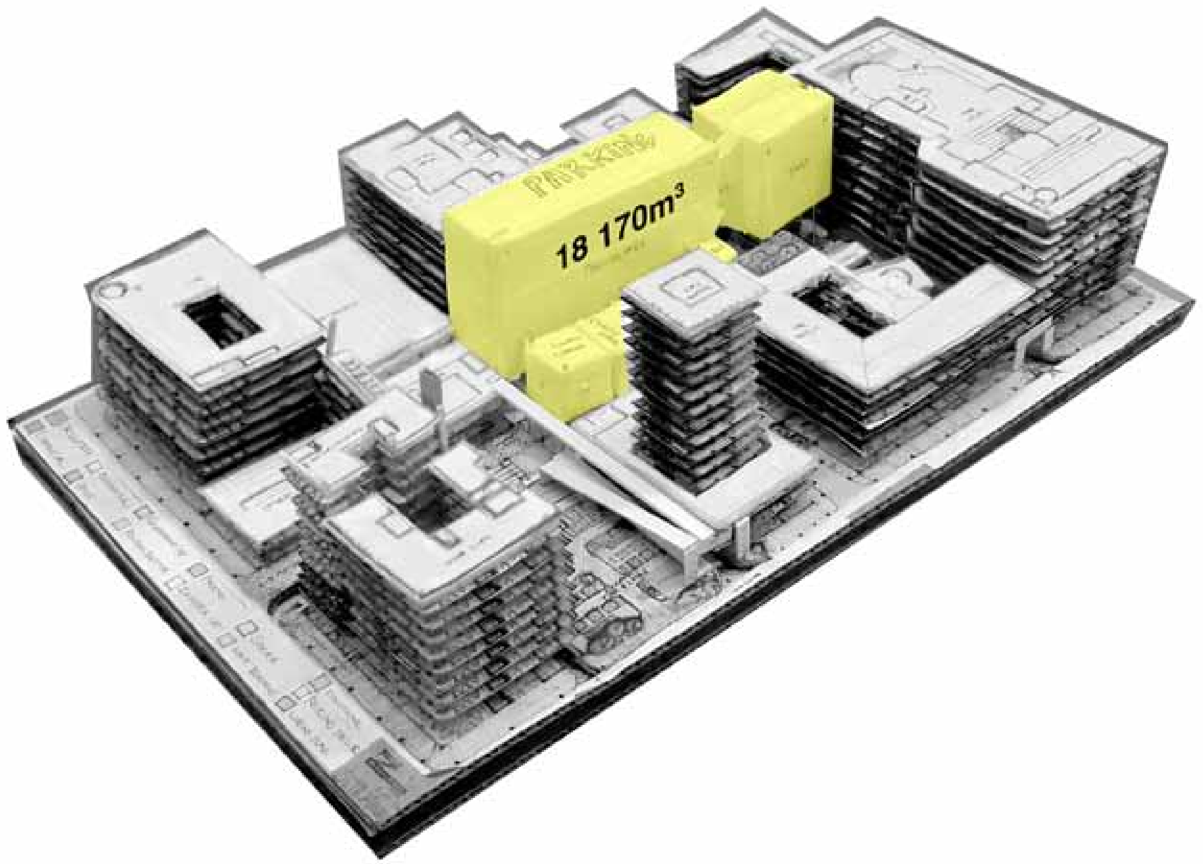
[Figure 4_15.] Open space volume in block core.



[Figure 4_16.] Total project volume in block core.



conception of the character________[5]________________[Conceptualizing]_____

____[5.1]_______ __INTRODUCTION___________

____[5.2]_______ __DESIGN INFORMANTS______

____[5.3]_______ __CONCEPT EXPLORATION___________________

____[5.4]_______ __CONCEPT DEVELOPMENT___________

[5.1] INTRODUCTION

Before all the required volumes and systems are stitched together, the project informants, theory and the ultimate character of the design needs to be combined to form a concept strategy to govern how the different volumes and systems will be stitched together and how decisions will be made. Thus an exploration need to be done to create a project concept which can guide the project from site layout up to detailing.

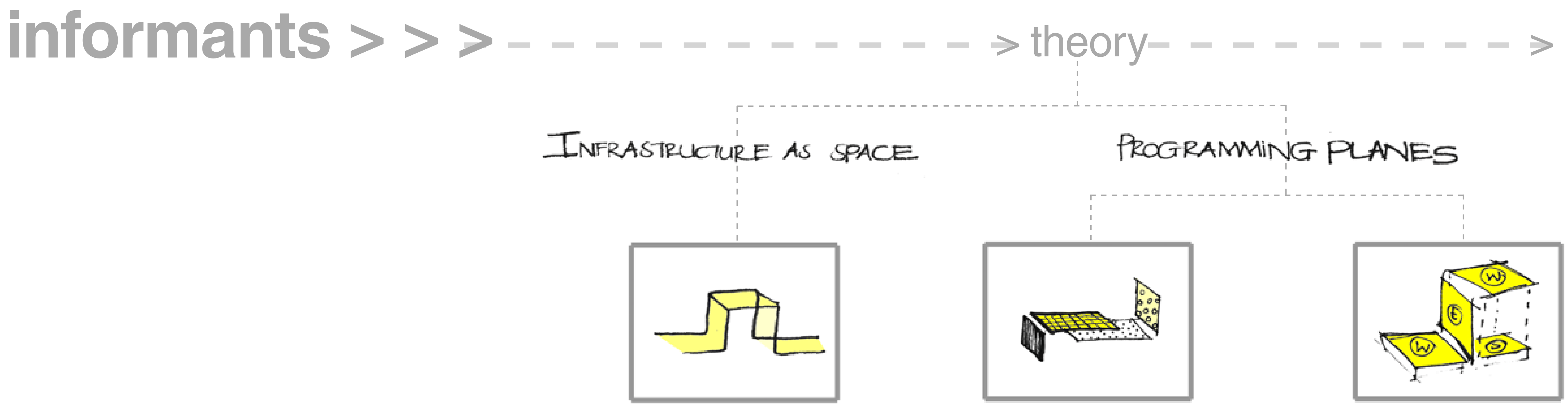
[5.2] DESIGN INFORMANTS

The project informants are core ideas which have been extracted from different influential categories. These core ideas inform and guide design decisions and start working together at different stages of the design process. The influential categories are:

_ **Theoretical stance**
_ **Group Framework**
_ **Systems involved**
_ **Site conditions**

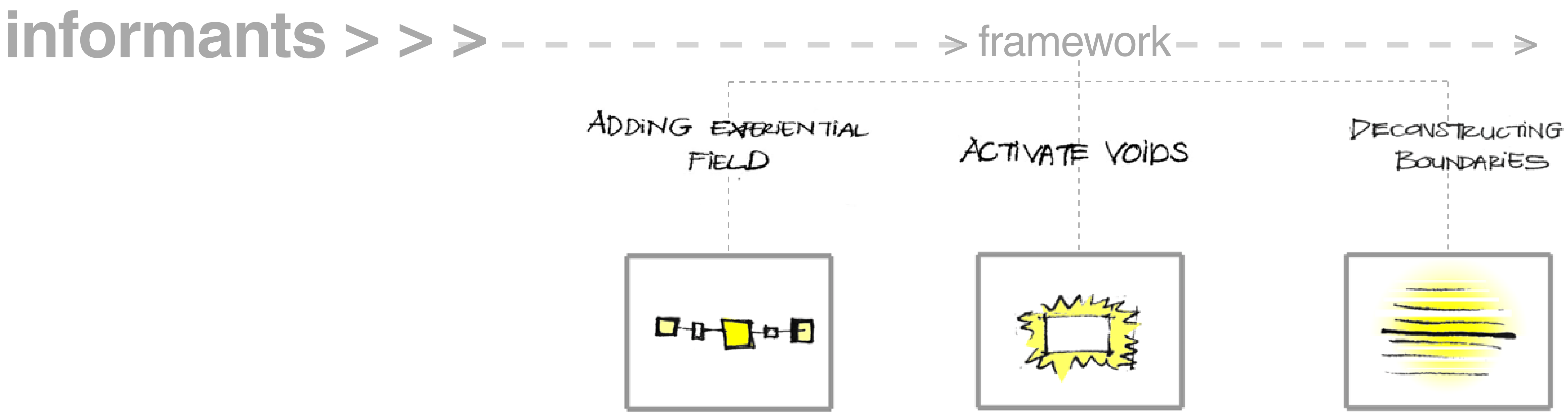
THEORETICAL STANCE

The theoretical approach of creating space and place via infrastructure, implies that **infrastructure become the framing structures and planes which define space and thus acting as architecture.**



GROUP FRAMEWORK

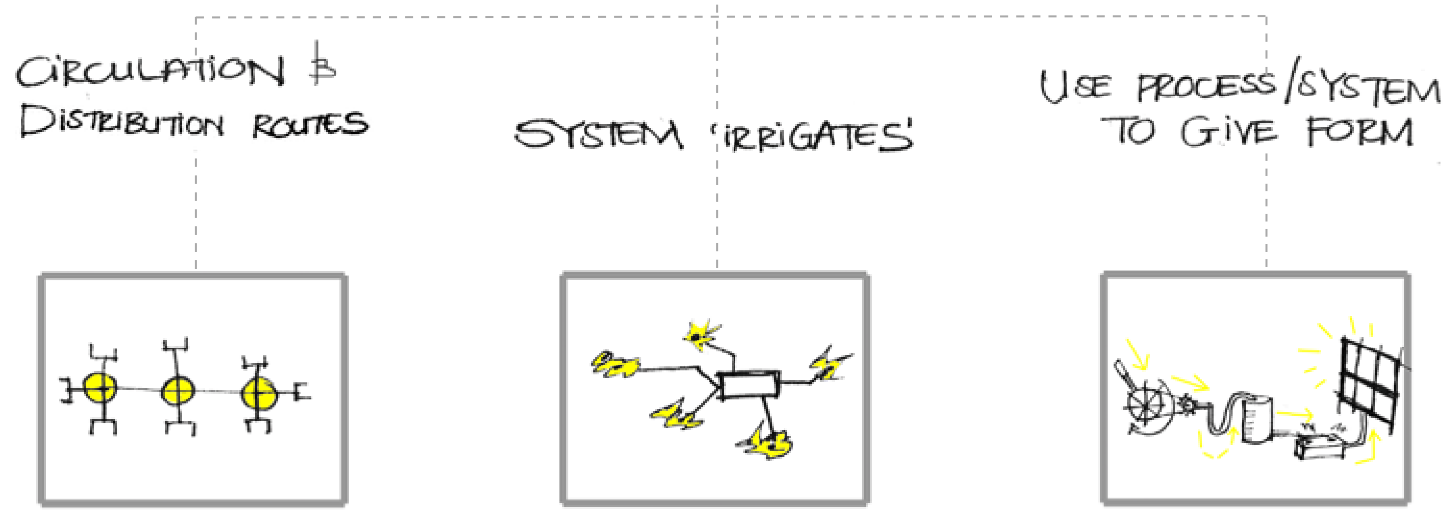
The BCe1 Framework is not a prescriptive framework with rules and regulations, but rather **aims to add an experiential layer to the urban space** through which people filter. The framework places emphasis on the importance of thresholds as they are the catalyst links which frame the urban experiential space. The **threshold as link between space and place**, threshold as an activation of void space and layering in complexity of the threshold is the main governing informants.



____SYSTEMS INVOLVED_____

The functionality of the systems used as discussed in the accommodation schedule is mainly focussed on linking the intervention with the existing fabric. The most practical way to do so would be via the **existing services connections and the circulation routes.** The individual systems are also used to **'serve' the spaces**, to have a presence and a positive contribution to space. Before design can start, the individual systems' roles and processes need to be taken into account, the processes then start giving shape to the spaces and intervention.

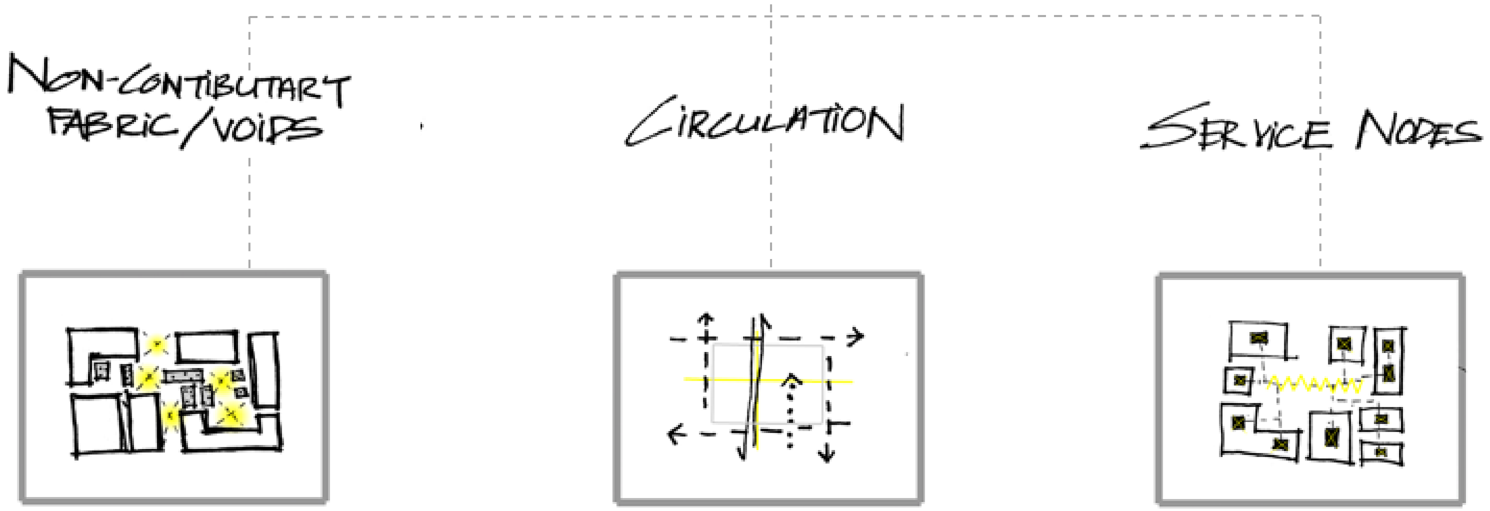
informants > > > - - - - - - - - - - - > systems - - - - - - - - >



____SITE CONDITIONS_____

Of the many informative site conditions, ones which link directly to the intervention intentions were identified to give direction to where the intervention should take place and what needs to be connected and changed. Thus looking at the **circulation patterns, void spaces and the nature and setting of the current services were used as informants.**

informants > > > - - - - - - - - - - - > site - - - - - - - - >



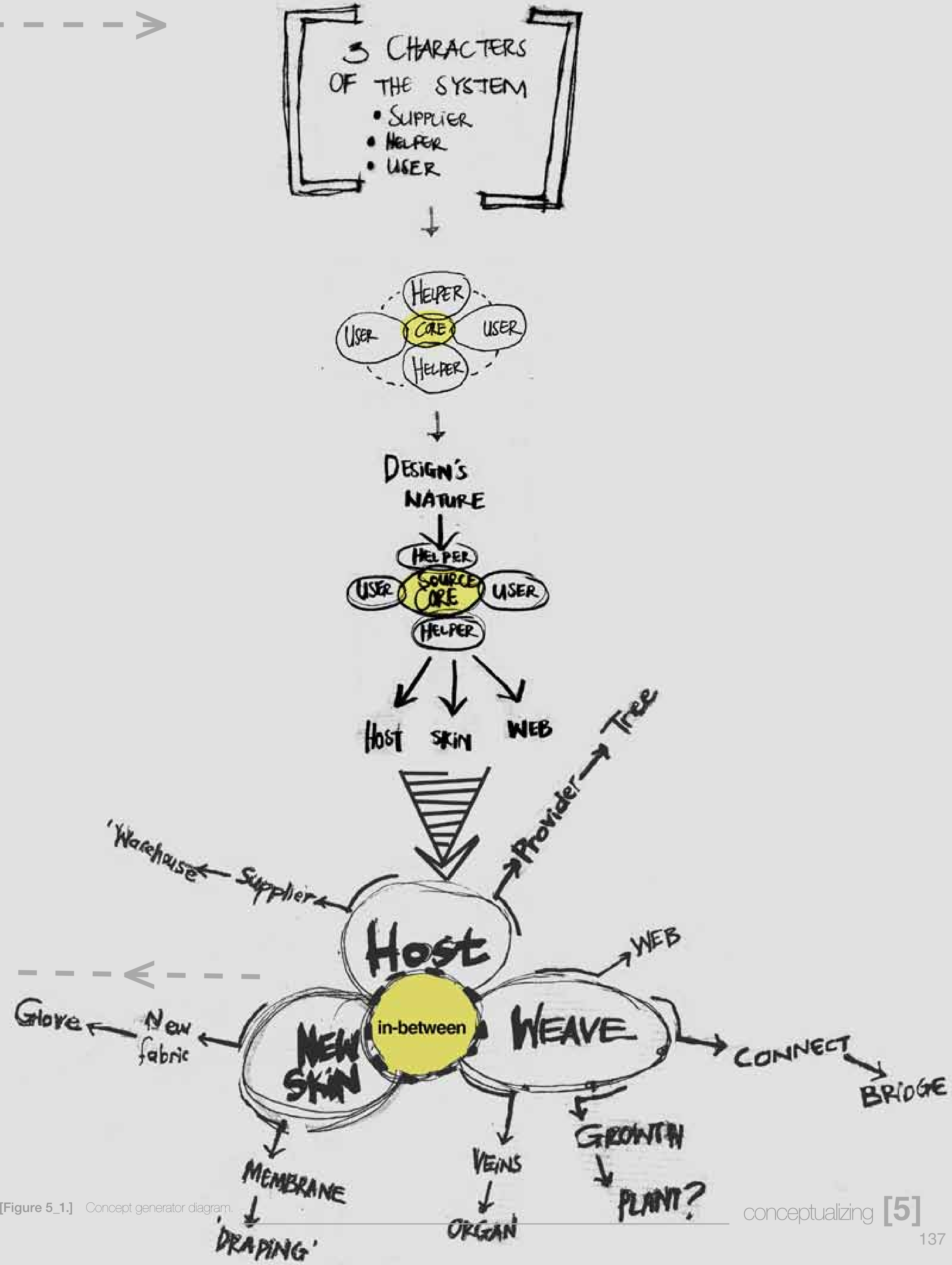
[5.3] CONCEPT EXPLORATION

Each informant starts giving clues of how the design's character should manifest either as a whole or in certain instances. After considering the **'connective' nature** of the intervention, certain characteristics which describe the intervention's intent start surfacing:

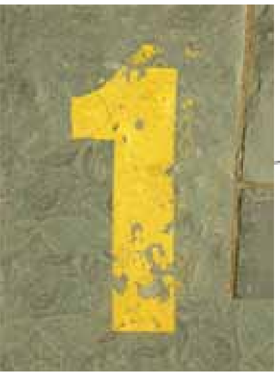
_ The intervention acts as a **host** in a **symbiotic relationship** with the existing urban fabric.
_ The intervention tries to **tie the loose elements together** and create a whole instead of parts.
_ The intervention wants to **connect** to the existing fabric and make a difference as well as accept the existing fabric's influence on the building.

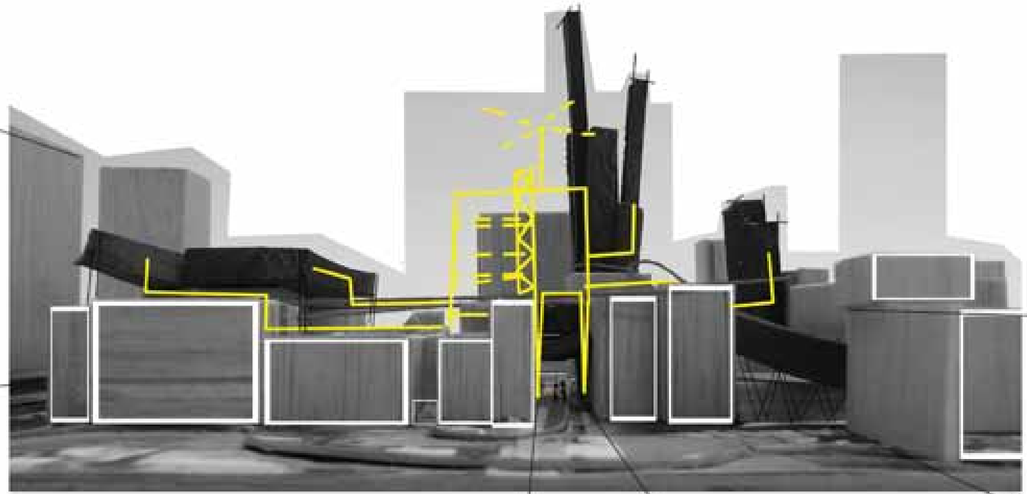
Thus the intervention manifests itself in an **in-between state** where it acts as the **link and supplier** between the different users. Three initial conceptual ideas were explored from this point of view:

_ The Host
_ The New Skin
_ The Web

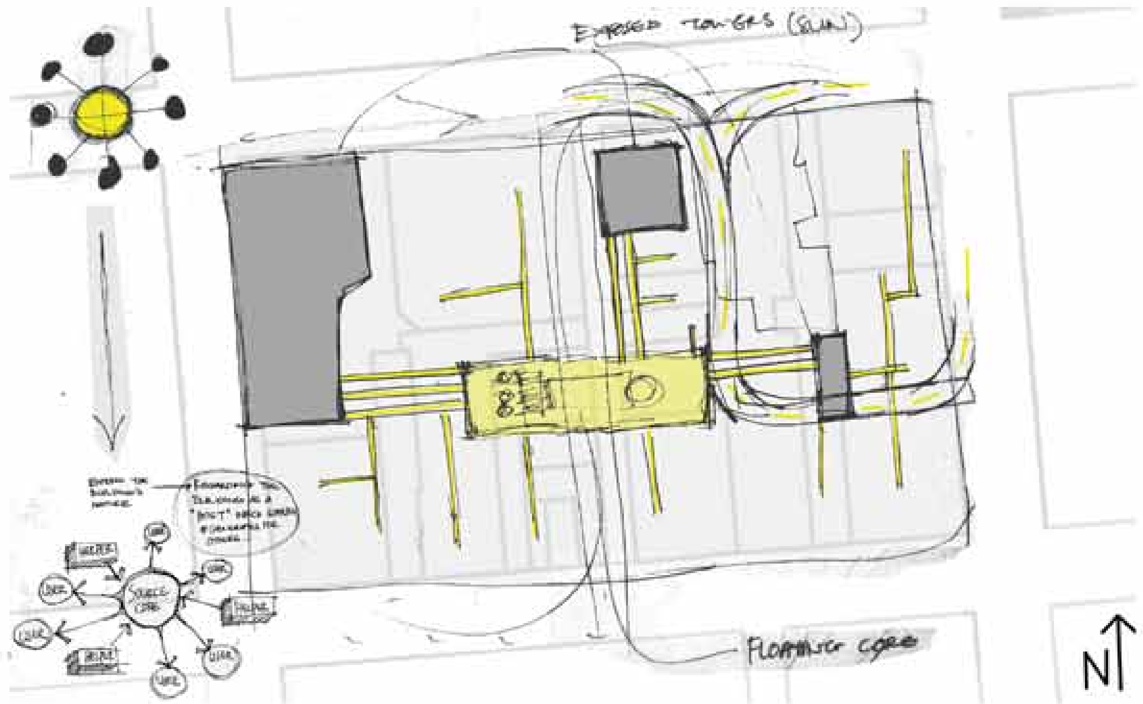


[Figure 5_1.] Concept generator diagram.





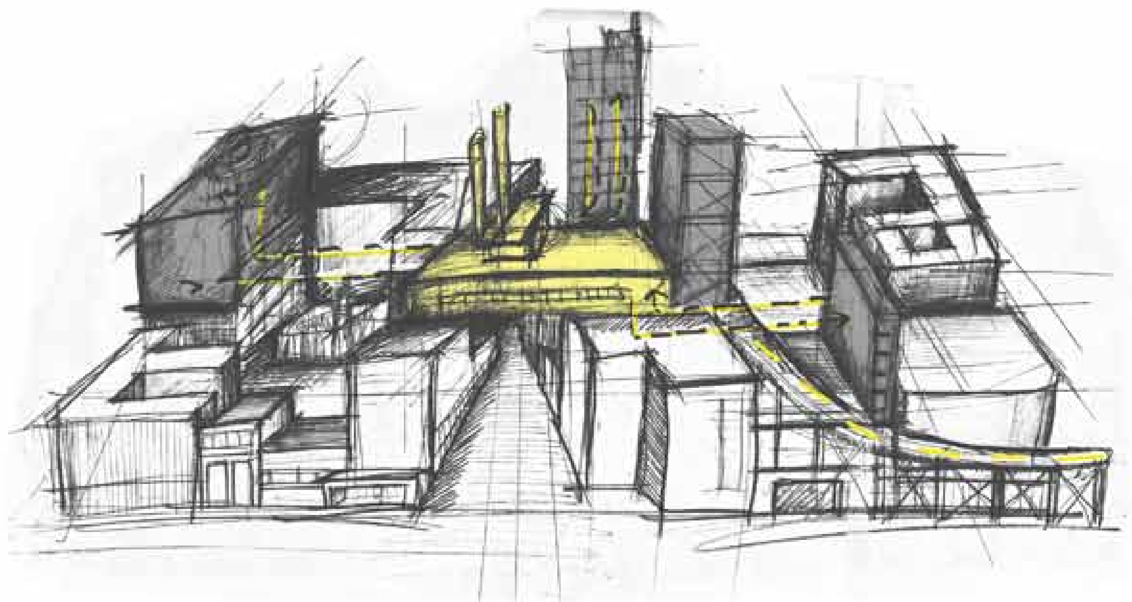
[Figure 5_2.] Abstract central host, placed in context model.



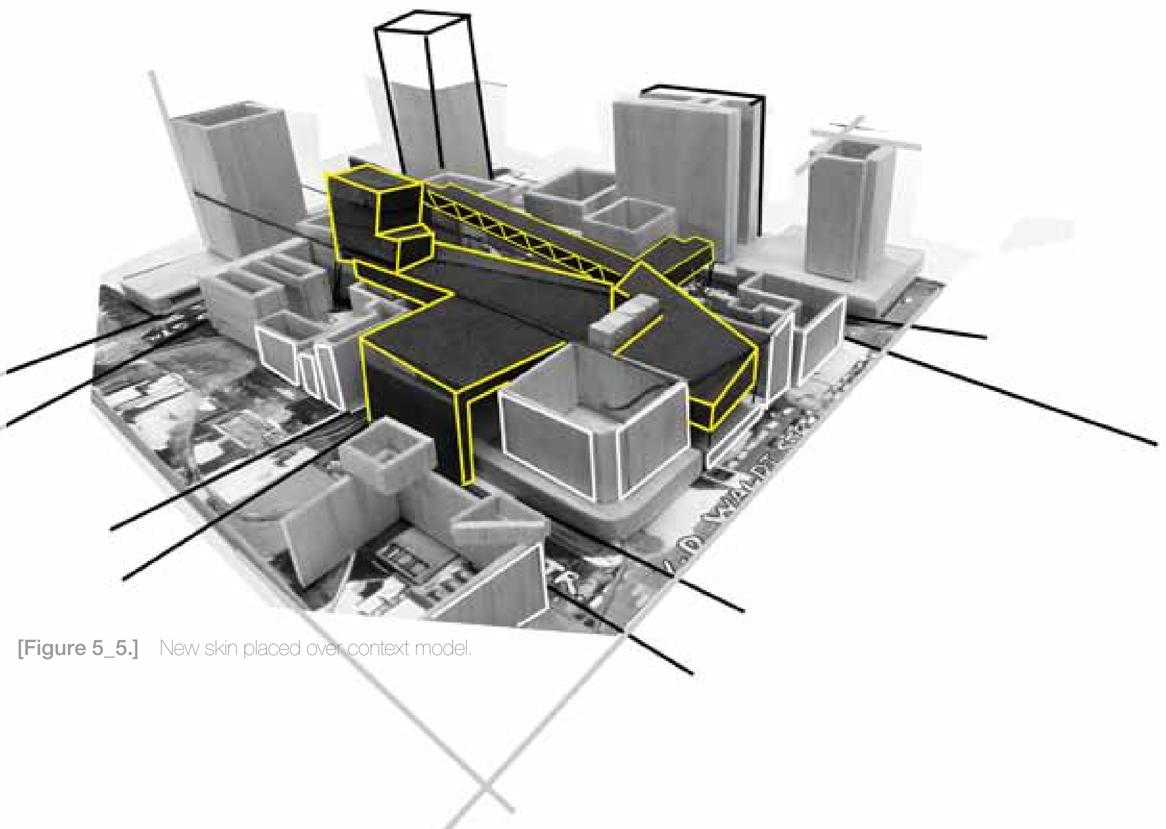
[Figure 5_3.] Plan (n.t.s) of central host structure in context, connected to the existing fabric.

____THE HOST_____

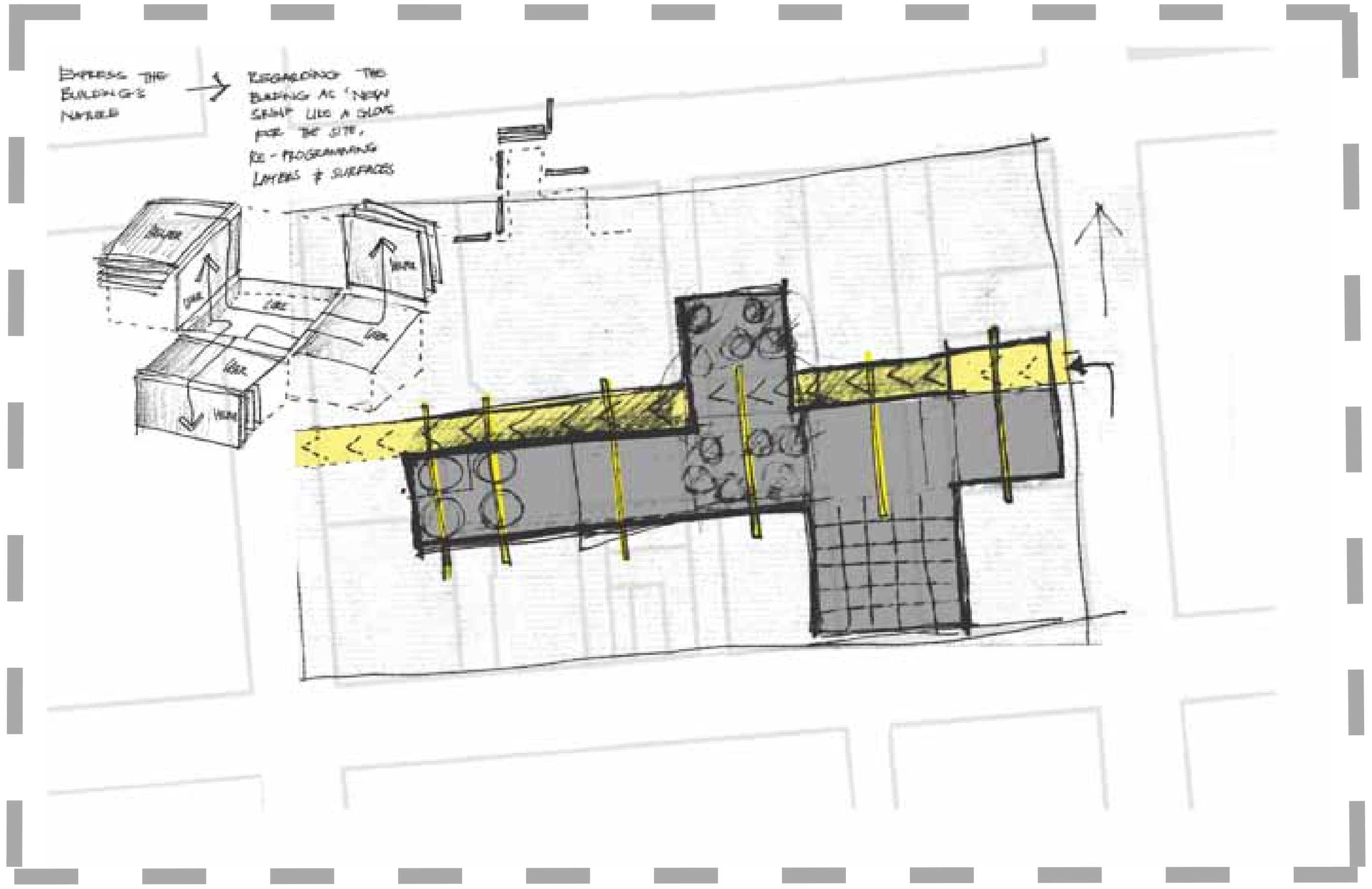
The Host is a central system which acts as a **core for its surrounds**. It functions as a node where all the different components meet and distribute from again. The host supports, sustains and facilitates spaces and resources. Although the diagram of the host is very nodal, a more **linear layout would be more efficient.**



[Figure 5_4.] Perspective of central host, connected to existing fabric.



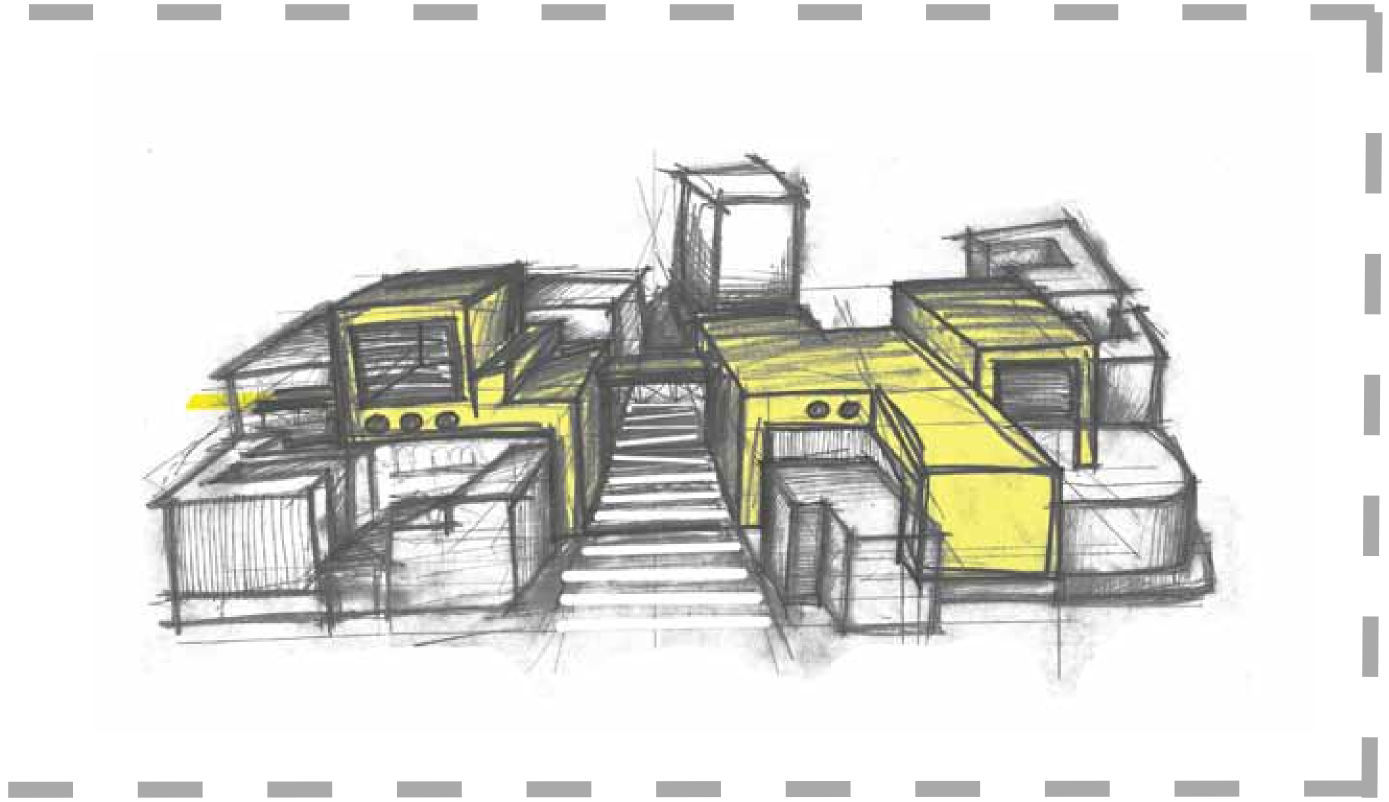
[Figure 5_5.] New skin placed over context model.



[Figure 5_6.] Plan (n.t.s) of 'New skin' wrapping over the context.

___THE NEW SKIN____

The New Skin focuses on **programming new and existing planes**. Addressing the complexity of the threshold by activating the threshold layers via programming. Surfaces which act as collectors, storage and public space work together and **wrap over and through the site like a glove** bringing new definitions to surfaces and spaces. Although the problem may only lie in the interpretation and thus the illustration of the concept, it does seem like this might not be such an appropriate approach because it seems to smother the site.



[Figure 5_7.] Perspective of 'New skin' wrapped across, over and around context.

cling
crawl
link
support
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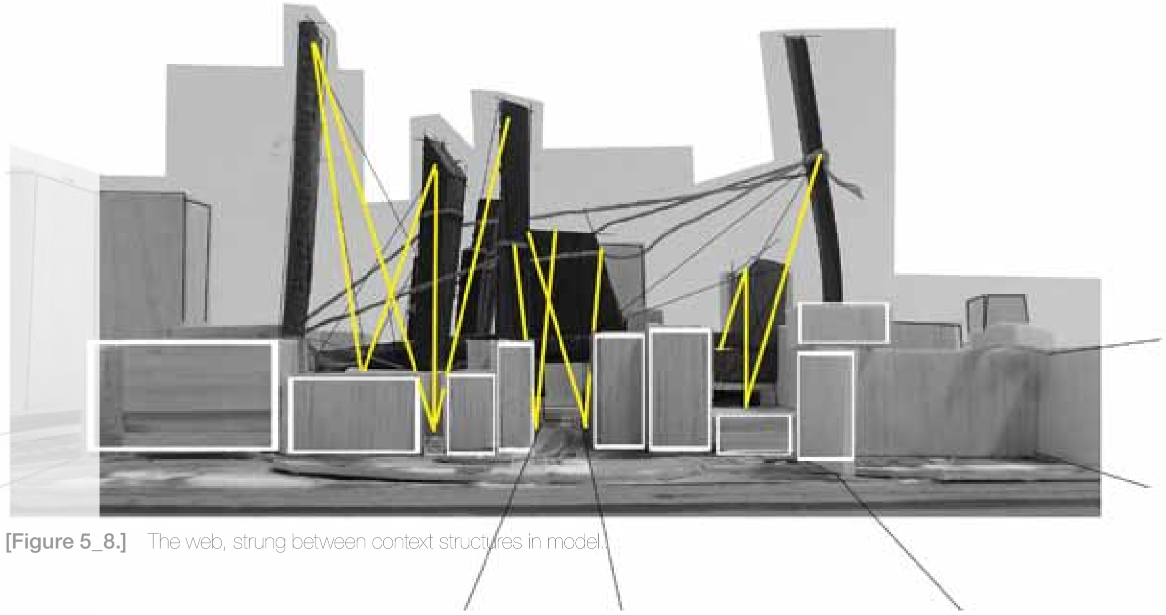
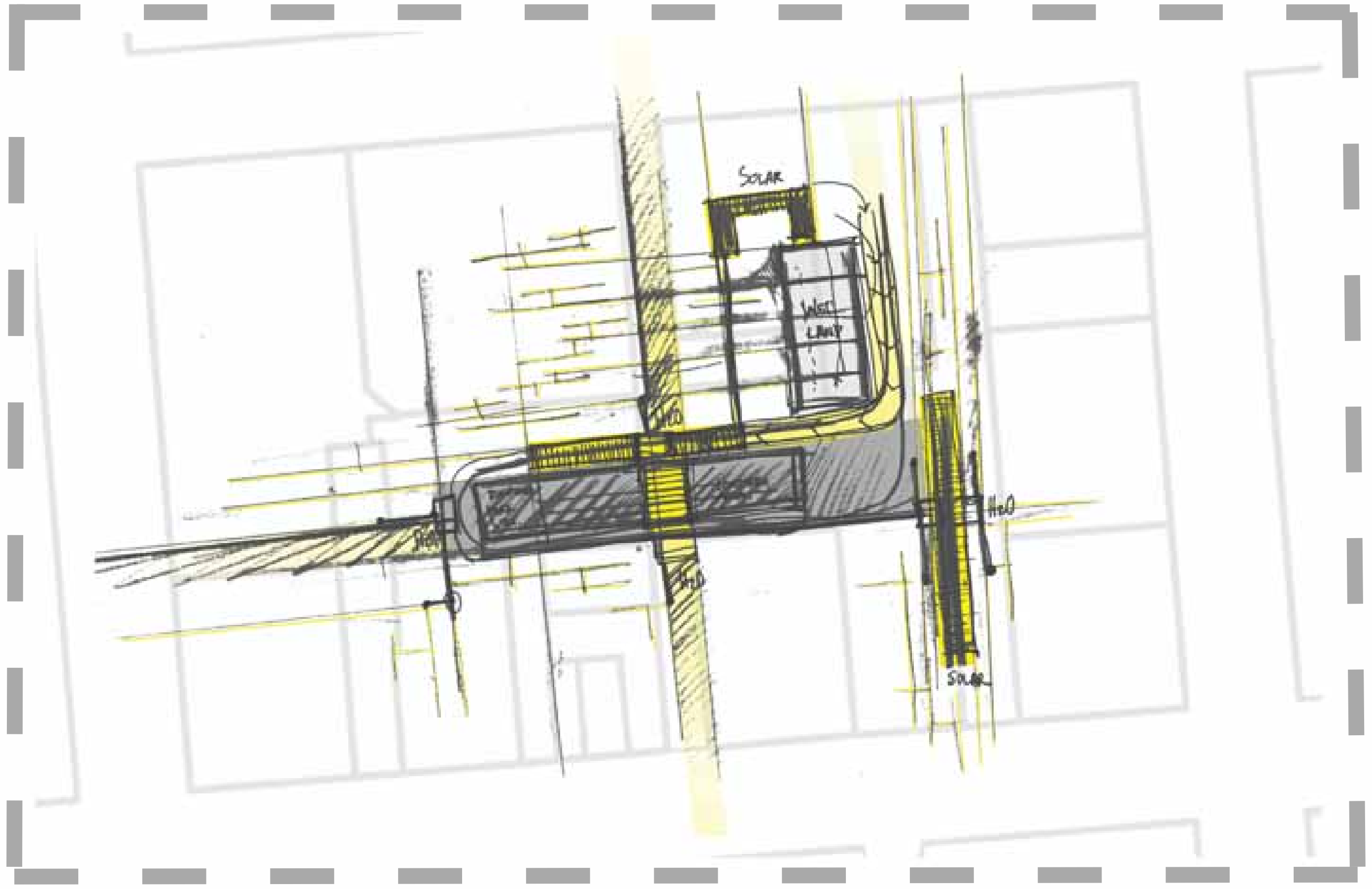


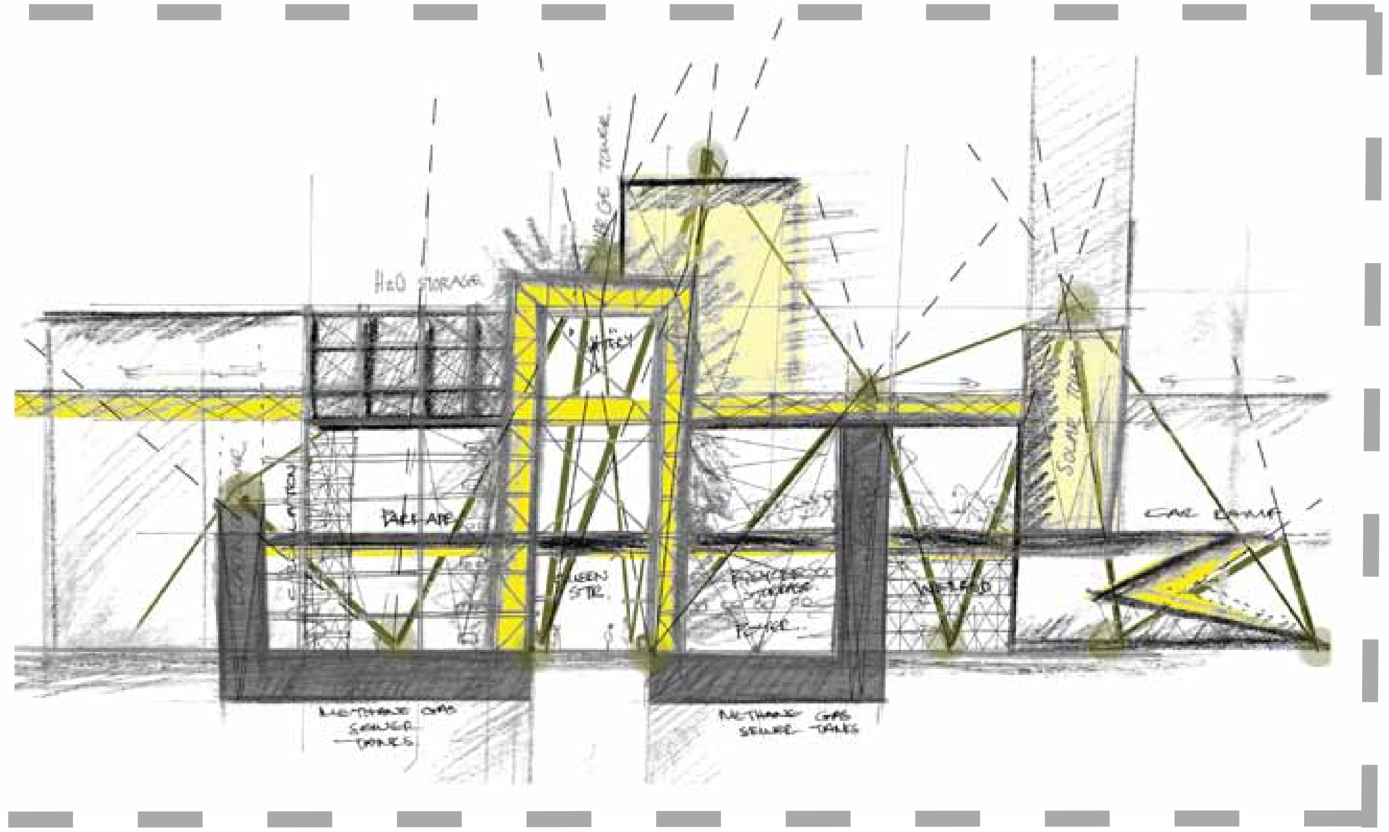
[Figure 5_8.] The web, strung between context structures in model.



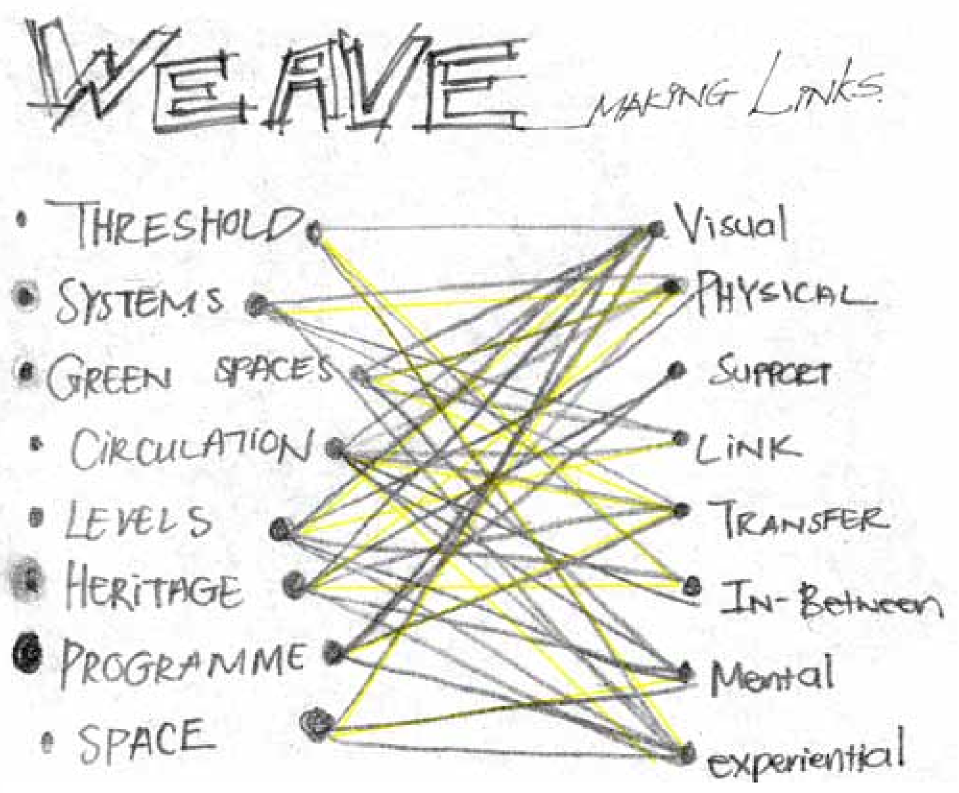
[Figure 5_9.] Plan (n.t.s) of spun structure, nested in-between context.

____THE WEB_____

The Web focuses on **elements joining nodes**, spaces and other elements. The Web is the tension, object and link in the i**n-between condition** which facilitates the manifestation of the overall systems, routes and spaces to operate as a whole. The web is **supported by its context** and without its context it cannot exist or stand up. As the web intensifies, it starts to create a membrane or surface.



[Figure 5_10.] Section (n.t.s) of spun structure connecting horisontal and vertical planes.



____THE WEAVE_____

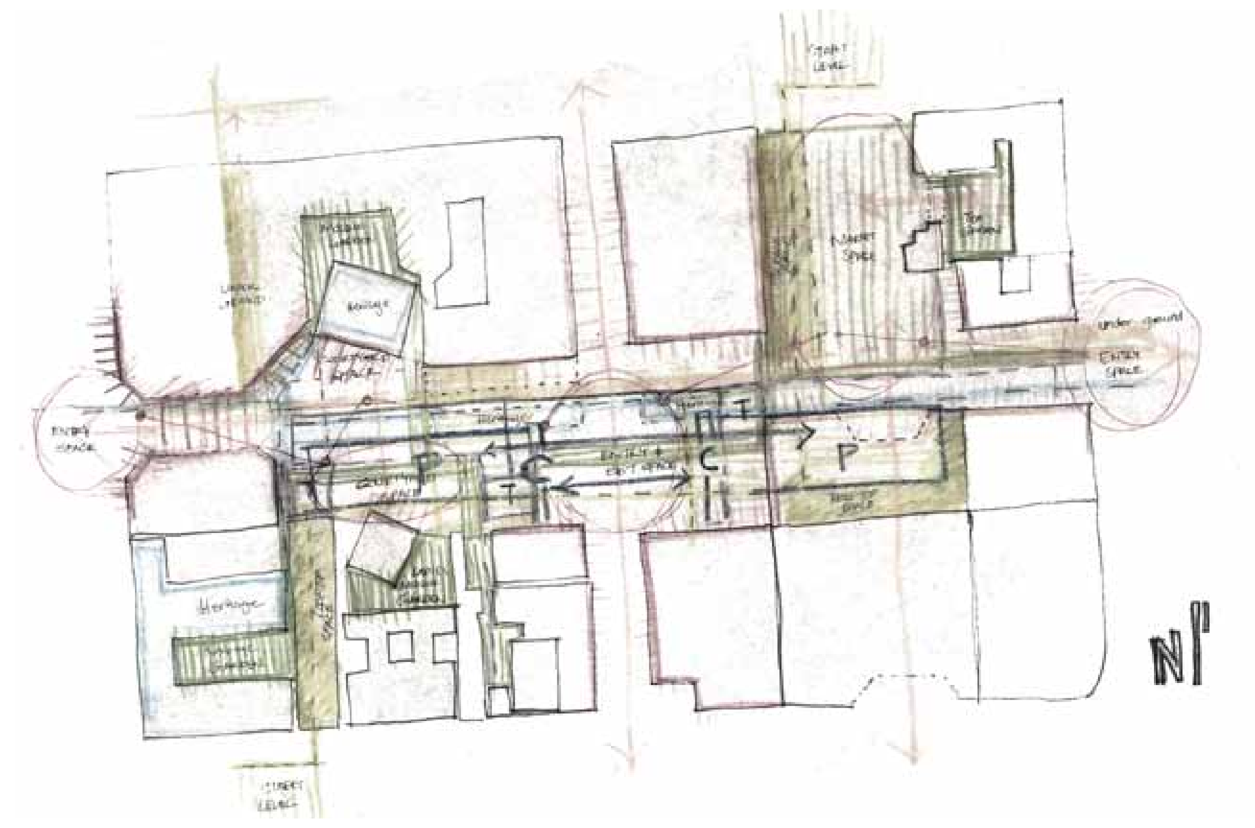
After considering the aim of each concept, a central commonality stood out; each concept aims to **connect the existing fabric with the intervention in an interactive manner.** Thus the main 'action' focuses on the **threshold between old and new** and how this relationship becomes **symbiotic** of nature. The synthesis of all these concepts, characteristics and ideas influenced by the informants is that the intervention **'weaves'** between the structures, between public and private, between inside and outside and between resources and users.

____CONCEPT STATEMENT_____

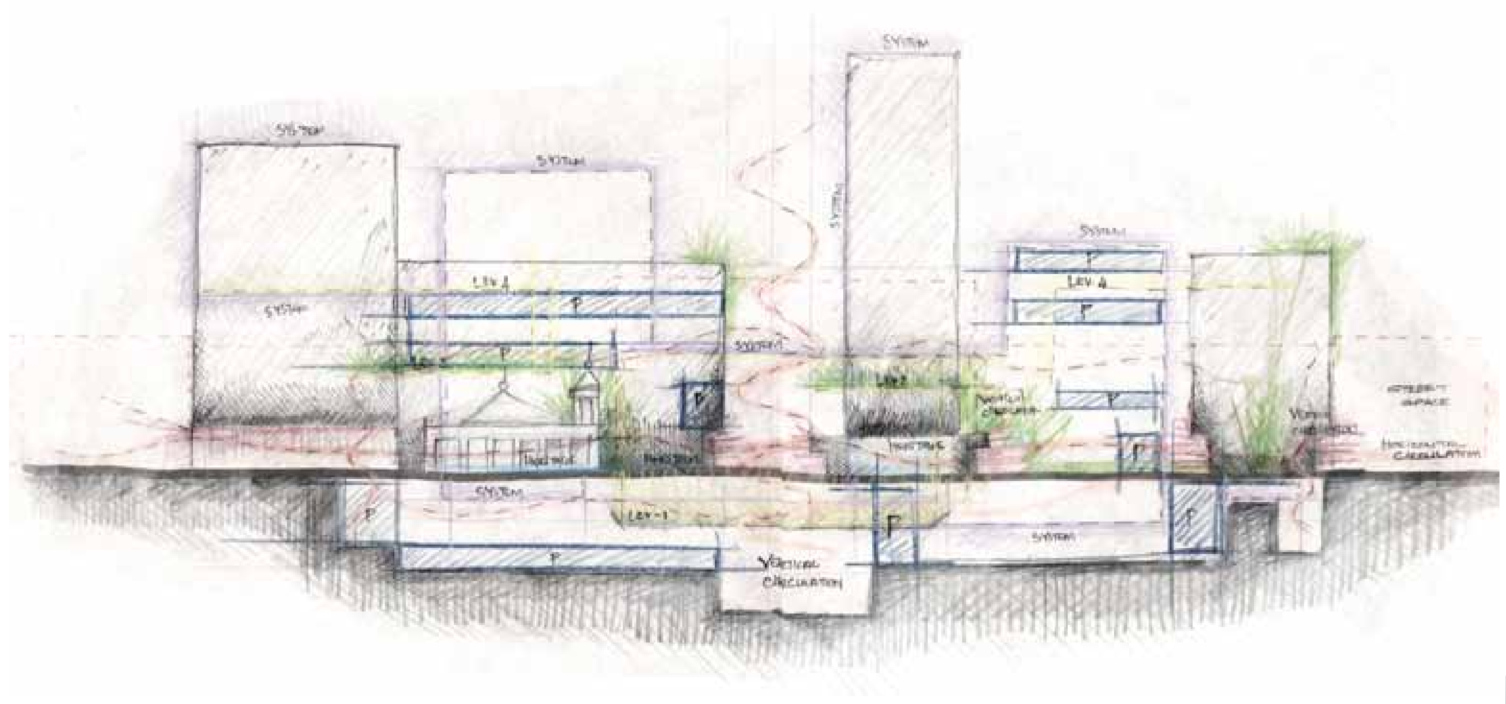
'Weave' as the conceptual character of the intervention focuses on **linking** elements, planes & energies through interconnected flows of resources, people and space. A series of different planes, objects and systems **working together as one**.

____CONCEPT INTENTION_____

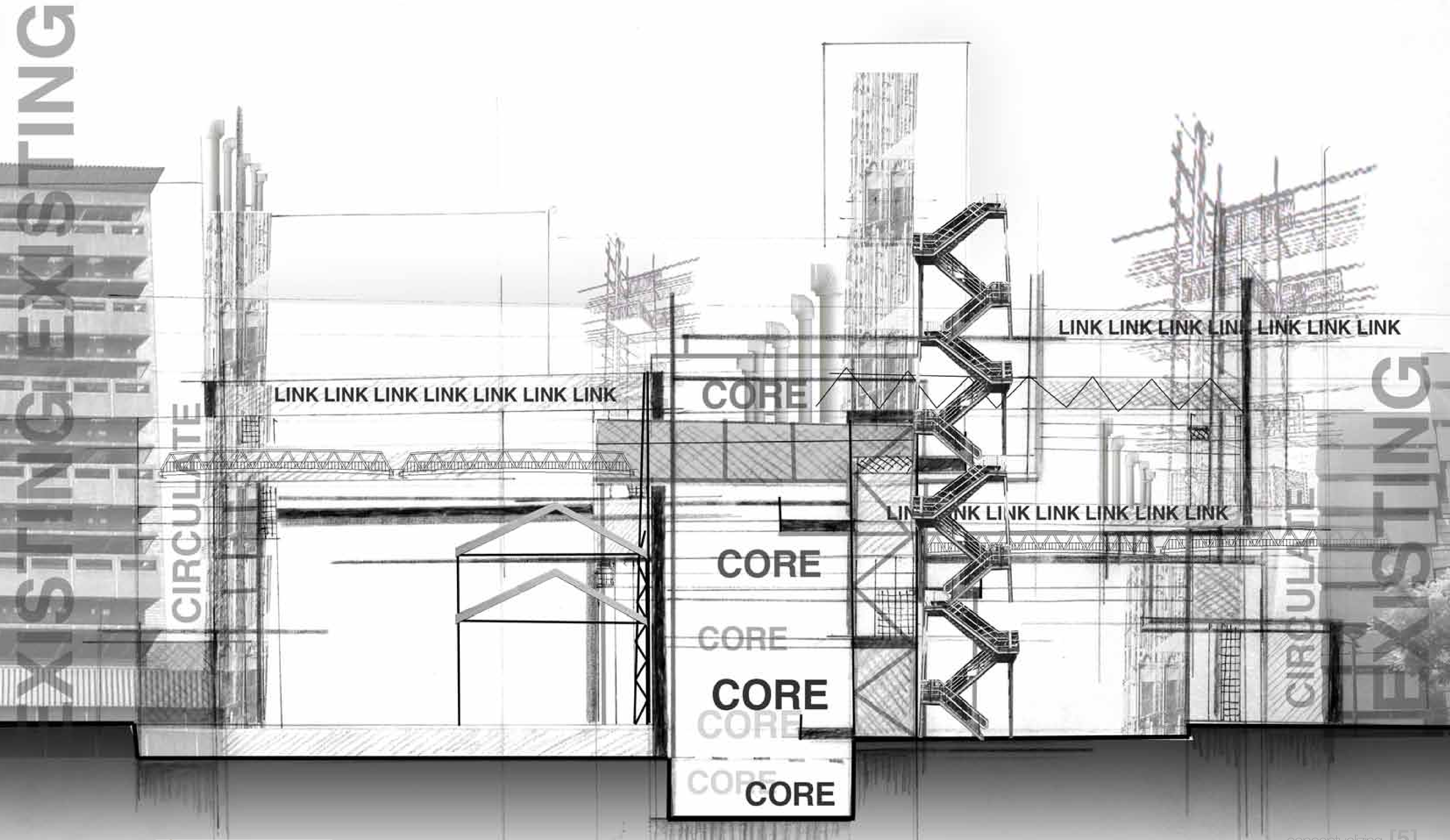
Establishing a relationship between elements, people and space through weaving them together in a support network, enabling the site to function as a whole.



[Figure 5_11.] Plan (n.t.s) of the weave connecting core functions via programme, planes and circulation.



[Figure 5_12.] Section (n.t.s) of weaving programme systems making new horisontal and vertical connections.



[Figure 5_13.] Abstract representation of woven planes and systems weaving the context together as a whole.

how did the design come into being?_____ _[6]______________[Design development]___

____[6.1]_______ ___DESIGN GENERATORS_________

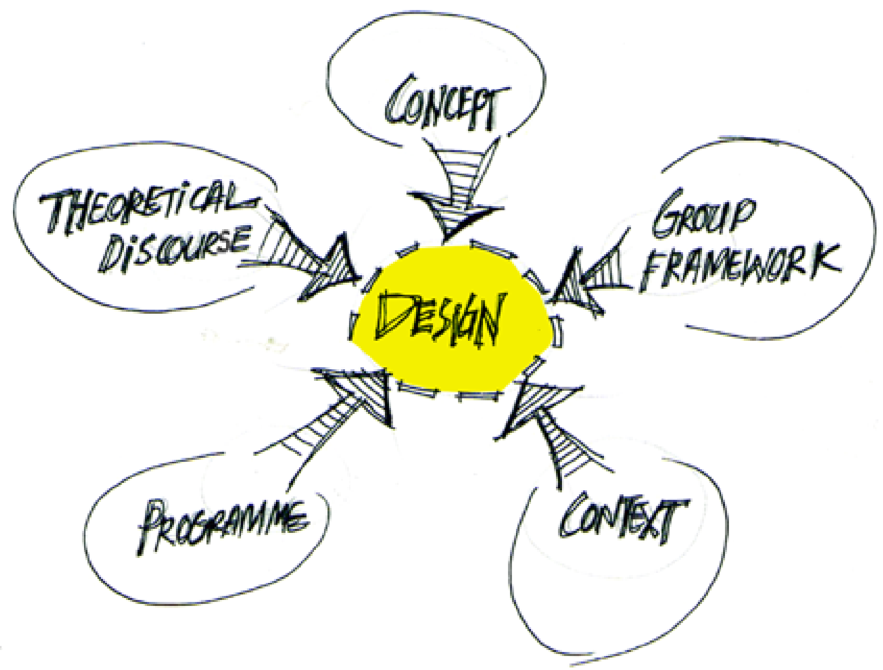
____[6.2]_______ ___SKETCH DESIGN_________

____[6.3]_______ ___CONCLUSION_________

[6.1] DESIGN GENERATORS

The ‘design generators’ are the main influential factors which govern the initial design decisions. For this project the design generators are:

- _ 6.1.1 Group Framework
- _ 6.1.2 Context
- _ 6.1.3 Theoretical Discourse
- _ 6.1.4 Concept
- _ 6.1.5 Programme

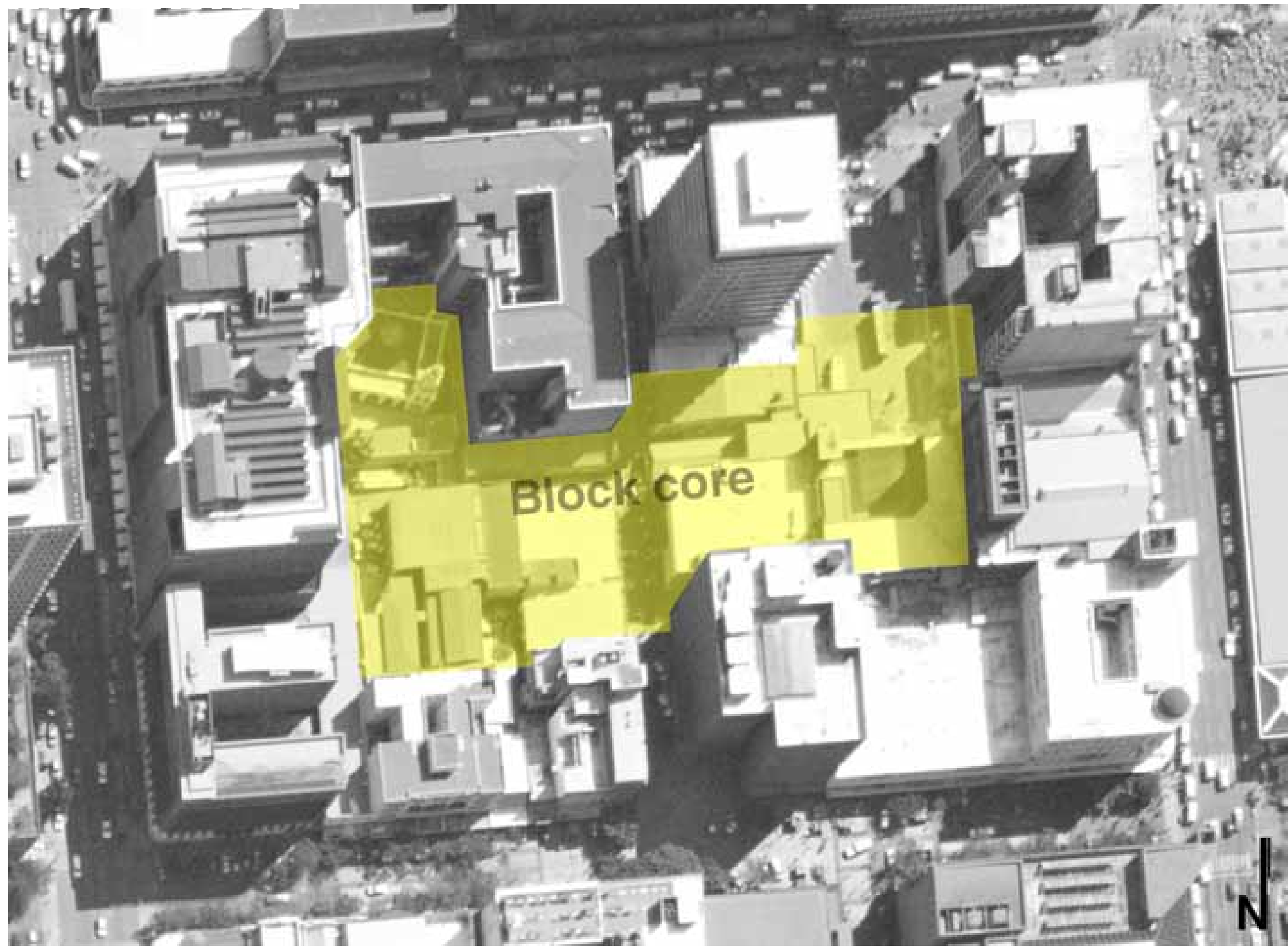


[Figure 6_1.] Urban scale intervention, the experiential field sparked by ‘host’ interventions in block cores all over the city.

6.1.1 _ GROUP FRAMEWORK

The group framework in essence aims to address **thresholds as the most important layer of the experiential field** adding richness and depth to the urban fabric. In a city which lacks an experiential field on many levels, block cores are often the last place where interventions are focused on revitalisation.

This intervention rather focuses on creating an experiential field from the **inside outwards**, instead of being the mediator between inside and outside. Thus the intervention as a whole acts as the threshold between the existing buildings and ultimately becomes the experiential field.



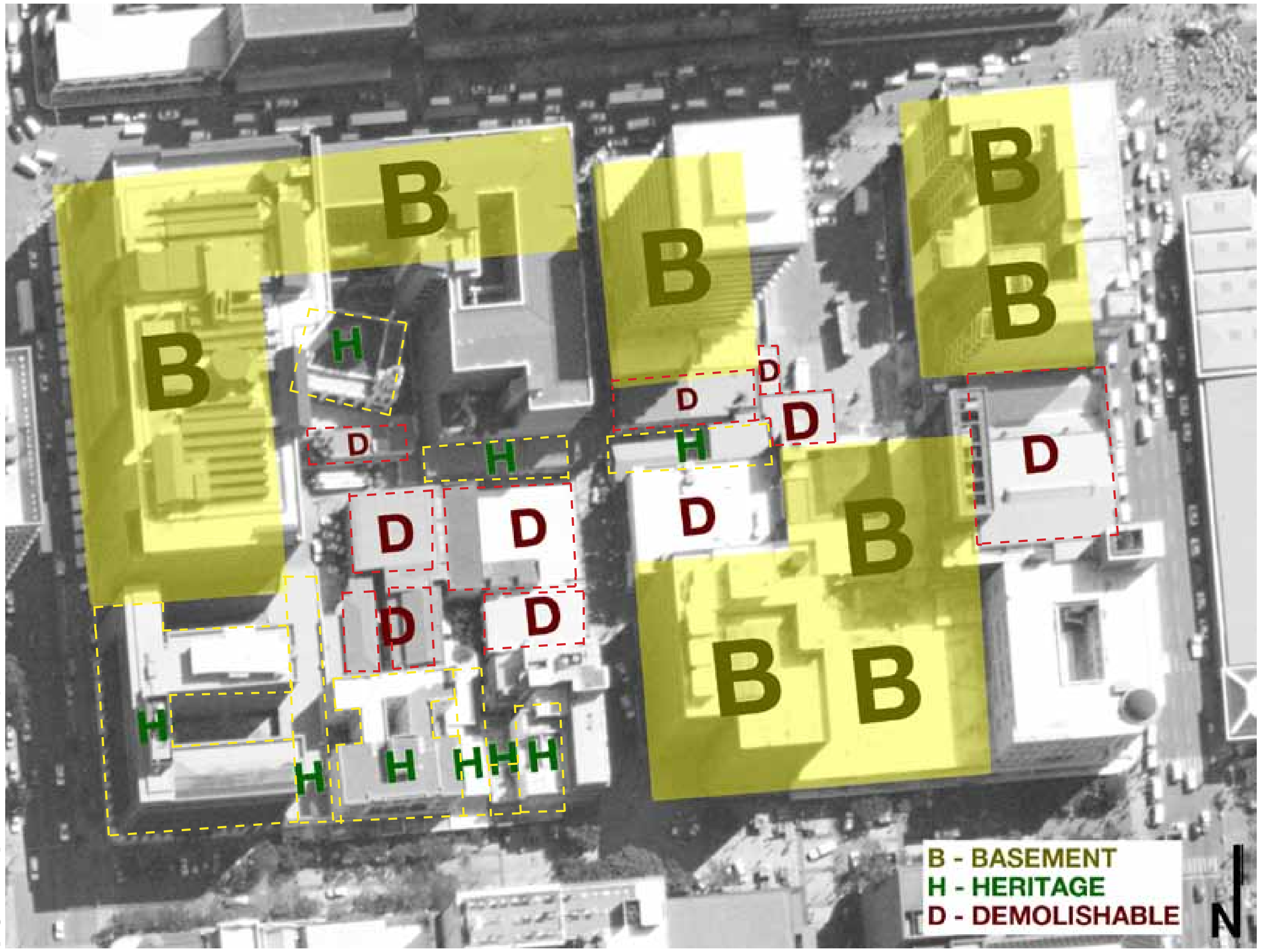
[Figure 6_2.] Arial photo of block, yellow highlighted block core as focus area.

___ 6.1.2 _ CONTEXT______________

Within the symbiotic relationship between the intervention and the existing fabric, certain responses occur between the context and the design in order to create a base block framework from which the intervention may sprout.

------------- BASEMENTS

The **existing on site basements are one of the main constraints** on the block. The basements determine where new development can take place and where expansion will not be possible. The yellow coloured buildings bellow indicate which buildings on site already have existing basements.



[Figure 6_3.] Block plan depicting constraints and opportunities of existing structures

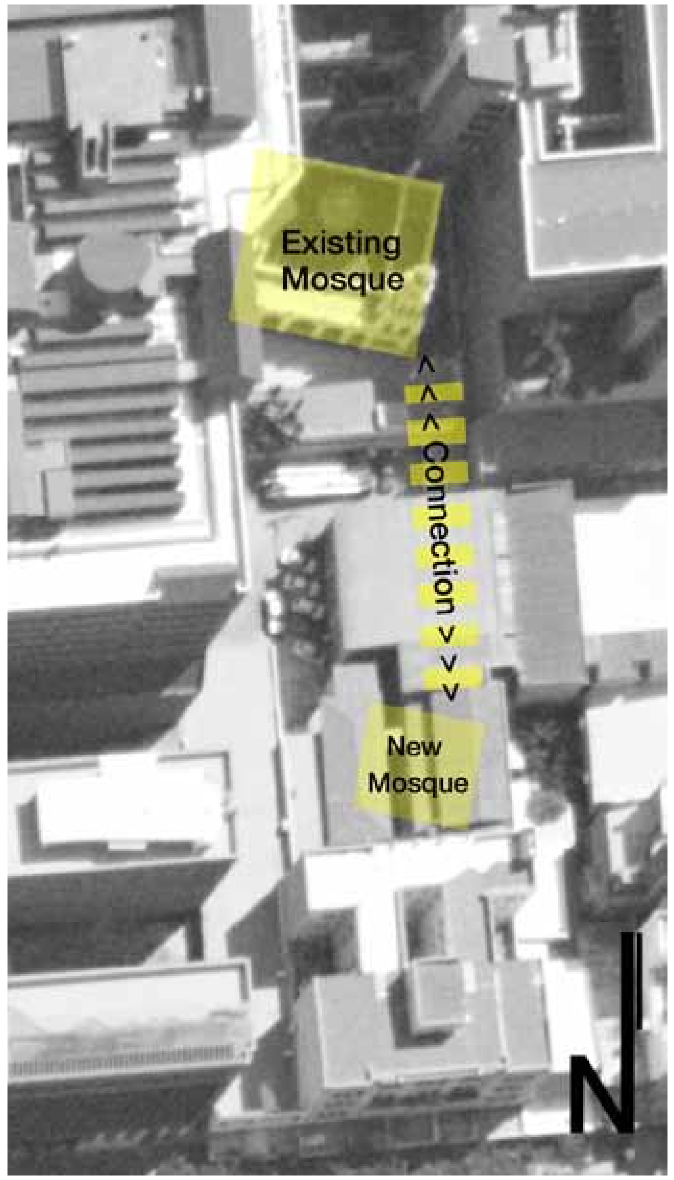
The existing fabric needs to be considered as to **which buildings are worthwhile to be serviced and sustained and which should rather be transformed or demolished.** The yellow dashed line in the image above show where there is on-site heritage buildings and the red dashed line indicates which buildings should rather be demolished or transformed. The footprint area of these derelict buildings becomes potential space for the intervention to take place.

------------- DEMOLISH

------- HERITAGE

FUTURE-------

Future on-site development needs to be considered, currently the owners of Queen Street Mosque are planning to expand their place of worship by building a **Ladies Mosque** on a site behind the Libri Building which has been donated to the mosque. The Ladies mosque is thus accepted as a **given part of the intervention.** The space between the two related but separate buildings thus becomes an **important linkage axis** which needs to be taken in account in the design of the ground floor square space between the two buildings.

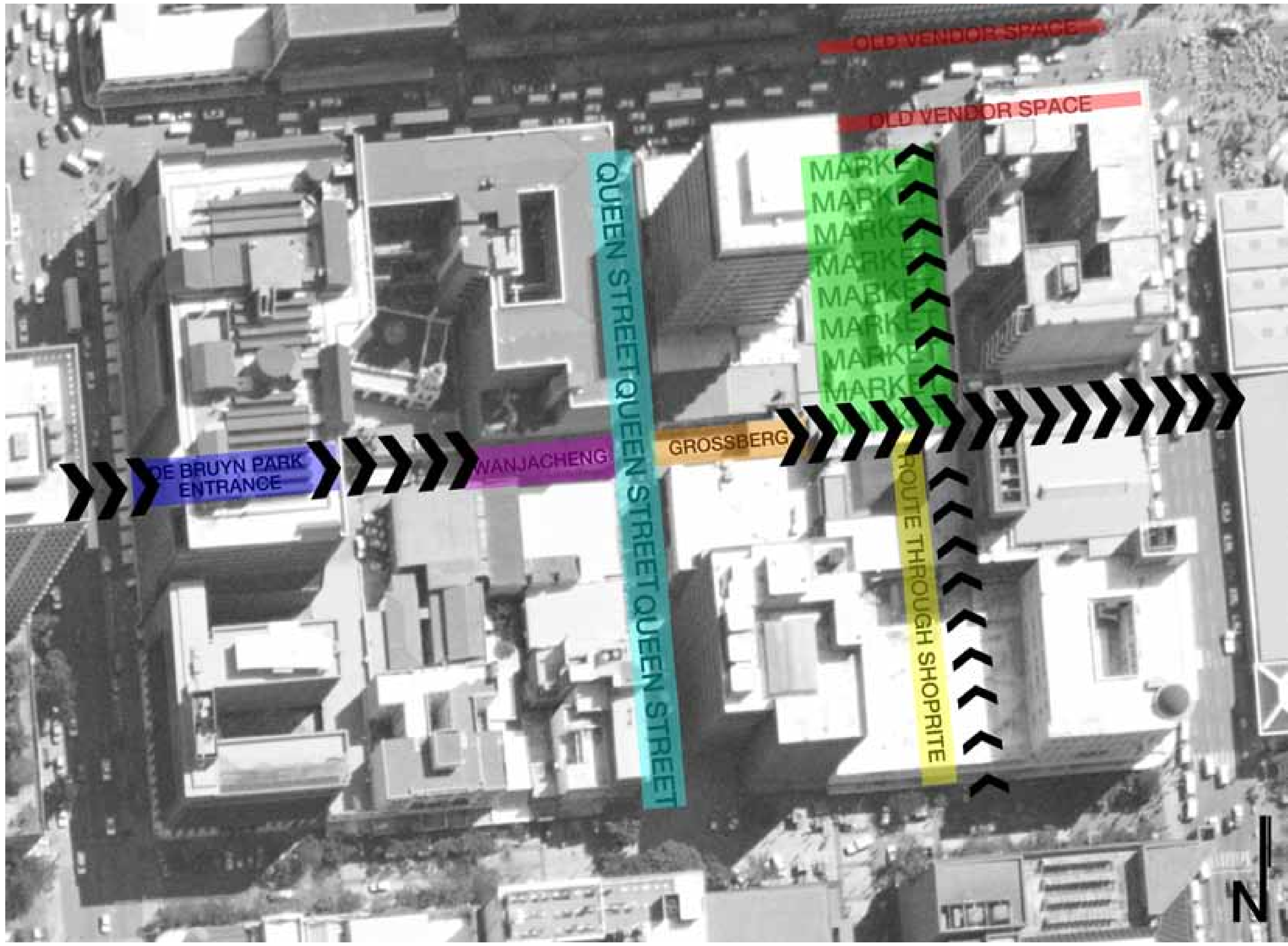


[Figure 6_4.] Aerial photo showing existing Mosque and proposed Mosque with connection axis.

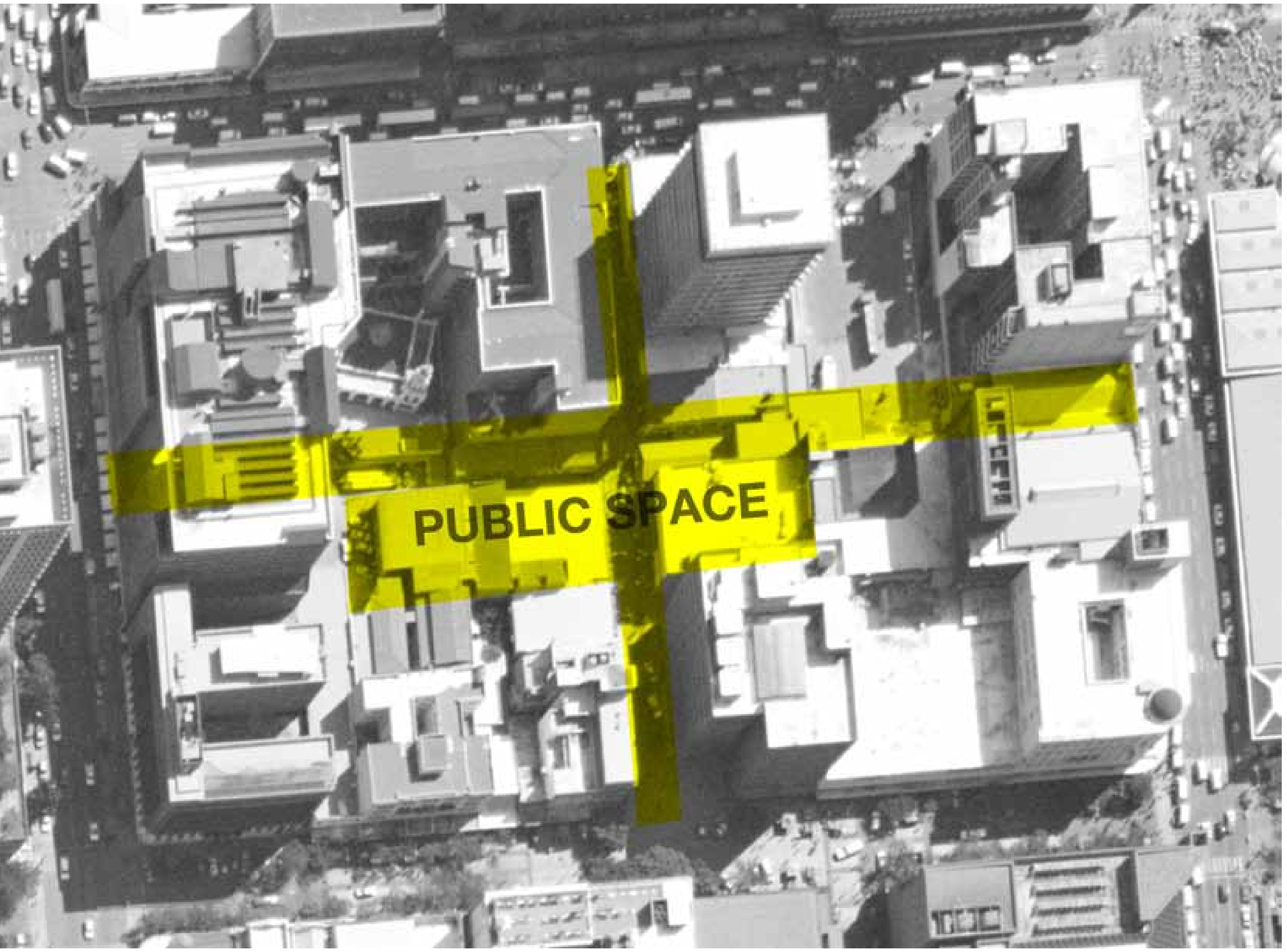
CIRCULATION

The on-site pedestrian circulation flows through Queen street and Church street but potential is lost in two scenarios. The Shoprite has an entrance on both the northern and southern edge, but the entrance on the northern side spills out onto a large loading zone next to Vermeulen street. It is thus proposed that the fruit and vegetable vendors which currently have stalls all along Vermeulen street, rather move their stalls into the open loading zone space. The loading zone is then moved to the basement and the **circulation axis going through Shoprite then moves through the new fruit and vegetable market** and joins up with Vermeulen street .

Secondly the entrance to de Bruyn Park cuts through an **eleven storey void and the abruptly terminates onto a boundary wall.** This access route lines up with two of the heritage buildings on site, Grossberg Traders and Wanjacheng, as well as the walkway in front of Shoprite and the central part of Sammy Marks square. This creates potential for a circulation axis going east west through the middle of the site which could be proposed as an **arcade.**



[Figure 6_5.] Block aerial photo of intervention's proposed circulation routes through site.

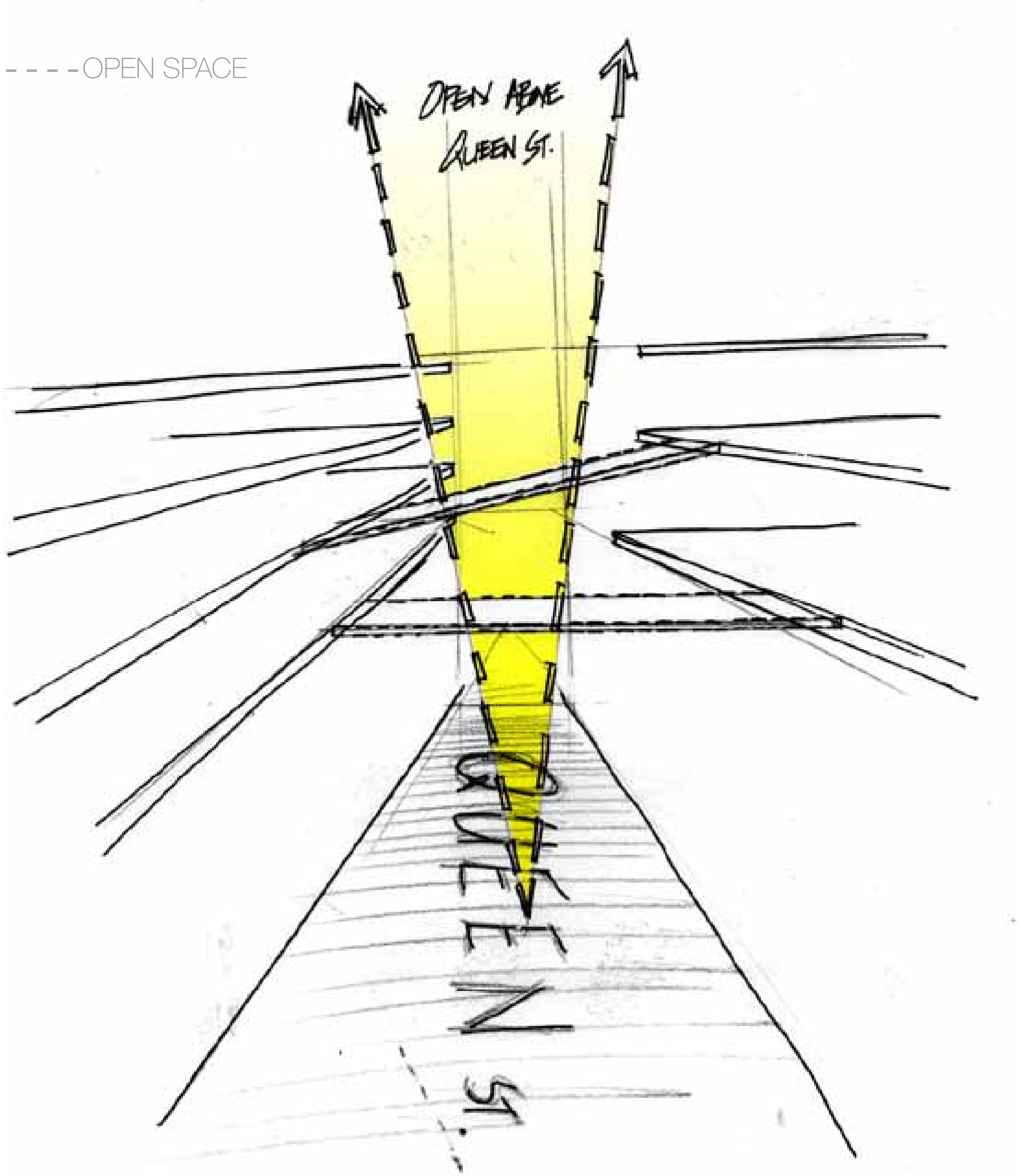


[Figure 6_6.] Block aerial photo illustrating new proposed public space.

As the block is densely built up and congested, an **open public space would be a welcome addition to the existing fabric.** The central part of the block where some buildings have been identified as demolishable proves potential to provide such a space.

Thus, if possible, the central ground floor portion of the block should be kept as open public space with enough void space above to allow natural light to penetrate into the space.

Because of the tall buildings on the northern neighbouring site, a large portion of the site already does not receive much sunlight. The space above Queen street should thus be kept clear for natural light to fall into the open axis of the street, **thus the intervention should straddle Queen street as lightly as possible.**



[Figure 6_7.] Clear overhead vertical space over Queen street axis.

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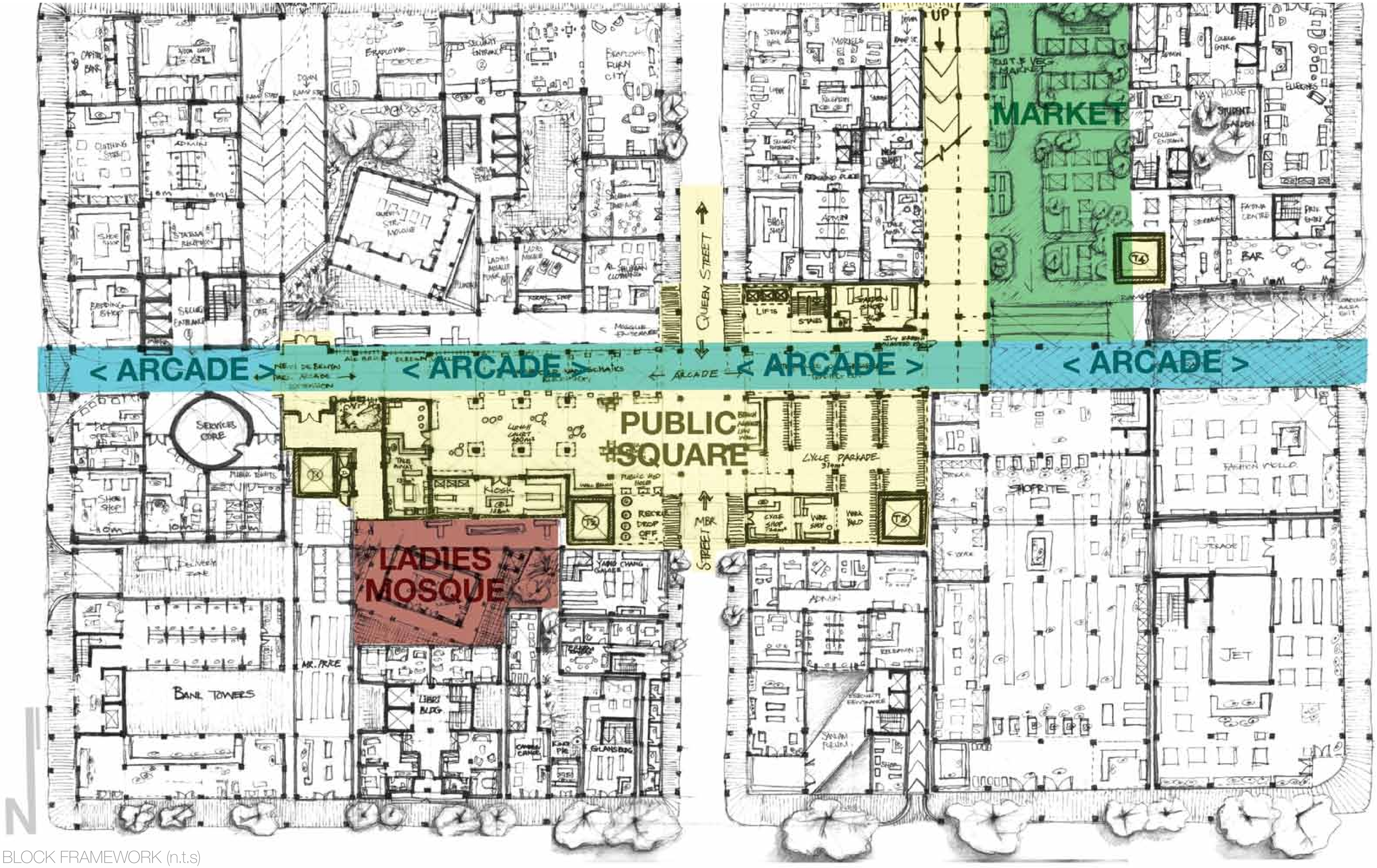
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



BLOCK FRAMEWORK (n.t.s)

[Figure 6_8.] Proposed block framework from which intervention will sprout.

___ 6.1.3 _ THEORETICAL DISCOURSE ______________

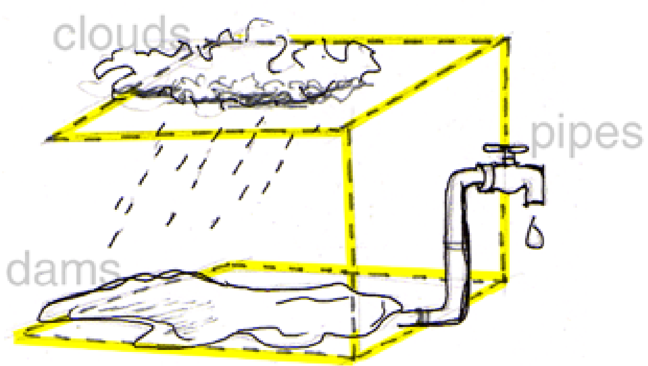
As the argument states; **infrastructure can be envisioned to create place and space.** Thus the infrastructure which the intervention specifically focuses on; **water, energy, waste management, access, public facilities and parking, needs to act in a place-/ space-making manner and not just to suit minimum and practical requirements.**

Each infrastructural system engages in the place-making process as part of the centralised system and cycle. The interface between the system and the user creates awareness and educational opportunity. Once each system is laid out, it provides a base from which development can sprout. **Thus the systems become the organisational structure of the project.**

It would be wise to decide how the systems would be organised on site in order to determine the next level of the design. In the next few pages an exploration of each system as a space making element will be explored.

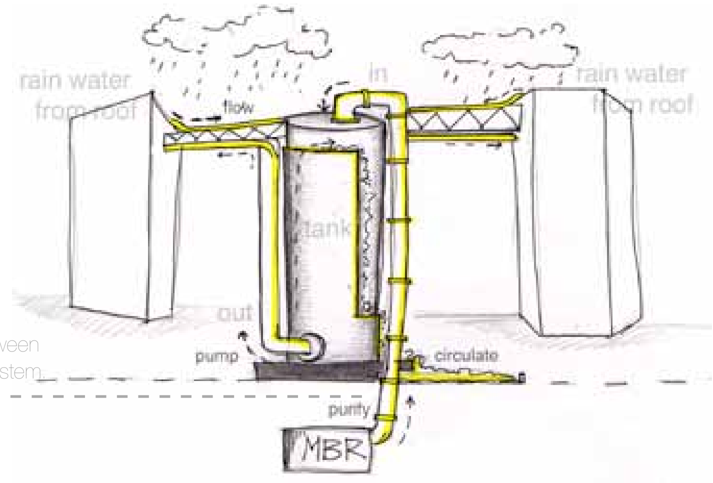
___ WATER AS SPACE ______________

Conventionally water is almost always present in space, its in the air, in clouds, in people, in pipes, in dams, plants etc. One usually, with the exception of rain, experiences water in a contained state eg. in tanks, pools, dams, in a bucket or a glass, mostly becoming part of the planes which gives shape to space. - - - - - - - - - - - PLANES



[Figure 6_9.] Water interface.

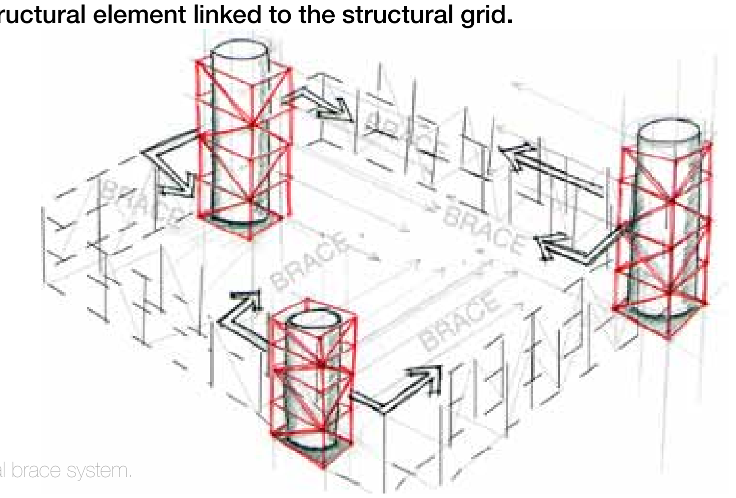
MOVEMENT - - - - - - - Water is a process element which even in a stagnant state poses the **potential of movement,** flowing, filtering, boiling, etc. The image below illustrates how water as a moving element flows, is pumped and circulated between the buildings, spaces and the containment reservoir on site. The water moves back and forth through the different spaces, cooling the site, creating ambience and serving the existing buildings whilst exposing the system to the user as an educational endeavour.



[Figure 6_10.] Water movement between user, nature and system.

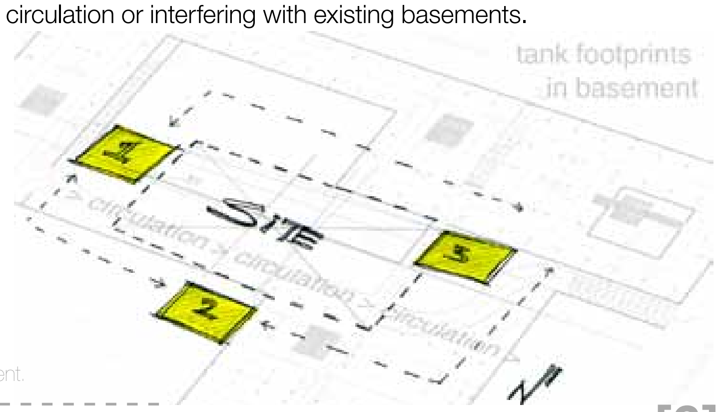
MASS - - - - - - - - - - - When contained, the mass of water is constantly pushing against the boundaries of the constraints keeping the water in position. The on-site water is tanked in 3 large 400 Kl concrete tanks. The concrete cannot support external forces because of the **shear pressure the water places on the concrete shell.** But the tank as a whole can act as a bracing element for the building, thus **becoming a structural element linked to the structural grid.**

BRACING - - - - - - - - -



[Figure 6_11.] Water tank structural brace system.

PLACEMENT - - - - - - The placement of these 3 tanks is crucial to the organisation of the site for two reasons; the tanks need to be **evenly spread out** in order to service the existing buildings and collect water from all of their roofs. Secondly the tanks' footprints need to **work in harmony with the basement design**, not obstructing circulation or interfering with existing basements.



[Figure 6_12.] Water tank placement.

ENERGY AS SPACE

CONCEALED

Energy as a stored amount of potential is usually concealed from our view, it forms **part of the planes that shape our shelters**, it is in the battery in the basement, it comes from the plant far outside the city, it lives somewhere in the wall and in conduits and fills our spaces with light, heat, sound and picture, etc. There is no space making properties involved in the transmission, production or use of energy, yet it is **present in all spaces**, whether it be in the form of a fossil fuel, kinetic objects or electricity.

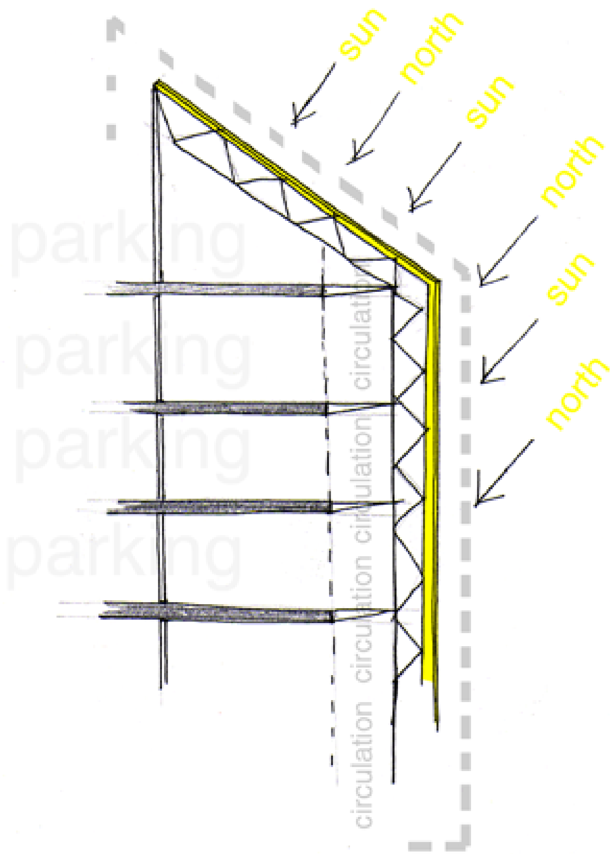
PRESENCE

SOLAR

It is proposed that photovoltaic panels and solar vacuum tubes are used for solar water heating and electricity. As stated before the photovoltaic panels will only serve the charging of the **electrical cars and the building's lights**. In order for the panels to perform at full potential they must be fixed at a 30° angle facing north. Instead of just placing the panels like an energy field in the desert, **the potential of the panels to serve as screens on the facade and roof is exploited**.

SCREENS

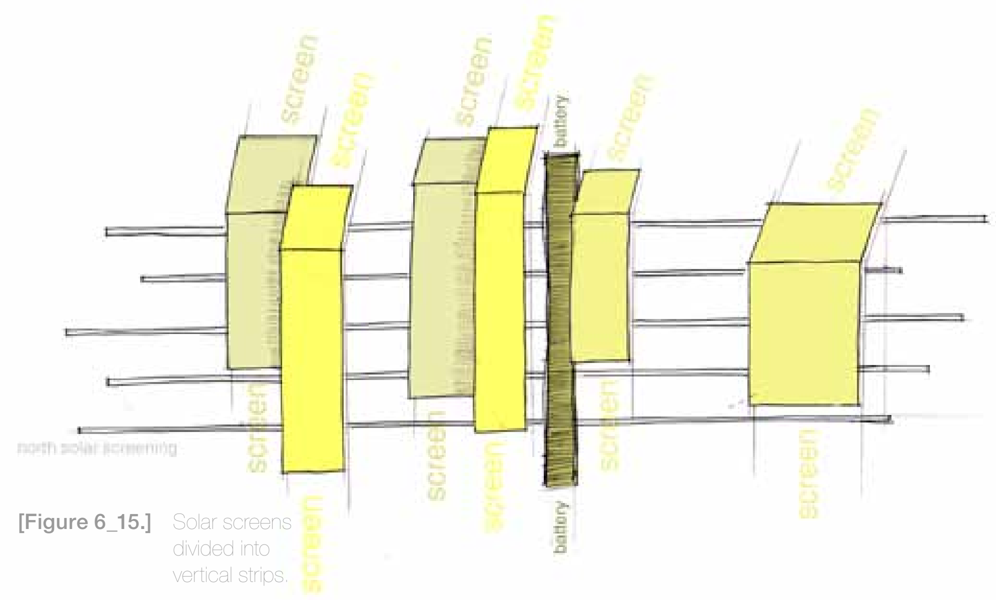
[Figure 6_14.] Photo collage illustrating the presence of energy in different spaces and applications.



[Figure 6_13.] Diagram illustrating solar screen wrapping over intervention's Northern face.

The concept is that the panels are **fixed in strips which 'wrap' over the building weaving back and forth, in and out, creating shading, screens for the circulation routes and privacy** for the existing buildings, as well as a trellis for the vegetation from the organic digesters to grow on. The screens are connected to a **battery on each floor** which serves that specific floor's lighting and car charging needs. For future development, when solar technology improves and it is possible for the building to generate enough electricity for the surrounding buildings, the **bridges serve as conduits along which new energy supply is transferred to the existing buildings' service cores.**

WRAP



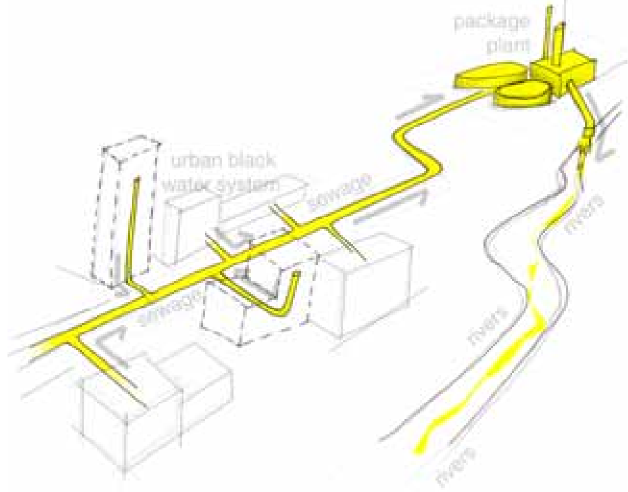
[Figure 6_15.] Solar screens divided into vertical strips.

CONDUIT BRIDGE

___SANITARY WASTE SYSTEM AS SPACE _____________

INVISIBLE PROCESS

The conventional sewage waste treatment system currently in use can be described as an 'invisible' process; once the waste has been flushed away it **'disappears' into a submerged sewer system** which transports the waste to package plants where the waste is treated and released into rivers.



[Figure 6_16.] Current conventional urban sewer services system.

EXPOSED PROCESS

CENTRAL POSITION

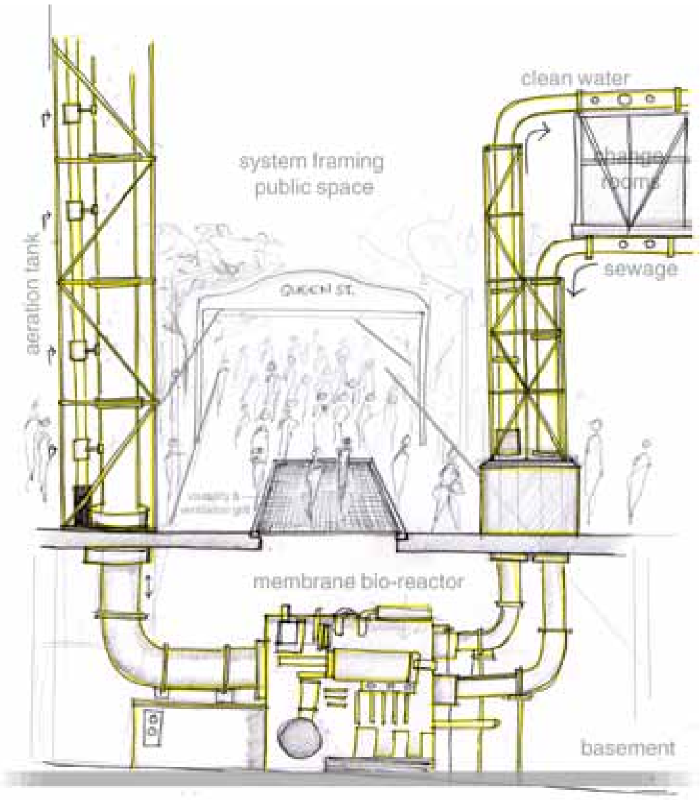
The proposed system to use a **M**embrane **B**io-**R**eactor on site to treat the whole site's wastes provides the opportunity to expose the system in order to educate, cycle the resources on site and **use the system as an addition to the intervention's aesthetics and spatial ambience.** The MBR is a compact machine which can fit into a 11m ² space. In order to keep the process as efficient as possible most of the process supply relies on gravity feed, the existing sewage pipes gravitate through the centre of the site towards Vermeulen street. Thus it would be wise to place the MBR at a **central position where it can be connected to the existing and additional sewage lines.**

The machine is **not noisy or smelly** and thus does not have to be concealed from the public but it would be ideal to place the machine below ground level for gravitational purposes. It would not be ideal though to place the machine in direct public contact in case of malfunction and tampering. It is thus proposed that the machine is placed **below the central part of Queen street.**

EXTRUSION

PORTAL STRUCTURE

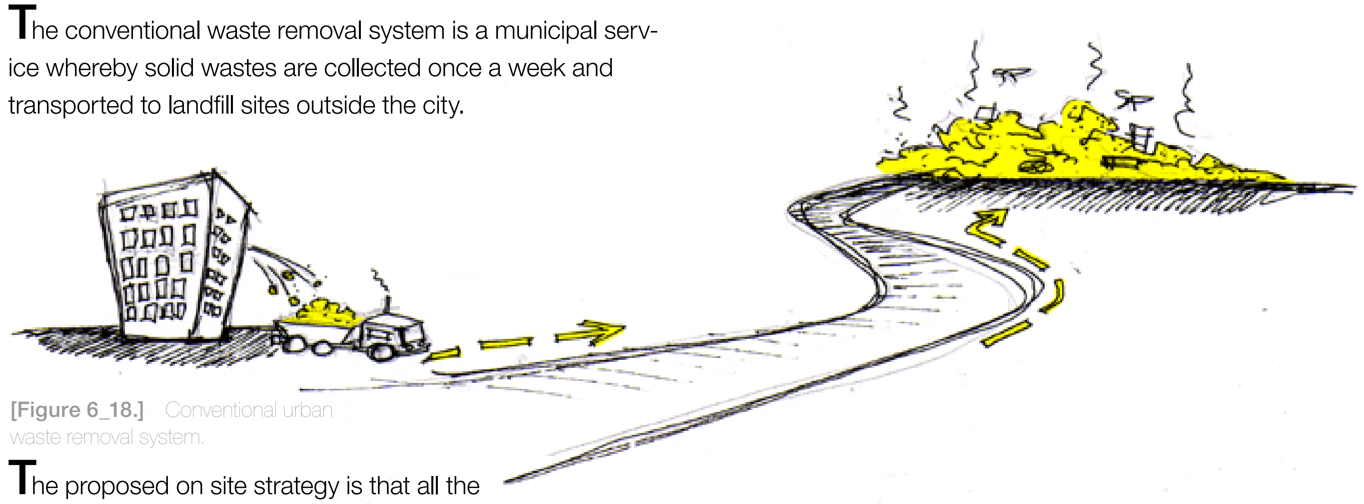
In order to expose the process three functions are **extruded above ground level** in order to communicate the process. The first part is the aeration tank; it is proposed that instead of a tank the aeration process takes place in a **vertical transparent pipe into which air is blown**. The second part is the supply of clean water from the MBR to the change rooms and thirdly the flow of sewage from the change rooms back to the MBR. These three processes manifest in **vertical emphasized pipes** on either side of Queen street creating a 'portal-like' structure in the middle of Queen street. The slab above the MBR is cut open and replaced with mentis grid for **ventilation and to make the machine visible.**



[Figure 6_17.] Proposed MBR positioning and extraction of system components to fran

___ORGANIC WASTE SYSTEM AS SPACE _____________

The conventional waste removal system is a municipal service whereby solid wastes are collected once a week and transported to landfill sites outside the city.



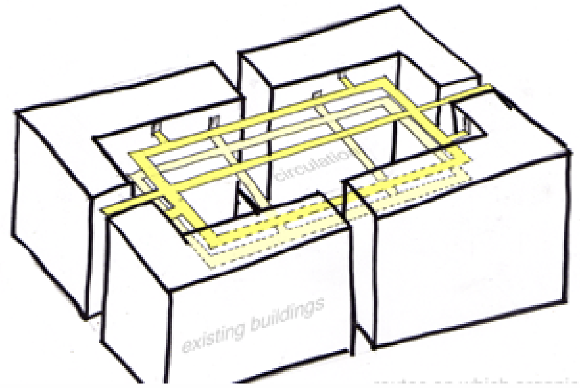
[Figure 6_18.] Conventional urban waste removal system.

DIGESTER

CIRCULATION

SCREENS

The proposed on site strategy is that all the solid wastes be dealt with on-site, the recyclable wastes are collected and go through an **organised recycle system**, the organic wastes are digested by patent designed **earthworm digestion containers**. Because the organic waste system should be accessible to all buildings and users on site, the strategy is that the containers are spread out along circulation routes between buildings and across the site. The containers are adapted to not only act as a 'dustbin' for organic waste but that the f**luids and compost produced by the digester be immediately put to use,** thus the digester is designed with an incorporated planter hosting creeper plants which grow vertically along a trellis structure which is part of the planter. Because the digester planter is placed along the walkways it is also then adapted to become seating in areas. Thus the spatial contribution of the digesters are that they provide screening and shading along walkways, it **softens spaces with the addition of vegetation and animates areas with street furniture**.



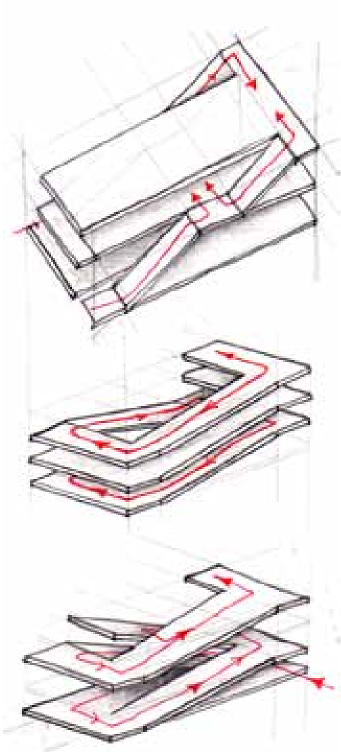
[Figure 6_19.] Organic digesters on circulation routes.

___ACCESS SYSTEM AS SPACE ______________

CONDUIT FOR MOVEMENT

FRAME

Access ramps in all their elegant appeal are one of the most difficult and determining elements in a design, **ramps rather take up space than create space**, they are a conduit for movement rather than a place or space. The proposed ramp is **part of the building's shell** for, if in future the building no longer needs upstairs parking and is adapted to adopt a different programme, the ramp could easily be **removed or adapted to the structure**. Because the ramp then circles around the building it starts to frame a series of spaces as it **climbs around the central public space.**



[Figure 6_20.] 'Framing' ramp systems going around central area.

___PARKING SYSTEM AS SPACE ______________

STREET SCAPE

NO-MAN'S LAND

Street space parking **allows vehicles to be a part of the street scape,** they become the buffer between the pedestrian and traffic Thus the parking is part of the greater whole of the street scape. Parkade areas are usually large **bulk parking spaces which are deserted**, a no-man's land waiting for 5 o'clock to be completely emptied out.

[Figure 6_21.] Californian urban streets scape with integrated parallel parking.

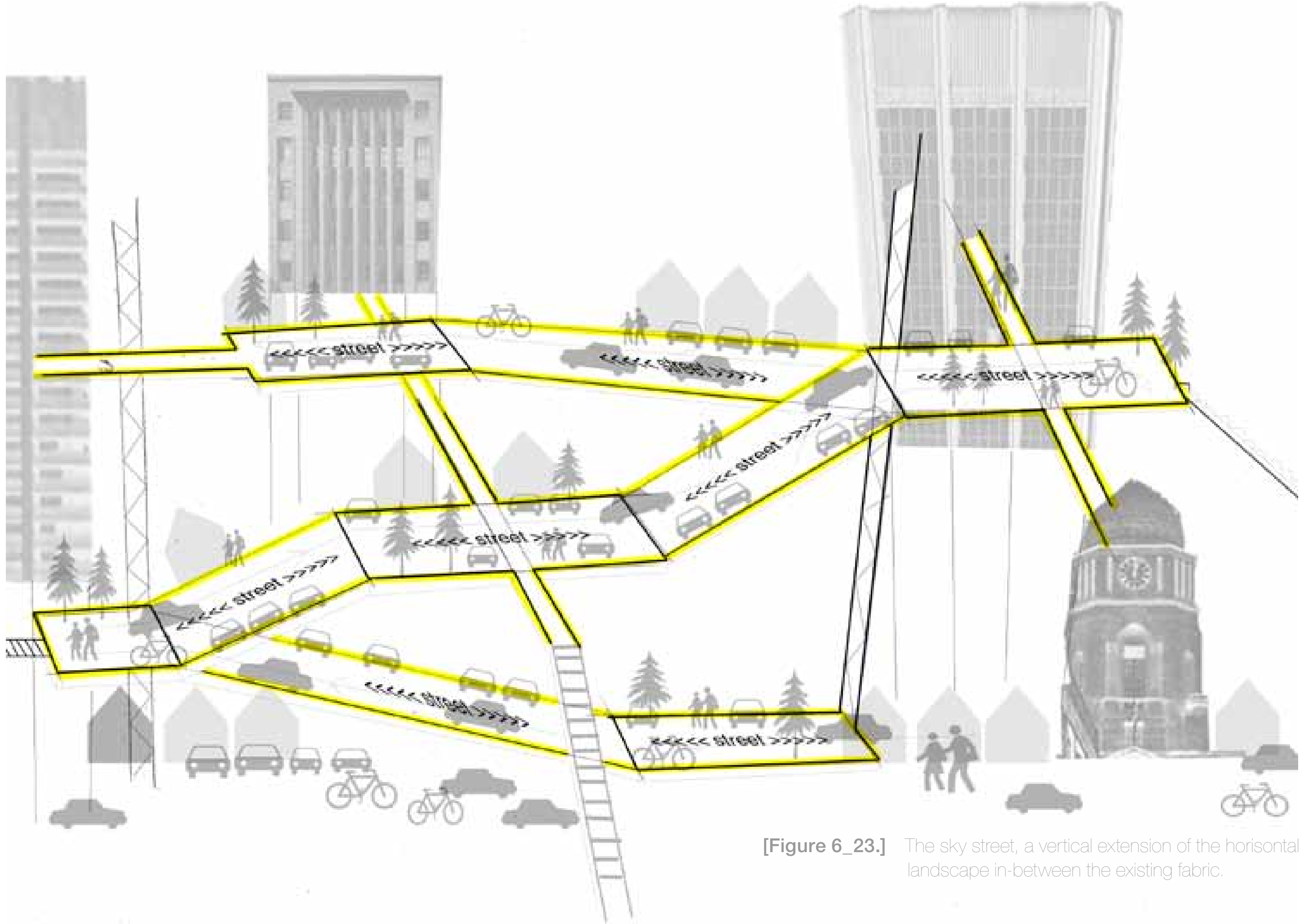
[Figure 6_22.] Outdoor mass parkade, Toronto.

SKY STREET

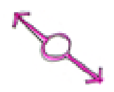
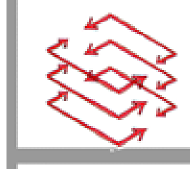
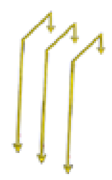
IN-BETWEEN

SPILL OUT

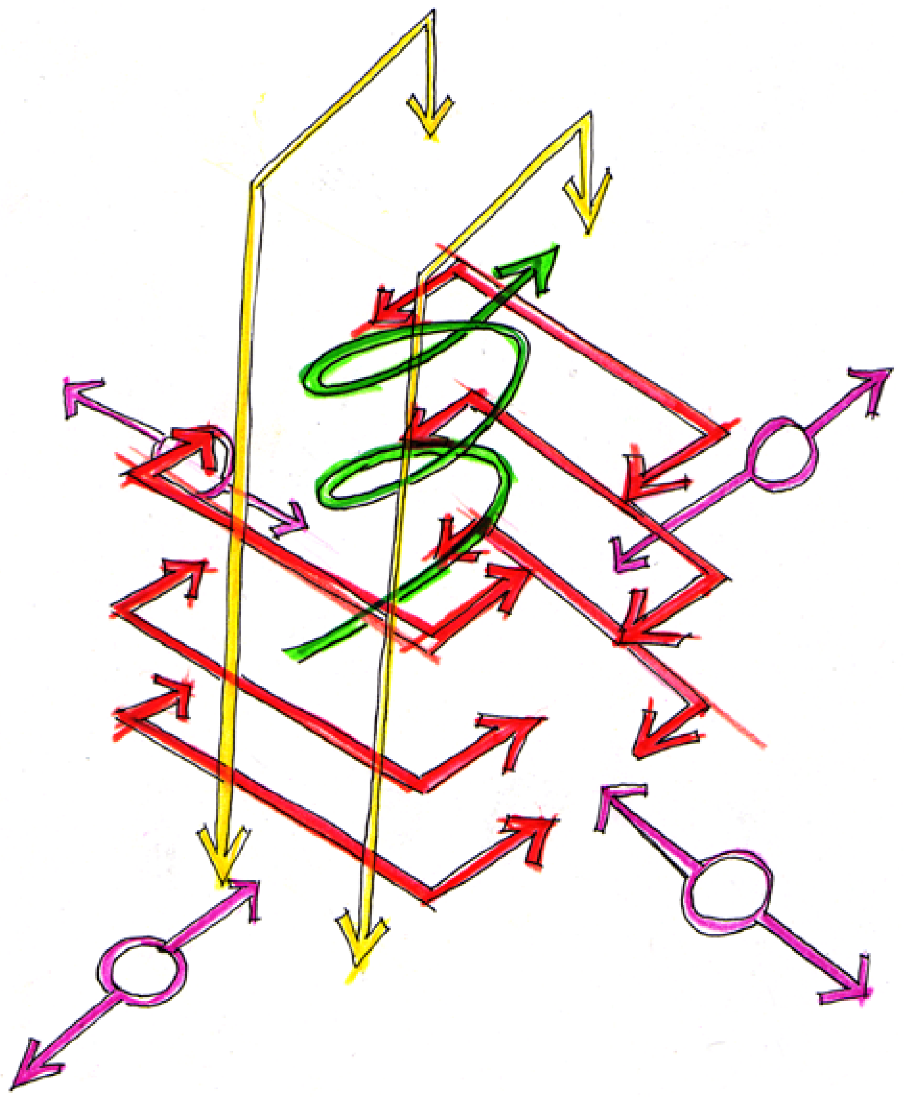
The proposed parking space is thus intended to **serve as a street scape in the sky**, a link between new and old, inside and outside, coming and going. The parkade is adaptable to serve the surrounding buildings as they all have access to alternate floors, eg. the Regend Place building has a small gym on the top floor, because of space constraints they now have the **option to use a part of the parking space to present group training programmes** (i.e aerobics) at off peak times. The Sanlam Forum building has large quantities of people coming every day to do paperwork for estate disputes and claims, people que for hours in narrow stuffy corridors. The building could use the extension to the parkade where the proposed pocket park meets the existing structure as an **alternative queuing space,** thus the people stand outside, have a view and seating on the digester planters. The parkade and intervention as a whole also serves as an additional **fire escape and emergency gathering space.**



[Figure 6_23.] The sky street, a vertical extension of the horizontal landscape in-between the existing fabric.

	connect -	bridges connect new spaces to existing spaces, also connecting circulation routes along which organic digesters are placed
	shell -	structure is a shell 'cupping' the space inside, the structure consists of circulation and large bracing tanks and serves as the grid into which the existing buildings
	wrap -	solar screens wraps over space providing electricity, shading, privacy and a trellis for vegetation.
	frame -	the framing of space is achieved by the circulation ramp going upwards towards the parkade, as well as the MBR framing Queen street and the heritage buildings framing the arcade.

space making elements

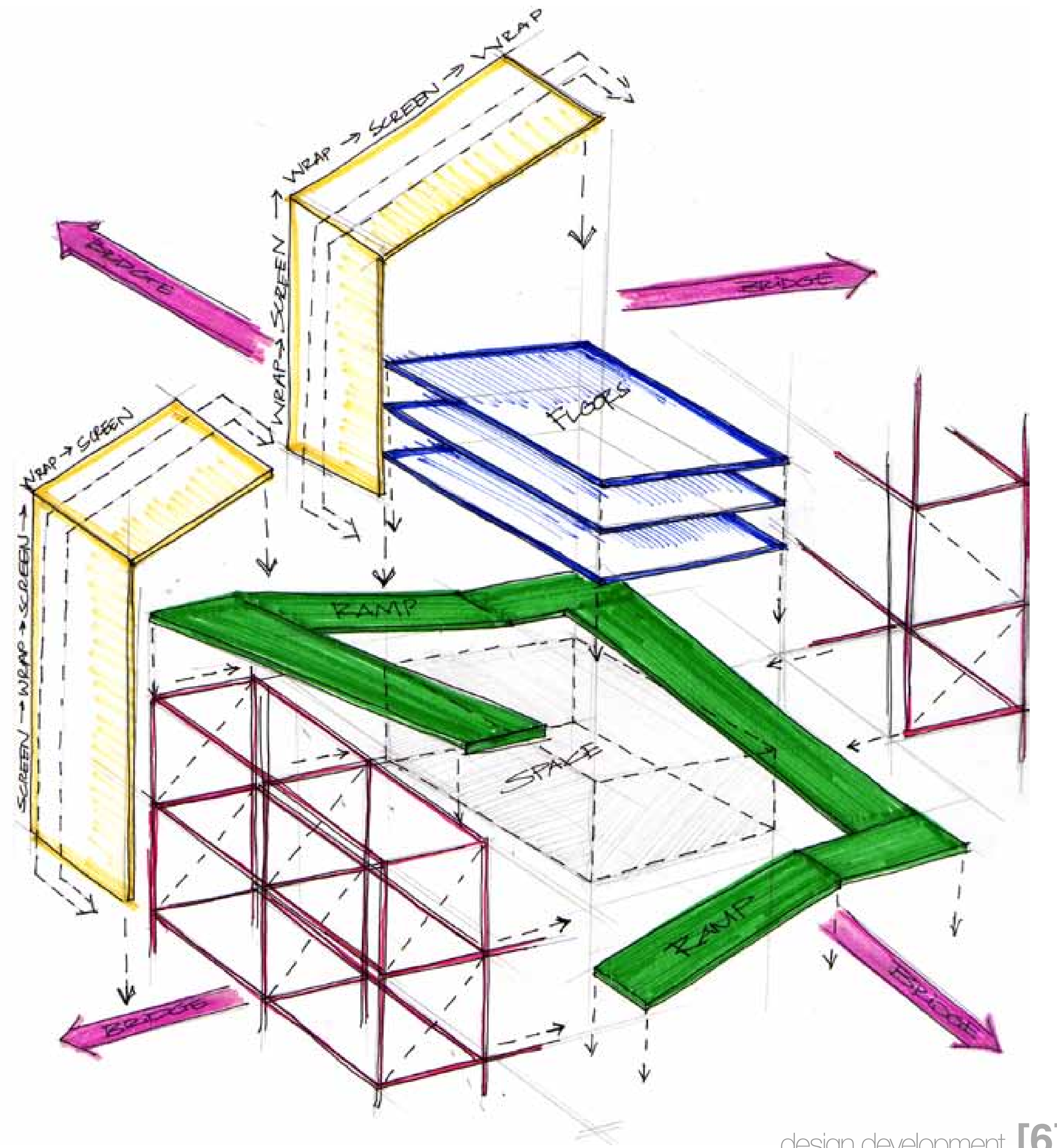


[Figure 6_24.] Summarising diagram of the space making system elements in intervention.

___SPACE MAKING REVIEW_____________

After exploring the space making potential of each system and assigning a characteristic post to them, whether it be in conjunction with other systems or elements or separately, a basic diagram can be drawn of how all the systems can start working together to **give shape to a central public space** and **different scales of circulation, connection and services spaces.**

The diagram bellow describes how the central space, which is the main focus as public commodity, is firstly framed by the ramp structure which spirals on the periphery of the space. Secondly, the **ramp structure is supported by an exoskeleton structure or 'shell' which houses the water systems, conduit space, pedestrian walkways and vertical circulation.** Thirdly, the space is 'roofed' by the floors above where the sky streets create extrusions and connections to and from the existing fabric's upper floors. Fourth, new spaces are connected to old spaces via sky bridges. And lastly, the building receives a skin by wrapping the solar screens over the northern facades and disperse outward to the rest of the facade.



[Figure 6_25.] Space making assembly, systems organised around a central space.

___ 6.1.4 _ CONCEPT _____________

The 'weave' connects different levels, buildings, resources, systems and people whilst creating space and place. Thus it is not a weave creating a **flat plane** but rather a weave which **envelops a space.**

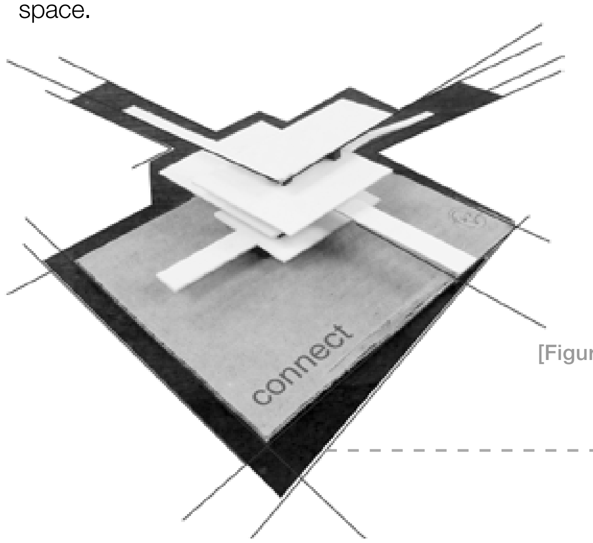
WEAVE SPACE

[Figure 6_26.] A wicker woven plane.

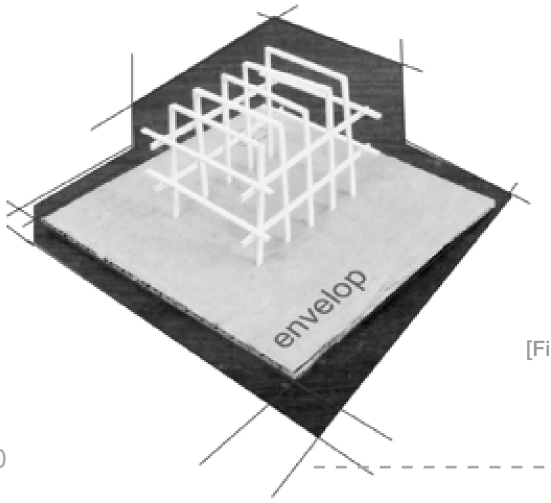
[Figure 6_27.] Woven space, a grass bird's nest.

The architecture not only attempts to connect planes but also to envelop the space by using the systems to 'frame' the space.

FRAME SPACE



[Figure 6_28.] Connecting new and old planes via staggered 'reaching and pulling' levels.



[Figure 6_29.] Frame structure (exoskeleton/shell) enveloping a central space.

Two precedent projects attempt to illustrate this **weaving action in a horisontal and vertical** manner respectively. In these scenarios the weave is regarded as a **growth** which latches onto the existing structures for **support.**

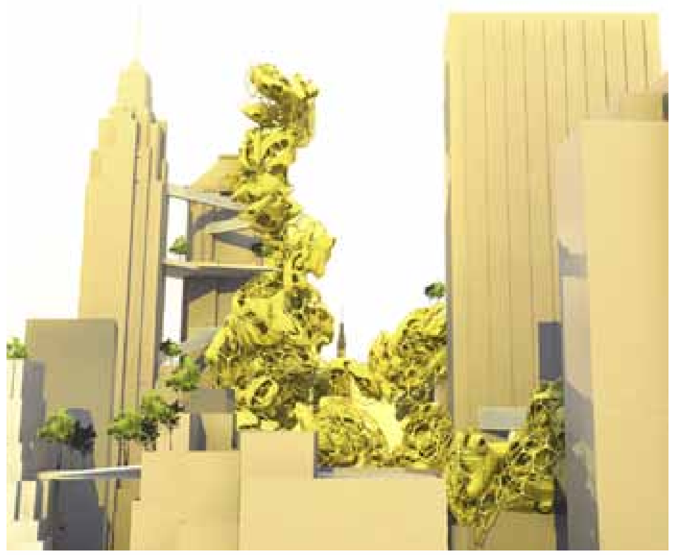
PARA CITY

Location: none (proposal for eVolo Skyscraper competition)

Architect: Somnath Ray

Project:

The competition called for designs of the 'skyscraper of the future' – to which Somnath responded by creating not a new form of skyscraper to be planted on an empty plot of land (like our typical current skyscraper, occupying a footprint and the sky above it), but an **organic, parasitic mass of volumes that inhabits the leftover areas between buildings**. 'With ever-increasing densities and changing programs,' Somnath writes, 'Para-city **grows in the entire three-dimensional space of its host**: the existing skyscrapers of the present urban landscape' (Ray 2010).



EFFICIENT LIVING MACHINE

Location: none (proposal for eVolo Skyscraper competition)

Architect: LEDarchitecturestudio & Hiddenoffice

Project:

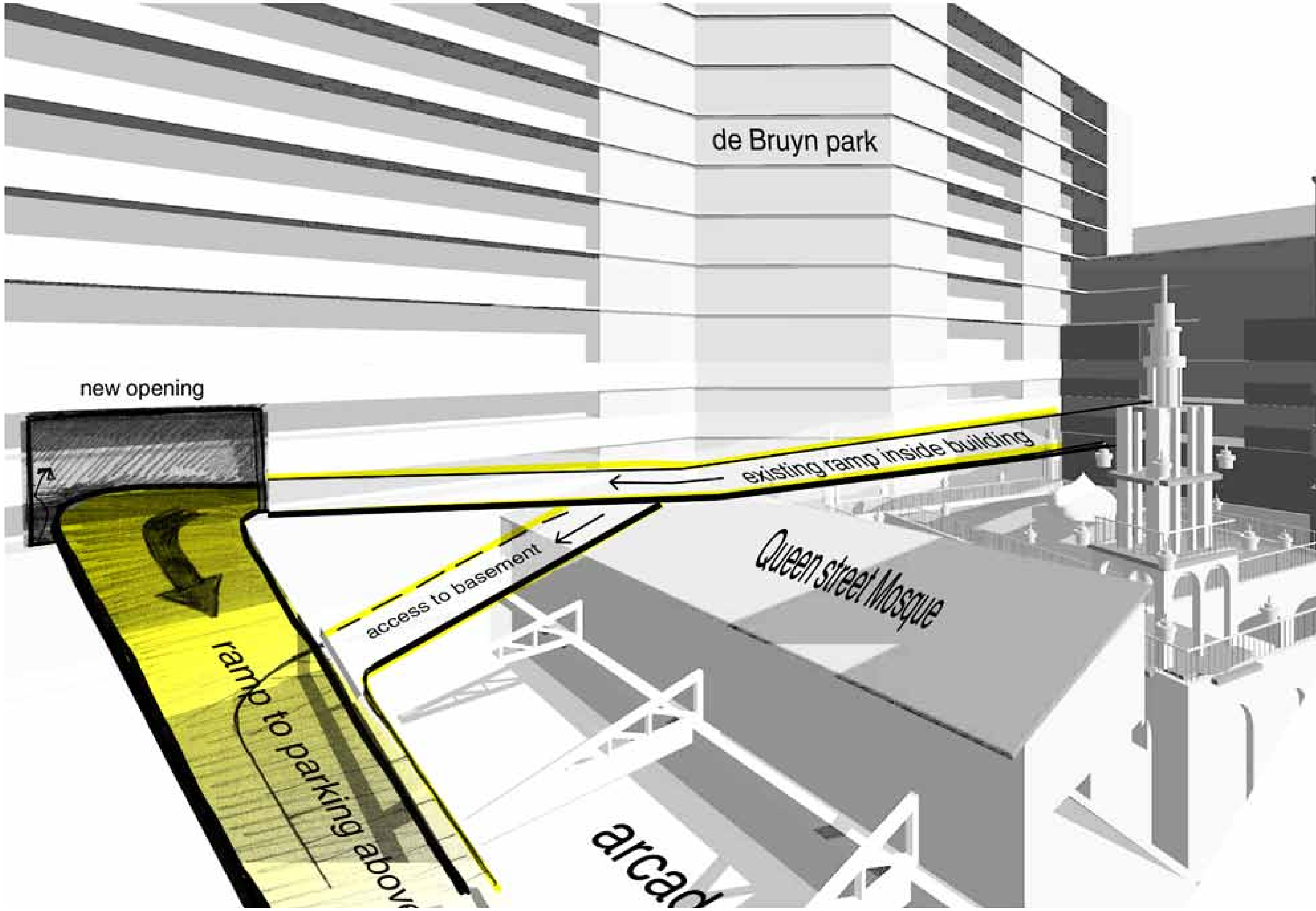
Efficient Living Machine project transforms a building into an **infrastructure able to improve and expand the lifestyle of the metropolis**. The firms propose that the skyscraper becomes a **system of overlapping grids upon the existing environment** as a way to read the city differently. These grids contain different layers of programmed activities, ranging from recreational areas to farms, and from public parks to areas of commerce. Although the project offers new nodes of activity, the system **fuses with the existing city's fabric** from the union of the Metro stations, both currently and in anticipation of the future. "This spatial structure increases the density of functions, which also has the ability to be mobile and change their configuration to the internal structure of each individual to follow what are the socio-economic dynamics of a metropolis in constant change and implementing as an **evolution of cross programming**" (Cilento 2010).

___ 6.1.5 _ PROGRAMME _______________

The nature of the intervention's programme demands **centrality, accessibility and verticality.** Thus to place the intervention in the **middle** of the block with a loading services basement from which industrial lifts sprout upwards, would be the most efficient approach for the resources, people and conduit structure to move between the intervention and the individual buildings.

ACCESS

The intervention demands efficient access, not only between the existing structures, but also for the cars. De Bruyn Park has parkade floors on the first floor and basement which is served by a ramp allong the western edge of Queen street mosque. Rather than building a new ramp to service the parking floors of the intervention, it is proposed that this **existing ramp is used** to service the new extension loading area of the basement and the access route to the upper floors as well as provide access to the bicycle parkade.



[Figure 6_30.] Existing de Bruyn Park ramp becomes part of the intervention.

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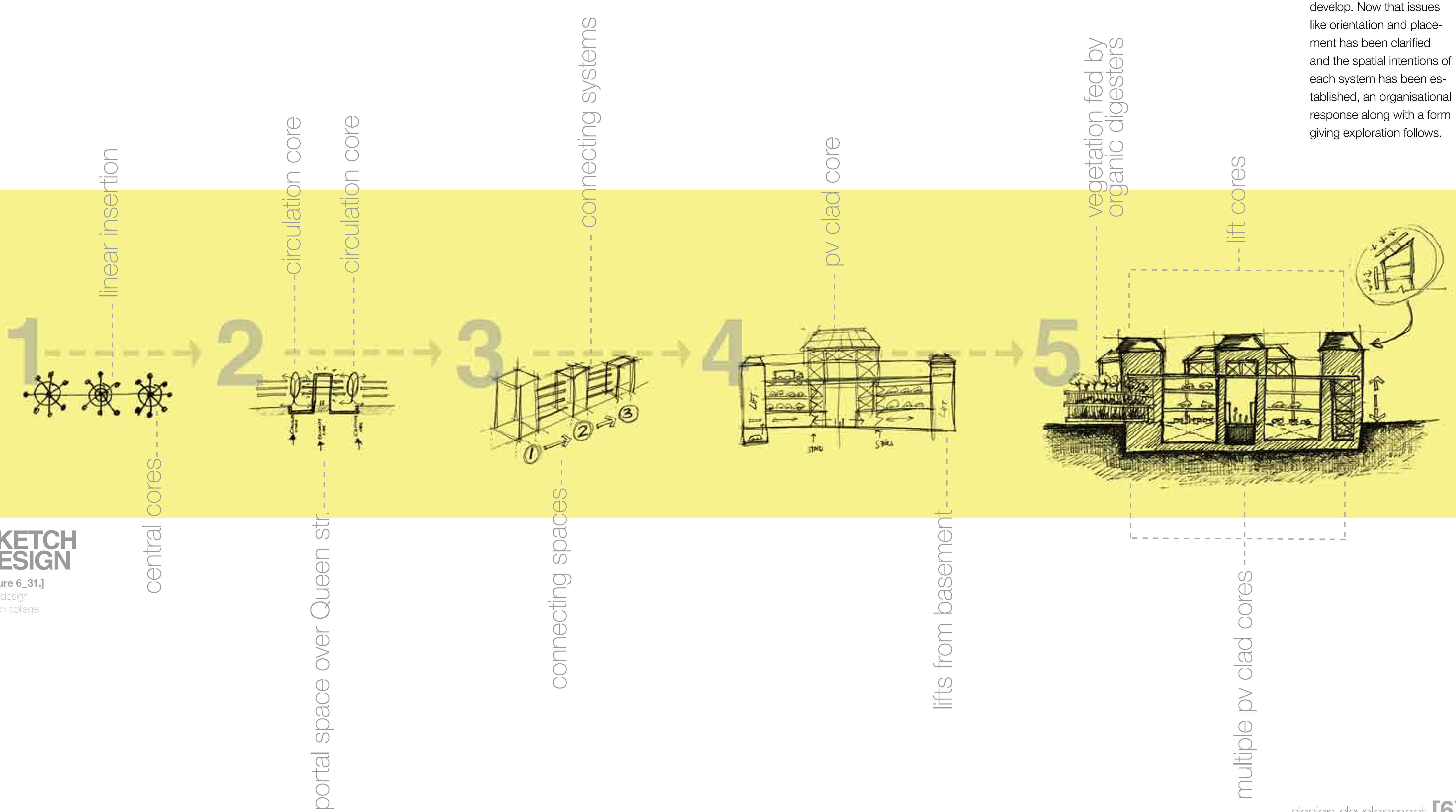
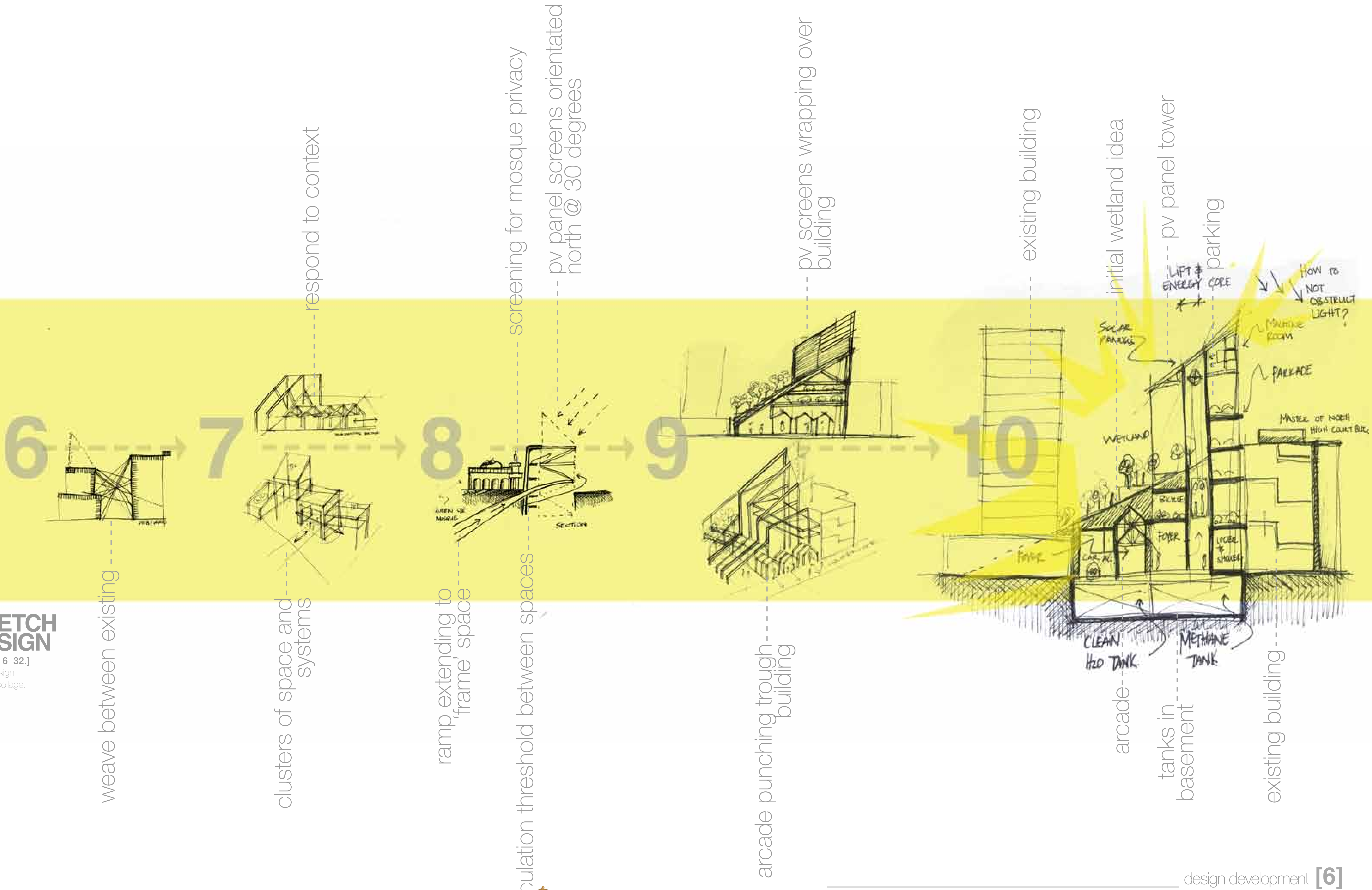
[6.2] SKETCH DESIGN

Whilst exploring the endless possibilities of the different systems, an architectural response starts to develop. Now that issues like orientation and placement has been clarified and the spatial intentions of each system has been established, an organisational response along with a form giving exploration follows.



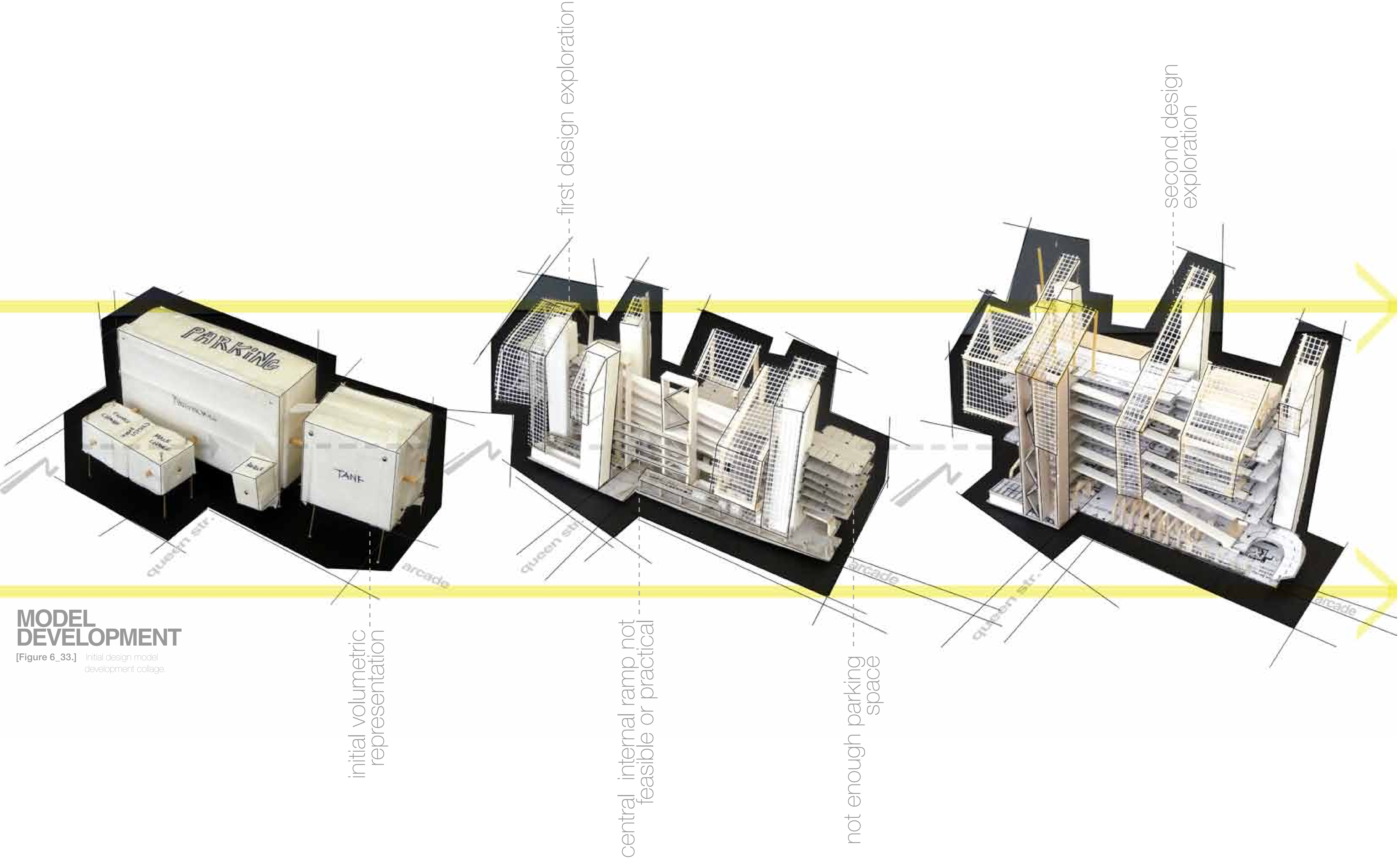
SKETCH DESIGN

[Figure 6_31.]
Initial design sketch collage.



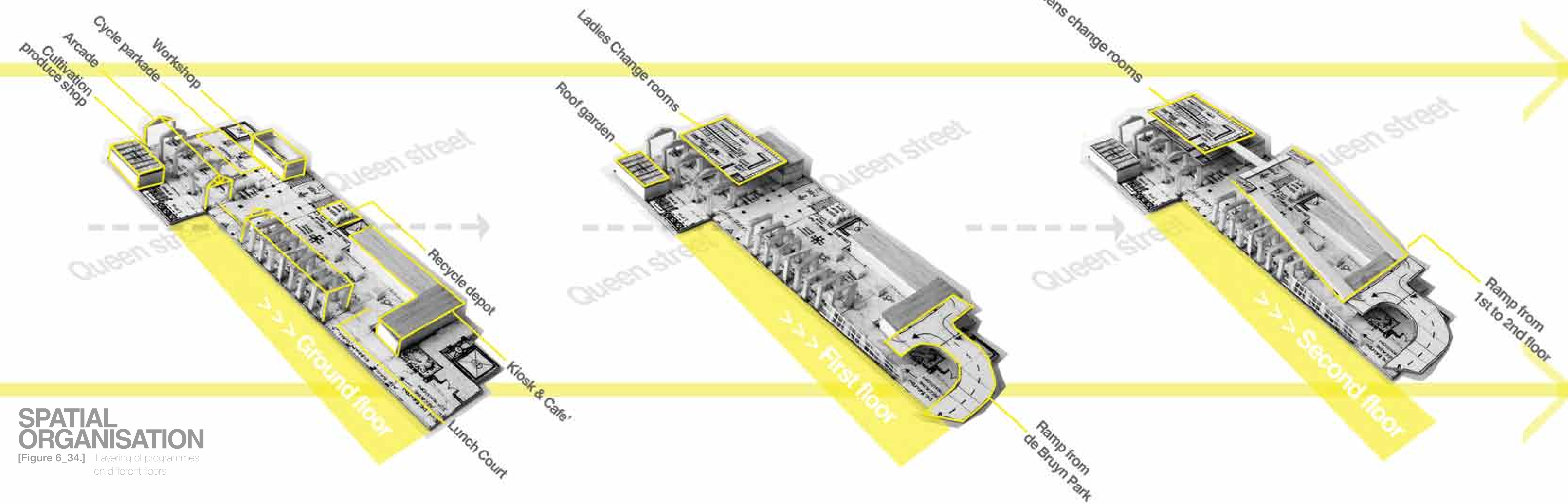
SKETCH DESIGN

[Figure 6_32.]
Initial design sketch collage.



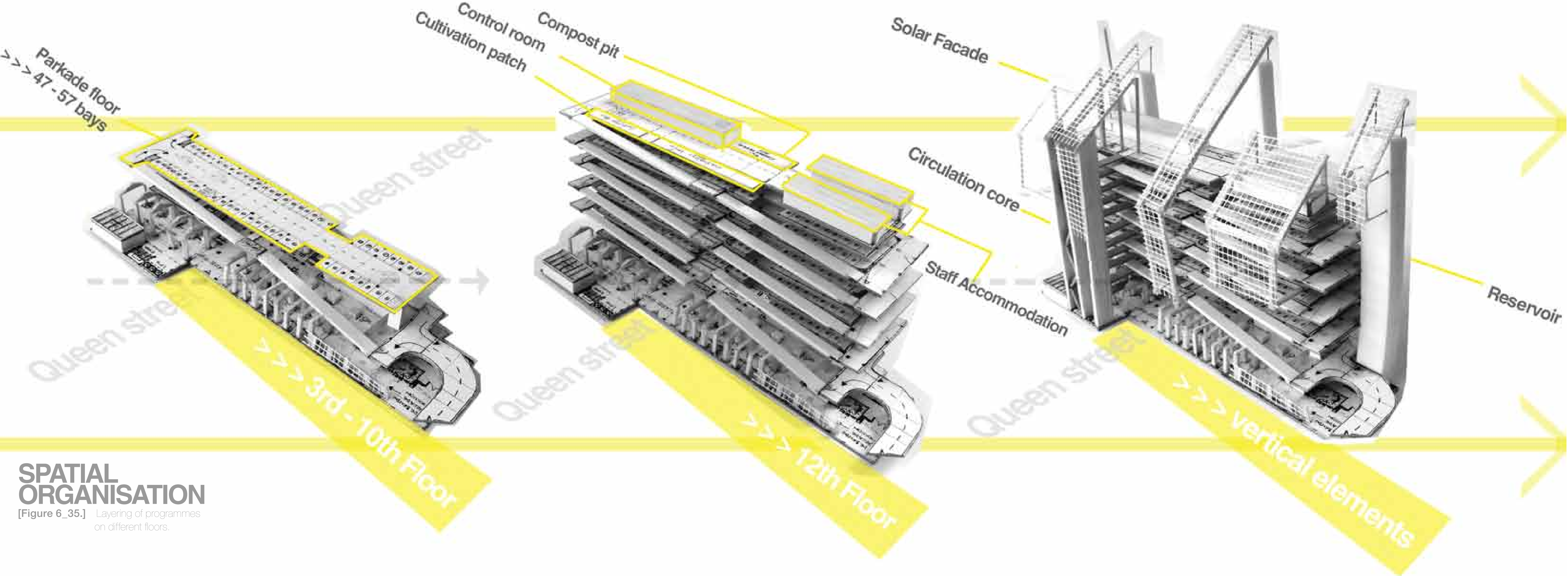
MODEL DEVELOPMENT

[Figure 6_33.] Initial design model development collage.



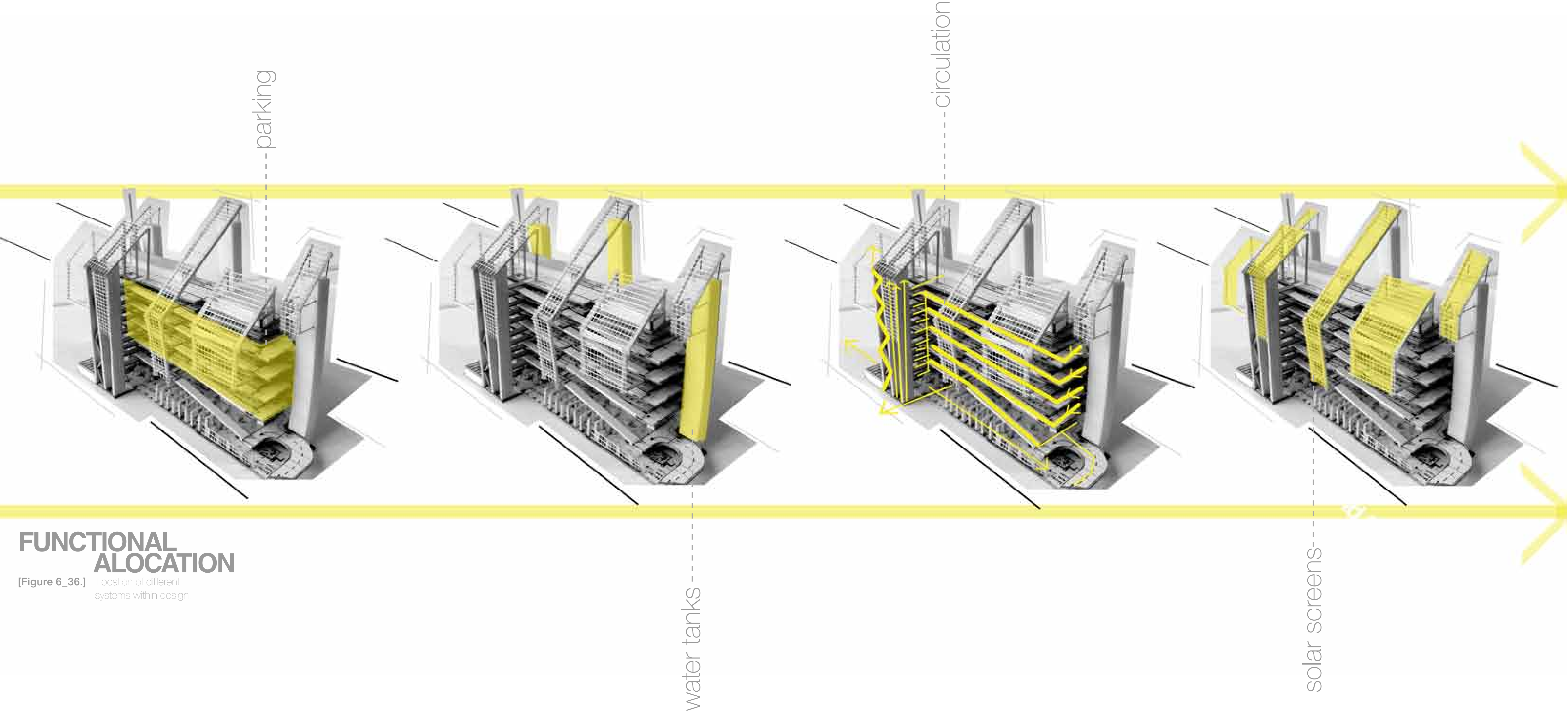
SPATIAL ORGANISATION

[Figure 6_34.] Layering of programmes on different floors.



SPATIAL ORGANISATION

[Figure 6_35.] Layering of programmes on different floors.

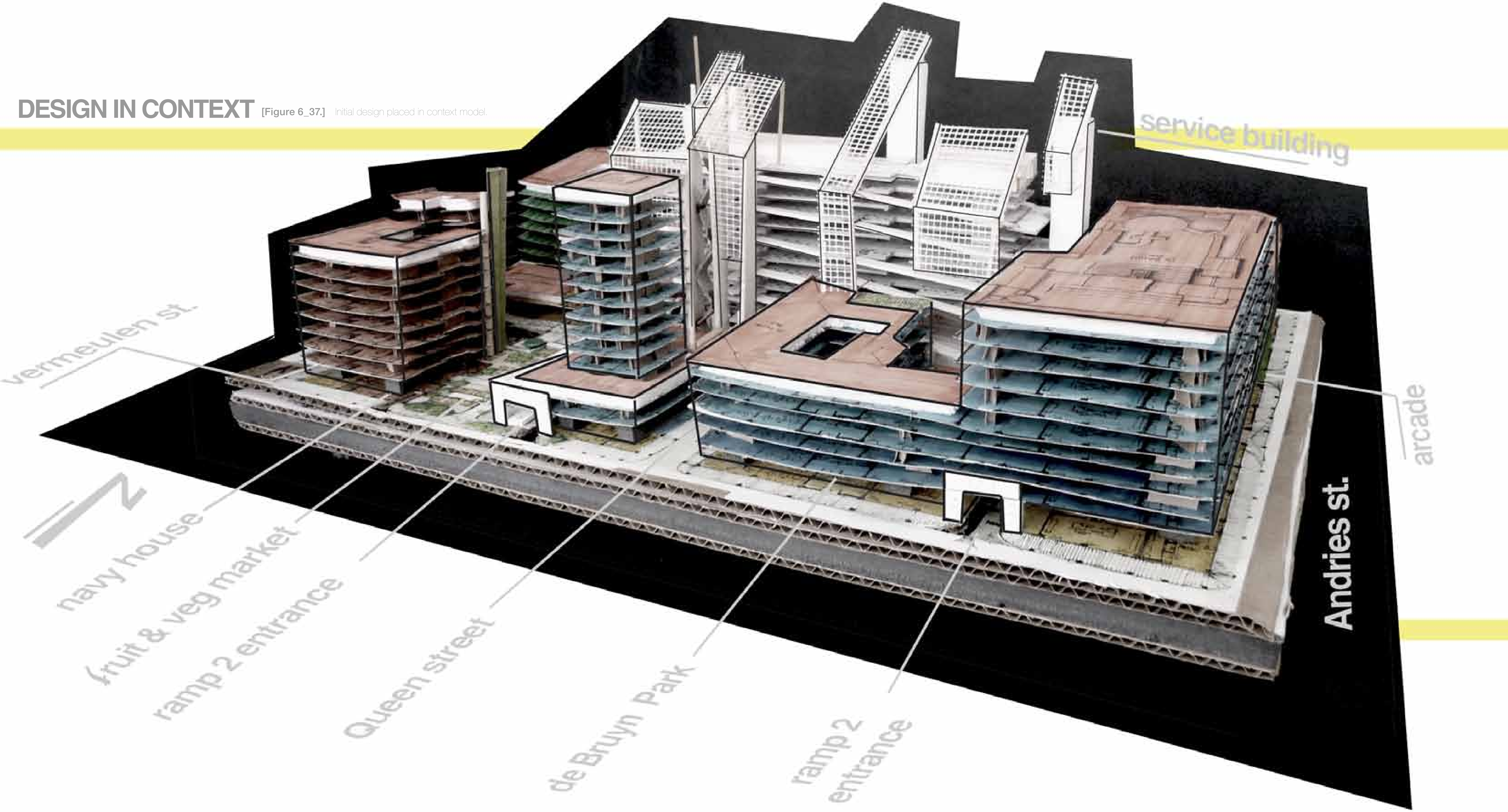


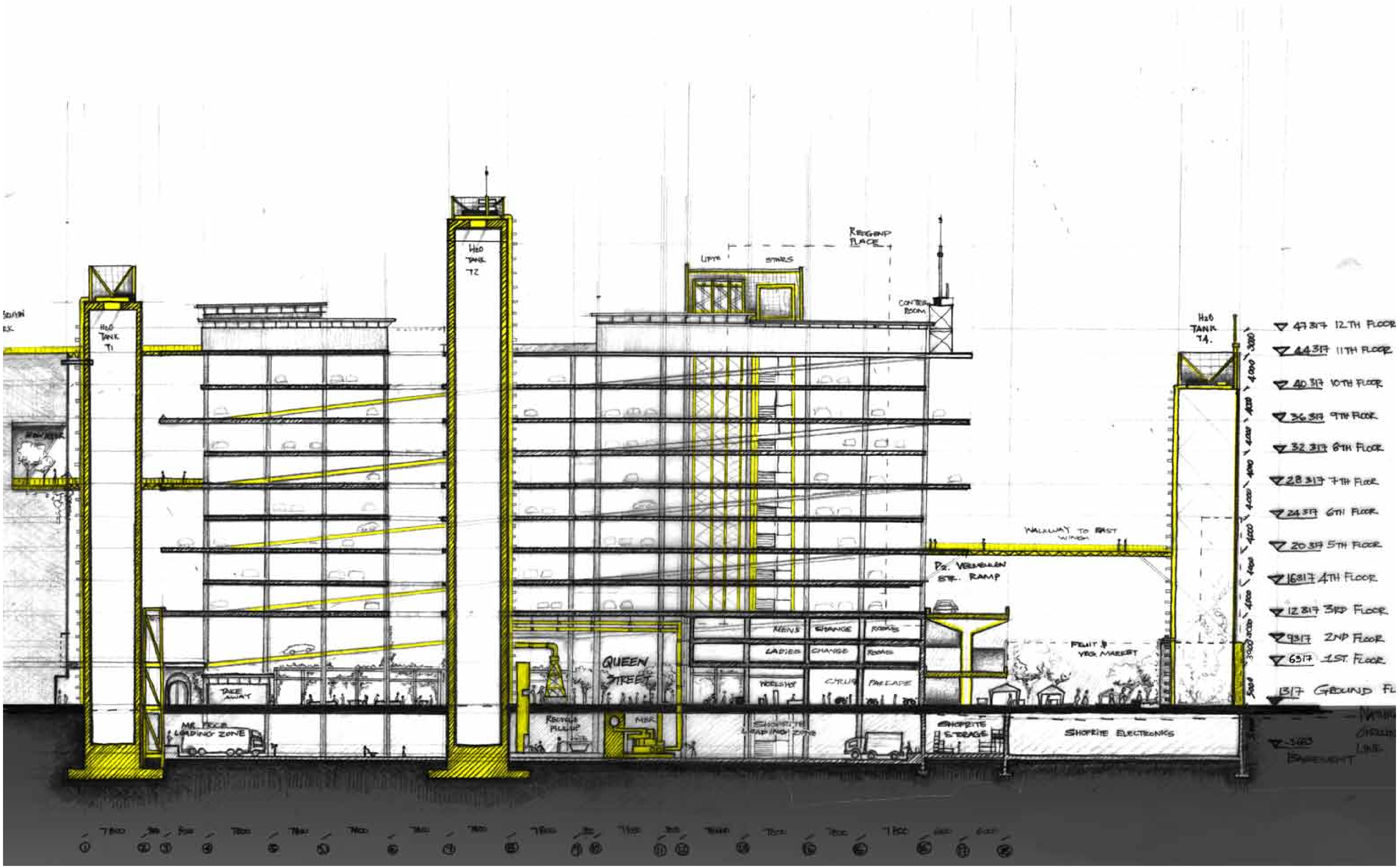
FUNCTIONAL ALOCATION

[Figure 6_36.] Location of different systems within design.

DESIGN IN CONTEXT

[Figure 6_37.] Initial design placed in context model.





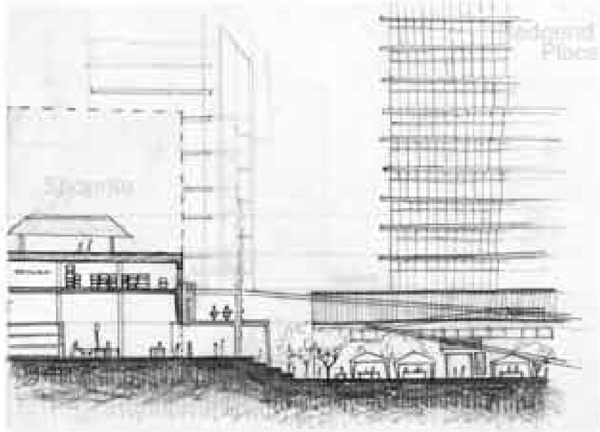
SECTION A-A [Figure 6_38.] Section through design illustrating the water tank scale and animated ground floor area.

[6.3] CONCLUSION

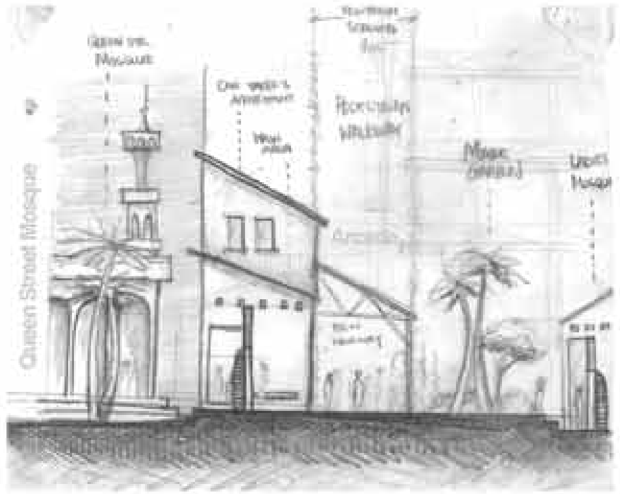
A review of the design up to this stage revealed that the architectural language of the scheme is still in question. Although a large portion of work was done in order to plan and organise the design, it seems that it may come across as **basic engineering** rather than an architectural design. Thus further investigation needs to be done questioning the **tectonic and contextual response.**

The design's **scale** is also questioned, because the design is placed in the block core, a very **sensitive** and strategic approach needs to be taken in order not to **'drown' out the existing fabric**. Thus it is proposed that the basement is optimised and a **super basement** is created in order to lessen the building's vertical mass. Also questioning the vertical organisation; right now the design is planned out to be an economically practical parking building - but this is not what the design set out to be.

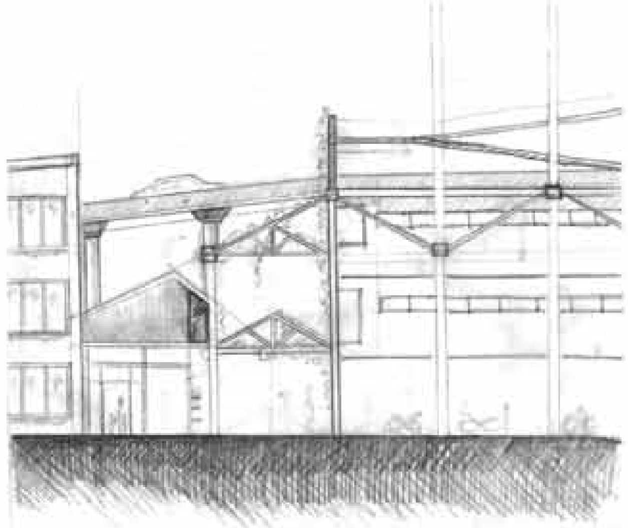
Must the parkade just be an extruded plan? Because of the symbiotic character of the intervention, the **linking spaces in between the intervention and the existing fabric** becomes very important. The mass as a whole as well as the circulation should **respond to the existing fabric** to establish this symbiotic relationship and an **appropriate contextual response.**



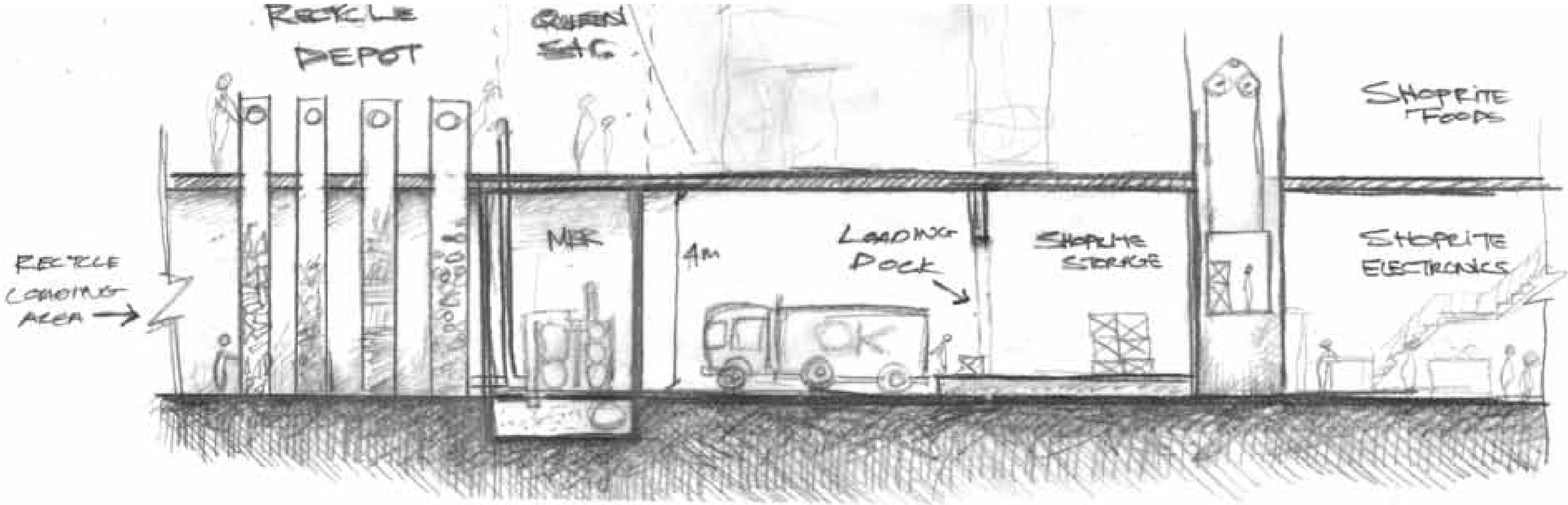
[Figure 6_39.] Proposed fruit and vegetable market space in front of Shoprite Foods with new ramp next to Regend Place facade.



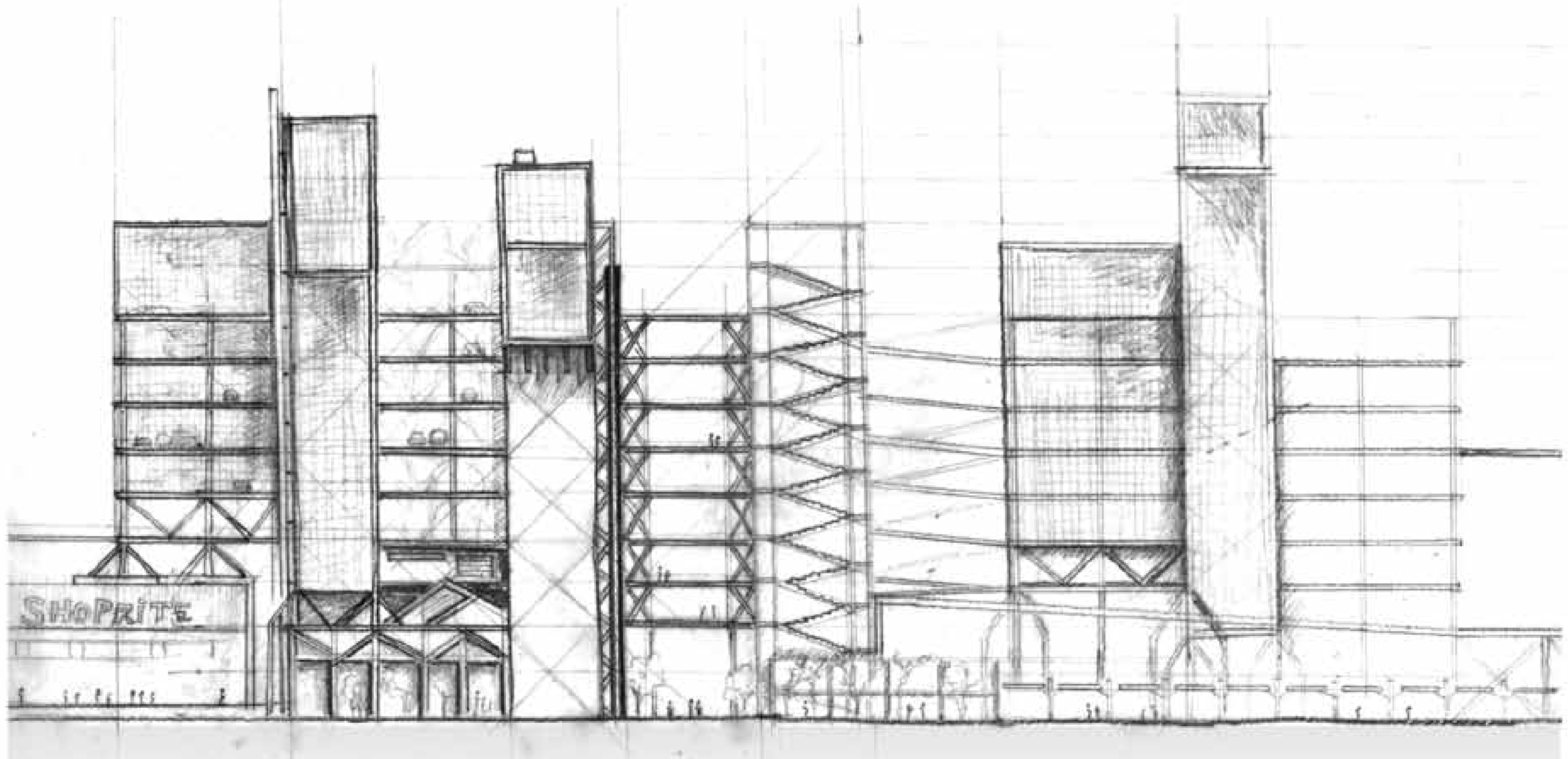
[Figure 6_40.] Arcade through old Wanjacheng structure creating a buffer between the square and mosque.



[Figure 6_41.] Concrete ramp with steel bracing extending over arcade with proposed cyclist parking on ground floor.



[Figure 6_42.] Basement recycling, storage and loading area with industrial lifts for goods being transported to serviced buildings. The basement serves the site systems above with a vertical 'feed' system.



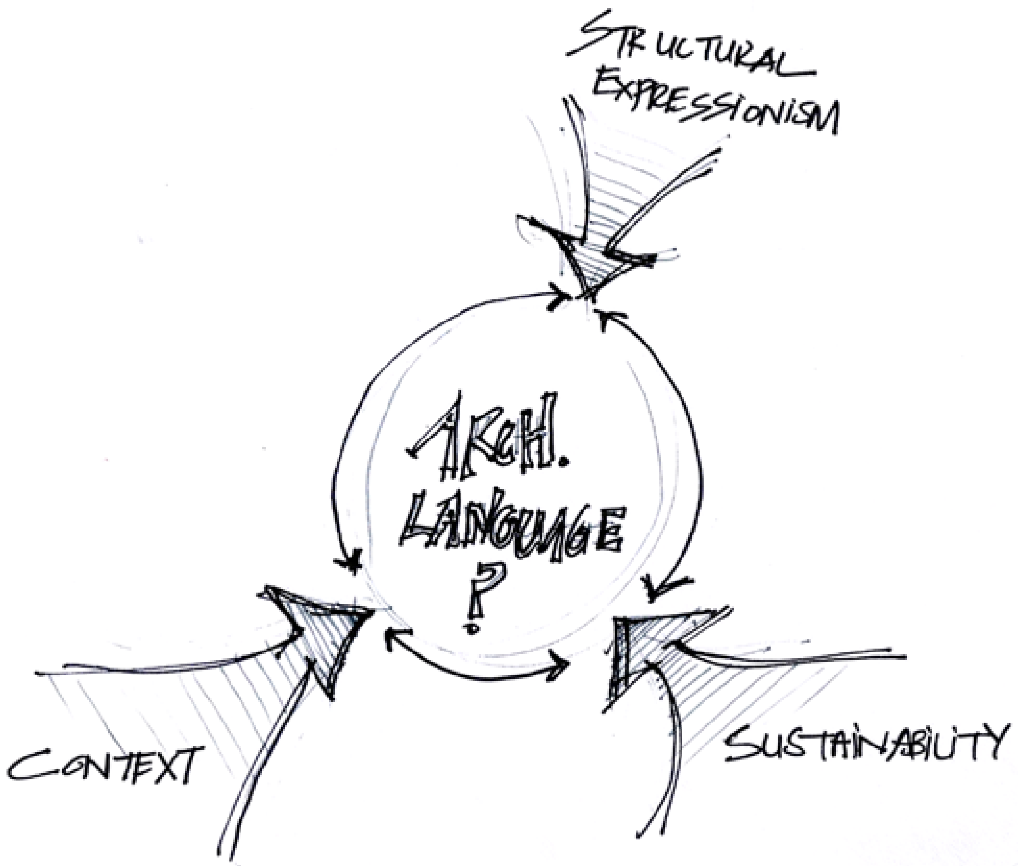
[Figure 6_43.] North elevation of intervention within context. Vertical screen/roof structures wrap over the facade.

identity and personality________[7]________________[Architectural Language]_____

INTRODUCTION

After the exploration, the **basic framework** of the project, which is the use of infrastructure to act as a host of space and place, it became evident that **more investigation is needed regarding the language of the architecture.** The architecture of the project is influenced by three main informants:

_ The architecture of infrastructure, also referred to as **Structural Expressionism** or Hi-Tech Architecture, a late modern movement.
_ The 'architecture' of **sustainability.**
_ And the architecture of the **context.**



[7.2] STRUCTURAL EXPRESSIONISM

The reason why structural expressionism is a relevant reference to this project, is because of the general similarities in approach. Like the work of the Structural Expressionists, the focus of the project revolves around **creating a building in which particular attention is given to the design of the services**; the infrastructure of the building.

The Structural Expressionists regard their architecture as an architecture which acts as a catalyst, a building which serves and responds, a building which can evolve and grow, which is **functional, efficient, makes use of technology, a 'muscular' architecture which is honest and expressive** (Davies 1985: 45).

Renowned Structural Expressionists are Richard Rogers, Norman Foster, Santiago Calatrava, Nicolas Grimshaw, Michael Hopkins, I.M Pei and Renzo Piano (Davies 1985 : 44). Individually they all translated and expressed parallel principles of Structural Expressionism in their work during the 1970s. These similarities were:

- _ To create an **exoskeleton** which consists of services and the structure of the building which is exposed either internally or externally.
- _ Highly **technological focus**, looking for inspiration from industry, transport, communications, flight and space travel.
- _ The use of glass, steel and concrete to contrast the 'muscular' structure with the smooth skin, making the **essential construction of the building the source of the aesthetic** of the building.
- _ Creating a building which does not have a set programme but can be **adapted** to house different programmes.
- _ Design and use of **prefabricated components** even to the extent where 'plug-in-pods' were used for set configurations such as ablutions.
- _ Use of tensioned steel and **dramatic suspended structures.**
- _ Transforming the **elevation into an abstract grid** that can accommodate a number of different functions (Davies 1985: 46).

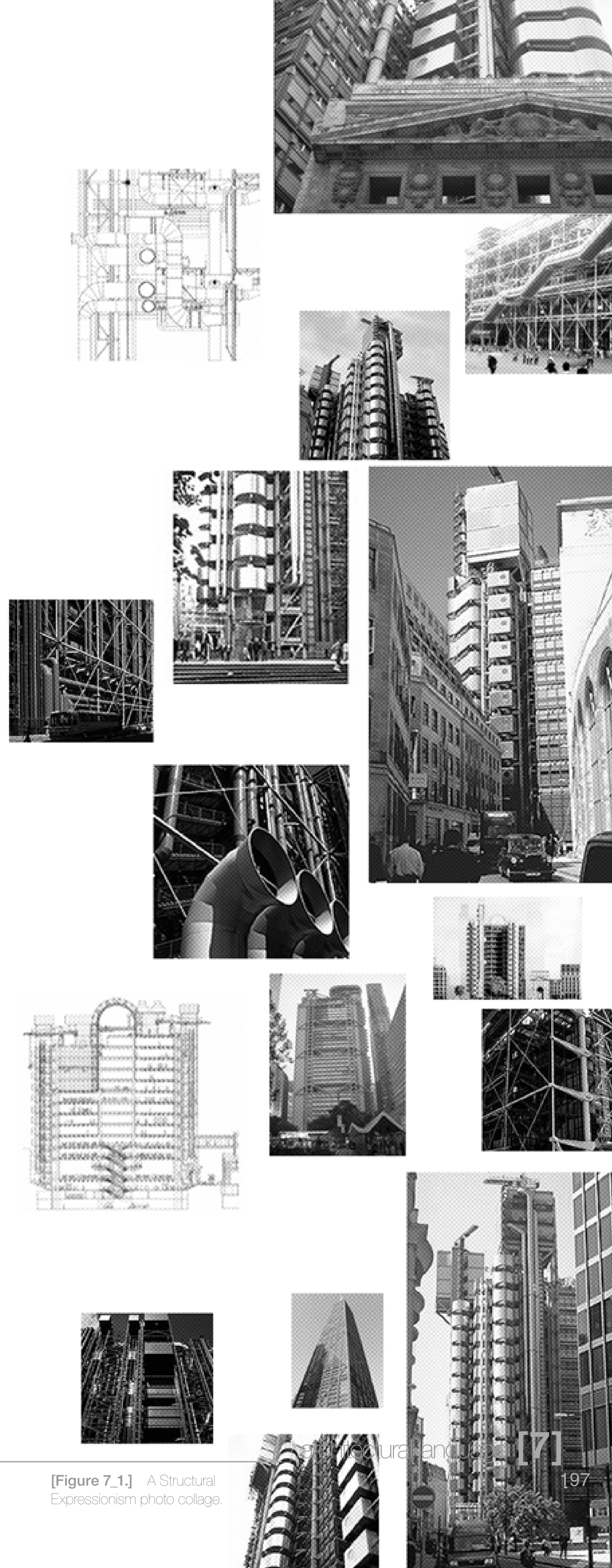
.

The difference in approach between *Infratecture* and Structural Expressionism is where Structural Expressionism fell short. Their work focused on intention rather than tradition, rather functional and efficient contributors than artistic or symbolic (Davies 1985 : 45). Thus the spaces they created were an abstract entity, devoid of cultural qualities, **context is not given priority over diagram and they had no urbanistic concerns.**

In contrast *infratecture* is primarily **concerned with the existing urban fabric,** contributing to the longevity thereof, the servicing thereof and the resultant **in-between public spaces**.

When viewed from outside, one doubts one's conception of the internal space of a structural expressionist building, the building's form is not derived from the function of the internal spaces. Instead, the **issue of space is replaced by the issue of flexibility**, the serviced zone or 'omniplatz' is a clutter-free space where possibility can reign free (Davies 1985 : 55). Although it is in many cases optimal to have clutter-free space, especially in a parkade, it seems that the **equipment becomes more important than the place/space,** even externally the building 'sits' on the ground like a piece of equipment disregarding the urban interface. It is *Infratecture's* endeavour to **create good architectural space via systems**, not only internally but also externally.

It is the Structural Expressionist's mission to make use of and participate in the 'spirit of the age' (Davies 2000: 45).
In the 1970s the spirit of the age was advanced technology. Today, however, it is sustainable technology. It might not necessarily be the spirit of the age but it surely is the obligation of the age. *Infratecture* focuses on sustainable technology to serve and sustain its context, to not only emphasize its presence in the name of aesthetics but also as a educating interface, a **communicative 'diagram' of give and take.**



[Figure 7_1.] A Structural Expressionism photo collage.

[7.3] THE ARCHITECTURE OF SUSTAINABILITY

What does sustainable architecture 'look' like? Entire books have been written on this topic and it all comes down to three approaches:

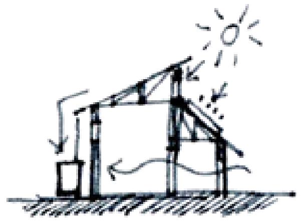
- _ **Integrative approach**
- _ **Organic approach**
- _ **Technological approach**

Each approach has a different architectural language provided by the approaches' principles, intent and resources used.

Integrating sustainable systems, principles and technologies into *Infratecture's* already mechanistic and serviced framework adds another layer of complexity to the building which is part of the emphasis on **infrastructure as a tool which can control and regulate the consumption of resources** and bring about behavioural change. Thus these principles and systems are not interpreted as subtle decisions and content elements but rather **emphasized, exaggerated and pronounced elements communicating their use and purpose and importance.**

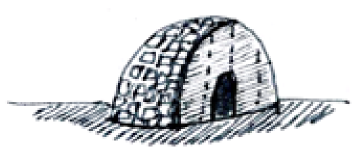
INTEGRATIVE APPROACH

This approach focuses on using different construction materials, **locally produced and easily constructed.** It would also apply **basic sustainable design principles** like passive solar heating and cooling, natural lighting and optimizing solar angles (Wines 2000 : 11). Typical examples of Integrative design would be the work of **Glen Murcut and Diébédo Francis Kéré.**



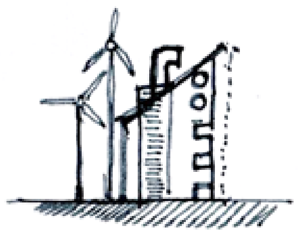
ORGANIC APPROACH

This approach relates closely to nature, using principles of **biomimicry and ancient construction methods.** The use of natural materials and rudimentary construction results in **biodegradeable structures which are low cost and have low energy consumption** (Wines 2000 : 24). This can be seen in new advances of old techniques like rammed earth construction and some of the work of **Peter Rich and Nobel Hamdi.**



TECHNOLOGICAL APPROACH

In this approach technology is implemented to start **regulating buildings' sustainability,** technologically advanced materials and machines are used to decrease energy consumption and cycle and generate resources. Here focus starts shifting to systems and products like **wind turbines, photo voltaic panels, solar panels, membrane bioreactors, mechanized louvre systems, solar thermal collectors etc.** (Wines 2000 : 47). Examples are expensive but efficient and lasting buildings like the **BEDZED project in London and the CH2 building in Melbourne.**

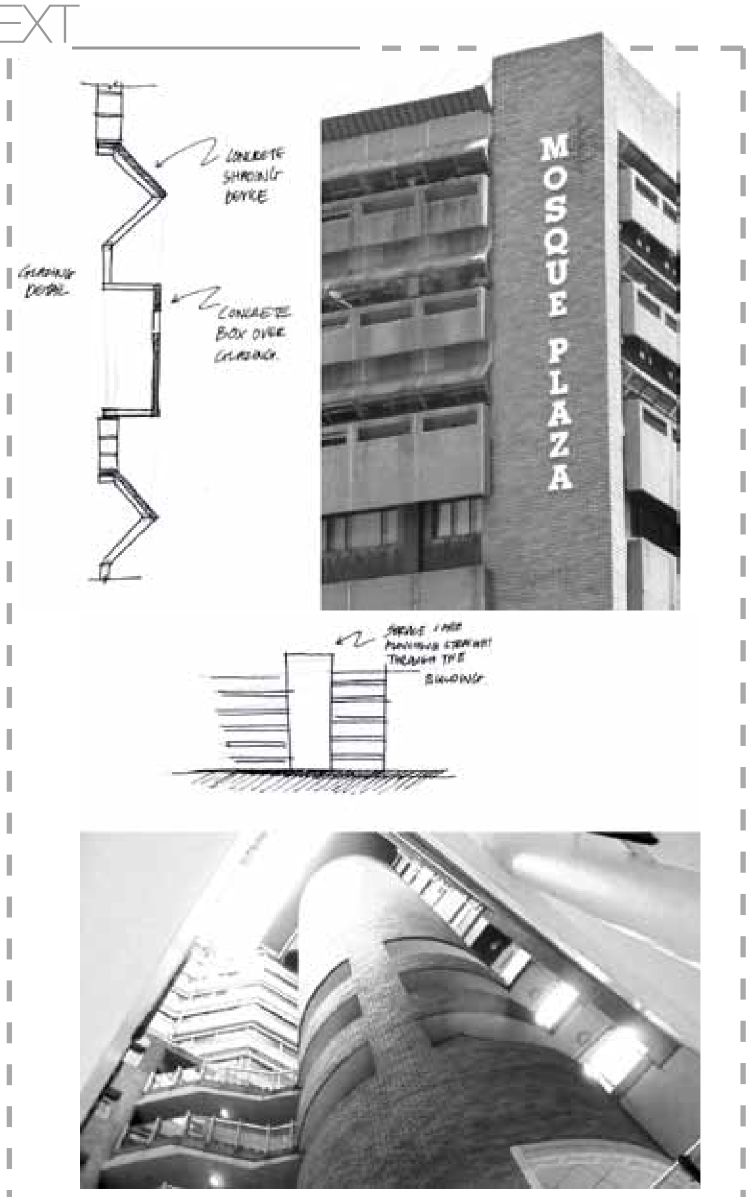


[7.4] THE ARCHITECTURE OF CONTEXT

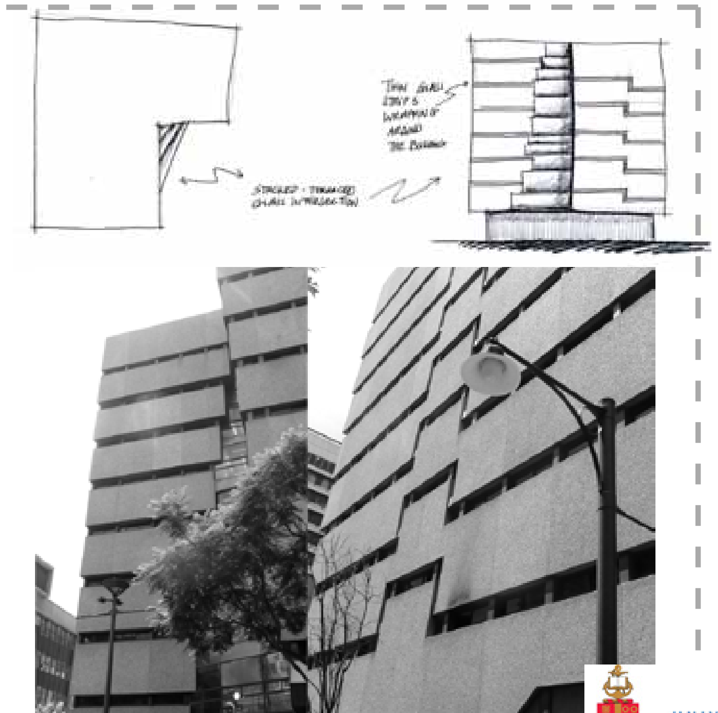
The contextual architectural language is an important informant, for here a 'bridge' needs to tie the design in-between numerous influences. The on-site architecture differs in scale, programme, materials and building style, to name but a few differences. For the *Infratecture* to respond to each and every of these differences might lead to a post modernist collage structure of confusion, a mini Dubai in the core of the block.

Instead, similarities should be sought out, clues of the general contextual response that these architectures had to reach to. **Most of the buildings on site were built in the 1970s, coincidentally also the late modern time.** A short photographic and sketch investigation was done to illustrate the findings (illustrations on following pages).

One of the biggest buildings on site is **de Bruyn Park.** The building's architecture places great **emphasis on services which has a mechanistic language as result**. The service core punches through the 11 storey atrium and up through the roof. The concrete clad shading over the glazing looks **robotic and tank-like**, the air-conditioning ducts come out the sides of the building like large sewer pipes. The staggered glass atrium entrance of the **Sanlam Forum building** in contrast with its heavy concrete clad façade with thin strip windows looks like the floors were stacked on a central vertical axis and then spined around leaving the glazing offset and confused.

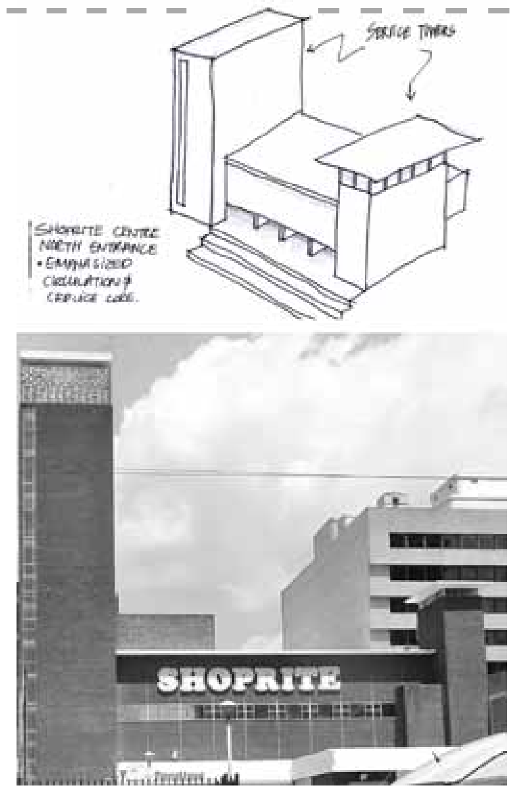


[Figure 7_2.] de Bruyn Park, emphasized service core & window cladding.



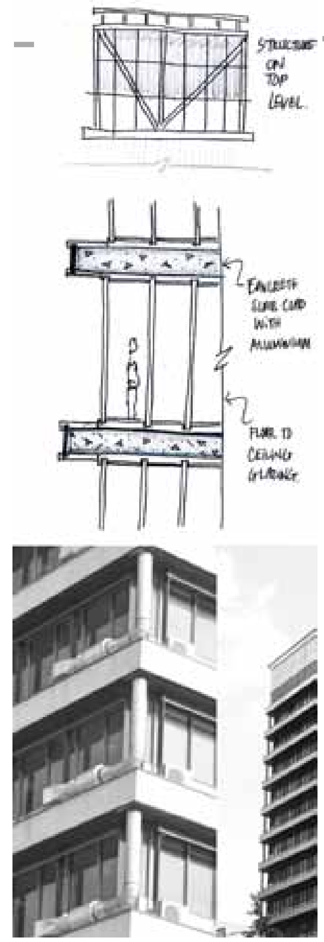
[Figure 7_3.] Sanlam Forum, stagered floors and thin strip windo

The **Shoprite and OK Furniture buildings** have definite **set aside service cores framing the building** and working from the outside inwards.



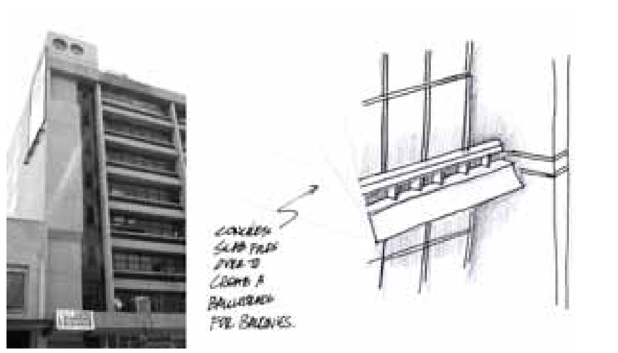
[Figure 7_4.] Shoprite Foods, prominent service towers.

Regend Place is a sleek glass and steel building with a **muscular exposed steel structure** which can be seen on the top two floors behind the glazing.



[Figure 7_5.] Regend Place, glass and steel structure.

The **Fatima Centre building's** circulation cores stand separately from the rest of the building like two **machines holding onto the structure.**

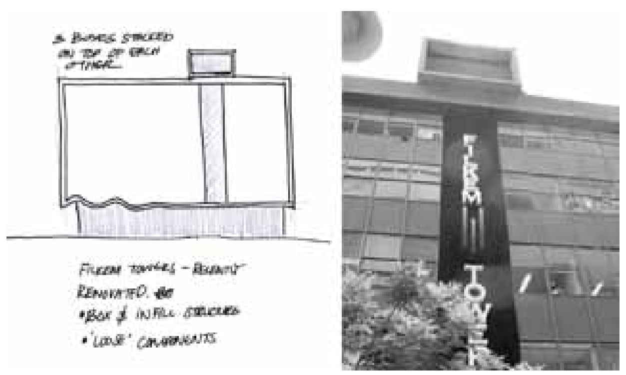


[Figure 7_6.] Fatima Centre, emphasized vertical circulation cores.

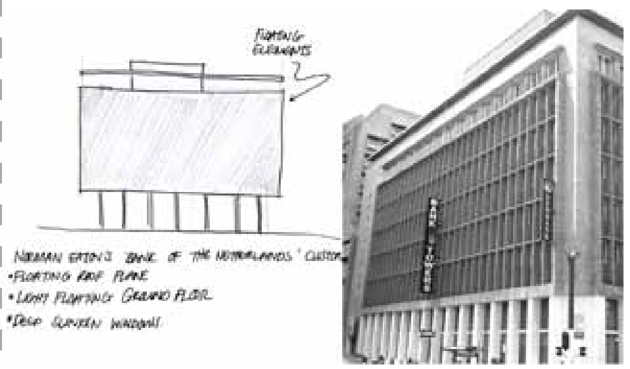
Navy House, Filkem Towers and the Bank of the Netherlands are more modernist with floating planes, piloti and strip glazing.

On neighbouring sites, the architecture of **Sammy Marks**' steel roofs reminds of a **railway-industrial language** and the **ABSA building** in itself is an object of machine-like existence.

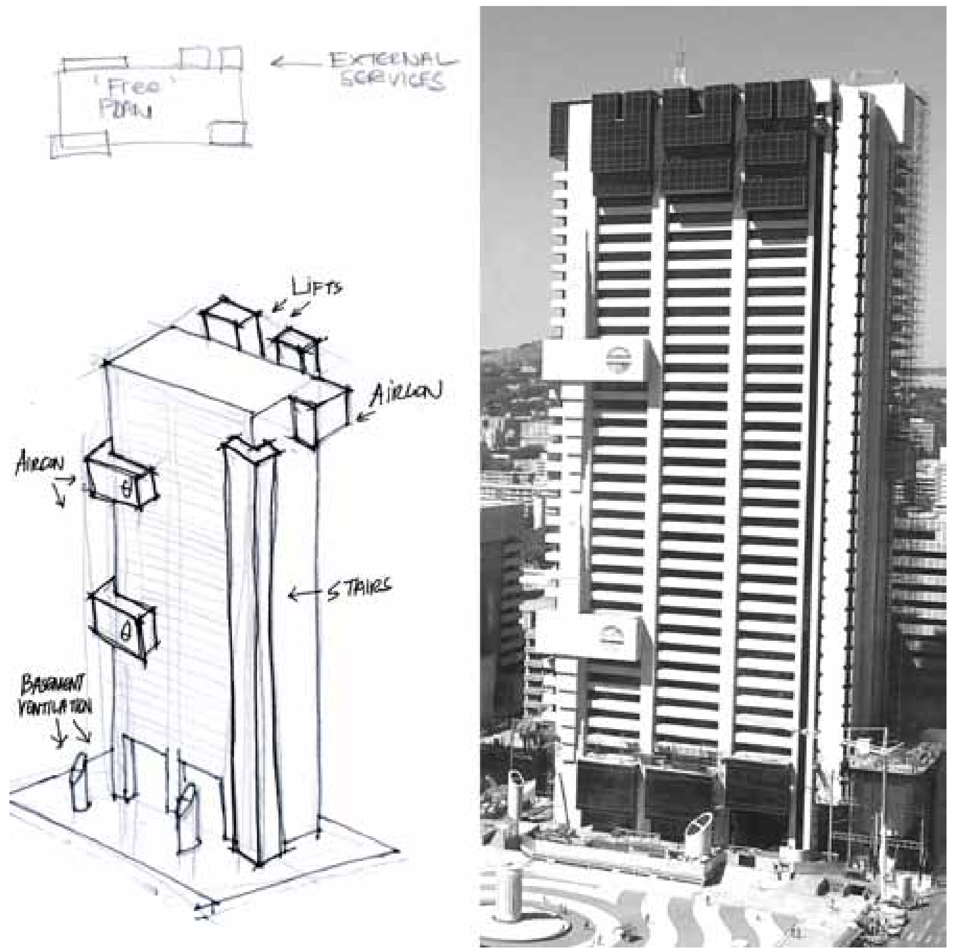
In conclusion, there is a strong element of the mechanistic era present on site. Thus the Infratecture does not communicate an alien language towards its context but rather is a **continuation of what is already there.**



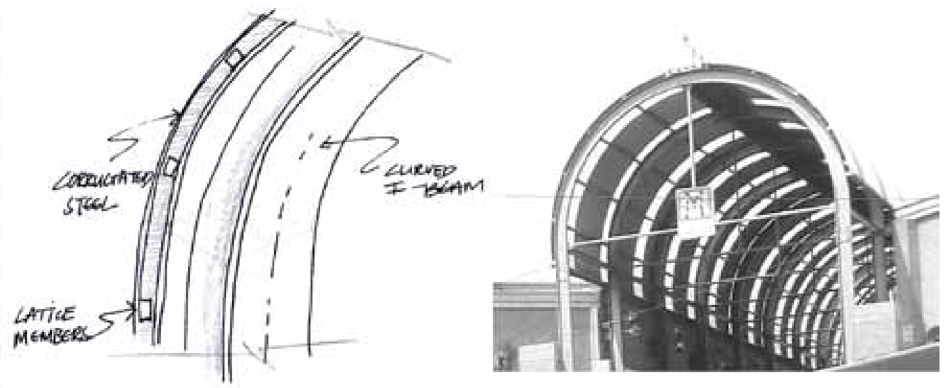
[Figure 7_7.] Filkem Towers, strip glazing & floating box on piloti.



[Figure 7_8.] Bank of the Netherlands, Sir Norman Eaton.



[Figure 7_9.] Volkskas/ABSA building, Samuel Pouw, machine-like aesthetic.



[Figure 7_10.] Sammy Marks, railway aesthetic.

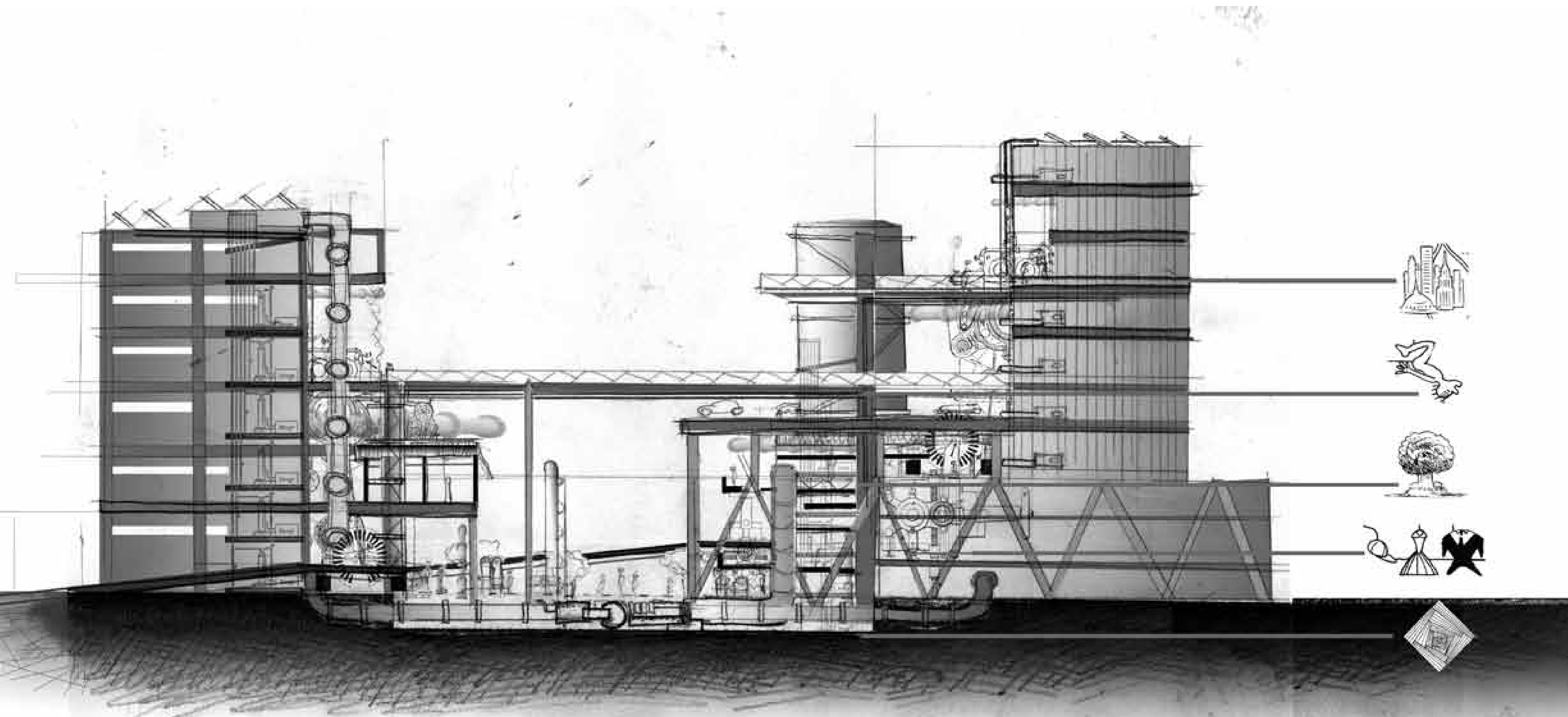
CONCLUSION an enlightened design approach

Although it is the project's focus to create place and space via infrastructure, there are different ways to achieve this means. Renzo Piano celebrated services in a playful, honest and somewhat brutal manner. **The Pompidou Centre stands in contrast with it's context**, it is an insertion, a machine in the city core. The **ancient aquaduct** system which is also an infrastructural service was built with natural materials, **blending in with the landscape and decorated as an extension of architecture.**

In context, the intervention endeavours to become an **extension of the surrounding buildings** yet communicate it's functional essence. The whole design becomes a **'form follows function'** statement. Thus the design exist as a **threshold, an interface between man and machine,** public and private, inside and outside, new and old. The buildings' existence first and foremost is as a services building built to serve it's context, but parallel with this it must serve the people of the context, **not only physically but aesthetically and phenomenologically.**

The building **promotes a change in lifestyle** whereby our lives becomes 'smaller' once again, more intimate, more responsible. Thus a space which **promotes sharing, a close cycle of resources, re-introducing the close relationship of nature and man is now emphasized by the workings on site.** Sustainable living is part of this lifestyle change, with recycling depots placed along the arcade for convenience, organic digesters on route to all destinations, water supply points, electrical cars park for free, the Joule sales rooms are promoted by its position on the turing point of both ramps' meeting point. Thus almost every on-site aspect **acknowledges, promotes and reveals this lifestyle change, change of power, change of space, change of locality.**

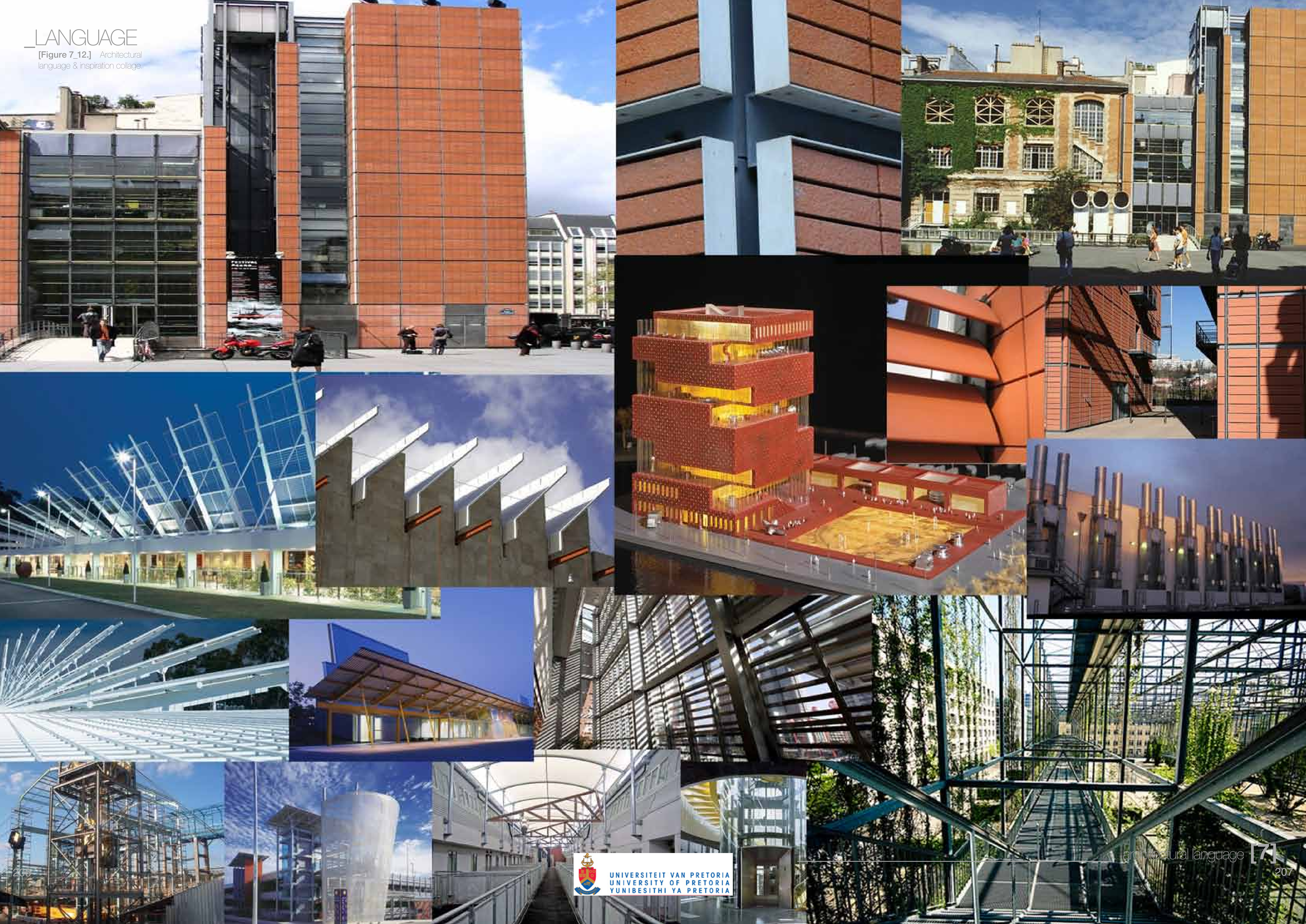
The building is a machine born from the contextual surrounds, it does not wish to boast as a machine but rather to communicate process, purpose and mentality. The machine is formed by and through connection, the weave of space, place, systems, people and matter.

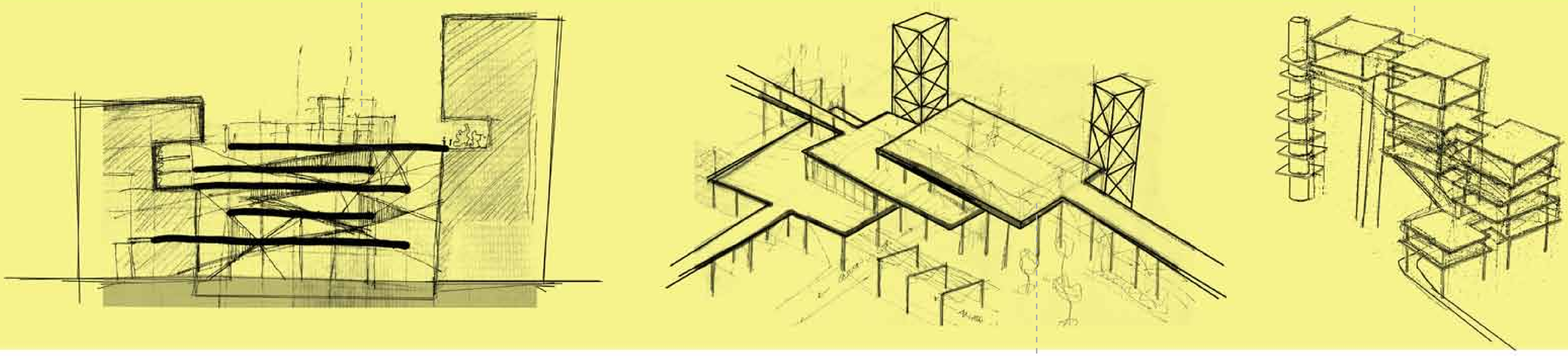


[Figure 7_11.] 'Systems 'born' from the context.

_LANGUAGE

[Figure 7_12.] Architectural language & inspiration collage.





CONNECTIONS & EXTRUSIONS OF THE EXISTING FABRIC

[Figure 7_13.] Revised design sketch collage.

NORTH-SOUTH SECTION THROUGH QUEEN STREET

[Figure 7_14.] Abstract section illustrating the central public core.

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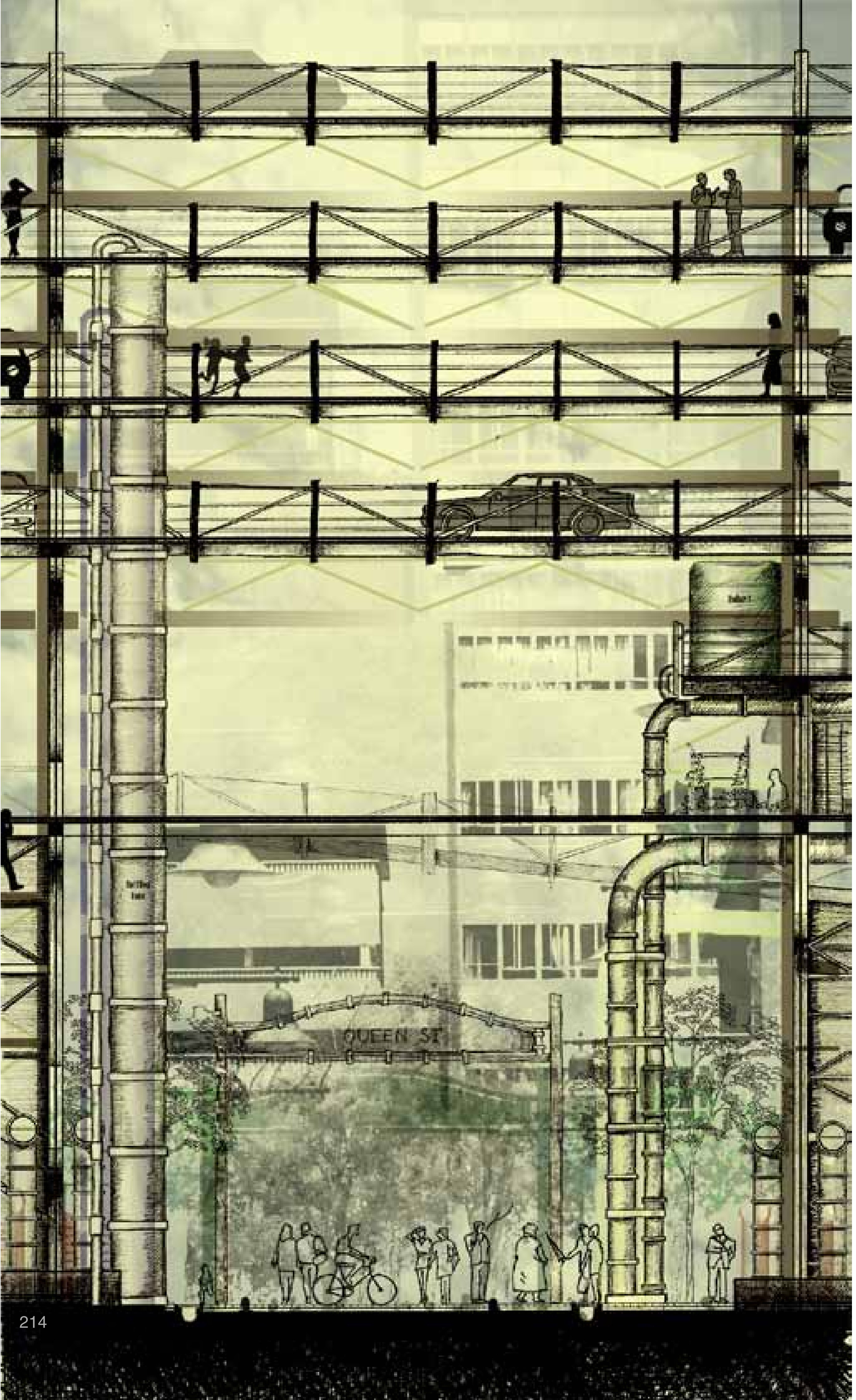
the sum of the parts________[8]______________________[Design Resolution]_____

____[8.1]______ ___PLANS___________

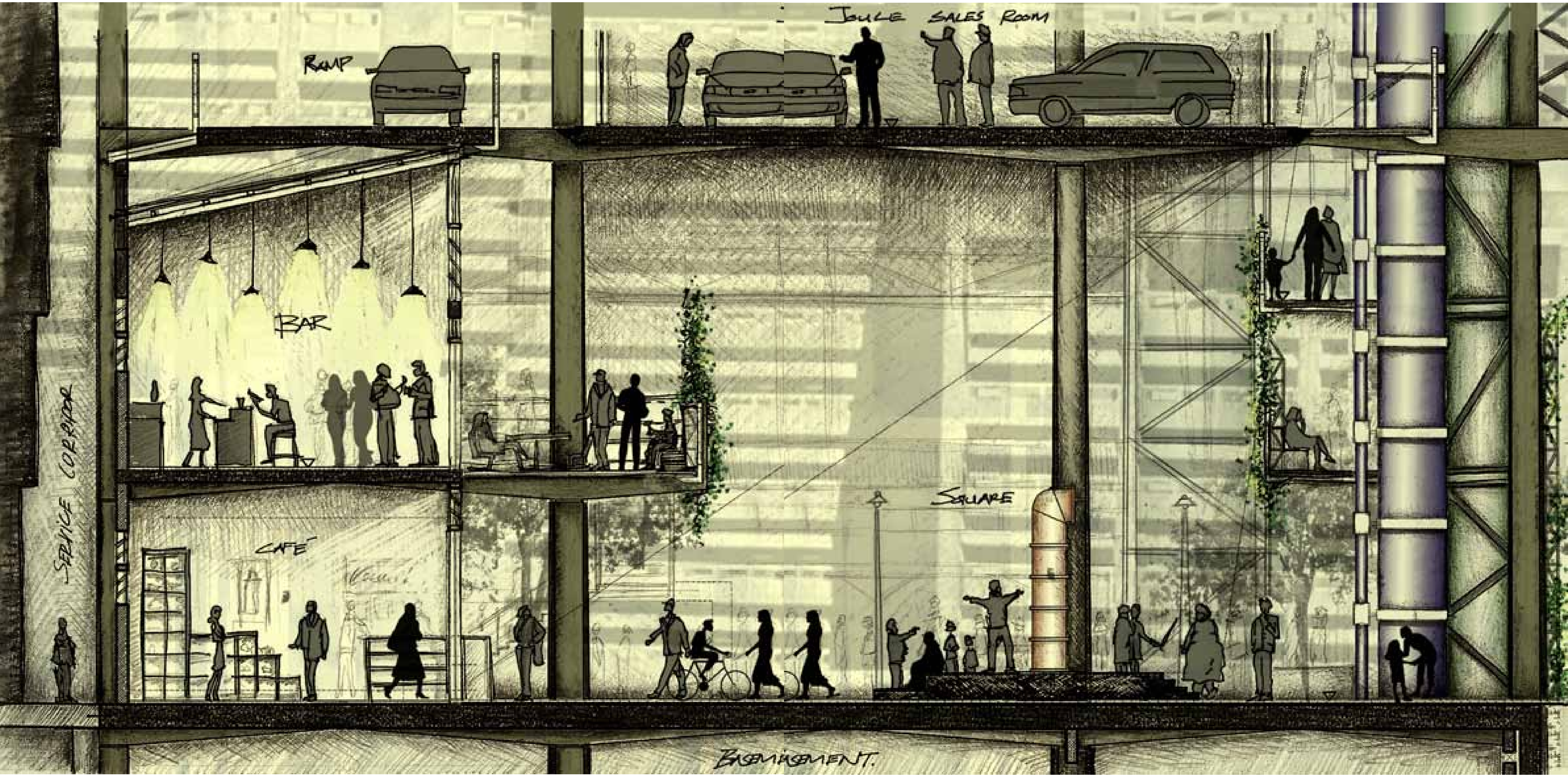
____[8.2]________ ___SECTIONS AND ELEVATIONS______

_____[8.3]________ ___PERSPECTIVES AND VIGNETTES___________



[Figure 8_1.]
Render image of north-south view down Queen street.

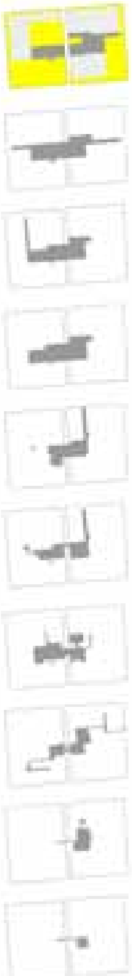
[Figure 8_2.]
Render image showing the connection between de Bruyn Park and the intervention via the pedestrian bridge and arcade.

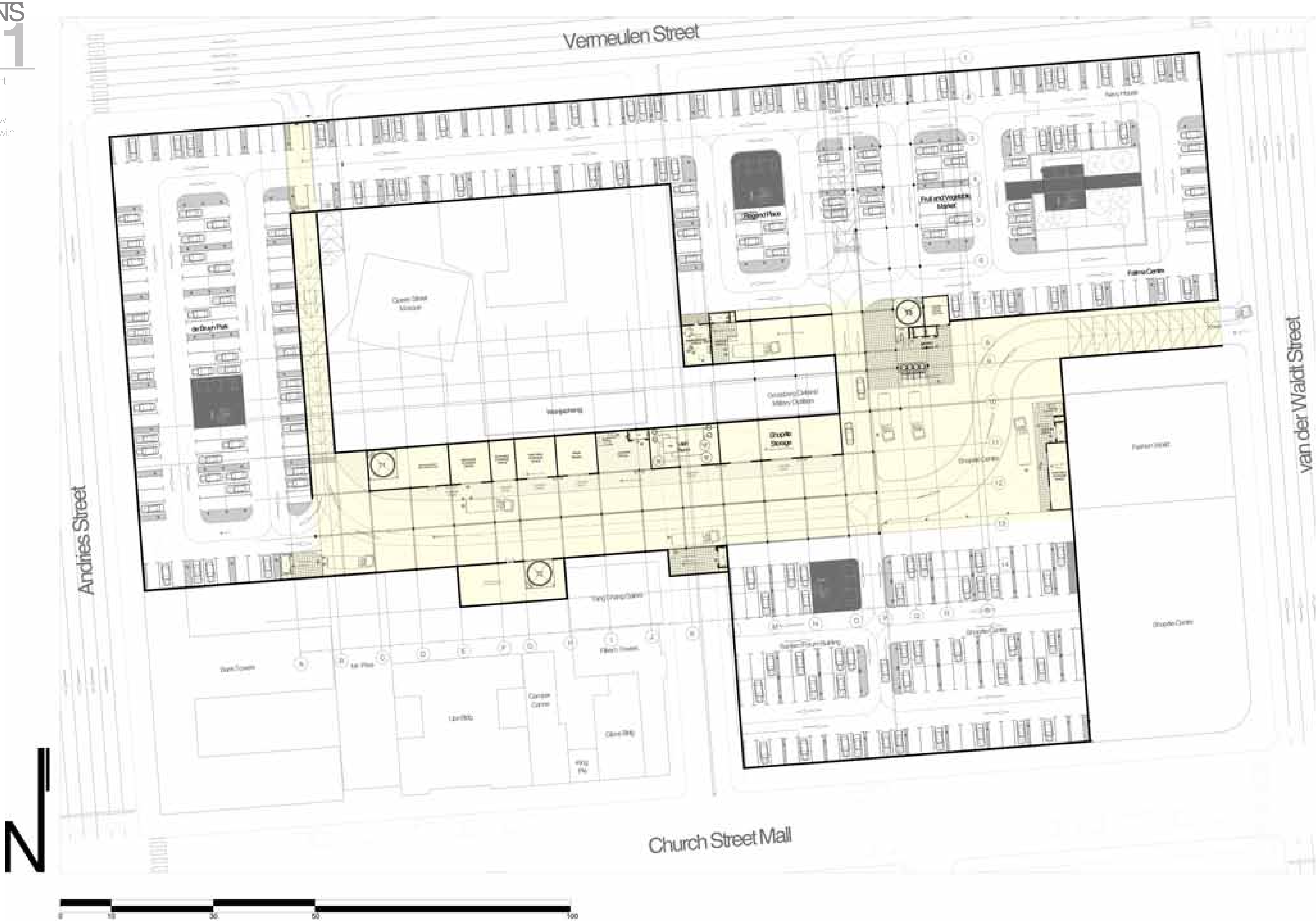


[Figure 8_3.] Render image of the public space framed by commercial activity and the arcade.

-0.01

[Figure 8_4.] Basement Plan showing existing basement parking, new proposed parking and new loading and storage area with entrance and exit paths.





PLANS
+00.0

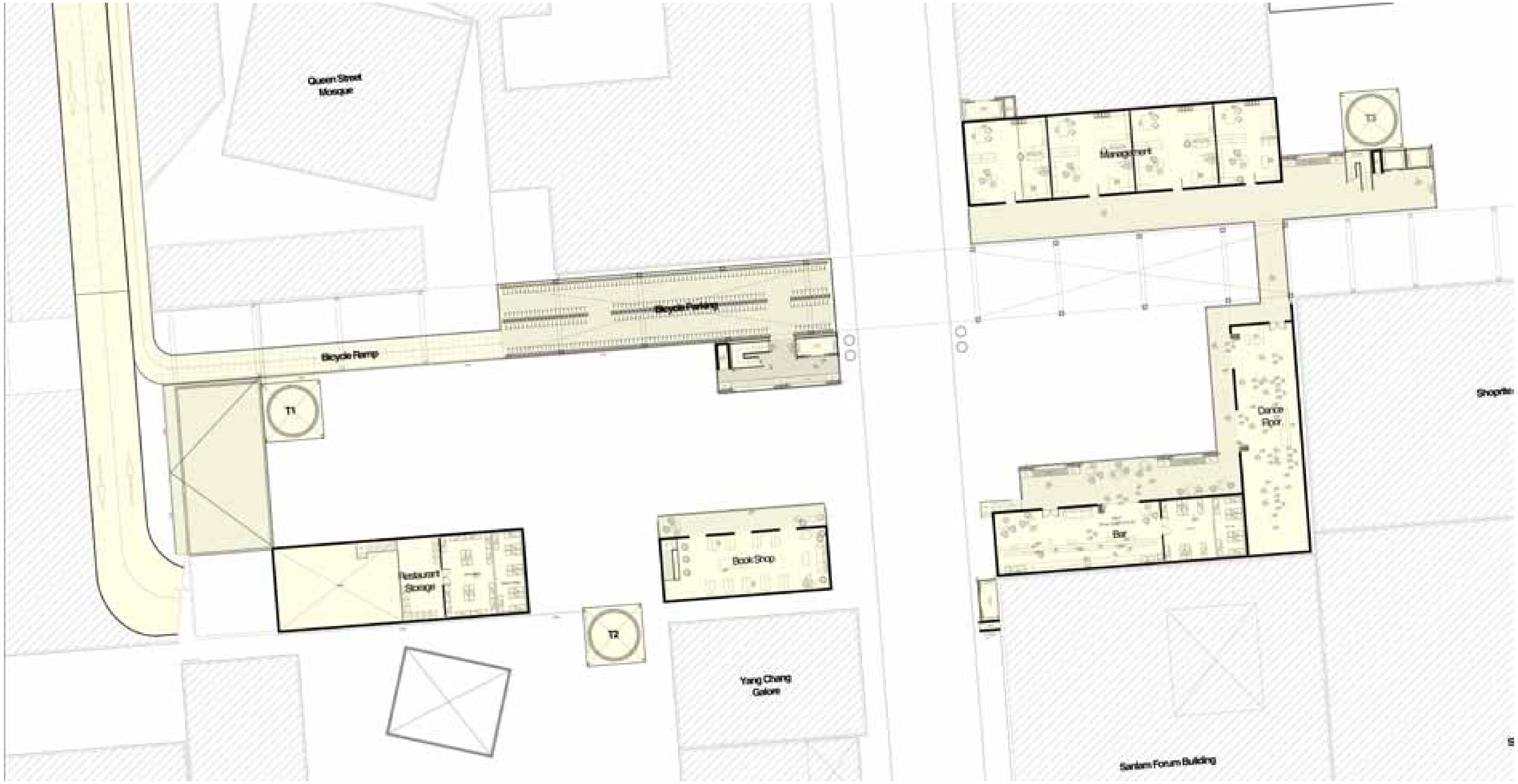
[Figure 8_5.] Ground Floor Plan, showing proposed arcade, fruit and vegetable market, new commercial areas, the Ladies mosque and the new central square.

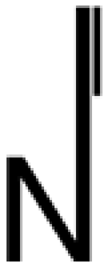
N

0 10 30 50 100

+01.0

[Figure 8_6.] First Floor Plan, showing the existing de Bruyn Park entrance ramp connected to the intervention, also showing new proposed East-ramp and Bicycle parkade above the Wanjacheng structure.

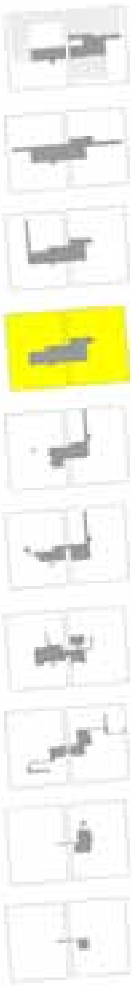


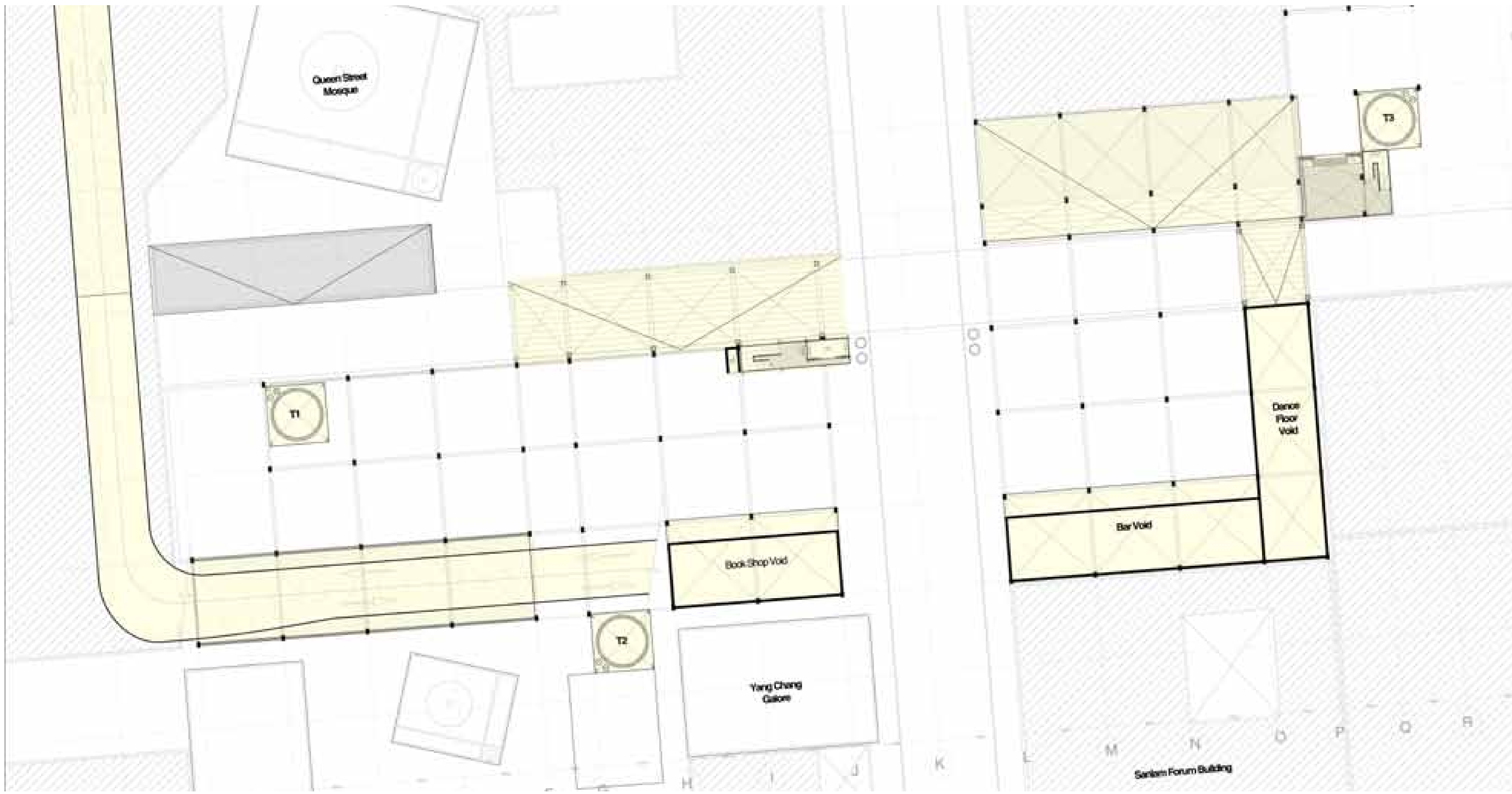


[8.1] PLANS

+02.0

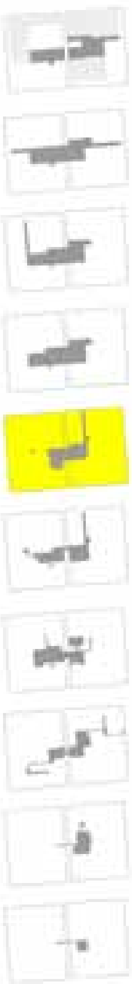
[Figure 8_7.] Second Floor Plan showing the new ramp extension climbing over the commercial zone and around the public space below.

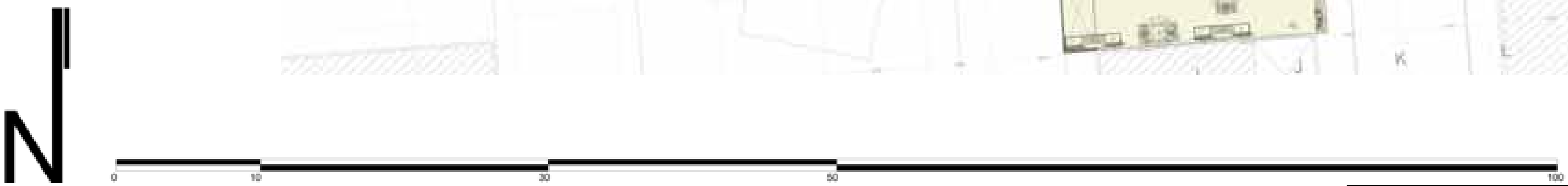




+03.0

[Figure 8_8.] Third Floor Plan showing the Joule car sales rooms, the merge point of the two ramps on the eastern side, the public change rooms and the walkway connection to the Filkem Towers pocket park.

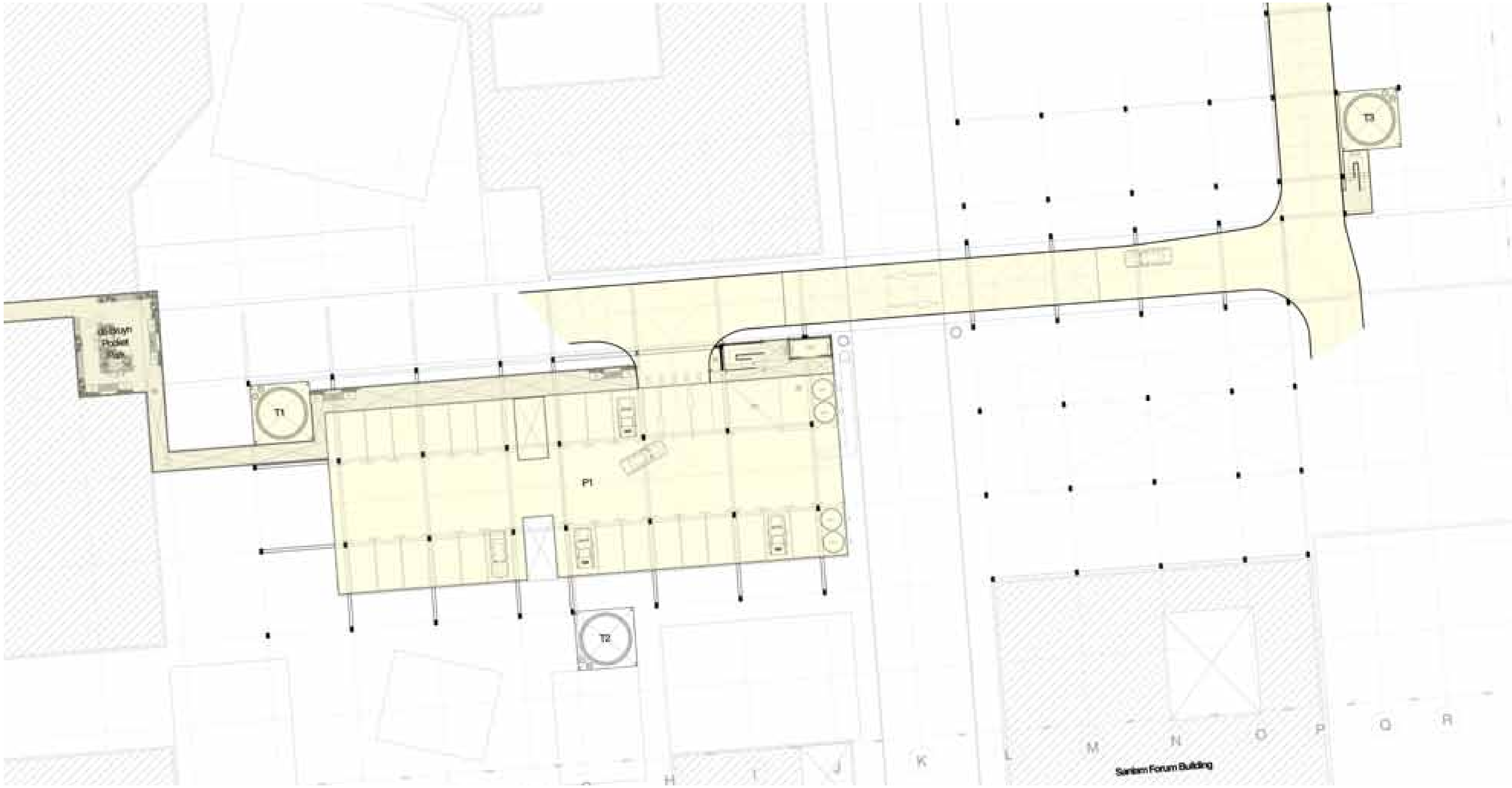


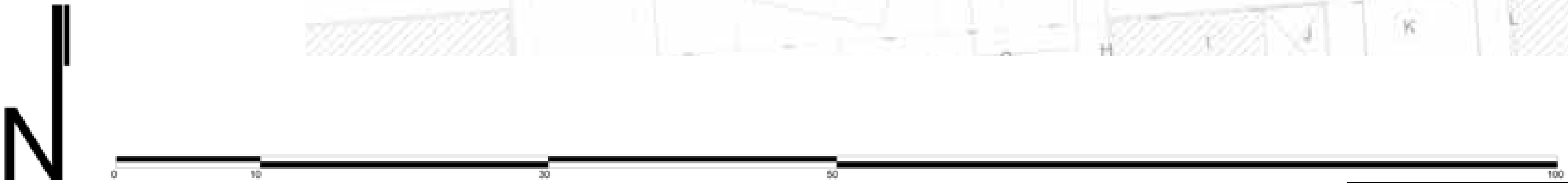


PLANS

+04.0

[Figure 8_9.] Fourth Floor plan showing the first parking floor with 15 parking bays. Connection bridge to de Bruyn Park pocket park.

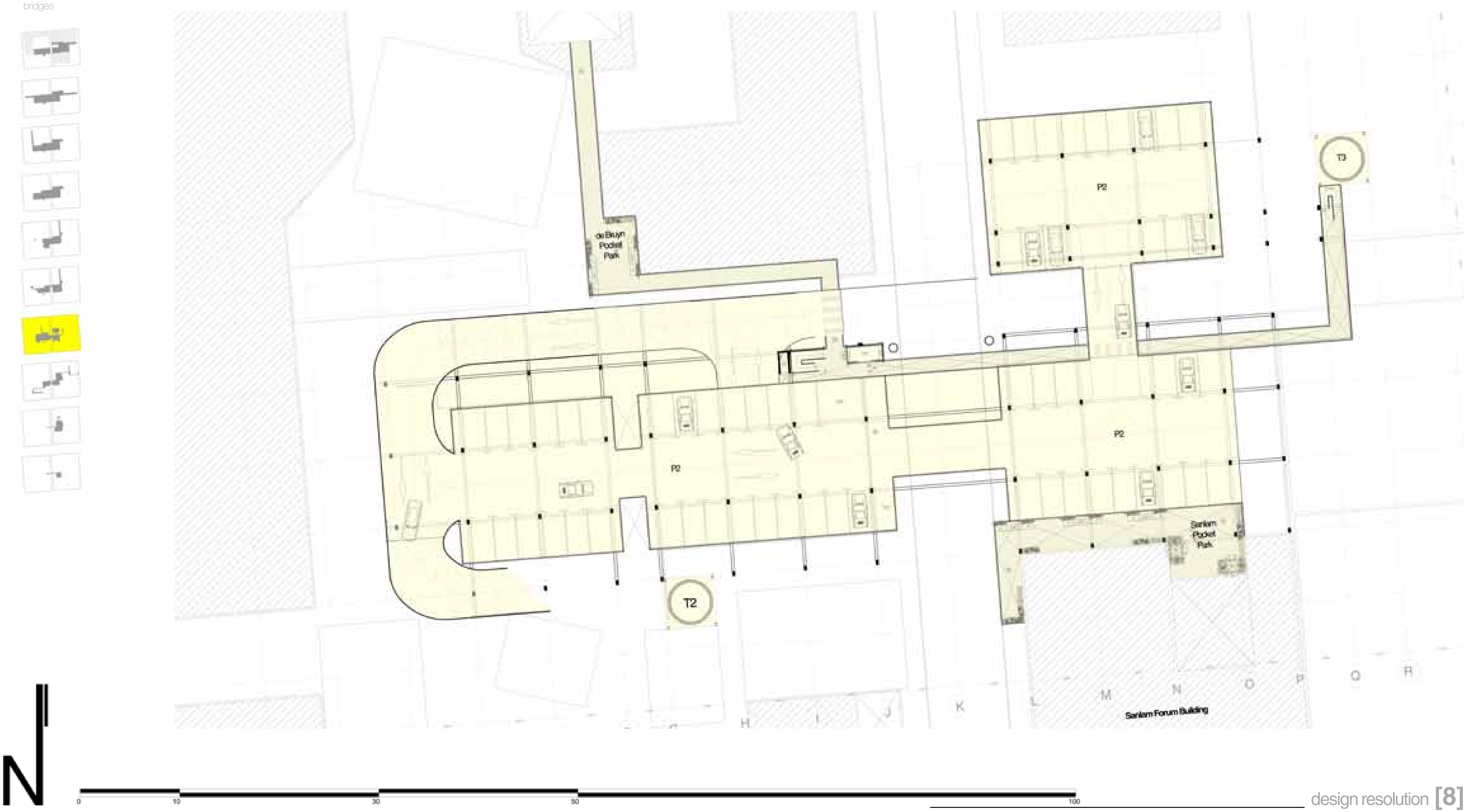




[8.1] PLANS

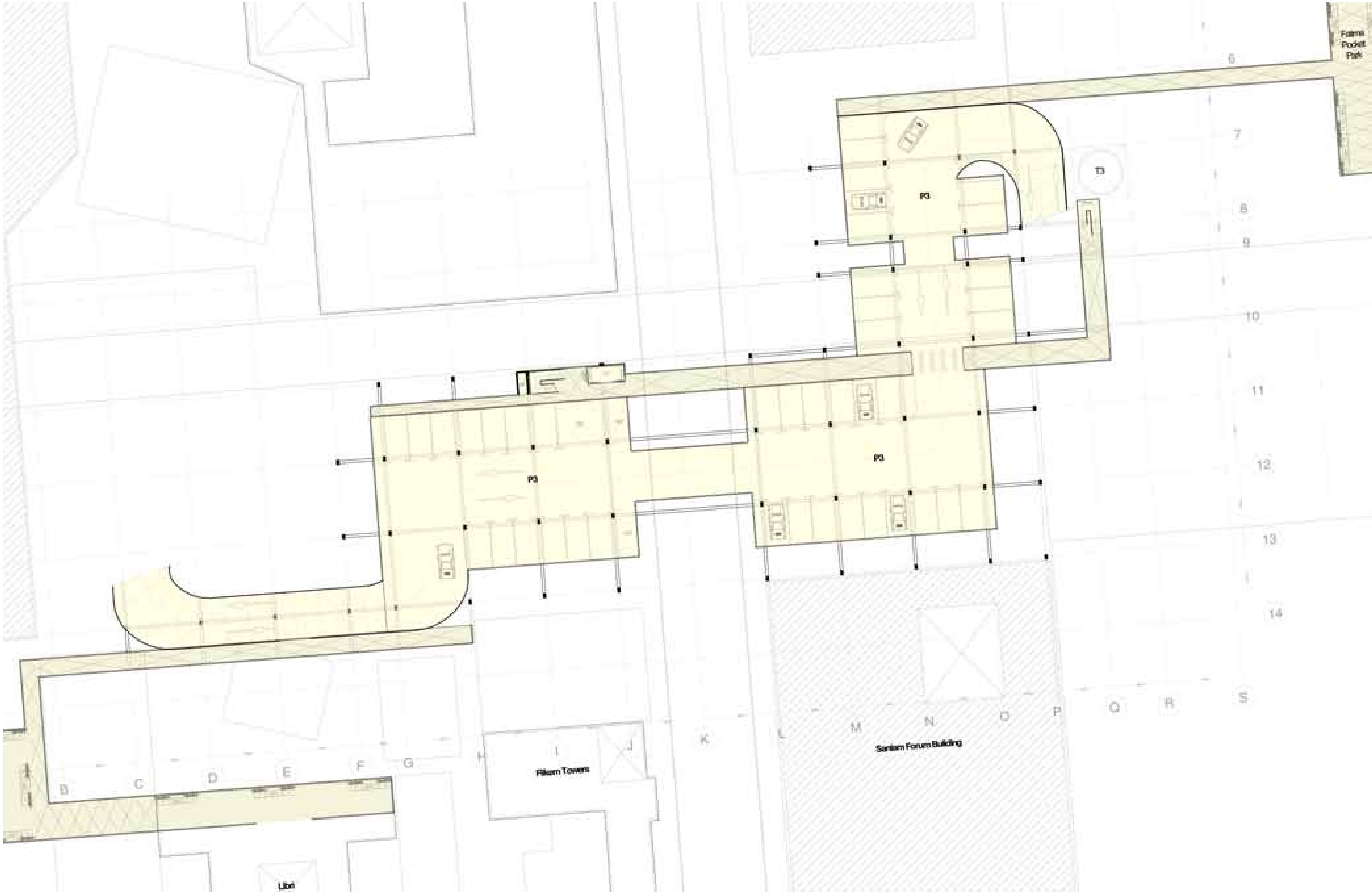
+05.0

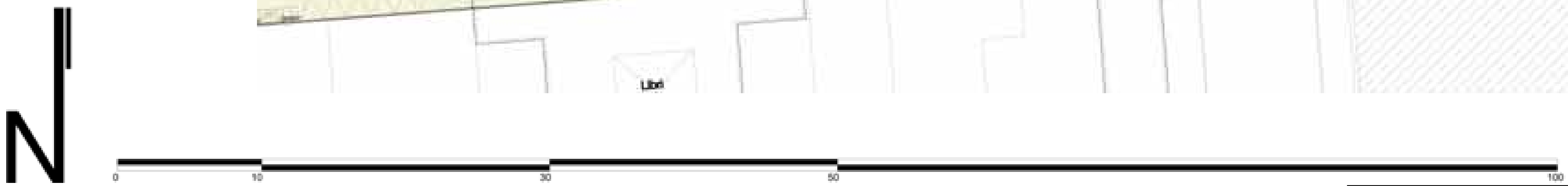
[Figure 8_10.] Fifth Floor Plan showing the second parking floor with 60 parking bays. Sanlam Forum and de Bruyn Park east wing pocket parks with connection bridges



+06.0

[Figure 8_11.] Sixth Floor Plan, showing the third parking floor with 43 parking bays. Bank Towers, Libri Building, Navy House and Fatima Centre pocket parks with connection bridges.

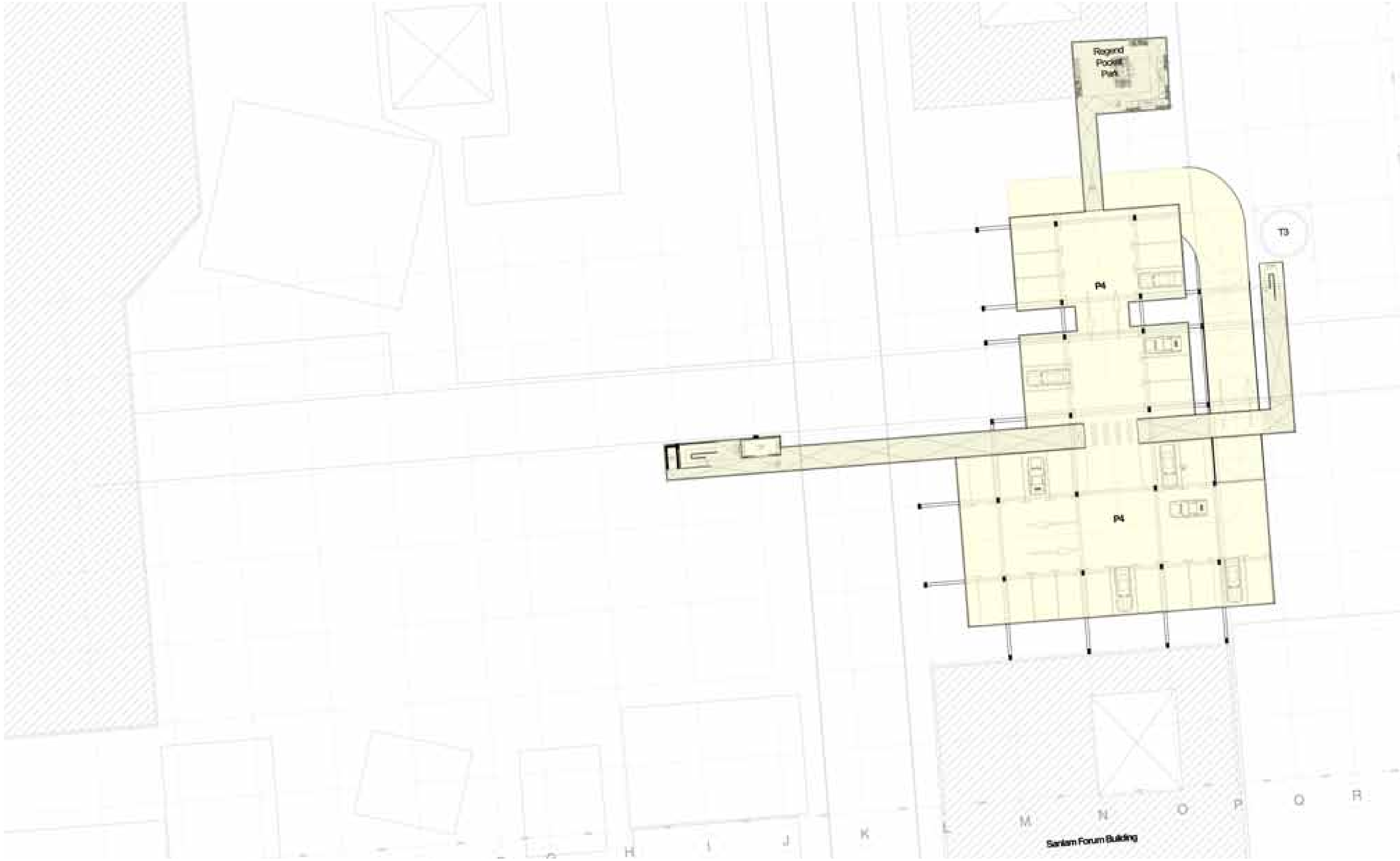




[8.1] PLANS

+07.0

[Figure 8_12.] Seventh Floor Plan, showing the fourth parking floor with 30 parking bays. Regend Place pocket park and connection bridge.



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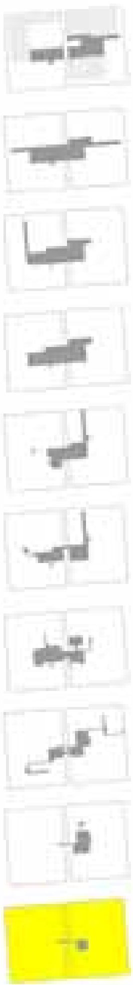
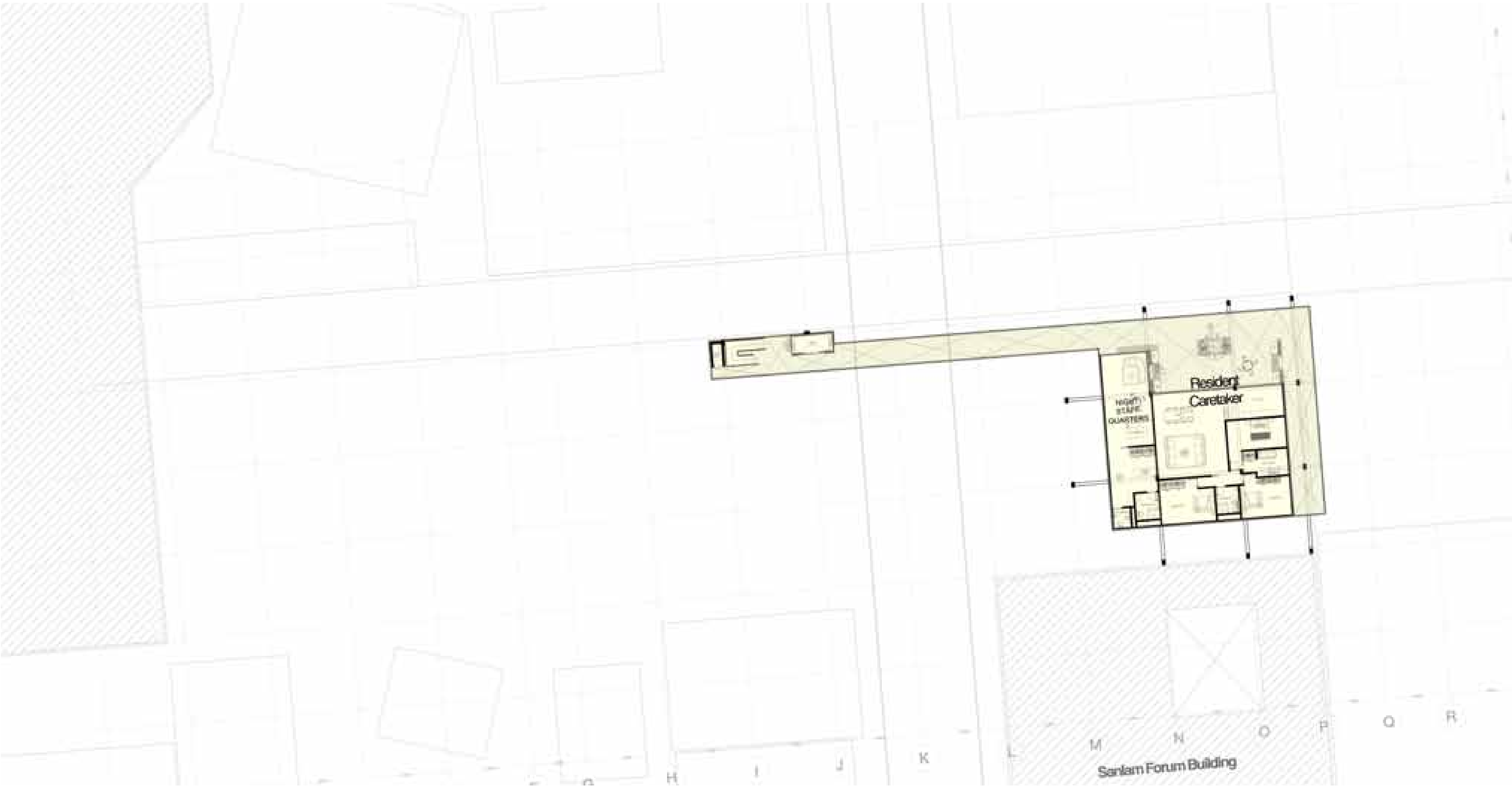
[Figure 8_13.] Eighth floor Plan, showing the caretaker's apartment and the overnight staff quarters.





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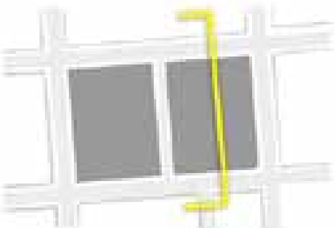
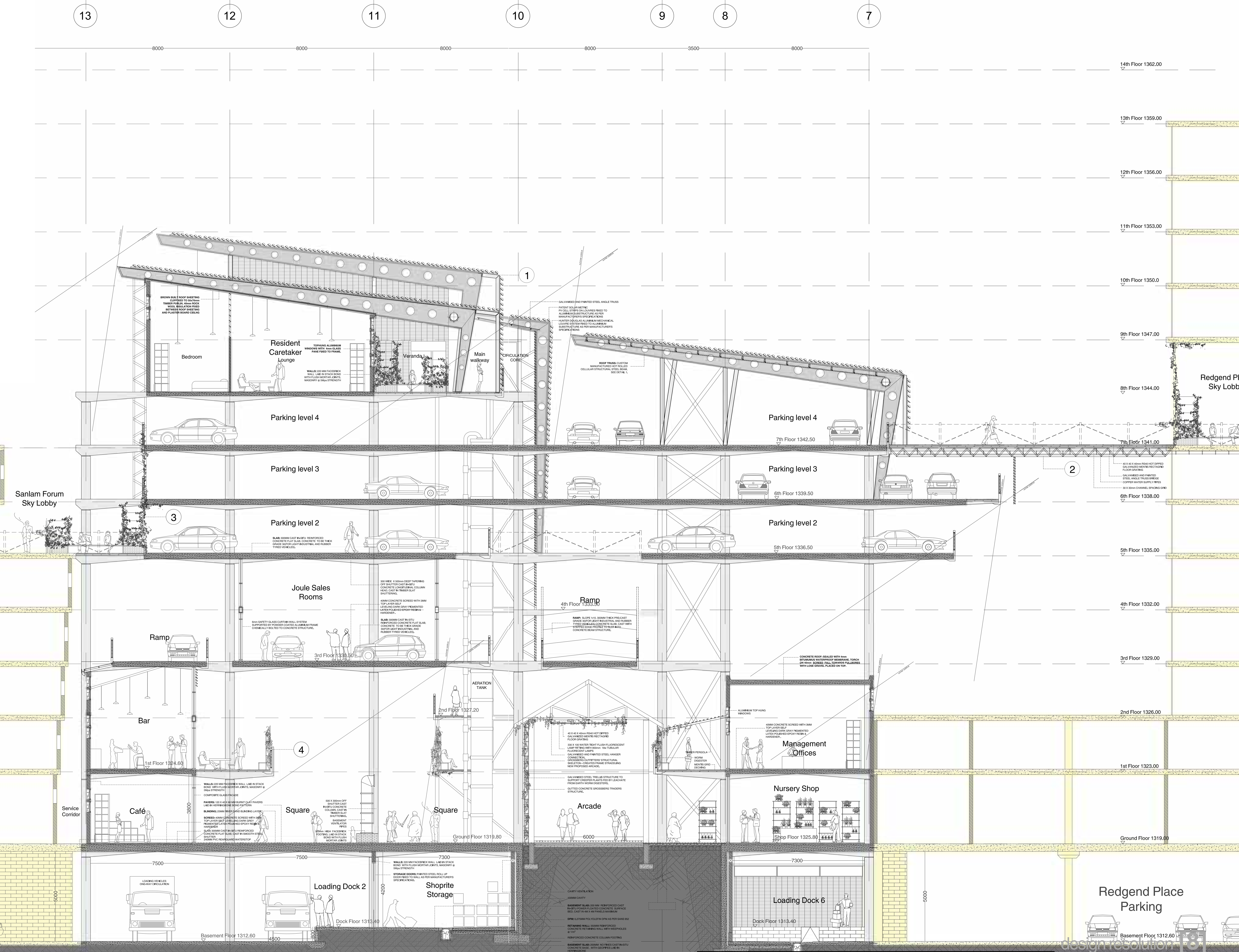
S.A-A

[Figure 8_14.] Showing roof screens wrapping over the northern facade, the Regend Place and Sanlam Forum pocket parks with connection bridges, the caretaker's apartment, the Joule Car sales rooms with commercial zone and public square below and the loading basement below the square.





section C_C n.t.s

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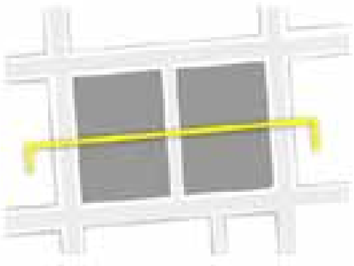
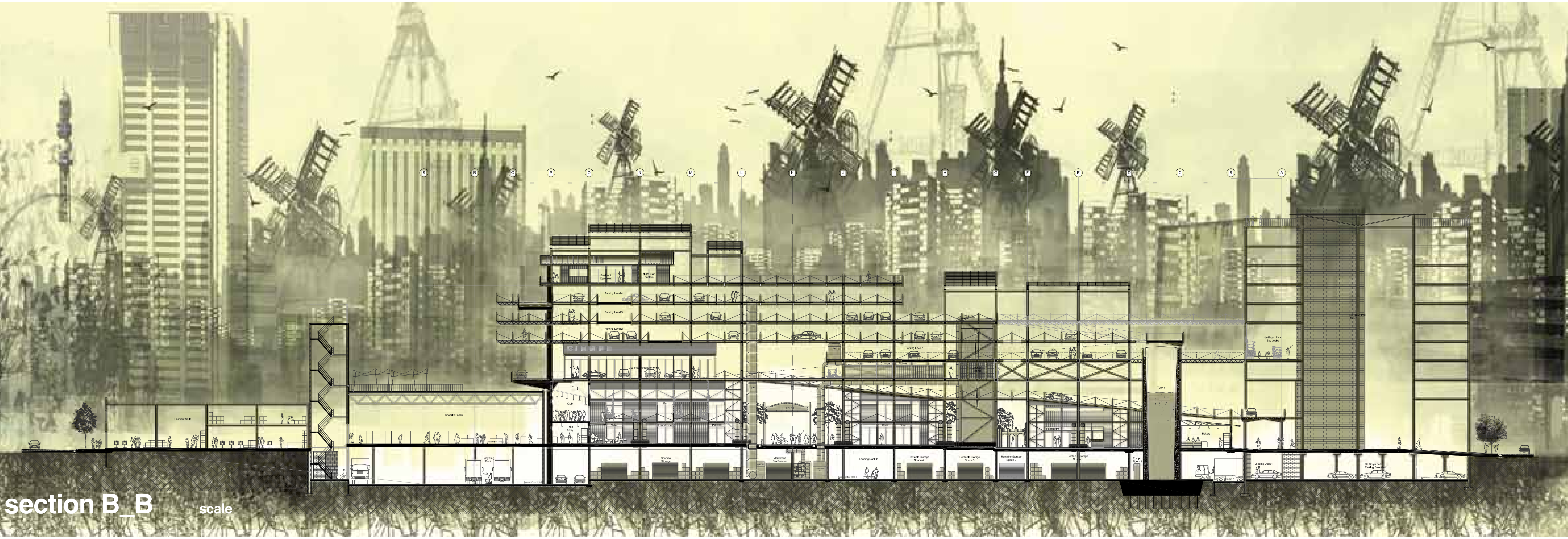
SECTIONS & ELEVATIONS

S.B-B

[Figure 8_15.] Showing the arcade stretching from Andries- to van der walt street, the light weight sky bridges over Queen street, water tank T1, the commercial zone on ground and first floor and the loading basement.





[8.2]
SECTIONS &
ELEVATIONS
NORTH

[Figure 8_16.] North elevation showing the roof-screen design. Because the building is weaved in between the existing fabric,the building as a whole (as shown in this elevation) will never be experienced as one big elevation but rather in portions and places.

[8.3] VIGNETTES & PERSPECTIVES

3D.01

[Figure 8_17.] North west perspective of basic design structure, showing columns, slabs, tanks, ramps and bridges.

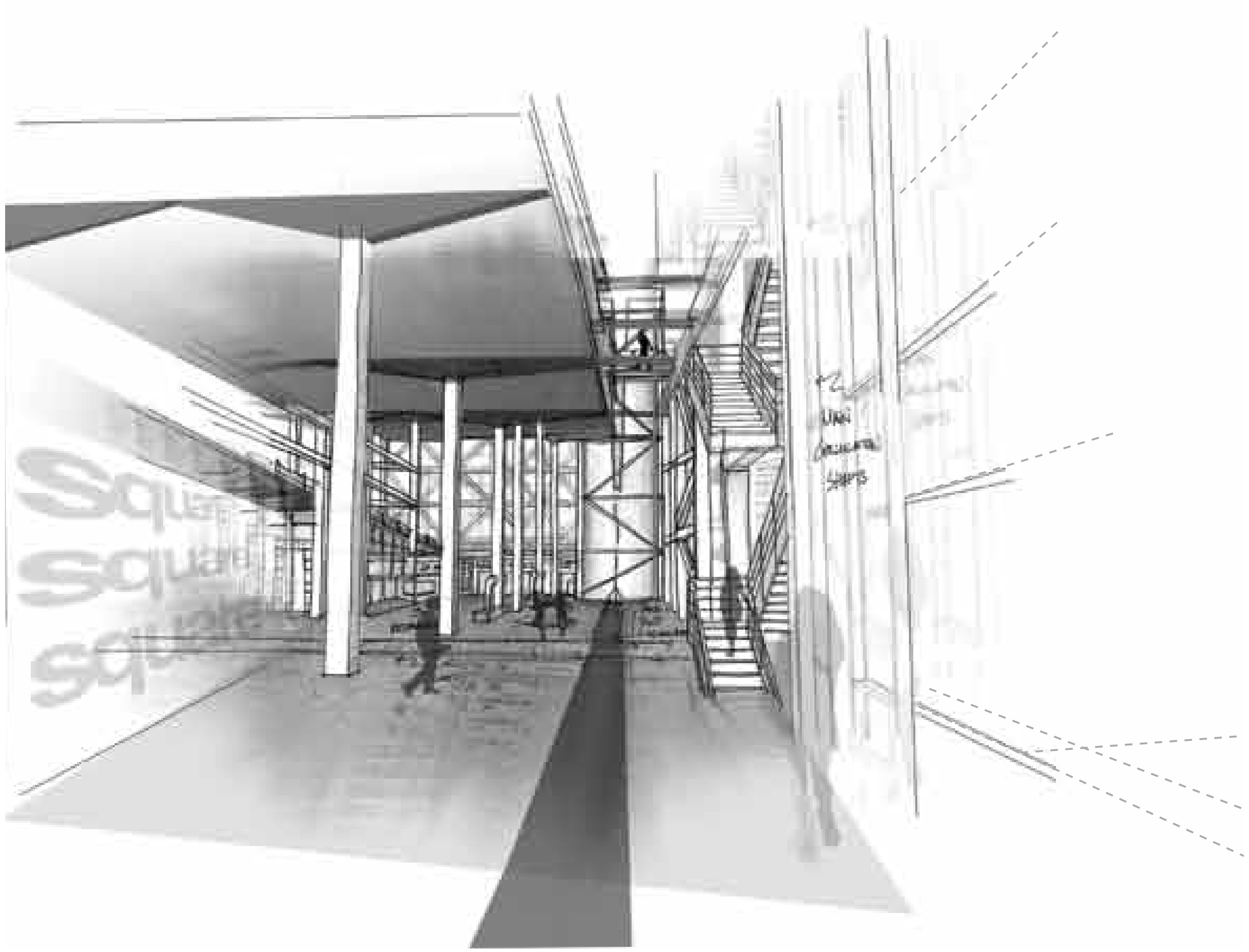
model perspective

model perspective

model perspective

[8.3] VIGNETTES & PERSPECTIVES

VIG.01



[Figure 8_18.] Central square space in front of main circulation area and the book shop. Three storey void above square space.

[8.3] VIGNETTES & PERSPECTIVES

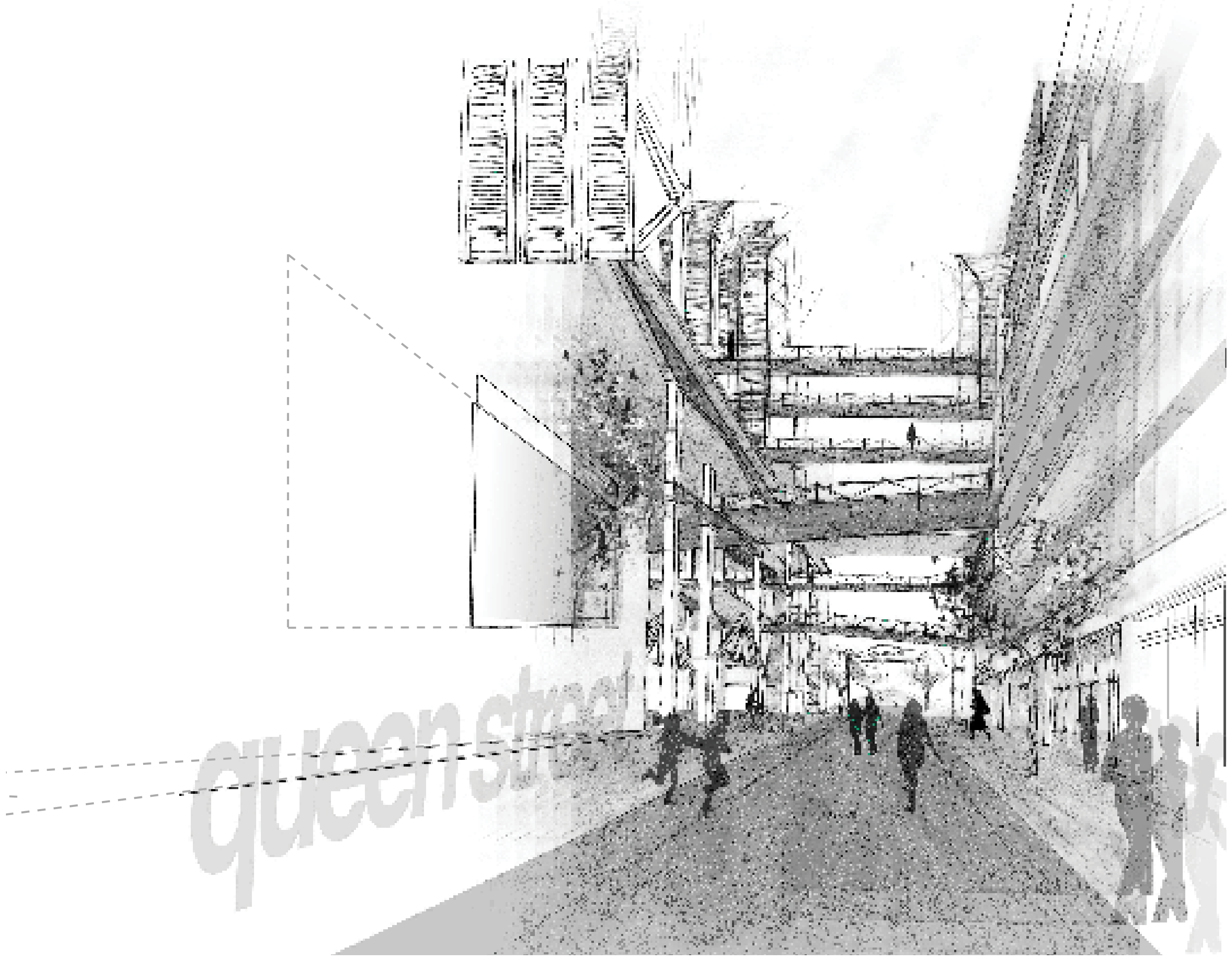
VIG.02

[Figure 8_19.] view from Mosque garden towards intervention showing ramp over the arcade and looking into the public square space in front of the book shop.

[8.3] VIGNETTES & PERSPECTIVES

VIG.03

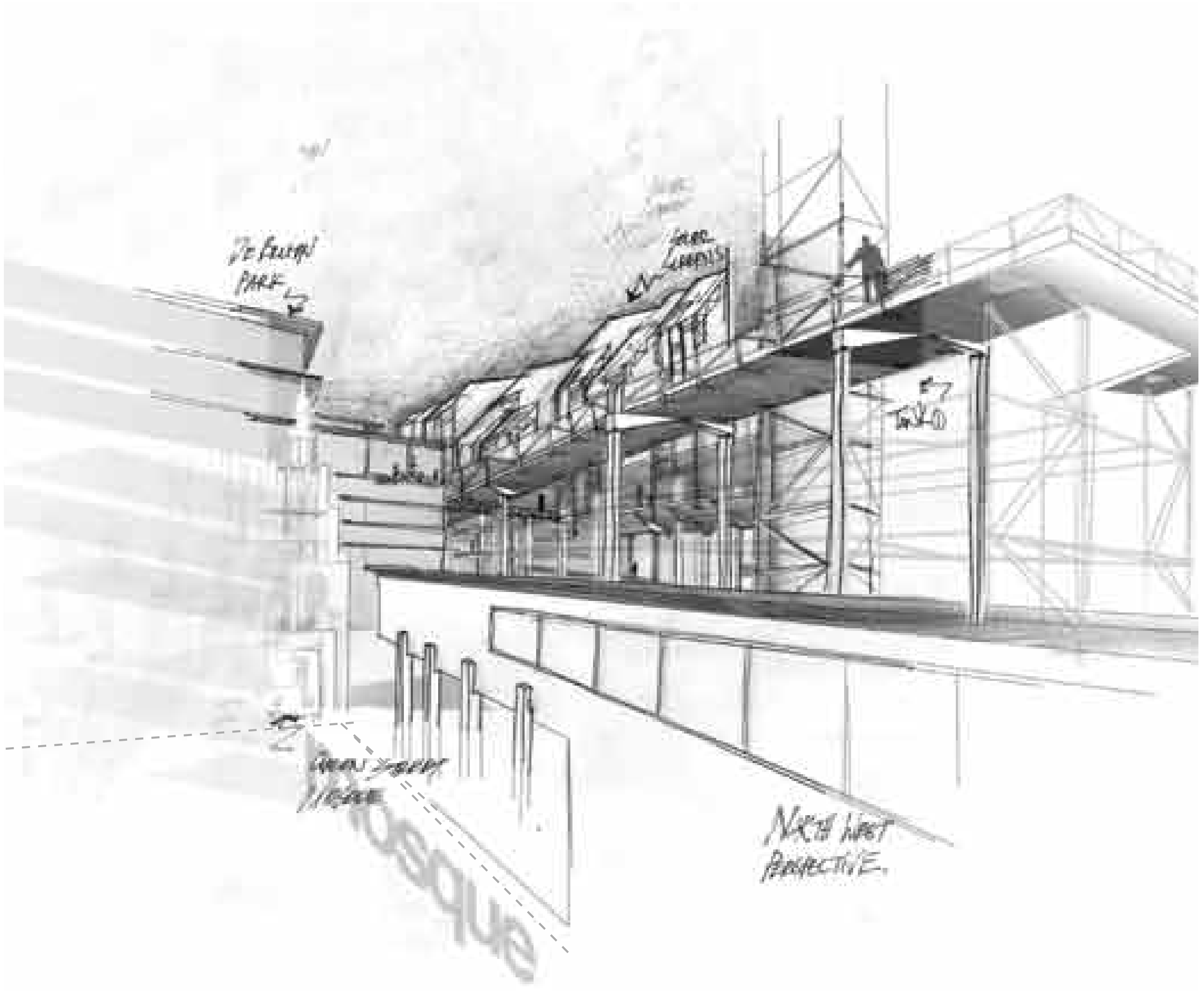
[Figure 8_20.] View down the arcade in front of Shoprite Foods and the fruit and vegetable market.



[8.3] VIGNETTES & PERSPECTIVES

VIG.04

[Figure 8_21.] View down the arcade when coming out of de Bruyn Park in front of the Bakery.



how does the machine work?__________[9]_________________________________[Technical
Resolution]_____

____[9.1]_______ ___SYSTEMS DESIGN__________

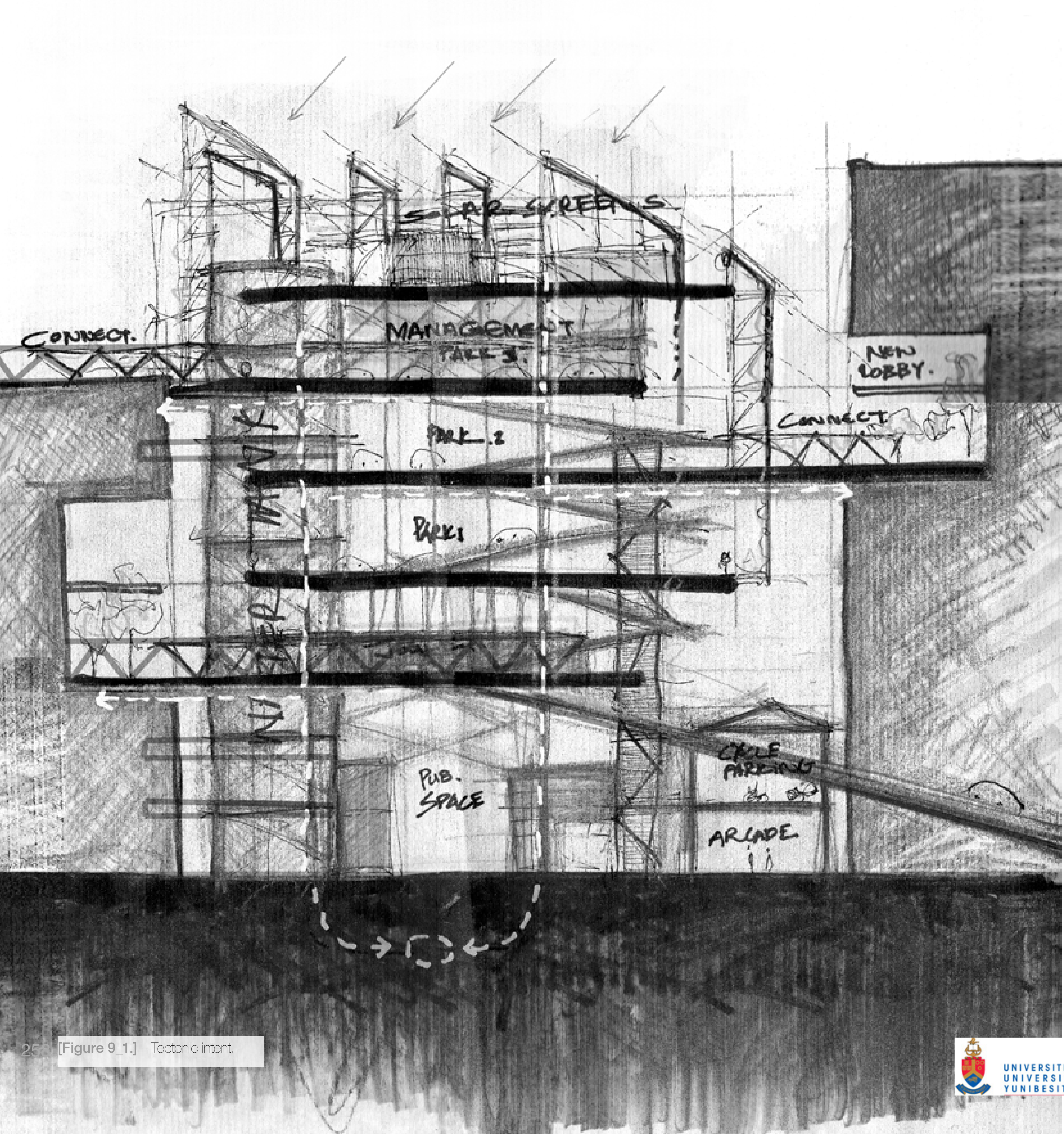
____[9.2]_______ ___DETAILS____________

[9.1] SYSTEMS DESIGN

TECHNOLOGICAL AESTHETIC

The design answers to the site's needs, thus it is a response to the existing fabric as well a projection of the future vision. The endeavour to create space via infrastructure demands that technical systems and ultimately the **tectonic language of the building is aimed at creating space.**

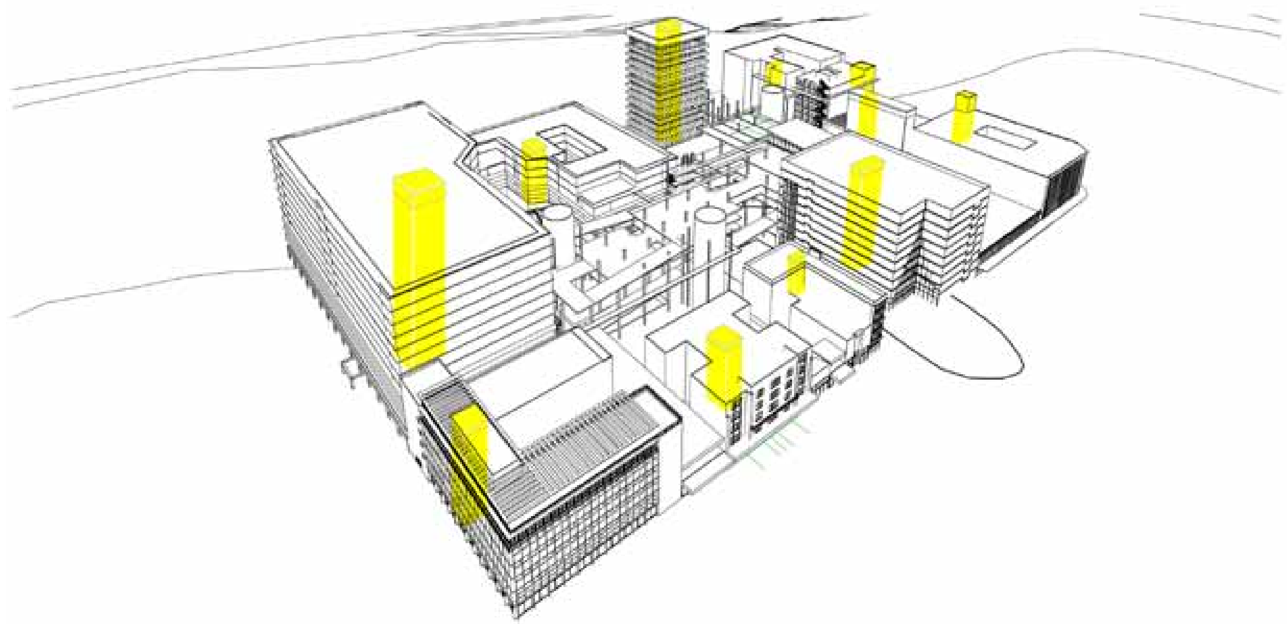
New planes are staggered between existing fabric as **extensions, bridges and new adaptable surfaces**. The building exists in an in-between state, its tectonic elements connecting and supporting the existing fabric. The roof belongs to the sun and sky, the water towers belong to the earth and context, the public space and circulation elements belong to the context whilst the floors 'float' in the in-between as an adaptable almost 'claimable' entity.



[Figure 9_1.] Tectonic intent.

SYSTEMS

Because of the nature of the project, the systems design, as previously discussed, is the main focus. The involved systems are electrical, water, organic waste digestion, solid waste management and sewage treatment. These systems respond to the contextual demand and usage, thus the existing services, **service cores in buildings and new proposed services need to be mapped out** in order to understand their contributory behaviour and layout.

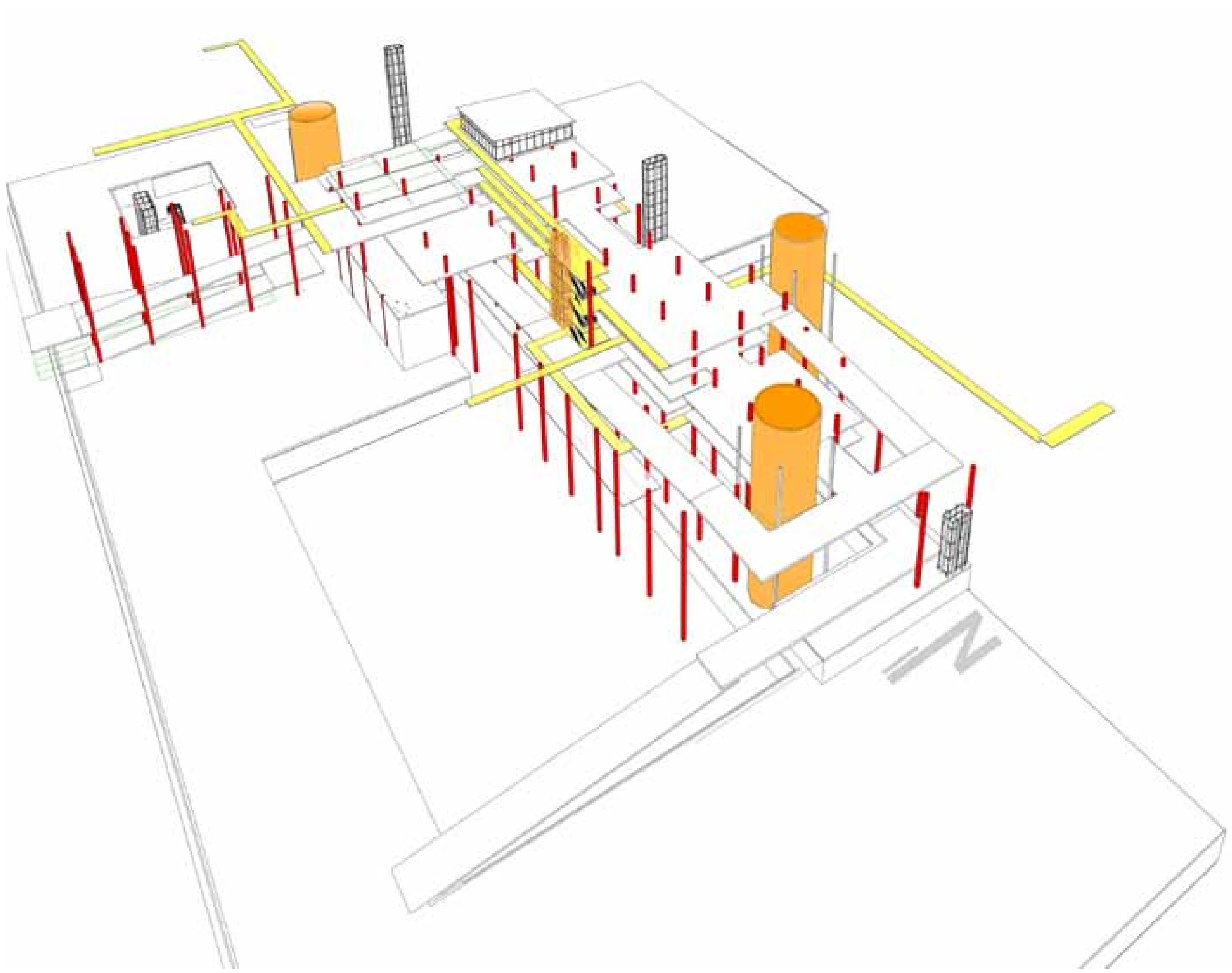


[Figure 9_2.] Existing buildings' service and circulation cores.

[Figure 9_3.] Existing municipal infrastructure around and on site.

____STRUCTURAL ELEMENTS_____

- **PRIMARY FRAME STRUCTURE**
- **HORISONTAL BRACING**
- **VERTICAL BRACING**

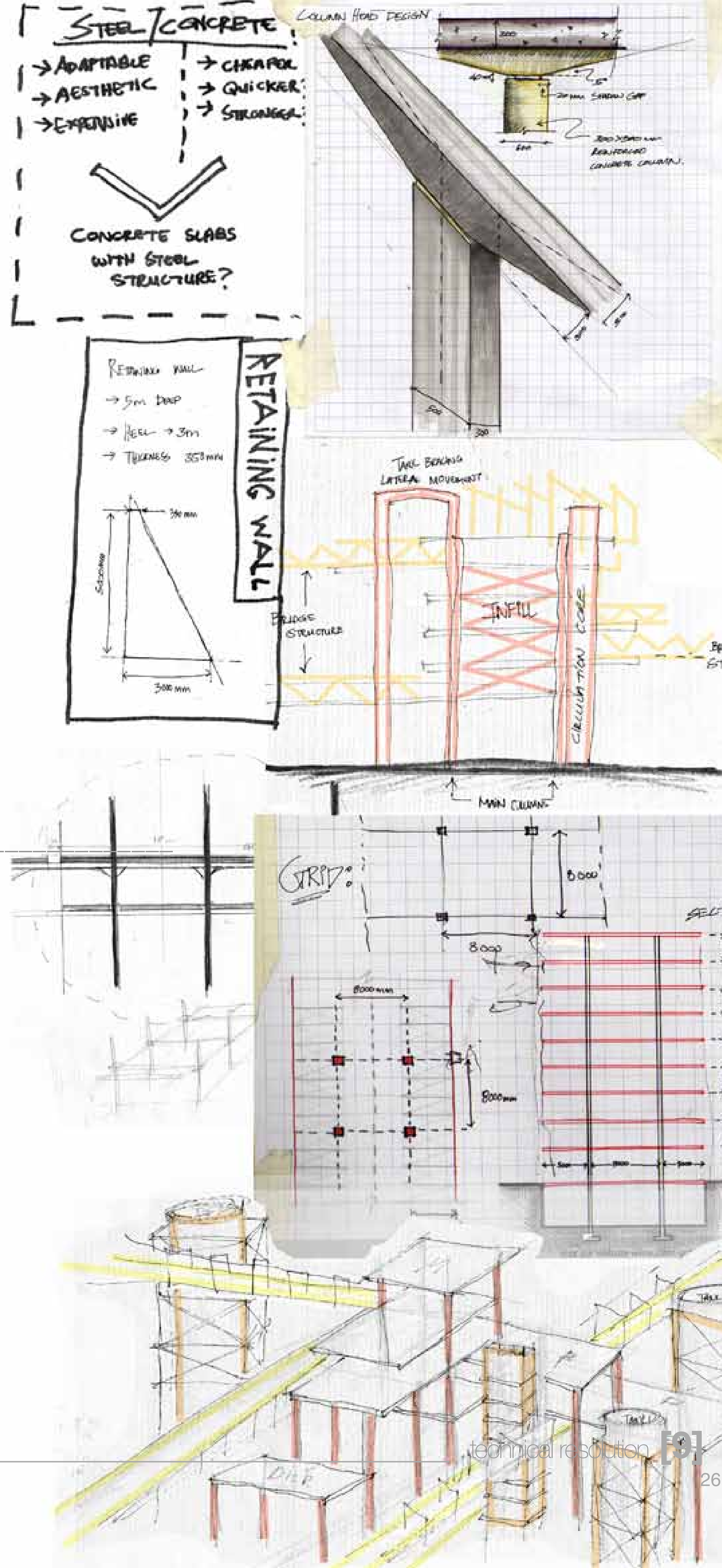


____STRUCTURAL SYSTEM____

The structure, as previously mentioned, acts as a **shell 'cupping' the space** inside. The primary structure is a **concrete column and beam structure** standing separately with the slab cast in, like an 'after thought' addition to the building.

The secondary structure is an **infill of light-weight horisontal and vertical circulation** structures, steel bracing and a ramp system.

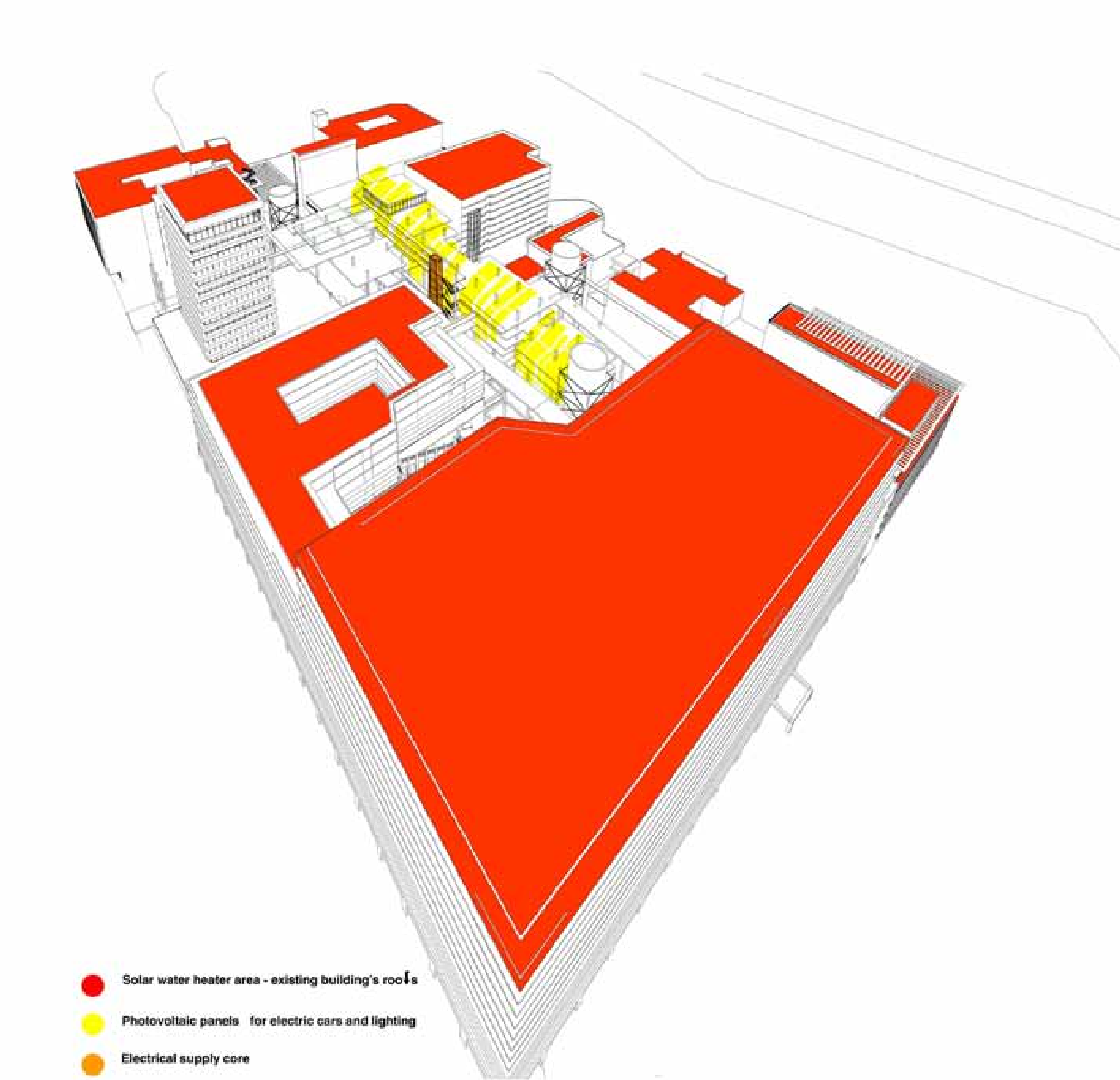
The light-weight steel elements are move-/changeable whilst the ground floor commercial structures are more **solid and 'attached' to the context.**



[Figure 9_5.] Structure exploration collage.

____ELECTRICAL SYSTEM_____

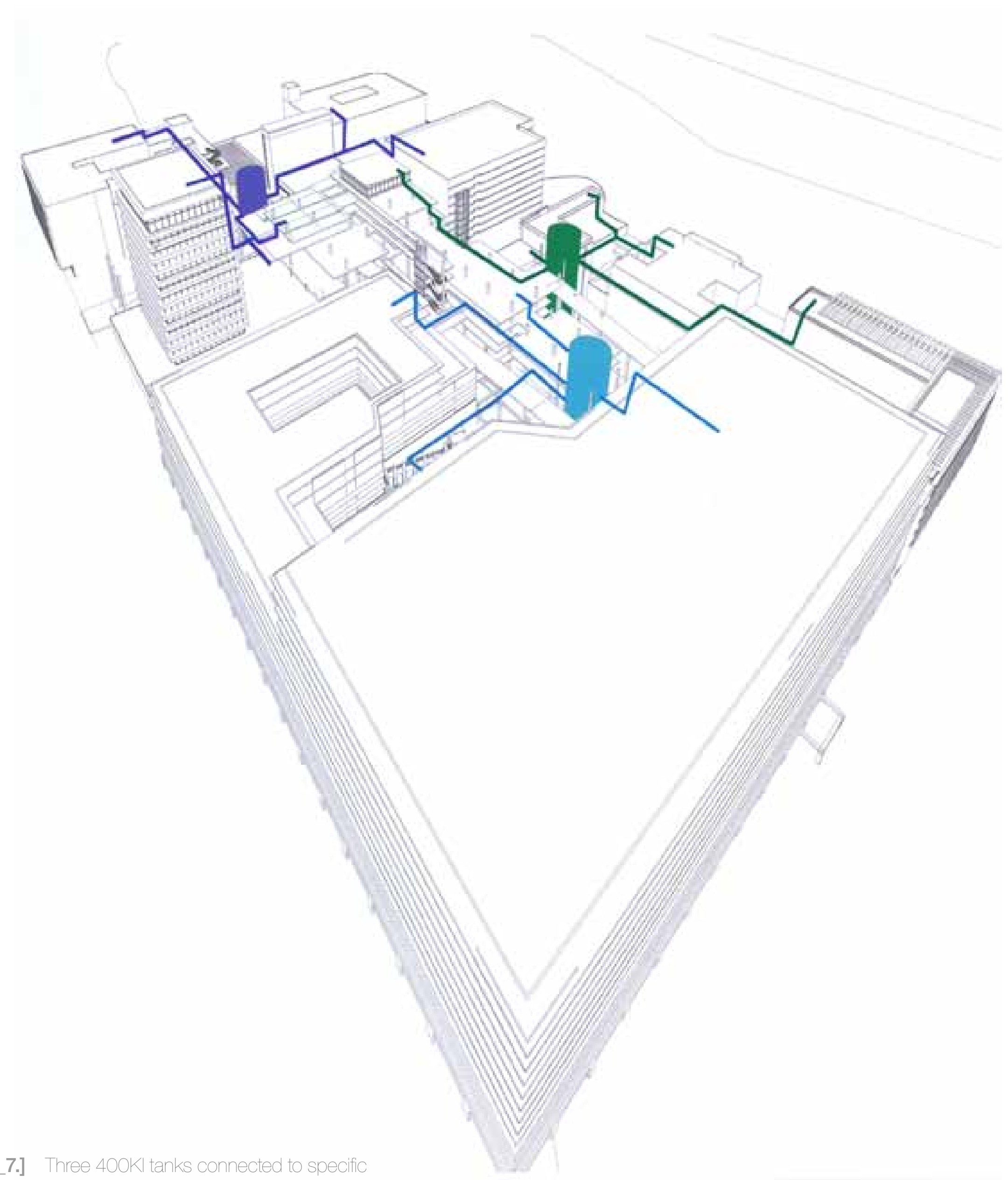
As previously discussed, the electrical system is not completely off-grid because the amount of photo voltaic panels needed to sustain the development would be too significant to deem feasible. Besides proposing that the existing buildings apply active energy saving strategies, there are two energy systems applied in the intervention. The first is **solar water heaters** via solar vacuum tubes, providing each building with warm water. The other is **photovoltaic panels** providing enough energy for the intervention's lighting and charging of the electrical cars' batteries. The solar vacuum tubes will be placed on the existing buildings' roofs and the photovoltaic panels will be fixed as a screen roof structure on the northern side of the intervention. See the detailing of the solar facade in the details section.



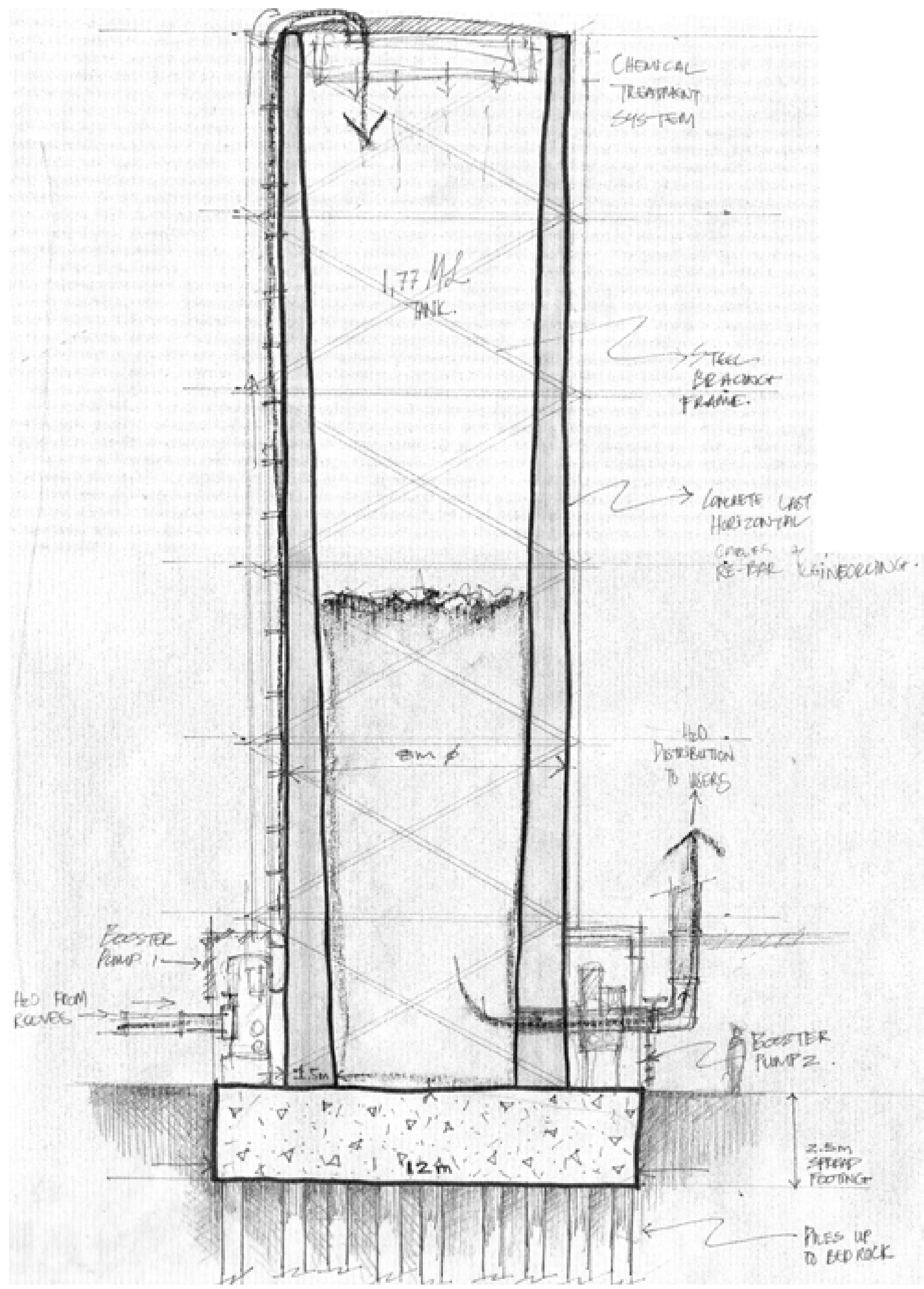
[Figure 9_6.] 'Energy planes', solar panels and pv-panels.

____WATER SYSTEM_____

The rain water collected from all the building's roofs are stored in **three 400 KL concrete tanks**. These tanks receive water from specific assigned buildings and feed cleaned drinkable water back to these buildings. The tanks cannot be load bearing (for external forces) but can be integrated into the structure as a **bracing element.** The basement level of the tank, where the water feeds in and out, has a pump room and a compact chemical treatment plant. The water is **circulated by using its presence as a water feature within the public space.** By designing a 'second skin' for the tank, creating an illusion that the tank is overflowing, the purpose of cooling the space, creating ambience and preventing the water from rotting, are achieved.



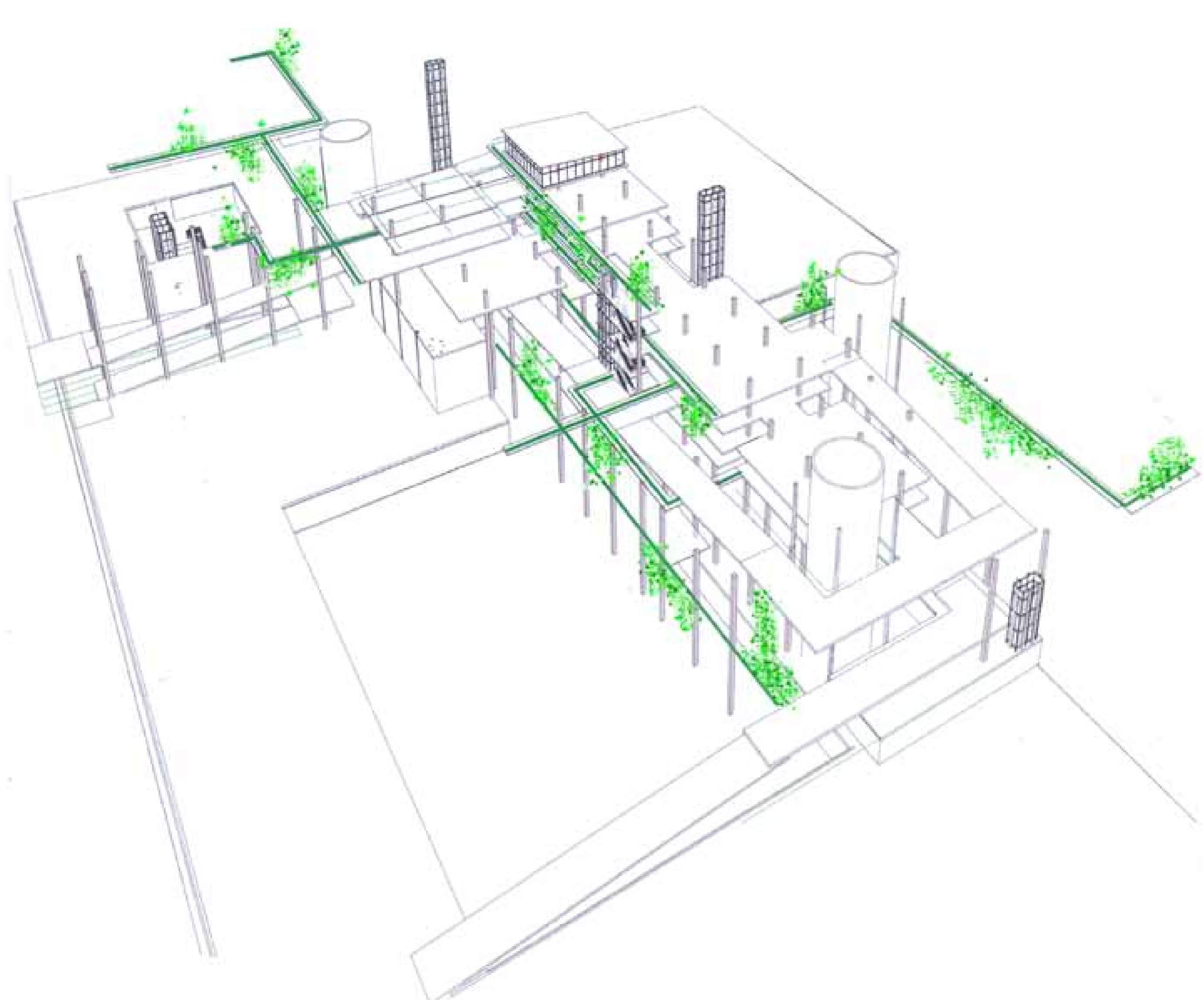
[Figure 9_7.] Three 400Kl tanks connected to specific roofs for collection and distribution .



[Figure 9_8.] Basic water tank design and circulation system.

____ORGANIC WASTE SYSTEM_____

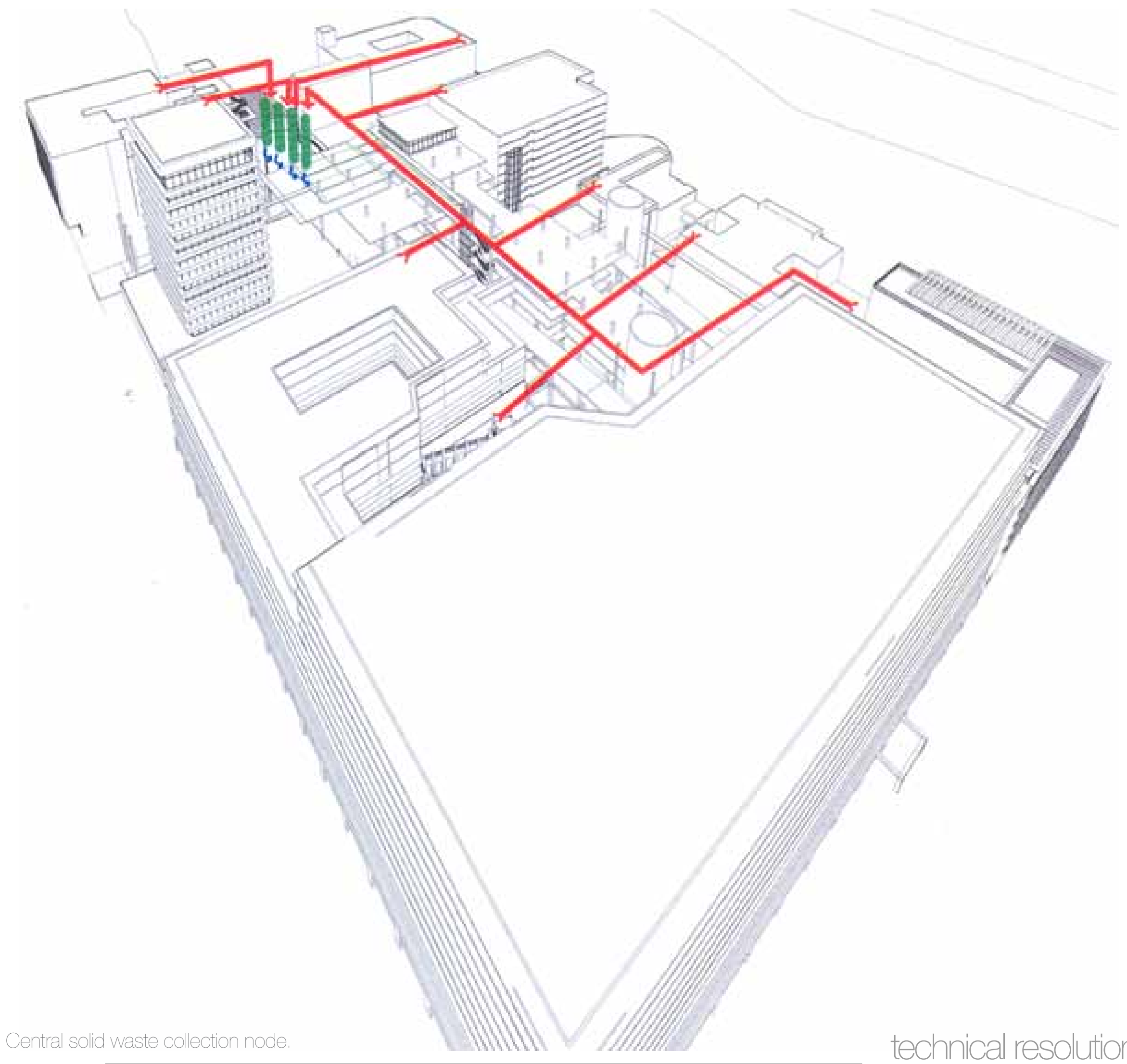
The organic waste digesters are placed **along circulation routes between buildings** and on ground floor. See the detail section for detail design of the organic digester unit.



[Figure 9_9.] Digester routes with 'green screen' system.

____SOLID WASTE SYSTEM_____

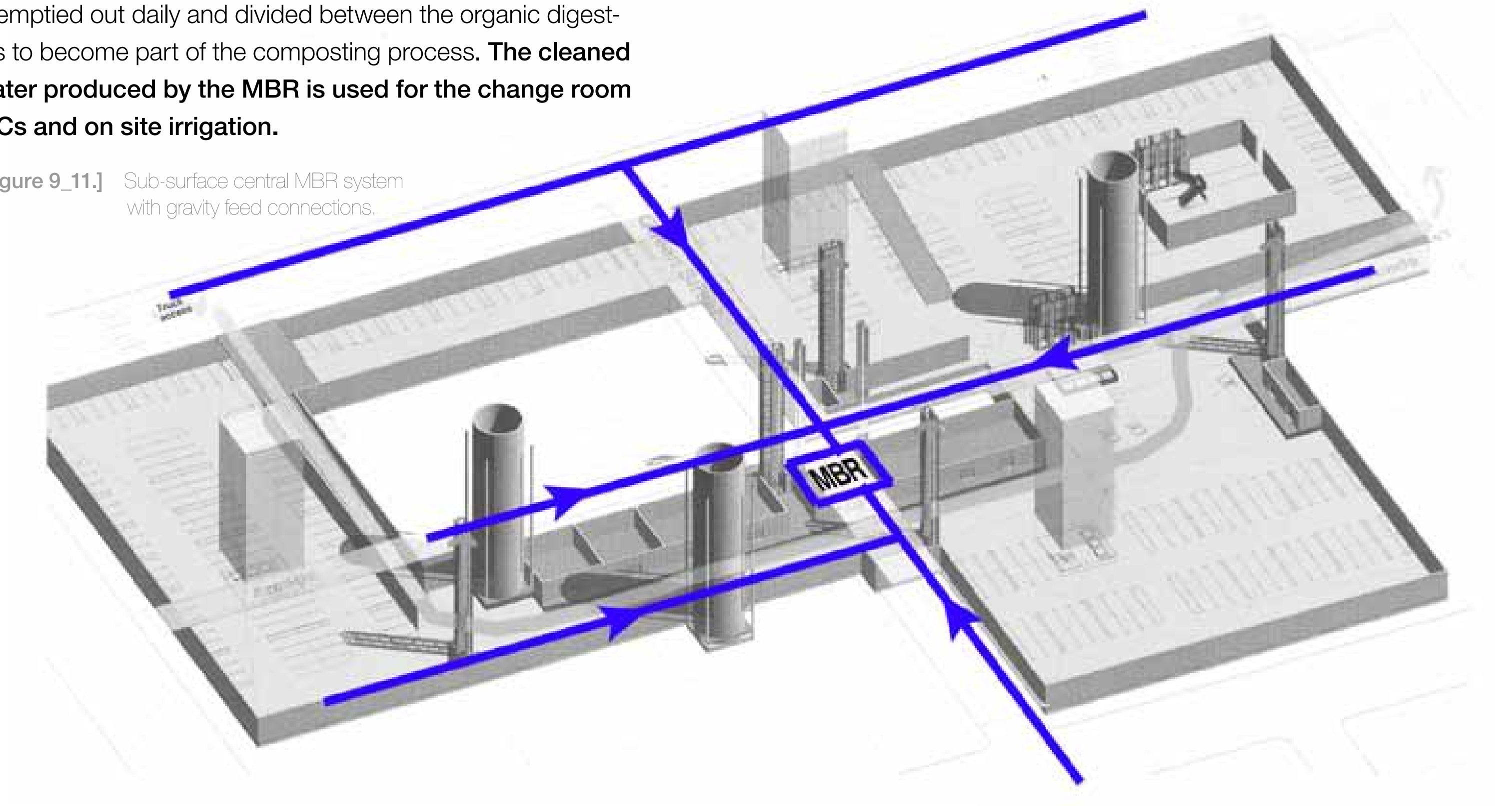
Solid waste management works on a 'separation at source' basis. Thus the parties on site are encourage to separate and group their wastes, site staff then collect the respective wastes and takes it to a **central collection depot** where it will be stored and sent to recycling factories. The collection depot is placed centrally on a circulation route so that the public can conveniently drop off their own wastes on their typical day's journey.



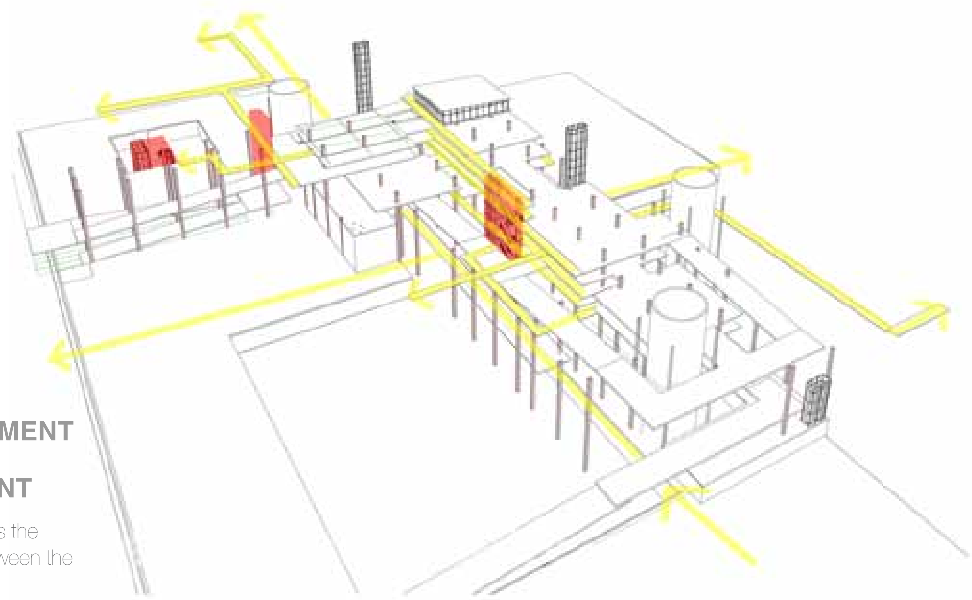
[Figure 9_10.] Central solid waste collection node.

____SEWAGE SYSTEM_____

The on-site sewage is directed towards a centrally located Membrane bio-reactor. The sludge produced by the reactor is emptied out daily and divided between the organic digesters to become part of the composting process. **The cleaned water produced by the MBR is used for the change room WCs and on site irrigation.**



[Figure 9_11.] Sub-surface central MBR system with gravity feed connections.

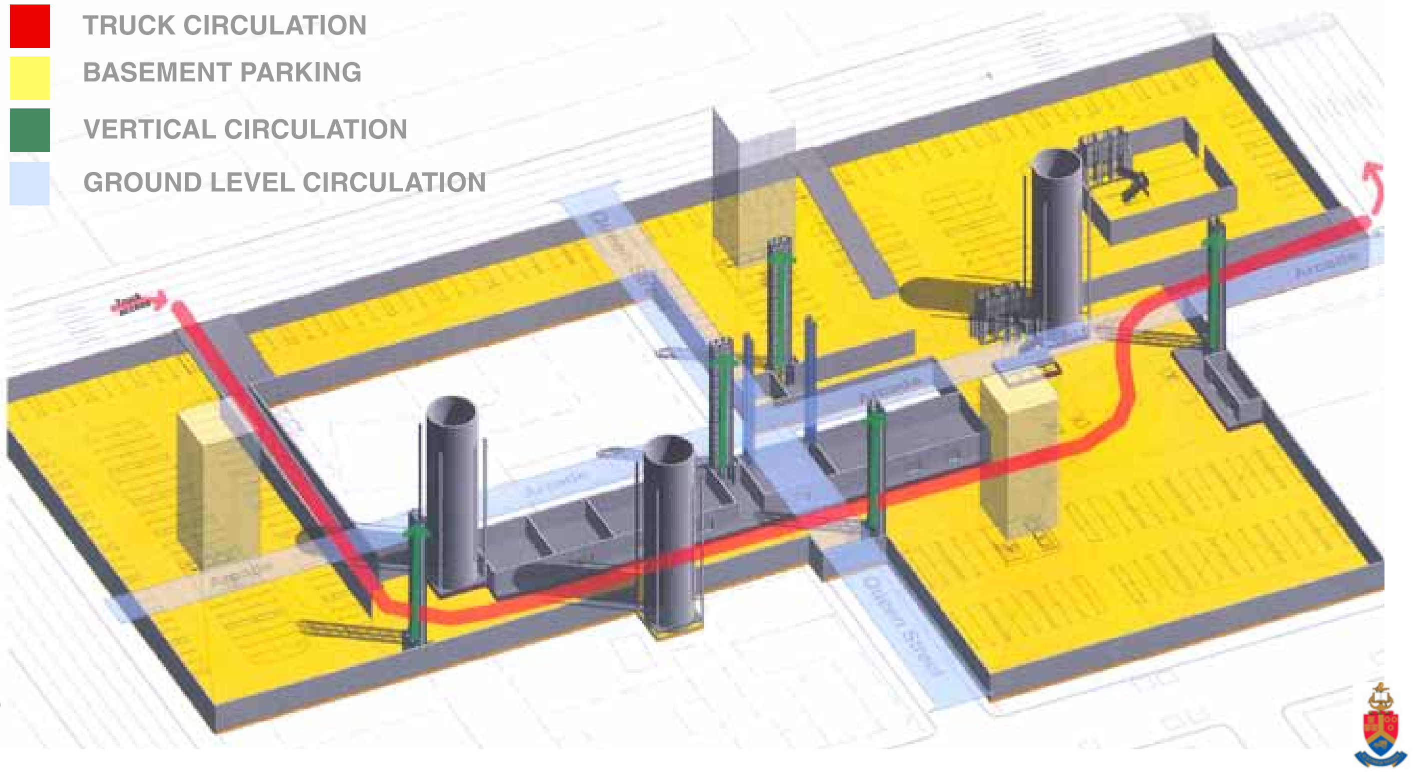


[Figure 9_13.] The second system is the pedestrian movement through and between the intervention and the surrounds.

____CIRCULATION SYSTEMS_____

There are three circulation systems on site. The first system is the **vertical circulation system** which sprouts from the basement. Stairs, lifts and goods lifts feed the site with the movement from below.

[Figure 9_12.] Basement circulation systems.



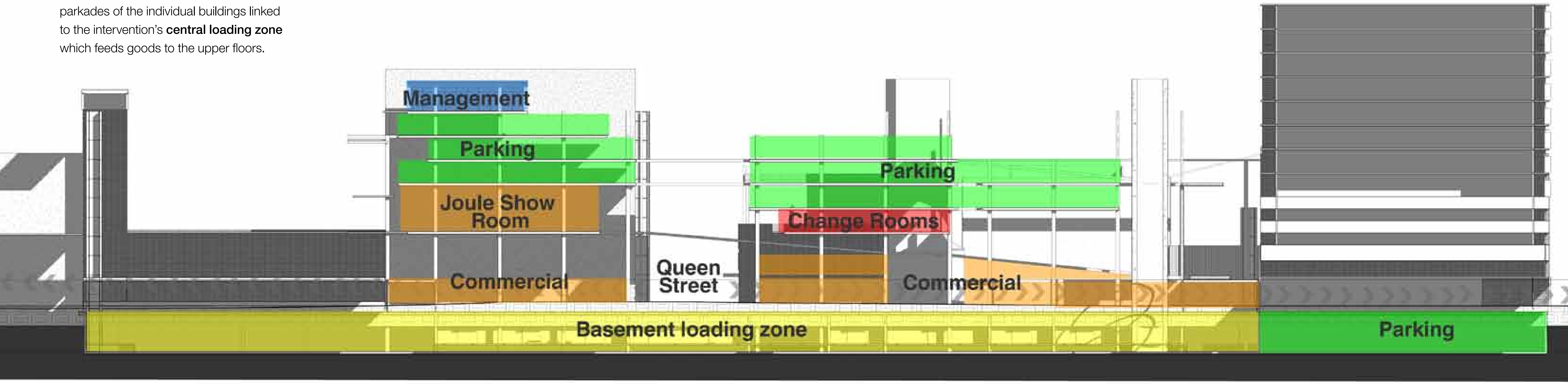
[Figure 9_14.] The third system is the vehicular movement system feeding the upper floors with cars as well as bicycles.

____VERTICAL ZONING_____

The building's vertical zoning is based on the functioning of the systems. The controlling body of the building, being the management and staff, is placed on the **top floor where their elevated position gives them a relative over view** of the whole site. The upper floors where the parking is placed are the **connective planes** where the conduit bridges exchanges energies between the buildings.

The change rooms are **central** but elevated above the public space and serves the upper cyclist parking floor and users of the context. Public bathrooms for pedestrians are available on ground floor. The Joule car garage is placed on the second floor for marketing reasons as the position of the sales rooms speaks to the public space below (via a tilted floor) and it is **positioned in the elbow of both ramps' circulation routes**.

The commercial ground floor is an unfolding space where the **energy of the existing fabric is framed by the commercial activities**. The basement floor is a combination of the existing basement parkades of the individual buildings linked to the intervention's **central loading zone** which feeds goods to the upper floors.

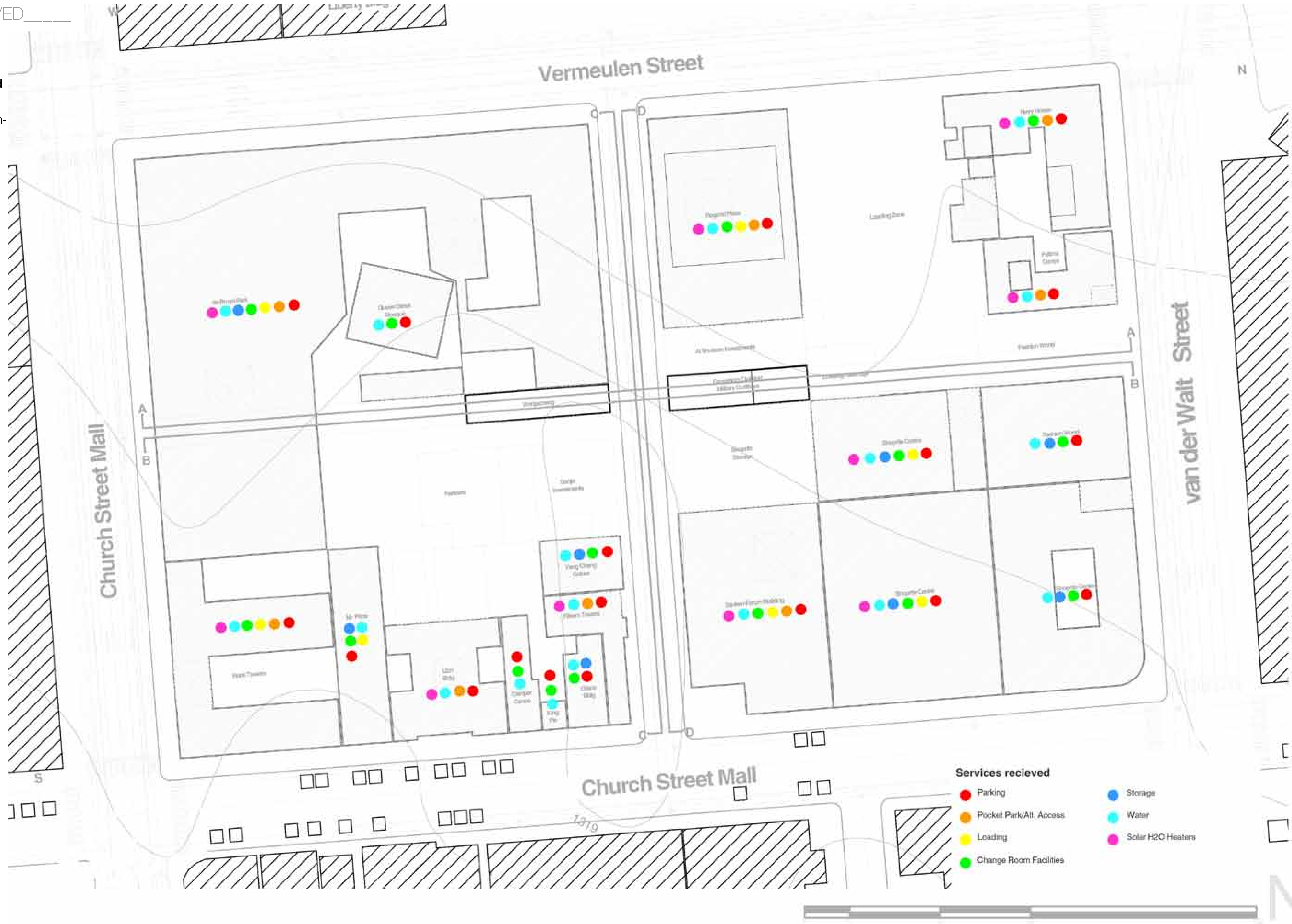


[Figure 9_15.] Vertical zoning, section A-A

____SERVICES RECEIVED______

This diagram communicates which services the **intervention supplies and which of these services are being used** by the context.

[Figure 9_16.] Services provided and usage chart.



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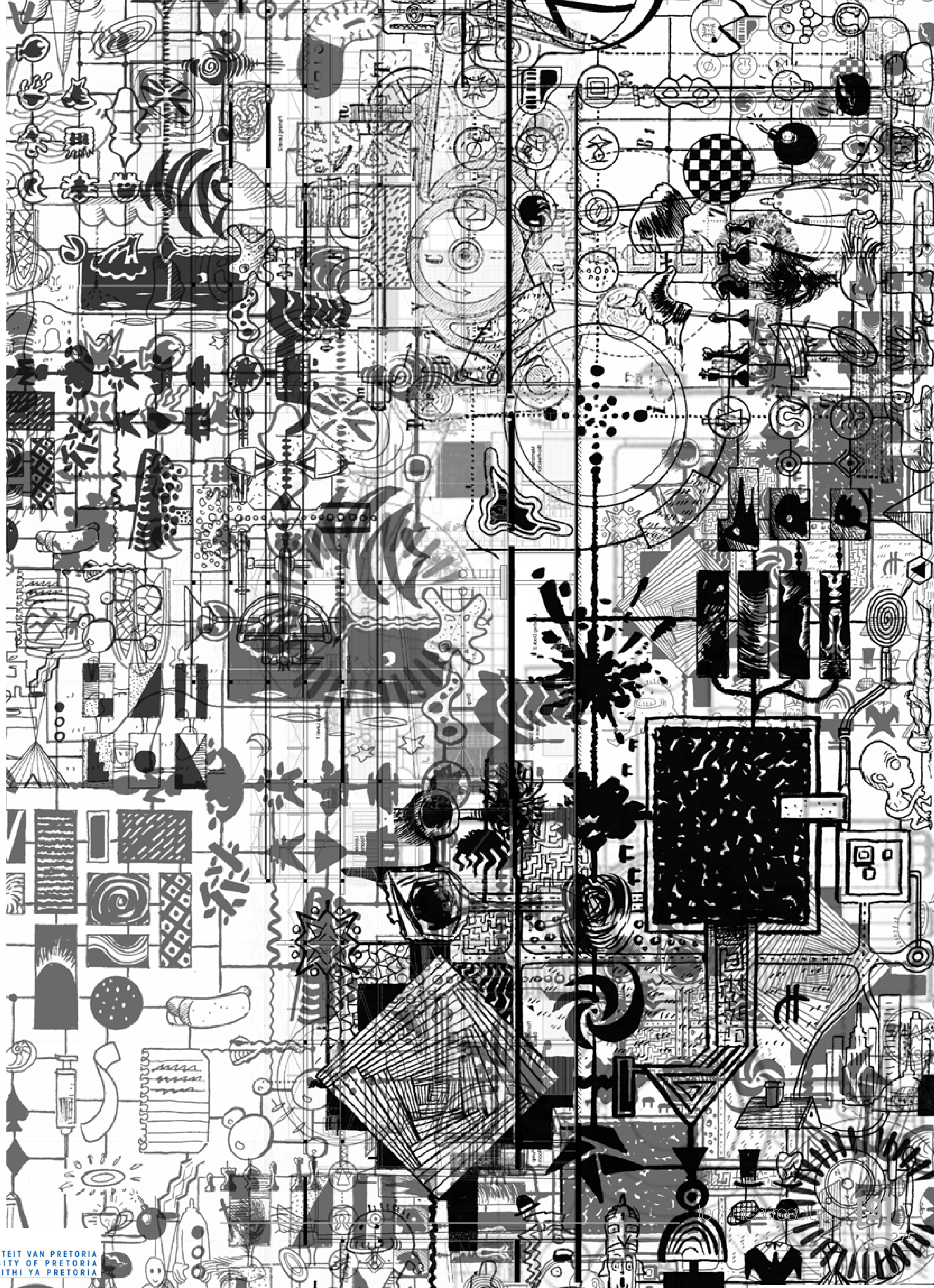
[9.2] DETAILS
TECHNICAL EXPLORATION

Four detail focus areas will be discussed in this detail section. Each detail exploration is **linked to one of the infra-structural systems** in the intervention. The following details will be discussed:

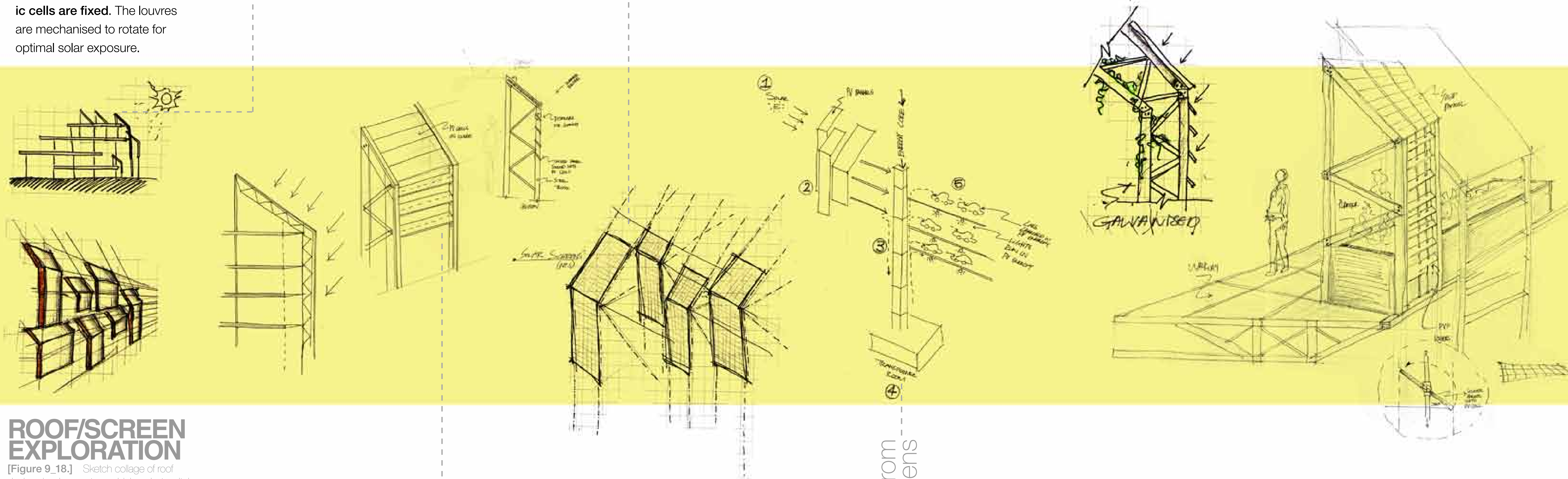
- _ **Roof and solar screen design.**
- _ **Conduit bridges**
- _ **Organic digester seating**
- _ **Slab edge and balustrade connection.**



[Figure 9_17.] 'Small things'

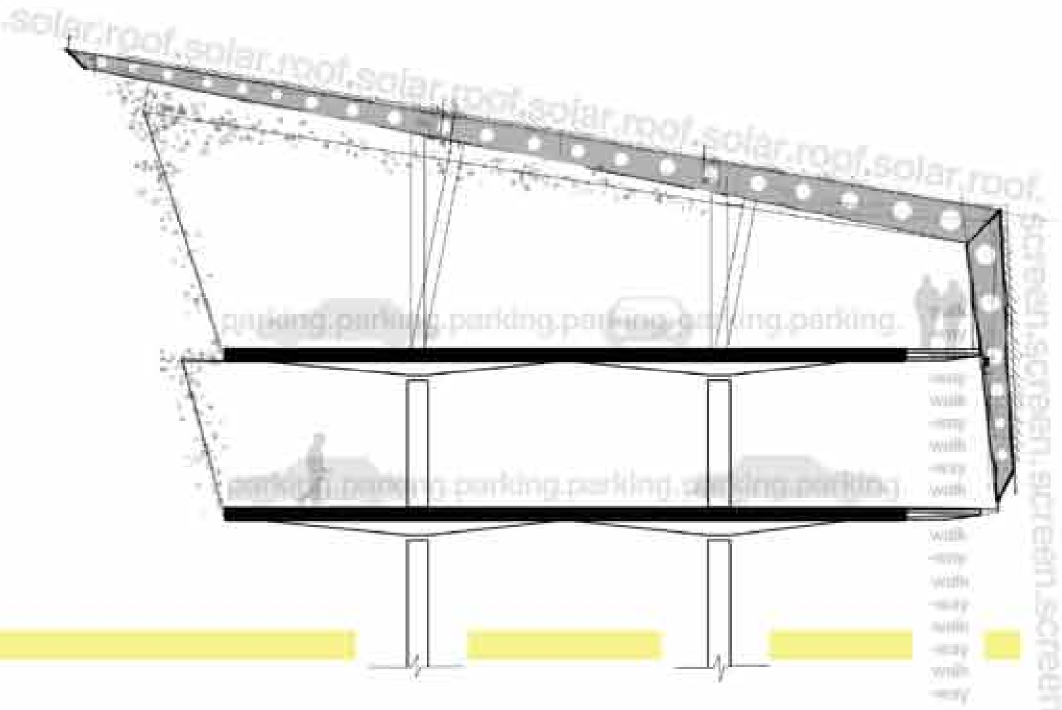
ROOF DESIGN

The roof structure is a light steel structure which links the sun and sky to the building. The **roof wraps over the northern facade to become a screen device.** The roof and screen structure is **'clad' with a louvre system on which photo voltaic cells are fixed.** The louvres are mechanised to rotate for optimal solar exposure.

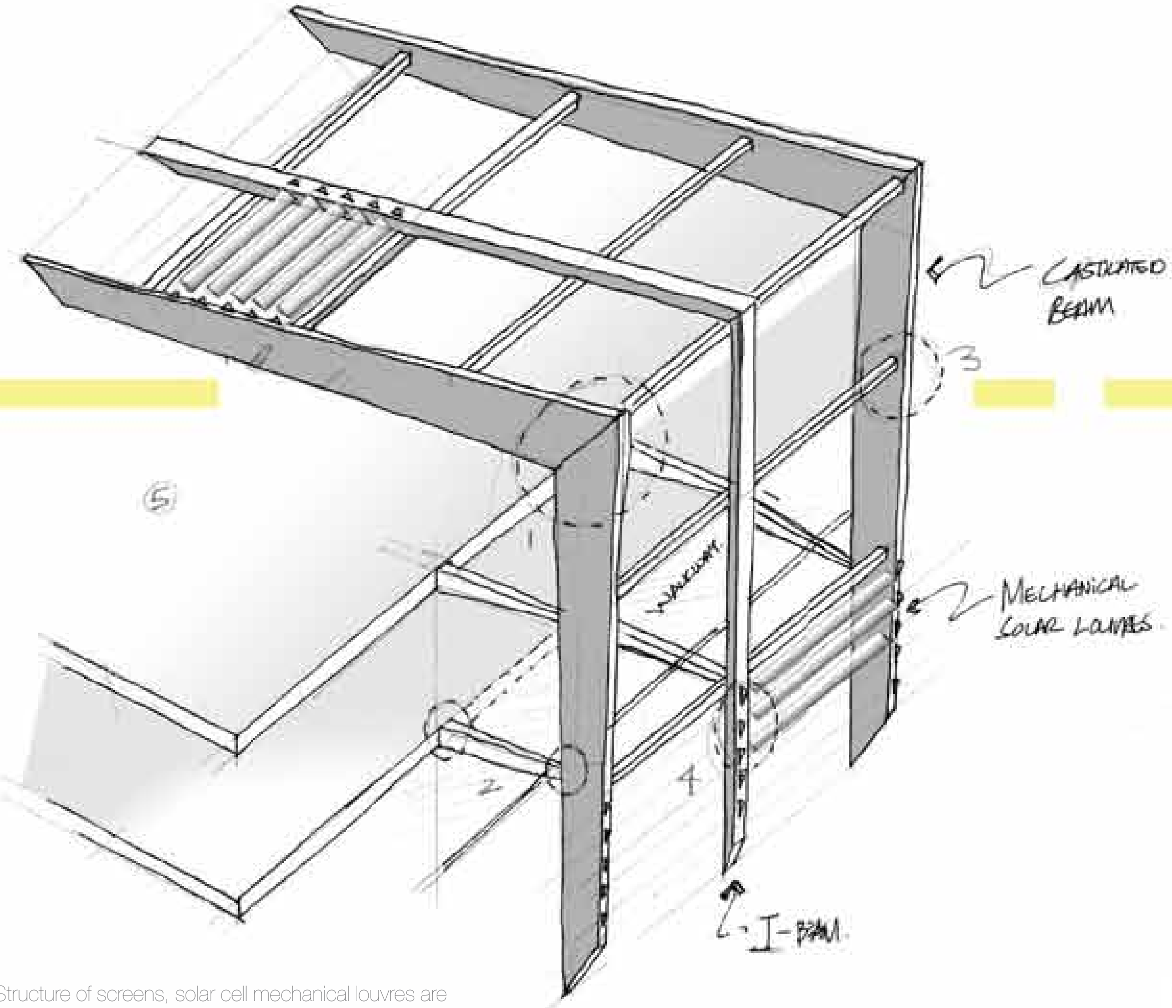


ROOF/SCREEN EXPLORATION

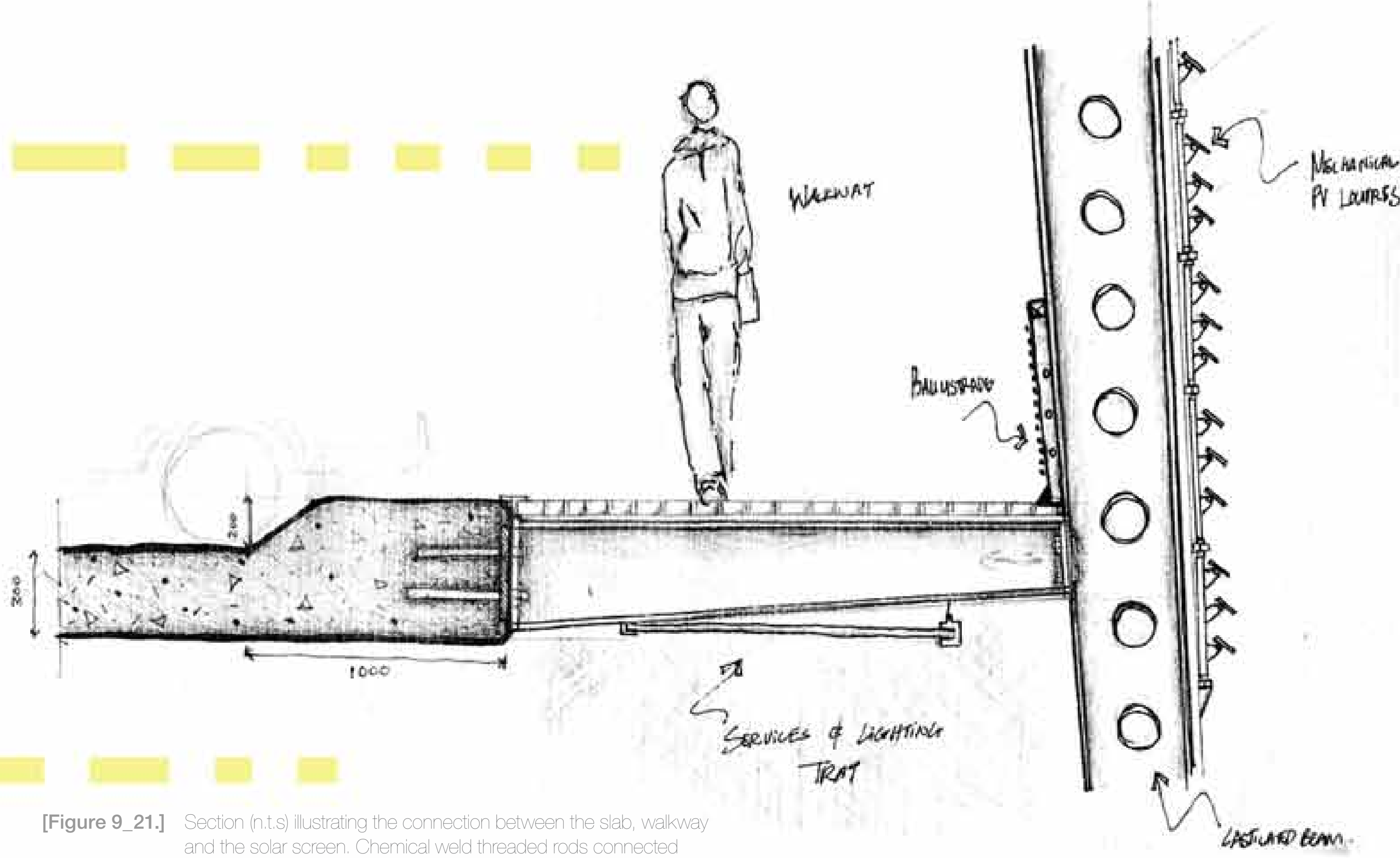
[Figure 9_18.] Sketch collage of roof design development, combining photovoltaic technology and a louvre system for shading and energy harvesting.



[Figure 9_19.] Castellated beam roof structure @ 8000mm centres with infill bracing fixed to steel I-sections on concrete slab.

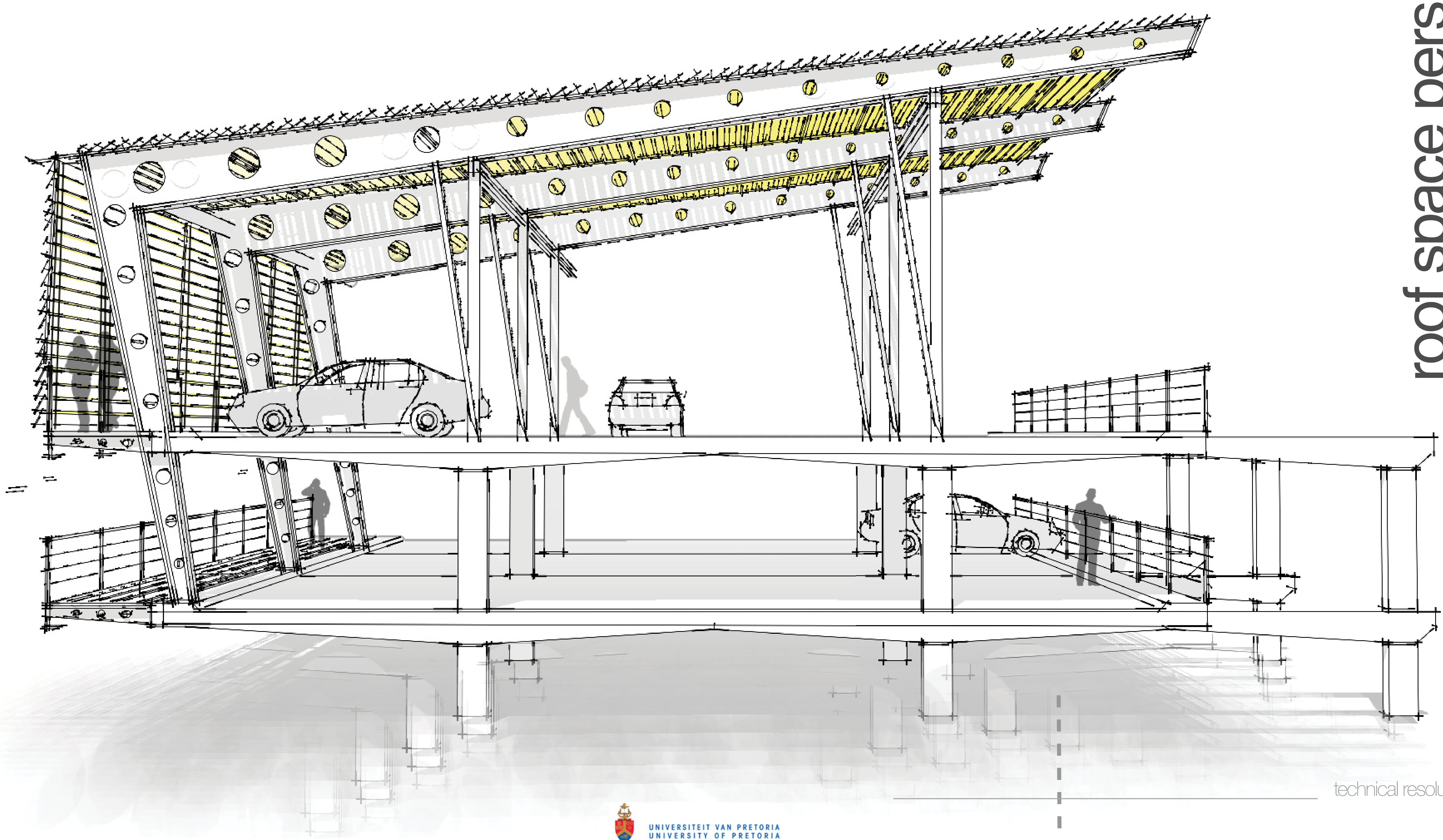


[Figure 9_20.] Structure of screens, solar cell mechanical louvres are fixed to the castellated beams for optimal solar exposure.



[Figure 9_21.] Section (n.t.s) illustrating the connection between the slab, walkway and the solar screen. Chemical weld threaded rods connected to slab to which custom I-section walkway beams are fixed and then fixed to the castellated beams.

roof space perspective

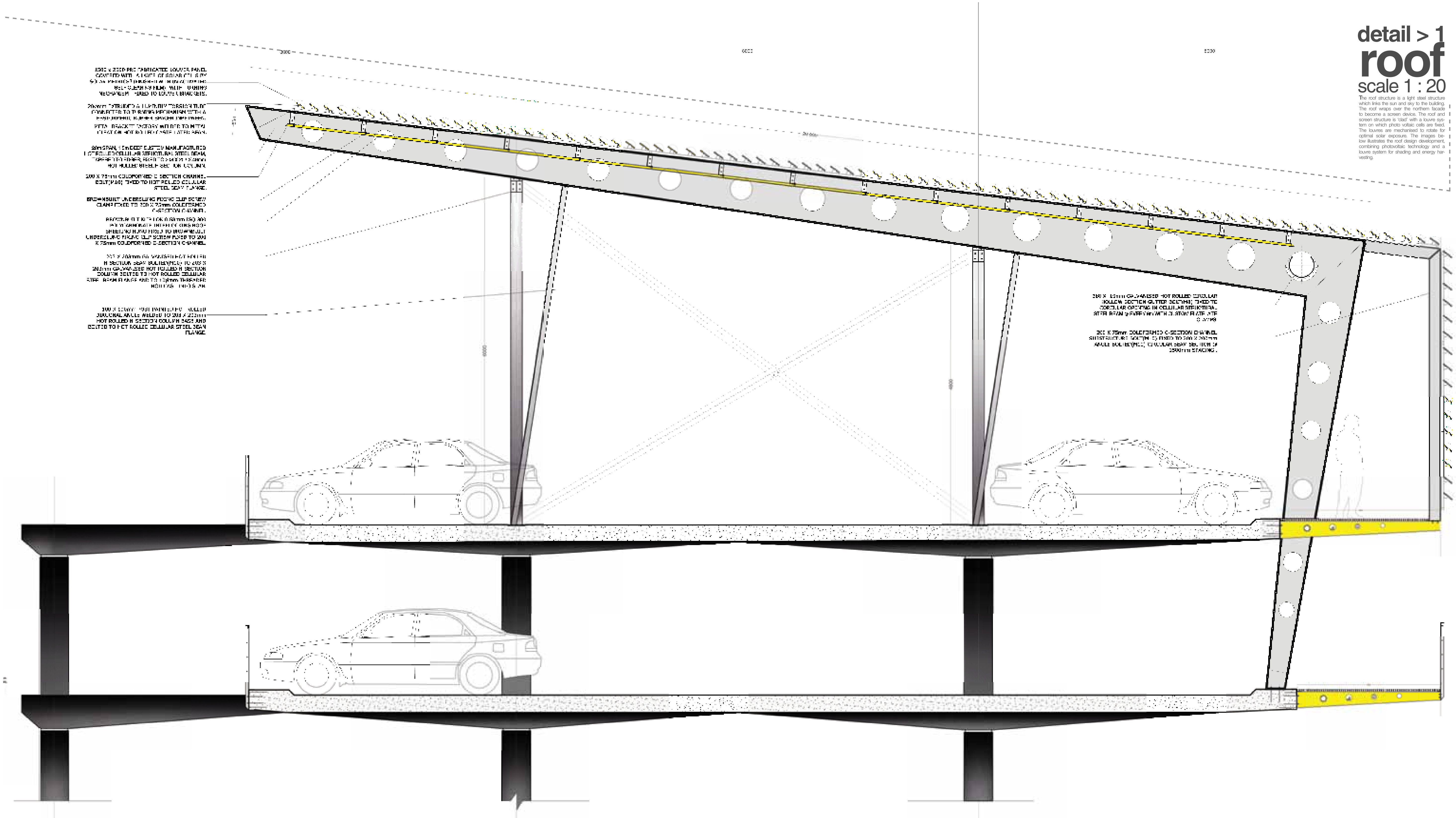


detail > 1

roof

scale 1 : 20

The roof structure is a light steel structure which links the sun and sky to the building. The roof wraps over the northern facade to become a screen device. The roof and screen structure is 'clad' with a louvre system on which photo voltaic cells are fixed. The louvres are mechanised to rotate for optimal solar exposure. The images below illustrates the roof design development, combining photovoltaic technology and a louvre system for shading and energy harvesting.

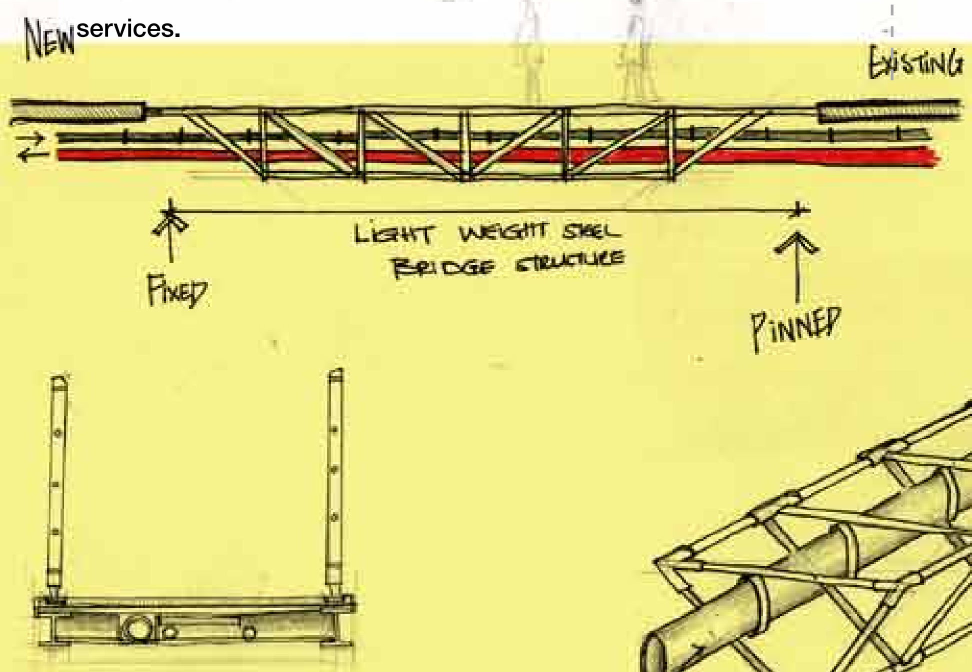


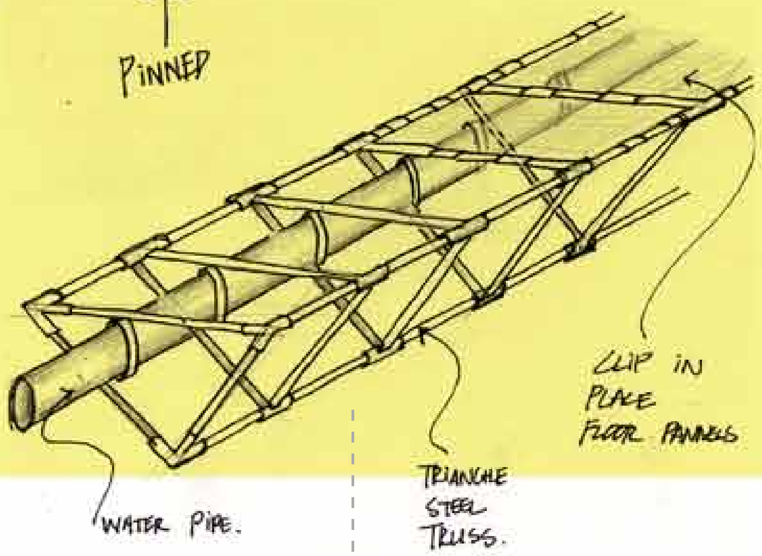
____BRIDGE DESIGN_____

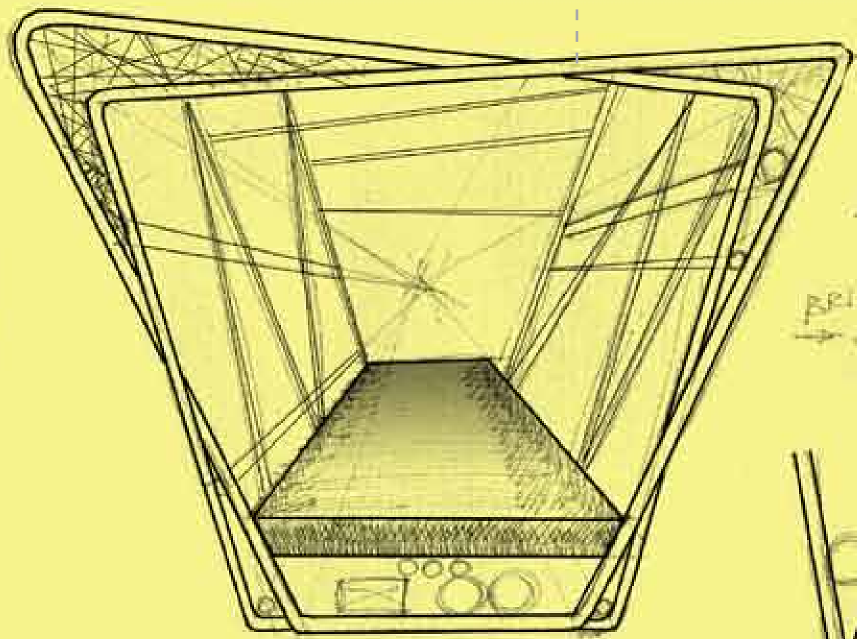
The conduit bridges act as the building's 'fingers' weaving into the existing fabric. The bridges not only enable water flow between the buildings but serves as an **alternative access way for the user.** The bridges are light weight steel structure trusses which can achieve large spans, clad with a mentis grid walkway. The piping, electrical cables and lighting are fixed in the void space under the bridge, thus the **bridge acts as a conduit for these services.**

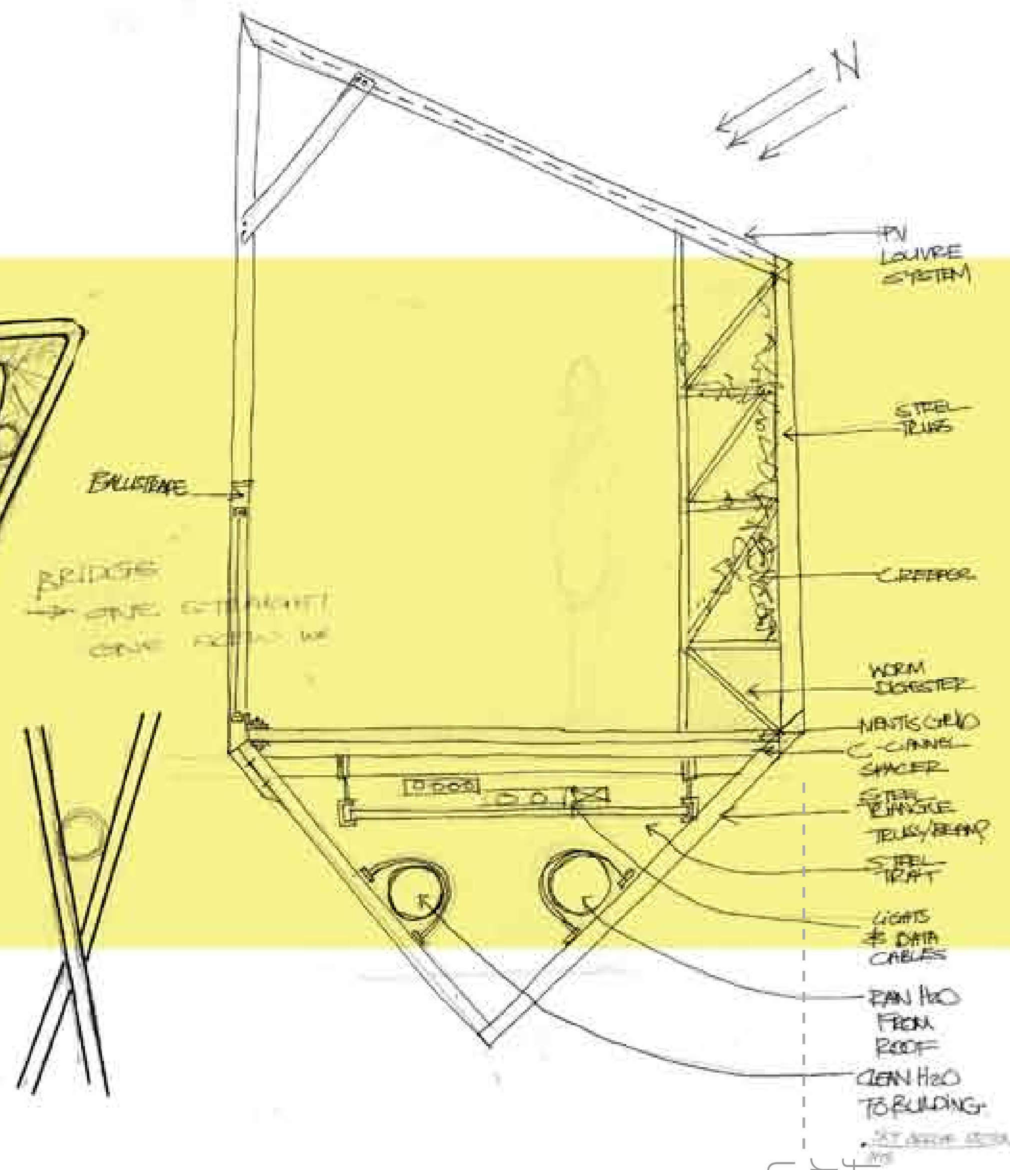
connecting two planes

framing the bridge







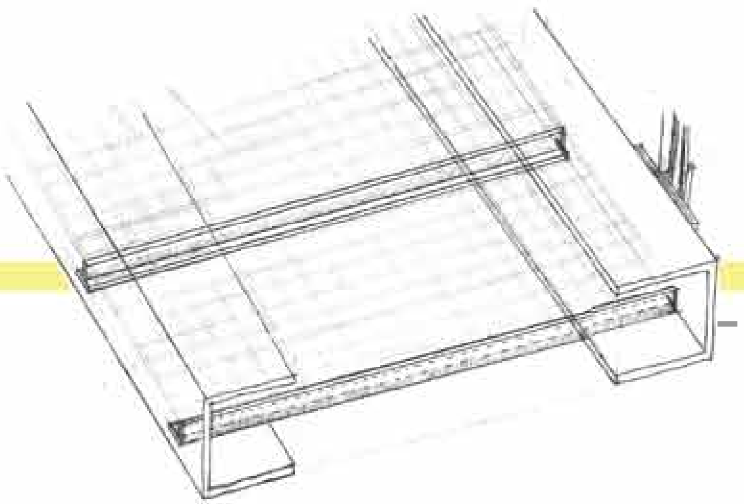


TRUSS BRIDGE EXPLORATION

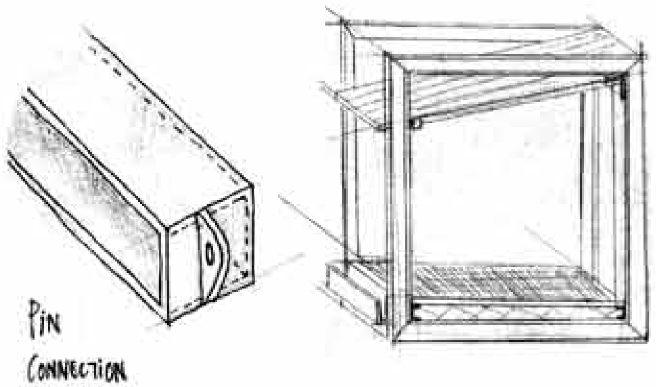
[Figure 9_22.] Sketch collage of connection bridges, lightweight steel and mesh construction, pinned fixing on both support ends. Cavity mesh floor with services placed inside for easy access.

steel 'conduit' truss

combination with digester and solar roof

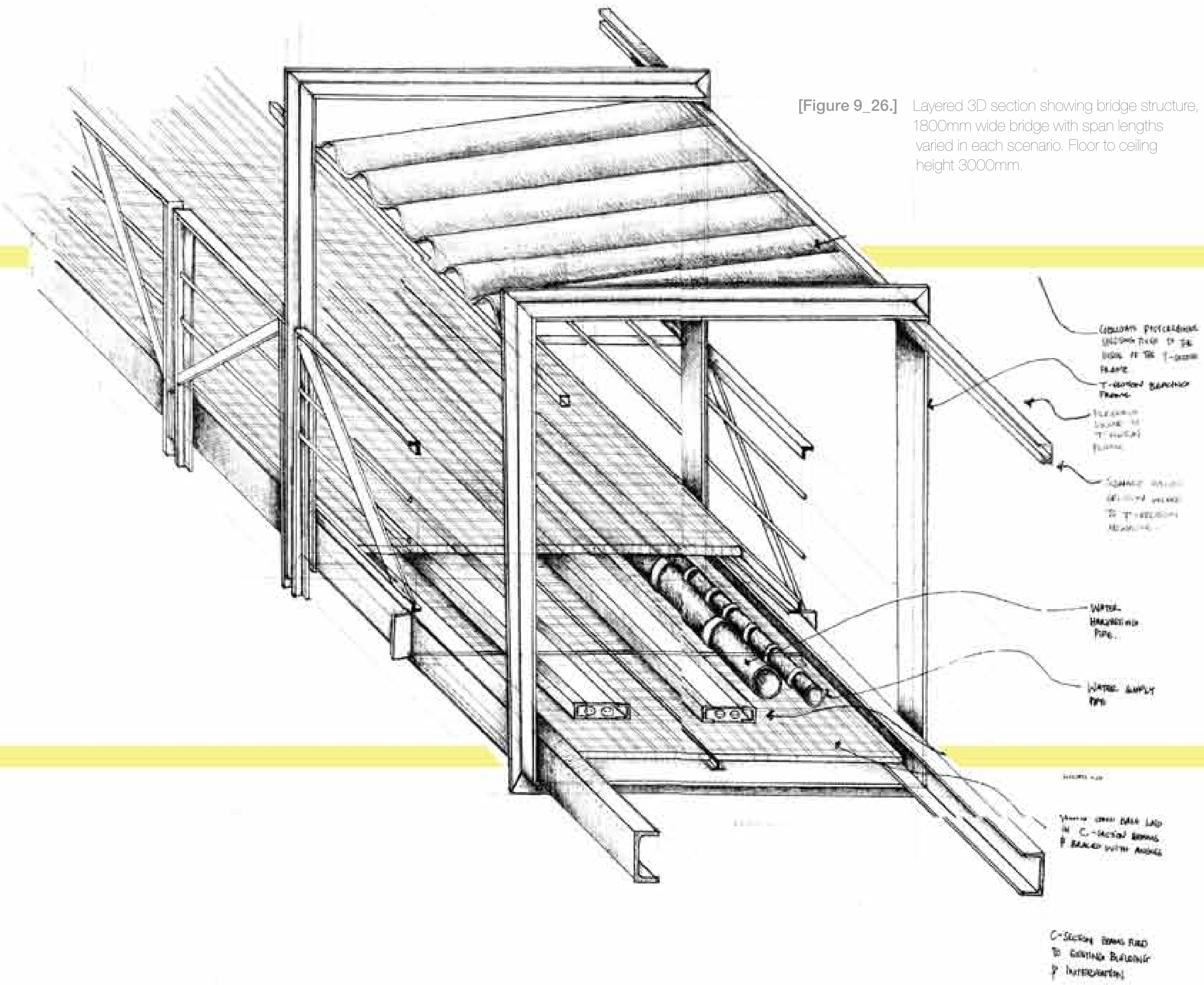


[Figure 9_23.] Mentis grid laid in steel channel beam to create flooring surface for services.



[Figure 9_24.] Pin connection on channel edge and 3D section portion of bridge showing slanted roof.

[Figure 9_25.] Mentis grid laid in steel channel and T-sections.



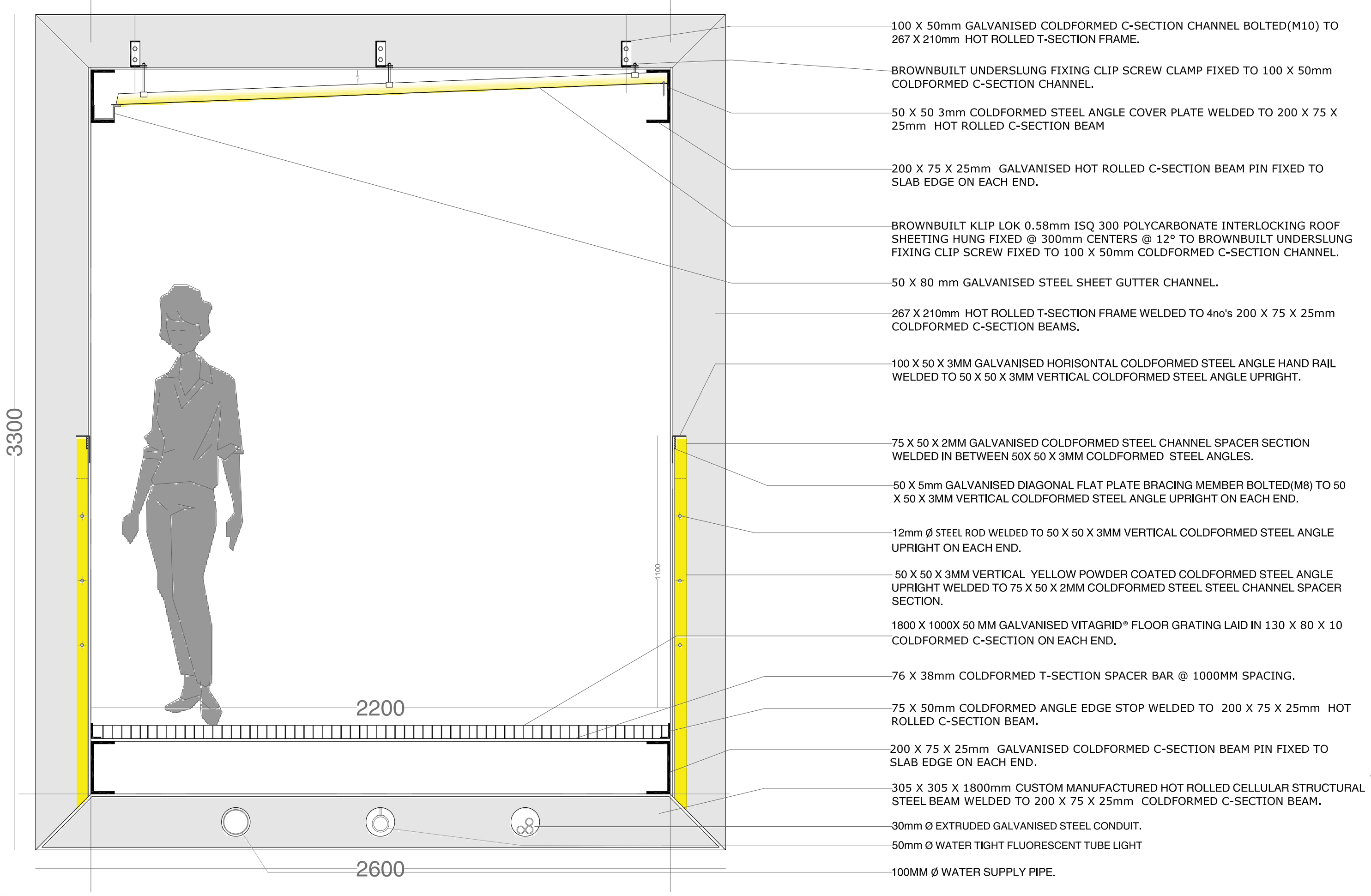
[Figure 9_26.] Layered 3D section showing bridge structure, 1800mm wide bridge with span lengths varied in each scenario. Floor to ceiling height 3000mm.

> > detail > 2

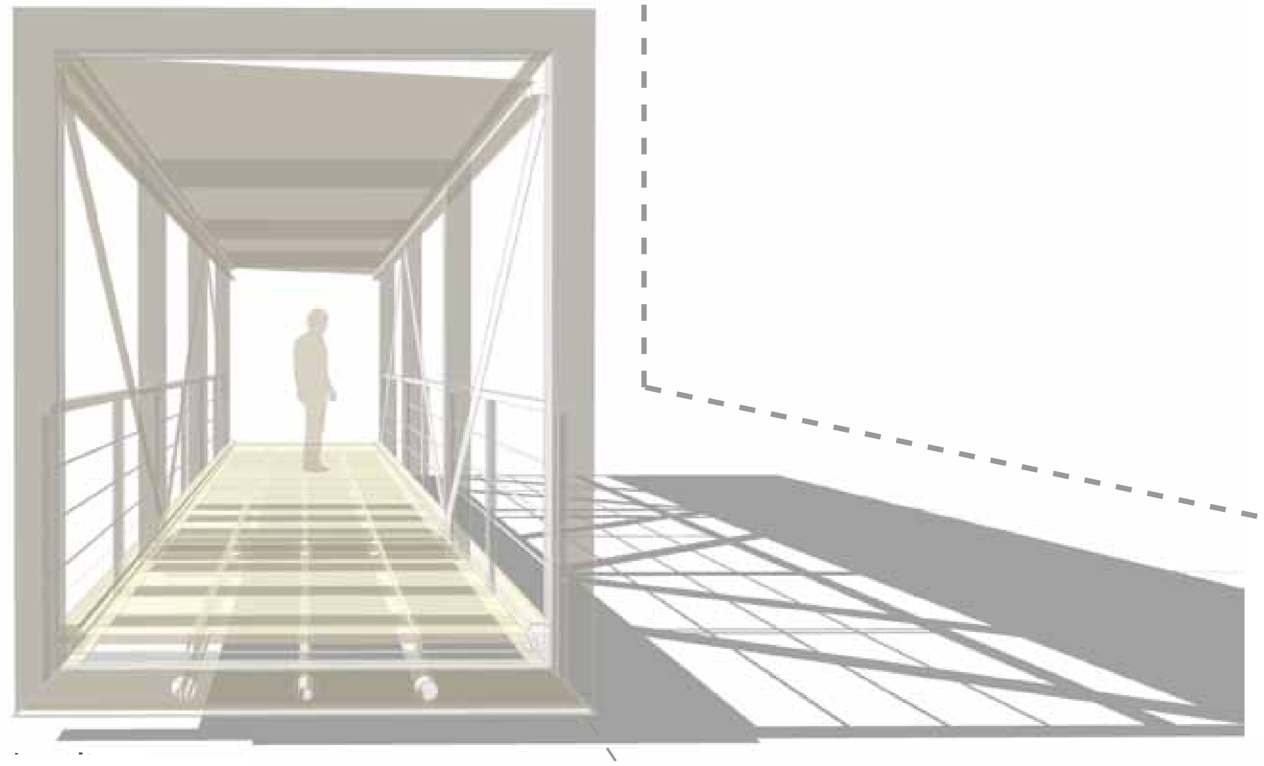
bridge

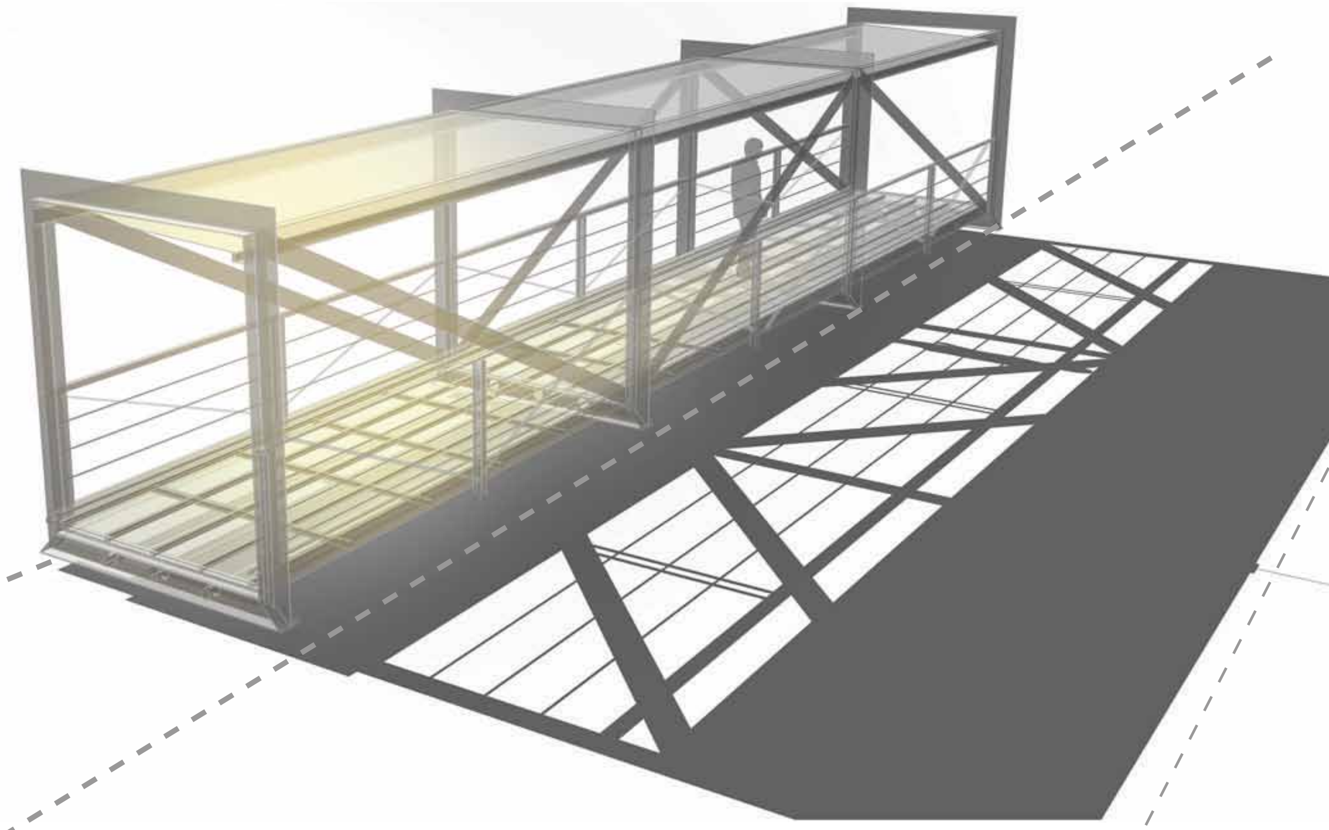
scale 1 : 10 & 20

The conduit bridges act as the building's 'fingers' weaving into the existing fabric. The bridges not only enable water flow between the buildings but serves as an alternative access way for the user. The bridges are light weight steel structure trusses which can achieve large spans, clad with a mentis grid walkway. The piping, electrical cables and lighting are fixed in the void space under the bridge, thus the bridge acts as a conduit for these services.



connection bridge section





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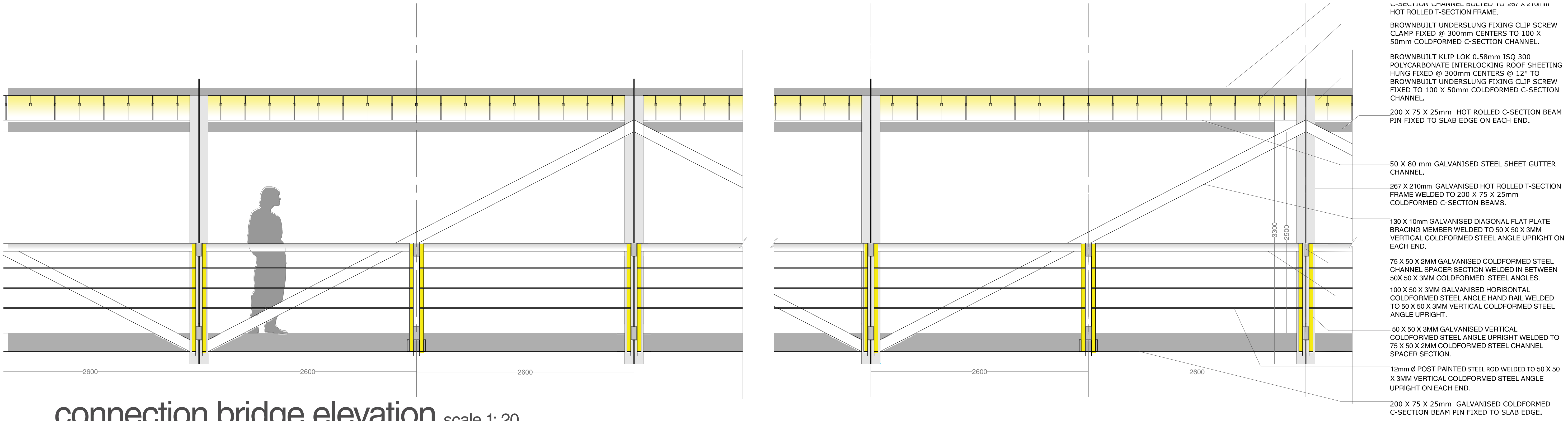
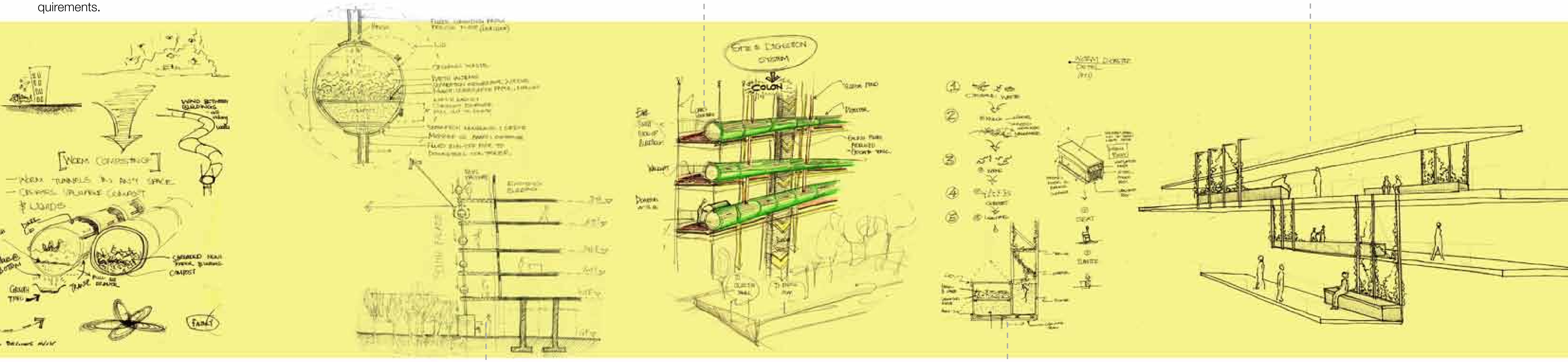


connection bridge elevation scale 1: 20

DIGESTER DESIGN

The digester detailing is more like a product design attempt, for the digester can be seen as **street furniture; a planter – dustbin – seating combination.** The digester needs to have a comfortable seating surface of wood or composite recycled timber resin slats. A sturdy digester base in which the worms are housed and the planter combined could be of steel or of composite recycled timber resin slats as well. The trellis on which the plants grow can be a light-weight steel structure which varies in length and width dependant on the creeper screen requirements.



WORM DIGESTER EXPLORATION

[Figure 9_27.] Sketch collage of earthworm digesters, combining seating, organic waste digestion and planters in one system.

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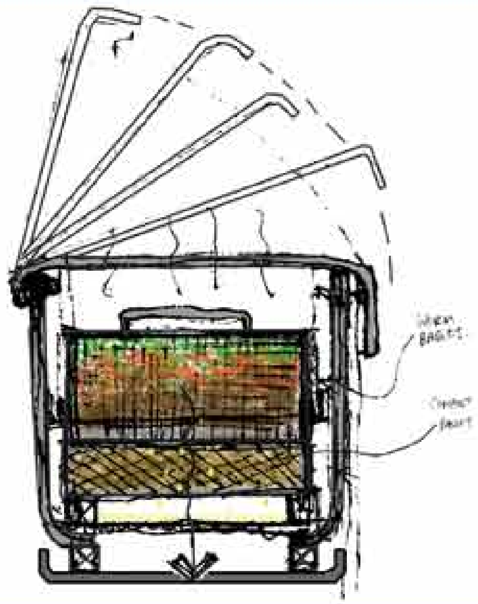
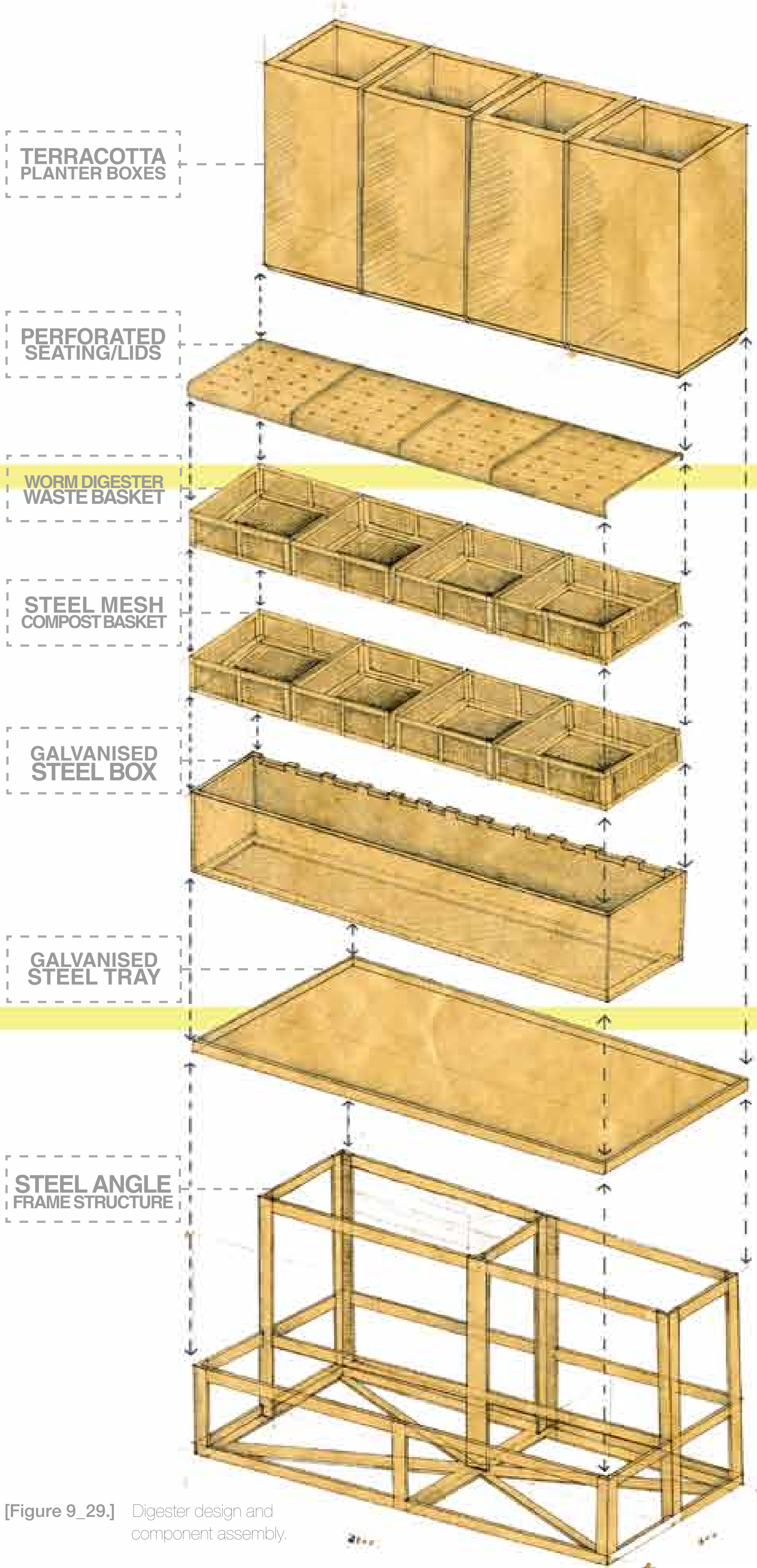
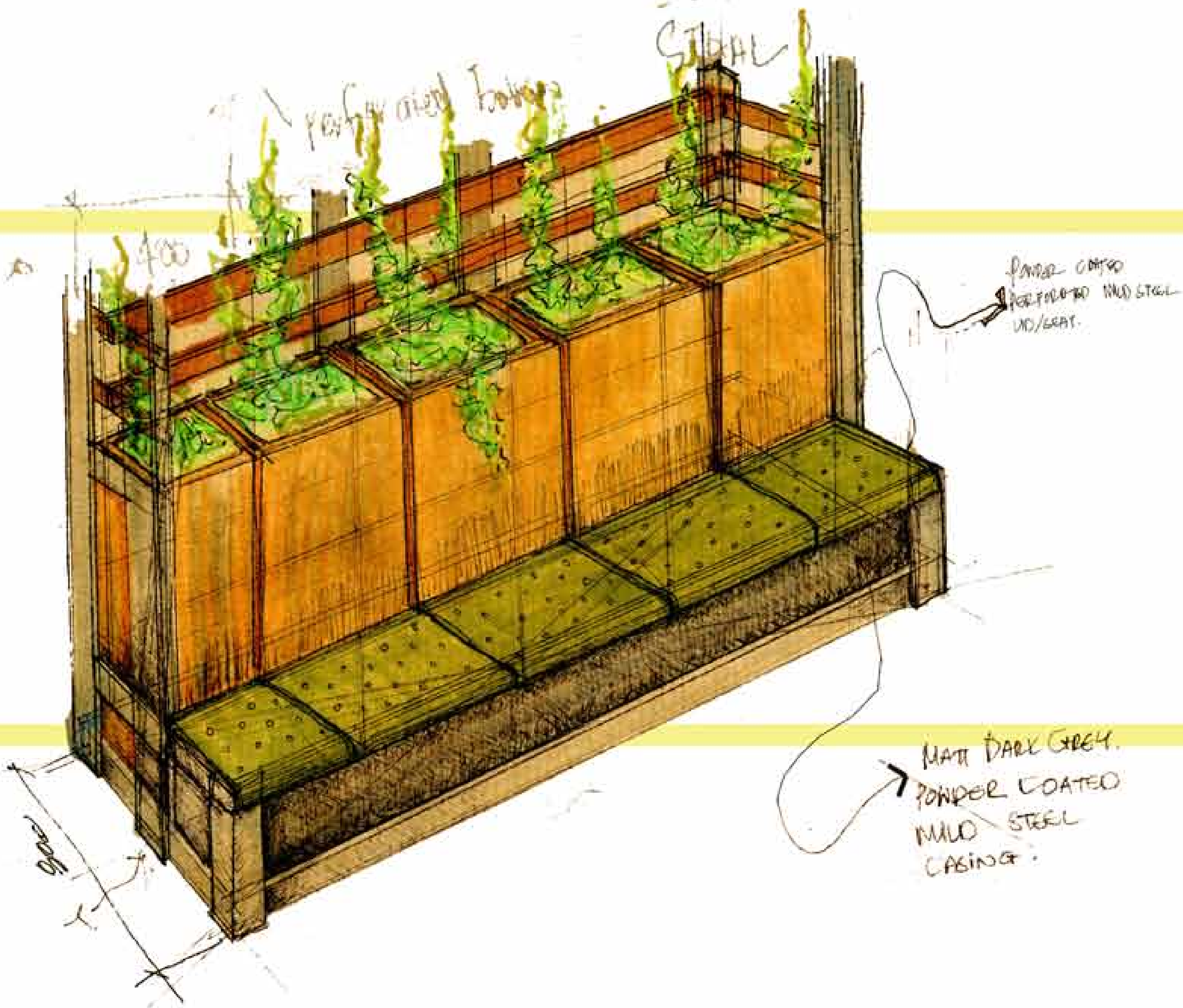


[Figure 9_28.] Digester box, galvanised steel box with, perforated, powder coated hinged seating lid, steel mesh organic basket on top of steel mesh compost basket, on top of a galvanised steel tray.



[Figure 9_29.] Digester design and component assembly.



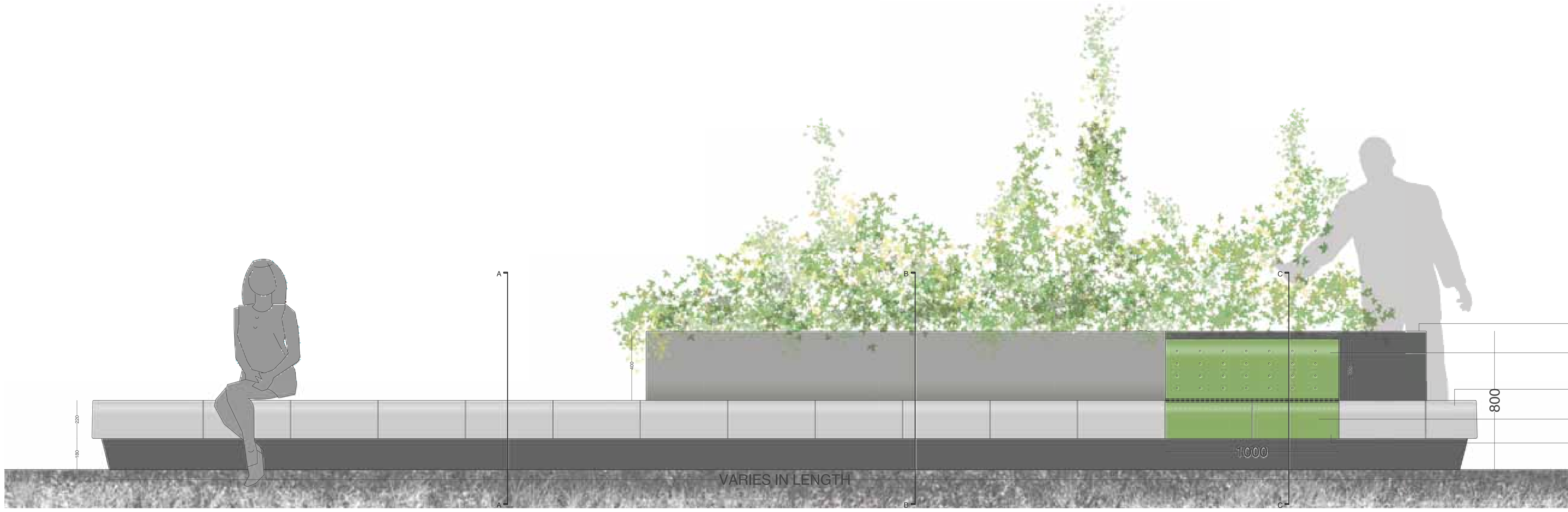
[Figure 9_30.] Organic digester design, terracotta planters are placed behind the digester boxes to make use of the leachate liquid produced by the digesters to feed the creepers growing in the digesters. The planters also serve as a backing to the seating.

> > > > detail > 3

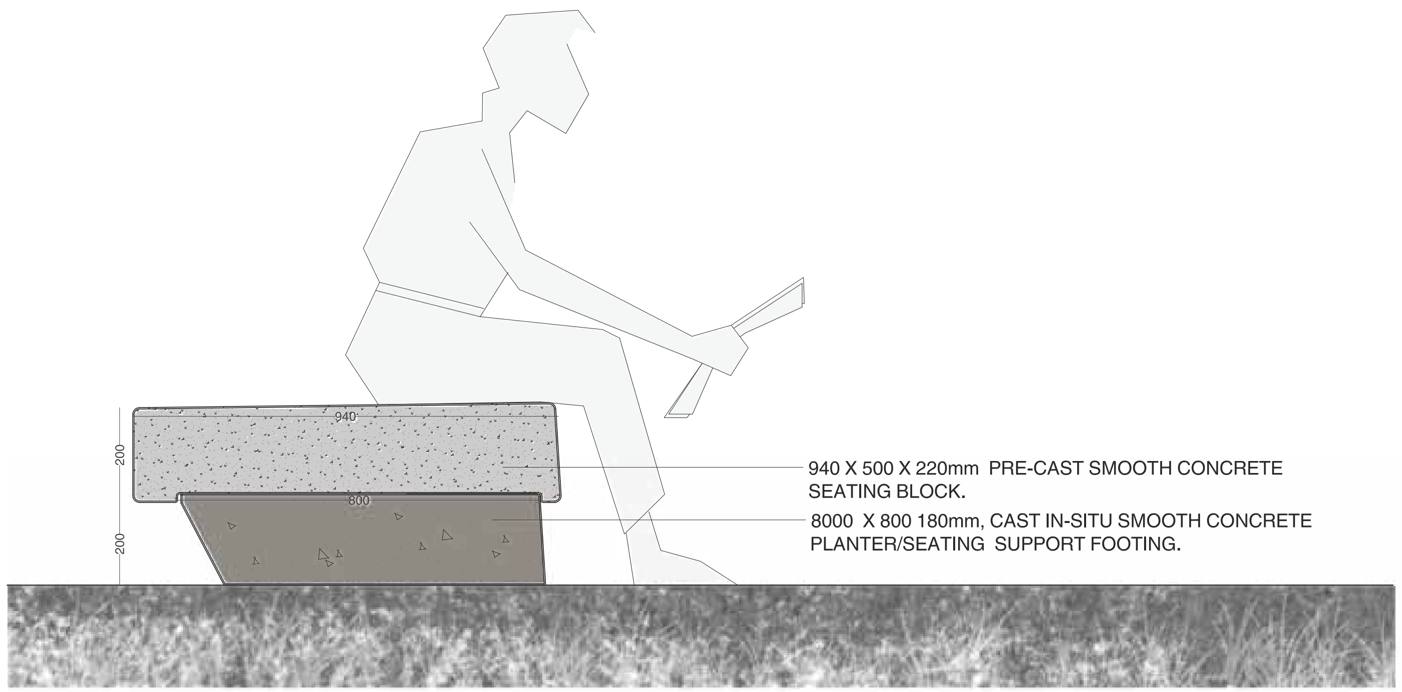
digester

> > > > > > scale 1 : 10

The digester detailing is more like a product design attempt, for the digester can be seen as street furniture; a planter – dustbin – seating combination. The digester needs to have a comfortable seating surface of concrete. A sturdy digester base in which the worms are housed and the planter combined could be of steel or of composite recycled timber resin slats as well. The trellis on which the plants grow can be a light-weight steel structure which varies in length and width dependant on the creeper screen requirements.

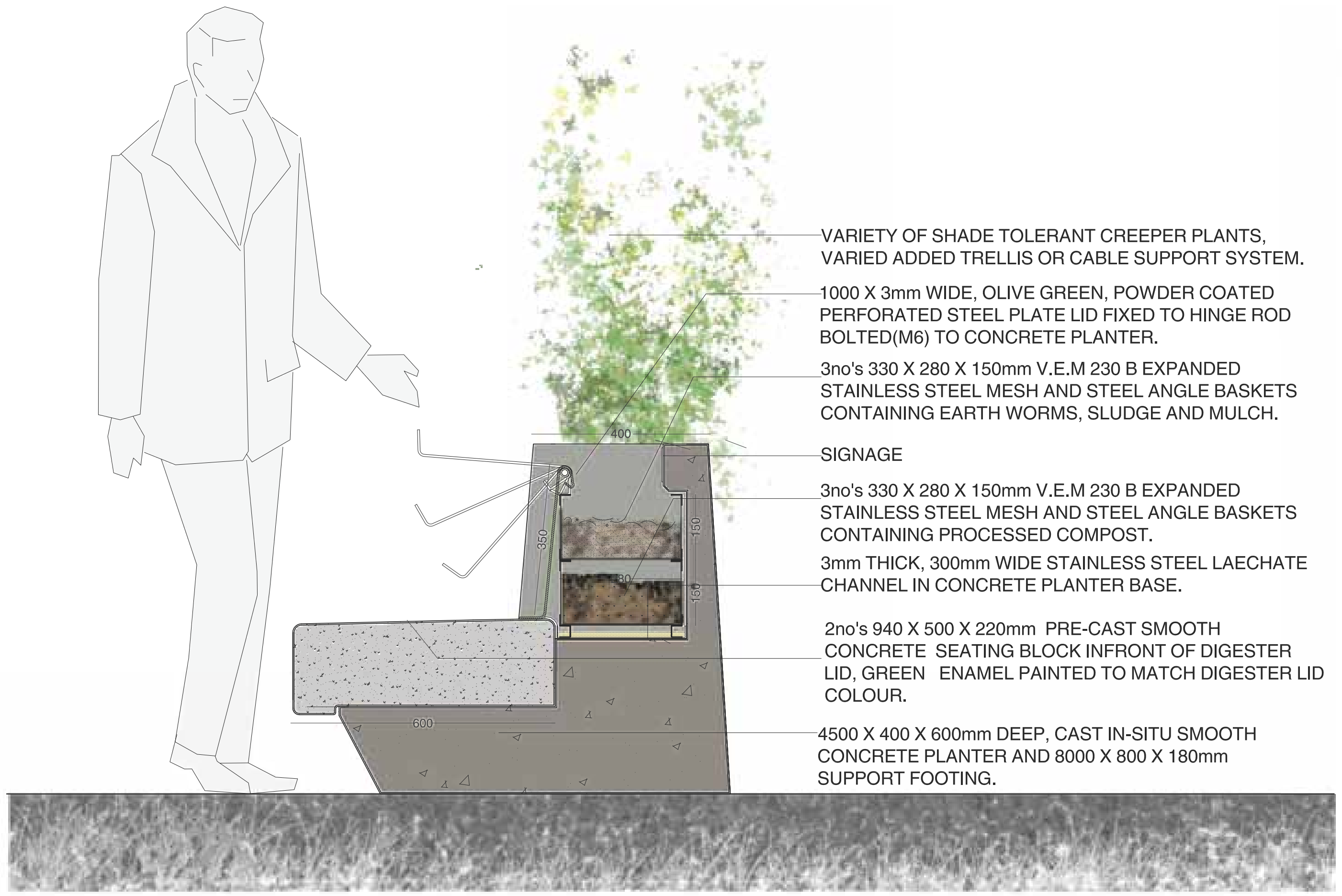


digester seating-planter elevation scale 1: 10



section A-A scale 1: 10

section B-B scale 1: 10



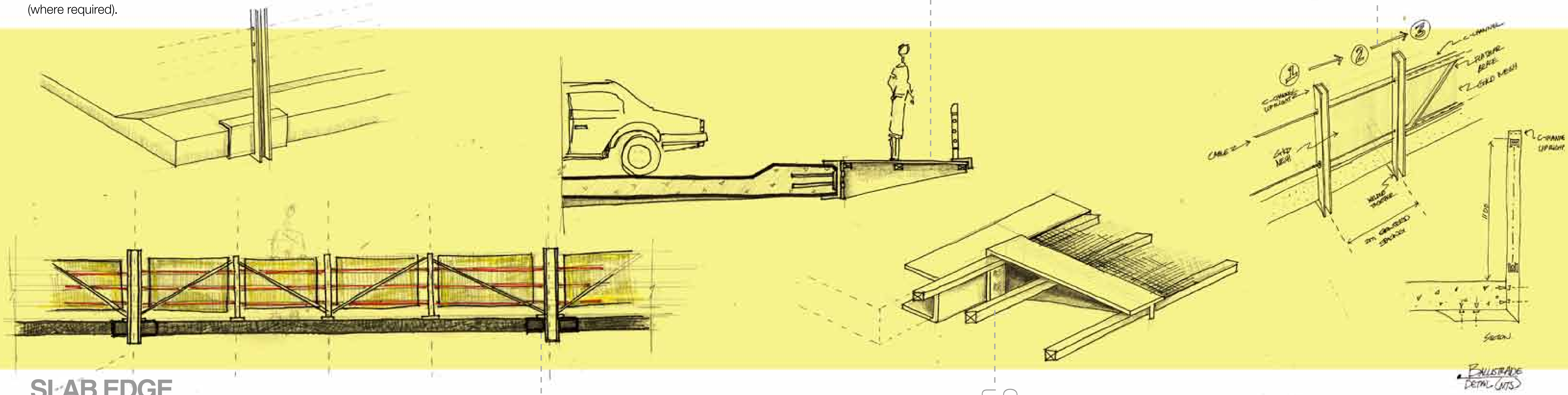
section C-C scale 1: 10

SLAB EDGE DESIGN

The slab edge houses the **conduit balustrade** which includes the electrical wiring for the charging of the electrical cars, as well as the cable structure for the safety buffer which prevents the cars from driving over the edge. Thus the **slab edge is thickened with reinforced upright balustrade supports** with tensioned cables and a GKD mesh cladding (where required).

walkway on slab edge

balustrade assembly

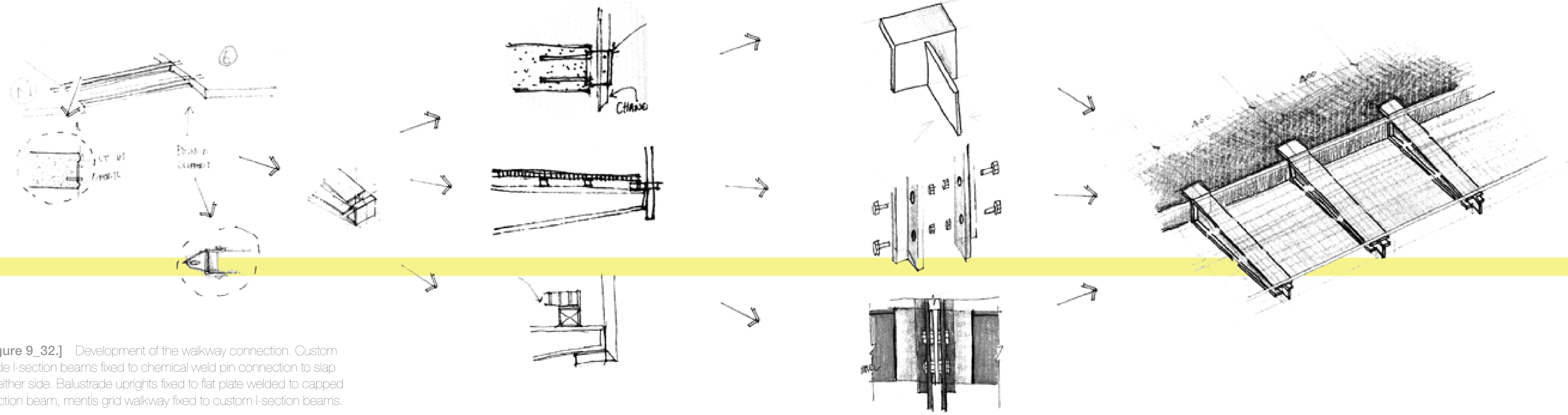


balustrade system

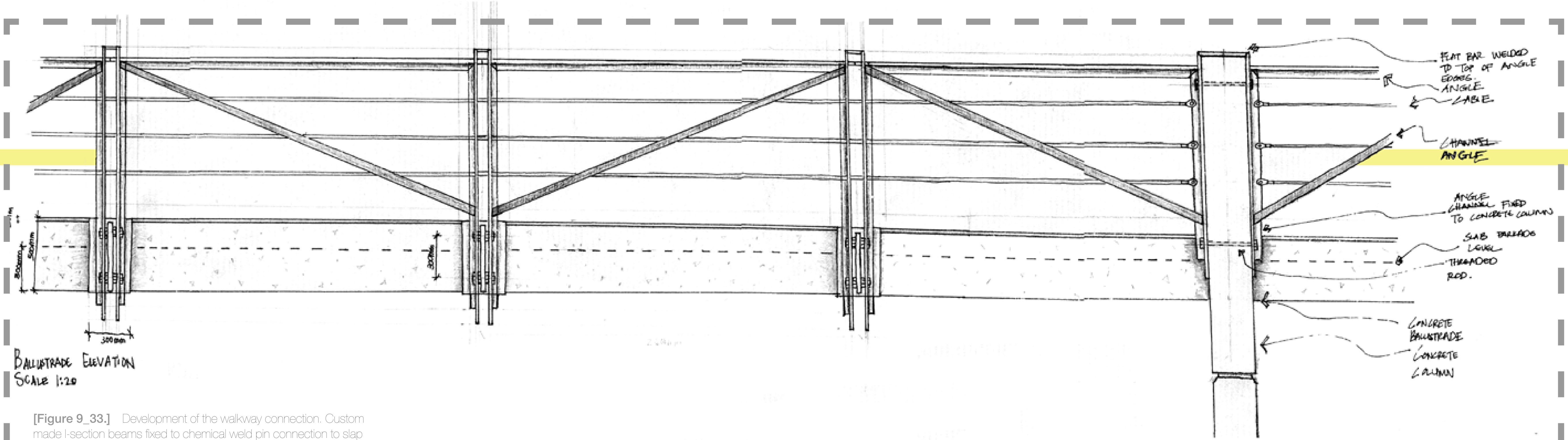
walkway connection to slab

SLAB EDGE EXPLORATION

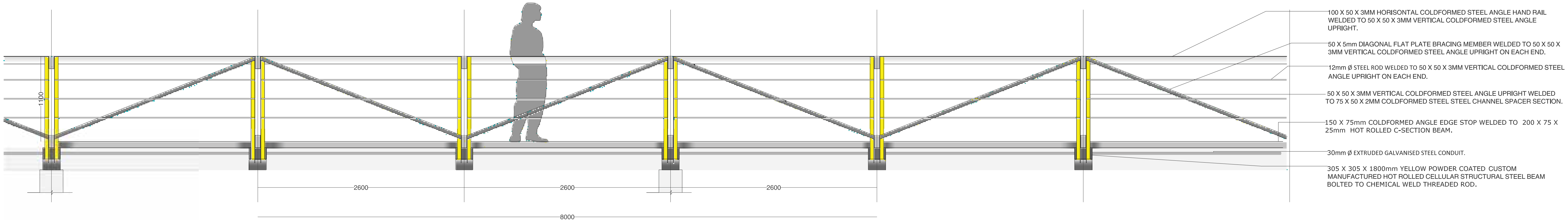
[Figure 9_31.] Sketch collage of slab edge, thickening concrete edge to create buffer stop for cars. Balustrade fixed to slab edge supporting a cable structure spanning between the concrete column supports.



[Figure 9_32.] Development of the walkway connection. Custom made I-section beams fixed to chemical weld pin connection to slap on either side. Balustrade uprights fixed to flat plate welded to capped I-section beam, mentis grid walkway fixed to custom I-section beams.



[Figure 9_33.] Development of the walkway connection. Custom made I-section beams fixed to chemical weld pin connection to slap on either side. Balustrade uprights fixed to flat plate welded to capped I-section beam, mentis grid walkway fixed to custom I-section beams.



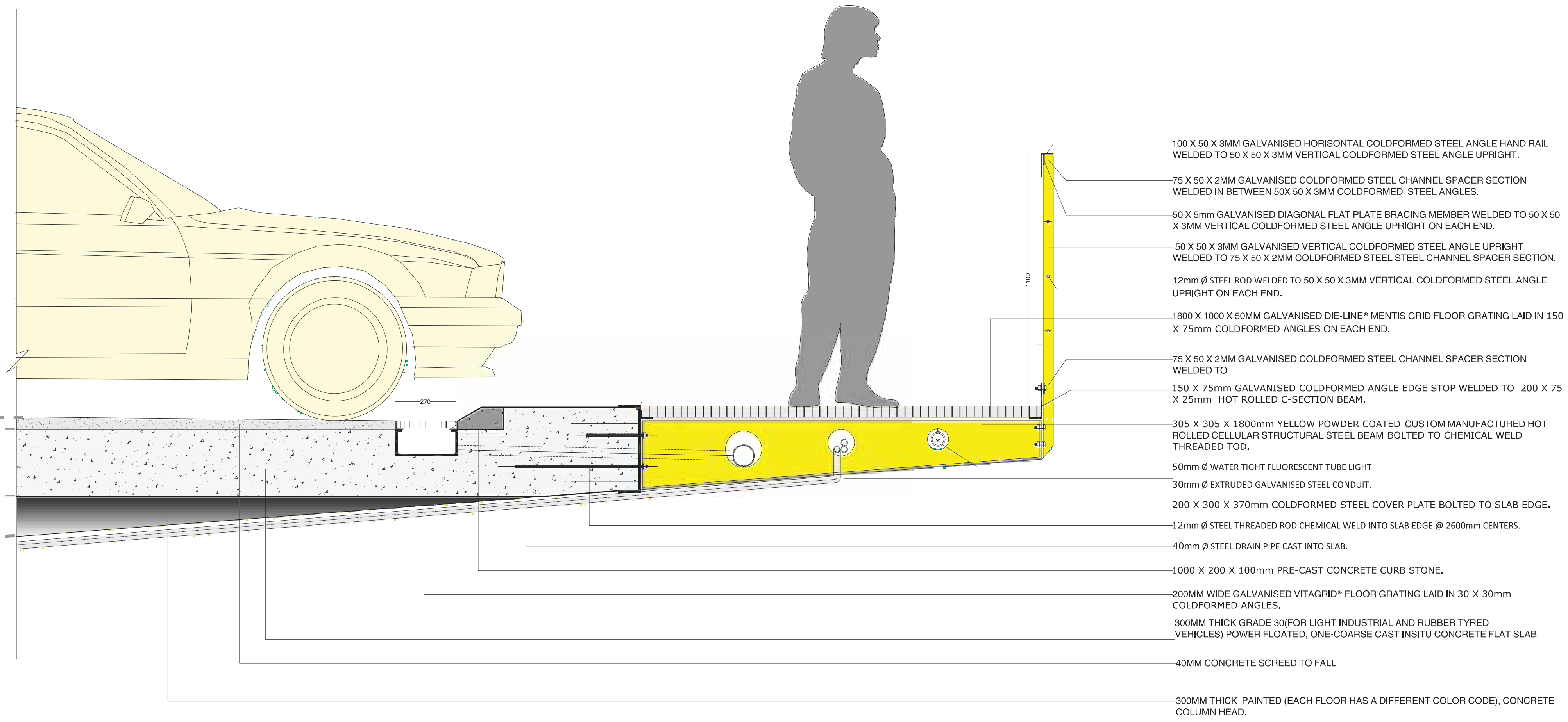
balustrade and slab edge elevation scale 1: 20

> detail > 4

slab edge

scale 1 : 10/20

The slab edge houses the cable/rod structure for the safety buffer which prevents the cars from driving over the edge. Thus the **slab edge is thickened with reinforced upright balustrade supports** with tensioned cables/rods.



balustrade and slab edge section scale 1: 10

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in retrospect... ________[10]____________________[Conclusion]____

____[10.1]_______ ____[10.2]_______

___DISCUSSION___________ ___FUTURE VISION_________________

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[10.1] DISCUSSION
THE SOLUTION?

The proposed aims and objectives as stated previously (p.20) were to:

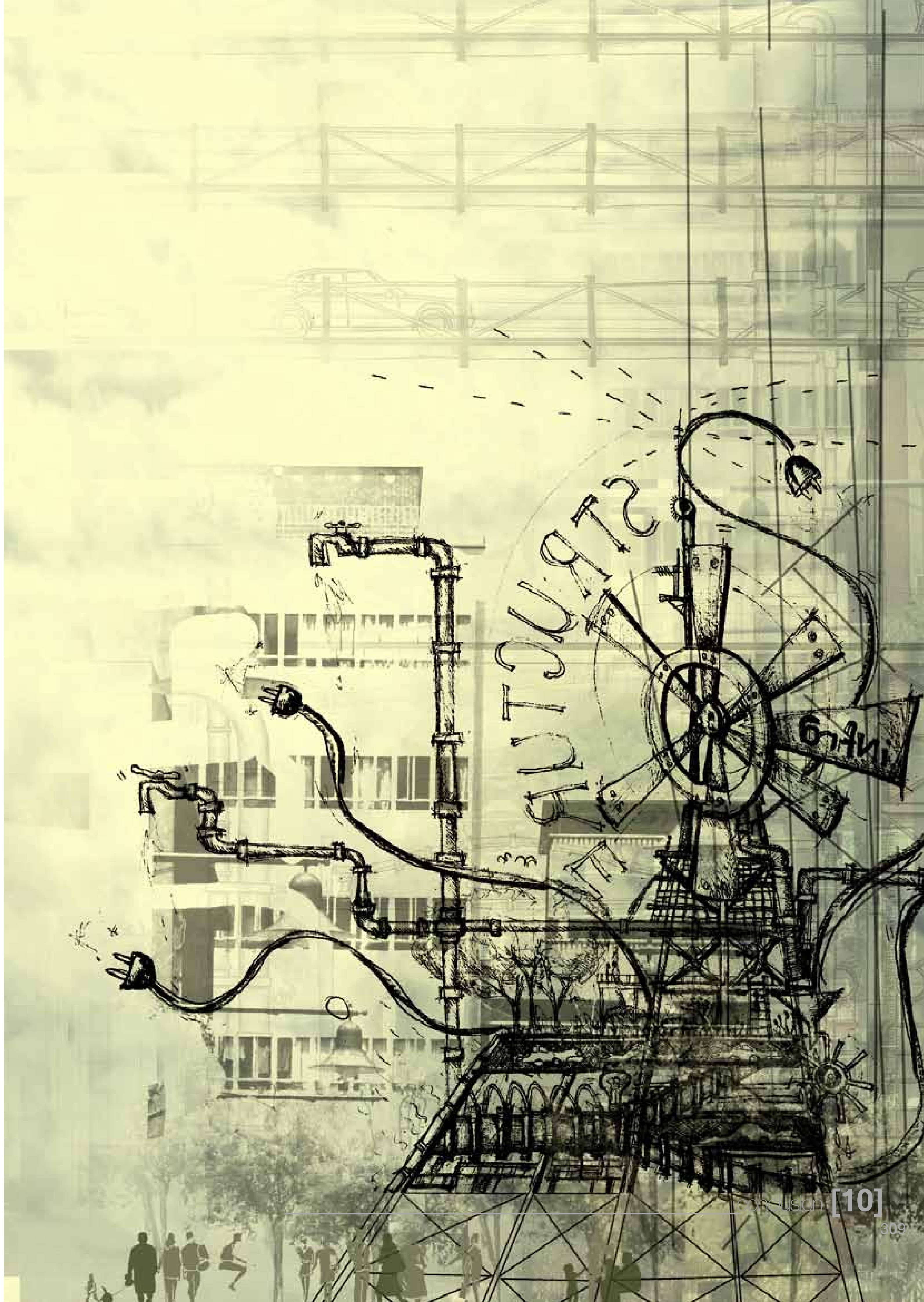
- _**Re-imagine green infrastructure** as a means to create place.
- _Address the **sustainability of existing structures** in the urban landscape.
- _Experiment with the idea of creating a structure which is woven into the urban fabric which can **generate and supply resources and services on a local scale.**
- _Research the ability of contemporary sustainable technology and techniques to **sustain large quantities.**
- _Attempt to **lessen the current demand, usage and wastage** of non-renewable resources supplied by infrastructure.

In retrospect one can now critically evaluate each of these aims and objectives within the intervention. The degree of success of these aims is debatable, but in the scope of the project every aim was addressed on some level. Some aims were achieved on a **qualitative** level whilst other aims were achieved on a **quantitative** level.

The design is a **services structure** which provides a number of services to the surrounding buildings. The building acts as an infrastructural system, it provides **physical resources** like water and energy as well as **social and logistical services** like public space, public restrooms, loading facilities, parking and commercial services. The structure is linked to the existing fabric via pedestrian bridges. These bridge connections provide the host structure with 'conduits' connecting to all the buildings on the block. Through these 'conduits' the structure provides water, digestion of sewage and organic waste and facilities for solid waste collection as an **on-site closed cycle**.

The entire site's resource requirements was met except for the energy demands of the buildings, because there is no current, appropriate and existing technology to provide enough energy for the entire site. Apart from this exception, the site has been **transformed into a productive space that is independent of any external infrastructural systems**.

The public space and services provided by the intervention ensures better and secure access, parking services, open spaces, pocket parks, public change rooms and cyclist facilities. These 'dwelling places' are designed and envisioned to **not only serve the user practically but also phenomenologically** These places are not just voids which has been given shape by solar panels, water tanks and dustbins. They are programmed spaces integrated with the systems of tanks, panels and bins which facilitate a space rendered by light, sounds, smells, textures and rituals, **spaces for production, experience and living**.



[Figure 10_1.] Integrated Infratecture.

[10.2] FUTURE VISION
IMAGINE...

The future vision of this project draws two opposing ideas together. The first endeavour is that t**echnology must be optimised**, re-thought and applied to create a better urban environment. This must manifest in combination with the second initiative, that the **ideological 'countryside living' notion must be brought back to the city**, whereby people return to a simpler smaller scale of living where one's resources are in one's 'back yard'.

If every single city block, or every second or third city block housed interventions similar to the proposed intervention it would result in a **larger scale 'off-grid' city system.** Less resources would thus be extracted from unspoilt natural areas and service systems are closer to the user. As the proposed intervention also endeavours to provide public space, green space and even eventually agricultural space as an initiative of the municipality it would result in the supply of **better neighbourhoods in all urban areas** and not just selected economically strong areas.

It is also the vision of the project that the intervention should **evolve with time**, as demand and circumstances change. For example, this specific proposal could after ten or twenty years of improved city infrastructure and public transportation systems loose it's obligation to act as a parkade, but change its function to a new contextual need. A portion of the parkade or even the whole building can then be transformed into, housing, classrooms or even offices for the expanding surrounding office blocks.

There could be many different scenarios for future development and interventions but the main future aim is that an intervention like this proposed project could be designed not just to **improve the urban environment** but to **bring about change in how we live in cities**, how we circulate, how we think about and use resources.

Imagine a city where we can slow down but still be efficient, where we do not create enclosed 'havens' to hide from the city but use the city as our haven, where we go outside and share the sky and feel the wind.

[Figure 10_2.] Green infrastructure of the future, small scale green spaces, pocket parks and open public spaces which are closer to the user and creates links in-between the larger scale green networks.

[Figure 10_3.] The urban outdoors.

borrowed words and thoughts______[11]__________________

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LIST OF FIGURES

CHAPTER 4

CHAPTER 5

CHAPTER 6

CHAPTER 7

CHAPTER 8

CHAPTER 9

CHAPTER 10