THE JOHANNESBURG GAS WORKS

Restoring Significance through Restitution

Nellis Basson

2017

THE JOHANNESBURG GAS WORKS

Restoring Significance through Restitution

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Submitted in fulfilment of part of the requirements for the degree of Master in Architecture (Professional)

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Project Summary

Programme:	Culinary Aromatic Plant Oil Extraction & Infusion Facility
Site description:	The infrastructure of the 1928 retort house at the Johannesburg Gas Works
Site Location:	Johannesburg Gas Works
Address:	Egoli Gas, 1952 Annet Road, Cottesloe, Johannesburg, South Africa.
Coordinates:	26°11'23.45"S; 28° 1'11.57"E elev. 1711 m
Research field:	Environmental Potential, Heritage & Cultural Landscapes
Client(s):	Egoli Gas as the owners of the site
	City of Johannesburg
	University of Johannesburg
	SACA (South African Chefs Association)
Keywords:	Johannesburg Gas Works, restitution, regeneration, aromatic plant oils, culinary
Theoretical Premise:	Regenerative, adaptive reuse of the abandoned infrastructure of the Johannesburg Gas Works
Architectural Approach:	The investigation and exploration of abandoned heritage architecture in the historic inner city of Johannesburg and the adaptive potential it entails in reconnecting it with the city and society

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

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

I further declare that this thesis is substantially my own work. Where reference is made to the works of other, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

Nellis Basson

"The earliest periods of human history are defined by the archaeological evidence for fundamental changes in the ways in which people made objects, and the importance of conserving and studying the evidence of these changes is universally accepted.

... The Industrial Revolution was the beginning of a historical phenomenon that has affected an ever-greater part of the human population, as well as all the other forms of life on our planet, and that continues to the present day.

The material evidence of these profound changes is of universal human value, and the importance of the study and conservation of this evidence must be recognised."

(TICCIH, 2003).

Abstract

Cities keep expanding as people move towards more desired locations on the outskirts, resulting in abandoned, dead nodes within the city centre. These buildings are left to deteriorate, especially those of heritage and cultural importance. Designed with a very specific function in mind, industrial architecture is mostly removed from society, hidden behind infrastructure. The process and economics are what drives the architecture.

But what happens when this industry fails, or become of no value to mankind? What is left behind except for the scarred ecology? This architecture that was specifically designed for this mono-functional purpose? Decay sets in: what was once a producer becomes no more than a relic - socially abandoned because it was never social to begin with.

The growth in technology as well as the realisation that many of the ways in which old industries used to function has had an immense negative effect on the environment. A calling for new, better ways of doing things were needed; though it has left our city landscapes scattered with industrial objects, from mine dumps to power plants, abandoned and without purpose.

There is an ethical responsibility that should address this and to reactivate these areas by re-appropriating these nodes by making them into desired locations for businesses as well as residents. The challenge being in finding an appropriate use for such nodes that will help the city flourish.

Re-appropriating such architecture will put a new focus and livelihood on it, as well as its surrounding precinct. By utilizing and re-appropriating the architecture, it will eliminate, or at least lessen, the chances of it becoming another abandoned monument.

This dissertation will highlight and investigate the importance of industrial architecture as an object of heritage for South Africa. This will be done by looking at the manner in which the architecture at the Johannesburg Gas Works can be re-purposed and re-imagined in contributing to an ever-evolving city and its people, by giving the existing structures a new purpose. There is therefore a need to keep the heritage of the Gas Works alive because the architecture, and the site as such, has become obsolete to the purpose it was built for.


Elize Basson
2017

To my parents for all the support they have given me throughout
my life and in setting a precedent for success.

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AN INTRODUCTION

Chapter 1

1.1 A City Abandoned

Our cities keep expanding as people move towards more desired locations on the outskirts thereof. This can be attributed to the perception that our cities are becoming more dangerous, with Johannesburg ranking amongst the top 50 most dangerous cities in the world (le Roux, 2017). This relocation to the outskirts leaves the inner city abandoned which in turn becomes a hub for criminals. The end result leaves many dead nodes within the city centres resulting therein that many buildings are left to deteriorate, especially those of heritage and cultural importance.

It may be argued that architecture, how significant it may seem to be, seems to become abandoned. Should the building(s) be part a of our heritage, the fate of many thereof (especially those in the inner-cities) is simply to be left desolated and abandoned whilst standing empty without upkeep and purpose. City sprawl is an ever present reality which unabatedly continues with the result that valuable land, stands and spaces of value stand empty. Especially buildings simply become an empty space that is not used or positively utilised.

We need to reactivate these (abandoned and desolate) nodes by re-appropriating and turning it into desired locations for businesses as well as residential purposes. Appropriate programs should be implemented which will benefit the city, not only on a social level, but also economically. The re-appropriation of the architecture in these nodes will not only lead to a new focus and livelihood, but will also change the image of the area, including the immediate surroundings. By utilizing and re-appropriating the architecture, it could/would eliminate the possibility of it becoming another abandoned monument.

This dissertation will focus on one such a site within the City of Johannesburg namely the Old Johannesburg Gas Works which is situated in Braamfontein Werf. The manner in which this site could be regenerated, will be explored in the following chapters in order to explore and find the potentials of what a site such as the Gas Works could become as a successful regional node for the City of Johannesburg.

1.2 Problem Statement

The Re-appropriation of abandoned architecture is an extremely relevant and important subject in our present time and age. We as humans must realise that we cannot simply keep on expanding in the fashion we currently are. We need to use, reuse and recycle, not only our resources, but our architecture as well.

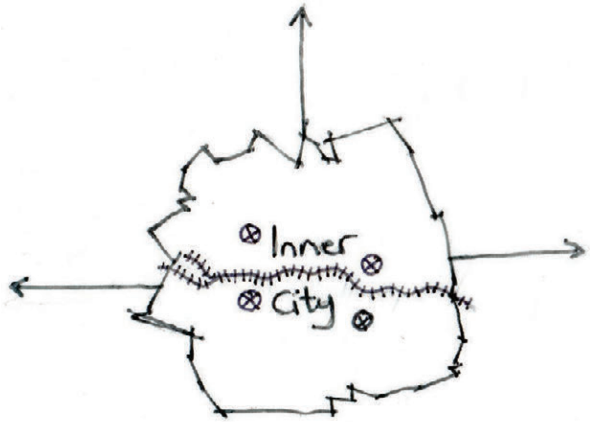


Fig 1 The City sprawling leaving abandoned nodes

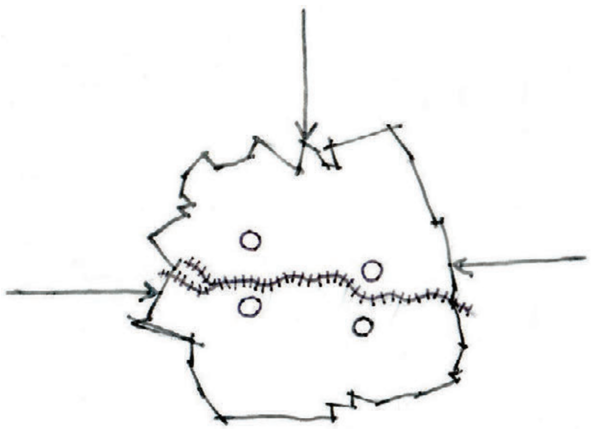


Fig 2 The City nodes reactivated

1.3 The City as Nucleus

In order to better understand the underlying problem why abandoned nodes, such as the Johannesburg Gas Works within the historical core of Johannesburg exists, it is important to understand how the city came to be.

1.3.1 The Origin of Johannesburg

After the founding of Johannesburg in 1886, a steady stream of people rushed to the city, resulting in the fast expansion of the settlement (RAU, 1977). Hundreds of miners, joined by traders, adventurers and a displaced rural peasantry rushed there, seeking fortunes and employment after the discovery of gold in the 1880 (Newtown Heritage Trail, 2010).

The railway played an important role in the development of the city and its suburbs (RAU, 1977). Trains transporting people and cargo arrived in Johannesburg for the first time in 1892 with the completion and opening of the railway line which ran from Delagoa Bay and which stopped at Park Halt, the origins of Park Station (Chipkin, 2008:25). The Johannesburg Station and the Braamfontein railway yards thus formed an effective buffer for the growth of the inner city (RAU, 1977) whilst confining it within these borders.

Not enough space was initially set aside for small industries. As a result businesses industries, (as trade and industry began to flourish) towards the turn of the century started to encroach on (and take over) residential wards. (RAU, 1977).

In late 1888, the ward of Braamfontein was established just north of the railway on the farm Braamfontein. The farm of Braamfontein was divided into three parts that were sold and divided between 1887-1889. Before the turn of the century, the University of the Witwatersrand, the show grounds and the new Gasfabriekstraat came to be on the portion of Braamfontein Werf (RAU, 1977). It is said that Braamfontein Werf was Johannesburg's first government suburb outside the boundaries of Randjeslaagte. Due to lack of control over the destination of sites, the suburb developed into an industrial ward (RAU, 1977).

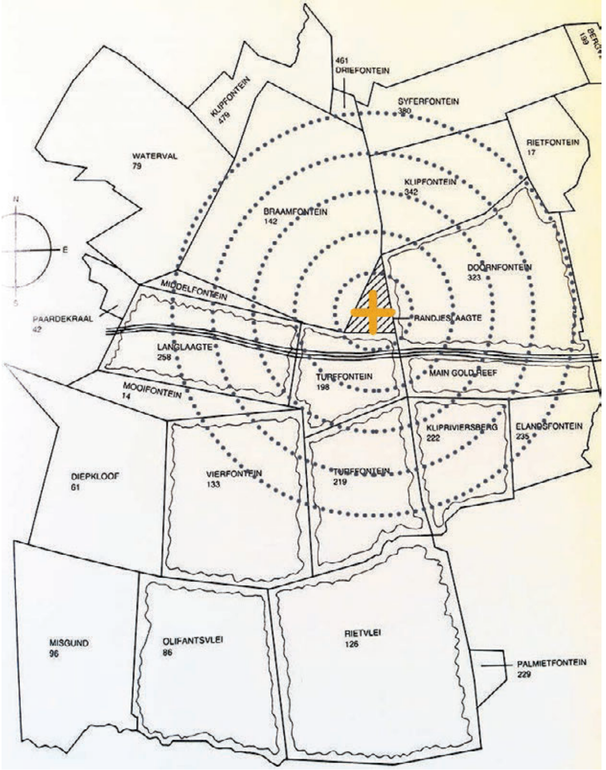


Fig 3 1886 farm portions prior the gold rush

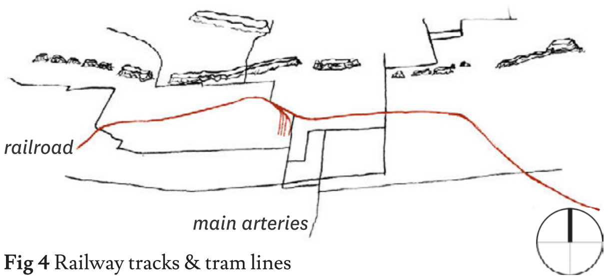


Fig 4 Railway tracks & tram lines

1.3.2 The Era of Industry

"Structural steelwork was enveloped with cladding or walling, all with standard industrial fenestration and roof ventilators. Bulk extractive materials from the ball mills were handled on inclined Euclidean geometry conveyor bridges. Receptacles and containers were everywhere: gravity-feed hoppers, bunkers, bins, large circular tanks and networks of tubular feed piping. Steam power, furnace heating and smelters required vertical, cylindrical fume stacks and flues and these, with head-gear and the mountain range of man-made tailings, were the characteristic signposts of the Rand."

Chipkin (2016:3)

In his introductory chapter in The Johannesburg Gas Works by Läuferts le Roux & Mavunganidze (2016), Chipkin (2016:1) states that the industrialisation on the Rand was dominated by the vast scale of the gold mines and the large-scale infrastructure that it brought with it.

It is said that the extensive industrialization programme on the Rand in the twenties and thirties created the pre-conditions for modernity as a concept in a grossly unequal society (Chipkin, 2016:2). The growth was spectacular, even by international standards. Chipkin (2016:2) states that it was observed by D.H. Aldcroft (Author of *The British Economy 1870-1939*) that, over the period 1919-1939, the South African economy was one of the most buoyant in the world, largely due to the massive drive towards its industrialization.

The generic forms of the Rand industrialisation comprised symptomatic building complexes on the veld, differing in its height, volume and the complexity, linked by the venerable Main Reef Road (Chipkin, 2016:3). The giant Johannesburg Gas Works became operative in 1928, after the first part of the project was completed (Chipkin, 2016:3). The larger expansion programme took three decades to be accomplish, and lasted well into the 1950's.

1.3.3 A Steady Decline

According to the World Bank Group (2015), the Inner City experienced severe decline beginning in the early 1950s, when the City Council decided to move to an outlying neighbourhood. Steyn (2015) states that many corporates also left the city for greener pastures and, at the time, lower rates, in Sandton, which is still today, very much desired. City sprawl continues to happen around our cities as people move to more desired locations; leaving the heritage of our cities behind.

It is not difficult to observe, as one drives through our cities, that a substantial amount of architecture, how significant it may seem, stands abandoned. Buildings are left desolate without upkeep and purpose, inviting unwanted criminals and the consequent destruction in their wake. After the establishment of democracy, new residents from faraway townships moved into the Inner City (World Bank Group, 2015). It is said that some of these people, together with immigrants from other countries, started squatting in these abandoned buildings. The inner City experienced an ever expanding decline of public spaces, lack of service delivery, high crime rates and a consequent sharp decline in investments. These combined factors resulted in the closing off, of not only these buildings, but also the surrounding areas with 24 hours security being implemented in areas such as the Maboneng precinct. The result is that many buildings were left to deteriorate, especially those of heritage and cultural importance.

But all is not negative and despair. The World Bank Group (2015) states that the historic core of Johannesburg has become the centre of economic activity in the Metropolitan Area. This was due it stated, to regeneration efforts led by the private sector over the last two decades. It also hosts many small businesses and local retailers which are owned mainly by the lower income segment. Initiatives (such as the upgrade of Main road with its big businesses) by the City of Johannesburg has also proven to be successful. Steyn (2015) argues that while there have been major improvements over the past decade, property owners contend that the existence of bad, abandoned buildings continues to hold back the regeneration of the inner city.

1.4 The Issues at Hand

Abandonment is what remains when there is no longer a need for that which was. This result in a slow decay of something that was once loved. The Johannesburg Gas Works was once a major provider for the City, losing its purpose as technology has evolved. Though the site is still used as a media of gas distribution, its derelict, decaying structures lay empty upon a scarred landscape, closed off from its surroundings because it has become a place of danger.

1.4.1 Urban Issue

Braamfontein has undergone a large re-generative process during the last decade which makes the area a well sought after district in the city. But then so in only one such area which is located on its Eastern boundary in Juta street. The suburb of Braamfontein Werf, on the other hand, which is situated between the University of The Witwatersrand and the University of Johannesburg, south of 44 Stanley (a recent regenerative project), has been left behind, largely due to the on-site pollution and the difficulty for the owners to decide on what they want to do with this site.

This urban space could become a major link between the Universities and poses a plethora of urban opportunities that could be explored on a landscape and architectural level. With numerous previous proposals for a larger framework in the precinct, such as that of the Empire Corridor by the City of Johannesburg, prospective positive things are busy happening in and around the area.

The Urban Vision

The current isolation of the site and the empty shells of industry abandoned and left to be consumed by the ravages of time and nature, almost create the surreal visual of the buildings surrendering to that which it once oppressed - nature.

This site provides the perfect opportunity for restitution between, not only industry and nature, but also industrial heritage and the city dwellers. Applying the principles of regenerative architecture we are challenged by the idea of a new typology for abandoned industrial heritage sites such as the Old Johannesburg Gas Works.

(See Chapter 2.14 on page 55)

1.4.2 Architectural Issue

Architecture is often left to decay simply because some perceptions exist that developers prefer to rather develop and build something new rather than re-imagining the existing. Leading architecture (2011) mentions that in the redeveloping of the Thesen Sawmill, the architects remarked that it is usually much easier to start from scratch whilst stating that the developer was very brave on this project. Reconstructing previously built spaces are often not seen as being financially viable. The costs associated with demolition and the sensitivity of such sites, can put a project far beyond budget.

Yet, there are success stories. But two examples are The Old Biscuit Mill (in the City of Cape Town) and the Maboneng precinct (in Johannesburg). These two projects have been immensely successful in re-imagining the existing to adapt to the changes within the cities, giving existing structures a new purpose. Re-imagining of the Gas Works and incorporating it within the precinct could make it an important node within the city.

The technology of the site has become obsolete. Technology has changed and become environmentally more friendly as manners to acquire gas has become the way of the future. The structures on site were designed for a very specific purpose which influenced the form. It is clear from the design of these structures that form, or in this instance at least, follow function. The challenge is how architecture that was used to build for such a specific function, could be turned around to follow a new one.

Finding ways in which to use industrial architecture - often seen as a negative reminder - can create a new memory for a positive future. This will create a place that attracts people to partake in its legacy. A new industry could create a new type of experience in such a way that connects with the environment; architecture that lives in cohabitation with its surroundings, supporting one another.

1.5 Intention of this Dissertation

The dissertation will focus on the manner in which architecture of the past can be re-purposed and re-imagined to contribute to an ever-evolving city and its people, by giving the existing a new purpose. The architecture at the Johannesburg Gas Works, and the site as such, has become obsolete as the purpose for which it was built, no longer exists. In creating a new interchange it has the potential to be able to reconnect and open new doors within the city.

In dealing with heritage, a central theme of remembrance will drive the projects, such as to how it could inform a celebration in a non-museum like manner. Industry past and industry present, how these two can intertwine to form a new type of celebrated productivity, a hybrid as such. The Issues at hand asks for the establishment of a relationship between industry and ecology that would allow for a beneficial coexistence where they support one another, all the while celebrating the heritage that is the Gas Works.

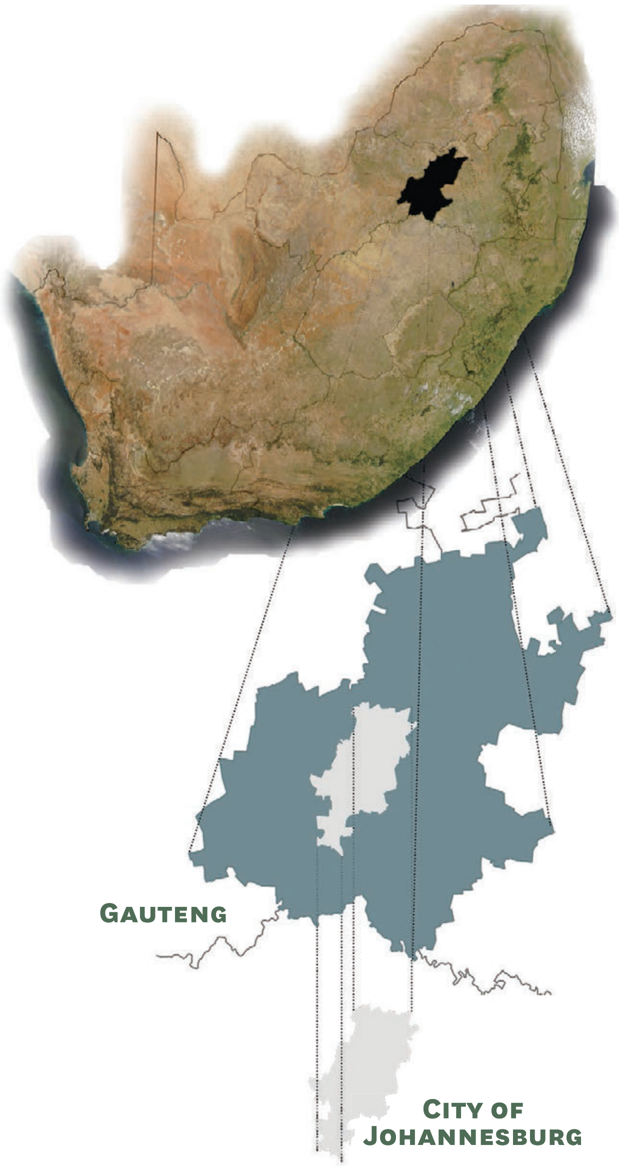


Fig 5 Locating the City of Johannesburg Metropolis

1.6 The Site

The industrial processes of converting coal to gas has left remnants of its destruction on site in the form of tar and other pollutants. Due to the intensive process of remediation that reoccupation would require, the site has become a relic, frozen in time. Even though the Gas Works node played an important role in the development of Johannesburg as a city, as a provider for the city and an icon of its time, it has become irrelevant in its function as well as in its architectural form, (like so many other industrial sites).

What was once a productive site that provided for Johannesburg, has become an abandoned industrial corpse within a valuable urban setting, due only to its failure to keep up with changing technology. The Gas Works precinct is envisioned as a site of restitution, where relationships between the industrial past and the environment needs to be mended. The focus of this dissertation will be on the 1928 Retort, the first retort that was built on site.

1.7 Program

Within the heritage core of the Johannesburg Gas Works, Retort 1 (Fig 6) borders Annet road which will become an important link that focuses on the connection and interaction with the public. This linking edge will form the buffer between public serving functions and accommodation.

As an icon of pollution, there is a need for a restitutive relationship in order to make it safe for the public in order to take full advantages of the site. There should therefore be a mutual beneficial relationship between the industry of the past and the ecology of the present.

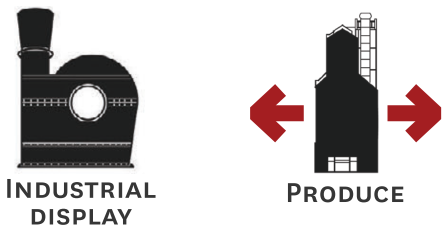
A program that support and help the landscape (Nature help architecture help nature) by reprogramming the existing to restitute past relationship of exploitation by creating a symbiotic relationship.

Fig 6 The first Retort, the Johannesburg Gas Works

The co-existence of industry and ecology aims to produce natural systems that could form an agricultural base for natural production.

The programs proposed will follow a productive nature, such as an aromatic plant oil extraction and infusion. The building will become highly interactive as a gathering space where visitors can experience in the process by means of their senses: see, touch, smell & taste.

The program will act as a civic space for the site, as an extension for the community and the surrounding. The design will include elements of display/exhibit, integrated within the architecture and the site itself. Experiencing a palimpsest of historical layering.



1.8 The User

The location of the site, the programs surrounding it and a vision for a future node, the user group will include a variety of people, primarily young adults. They are the innovators and activators of space, the trend-setters that go where no other user would, experiencing the new and setting a benchmark for others to follow.

1.8.1 User profiles

1.8.1.1 The student

The everyday student is a young person who studies at one of the many Tertiary Educational Systems around the site namely Wits, UJ, AFDA & ATLAS. She is hard at work trying to make a future for herself. She is looking for a relaxing place to work, exercise and meet and catch up with friends.

1.8.1.2 The young working class

The young working person is somebody that only recently started working. She is *new money* and looking for a place to meet with friends, maybe even set up a business and meeting with clients. She also looking for a relaxing space in which to have brunch with her friends.

1.8.1.3 The creative person

The creative person is someone looking for a place to explore and exhibit his talents. He wants a place to practice his work and be creative in a trendy precinct. A quite place with a lot of things to do if he is looking for inspiration.

1.9 Research Questions & Objectives

1.9.1 Research questions

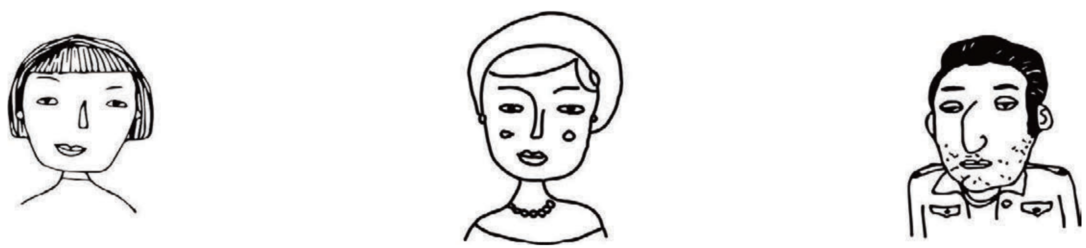
The aim of this dissertation is to find ways in which to regenerative architecture and could form a core unification between the environment, industry past (heritage), industry future, the city and its people. The dissertation aims to answer the following research questions:

- Can architecture designed for such a specific function (and which has become obsolete), become functional architecture of a very different nature and form?
- How can architecture from a past era be brought back and integrate and be reactivated in the present, whilst retaining its existing characteristics?
- Can the perception of a dilapidated, obsolete and dangerous site be changed to accompany a well-functioning thriving architecture?
- Could industry and social functions coexist and share the same space?

1.9.2 Objectives

The objective is to achieve a multi functional inclusive space that links and binds with the historic architecture of the Gas Works.

- Integrate a contemporary form and function in an industrial landscape.
- Create architecture that is both functional and aesthetic.
- To reactivate architecture from a past era and bring it to the present.
- Change the perception of place (perceived as being dilapidated, obsolete and dangerous) into a thriving well-functioning building.
- Stay true to the existing architecture.



THE STUDENT THE YOUNG WORKING THE CREATIVE

Fig 7 The typical users

1.10 Research Methodology

1.10.1 Qualitative

1.10.1.1 Hermeneutics

- Textual & narrative studies

Historical texts will be used to understand the context of the site in the context of the development of the City of Johannesburg.

A valuable (and almost only) source of information on the site and its structures was published in 2016 in a book: The Johannesburg Gas Works (Fig 8), by Monika Läuferts le Roux and Judith Mavunganidze from Tsica Heritage Consultants.

1.10.1.2 Ethnographic/phenomenological

- Field studies

Accessing the site will help to better understand its scale and the context a lot better, gaining respect for it as we progressed through the process of gas making. Living and experiencing the Genius Loci as we used the imagination to access the heritage context.

1.10.1.3 Contextualisation

- Case studies & Precedents

Researching similar sites around the world to get a better understanding of its potential future.

Studying proposed frameworks also helped to contextualise the Gas Works better by finding out where it is situated in the proposed future of Johannesburg.

1.10.2 Quantitative

1.10.2.1 Mapping & Visualisation

Mapping the site and its surroundings are important to understand its context within the city. This method will be used to understand aspects such as movement, traffic, the spatial economy, structures and vegetation.

1.11 Delimitations

There have been numerous frameworks, including ones by GAPP architects, Boogertman Architects and The City of Johannesburg in conjunction with Egoli Gas (as the owners of the site). These frameworks are still in the works and will have to be critically analysed in respect of decisions that have already been made regarding the site.

Four Architects, together with a Landscape Architect will be working on the Gas Works site. It is an enormous site. As such, the complete site cannot be resolved in its entirety. The areas not affected by the proposed programs, will be resolved on a conceptual level.

1.12 Limitations

There is a limitation on available information regarding the plans of the existing buildings. Due to this limitation, the existing structures will be drawn up digitally according to available information and will be taken further regarding the design.

1.13 Assumptions

The assumption is that Egoli Gas as the owner of the site will move to a new location on the outskirts of Johannesburg - as they have already began to acquire a potential new site to relocate to. The Johannesburg Gas Works will thus not be a distributor of gas any more. The three existing gas tanks will thus also be proposed to be re-purposed to form part of the new vision for the Gas Works node and as such form part of the new proposed architectural intervention.

The City of Johannesburg, as one of the clients, can still give incentives with regards to the larger framework for the precinct as proposed by the Empire Perth Corridor framework (discussed in chapter 2.9.2).

From our understanding of the site and our meetings with Läuferts le Roux (Heritage Consultant & co-author of The Johannesburg Gas Works), the site has been analysed in terms of what buildings on site can be demolished. This helps in better understanding the heritage sensitivity of the site and its structure and will guide the historical analysis of the site.

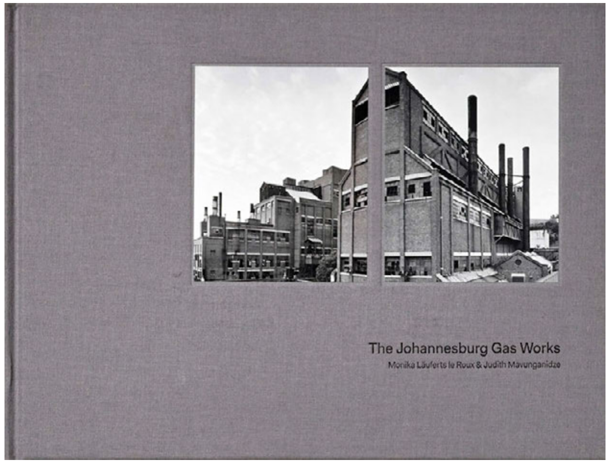


Fig 8 Cover of The Johannesburg Gas Works by Läuferts le Roux & Mavunganidze

CONTEXT

Chapter 2

2.1 A Vision For the Gas Works

In our masters group (the *Gas Works group*) our focus on understanding the Johannesburg Gas Works (the *Gas Works*) came from the idea that the Gas Works was once a major energy provider for the City of Johannesburg.

From our research of the City and the site, this massive energy plant that once served as a major energy provider for the City of Johannesburg, has become absolute in modern times and now only acts as a distributor of natural gas. Egoli gas (the current owners of the site) is looking to relocate the works to the outskirts of the city, which will mean the end of this historic site.

The *Restitution Park* urban vision focuses on the idea of different types of energies in the City of Johannesburg. As a way of reading and understanding the context, the group identified a lens of various types of energies to analyse the context according to our understanding of what each energy entails (see Fig 9):

- Nuclear energy is seen as the origin of Johannesburg and the Gas Works - all historic events that lead it to become what it is today.
- Kinetic energy is used to look at the activities around the site, movement patterns as such.
- Electromagnetic energy looks at the events that happen around the site - business, education, social aspects and spaces within the larger city.
- Renewable energy looks at the possibility of the site at becoming something new and what the potential of the site could become in dealing with its downfalls.
- Potential energy contains the Urban Vision and looks at the potential of what the Gas Works could become in the urban condition as well as for the City of Johannesburg.

Analysing the macro and micro context was then done by breaking it up into the various energies, so as to come to a *Urban Vision* for the Gas Works.

Analysis was done on its location within the city, routes leading to and from the site, public green spaces within the city, and other successful regenerative projects within the city. Public green spaces surrounding the Gas Works are mostly private, such as the many golf courses and other private sport fields, but open green spaces are few and far between.

The Gas Works was built to provide gas to the city. It was closed off from the rest of the city and there was little connection to the people. There was no knowledge as to what happened on site, as people used its produce, but didn't understand nor cared as to where it came from. The impact it had on the environment was largely unknown. Only in recent times were concerns raised on the effect it had on the ecology and natural environment. This is also something that need be addressed in the urban strategies and architectural design.

The urban analysis summarised the mapping of all variables of the Gas Works and spaces surrounding it. These were everyday movement in and around the site, production that still exists on the site, the interfaces between the site and the city. Nodes were identified as the best opportunity for connecting the site with the surroundings.

2.1.1 The Future Vision

The Gas Works group's urban vision focused on the theme of energy within the City of Johannesburg. Analysis was done on the various regenerative projects and landmarks within the larger city such as the Maboneng precinct, Juta Street in Braamfontein, the Newtown precinct and 44 Stanley (situated within walking distance from the Gas Works).

The aim of the framework is to:

- Build on the future vision of Johannesburg and to slot in with the *Empire Perth Corridor* as proposed by the City of Johannesburg.
- Redevelop a polluted landscape by bringing a new form of energy back onto the site.
- Build on a lost, disconnected space by using it to connect to the city.
- Redevelop a closed space into a well functioning public open space; as a connection between the various educational nodes surrounding the site.
- Connect the people of the city to the industrial heritage.
- Mitigate the feeling surrounding the site, seen as a past polluter, by creating an identity as a restitutor of past exploitation by celebrating and educating.
- Restitute ecological systems and the environment on the site that have been destroyed by the pollution, to facilitate new industry that act as a synergy between new industry and the environment.

2.1.2 The Mapping

Mapping was done of the various functions surrounding the site as well as in the larger City of Johannesburg to better understand and to isolate the problems within the city where the site is situated, public open spaces and functions within the city.

By looking at other initiatives within the city of Johannesburg and the Gas Works Site, an initiative was developed to what is believed will be a valuable asset to the precinct, as well as the larger city.

From the mapping that was done, various observations were made about the Gas Works site within its urban context:

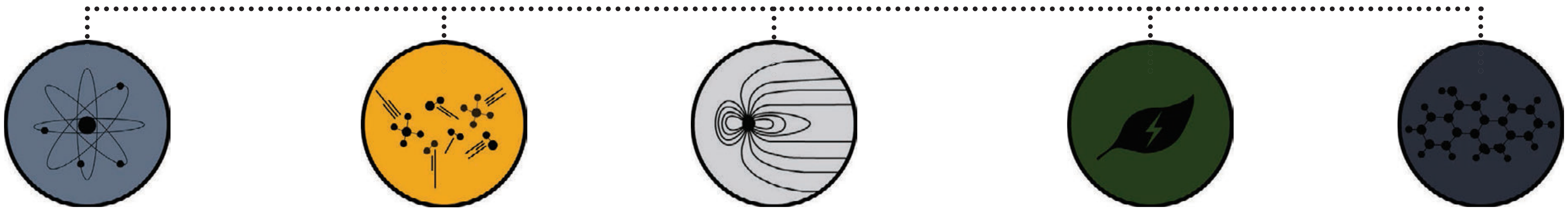
- The site is completely removed from the surrounding functions.

- There is a lack of open green spaces within the city, and those that are there, are few and far between.
- The privatisation of land has created a disconnectedness between man and nature, but also man and industrial heritage.
- The soil on the site is polluted and not suitable for planting, or even direct interaction.
- There is a disconnection between ecological systems and the industry due to past relationships of exploitation (Fig 62 - Fig 66).
- Through this disconnection the public have not been able to partake in the heritage of the Gas Works. A lack of interest from the City, and the prime location of the site, for development, could mean the end of this monumental site.

ENERGY
/ˈɛnədʒi/

noun

1. The strength and vitality required for sustained physical or mental activity.
   synonyms: vitality, vigour, life, liveliness, animation, vivacity, spirit, spiritedness, fire, ardour, zeal, verve, enthusiasm, zest, vibrancy, spark, sparkle, effervescence, exuberance, buoyancy, sprightliness;
2. Power derived from the utilization of physical or chemical resources, especially to provide light and heat or to work machines.
   "nuclear energy"
   synonyms: power



NUCLEAR
/ˈnjuːklɪə/

noun: **nuclear energy**;
plural noun: **nuclear energies**
The energy released during nuclear fission or fusion, especially when used to generate electricity.

KINETIC
/kɪˈnɛtɪk,kʌɪˈnɛtɪk/

noun: **kinetic energy**; *plural noun*: **kinetic energies**
Energy that a body possesses by virtue of being in motion.

ELECTROMAGNETIC
/ɪˌlɛktrə(ʊ)magˈnɛtɪk/

adjective: **electromagnetic**;
adjective: **electro-magnetic**
Relating to the interrelation of electric currents or fields and magnetic fields.

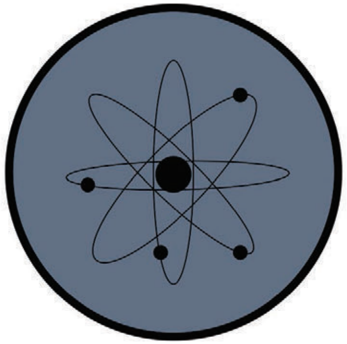
RENEWABLE
/rɪˈnjuːəbəl/

noun: **renewable energy**
Energy from a source that is not depleted when used, such as wind or solar power.

POTENTIAL
/pə(ʊ)ˈtɛnʃ(ə)l/

noun: **potential energy**
The energy possessed by a body by virtue of its position relative to others, stresses within itself, electric charge, and other factors.

Fig 9 Energy lenses



'NUCLEAR'

- The Rapid Growth of Industrialization
- The Development of the Gas Works
- Historic Timeline of Development

2.2 Johannesburg on the Brink of Industry

2.2.1 The President Street Gas Works

It is stated (Läuferts le Roux & Mavunganidze, 2016:17) that on 15 October 1888, a fifty-year concession was signed by the President of the Transvaal. Two men, Dawson and Hamilton, were given the exclusive right to produce and distribute gas to power the street lights in the burgeoning mining town of Johannesburg. This was the first Gas producing works, (in President street in the City of Johannesburg) and only the second one in South Africa other than the Cape Town Gas Works (Fig 78) which was built in the same year.

The construction of this gas works (at President Street in Newtown, Johannesburg) took place over a three-and-a-half year period. In 1892, just as the gas works was completed, the company of Dawson and Hamilton was dissolved. The concession was taken over by the Johannesburg Lighting Company and extended to a ninety-nine year leasehold. The Johannesburg Lighting Company arranged for a gas plant to be designed in England and shipped to East London in South Africa. From there it was transported to Johannesburg by ox- wagon (Läuferts le Roux & Mavunganidze, 2016:17). The President Street Gas Works began operating on 23 June 1892 and continued without interruption until its closure on 23 December 1928, when the new Gas Works was completed in Annet Road, overlaying they suburbs of Braamfontein Werf & Cottesloe.

2.3 Locating the Gas Works

The Gas Works is located within the City of Johannesburg, located in Gauteng Province. The chosen site for the new Gas Works (Läuferts le Roux & Mavunganidze, 2016:6) was on Annet Road in Braamfontein Werf and Cottesloe.

Some destinations in the vicinity of the Gas Works:

- University of Witwatersrand
- University of Johannesburg
- 44 Stanley
- AFDA & Atlas Studios

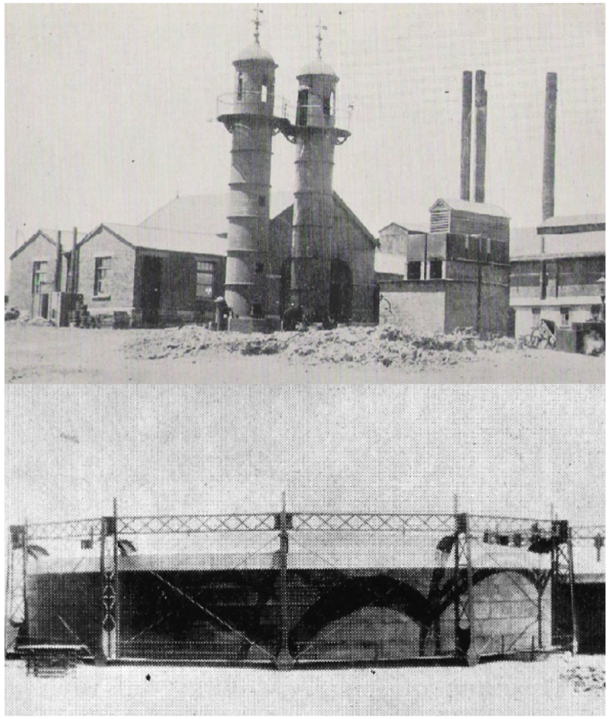


Fig 10 The President Street Gas Works, Newtown 1897 (Archives of Läuferts le Roux, 2017) obtained from the Gas Dept. Brochure, 1929

2.3.1 The Site

Chipkin (2016:6) states that the original rationale for Johannesburg's existence was based on the extractive processes of the Industrial Revolution. The industrial production required seclusion from sight from the middle class suburbs. The most significant factor affecting the upper-class suburb of Parktown (1892) was that It turned its back on the whole structure of 19th century industrialisation that had been thrown up on the veld to the south. Thus setting the precedent.

It is stated (Chipkin, 2016:7), that the topography was part of the sloping valley of the Braamfontein Spruit as it meandered down to meet its Empire Road tributary. The site was ideal because of the gravity flow of industrial liquids and its accessibility to a railway spur off main-line traffic to the collieries. Though in 1953 the Braamfontein spruit had disappeared into a straight-run 'underground storm water drain'.

2.4 The Gas Works Story

2.4.1 Making Way for the New

The Cottesloe/Braamfontein Werf Site

(The Gas Works site falls on two precincts; half of it on Cottesloe, to the west, and the interior of the site on Braamfontein Werf).

After thirty-six years of operation, the President Street Gas Works became too small to meet the demand for gas in Johannesburg. Because of this, the Sanitary Board (later the Johannesburg municipality) decided on another site in Cottesloe which was identified as 'a suitable area so well tucked away as to render the works invisible from the residential areas' (Gas Dept. Brochure, 1929, p. 5). (Läuferts le Roux & Mavunganidze, 2016:7)

It is said (Läuferts le Roux & Mavunganidze, 2016:19) that more than twenty buildings were proposed in the 1927 site plan for the Gas Works. While the plan does not mention the name of the architect who designed the buildings, archival records show that Mr A. Stuart Germiston was responsible for the foundations and the construction of the buildings. Most of the steel work was manufactured and erected by Mr Gilbert Hamer of Durban. The major contract for manufacturing the machinery was placed in the hands of West Gas Improvement Company Ltd of Manchester, England in collaboration with Blaine and Company Ltd of Johannesburg (Gas Dept. Brochure, 1929, p. 33). The lettering for these companies can still be seen on some of the remaining machinery in the ruins of the old factories.

The gas holders, purifiers, condensers and works mains for the Cottesloe site were manufactured by C. and W. Walker of Donnington, Shropshire, England. According to Peter Finsen, a chemical engineer who worked for the company from the 1960s until operations ceased in 1992, the machinery and the skills came mainly from England since South Africa was very new to the production of gas in the 1920s while the United Kingdom had been producing gas from coal since the early nineteenth century.

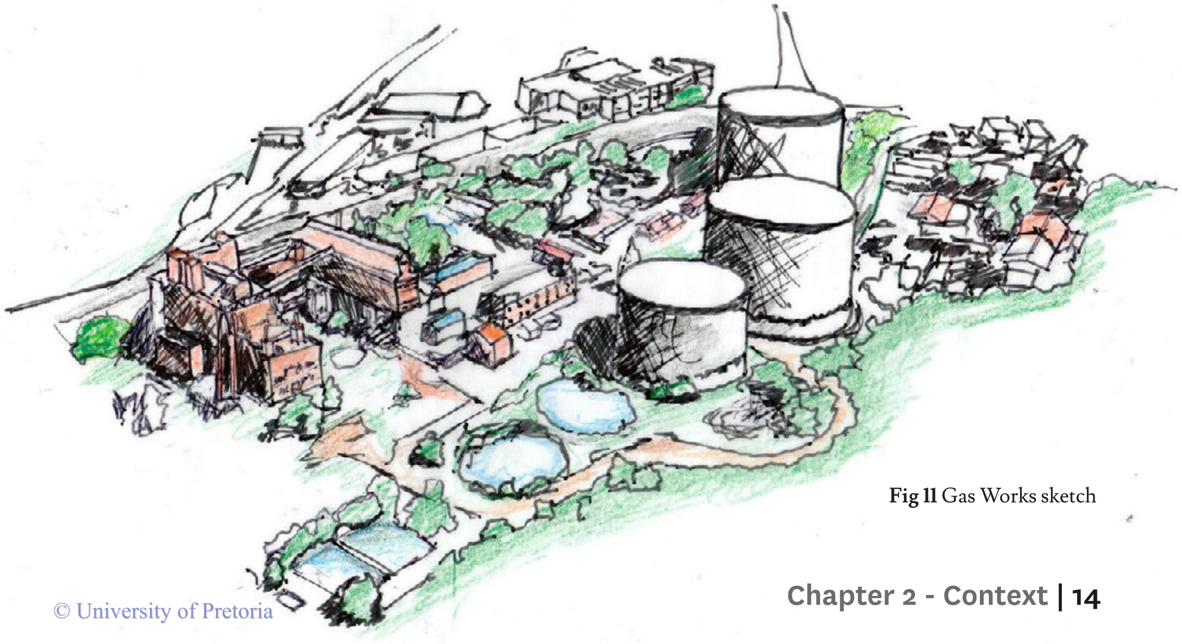


Fig 11 Gas Works sketch

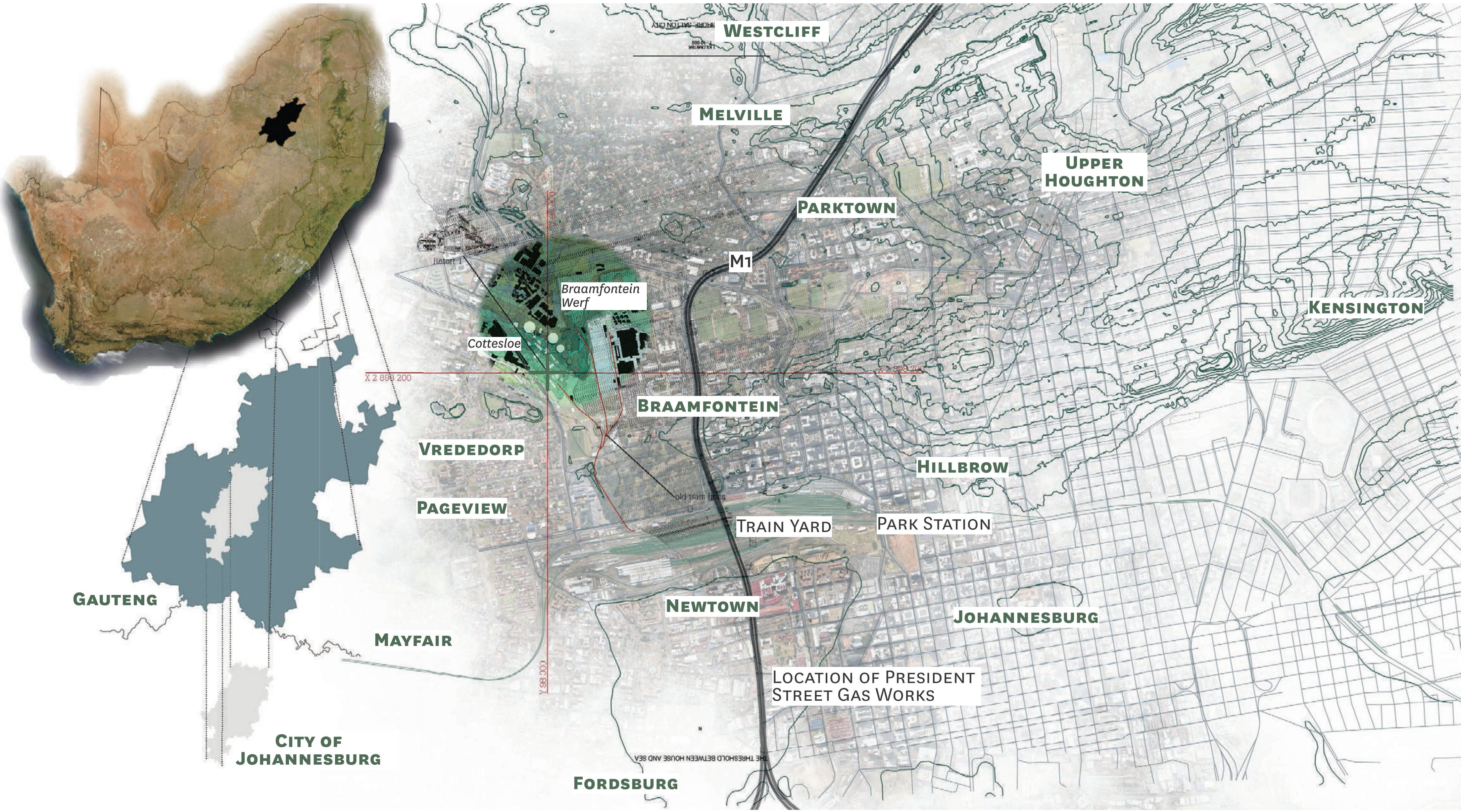


Fig 12 Macro locality

Fig 13 Looking north east, towards WITS

Fig 14 The Oudstryders monument

Fig 15 View from the Oudstryders monument south-west of the Gas Works

The plans show that the gas tanks, the most prominent feature of any gas works, were to be of the 'disappearing type', namely that is, 'only visible to the extent to which they are inflated and moreover they are to be placed upon the lower level of the site, where trees existing and such as may be planted will almost completely screen those structures' (Gas Dept. Brochure, 1929, p. 7). The idea of making the gas tanks inconspicuous seems, however, to have been abandoned later when three additional tanks were constructed. Though these were also 'of the disappearing type', they were much higher than the first two tanks and thus more visible from the road. The city anticipated in 1927 that the gas tanks would be an eyesore, but now they are heritage landmarks and part of the city skyline.

An additional advantage of the new site was the gentle slope it offered. The engineers thought that this would assist in the gravity flow of the various liquids involved in the gas making process.

Construction on the site got under way in early 1927 and operations began on 23 December 1928, the same day that the President Street Gas Works was shut down.

"[...] Our futurism is not mainstream and certainly not coherent with a resident intellectual centre. Rather it is latent, spasmodic and reticent, revealing itself as a subculture that breaks surface here and there causing us to exclaim (retrospectively). How simply extraordinary: new forms and spaces right under our noses. That is the reaction the Johannesburg Gas Works invokes.

But there is an objective reality that created not only a middle class in the suburbs but a proletariat in the dormitory working areas and near-futurism on the ground, if not in the mind.

The Johannesburg Gas Works at the Cottesloe site, barely recognised, scarcely acknowledged, is a working example of this. I am mindful of Le Corbusier's words in Vers une architecture (1923): "A great epoch has begun. There exists a mass of work conceived in the new spirit; it is to be met with particularly in industrial production."

It is to be met at the Gas Works site, a formerly unrecognised monument to an emerging new spirit in the early part of the twentieth century."

(Chipkin , 2016:15)

2.4.2 Phased Expansion

The Gas Works was built to an initial master plan that permitted six principal growth phases over a period of three decades. The consistency of the overall design confirms that future expansion was part of the original thinking. These intentions are corroborated by the spatial layout and by the west gable-end of the first Retort House that was temporarily clad in removable corrugated iron cladding to permit future extensions.

Timeline Of Expansions (See Fig 22)

It is significant, too, that all the steel construction and production know-how was in large part imported from Britain. This is confirmed by the manufacturers' plates and by the mill imprint of Dorman Long, Middlesbrough on rolled steel joists. But the fourth and largest circular gas holder, completed in January 1946, comprised 1800 tons of South African steel plate supplied at the The plate mill at Vanderbijlpark by ISCOR and fabricated and installed by Dorman Long from their South African plant at Germiston, a perfect illustration of import-substitution occurring in South Africa.

Fig 16 Site section indicating fall

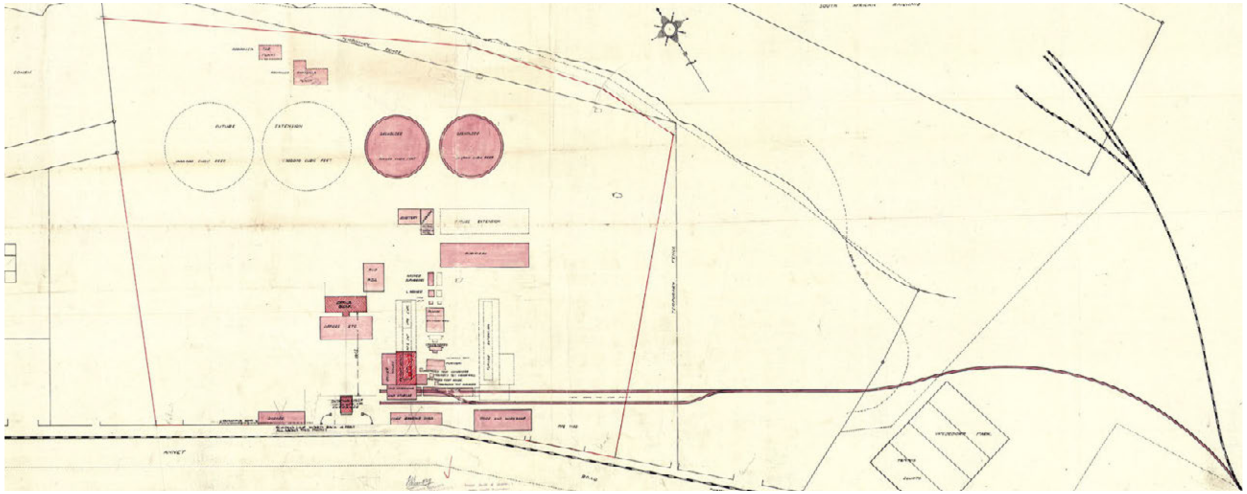


Fig 17 1927 General Site Plan (Archives of Läuferts le Roux, 2017)

Fig 19 1929 North east view towards 'new' gas works site Cottesloe (Archives of Läuferts le Roux, 2017)

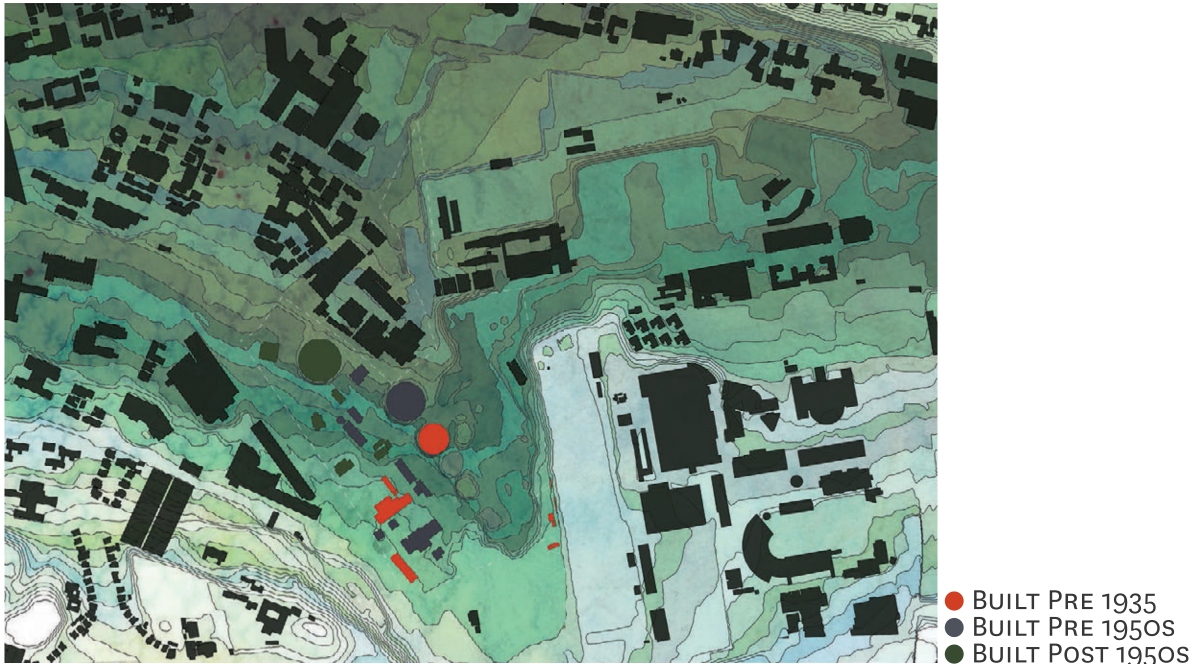


Fig 18 Aging the structures

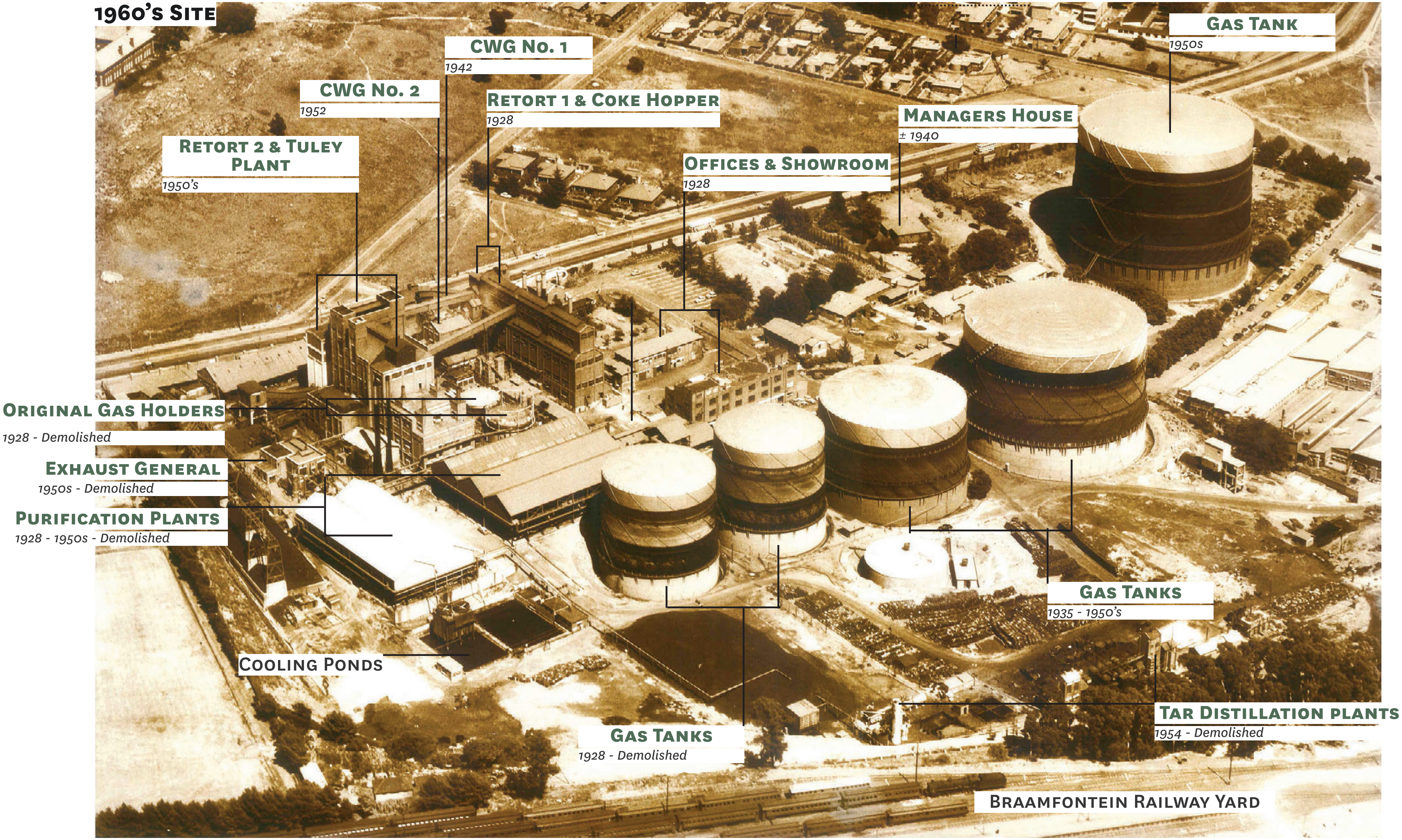


Fig 20 1953 Aerial (Adapted by Author, 2017, Archives of Läuferts le Roux, 2017)

Fig 21 Aerial of the Gas Works indicating focus area (Archives of Läuferts le Roux, 2009)

A Timeline of Important Events

1806 *First indication that gold could be found in the vicinity of Witwatersrand (South Africa profile Timeline BBC News, 2017)*

1850s Gold is discovered in the Transvaal, triggering the gold rush (South Africa Profile Timeline BBC News, 2017)

15 October a fifty year concession signed by the president of the Transvaal, gave two men Edward Dawson & John James Hamilton, the exclusive right to produce and distribute gas to power; the exclusive right to produce & distribute gas to power the street lights in the Burgeoning mining town of Johannesburg. Construction of the gas works at the President Street in Johannesburg (Läuferts & Mavunganidze, 2016)

1892 The Gas Works was complete. The most significant factor affecting the new, instant, upperclass suburb of Park was that, turned its back on the whole structure of 19th century industrialisation that had been thrown up the veld to the South. This set the precedent (Läuferts & Mavunganidze, 2017

1919 South African Economy one of the most buoyant in the worl, largely due to the massive industrialisation (Läuferts & Mavunganidze, 2016)

1927 Over 20 buildings were proposed in the 1927 site plan (Läuferts & Mavunganidze, 2016)

1928 - 1936 Closure of the President Street Gas Works

The Gas Works became operative in 1928, the first part of the large expansion programme that took three decades to accomplish (Läuferts & Mavunganidze, 2017

1929 Original plant consisted out of 18 vertical retort expansion halted due to perilous economic crises in 1929 (Läuferts Le Roux & Mavunganidze, 2016)

1930 The gas arterials mains from the Ophirton and the new centre of production at Industria, which dates from 1930 (Läuferts & Mavunganidze, 2017)

1931 21 September, Britain abandons the gold, leading to a rise in the gold price. (South Africa profile Timeline BBC News, 2017)

1933 South Africa economy was entering a period of uneven recovery with dramatic growth occurring on the Witwatersrand (South Africa Profile Timeline BBC News, 2017)

1933 Mr Therm introduced to the British public (Läuferts & Mavunganidze, 2016)

1935 - 1936 Phase 2 of the expansion programme was under way in 1935, closely followed by phase 3 1936 when production capacity was trebled (Läuferts & Mavunganidze, 2016)

1939 - 1945 Retort 2 was built during World War II (South Africa Profile Timeline BBC News, 2017)

1946 Circular holders was built in 1946 (Läuferts & Mavunganidze, 2016)

1948 Apartheid set in law (South Africa Profile Timeline BBC News, 2017)

1949 Large scale Gasification Building during the post-war completed (Läuferts & Mavunganidze, 2016)

1800 ... 1900 1905 1910 1915 1920 1925 1930 1935 1940 1945

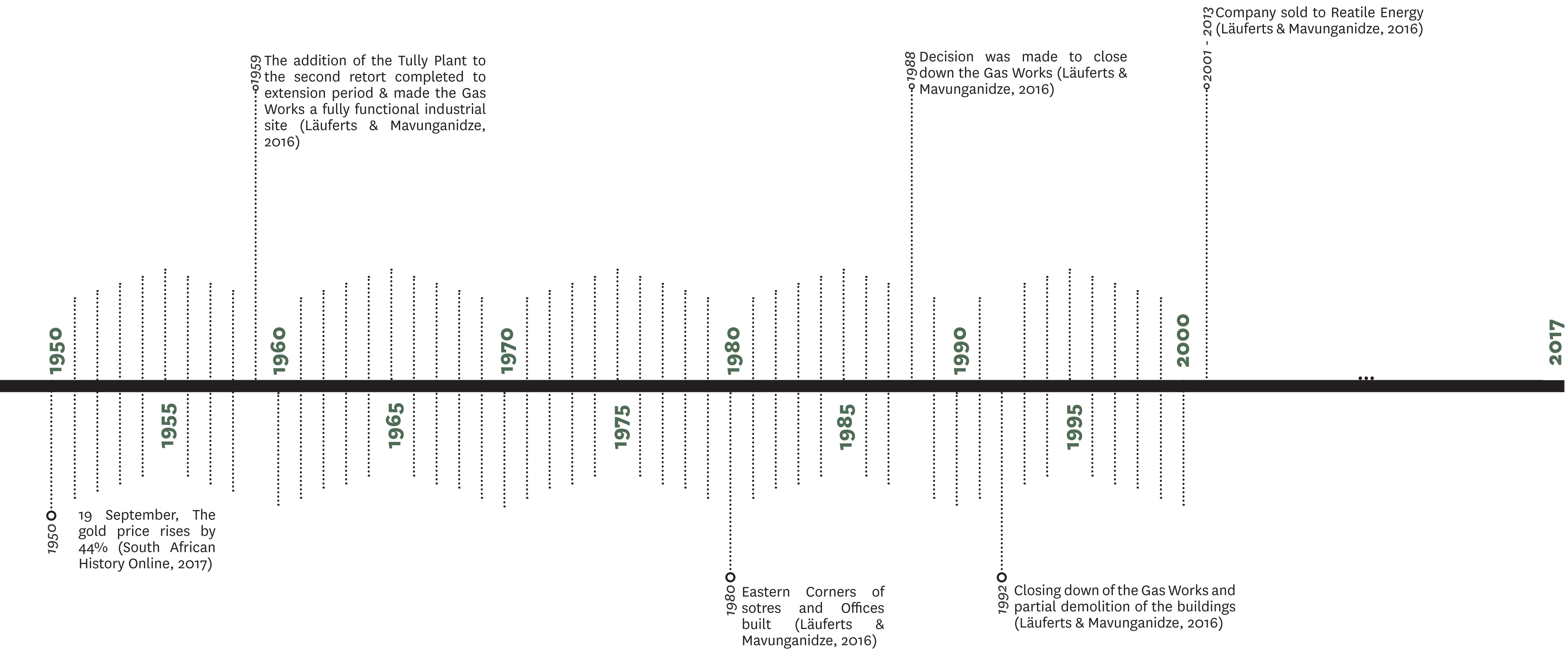


Fig 22 Johannesburg timeline

2.5 Theoretical Departure

2.5.1 Heritage & Conservation

The South African Heritage Resources Agency (n.d.) considers the adoption of a set of internationally acceptable principles which relate to South Africa's social, cultural and physical situation to be essential for the development of a sound conservation ethic and practice in this country. The precise usage of internationally standardised terminology also contributes to clarity and understanding in the discussion of heritage conservation issues. The South African Heritage Resources Agency (SAHRA) has therefore used various international conservation charters as the basis for these principles.

They are applicable to all places of cultural significance which are protected in terms of the National Heritage Resources (Act 25 of 1999). This legislation aims to promote good management of the cultural landscape, and to enable and encourage communities to nurture and conserve their legacy. Although the Nations Heritage Resource Act (NHRA) makes mention of places of scientific importance - it does not address Industrial Heritage specifically. A future, much needed, revision of the act should perhaps be more specific as to the object that is dealt with as every piece of heritage differs in the way it is approached and dealt with. *The International Committee for the Conservation of the Industrial Heritage* (TICCIH) (2003) argues that industrial heritage should be seen as an integral part of the cultural heritage and not as an entity on its own.

The SAHRA (n.d.) states that the growing awareness of heritage conservation issues in South Africa reflects an international trend. Conservation of the cultural landscape has become a specialised field in its own right, guided by principles which have been set out in various conservation charters adopted by international and national conservation bodies; such as the Australia ICOMOS Burra Charter, The Nizhny Tigal Charter.

The Australia ICOMOS Burra Charter (2013) sets out guidance for the conservation and management of places of cultural significance or heritage places in general; whereas TICCIH (2003) compiled the Nizhny Tigal Charter aimed specifically at industrial heritage that consists of the remains of industrial culture which are of historical, technological, social, architectural or scientific value. Both these charters set a standard of practice for working with sites such as the Gas Works.

When asked why one would want to conserve, the Burra Charter (2013:1) states that places of cultural significance enrich people's lives, as it often provides a deep and inspirational sense of connection to community and landscape, to the past and to lived experiences. They act as historical records that are important as tangible expressions of the identity and experience. It is of great importance to identify, record and research the industrial typologies and that those sites and structures that are identified as important should be protected by legal measures that are sufficiently strong to ensure the conservation of their significance (TICCIH, 2003). TICCIH states that the World Heritage List of UNESCO should give due recognition to the tremendous impact that industrialisation has had on human culture.

Places of cultural significance reflect the diversity of our communities, telling us who we are and the past that has formed us and the South African landscape. They are irreplaceable and precious. The Gas Works forms a important part in the history of infrastructure in South Africa. It refers to a technology that is no longer used. It played an important part in the growth and existence of Johannesburg, one that is not widely or well known. This could be changed to form a cultural identity that gives a tangible experience of that which once was. TICCIH (2003) argues that programmes for the conservation of the industrial heritage should be integrated into policies for economic development and into regional and national planning.

These places of cultural significance must be conserved for present and future generations. The Burra Charter (Article 2.2 2013:3) states that the sole aim of conservation is to retain the cultural significance of a place.

Burra Charter (Article 3.1 2013:3) argues for a cautious approach towards conservation which is based on a respect for the existing fabric, use, associations and meanings. TICCIH (2003) states that new uses should respect the significant material and maintain original patterns of circulation and activity, and should be compatible as much as possible with the original or principal use. It is also stated that by continuing to adapt and use industrial buildings avoids wasting energy and contributes to sustainable development. Industrial heritage can have an important role in the economic regeneration of decayed or declining areas. The continuity that re-use implies may provide psychological stability for communities facing the sudden end a long-standing sources of employment (TICCIH, 2003). Changes to a place should not distort the physical or other evidence it provides, nor be based on conjecture. In conserving the architecture at the Gas Works little of the existing fabric need be changed because it is the architecture that tells the story of the site and place.

Cultural significance is a concept which helps in estimating the value of places (Burra Charter Article 2.1 2013:12). In the context of cultural significance (Burra Charter Article 2.2 2013:12) the Gas Works has aesthetic value in terms of its the form, scale, colour, texture and materiality of the fabric. The smells and sounds associated with the place and its use is also quite significant.

Historic value (Burra Charter Article 2.3 2013:12) encompasses the history of aesthetics, science and society. A place may have historic value because it has influenced, or has been influenced by, as is the case at the Gas Works, an event, phase or activity. The site also has historic value as the site stands against an important event. It is of technological and scientific value in the history of manufacturing, engineering, construction, and has considerable aesthetic value for the quality of its architecture and design (TICCIH, 2003). They say that the rarity, in terms of the survival of a particular processes, site typologies or landscapes, adds value and should be carefully assessed. The Gas Works as such is a very rare gem in the South African context as it is the only one of its kind left and only one of a few around the world.

The aim of conservation is to preserve, retain or recover the cultural interest of a place, and must include provision for its maintenance and its future (SAHRA, n.d.). SAHRA argue four fundamental principles for heritage conservation in South Africa:

- The heritage is a valuable, finite, non-renewable and irreplaceable resource, which must be carefully managed to ensure its survival.
- Has a rich heritage, both natural and man-made, which is unique and worthy of conservation.
- Numerous cultures, both past and present, have contributed to that heritage and all have the right to be protected. Conservation of the heritage is in the interest of all South Africans.
- Every person, community and institution has an obligation to ensure that significant elements of the natural and cultural heritage are not damaged or destroyed.

The Gas Works meets, or could meet all four of these criteria. It is already irreplaceable as the only one in South Africa. It is, in addition also unique in that sense and should be worthy of conservation. The story of the Gas Works tells one of hard work by many different cultures in Johannesburg at the time, as they worked to supply everyone in the City of Johannesburg.

TICCIH, (2003) states that the value of significant sites should be defined and guidelines for future interventions established. Any legal, administrative and financial measures that are necessary to maintain their value should be put in place. It is stated that sites that are at risk should be identified so that appropriate measures can be taken to reduce that risk and facilitate suitable schemes for repairing or re-using them. It should be said that the owners of the site has already neglected the site to a point where it has started to effect the structural integrity of some of the structures. The owners should be held accountable to conserve this place so as to stop any further decay from taking place.

Conserving the site and using it on a permanent basis will ensure the maintenance of the architecture where it will be preserved for the future as an informative space on industrial heritage and the influence it had and is having on our lives.

Fig 23 Burra Charter planning process (Burra Charter, 2013:10)

Fig 24 1941 Retort No1 Coke bins (Archives of Läuferts le Roux, 2017)


Fig 25 1953 Aerial view on gas works (Archives of Läuferts le Roux, 2017)


Fig 26 Dunvegan Chamber (left), Union Castle Building (Right) (Heritage Register, 2017)

2.6 Analysing the Architecture

Though the site is vast and littered with buildings, focus will be placed on the buildings where the proposed project will take place (Retort 1, the Coke Hopper, Power house, Boiler rooms, CWG Building 1 & 2).

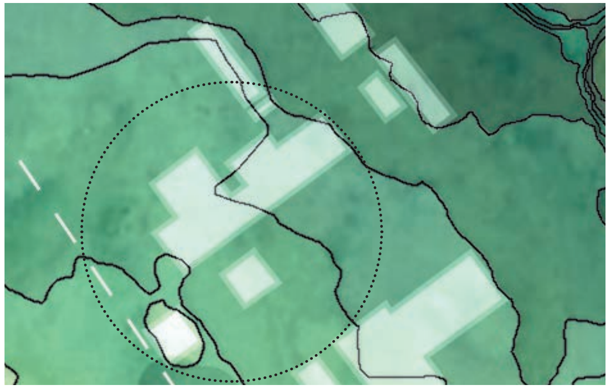


Fig 27 Area of focus

2.6.1 Its Importance as an Industrial Artefact

Chipkin (2016:4) states that some of the industrial shapes controlled the mode of production and the material culture that it had inherited from the past. It is argued that the verticality of the principal processing plant and the vast expandable containers holding the gas end-products is noteworthy. This verticality dominates the landscape, creating strong forms; apsidal shapes inspiring a sense of awe as one enters (Chipkin, 2016:4). Chipkin argues that the production buildings are built for the contemporary moment in the economic cycle, part of the brilliant typological development of nineteenth- and early twentieth-century industrialisation. Hence, he says, the enormous complexity of the surviving architecture on this obsolescent industrial site is now superseded by radical change.

But, Chipkin argues, it has left us with momentous shapes, part of our industrial inheritance with artefacts on the fringe of Futurism. He argues that Johannesburg's asymmetrical industrial landscape is the forerunner of this Futurist infiltration - the essence of the machine age.

2.6.2 Defining Style

Chipkin (2016:1) suggests the Gas Works as a statement of near-Futurism. He describes Futurist ideas as relying partly on the nineteenth-century technologies of coal, steam, iron and gaseous smoke as well as the brand new technologies of the twentieth century. Thick smoke plumes were regarded as emblems of progress and were depicted in Art Deco sculptural relief panels on new buildings such as Dunvegan Chambers and the Union Castle Building (Fig 26) on Commissioner Street (Chipkin, 2016:1). Chipkin states that in a generalised form Futurism, much like Constructivism and De Stijl, recognised the centrality of industrialisation and it first in this form that it became an undisclosed factor in Johannesburg's development, part of our futurist sub-plot-futurist, rather than mainstream Futurism.

From Johannesburg's peculiar history came this taste for modernity, up-todateness, for modernistic Art Deco or the Modern Movement, even partial Futurism (Chipkin, 2016:2).

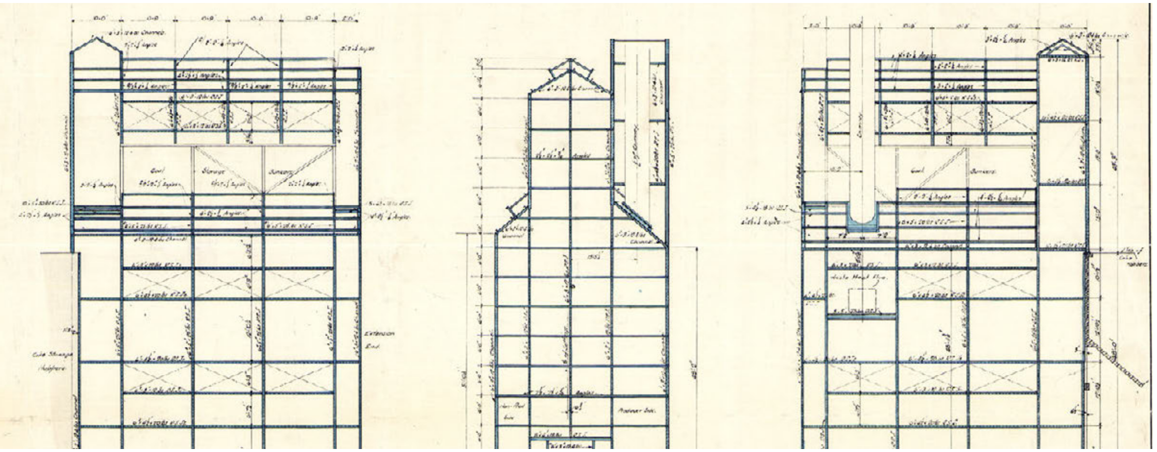


Fig 28 1927 Retort 1 steelwork (Archives of Läuferts le Roux, 2017)

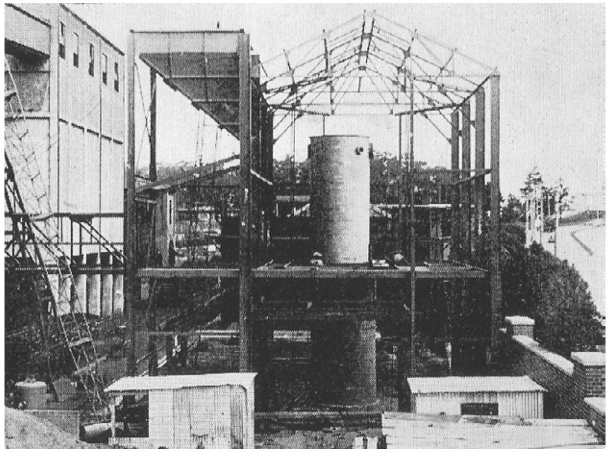


Fig 29 1951 Erection of No2 Carburetted Water Gas Plant showing steel structure (Archives of Läuferts le Roux, 2017)

2.6.3 The Structures

The dominant structures on site primarily comprises of a steel skeleton (Fig 28 & Fig 29) enclosed in brickwork. Chipkin (2016:7) argues that this indicates one of the lines of development that lead to modernism, but that it was not part of the consciousness of the builders of the Gas Works.

For the Gas Works, the builders wanted a wrap-around to create something substantial - with civic qualities to represent municipal government and service delivery (Chipkin, 2016:7). Chipkin also says that the Gas Works designers were responsive to modern ideas.

Chipkin (2016:8) mentions that the working drawings of Retort 1 (Fig 34 & Fig 35), as well as those of the CWG houses (Fig 36 & Fig 37), indicate that the building forms comprises of structural steelwork with red facebrick walling. He states that this was most probably established from the initial outset, resulting in a design consistency enduring throughout all six major building phases over the three decades it took to complete.

There are three projecting vertical brick dentils (visible at the bottom of Fig 35) on each major elevation. Chipkin states that this acknowledges the civic importance of the towers-pointing to external influences.

The retort houses are monumental, marvellous and daunting, all at the same time. The brickwork is precise and exact as only the best workmanship could offer.

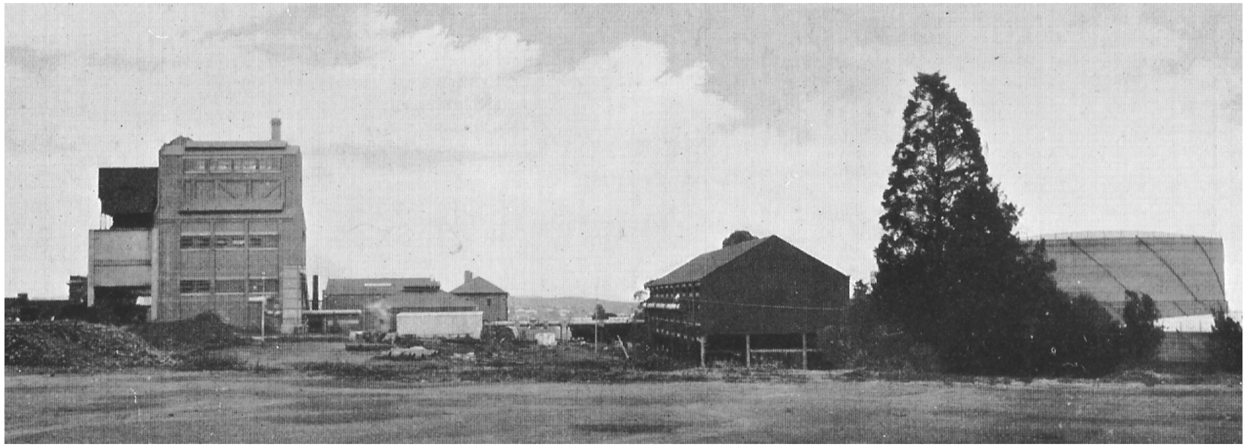


Fig 30 1229 North west view towards new gas works site (Archives of Läuferts le Roux, 2017)

Fig 31 1988 Retort 1 production (Archives of Läuferts le Roux, 2017)

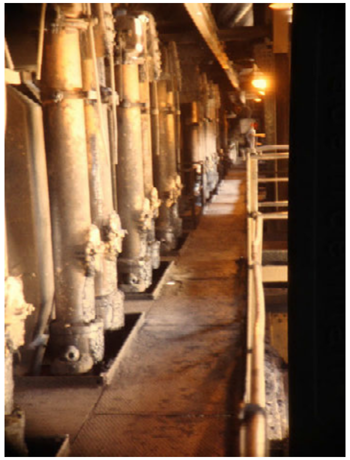


Fig 33 1986 Retort 1 rising gas mains (Archives of Läuferts le Roux, 2017)

Fig 32 Retort 1 conveyor belts (Archives of Läuferts le Roux, 2017)

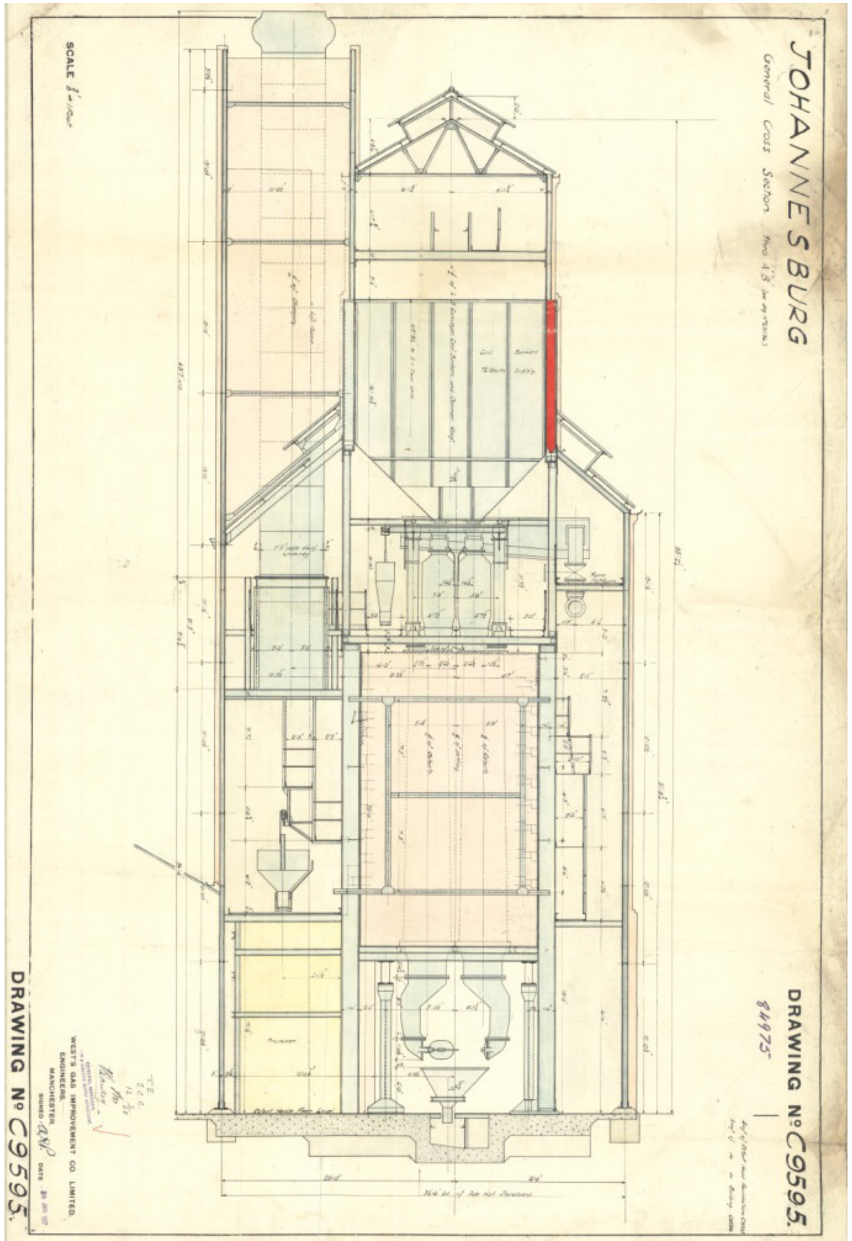


Fig 34 Working drawings of Retort 1 (Archives of Läuferts le Roux, 2017)

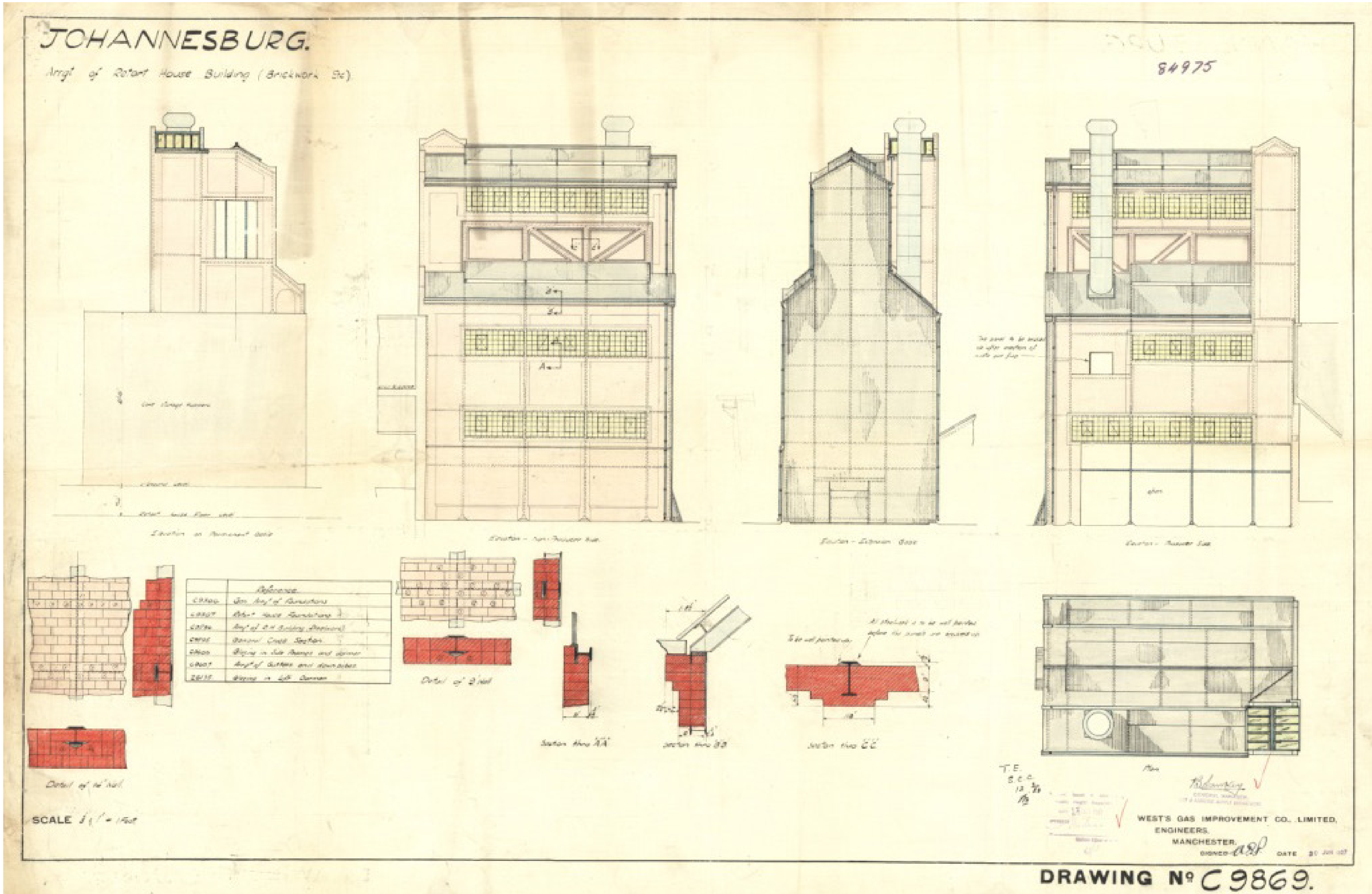


Fig 35 Working drawings of Retort 1 (Archives of Läuferts le Roux, 2017)

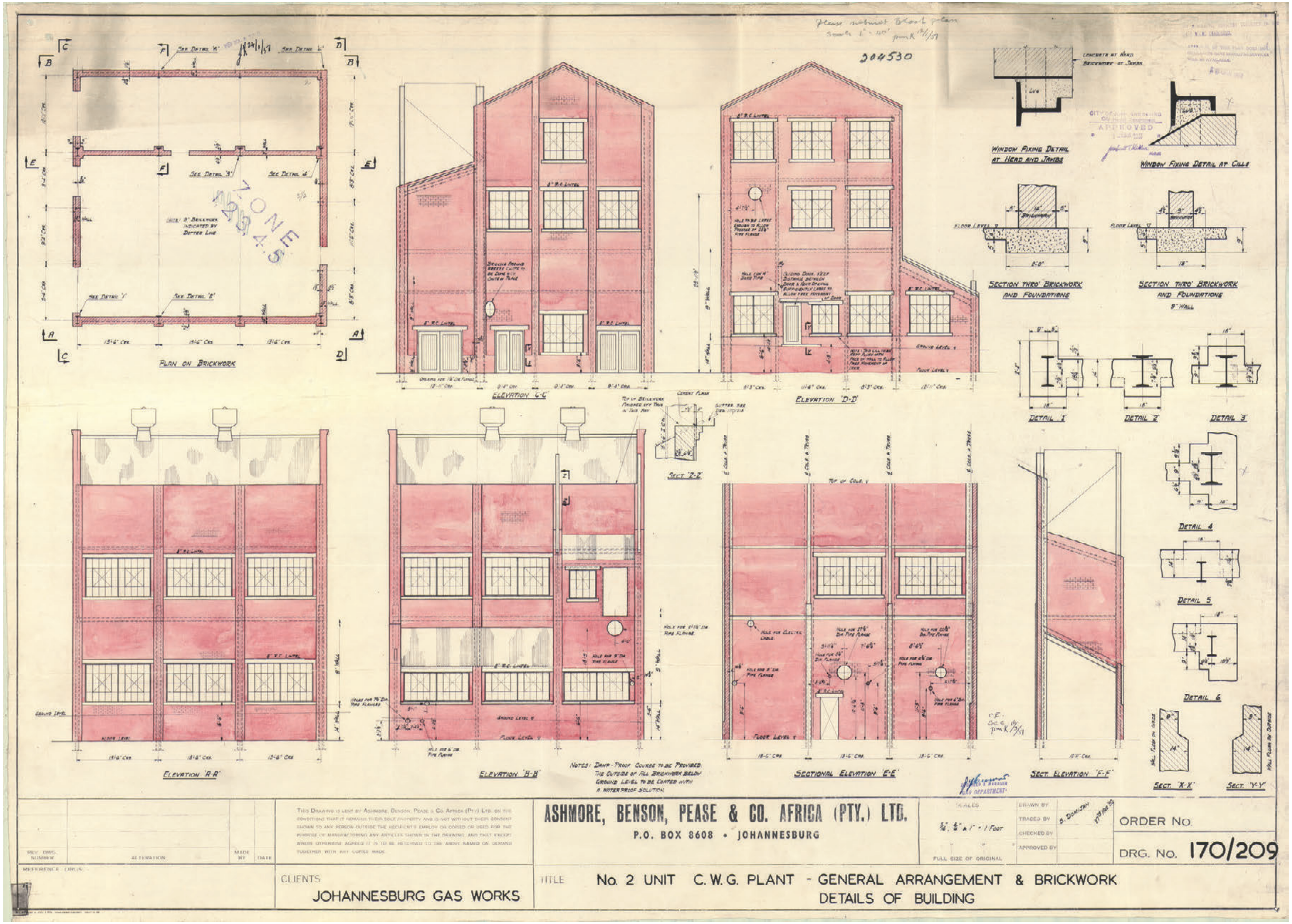


Fig 36 Details of CWG No 2 (Archives of Läuferts le Roux, 2017)

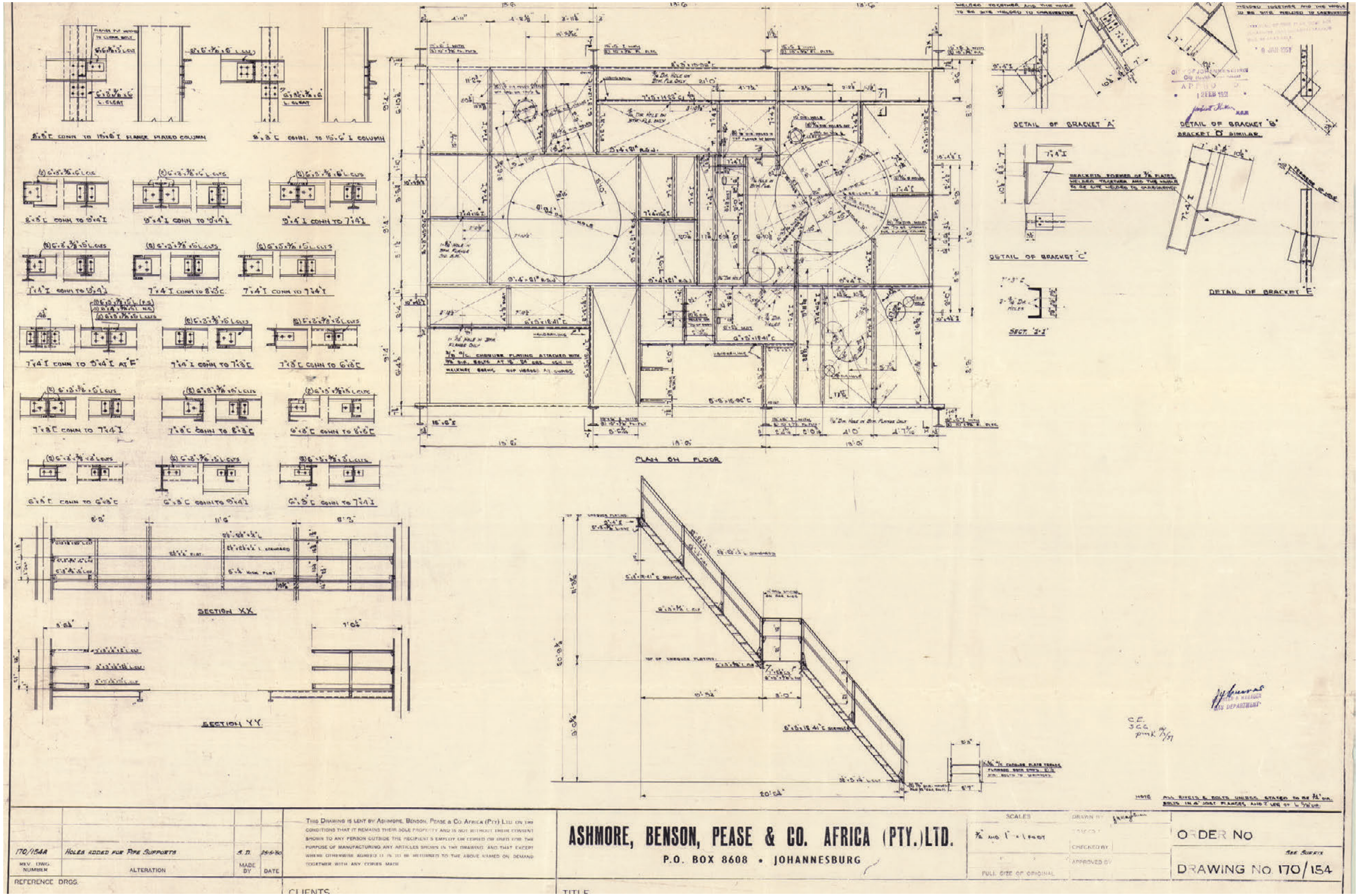


Fig 37 Steel details of CWG units (Archives of Läuferts le Roux, 2017)

2.6.4 Brickwork

The high quality brick-clays with their tonal variations and mineral tints that are iconic to the highveld interior of South Africa and contributed to the facebrick building traditions of these areas (Chipkin, 2016:8). Chipkin says that the superb red facebrick walling at the site can be traced to various local sources. Many of these manufacture-imprinted bricks (Fig 39) still litter the site as a reminder of the demolished structures.

2.6.5 Modern Infiltrations

In the twenties and thirties there were strong brick traditions in contemporary architecture, especially in Britain and the northern countries (Chipkin, 2016:9). Chipkin says that in our society many responses were filtered through Britain as part of our colonial complex.

Chipkin (2016:9) argues that we must look from the Gas Works site during the crucial period of 1928-1936 to Giles Gilbert Scott's 'brick industrial style', particularly at the 1929 Battersea Power Station (Fig 42). He argues that the brick elaborations and details of the enclosure walling are vertical wonders; the trio of vertical dentils used at the Gas Works and the surface enrichment are exactly that.

Fig 42 Battersea Power Station (Dailymail, 2014)

Fig 39 Brick types used on site

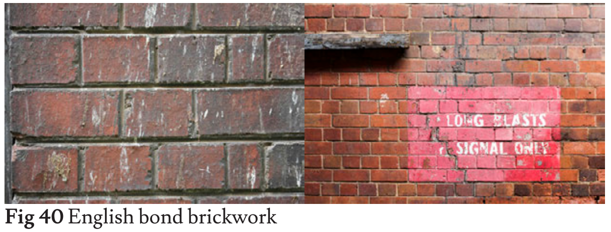


Fig 40 English bond brickwork

Fig 41 1960 General view (Archives of Läuferts le Roux, 2017)

2.6.6 The Classical Entrance

The entrance gates to the site, facing Annet Road (opposite the entrance of the University of Johannesburg), date from the initial building phase of 1928 (Chipkin, 2017:10). It is argued that it was clearly imagined as a formal classical portico to the twelve hectare campus: Classicism, symmetry and symbolism are reserved for the street entrance and formal portico with bold, white-plastered, classical entablature; supported on white Tuscan-Doric columns and red facebrick pilasters, conforming to the Edwardian classical norms (Chipkin, 2016:10). This entrance is very different to the red facebrick industrial architecture to be found on the rest of the site. It almost seems as though it was only added much later, or as an afterthought.

Fig 43 Classicism entrance to site (Archives of Läuferts le Roux, 2017)

2.6.7 Engineers & Architects

The designers of the Gas Works are not known for certain, states Chipkin (2017:11). There are attributions, but these are merely formal statements and not personal identifications. It is stated that even at Battersea Power Station one can see attribution to the engineer *S.L. Pearce* and the Manchester firm of *C.S. Allott & Sons* in 1927. Chipkin states that architects were only involved at a later stage. The Pevsner Architectural Guide to London recognises the architects as *J.T. Halliday* (of Halliday & Agate) and Scott. It is said to have been a collaborative effort but, in Chipkin's opinion Scott's influence predominates.

Chipkin (2017:11) states that in his opinion and analysis the engineers & architects were as follows: Retort 1 (1928-1936), the CWP plant and Retort 2 (1942-1948) are all the work of *West's gas engineers* of Manchester. The Gasification Building of 1956 is the product of *West's* and their associates *Tully Engineering*.

Chipkin (2017:12) states that in those times, engineers either used an in house architect or out-sourced the work to a specialist architectural practice. Chipkin suggests that whoever did the detailing was in touch with the Battersea project either at site or via the Manchester design office. The unrecognised designers inside or outside the engineering shop were sensitive to brick tradition and equally to the infiltration of modernity.

Fig 44 Engineers signature on steel

2.6.8 Economic Base

As an alternative energy source, the Gas Department's Report of 1949/1950 reflect that 15 000 consumers which 75% used gas for cooking and heating included residential houses, blocks of flats, hotels and hospitals (Chipkin, 2017:11). A mainly middle-class residential population of 60 000 - 100 000 were beneficiaries (Chipkin, 2017:11). It is also shown that there were 300 supply outlets for industry in pharmaceuticals, breweries, diamond cutting, bakeries and laundries.

Earlier reports (1940/41) show that 410 miles of gas mains had been laid in Johannesburg. By 1962 the length was in excess of 550 miles (Chipkin, 2017:11). This confirms how quickly the Gas Works had expanded its arteries into the city. Chipkin (2017:11) mentions that the gas arterial mains from the Gas Works site supplied gas to the CBD, the old suburban core, Ophirton and the new centre of production at lndustria, dating from 1930.

Recycling By-Products

Many important by-products were produced at the site such as coke, tar and creosote. In addition to producing and distributing gas, ammoniac liquid was given away as a way of dispensing by-products of the processes (Läuferts le Roux & Mavunganidze, 2016:52). It is reported that customers would bring containers for the liquid, which contained fertilising and insecticidal properties.

Coke and tar, being two of the major by-products, (producing more than 25 000 tonnes of tar annually by the 1940's) was sold for use in the construction of roads, protective coating for walls and roofs, along with tar oil and black varnish (Läuferts le Roux & Mavunganidze, 2016:52). It is also mentioned that the Gas Works itself reused more than half of the coke by-product for heating purposes. Since coke could be used for various industrial purposes such as light concrete works, brick making, sound dampening, etc. it was sold to many industries (Läuferts le Roux & Mavunganidze, 2016:52).

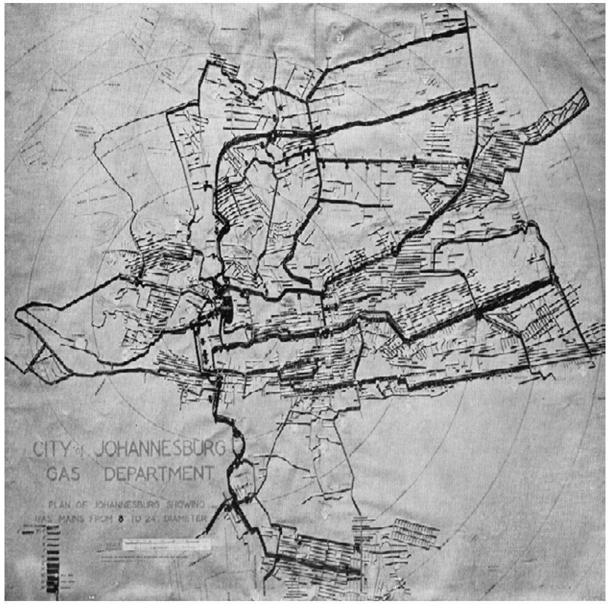


Fig 45 1950 Gas distribution , Johannesburg Municipal area (Archives of Läuferts le Roux, 2017)

Fig 46 Coke dispatch office (Archives of Läuferts le Roux, 2017)

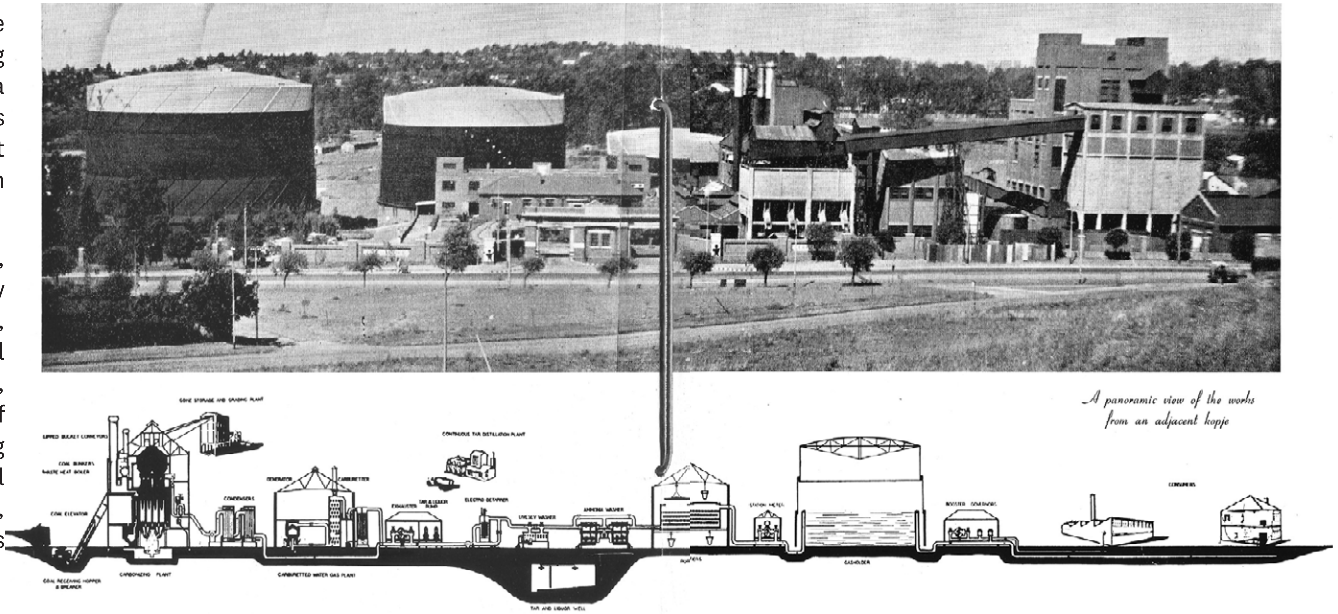


Fig 47 1950 Section through gas production (Archives of Läuferts le Roux, 2017)

Years of Growth 1940s and 1950s

The 1940s and 1950 were years of great expansion for the Gas Works (Läuferts le Roux & Mavunganidze, 2016:33). A number of new buildings were being erected to accommodate the expansion. This included the construction of a second retort house and a second carburetted water gas plant (CWG2) which continued well into the 1950s. This extensional period had made the Gas Works a fully operational industrial site.

2.6.9 Reaching the End of an Era

From the 1960s the Gas Works began to experience a decline in the production of gas (Läuferts le Roux & Mavunganidze, 2016:59). From the 1960's, Sasol began supplementing the gas supply produced by the Gas Works in order to help meet demand in Johannesburg. It is said that in 1988 the decision was taken to shut down the Gas Works. This only happened in 1992. During this time frame, the supply of gas from Sasol began to outstrip gas produced at the Cottesloe site. At the time of closure, the Gas Works was producing only 5% of the gas needed by consumers in Johannesburg (Blainey, 1992).

2.6.9.1 Factors Leading to Abandonment

Factors that led to the closure of the Gas Works was the inferiority of the gas that was being produced compared to that supplied by Sasol. Technology used to produce the gas was now also regarded as antiquated and it was becoming more expensive to produce gas than to buy gas from Sasol. Consumers were also becoming more aware of the hazards of pollution from the process of the making of gas. They began to complain about the smoke that could be seen bellowing from the chimneys of the retorts. There were also concerns that the Gas Works was introducing pollutants into the Braamfontein Spruit even though the engineer Peter Finsen contended that the water was constantly tested and always shown to be of good quality.

Läuferts le Roux & Mavunganidze (2016:59) says that through their research it is uncertain if concerns about pollution were exaggerated but what is clear from the archival material was that the City Council was eager to get rid of their asset. In 1988 when the decision was made to stop operations the Council decided to lease the Gas Works to an independent company. The tender was awarded to the Energy Equipment Company. The arrangement seemed to work well until early 1992 when water and air pollution prompted the City Council to terminate the private company's lease at the end of June. The Cottesloe Gas Works officially shut down their operations in July 1992 and entered into a new phase as a distribution plant only.

Fig 48 Retort 1 & Exhausters, Demolished (Archives of Läuferts le Roux, 2017)

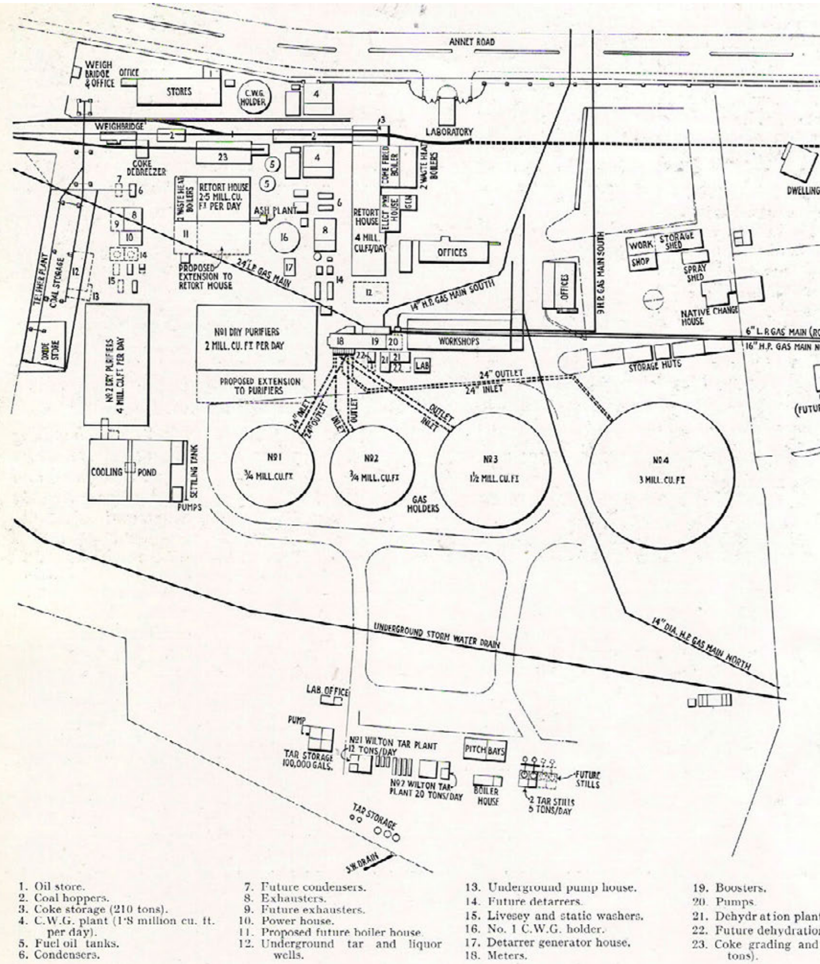
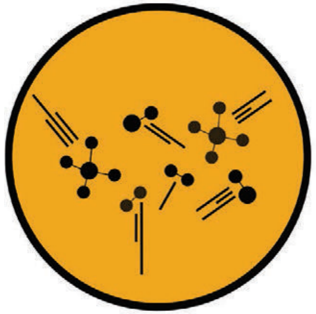


Fig 49 1954 Gas Works site plan (Archives of Läuferts le Roux, 2017)



'KINETIC ENERGY'

- Public Transportation Routes & Stops
- Traffic Analysis
- Pedestrian Movement

2.7 Analysing the Context

2.7.1 The Gas Works of Today

Läuferts le Roux & Mavunganidze (2016:69) says that since the closure of the Gas Works in 1992, most of the buildings that were used to produce gas have lain dormant. The offices remained in use and the Gas Holder tanks were used to store gas. In 1993, it is said that the City Council made a conscious decision that the site was of historical importance and they began to communicate with the National Monuments Council (NMC) about the demolition of buildings and the clearing up of the site so that it could be used for other purposes (some sections of the site were already being leased to other companies). The Council was permitted to demolish or remove some of the machinery on the site but would require permits for the demolition of buildings.

The NMC was able to stop further demolition until a proper site inspection of the historic buildings had taken place. Between 1993 and 1996 a great deal of correspondence went back and forth between the NMC and the Council regarding plans for the demolition and the future of the Gas Works. None of these plans came to fruition and the buildings on the site slowly began to deteriorate. Shortly after his retirement in 1992, Peter Finsen was called back to site to supervise the decommissioning of the structures and machinery. His decisions ensured the survival of the oldest bench in Retort House No. 1, which had been shipped from England in the 1920s. This piece of machinery is a remnant of the Glover-West System for the production of gas, developed in England and imported to South Africa. Historically, it is one of the most important elements of industrial technology in Johannesburg.

In 1996 plans for the demolition of some of the machinery and buildings were revived, but some of the applications to demolish buildings were refused on the basis that they had to be part of a larger conservation management plan. Before such a plan could be implemented, however, vandals began to damage and strip machinery on the site.

In 2001 the Gas Works was sold to an American company that sold 95% of their shareholding to three individuals in 2003 (Egoli Empowerment Holdings holds 5% of the shares). In 2003, the current management began re-laying all of the gas pipes in Johannesburg so as to make them compatible with the natural gas pumped from Mozambique, via Sasol Secunda, to the suburbs of Johannesburg. Reatile Resources through Reatile Energy took up 25% of the company's shareholding and in July 2013 the company was sold to the Reatile Group umbrella which is currently the major shareholder (www.egoligas.co.za/about-us.html).

Despite this success, a question still hangs over the future of the old buildings. They have been standing empty for almost two decades and are in a deplorable and unsafe state. A creative development plan could revive the buildings and bring new life to this historic industrial site.

2.7.2 Transport Infrastructure

PUBLIC TRANSPORTATION ROUTES & STOPS

- Minibus Taxis
- Gautrain buses
- Gautrain
- Metro buses
- Metro Rail
- Rea Vaya

TRAFFIC PATTERNS

- Medium congestion
- High congestion
- Low congestion

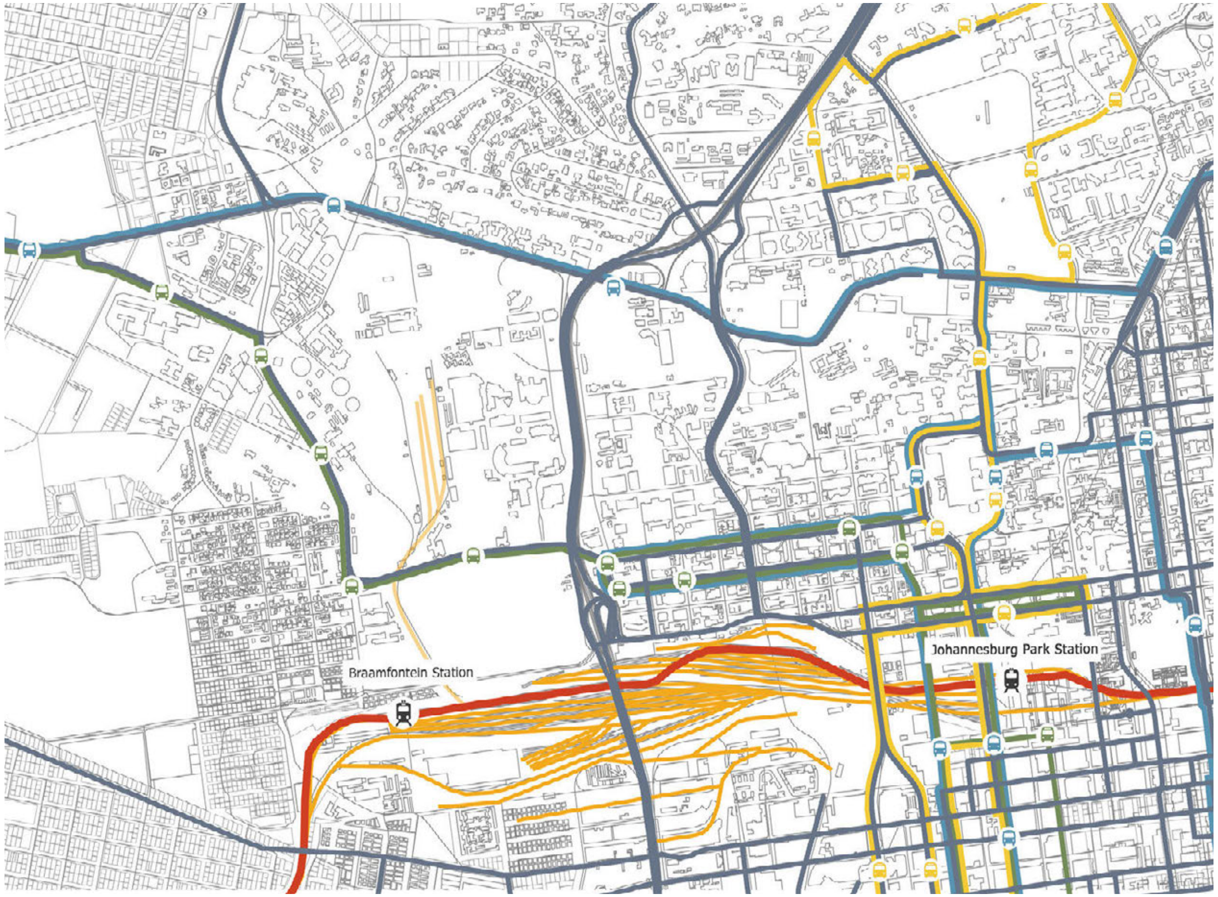


Fig 50 City of Johannesburg transport infrastructure

MORNING TRAFFIC PATTERNS
DOCUMENTED AT 8 AM ON A WEEKDAY

MIDDAY TRAFFIC PATTERNS
DOCUMENTED AT 1 PM ON A WEEKDAY

AFTERNOON TRAFFIC PATTERNS
DOCUMENTED AT 5 PM ON A WEEKDAY

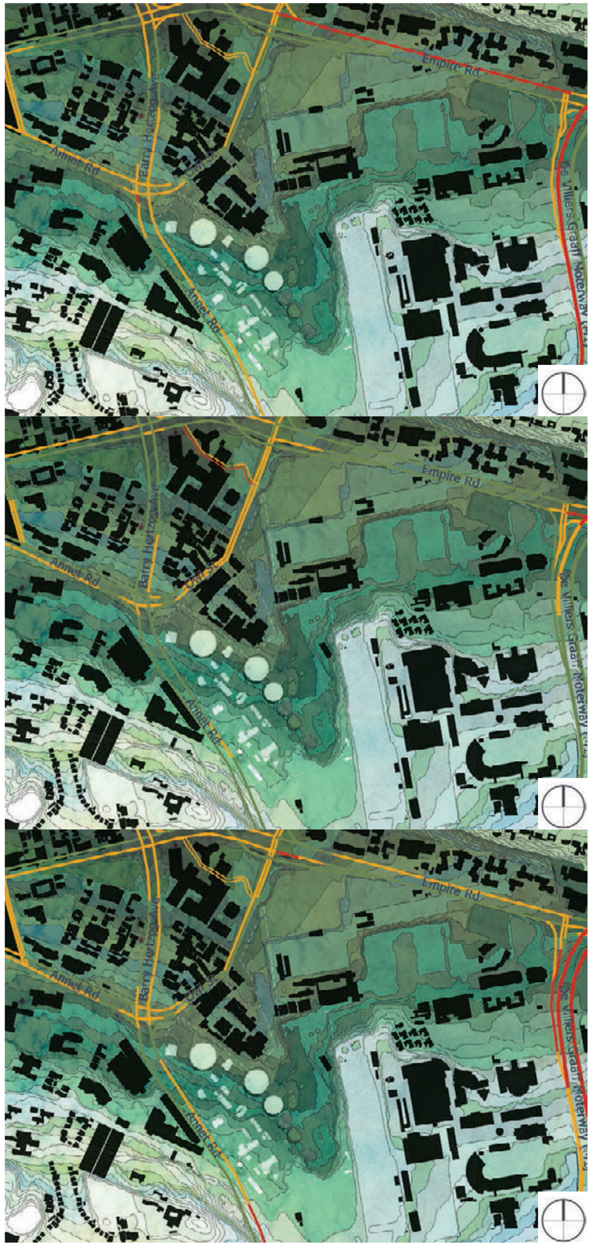


Fig 51 Traffic patterns

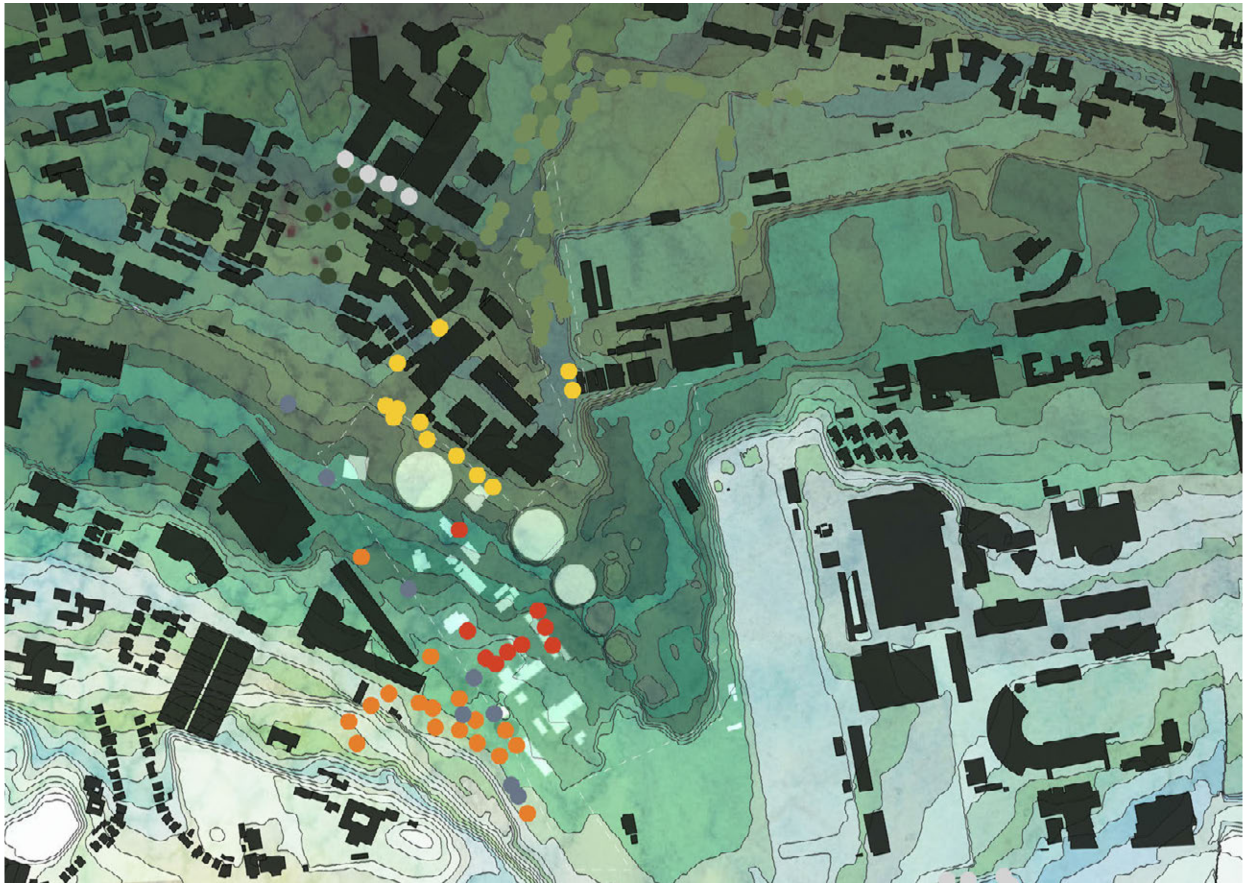
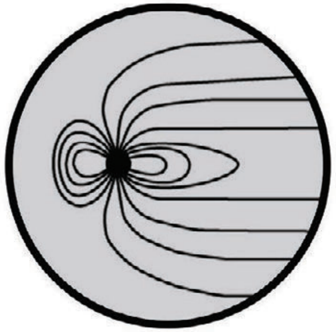


Fig 52 Social movement

2.7.3 Social Movement

- John Orr Scholars
- Afda Students
- Taxi Users
- UJ Students
- Informal Traders
- Masters/PhD & Upper Middle Class
- Egoli Employees



'ELECTROMAGNETIC'

- Spatial Economy
- Regenerative Projects & Landmarks
- Recreational public green Spaces
- Energy Map

2.7.4 Spatial Economy

The Spatial Economy looks at the various functions in proximity of the site. From this it was clear that the Gas Works is situated in a largely educational node.

- Educational
- Site
- Religious
- Residential
- Mixed use
- Corporate and offices

1 Egoli gas
2 University of Jhb Hotel school
3 Wits Driving range
4 Wits campus buildings
5 Millpark Bus depot

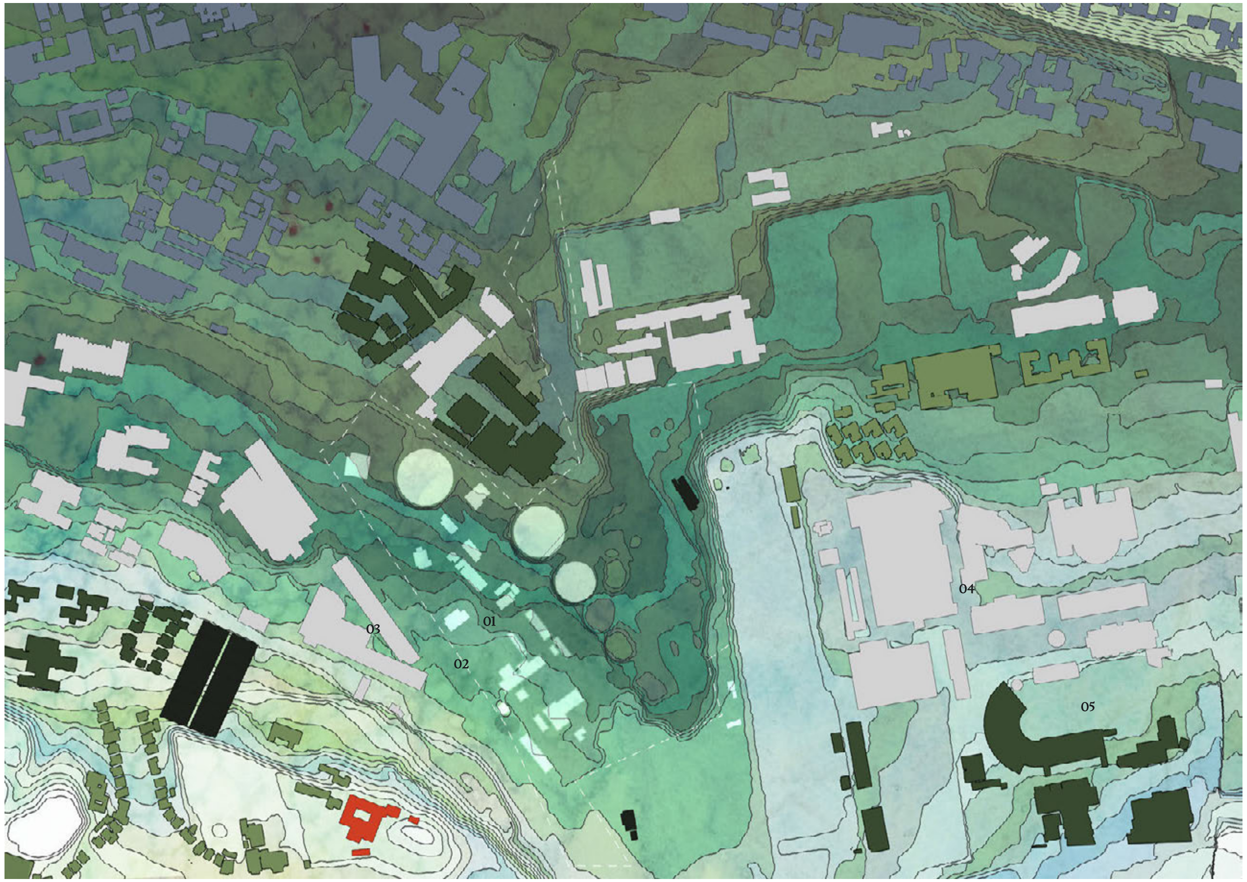


Fig 53 Spatial economy

2.7.5 Regenerative Projects in the City

There are numerous successful regenerative project well underway in the City of Johannesburg

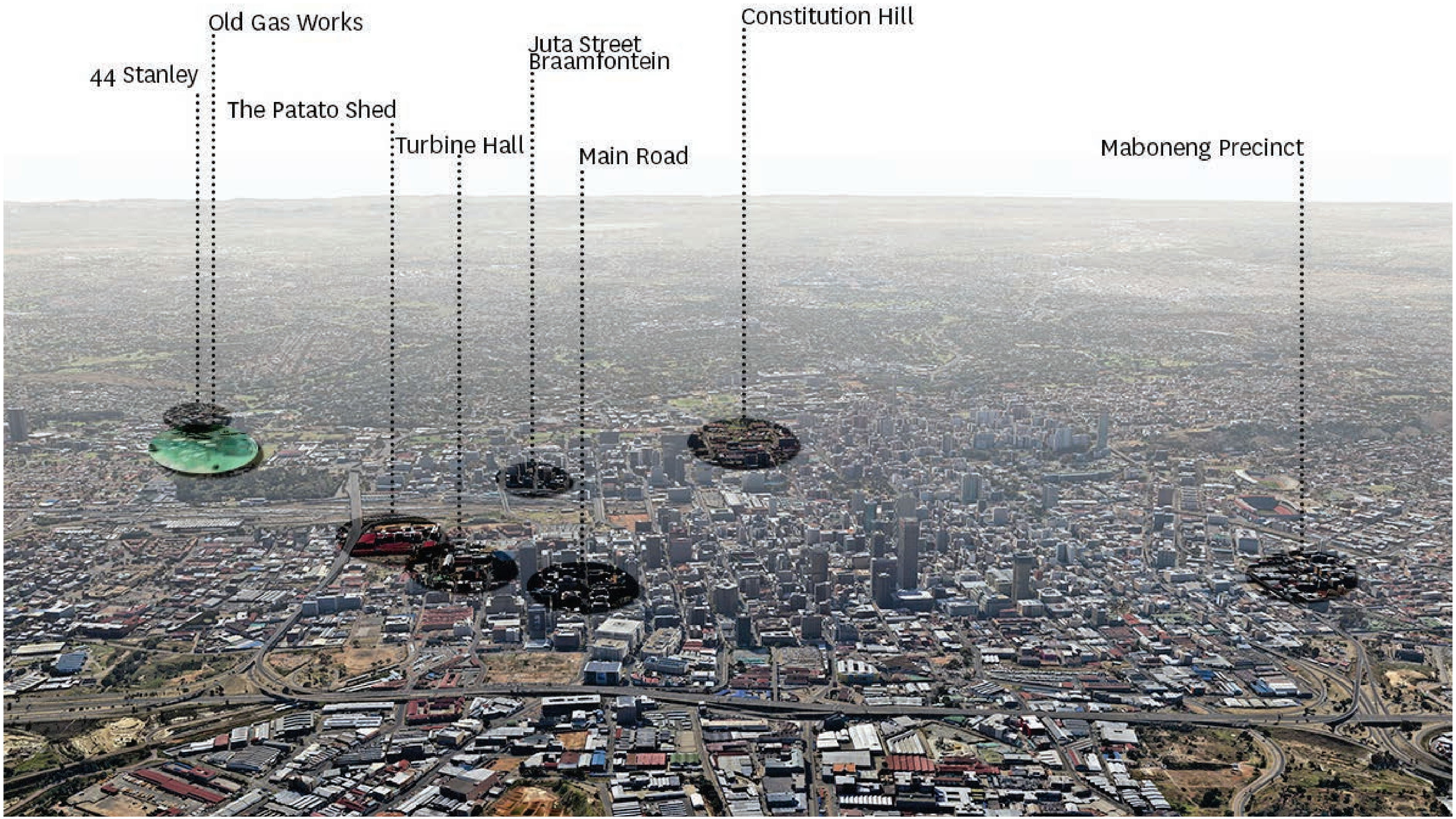


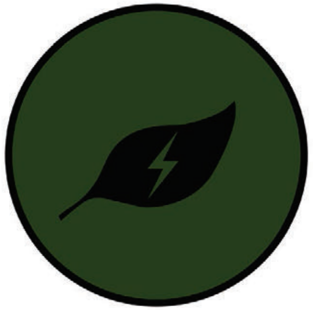
Fig 54 Urban renewal projects in the City of Johannesburg (The Gas Works Group, 2017)

2.7.6 Public Urban Green Spaces

Fig 55 indicates the location of public green spaces within the City of Johannesburg. The ones that are available are few and far between; especially in the Braamfontein area.

The Gas Works has been a producer of gas and the by-products provided the city with liquid ammonia for gardens and briquettes. There was also a considerable amount of pollution as a result on the site. Now being a derelict station stripped of its purpose to provide, it is time to bring energy and life back onto the site.

Fig 55 Publicly accessible urban green spaces



'RENEWABLE'

- OPEN SPACES
- WATER
- VEGETATION
- TAR POLLUTION

2.8 The Johannesburg Metropolitan Open Space System (JMOSS)

2.8.1 Defining Open Space

The Johannesburg Metropolitan Open Space System (2000:6) defines an open space as any undeveloped vegetated land within and beyond the urban edge, belonging to any of the following six open space categories:

- ecological,
- social,
- institutional,
- heritage,
- agricultural, and
- prospective (degraded land).

The Metropolitan Spatial Development Framework (2002:), defines a Metropolitan Open Space System (MOSS) as an inter-connected and managed network of open spaces, which supports interactions between social, economic and ecological activities, sustaining and enhancing both ecological processes and human settlements. The MOSS comprises public and private spaces, human-made or delineated spaces, undeveloped spaces, disturbed 'natural' spaces, and undisturbed or pristine natural spaces.

2.8.2 The purpose & categories of urban open space

JMOSS (2002:8) sets out the purpose of open spaces as defined by the Department of Environmental Affairs and Tourism. The purpose of any open space is to:

1. Provide recreation opportunities
2. Conserve natural resources
3. Be ecologically productive
4. Provide opportunity for environmental education
5. Provide concrete opportunity for urban agriculture
6. Be a viable economic entity, and
7. Enhance the city 's appearance

JMOSS (2002:20) states that there are 6 categories of Open Space, namely:

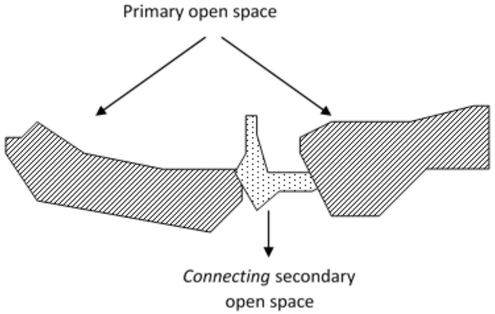
1. Ecological open space – Existing and desired.
2. Social open space.
3. Institutional.
4. Heritage.
5. Agriculture.
6. Prospective open space – Tarnished sites (e.g. slimes dams or mines before being decommissioned and landfill sites) which, will potentially form part of the ecological corridor system when rehabilitated.

2.8.3 Various Forms of Open Spaces

2.8.3.1 Primary Open Space Network

Ecological areas that already exists and recognized by JMOSS as core areas of equal importance. Examples include riverine corridors and nature reserves (SEF, 2002:32).

Desired areas qualify certain criteria, but may be re-categorised in Phase 2 of JMOSS. Isolated spaces are also found in this sub-category. These spaces are not connected to primary, secondary or tertiary open spaces and usually is deemed to remain as is (SEF, 2002:33).



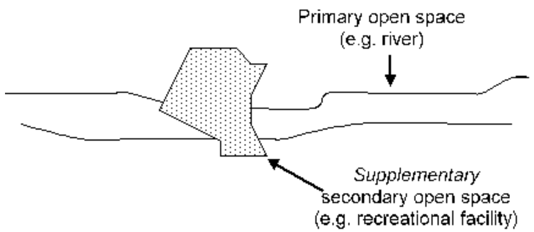
2.8.3.2 Secondary Open Space

These open spaces consists of heritage, institutional and agricultural spaces (SEF, 2002:34-35).

a) Connecting secondary open spaces: This secondary space links two primary open spaces that JMOSS prioritizes as high.

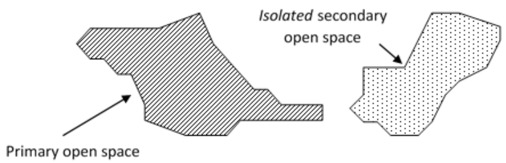
b) Supplementary open spaces: An area that extends over a geographical feature such as a river or a ridge. JMOSS classifies this as medium priority.

c) Isolated open spaces: Can be re-categorised as discussed under desired open spaces (See JMOSS 2002).



2.8.3.3 Tertiary open space

This category is inclusive of all open spaces within the prospective category and the same differentiations are applicable to tertiary spaces as with secondary open spaces. It may also be re-categorised (SEF, 2002:35-36).



2.8.4 Johannesburg Open Spaces

Fig 56 shows maps some of the open spaces within the city and around the Gas Work site. It is notable that there are many social spaces surrounding the site, but all of these are privately owned and not accessible to the public.

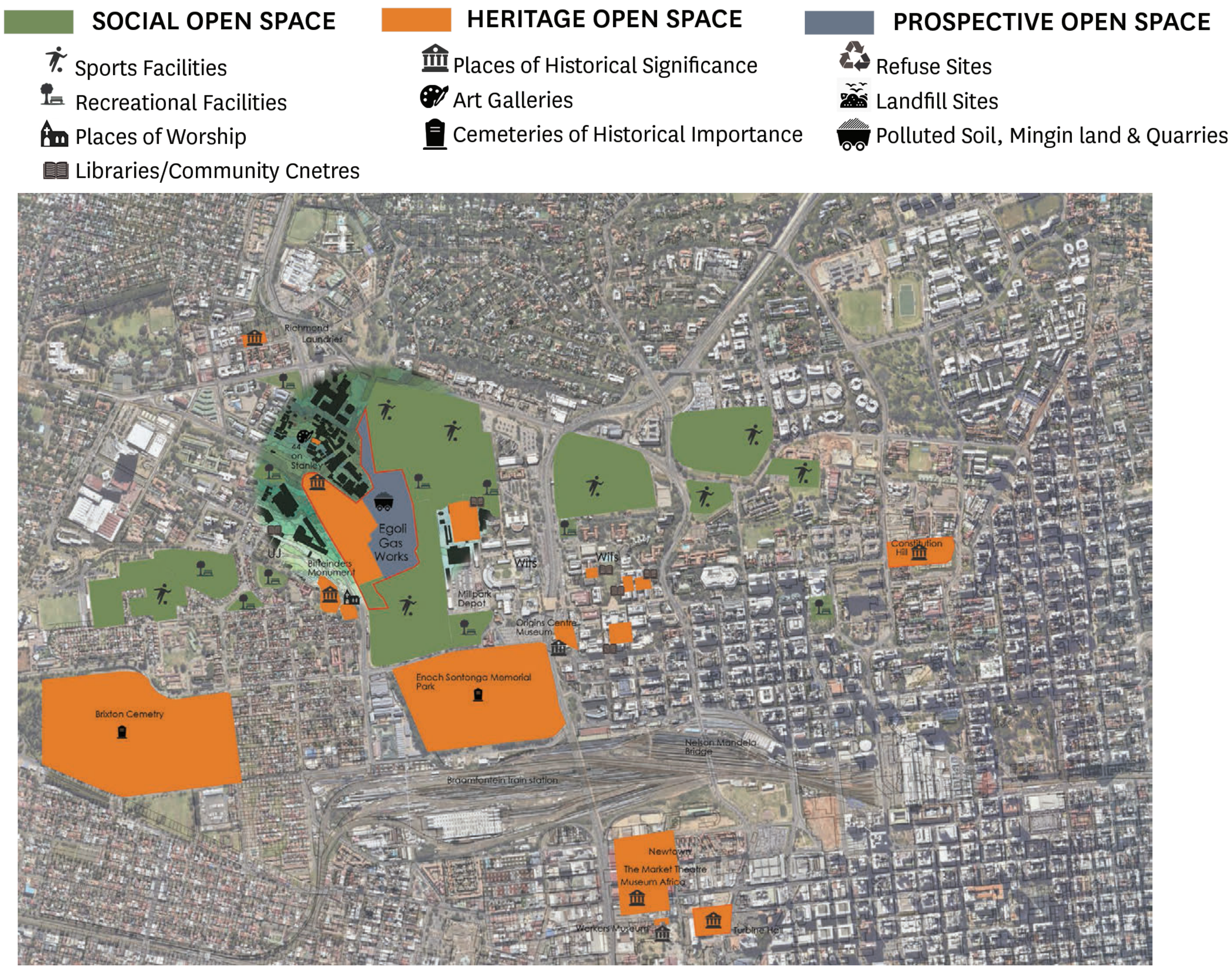


Fig 56 City of Johannesburg open spaces

2.9 Johannesburg Spatial Development Frameworks

In order to understand the Gas Works site, the Gas Works Group had to look to future of the city and critically analyse the various frameworks that are proposed by the city of Johannesburg

2.9.1 2040 Spatial Development Framework

The 2040 Spatial Development Framework for the City of Johannesburg is a '*dynamic model of strategic planning*' (City of Johannesburg, 2016:18) that strives toward spatial transformation through the use of: justice, equity, urban efficiency, resilience and sustainability.

Three development scenarios were tested to find a solution to best fit Johannesburg on a social, economic and environmental level (City of Johannesburg, 2016:18). The 'Business-as-usual' scenario which led to dispersed growth and sprawl. The second scenario was 'linear development' which directed its focus along corridors of public transport. The final scenario was based on the polycentric model. This model is based on the idea of concentrating growth in the compacted core of urban areas and other vital transit orientated nodes. The polycentric model out-performed the other two scenarios and was identified as the most appropriate scenario for the city (City of Johannesburg, 2016:18).

"... the spatial vision envisaged by the SDF 2040 for Johannesburg is a compact polycentric city with a dense urban core linked by efficient public transport networks to dense, mixed use, complimentary sub-centres, situated within a protected and integrated natural environment."

City of Johannesburg (2016:18)

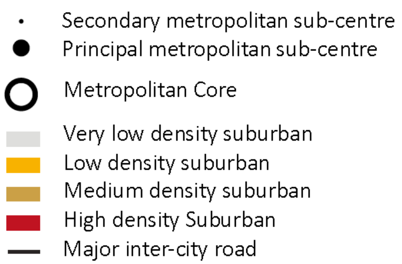
2.9.2 Corridors of Freedom Vision

The Empire-Perth corridor

The Empire-Perth corridor is a transit-orientated development, that aims to create a future city with well-planned transport corridors that are safe, provide affordable buses, pedestrian activity and cycling routes. The dream is that it would allow the people of Johannesburg to create a life within the city without having to make use of privatised motor transport, to break away from the entrenched settlement patterns and to allow for high density accommodation along the main arterial routes in order to draw residents back to the economic opportunities within the city (City of Johannesburg, n.d.).

Potential Future Regional Node

The Gas Works falls under the Millpark area which is proposed within the vision to be a 'potential' future regional node. This area has, according to the City of Johannesburg the potential to be a major mixed-use node. The Gas Works would link into the broader nodal precinct and has been classified as a potential catalytic project



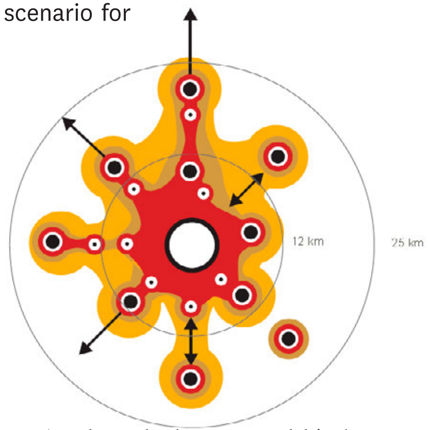


Fig 57 raditional Polycentric model (Urban Morphology Institute, 2016)

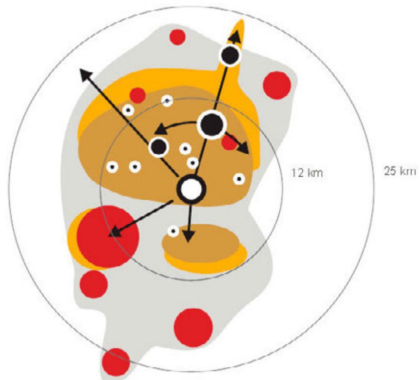


Fig 58 Inverted Polycentric model - Current condition (Urban Morphology Institute, 2016)

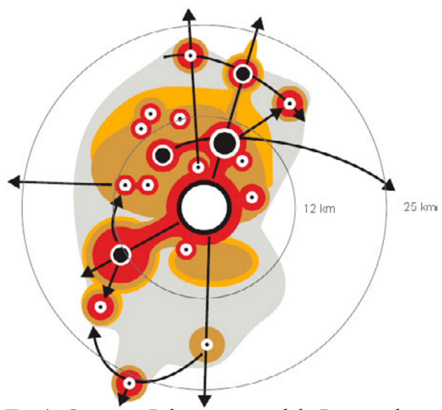
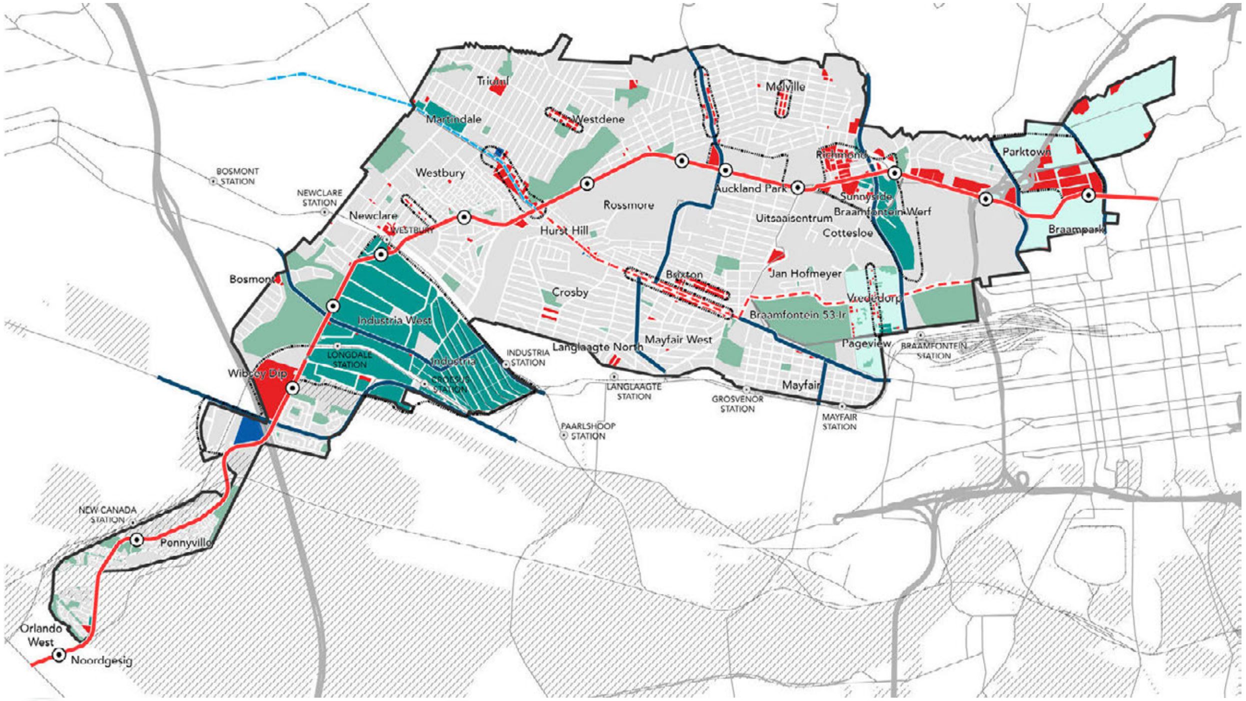


Fig 59 Compact Polycentric model - Proposed scenario (Urban Morphology Institute, 2016)



1 Industria Industrial Area
2 Retail Centre
3 Gasworks / Greater Milpark (Future Node)
4 Parktown Office Node
5 Campus Square Shopping Centre
6 Central Street (Brixton) retail strip
7 Caroline Street (Mixed use strip)
8 Main Road (Westdene) Retail & Commercial Strip
9 Main Road (Melville) Retail Strip
10 Thornton Street (Sophiatown) Small Retail Strip
11 5th Street (Melville) Retail Strip
12 Steytler Road (Westbury) Retail Strip
13 De la Rey Street (Vrededorp) Small Retail Strip

Fig 60 Key economic areas & Millpark as potential future regional node (Johannesburg Development Agency, n.d)

for the rest of the Empire-Perth Corridor (Johannesburg Development Agency, n.d.:86).

Proposed interventions for the Millpark area The construction of a cycle and walkway link in Owl Street, to link the BRT station in Empire Road to the 44 Stanley Road and eventually creating a link to the proposed mix-use development on the Gas Works site (Johannesburg Development Agency, n.d:87).

Proposed interventions for the Millpark Area

The construction of a cycle and walkway link in Owl Street to link the BRT station in Empire Road to the 44 Stanley Road and eventually creating a link to the proposed mix-use development on the Gas Works site. The design of innovative traffic solutions will enable the development of 'mixed use Regional Economic' Facilities (Johannesburg Development Agency, n.d: 87).

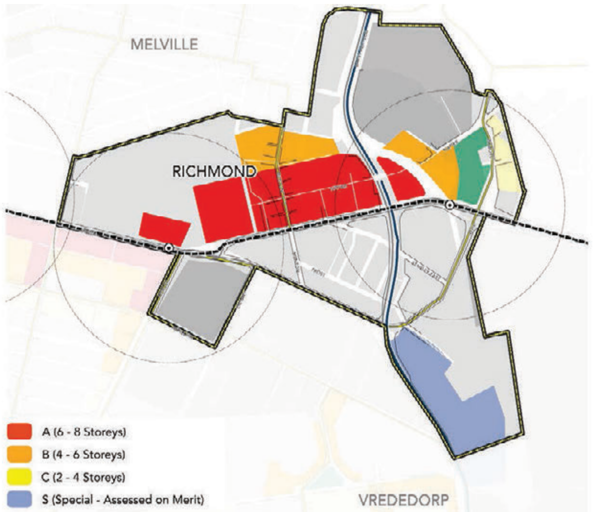


Fig 61 Densification (Johannesburg Development Agency, n.d)

Both these frameworks are very much transport oriented, focusing on access and liveability. Looking at the proposed model for the city and that which is envisioned, the site could well become a good addition that fits in with these frameworks. The precinct has the potential of becoming a space that act as a destination rather than a place that one passes every day. With the site being central and well connected to the rest of the City, a concentrated precinct can be created that fulfils the needs of the surrounding communities (new and old) by connecting the educational nodes to the larger city.

Läuferts le Roux & Mavunganidze (2015:85) are of the opinion that for it to work, what is required is a productive synergy between official top-down policy and planning processes, and bottom-up needs and desires at neighbourhood and street level. Where corridors support multi-modal vehicular transport systems and their strategic crossing points.

Currently Johannesburg planners and policy makers are preoccupied with discussions about 'Corridors of Freedom'. These corridors represent large-scale plans for improved north-south and east-west mobility-based links across Johannesburg's disjointed urban patches. An 'urban carpet', of which the Gas Works complex might become a key part, could embody a test case for smaller-scale and district-based complements to the proposed city-scale corridors. Without the fine-grained, neighbourhood-scale, (qualities that such context-responsive carpets would ensure) the corridors could become cold and reductive technocratic infrastructural devices that look good only on paper. For a real chance at overall urban success, what is required is a productive synergy between official top-down policy and planning processes, and bottom-up needs and desires at neighbourhood and street level. Where corridors support multimodal vehicular transport systems and their strategic crossing points, the neighbourhood-carpet approach fosters smaller-scale movement possibilities. In the carpet-like weave of the neighbourhood, pedestrians and cyclists would be afforded opportunities for integrated and safe connection from one neighbourhood to another: in this case via the revitalised Gas Works terrain. Numerous carpet-like fragments in close proximity to one another across the city could connect neighbourhoods through foot and cycle traffic. If such a scenario could be realised and the CoJ's currently shelved idea of decking the expansive railway shunting yards and converting this reclaimed surface into a park-scape were taken up, it would be possible to cycle or walk more safely from the Gas Works site all the way to Joubert Park and even to the Ellis Park precinct and beyond.

2.10 Pollutants on Site

Strategies to address this issue

Tar Pollution

Undissolved tar-like liquids are also known as a dense non-aqueous phase liquid or DNAPL. The by-products produced at the Gas Works includes the following:

- o Coke
- o Tar
- o Creosote

North Shore Gas Plant

Each clean-up option is to be evaluated against all nine of below criteria:

7. Overall protection of human health and the environment
8. Compliance with applicable or relevant and appropriate requirements (ARARs)
9. Long-term effectiveness and permanence
10. Reduction of toxicity, mobility or volume through treatment
11. Short-term effectiveness

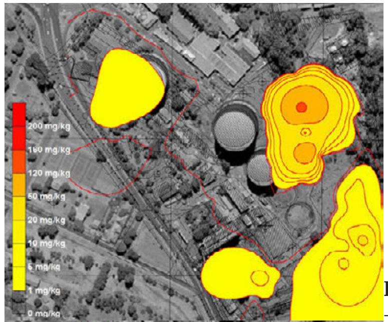


Fig 62 Benzoanthracene Pollution +0.58mgkg (GeoRem, 2006:19)

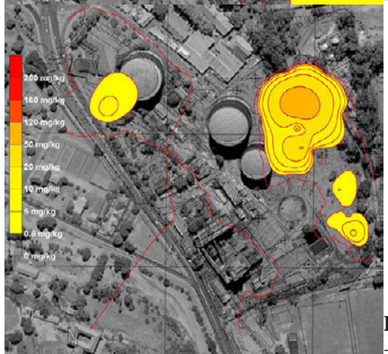


Fig 63 Benzofluerantine Pollution +0.58 mgkg (GeoRem, 2006:20)

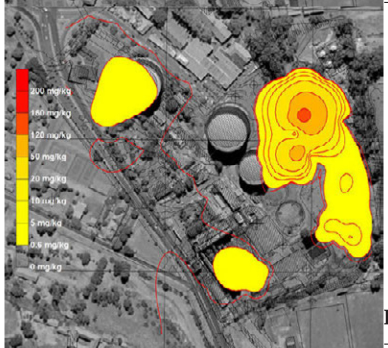


Fig 64 Benzopyrene Pollution +0.06mgkg (GeoRem, 2006:21)

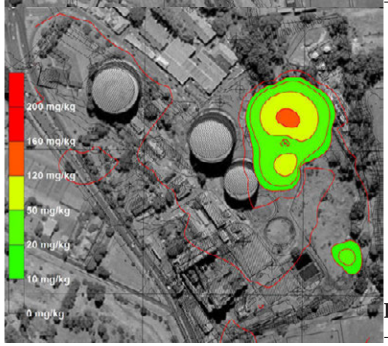


Fig 65 Chrysene Pollution +58.25mgkg (GeoRem, 2006:22)

12. Implementability
13. Cost
14. State acceptance
15. Community acceptance

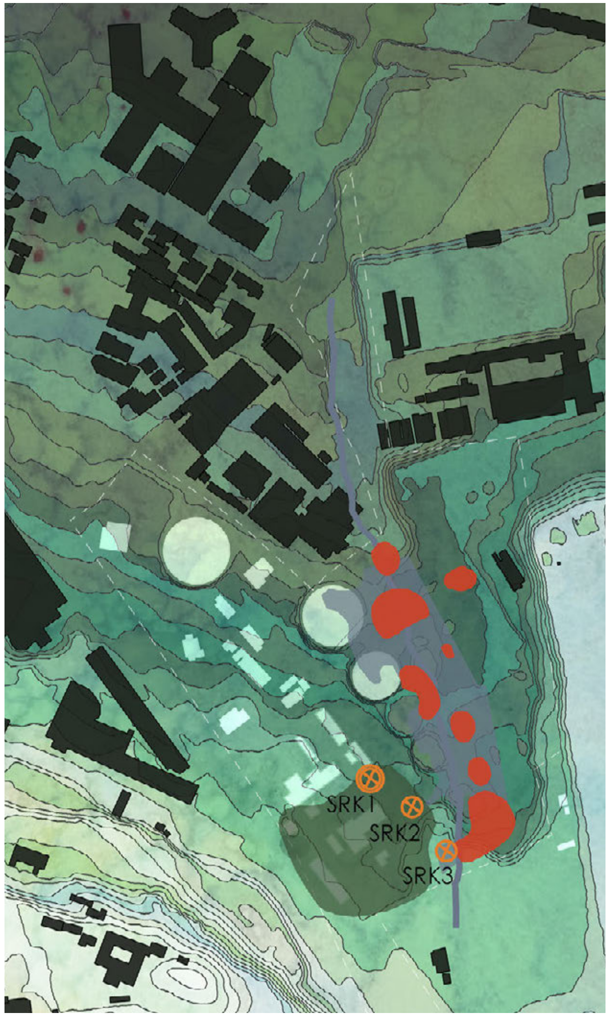


Fig 66 Site pollutants (Gas Works Group, 2017)

Clean-up options considered:

1. No Action
2. Institutional Controls – physical boundaries around polluted area.
3. Vertical Engineered Barrier – block pollution and water off from further contaminating rivers.
4. Horizontal Well DNAPL Recovery – pollutants run through horizontal wells and collected for off-site treatment.
5. Physically Enhanced DNAPL Recovery - pumping groundwater through area of contamination to vertical and horizontal wells for collection and of-site treatment. (7 yrs)
6. Chemically Enhanced DNAPL Recovery – inject chemical compounds into area to assist in breaking down the pollutants. (4 yrs)
7. Thermally Enhanced Recovery – heat soil and groundwater to increase pollutant removal or break down the substance. (4 yrs)

Other in-situ options to clean tar pollution (Claire, 2015:p):

- Enhanced bioremediation;
- Monitored natural attenuation;
- Stabilization/solidification;
- Venting
- Thermal heating/ smouldering (STAR/STARx) – specifically to clean creosote chemical compound.

● General Contamination
● Indicative area of PAH's (Benzo(a)pyrene;
● Benzofluoranthene; Chrysene; Benz(a) anthecene)
Area of Bore hole Tests
⊗ Inorganic & Organic contamination in Borehole wells

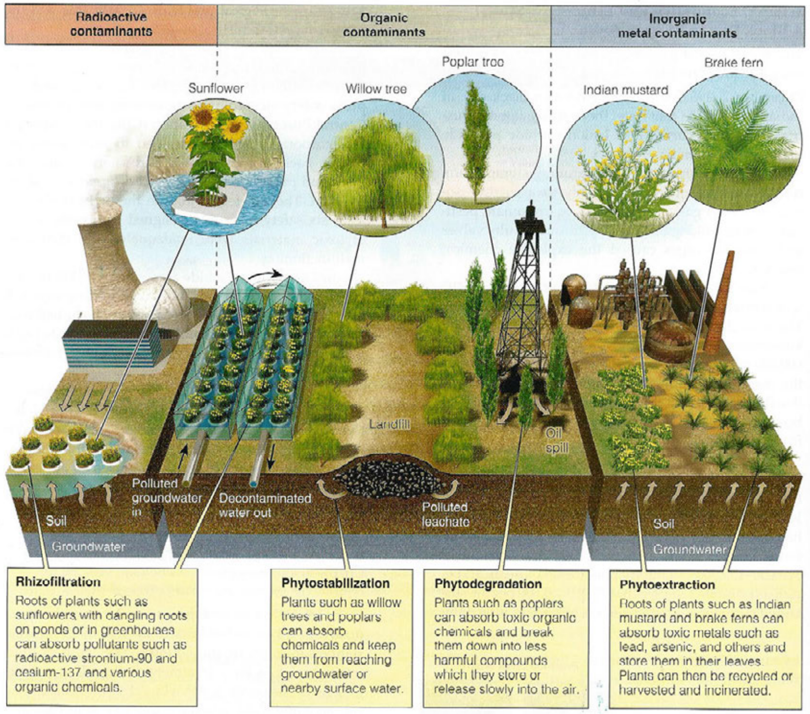


Fig 67 Phytoremediation (Tyler Miller, 2005)

Less commonly used options to treat contamination, includes (Claire, 2015)

- Electro-remediation
- Phytoremediation
- Vitrification

2.11 Re-purposed Industrial Sites

Local and International precedents of re-purposed industrial heritage sites

Turbine Hall

Country: Johannesburg, South Africa

Original use: Jeppe Street steam driven power station

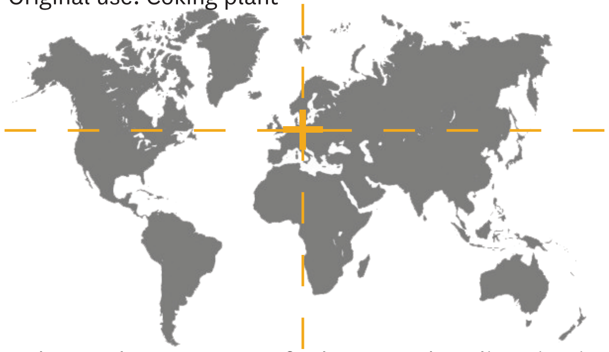
Turbine Hall, previously known as the Jeppe Street Power Station is now home to the Anglo Gold Ashanti family. This regenerative project made use of the heritage as a resource, by allowing the old building to shine through. The designers respected the history and responded sensitively to the context by incorporating all these influencing factors into the new building. This is a good example of paying homage to industrial heritage without turning it into a stagnant monument, but rather breathing new life into the existing structure in a respectful and sensitive manner. (Bethlehem, 2008)

Fig 68 Turbine Hall (Crowdtalk, 2009)

Kokerei Zollverein

Country: Ruhr district, Germany

Original use: Coking plant



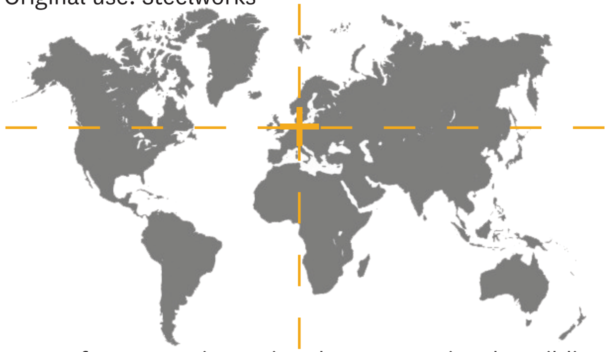
Perhaps the success of the complex lies in its programmatic diversity. The Zollverein not only offers spaces for art and entertainment, but also provides the public with ice-skating facilities during winter, when the water basins that run along the ovens' batteries freeze up. During the warmer months the open-air swimming pool, nestled between pipes, furnaces and the rusting ruins is opened up. It was originally intended as a temporary artistic installation, but after visitors started jumping in the pool and having a blast, it was decided to leave the installation as a permanent fixture (Vollmer & Berke, 2010:96).

Fig 69 Zollverein (Archdaily, 2014)

Duisburg-Nord

Country: Germany

Original use: Steelworks



One of 100 projects in the International Building Exhibition Emscher Park built in the Ruhr District in a period of 10 years. (Landezine, 2011) A re-interpretation was made by taking and developing existing patterns and fragments formed by the industrial uses. The existing is interwoven with the new landscape (Landezine, 2011). The 230 hectares' steelworks site consists of 230 hectares. The central theme of regeneration evolves around the natural processes including phytoremediation that decontaminates the soil over a longer period (Cumberlidge & Musgrave, 2007).

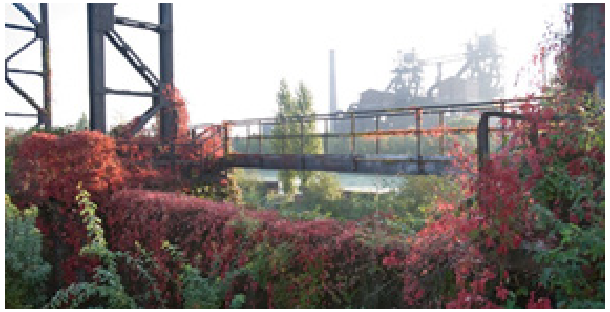


Fig 70 Duisburg-Nord (Landzine, 2011)

Turbine Hall

Country: Johannesburg, South Africa

Original use: Jeppe Street steam driven power station

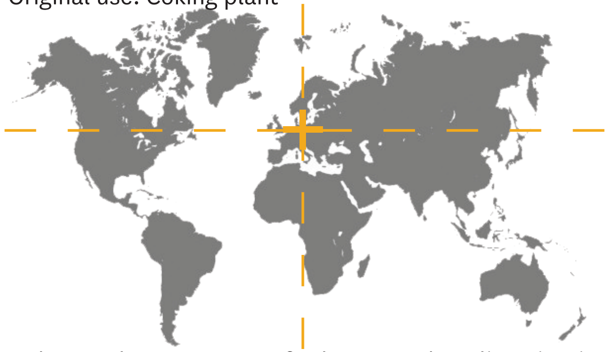
Turbine Hall, previously known as the Jeppe Street Power Station is now home to the Anglo Gold Ashanti family. This regenerative project made use of the heritage as a resource, by allowing the old building to shine through. The designers respected the history and responded sensitively to the context by incorporating all these influencing factors into the new building. This is a good example of paying homage to industrial heritage without turning it into a stagnant monument, but rather breathing new life into the existing structure in a respectful and sensitive manner. (Bethlehem, 2008)

Fig 71 Turbine Hotel Interior (Leading Architecture, 2011)

Kokerei Zollverein

Country: Ruhr district, Germany

Original use: Coking plant



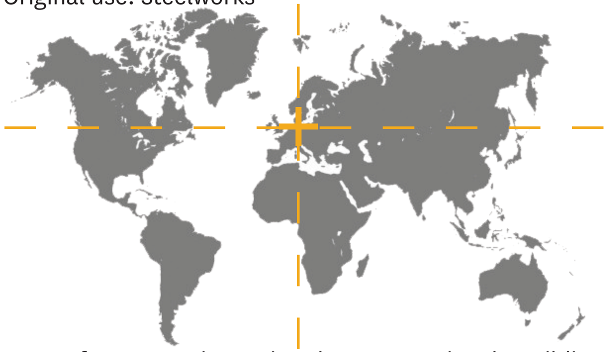
Perhaps the success of the complex lies in its programmatic diversity. The Zollverein not only offers spaces for art and entertainment, but also provides the public with ice-skating facilities during winter, when the water basins that run along the ovens' batteries freeze up. During the warmer months the open-air swimming pool, nestled between pipes, furnaces and the rusting ruins is opened up. It was originally intended as a temporary artistic installation, but after visitors started jumping in the pool and having a blast, it was decided to leave the installation as a permanent fixture (Vollmer & Berke, 2010:96).

Fig 72 Westergasfabriek (Westergasfabriek, n.d)

Duisburg-Nord

Country: Germany

Original use: Steelworks



One of 100 projects in the International Building Exhibition Emscher Park built in the Ruhr District in a period of 10 years. (Landezine, 2011) A re-interpretation was made by taking and developing existing patterns and fragments formed by the industrial uses. The existing is interwoven with the new landscape (Landezine, 2011). The 230 hectares' steelworks site consists of 230 hectares. The central theme of regeneration evolves around the natural processes including phytoremediation that decontaminates the soil over a longer period (Cumberlidge & Musgrave, 2007).

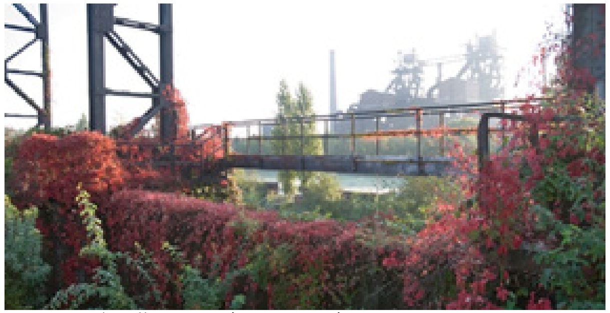


Fig 73 Fresh Kills in 2016 (Lange, 2016)

2.12 Energy Plants of South Africa

By looking at Various power stations in South Africa, from about the same time as the construction of the first Retort at the Gas Works, it is clear that The form is not just an aesthetic form, nor just a random form. It shows that the Architecture was built for a specific reason and thus, the form Follows Function

Johannesburg Gas Works

1928

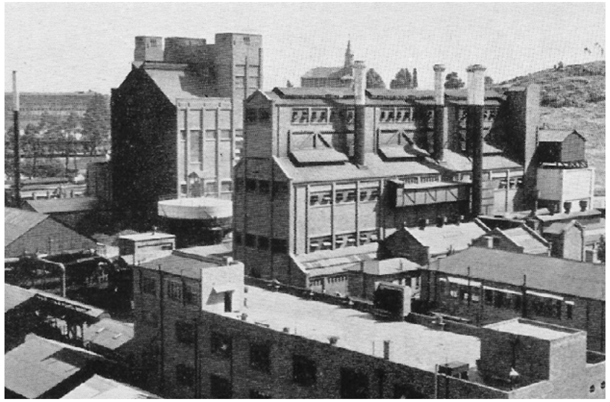


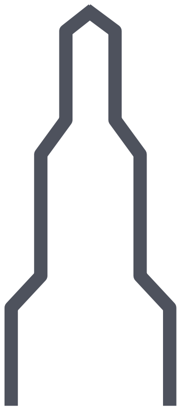
Fig 74 The Gas works (Archives of Läuferts le Roux, 2017)

energy production method

COAL TO GAS

area served

Johannesburg



Rosherville power station

1911- 1966

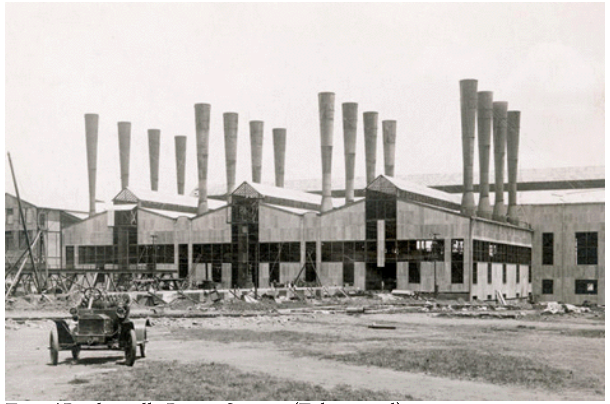


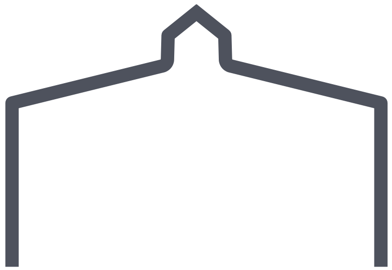
Fig 75 Rosherville Power Station (Eskom, n.d)

energy production method

Coal-fired

area served

Primarily the gold mines of the Witwatersrand



Congella Power Station

1928

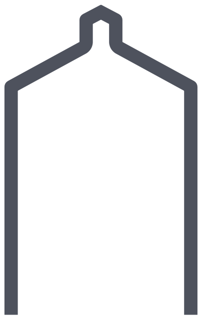
Fig 76 Congella Power Station (Eskom, n.d)

energy production method

Coal fired

area served

Durban and Pietermaritzburg



Witbank Station

1927

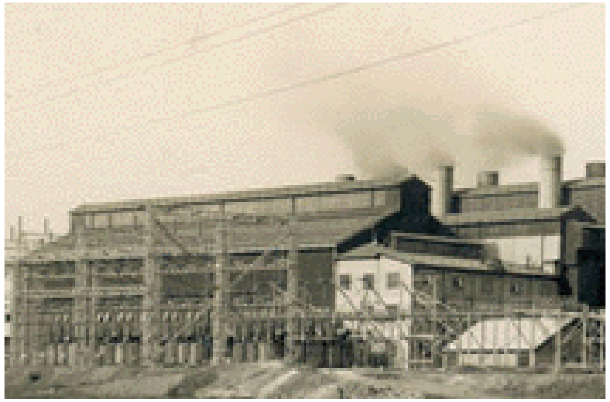


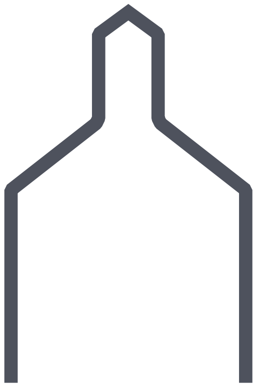
Fig 77 Witbank Power Station (Eskom, n.d)

energy production method

Coal powder

area served

Primarily the Witwatersrand gold fields



Cape Town Gas Works

1888

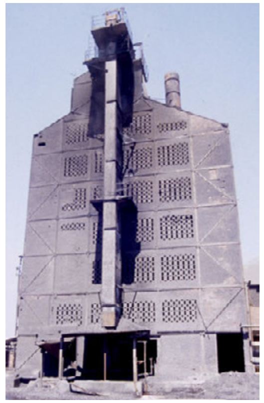


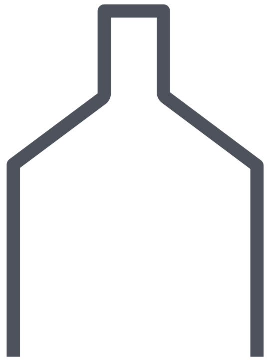
Fig 78 Cape Town Gas Works (Eskom, n.d)

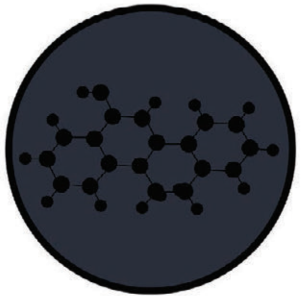
energy production method

Coal to Gas

area served

First street lights in the city centre and later supplied the Southern suburbs with gas





'POTENTIAL ENERGY'

- Intuitive Site Vision
- Framework Energy

"Man's attitude toward nature is today critically important simply because we have now acquired a fateful power to alter and destroy nature.

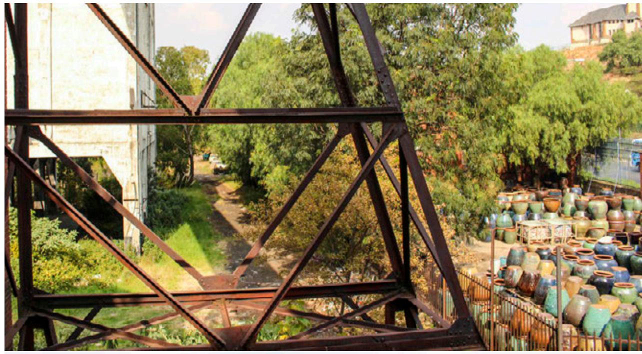
But man is a part of nature, and his war against nature is inevitably a war against himself? [We are] challenged as mankind has never been challenged before to prove our maturity and our mastery, not of nature, but of ourselves."

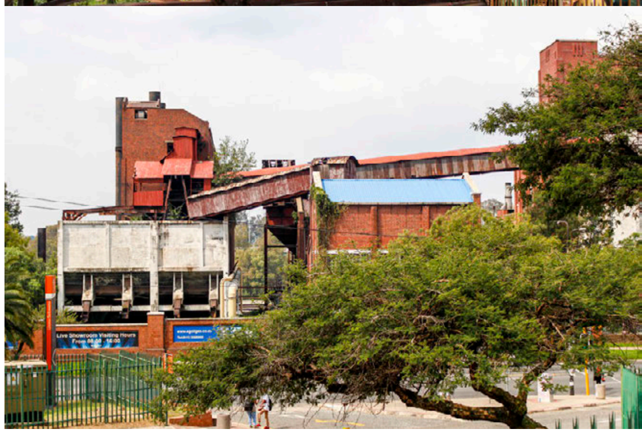
- Rachel Carson -

(NRDC, 2015)

2.13 A Sense of Place

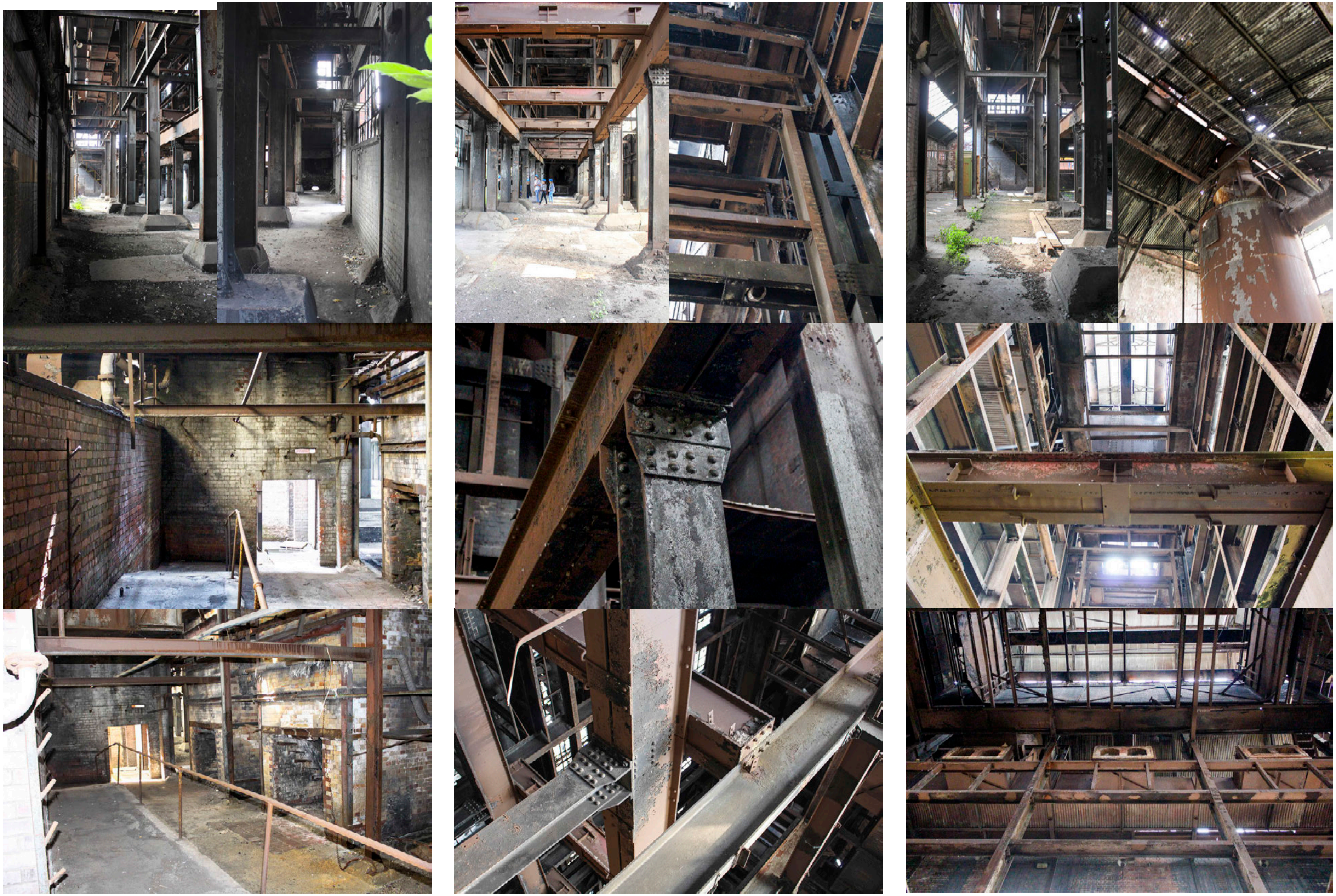
Photographic exploration of the site (Retort 1 and Surrounding)





Exploring the Exterior

Exploring the Interior



Objects in and Around

2.14 Proposal for a New Park Typology

Restitution:

Noun | res·ti·tu·tion | \ res-tə-'tü-shən, -'tyü-\

- an act of restoring(Merriam-Webster, 2017)
- act of giving back something that has been lost or stolen.
- act of compensating for loss or injury by reverting as far as possible to the position before such injury occurred (Collins Dictionary, 2017)

2.14.1 Defining the Vision

The hazardous process of coal to gas has left remnants of its destruction on site in the form of tar pollution. The current isolation of the site and the empty shells of industry abandoned and left to be consumed by the clutches of time and nature almost create the visual of the buildings surrendering to that which it once oppressed: Nature.

This site provides the perfect opportunity for restitution between not only industry and nature, but also between industrial heritage and the city dwellers. Applying the principles of regenerative architecture we are challenged by the idea of a new typology for abandoned industrial heritage sites such as the Gas Works. Restitutive relationships were identified to target this approach. The five restitutive relationships became the key to architectural interventions within the Gas Works framework.

In order to rejuvenate the Old Gas Works, relationships were identified that are in need of restitution:

2.14.1.1 City ⟨—⟩ Site

[The need: The site is currently completely isolated and does not contribute to the city in any manner. A new relationship needs to be established in order to restitute the site's solitary nature]

According to the Johannesburg Metropolitan Open Space Systems (City of Johannesburg, 2002:6), open spaces can be defined as any undeveloped vegetated land within and beyond the urban edge. An open space can belonging to any one of the following six open space categories:

- Ecological
- Social
- Institutional
- Heritage
- Agricultural
- Prospective (degraded land)

The Gas Works site as an inaccessible developed space in the urban fabric comprises of a heritage component as well as a prospective/degraded component. The site however can become a fully functional open space within the greater city by connecting to the remaining categories.

The Metropolitan Spatial Development Framework (2000), defines a Metropolitan Open Space System (MOSS) as an interconnected and managed network of open spaces, which supports interaction between social, economic and ecological activities, sustaining and enhancing both ecological processes and human settlement. A MOSS comprises out of the following:

- Public & private spaces,
- Human-made or delineated spaces,
- Undeveloped spaces,
- Disturbed 'natural' spaces, &

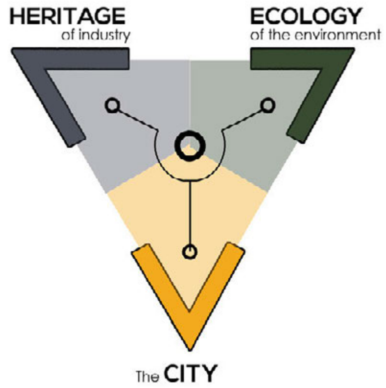


Fig 79 Relationships within Restitution

- Undisturbed or pristine natural spaces.

(City of Johannesburg, 2002:7)

As set out by the Department of Environmental Affairs and Tourism (1995), the purpose of open spaces is to:

- Provide recreation opportunities,
- Conserve natural resources,
- Be ecologically productive,
- Provide opportunity for environmental education,
- Provide concrete opportunity for urban agriculture,
- Be a viable economic entity,
- Enhance the city's appearance.

(City of Johannesburg, 2002:8).

In order for the Gas Works site to work, it will need to be restitutive in its relationship within these functions. The site should be designed to act as a future regional node for the Empire-Perth corridor to fit into the SDF for Johannesburg. The site should be programmed according to the needs of the immediate surroundings.

2.14.1.2 Industrial heritage ⟨—⟩ People

[The need: Previously these industrial buildings were completely isolated from the public for safety reasons. However the notion of isolated industries should be challenged by exposing the public to the production process as well as making them active participants/ observers.

Restitution in terms of:

- Serving people by re-purposing the industrial heritage

The re-use of structures to create the new, as palimpsest to the old. Layers of history as a way forward.

- Education and exposure to previous privatised processes.

Displaying elements & processes by explanatory signage. Integration the heritage into the site and the Architecture, making it a part of the architecture.

Exploration of the site by means of experience it in the way that users move through the site.

2.14.1.3 Industry ⟨—⟩ Ecology

[The need: The by-products left by industry has had damaging effects on the site's ecology and there is thus a need for the restitution of this relationship in order to make it safe for the public to take full advantages of the site as well as to prevent industry from damaging the ecology in the future]

- Remediation of pollution/landscape

Programs to remediate/restitute polluted areas within the landscape

- Mutually beneficial relationship, instead of exploitative

Programs that support & help the landscape (Nature help Architecture help nature). Reprogramming existing to restitute past relationship of exploitation.

- Integration of industry & nature (co-existence)

Production of natural systems (Agriculture, Natural produce, finding alternatives in conventional production processes)

2.14.1.4 Landscape ⟨—⟩ people

[The need: The areas surrounding the Gas Works is laden with privatized recreational spaces, isolating themselves from the use of the general public. This site comprises of a vast piece of land with the potential to become an anti-privatized park for everyone to enjoy]

- Providing recreational space (non-privatized)

Relaxation, exercise, health, Walking, jogging, cycling, gym(indoor).

- Provider to people (think agriculture...)

Such as the programs suggested in Industry – Ecology. As a giver.

2.14.1.5 Site ⟨—⟩ People

[The need: Due to the industrial and privatized nature of the site it has been completely isolated from the city dwellers. The site layout and the design of the buildings were dictated by the process of producing gas and now that this technology has been deemed obsolete the site has lost its purpose. Restitution between the site and city dwellers are needed in order to bring energy and life back onto this site.

- Access & linkage

Access to and from the site. Connecting nodes (Educational & Social). Connecting Transport. Linking edges.

Linking as a mean of experiencing the site.

- Functions to serve public
- Accommodation

Restitutive relationship diagrams

THE CITY TO THE SITE	HERITAGE OF INDUSTRY TO THE PUBLIC	INDUSTRY TO ECOLOGY	LANDSCAPE TO PEOPLE	THE SITE TO THE PUBLIC
THE NEED				
The site is currently completely isolated and does not contribute to the city in any manner. A new relationship needs to be established in order to restitute the site's solitary nature	Previously these industrial buildings were completely isolated from the public for safety reasons. However the notion of isolated industries should be challenged by exposing the public to the production process as well as making them active participants/ observers	The need: The by-products left by industry has had damaging effects on the site's ecology and there is thus a need for the restitution of this relationship in order to make it safe for the public to take full advantages of the site as well as to prevent industry from damaging the ecology in the future	The areas surrounding the Gas Works is laden with privatized recreational spaces, isolating themselves from the use of the general public. This site comprises of a vast piece of land with the potential to become an anti-privatized park for everyone to enjoy	Due to the industrial and privatized nature of the site it has been completely isolated from the city dwellers. The site layout and the design of the buildings were dictated by the process of producing gas and now that this technology has been deemed obsolete the site has lost its purpose
THE REMEDIATIVE APPROACH				
According to the Johannesburg Metropolitan Open Space Systems (City of Johannesburg, 2002:6), the Gas Works site as an inaccessible developed space in the urban fabric comprises of a heritage component as well as a prospective/degraded component. The site however can become a fully functional open space within the greater city by connecting to the remaining categories. In order for the Gas Works site to work, it will need to be restitutive in its relationship within the functions set out by MOSS (City of Johannesburg, 2002:7). The site should be designed to act as a future regional node for the Empire-Perth corridor to fit into the SDF for Johannesburg. The site should be programmed according to the needs of the immediate surroundings.	Serving people by re-purposing the industrial heritage. The re-use of structures to create the new, as palimpsest to the old. Layers of history as a way forward. Education and exposure to previous privatised processes. Displaying elements & processes by explanatory signage. Integration the heritage into the site and the Architecture, making it a part of the architecture. Exploration of the site by means of experience it in the way that users move through the site.	Remediation of pollution/landscape Programs to remediate/restitute polluted areas within the landscape Mutually beneficial relationship, instead of exploitative Programs that support & help the landscape (Nature help Architecture help nature). Reprogramming existing to restitute past relationship of exploitation. Integration of industry & nature (co-existence) Production of natural systems (Agriculture, Natural produce, finding alternatives in conventional production processes)	Providing recreational spaces that are non-privatized such as: relaxation, exercise, health, walking, jogging, cycling, gym(indoor/outdoor). The site becomes a provider to people; thinking of ways such as agriculture. Such as the programs suggested in Industry - Ecology. As a giver.	Access & linkage to and from the site. Connecting nodes between Educational & Social. Connecting the various transport. nodes and linking edges. Linking becomes a mean of experiencing the site. Introduction of functions to serve public such as accommodation.

Fig 80 Restitutive relationships (The Gas Works Group, 2017)

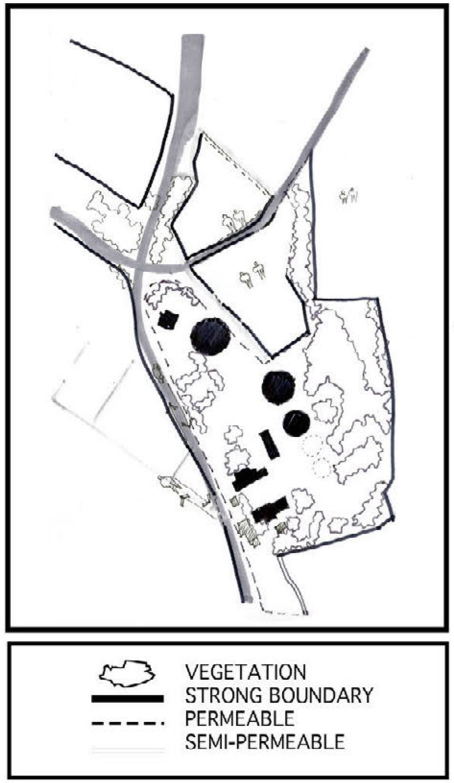


Fig 81 Industrial - Ecology. Footprints of the past

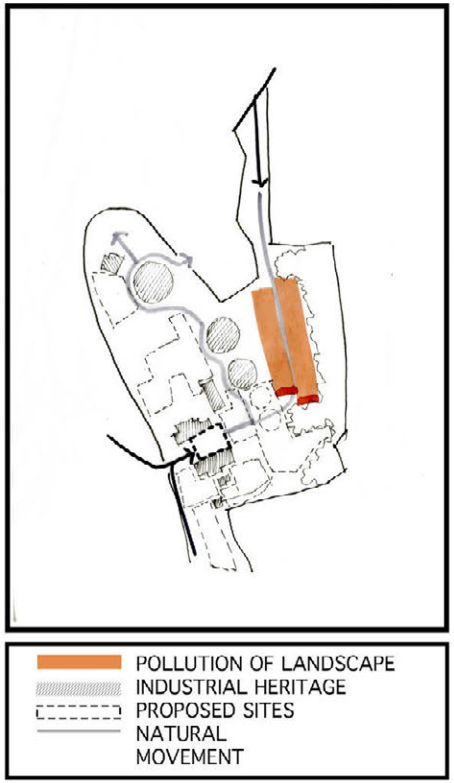


Fig 82 Site - People. Connecting edges

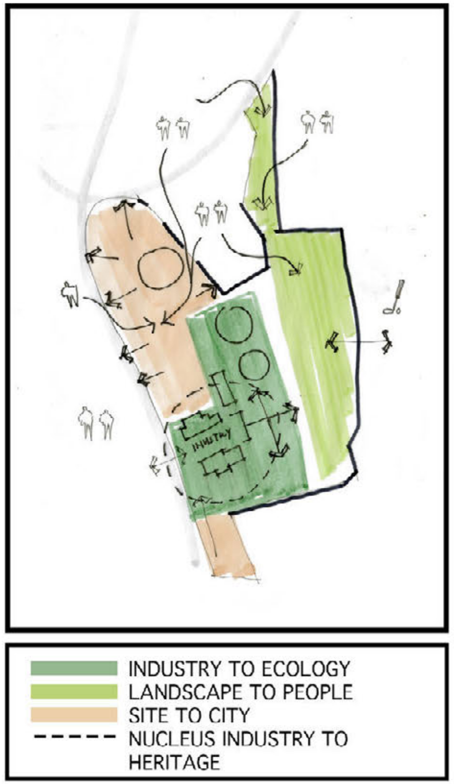


Fig 83 The site as restitutive layers

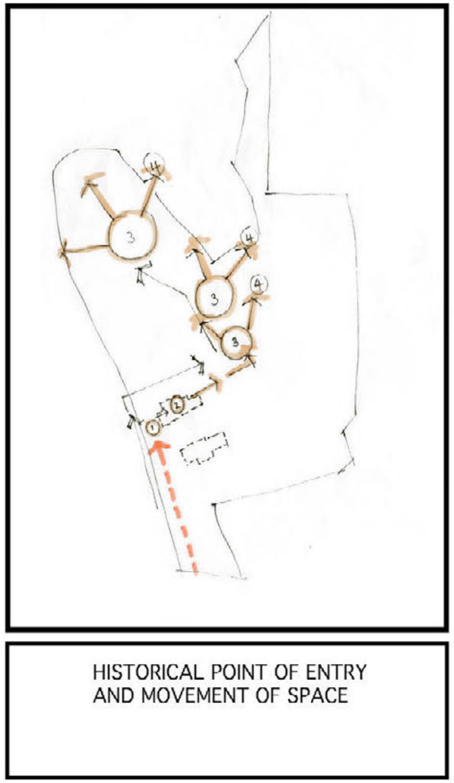


Fig 84 Industrial Heritage as a means of movement

Relationships zoned on site

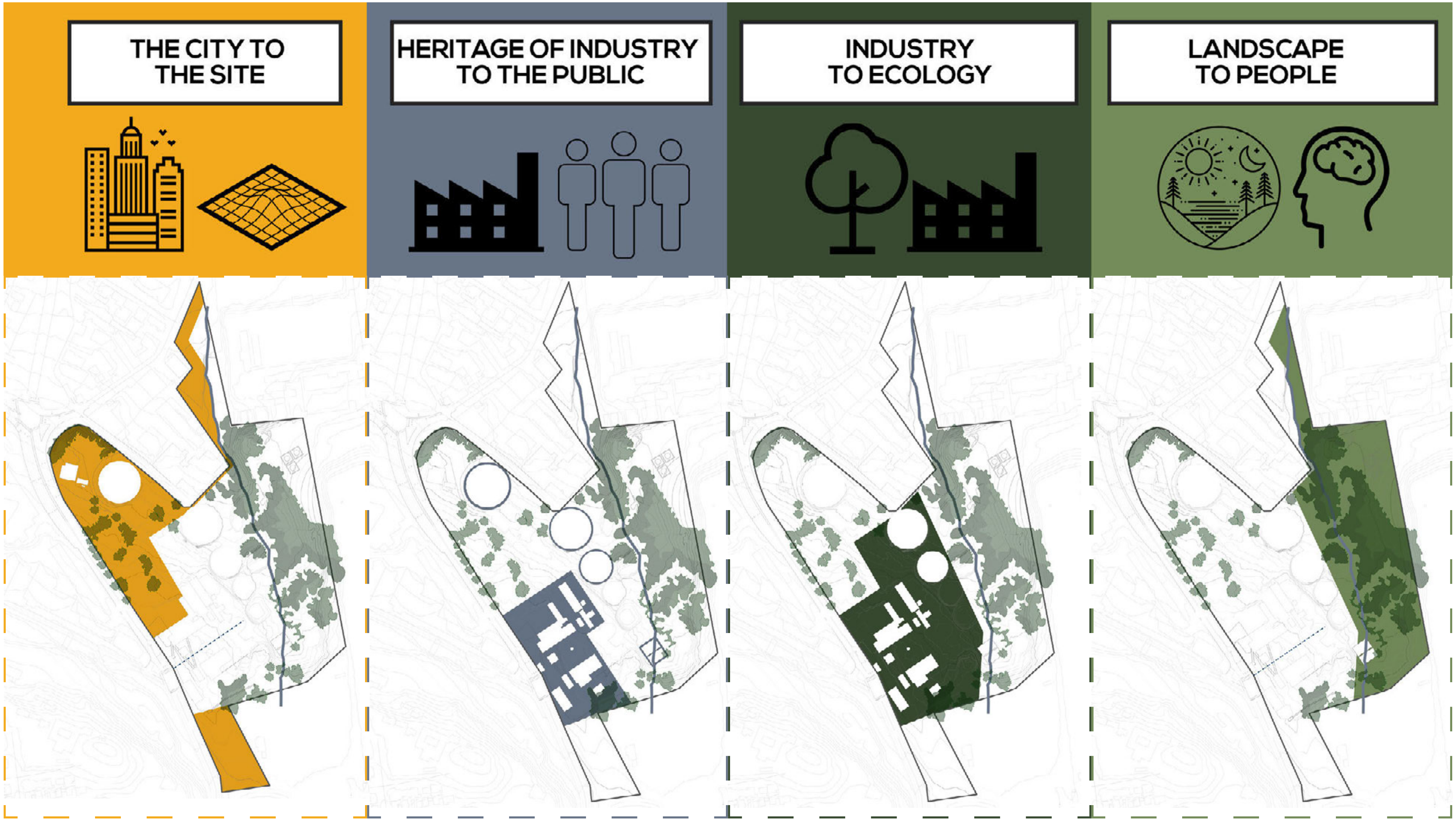


Fig 85 Relationship zoning (The Gas Works Group, 2017)

2.15 Restitution Park Master plan

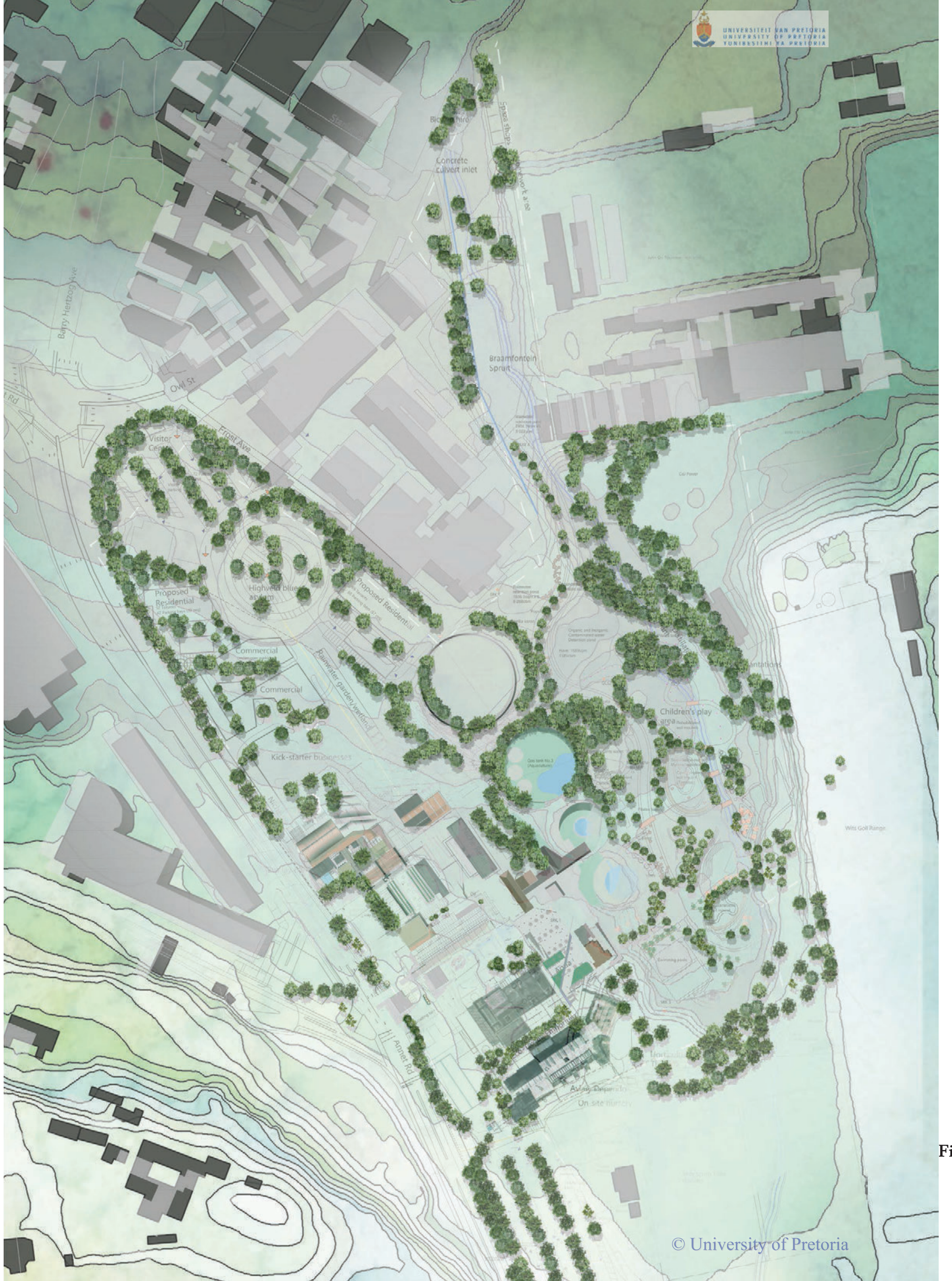


Fig 86 Urban vision master plan (The Gas Works Group, 2017)

2.16 Precedents

Emscher Park and the Turbine Hotel was briefly looked at page 47 in realising the urban vision. It will now be looked at in more detail to see what projects such as this could potentially mean for the redevelopment of the Gas Works.

2.16.1 Emscher Park/Landschaftpark

Duisburg-Nord, Germany 1999-2002

There are many aspects of this project that speaks to that of the Gas Works: which is to regenerate abandoned post-industry in modern times. Duisburg is known for the landmarks which bear witness to its important industrial past: mines and iron and steel works which are largely disused, and a road and rail network which crosses the region, next to the river Emscher which was channelled to provide a sewage collector; thus it revealed high levels of land and water pollution (Oliveres, 2014).

The park was created in order to give a new ecological, economic, social and cultural impulse to the old industrial Ruhr area by means of these restructuring projects (GroenBlauw, n.d.).

The programme was based on the conviction that future economic competitiveness should involve the ecological quality of regions and, in line with this, the main task of renewing the zone should seek to eliminate urban and ecological shortcomings in order to obtain a new basis for its future development (Oliveres, 2014).

The specific aims outlined by the body were:

- the ecological transformation of the fluvial system of the Emscher,
- the modernisation of workers' housing developments,
- the reassessment of old industrial sites,
- the conservation and re-utilisation of industrial monuments as witnesses to history, and
- the preservation and reconstruction of the regional landscape.

The core topic was thus the creation of a major landscape park with a network of green spaces which needed to be preserved and linked up through new uses and new values given to old industrial sites (Oliveres, 2014).

GroenBlauw (n.d.) says that the Emscher drains rainwater and purified wastewater; making it possible to transform the canalised river bed into a valley with possibilities for nature development and recreation.

Oliveres (2014) states that the park stands for the recovery of an important green area, the preservation of an industrial monument and the renewal of the river Emscher. Essentially, the park was to contribute to ecological renewal and give the broadest consideration to ecological reserves which could be made use of.

The intervention sought basically to recover a landscape shaped by former manufacturing industries and to open it up to new uses (Oliveres, 2014).

The systems were adjusted to the regional objectives which is focused on water quality, discharge and catchment. GroenBlauw (n.d.) states that the scale and approach of the project make it an important precedent both nationally and internationally.

Existing infrastructures, such as the gas holder and the purification installation for process water, have been kept and are being used again. GroenBlauw (n.d.) states tat is was an important theme in the development to make the water system visible, in order to stimulate a relationship between visitors and the water. GroenBlauw (n.d.)

A historic landmark. The demands of the residents' associations were also taken into account. T hey presented a number of options of a cultural and recreational nature.

These suppositions meant that the park was divided into a number of systems amongst which was the fundamental one: the water system. The channelled river Emscher which runs through the park has been regenerated due to the supply of rainwater which throughout its cycle, until it enters the river, utilises the factory's old cooling tanks. One of the other systems in the park is formed by the railway lines which have been used to provide overhead walkways which run through the site and afford superb views of the area. The presence of the tracks together with other built elements mean that vegetation does not grow in a uniform way but is fragmented and has adapted to the characteristics of the soil. Oliveres (2014)

The pollution of the land is visible in some areas but underground in others. A number of interventions have been carried out in order to clean it up, according to the type of pollutant materials.

The main structure of the old blast furnaces now serves to illustrate the site's industrial past; its great height means that it can be used as an observation deck for the area, and its centre contains an auditorium for large-scale concerts. Oliveres (2014)

Today, everyone considers the old Thyssen factory a park with clear landscape values and an industrial heritage which has been converted into a new generation of park. The case of Duisburg should serve as an example to other similar cases.

The intention is to make greenery a dominant feature of the old industrial facilities in the park. This will however be a slow process due to the degree of irreversibility of the situation inherited as a consequence of the serious pollution levels of the site.

The park has also achieved its objective of opening up to the inhabitants a large-scale complex -previously only accessible to the employees of the iron and steel works-since the time when most of the activities performed there have been the result of residents' groups and associations in the zone. Today, all the surfaces in the park can be used freely. It is the venue for a varied range of cultural and recreational activities and these will increase when the restoration of the disused power station has been completed.

In researching this precedent a program for the site becomes apparent. One where the dilapidation of the site is used to the advantage of the new. An experience as such.

Fig 87 Emscher Park I (GroenBlauw, n.d.)

Fig 88 Emscher Park II (Travel Germany, n.d.)

2.16.2 Thesen Island Turbine Hotel

Knysna, South Africa 2010

The Turbine Boutique Hotel and Spa, designed by CMAI Architects, is a reincarnation of what used to be the old Knysna wood-fired turbine and power station of the Thesen Sawmill (Leading Architecture, 2011). It is said that Its restaurants, the Island Café and the Turbine Tapas Bar, opened in time for the 2010 FIFA World Cup.

Given the heritage status of the power station, most of the primary components were left in position and form an integral part of the theme of the hotel (Leading Architecture, 2011). It is argued that the most noticeable feature of the 2618m² building is the old building shell and all the old machinery, in particular the boiler and the turbines. These features are integral to the ultimate style of the project, a preservation of the industrial vernacular with various modern elements integrated into the design (Leading Architecture, 2011). As a industrial machine, the Gas Works can learn many things from the Turbine Hotel and the way that it has used the existing infrastructure and machinery, incorporating it with the new.

The adjacent refurbished factory buildings on the one side provided the public context, while the new canals on the eastern side provided a setting for the bedrooms (Leading Architecture, 2011). The climate and use of resources also had a big influence on the design and was outset of the project - reuse building materials, passive design systems, solar water and lighting systems, gas power, rainwater harvesting, other energy saving initiatives (Leading Architecture, 2011). It is also mentioned that, from a social and economic perspective, job creation was a major consideration with the use of local labour being promoted as far as possible.

The project is a good example of the reuse of the existing as well as that one do not have to look far in order to find the right materials for a project. Although it was not without problems it is mentioned that a number of challenges were encountered such as getting Heritage and municipal approval as well as the refurbishment of the equipment as well as working within the existing building shell.

Leading Architecture (2011) says that the new building really gives one a sense of the history of the old power station and the Thesen Sawmill. They end off by stating that more developers are seeing the potential and beauty of old industrial structures and are willing to work through the challenges of preserving them. This is a very valuable statement to see that developers in South Africa are showing interest in projects such as these, and potentially the Gas Works.

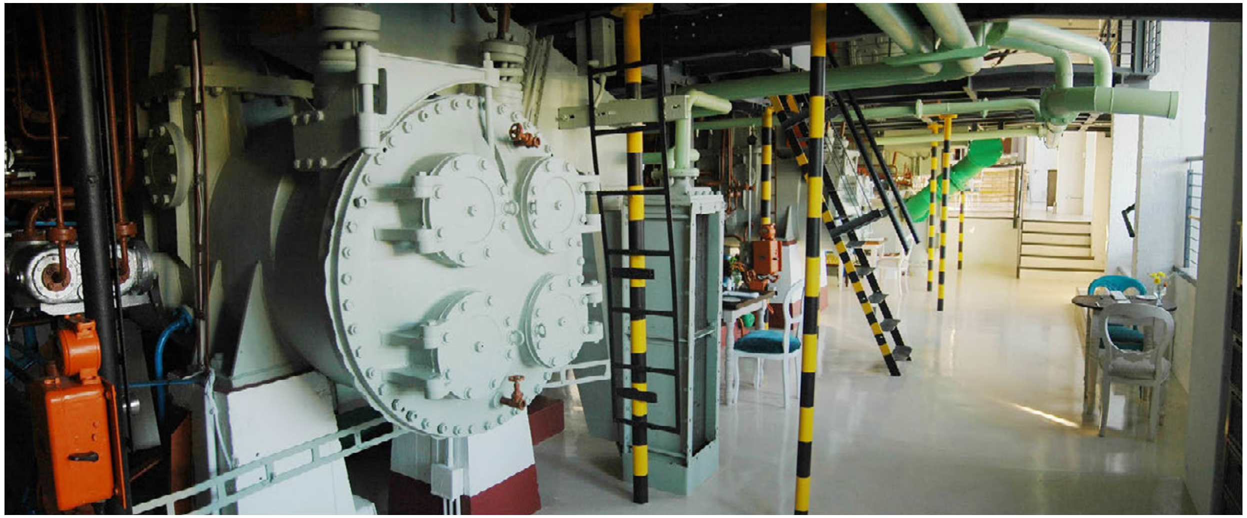


Fig 89 Turbine Hotel (Leading Architecture, 2011)

2.17 Solar Analysis

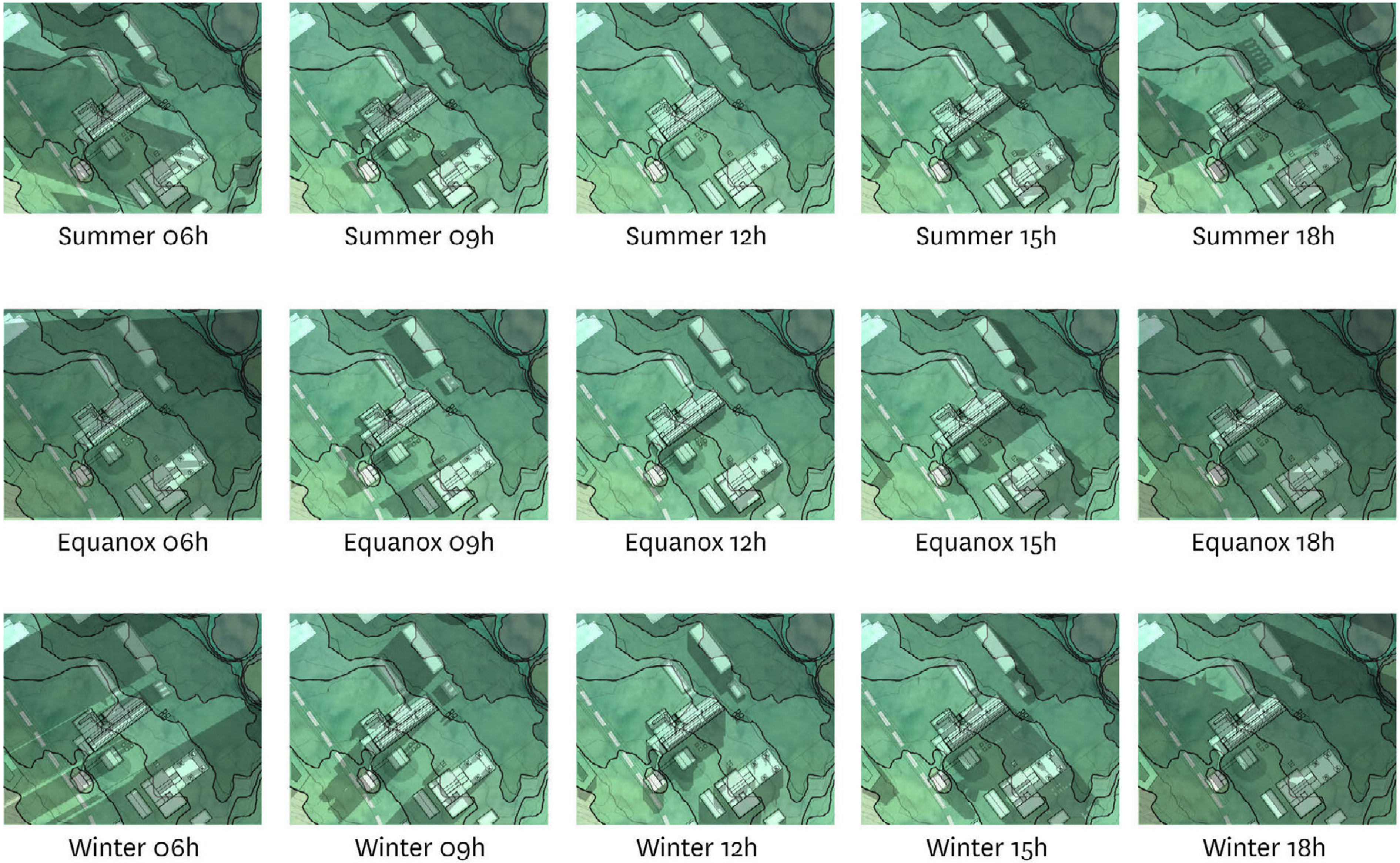


Fig 90 Solar study

The Existing structures on site is rotated 34 degrees north-west, meaning the foyer space between the two main retorts are not completely shaded by the buildings.

Even in Winter times the foyer gets ample sunlight, with shading only really being cast from 14h in the afternoons. With the great volume of Retort 1; one could imagine opening it up to allow for light to pass through the building to enter the foyer space.

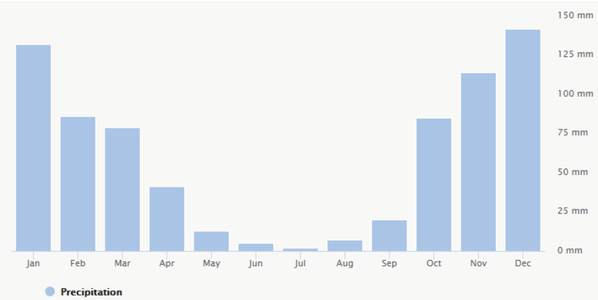


Fig 91 Average precipitation for Braamfontein (Meteoblue, 2017)

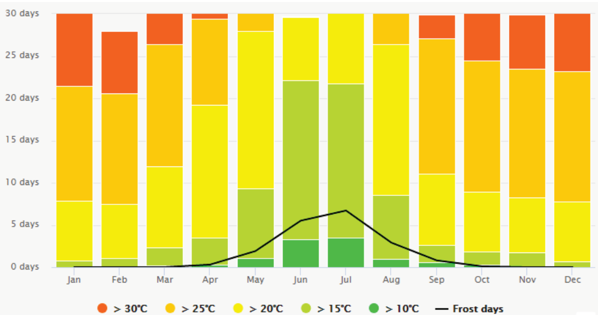


Fig 92 Range of temperature for Braamfontein (Meteoblue, 2017)

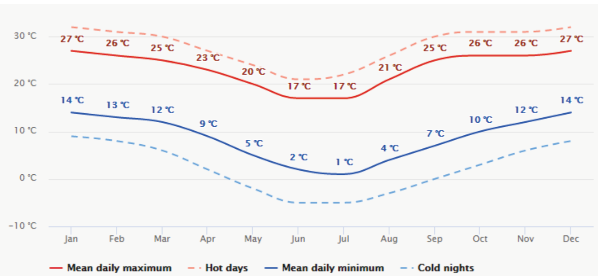


Fig 93 Average temperatures for Braamfontein (Meteoblue, 2017)

2.18 Micro Site Analysis

2.18.1 Climate Analysis

From the climate analysis obtained from Meteoblue (2017) the mean daily maximum and minimum temperature (Fig 92) of an average day for every month for Braamfontein can be seen. Hot days and cold nights also show the average of the hottest day and coldest night of each month of the last 30 years. The maximum temperature diagram for Braamfontein displays how many days per month reach certain temperatures.

The precipitation chart (Fig 91) is useful in planning for seasonal effects. Monthly precipitations above 150mm are mostly wet, while precipitation below 30mm mostly is dry. The precipitation diagram (Fig 94) for Braamfontein shows on how many days per month, certain precipitation amounts are reached.

The wind rose for Braamfontein shows how many hours per year the wind blows from the indicated direction.

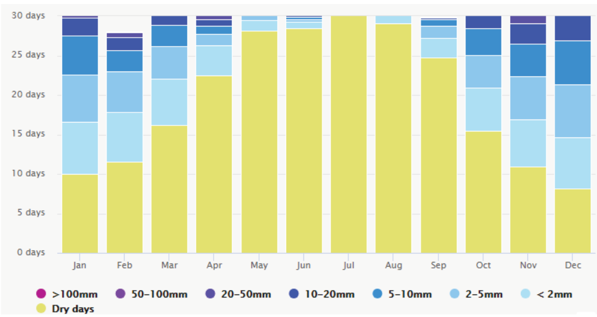


Fig 94 Amount range of precipitation for Braamfontein (Meteoblue, 2017)

2.18.2 Climatic Understanding

From looking at the climate studies done one can see that Johannesburg has warm summers and cooler winters than that of Pretoria; with a difference of 2 degrees centigrade on an average. With the high temperatures in the Summer one would need to provide for optimal shading from the north. With the existing retort being rotated 34 degrees north-west. Creative ways in which shading is used will be needed.

The Highvelt region is known for its summer rainfall, with very seldom rainfall in the winter. Water storage would thus be needed for the winter months. Water catchment will be needed in order to gather all the water.

Wind Speeds in Johannesburg is not very strong with most of it coming from the south. With the most active time being through August to October.

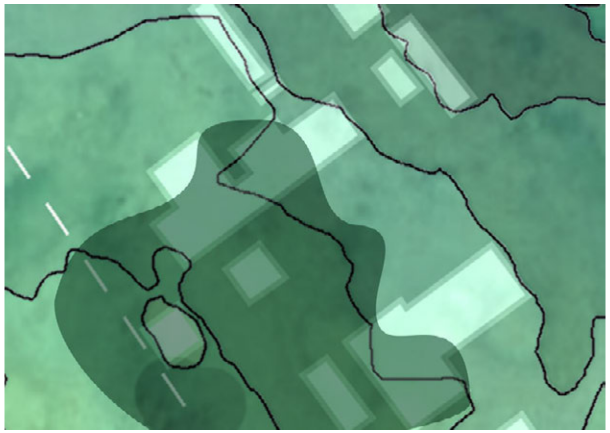


Fig 95 Wind rose on Site (Meteoblue, 2017)

THEORY & PROGRAM

Chapter 3

"Even under the best of circumstances, centre cities are unlikely to ever emerge as the geographically dominant centres of their metropolitan regions as they were in the industrial era. Instead, the new urban core resembles more that of the renaissance city-relatively smaller, and built around classical urban functions such as arts, cross-cultural trade, and highly specialized small-scale production. [...] Ultimately, the revival of the urban core, whether in the traditional city or the more dispersed model common to the Sunbelt agglomerations, stems from a search for a sense of place and history amidst a society in which the barriers of time and space are under constant assault. As centres of arts and culture, repositories of our past history and architecture, the core retains a powerful tug of consciousness. It reminds us not only who we are but also what we have been."

- Kotkin (2000:3)

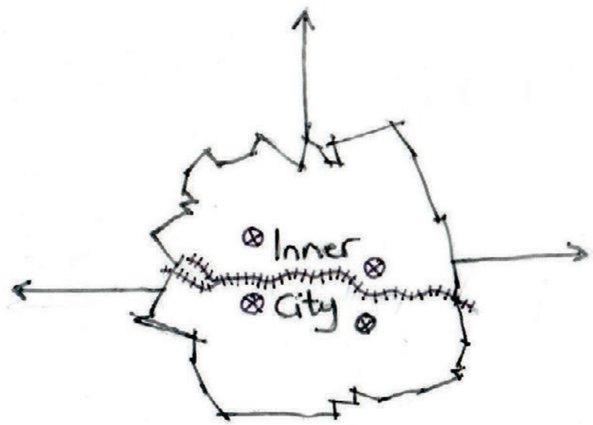


Fig 96 The City sprawling leaving abandoned nodes

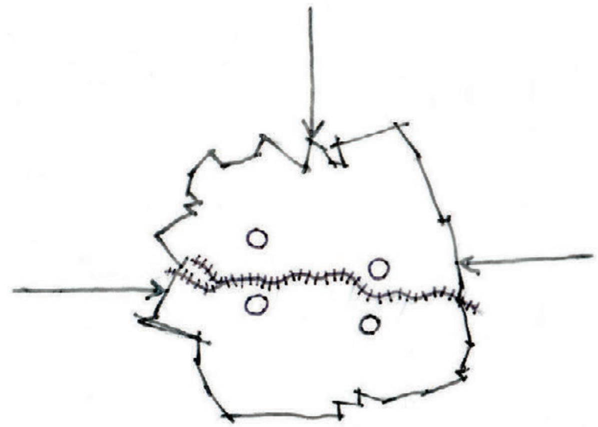


Fig 97 The City nodes reactivated

3.1 Theoretical Departure

3.1.1 Regenerating the Abandoned

In generating a better understanding of the site and what it means, and could essentially mean - a theoretical contextual investigation will be done by looking at various theoretical approaches that could be deemed important for the scheme.

Tying in with the context of the site, a better understanding of the industrial past will become clear in the cultural landscape that is the Gas Works.

From the proposed urban vision, looking at theory of regeneration and heritage approaches for the architecture becomes applicable. Identifying different aspects in the research will essentially inform decisions and in a way set a design guide going forward in the project; setting a lens as such.

3.2 Urban Regenerative Heritage

The area of the old inner city is essential in the context of *Urban Regeneration and Sustainability*, but in the way it was and not the way it has become (Mander et al, 2006). The historic embedded identity forms the counterpoint for the dominant influence of a levelling global culture. The quicker society is changing, the more attention for the stability of history, the more popular is the preservation of cultural heritage.

Mander et al (2006:61) states that on that basis alone, in many European cities plans are made or carried out to restore and maintain cultural heritage in combination with renewal, all integrated in transformation plans for parts of the inner city. The decision process about inner city transformations is based on the economic interests of private as well as local public participants (Mander et al, 2006:61). But what about our South African Heritage: the negligence that it is put through to hide a past as if it did not exist. Is there such a decision process or are most of it politically driven in the first place?

Mander et al (2006:62) argues that any discussion of the historic inner city is inevitably also a discussion on cultural heritage. These two become inseparable as such and thus any heritage always has some kind of cultural roots. European societies definitely make a selection in their judgment of what part of our heritage should be seen as cultural and what should not. With our past, South Africa is not that different. Mander et al (2006:62) states that the Dutch government for instance looks at the rarity, the state of damage, and the representative in making their judgement.

From past to present

In the case of Johannesburg, *the Industrial Revolution* triggered off a considerable increase in urban areas, as was the case in Europe. There are many similarities between the South Africa context and in that what Mander et al (2006:63) says - as discovered in Chapter 1.3. It is said that with the growth in all sectors, there was an increase in spatial scale; which was not allowed by the historic city centre. This resulted in functions moving to new premises. It is said that more space and better accessibility were the key motives for choosing locations other than the historic centre.

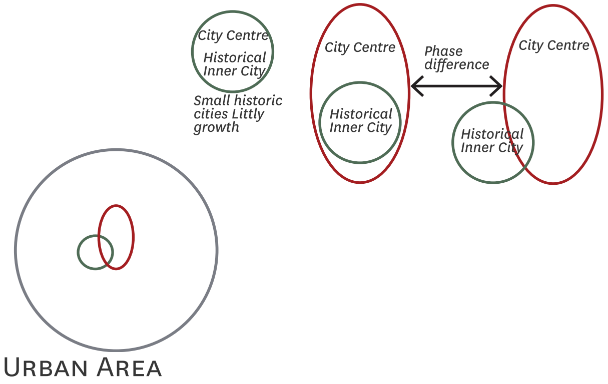


Fig 98 Historic Inner City, City Centre & Urban Area (Adapted by Author 2017, from Mander et al, 2006)

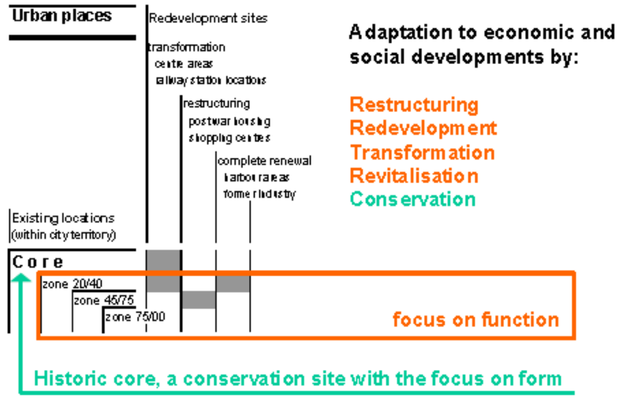


Fig 99 The Historic Core, a Conservation site (Mander et al, 2006)

The finely woven spatial structure of the historic centre combined with a wide differentiation in types of ownership makes it either difficult or impossible to fit large-scale functions without affecting the centres spatial quality (Mander et al, 2006:63). In the *Spatial framework 2040* plans for large economic development in the area are proposed (Chapter 2.9 on page 43).

The relative market positions of individual distinct urban areas are subject to constant change. The evolving market position of the historic city centre can be ascribed to the following developments and aspects: (Narrowed down to applicability of the Gas Works area) (Mander et al, 2006:63-64)

- Relative functional obsolescence: technology is developing quickly and continually generates new 'tools' for industry and consumers. The historic city centre adapts with greater difficulty to the demands of present times; in particular those with large-scale modifications.
- Demographic developments: population growth induces expansion within existing cities. The territory and population size of the city as a whole increase, while the land area of the historic centre remains constant and thus 'shrinks' in relative terms.
- The increasing 'rarity value' of the historic inner city, which exerts a positive effect on its attractiveness and market position.

Mander (2006:65) argues for three strategies of modifications within the historical city, discussed below:

The continually fluctuating market position of individual city areas is reflected in changes to their status and function. These changes are in turn a spur to spatial modifications. It is more complex to modify an existing urban area than to develop a greenfield site. This statement again adds to that of the urban sprawl that seems to be a trend in Gauteng with new commercial developments such as Waterfall and Fourways as such. These developments are very much economically based and market driven. Everything that we do is based on economic value where it could be argued that often, heritage is discarded as not being viable. It is argued that identity is made up of personal experiences that have a direct relationship to a location, and not so much the objective spatial characteristics as individual experiences evoked by a place. The city centre has an important function in this respect. It serves as an emblem for the modern city that has developed around it.

The historic city centre thus has an important communal function. The extent to which that function can be adequately fulfilled in the future depends strongly on how the renewals, which must inevitably take place, will be implemented.

The spatial modifications in the historic inner city have to be made with respect for the smallness of scale of buildings and the 'finely woven' urban structure. During modification, the historic inner city stays in function, making it complicated. The spatial modifications can be related to preservation, restoration and renewal applied to parts of buildings, public space and urban infrastructure.

Decision making implicating the balance between preservation, restoration and renewal can be structured by asking the following questions (Mander et al, 2006:67):

- Why save it, why modify it?
- What to save or modify?
- How to do it, regarding the aspect of authenticity.

3.3 Approaching Heritage & Memory

"Architecture can put heritage back on the map, as it were, and give it a right to exist."

(Meurs 2016:29)

Heritage and architecture approaches the design challenge from three angles, which correspond to the chairs *Heritage & Cultural Value*, *Heritage & Technology* and *Heritage & Design* (Meurs, 2016:8). The cultural value is the starting point for the design, which in turn is further specified and defined by the technology – with the focus on conservation as well as on the details of the new design. The design approach can be symbolised by a triangle (Fig 100), with cultural value and technology as the basis for the design (Meurs, 2016:8).

The design of the Gas Works focuses on a technological heritage of the Industrial Revolution which helped shape the City of Johannesburg. Since its start it played a major role in the shaping of the City. Its history and presence guides the program as to what it can become and the appropriate way in which the design is approached and technologies are chosen.

It is according to Meurs (2016:29) that an increasing importance should be attached to adding architectonic value in the conservation of heritage. He continues by saying that the architect is strongly challenged to make a visible and prominent contribution to bringing the heritage back to life and putting it into operation.

3.3.1 Forming an Approach

Meurs (2016:67) argues for three ways in which cultural heritage quality can be incorporated in the site as well as in the design, by:

- **Preservation of existing elements** such as buildings or fragments (conservation/restoration of substance);
- **Redefining** a structure or an architectural tradition (renewal within the morphological structure);
- **Architectural interpretation/expression** of intangible value (using mentality and intangible values as design theme).

Among the multitude of architectural solutions, Meurs (2016) states that there are three basic approaches to incorporate heritage in the design: designed past, designed presence, and non-designed presence.

These three basic approaches were evaluated in accordance to the Gas Work Group's vision for the site. The applicable approaches will be discussed in order to develop a personal approach towards heritage and designing within a heritage landscape.

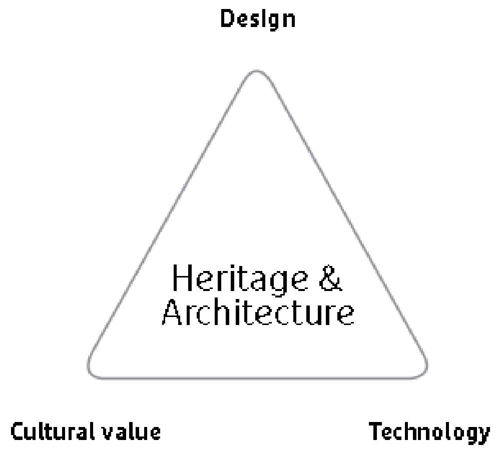


Fig 100 The Triangle of H&A (Meurs, 2016:8)

Designed presence

When designing in a historical context (Meurs, 2016:75), certain features of the existing architecture are used in a new way. There is a connection between the old and the new, but the new design is also autonomous. This may result in a 'historical' form of modern materials, or in a contemporary architectural design with historical materials.

There are also subdivisions within *design presence*. Rearrangement where the redesign is prominent but has Cohesion with the existing architecture. Were the old and new engage in a dialogue. A narrative can be started where the intangible of a space is made visible to start a new dialogue about the heritage. This can be done in a way where the past processes are highlighted with the new programs.

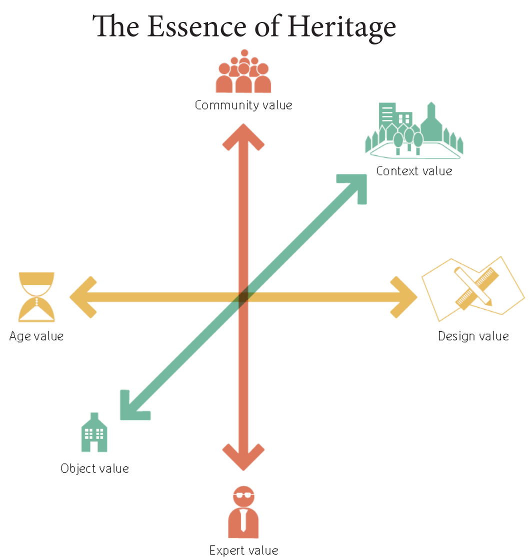


Fig 101 The dimensions of cultural value. (Meurs, 2016:35)

Non-designed presence

"Imperfect products too can contain beauty & satisfy our sense of aesthetics & functionality."

When hardly anything is designed in the sense of architectural design, a successful type of intervention would be leaving the monument untouched (Meurs, 2016:102).

The innovation lies in the usage, the programming and the furniture – resulting in inexpensive and flexible ways to provide cities, areas or buildings with a new vitality and economic perspective.

It is argued that the non-designed presence does not mean that adaptive re-use is little more than carrying out some minor jobs and then move in. The design is essential to give buildings a 'wake up kiss' or to set the process in motion whereby an old building is gradually discovered, opened up and developed.

Empty buildings stimulate entrepreneurship of individuals and groups of people, who decide to join forces, with or without architects, in order to develop successful business cases. This kind of cooperative development leads to new typologies and forms of spatial organization.

3.3.2 Developing an Approach

Contemporary Heritage

By responding to heritage is to stay sensitive to the old. By doing something that does not distract from that which made it monumental, but rather to add in a way that contrast the existing structure as well as forming a new, complementary unit with the old.

Responding to the old should never copy the materiality and form of the existing historical building. The response must be clear & contemporary in style, and must not be damaging to the historical building.

In unity a new design should sit comfortably along side the original; without it taking from the other, but rather add to the existing characteristic of the structure and recognising that which defines it - its defining characteristics.

3.4 Hybrid Architecture

"Hybrid architecture defines as hybrid all architectural intervention that is at once object, landscape and infrastructure."

(Pinto de Freitas, 2011a)

Architecture should rarely be mono-functional. It should serve a multiplicity of functions and users to achieve a rich and changeable future. Hybrid Architecture concentrates on a *single* architectural intervention; a triple object-, landscape- and infrastructure- related nature, that generates architectural answers with very specific features, which widen the conceptual framework of topics that are transversal and consubstantial to architecture (Pinto de Freitas, 2011a). In hybridisation the original parts are no longer recognisable in the new being (Pinto de Freitas, 2011b); the original components instead disappear as autonomous elements in the formation of a new entity.

"Transferring this original concept of hybridization to the field of architecture defines architectural hybridization as a process that, through the act of cross-breeding (or unifying) diverse architectural natures or elements, makes the attainment of a new reality possible - a reality with its own identity and new architectural qualities that do not exist if the hybridised elements are considered individually and separately."

(Pinto de Freitas, 2011b)

The hybrid architecture defined here is the result of the hybridisation of three diverse natures in one intervention: object-related nature, landscape-related nature and infrastructure-related nature.

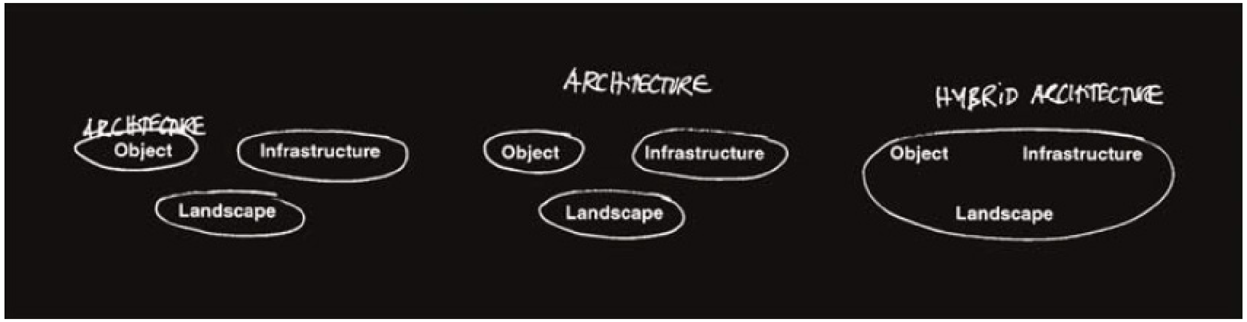


Fig 103 Hybrid Architecture Diagram. (Pinto de Freitas, 2011b)

Pinto de Freitas (2011b) argues that such an intervention should simultaneously meet three conditions:

- A physical intervention that proposes an architectural space generated on the basis of human intervention.
- An architectural intervention, beyond simply being an object within the landscape: using a variety of possible mechanisms (fusion, transformation, reconfiguration etc.), the architectural intervention integrates inseparably into the landscape.
- At once an architectural intervention and an infrastructure, beyond its connection to infrastructure: in transforming into a section of infrastructure itself, the architectural object becomes a part of the infrastructure and incorporates its laws and mechanisms of functioning.

The architectural object incorporates the infrastructural nature into its own, implying that the precondition that this object becomes an integral part of an infrastructural system of higher order.

A hybrid is also a section of infrastructure integrated in a wider infrastructural system (conceived to absorb flows of circulation) with its own laws and functioning. The project will relate to this in terms of its integration with all the other programs on site and its urban settings.

"Hybrid architecture maximises the physical continuity between an object and its immediate physical environment."

"... continuity between the physical area defining the project and the infrastructural system to which it belongs, leads to the disappearance of the concept of limit associated with that of border in light of the emergence of its definition as space of transition." -

(Pinto de Freitas, 2011b)

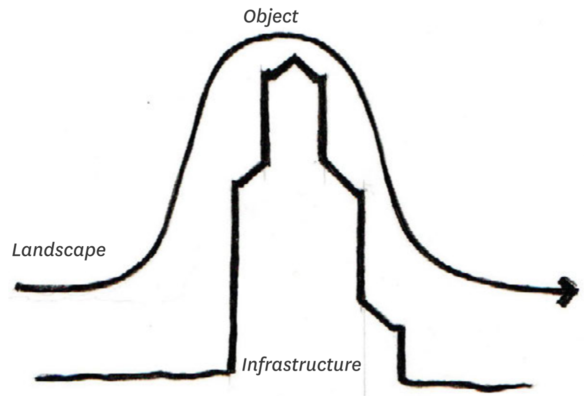


Fig 102 Hybrid retort architecture

Mobility becomes a core quality of the architectural intervention with significant consequences concerning the spatial configuration:

- **Programmatic dimension;** spaces of circulation integrate into the realm of the primary spaces as part of the core programme and occupy a greater proportion of the surface to the available surface.
- **Order system;** the fact that the hybrid object belongs to an infrastructural system of a superior order will result in the necessary incorporation of part of the laws defining this infrastructural system as an ordering system into the genesis of the hybrid.
- **Condition of limit;** the indispensable condition of physical continuity between the physical area defining the project and the infrastructural system to which it belongs, leads to the disappearance of the concept of limit associated with border, in light of the emergence of its definition as space of transition.

Pinto de Freitas argues for the borders between architecture, landscape and infrastructure to disappear in this process, in order to achieve a common architectural reality that simultaneously possesses this triple nature.

The concept of hybrid architecture of this study (See Fig 103) takes a third step by which the direct association of architecture with the architectural object disappears, and in which the elements that make up the triple reality of object, landscape and infrastructure lose their autonomy when they are hybridised in architecture. Elements of landscape, sections of infrastructures and the architectural object together make up the architecture, the hybrid architecture.

Pinto de Freitas (2011b:4) argues that the nature of hybrid architecture could be described by outlining the set of qualities that characterizes it. These qualities are interdependent and form a common reality that depends on one another to explain themselves.

Context

Landscape and infrastructure are elements that belong simultaneously to both architecture and context. This inseparable relationship between the architectural intervention and the context emerges as a core issue with respect to the hybrid's identity (Pinto de Freitas, 2011b:4). It is explained that the context-intervention relationship works in two ways:

- the hybrid incorporates the environment by abstracting and extracting certain of its qualities into the genesis of the project;
- while at the same time it exerts a *transformative* impact on the same environment by means of its subsequent incorporation into its physical reality.

This simultaneous relationship of incorporation and transformation converts the hybrid into a 'revealing' element of selected qualities of the context (Pinto de Freitas, 2011b:4). By interlinking the contextual environment of the site into the architecture by means of process and in a sense an abstraction of a linear past will bring the whole into perspective and so reveal the core of the program. In a way the architecture will become a direct response to the environment it finds itself in.

Limits

The dissolution of the physical limits is inherent to architecture of this triple nature (Pinto de Freitas, 2011b:5). The dissolution is the reflex of dissolving conceptual limits by an object that does not generate itself in a self-referential manner, but through strategies of inclusion and effects from other components within its physical environment. A hybrid emerges as the limits between architecture, landscape and infrastructure dissolve.

The new architectural intervention taking place will act as a direct response to the happenings of the Gas Works past and present; as a direct response to the effect it had on the environmental landscape, but also in the heritage it manifests.

Ground

Pinto de Freitas (2011b:6) argues that with the notion of limit as border transcended, the mechanisms of continuity which are established between a hybrid and elements of its environment, as well as the necessary physical continuity demanded by a hybrid's infrastructural condition, imply a specific form of an interdependent relationship between architecture and ground. On this contact and continuity with the ground, a hybrid lays the foundations for its ability to convert the architectural object into landscape and infrastructure simultaneously.

The hybrid architecture maximises the physical continuity between an object and its immediate physical environment. It is the transcended differentiation between object and ground. The difference between ground and object becomes blurred and a fusion of ground and object is introduced.

By opening up the architecture and allowing for an almost permeable architecture that stems from the ground, but does not necessarily become a tectonic boundary one allows for free movement; as though the architecture grows out of the ground in stead of it being plotted on the landscape.

Scale

The inseparable relationship between object and context and their impact on one another introduces the indispensable references to the topic of scale (Pinto de Freitas, 2011b:7). The concept of architectural scale assumes a specific meaning, which expands the group of existing definitions of the concept: The scale of hybrids coincides with the scales of the context that have generated the object and which the object impacts upon.

The scale of hybrids is multiple, as It implies three qualities (Pinto de Freitas, 2011b:7): The interdependence between scale and relationship to the context, the concept of scale associated with the analysis of an object's qualities rather than its size and the fact that hybrids contain multiple scales at the same time.

The scale of a hybrid object is defined on the basis of the relationship between architecture and its context (Pinto de Freitas, 2011b:7). On the one side, a hybrid object extracts references from the context to define its own mechanisms of conceptual generation as it selects specific qualities to transform them into order structures of the project - into mechanisms of spatial generation. On the other side, the hybrid generates itself with the intention to make latent realities of this very context emerge.

In working with the existing; one cannot intervene with scale, especially with that of the Gas Works where scale is one of the major characteristics of the infrastructure. The scale proposed will then become something that is light and does not overshadow the existing architecture, where order and hierarchy directs form and function.

Mobility

Pinto de Freitas (2011b:8) states that a hybrid that is simultaneously object and infrastructure, that space allocated to mobility becomes more relevant and indispensable for the comprehension of the architectural space as they are inseparable elements in an architecture. The fact that the architectural object incorporates the infrastructural nature into its own implies the precondition that this object becomes an integral part of an infrastructural system of higher order. At the same time that it possesses the autonomy characteristic of all architectural objects, a hybrid is also a section of infrastructure integrated in a wider infrastructural system with its own laws and functioning.

The hybrid itself becomes a physical fragment of an infrastructure conceived to absorb flows of circulation and transforms the issue of mobility into a core feature of its own conception, with significant consequences on the configuration of the space (Pinto de Freitas, 2011b:8). The fact that mobility becomes a core quality of the architectural intervention has particular ramifications for both the programmatic dimension and the order system of the architectural intervention (Pinto de Freitas, 2011b:8).

At the Gas Works, mobility will in fact become an integral part of the architectural programme as heritage is a large focus and commemoration plays an important part in guiding the new, movement and as such guidance is very important.

The theory of hybrid architecture is very relevant to the vision for the site as a restitutor between existing, scared and new relationships as it aims to bring the various relationships together. Working with the environment, the existing infrastructure and binding it with a new architecture that aims to create a unity between the three, as well as in the larger system of the city at large.

3.5 Regenerative Architecture

"By design I mean conceiving and shaping complex systems."

- Lyle (1994:ix)

Environmental design is where the earth and its processes join with human culture and behaviour to create form (Lyle, 1994:ix). Design in this sense requires re-establishing some connections that, according to Lyle, started becoming loose in the Renaissance and were entirely severed by industrialization.

Lyle argues for the connection between people and nature to be re-established. At its best, environmental design is where people and nature meet, where art and science join (Lyle, 1994:xi).

Design is the place where society and technology meet. During the industrial era, technology split apart from daily life. It became something physically separate, emotionally remote, hardly under human control, something inherently ugly. Lyle is of the opinion that we should regain control of our means for supporting life. He continues to say that we must embrace it and celebrate it. Design is one of the major means.

The conventions of the last few centuries predispose us to think of them as separate subjects, the provinces of separate specialists. In reality-that is, in nature-they are inextricably interrelated. Water requires energy to flow, and at the same time water often also generates energy. Other life-support processes are equally interrelated; by considering them together, we can take into account their commonalities as well as their interactions and

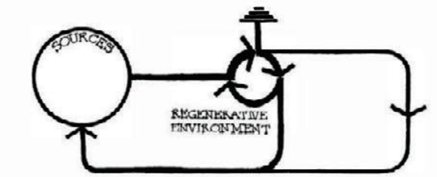


Fig 104 Regenerative system design (Lyle, 1994:10)

overlaps and we can benefit from their synergies. They all work together in nature and with some thought we can shape the human Landscape to follow nature's ways (Lyle, 1994:x).

Our ecological understanding makes it clear that we can only meet the needs of humans in an environment where the needs of countless other species are also met. This requires maintaining the integrity of nature's life-support processes. In this case, maintaining does not mean simply preserving (Lyle, 1994:3).

"For all its fatal faults, there is much to admire in the grand pattern of industrial organization that we have imposed on the earth over the past two centuries. Judged by any standards, it is an impressive product of human ingenuity."

- Lyle (1994:4)

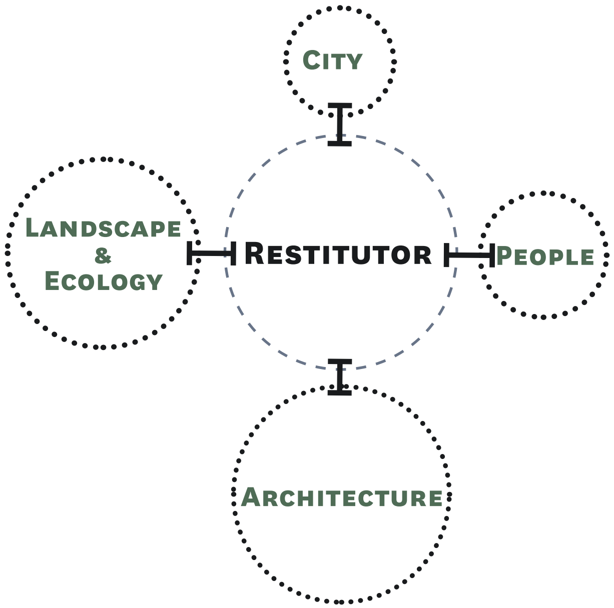


Fig 105 Restitutor (Architecture) as binding element

In supporting its population the developed landscape has to provide ongoing supplies of energy and materials for habitat, daily living, and economic activity (Lyle, 1994:10). In order to be sustainable, the supply systems for energy, and materials must be continually self-renewing, or regenerative, in their operation. Sustainability requires ongoing regeneration (Lyle, 1994:10).

"Regenerative design means replacing the present linear system of throughput flows with cyclical flows at sources, consumption centres, and sinks."

- Lyle (1994:10)

Energy is replaced primarily by incoming solar radiation, while materials are replaced by recycling and reuse. Such a system generally has the following characteristics (Lyle 1994:10 - 11):

- Operational integration with natural processes, and by extension with social processes;
- Minimum use of fossil fuels and man-made chemicals except for backup applications;
- Minimum use of non-renewable resources except where future reuse or recycling is possible and likely;
- Use of renewable resources within their capacities for renewal;
- Composition and volume of waste within the capacity of the environment to re-assimilate them without damage.

In this sense the Gas Works can by means of restitution and regeneration tie in with natural systems in stead of exploitation of past relationships. Lyle argues that regenerative systems can play a central role in global renewal, but only if the human relationship coincide with that of natures'.

Ecosyscemaric order is analogous to the order found in buildings (Lyle 1994:23): There is the structural order, the functional order and there is the locational order. The ecosystem and its modes of order provide a conceptual model of the world that serves well as a basis for regenerative design.

Structural order describes the composition of living and non-living elements: rocks, soil and plant and animal species (Lyle 1994:23). In considering the structure of an ecosystem, we include all life and its interactions with non-life. Lyle argues that we can understand ecosystem structure as a process in that it changes with time, either gradually through succession or rapidly through sudden perturbation. Natural structures are continually reorganizing themselves according to certain principles. Cause and effect are unclear, though evidence of a relationship between diversity and stability is strong.

Lyle states that regenerative systems has a need to reduce energy input. They tend to be much more diverse in structures, offering numerous means for accomplishing any particular task and using the interactions among elements within a system to benefit the system as a whole. It thus has resilience built into the structure.

Functional order (Lyle 1994:23) argues for the flow of energy and materials that distribute the necessities of life to all of the species within the ecosystematic structure. These flows constitute the dynamics of the ecosystem and often explain the flux and change that it undergoes. Water, nutrients, and other materials, by contrast, having no source of new supplies, are not lost or dissipated but instead are continually recycled, it is argued. The cycling systems also work through the food web, closely paralleling the flow of energy and supplying all living creatures with the materials needed for bodily functions. (Lyle 1994:23)

3.5.1 Urban Evolution and Future Cities

Lyle (1994: 131) states that when all aspects of human habitat are added up, a new kind of city, one quite different in form and content from the cities of the present can be sketched. This suggests a complete reshaping of the urban environment. Lyle says that as our communities grow and as we build new ones, we can apply regenerative principles to achieve sustainability in new areas.

Our existing cities are another issue, Lyle states. Their Paleotechnic forms foreclose some of the options. Our cities evolve as do other ecosystems. As old parts wear out, we can replace them with regenerative parts.

We tend to think of urban environments as permanent fixtures (Lyle, 1994:131). Planning regenerative communities requires us to think in more dynamic terms to think of the human-made environment as ever changing and to see its buildings as fixtures that are periodically reconstructed and reconnected, perhaps reusing the same materials. Processes of decline and regeneration are part of the urban pattern and thus part of the planning processes (Lyle 1994:131).

The theory of regeneration ties in with the theory of hybrid architecture by integrating the landscape not only for the sake of integration, but by making use of its processes as well. Creating a chance for a sustainable design that works together with nature instead of exploitation. Also in making use of elements on site to construct new ones.

3.6 Layering the Old

Palimpsest: Any inscribed surface from which one text has been removed so that the space could be used again for another.

- The Encyclopedia Britannica (2017)

Palimpsest is seen as a way of layering the new on the old; as a juxtaposition of polar opposite. Adaptive reuse (remodelling) is characterized by formal intervention upon existing form (Machado, 1976:46).

If an original building is considered as a first discourse that conditions future formal discourses to be inscribed upon it, then remodelling can be conceived of as rewriting. (Machado, 1976:46). The architectural history is thus rewritten. A new history is then created; which again can be written upon. In this sense, the Gas Works can live forth with a new purpose and function which could be savoured for generations to come.

Machado (1976:46) also argues that remodelling could be discussed as rewriting when the alterations in the building's content (re-semanticization) are of such a type that the building's original or latest function is changed;. Then the building is refunctionalized, a different story is born, a new plot is composed out of the old words, a new interpretation has taken place. As the functions for which the architecture at the Gas Works were built is no longer in use, it needs a new function to remain purposeful. Remodelling as such then becomes a technique of formal interpretation, a design technique for which very little prescriptive information has been established, and that which is interpreted is always a product of the past (Machado, 1976:47).

As a repository, the past is seen as a complete package of interrelated repertories, of things already built, drawn and written. This repository is there to earn from, to copy, to transform. Being almost impossible to forget, its presence or weight, its importance has different values at different moments in the development of architecture (Machado, 1976:48). He continues to explain that in the process of remodelling the past takes on a greater significance because it, itself is the material to be altered and reshaped. The past provides the already-written, the marked 'canvas' on which each successive remodelling will find its own place. It becomes a cycle of rewriting a continuous loop that adds to the previous, or at least till its end.

"... things which are today inconceivable as objects of remodelling might be seen in a wholly different light in the future."

- Machado (1976:48)

Machado (1976:48) argues that even though the valuable service remodelling provides in helping to preserve cultural heritage, more important is that it can take on more active roles to prevent undesirable environments in the first place.

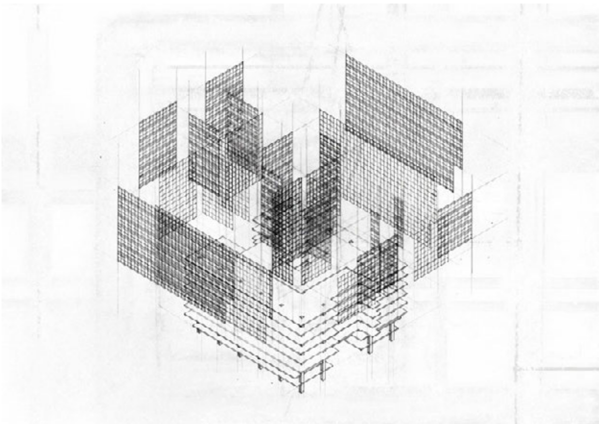


Fig 106 Palimpsest as layering (O'byrne, 2013)

Fig 107 indicates the theory that used to guide and conclude the programs and concepts that follow. The departure of this dissertation as being the core of the theory - asking the question of abandoned architecture within our cities. Making use of regenerative theories guiding the urban vision of the site and the programs it entails and researching precedents of similar cases.

Heritage, as also being a central part of the dissertation, has led to a way in which to approach the existing infrastructure of the Gas Works and how to react to it. These theories helped guide materiality as well as technology for the project.

The theory of hybridity by Pinto de Freitas is a guidance to the program as to connect the various parts of the site - the existing infrastructure, the scarred ecological landscape and the new architecture - in a singular combined architecture that tells a story of past and present. Palimpsest as discussed by Mochado flows through all theory as a layering upon the existing, as a rewritten story for the Gas Works, a new chapter.

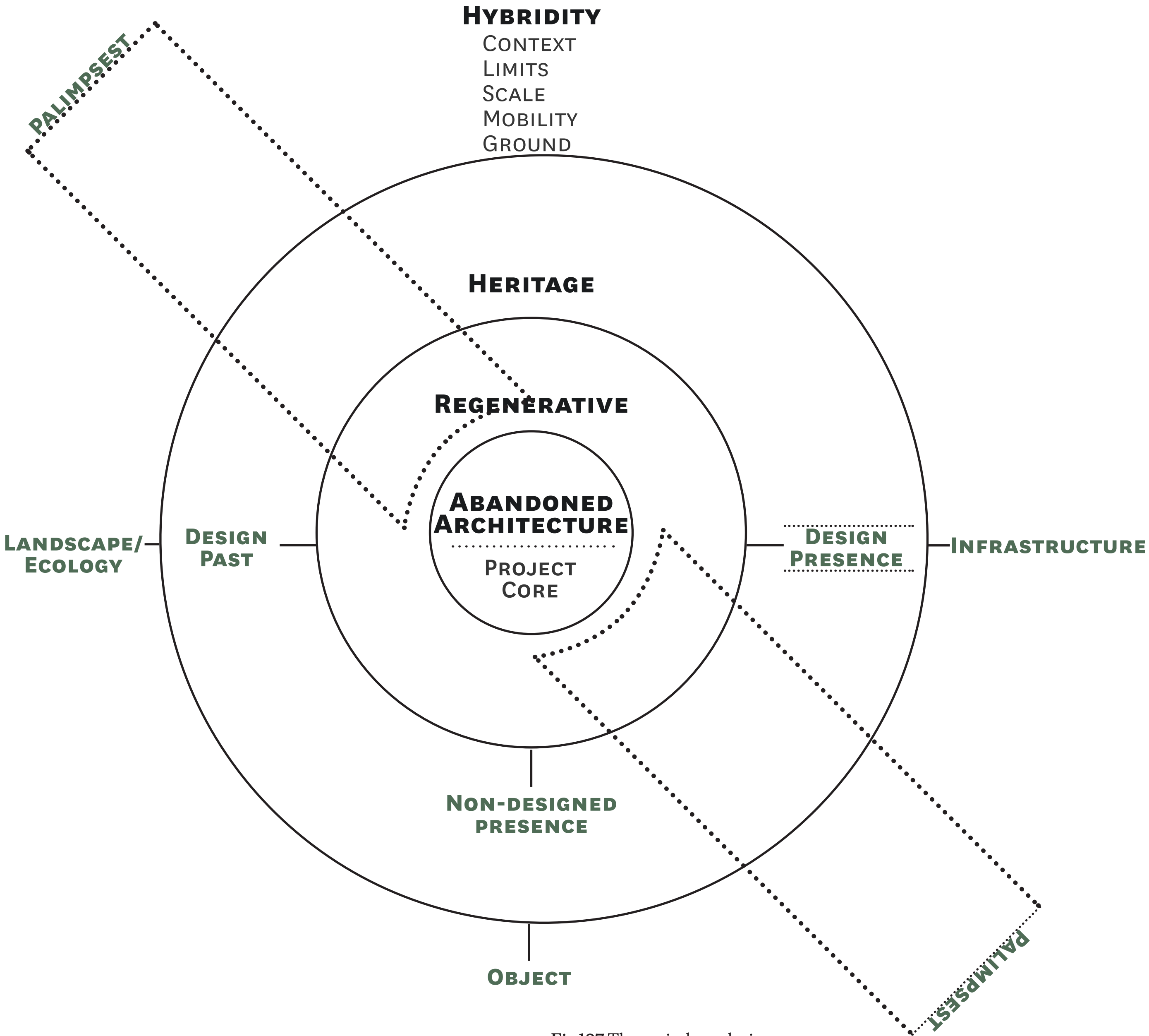


Fig 107 Theoretical conclusion

3.7 A New Industrial Experience

The high rising retorts stands like giants in the landscape. Though they are now inactive. The project wants to reactivate these monsters by creating a new industry that serves various functions. Instead of being a monotonous monument that could be visited in an attempt to remember its importance. The envisaged architecture will attach and grow through the infrastructure to awaken it.

The proposed vision for the architecture is a multifunctional industrial space that is highly interactive in function and educational in experience. Where a continuous dialogue exists between the two industries; a continuous celebration of the Gas Works.

It becomes important to retain as much as possible to remember the monumentality of the structures on site. By staying true to those elements that define it; a celebration as such. Allowing for the visitors to find their way around by means of movement of past and present processes.

In creating a new industry; the abandoned structure that stands as a reminder of pollution can regain a new ego as a restitutor of past wrongs. Correcting its wrongs in an era where the environment is seen as almost the most important aspect in design. The new industry could in a way improve the environment and stand as a monument of change; redeeming its past. Regenerative infrastructure as a new architecture, a palimpsest of industries.

In creating an experiential memory of the past, a journey through the site and architecture is created. Seeing the existing structure and the elements that makes it so unique is important, a new architecture should not overshadow it, but should be light and in a sense transparent to be visible at all times. Emphasising the structure as a whole, working with its modularity and ordering it in new ways to suit the heritage.

As with the urban vision of the park as a restitutor of past, a new way of remembrance is needed; where industry works together with the environment to form a new relationship. Becoming dependant on ecology instead of just using its resources. A new meaning is added to the word ‘industrial’: a new connotation.

Fig 108 Cooking with essential oils

3.8 Heritage as Experience

The program came as a direct response to the historic and context analysis done in Chapter two together with the theory explored throughout. From the idea of the site as a *restitutive park*, it was analysed as to what the site could mean for the city. Looking at JMOSS’s six types of spaces (*Ecological, Social, Institutional, Heritage, Agriculture, and Prospect*), clues were found as to what the program could become; essentially, what it asked to become.

For this spaces to be a successful, fully functional space has to adhere to the following criteria from JMOSS (2002):

- Recreational opportunities
- Conserve the natural resources
- Opportunity for ecological productivity
- Opportunity for environmental education
- Opportunity for urban agriculture
- Viable economic entity
- Enhance city appearance

It was then thought of in terms of where the site sits within the park, and what it could mean for the park as well as the surrounding urban environment.

Within the larger park, the site sits in the *Heritage core* and within the *Industry to ecology*. It is also located next to the public interface on the street edge and to the north the *City* restitutive node. From this, the needs were identified under each relationship: From a heritage aspect.

Fig 109 A sensory experience

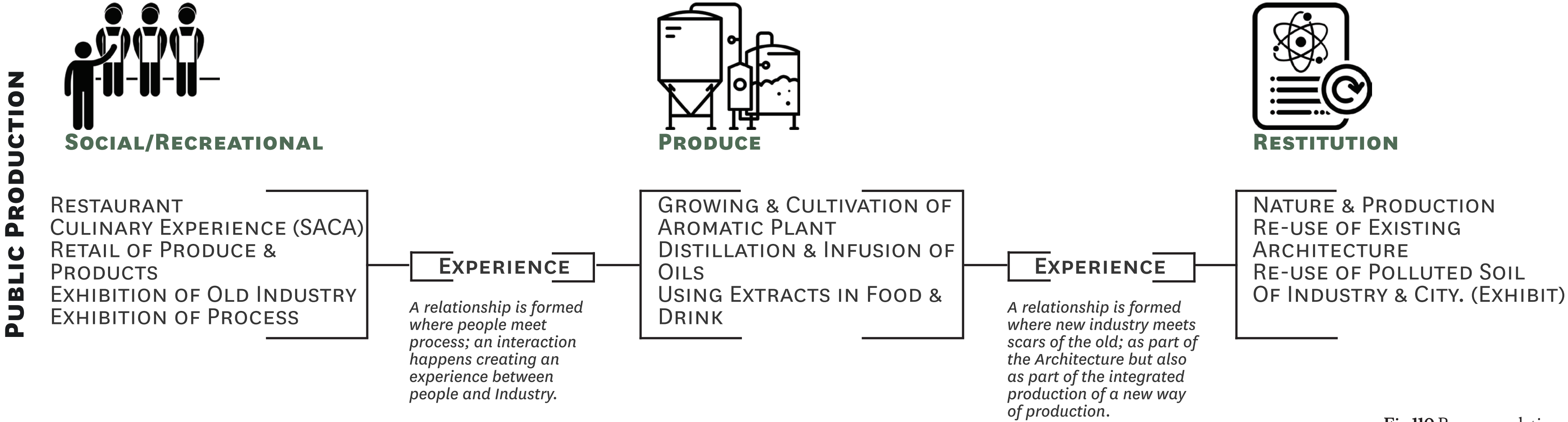


Fig 110 Program relations

3.8.1 Primary Program

The aim is to create a public experience in and around the Retort 1 that commemorates the history that has been inaccessible by the public since its origin. It aims to introduce a program that both support and help the landscape by reprogramming the existing to restitute past relationship of exploitation.

The co-existence of industry and ecology aims to produce natural systems that could form an agricultural base for natural production.

The program will act as a civic space for the site, as an extension for the community and the surrounding. The design will include elements of display/exhibit, integrated within the architecture and the site itself. Experiencing a palimpsest of historical layering.

The overall aim is to introduce a productive function within a building that was designed for the specific function of gas production. As an aromatic plant-oil extraction and infusion plant, the building will become highly interactive as a gathering space where visitors can experience in the process by means of their senses: see, touch, smell & taste.

The hydroponic space will *grow* vertically within the building as well as the landscape to occupy the verticality of the building, but also act as a commemoration to the pollution of the soil in which one could not plant. The verticality also means more produce per square meter.

3.8.2 Secondary program

The program aims to connect with the various other programs that are proposed within the Gas Works group. The aim being to create a closed loop between the site, infrastructure and users.

A restaurant has been suggested with the program so the users can experience in the productive nature of the program; as well as the experience and awareness of the productivity of the past. Connecting the restaurant with the function of the South African Chefs Association and Hotel school (See Fig 111) on the University of Johannesburg grounds will tie its function with that of the surrounding urban fabric. Continuing what was started at 44 Stanley; by creating an attraction that will allow for users to visit the site on multiple occasions, as it is not only a once off experience.

Fig 111 The Kerzner Building (University of Johannesburg, 2017)
Fig 112 South African Chefs Association (SACA, 2010)

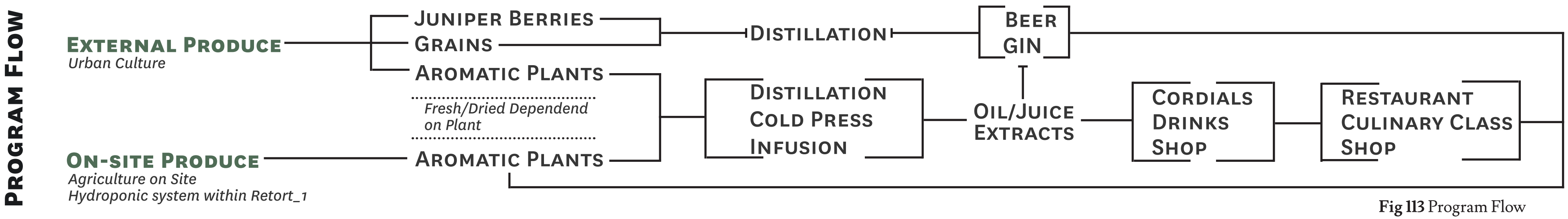


Fig 113 Program Flow

As research on planting took place (Chapter 3.15 on page 93), many of these plant are used in drinks such as gins and cordials. To add to the production, Hobbs and juniper berries will be outsourced in order to make these products, as well as beers (as a less distilled product of gin).

This will in turn support external urban farmers who's produce will be bought, thus helping others create business and help growth in other parts of the economy.

A large storage space will be needed for the harvested plants as well as for the delivery of off-site produce. This space will be used for plants that need to be dried as well as preparation before distillation/infusion/pressing.

Retail of products produced within the building and on site will be sold as a means of income for the site, but also as an external experience at home, of what happens on the site and in the program.

The Hydroponic systems that will grow the plants will make use of the aquaculture system that is proposed on site . The waste produced by the farmed fish will supply nutrients for the aromatic plants to grow in, where in turn the hydroponic system will purify the water, forming a closed system, multi beneficiary relationship. Composting products will also be sent to the aquaculture for the secondary program of vermiculture to sustain the fish. This compost will be worked back into the site; helping in the restoring the soil.

The by-product from the plants (such as Flaxseed) will be sent to the textiles program where the material will be used in the creation of textiles. Other plants such as Hemp that is grown for textiles could in turn be distilled to obtain the oils. These programs will thus feed off each other and become dependent on the other.

The Hydroponics and other production will be constantly visible to users of the building. Bringing production into full view, as a means of education and interaction.

A germination and translocation space is necessary to grow plants until they are strong enough to be transplanted in the hydroponic system and the site. This will also ensure a space for constant growth and regrowth so plants will never fail to exist.

Lighting will become an important role within the building for the plants (that need a lot of light to flourish). If this cannot be achieved, artificial lighting will need to be introduced into the system to enhance growth time.

There will be a lot off staff running the site: distillery, retail, restaurant and management. Offices and quarters for the staff is thus needed.

Movement/circulation is important as experience forms part of the production; as well as in commemorating the past historic process. Learning about the gas making process as one enters and passes through the space.

The idea is to bring back a productive, interactive system that restitute past relationships with users and nature. And in a way rehabilitate a polluted site into a well flourishing ecology.

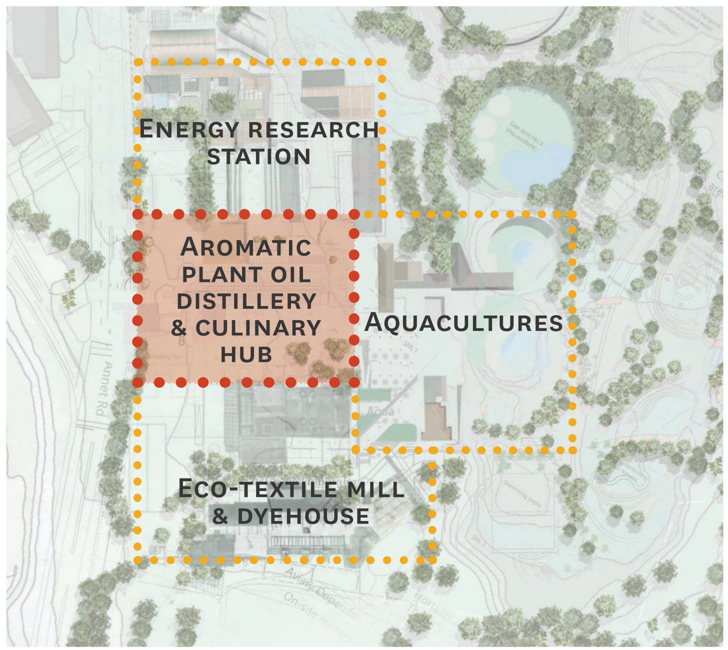


Fig 114 Program proximity

The architecture will become a hybrid, that will be restitutive in terms of its:

- Form: As the scale and exclusivity of the iconic structures insinuates a hostile relationship towards the natural landscape and the public. The new architectural intervention within and surrounding Retort 1 will establish the association of these forms as contributor to the natural/public environment. Because of a restitutive attitude towards the existing structures, a sensitive approach will guide the manner in which heritage will be altered; as a celebration of its heritage.
- Context: Of the identity of the site within the precinct. Society within the context surrounding the site, because of its history with pollution, noise etc. Its isolated nature from its surrounding context.
- Function: The damaging effect the industry had on the environment, evident in the scarred environment; will become restitutive in the new functions, and are meant to correct this disruptive past with the new industry.
- Technology: New applied technologies will compensate the environment instead of causing it damage. South African Chefs Association (SACA) is situated in the Kerzner building opposite Annette road on the University of Johannesburg campus.

Fig 115 shows the synergistic relationship and flow of materials between the various proposed programs. Sharing of materials and produce. Sharing of resources and the binding factor of water.

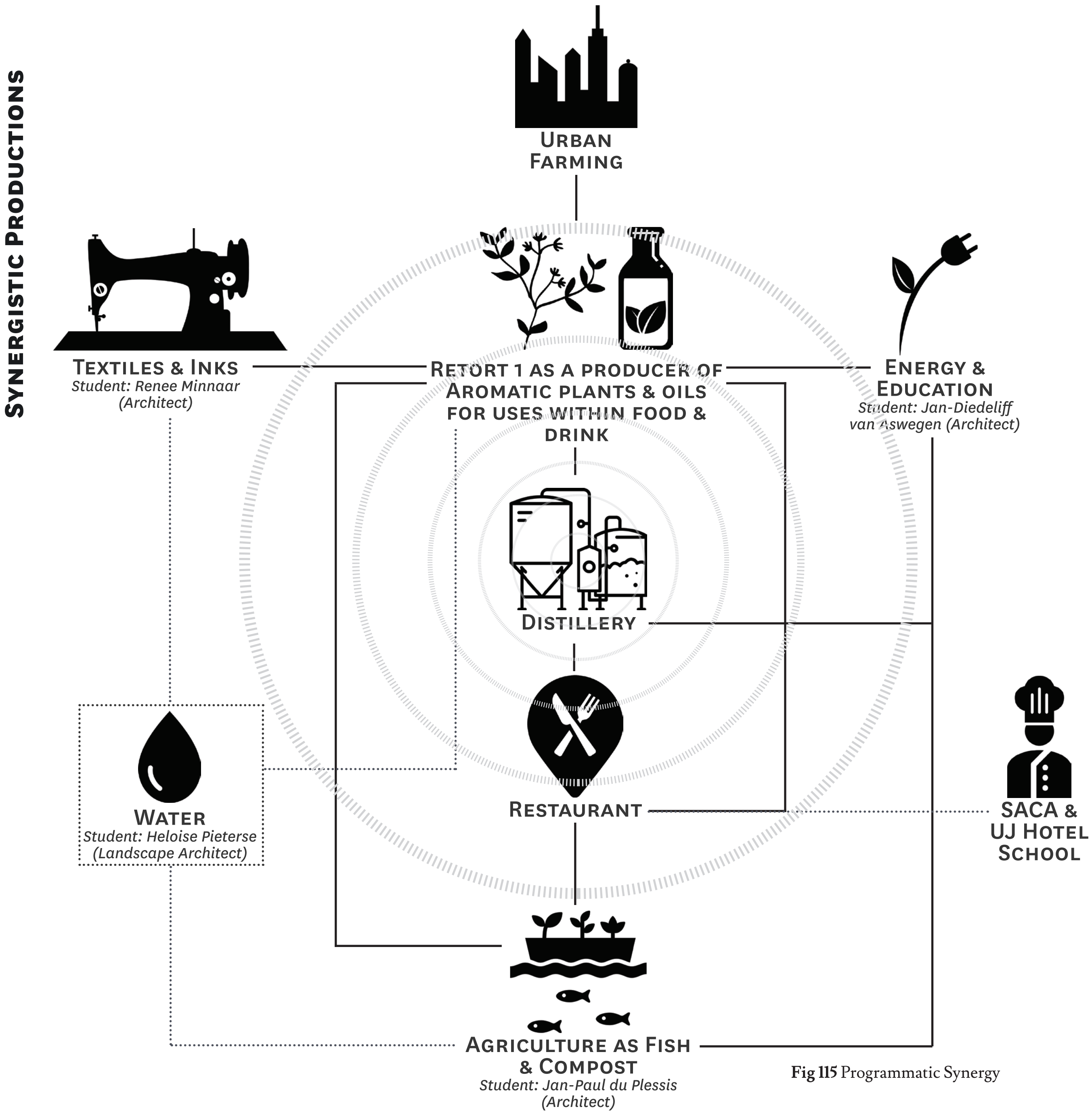


Fig 115 Programmatic Synergy

Fig 116 From left: horizontal PVC system, zig-zag PVC system, stacking system, tiered system (Homesteading, 2017); Far right: Vertical light steel structure (Undercover Tree Planter, 2011)

3.9 Hydroponics

Grybby Cup (2015) mentions that there are many different hydroponic systems available, with each meeting plant needs in slightly different ways. He states that these systems have much in common.

The plants' roots require access to both air and water. Most of the differences between the systems are in the specifics of how they make water and air available to the root system. (Too much of any one of these two are bad for the plants)

The most used growing systems (Grybby Cup, 2015):

- Soil/Soil-less Mix
- Passive Hydroponics
- Active Hydroponics
- Drip Systems
- Nutrient Film Technique
- Ebb and Flow
- Deep Water Culture
- Aeroponics

The various growing systems (Grybby Cup, 2015) applicable to the program will be discussed.

3.9.1 Soil/Soil-less Mix

The benefits of growing plants in soil are numerous. Soil buffers against changes, is a natural root support structure and is a familiar medium to many. Though Soil-based gardening tends to be heavy labour and as soil holds moisture so well, over watering of the plants is a concern.

Soil-less mixes are designed to mitigate these drawbacks by using ingredients such as peat, coir and compost. These mixes tend to be lighter and are commonly used in nurseries for potted plants. They can be hand-watered to provide moisture, and allowed to dry slightly between watering to provide access to air.

This is considered a hydroponic method of growing since plants are not grown in soil, but the experience is similar to growing in soil, which makes them a good choice for the average indoor plants.

This process, which is the most natural will be used for planting directly in the soil in the foyer of the site, between the two retorts.

3.9.2 Active Hydroponics

The addition of a pump to the system creates an active hydroponic system and *can* save effort, from that of the still standing passive system. Though it is said that having to water the system by hand, takes a lot of effort and constant regulation

Sprinkler systems use pumped water to spray the top of the media, which soaks down to the root system. Aeration is achieved by using fresh water and allowing the media to partially dry before watering. Sprinkler systems are often run to waste, meaning runoff is not recovered nor is part of a recirculating system.

They are inexpensive, but generally less exact than other systems. The spray can be difficult to contain, and therefore traditional sprinkler systems are not recommended for a home indoor garden where water damage may result.

This system could also be used on systems introduced on the outside of the building, but not indoors. With plants growing overhead it would not be suitable as the water spray will fall on the users below.

3.9.3 Drip Systems

Drip systems use pumped water and low-volume emitters. The slow-dripping action allows the water to be absorbed over a longer period of time, allowing for greater penetration with less runoff and uncontrolled spray than traditional sprinklers. Aeration is regulated by the media used, the amount the media is allowed to dry between nutrient applications and the amount of air bubbled into the solution.

This system would be most efficient for the vertical use within the retort as it makes use of gravitational flow that and less wastage.

3.9.4 Deep Water Culture

Deep water culture systems can be as simple as letting the roots dangle in a nutrient solution and adding an air stone for aeration. Because air is pumped into the water, the solution does not go stagnant and the plant can absorb both air and water.

Soil is common, but tends to have the most insect issues. Hand watering works well for a few plants, but can become arduous if there are a large number of plants to be tended. Pre-fabricated systems are more expensive, but DIY systems tend to require more creativity and understanding of the principles involved.

3.9.5 Vertical Growing Systems

There are many innovative ways in which one can customize and make a simple hydroponic system with materials such as PVC pipes or gutters. By evaluating different systems to find the best ones that could be implemented, one needs to look at height as the system will need to be more than a storey in hight. Infrastructure then becomes important to be able to support the weight. Some of the systems could well be imagined with the right type of infrastructure to support it.

Evaluating the different systems, the Vertical Tiered system would be the most effective within the retort as it will get the most lighting. It also allows for more production to exist within the system.

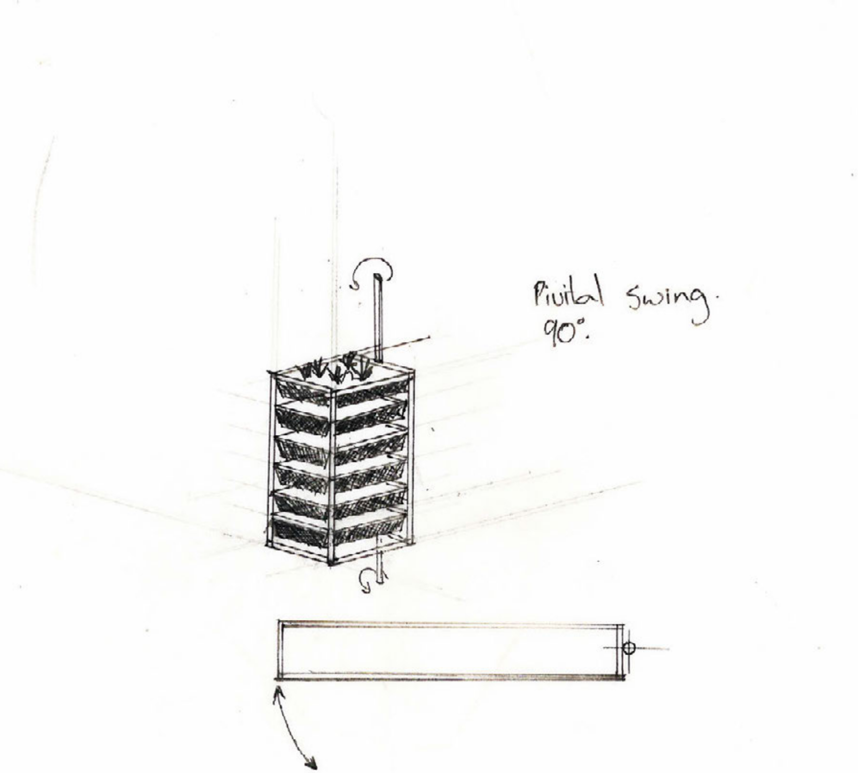


Fig 117 Exploration of hydroponic structures

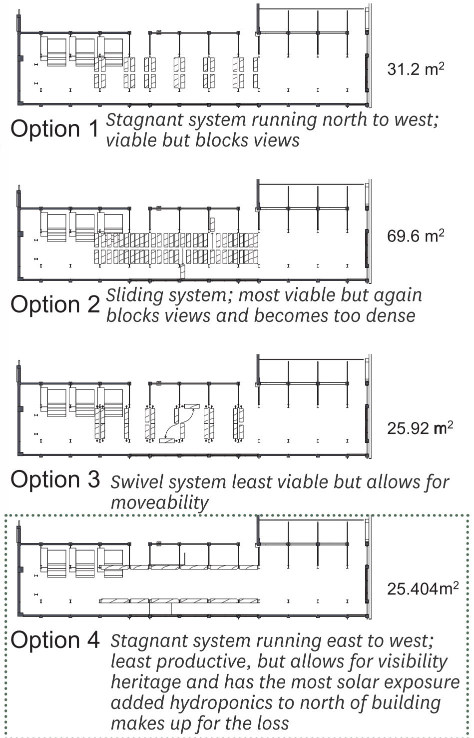


Fig 118 Testing layout the find validity

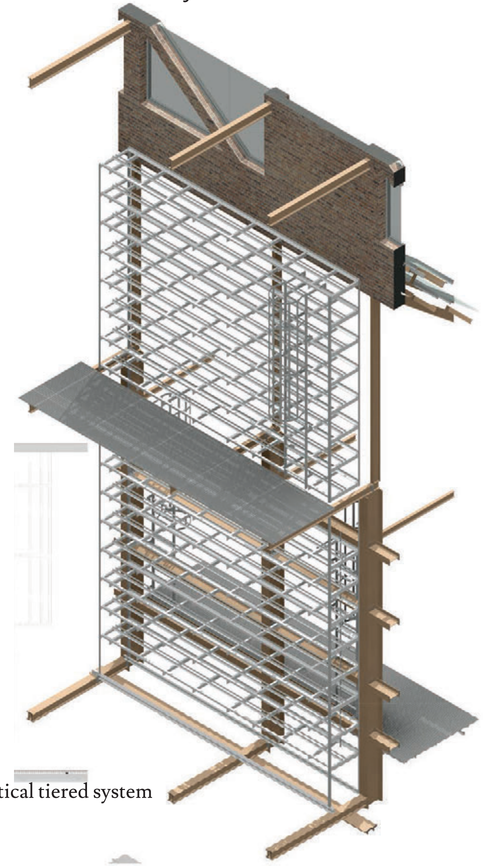


Fig 119 Final vertical tiered system

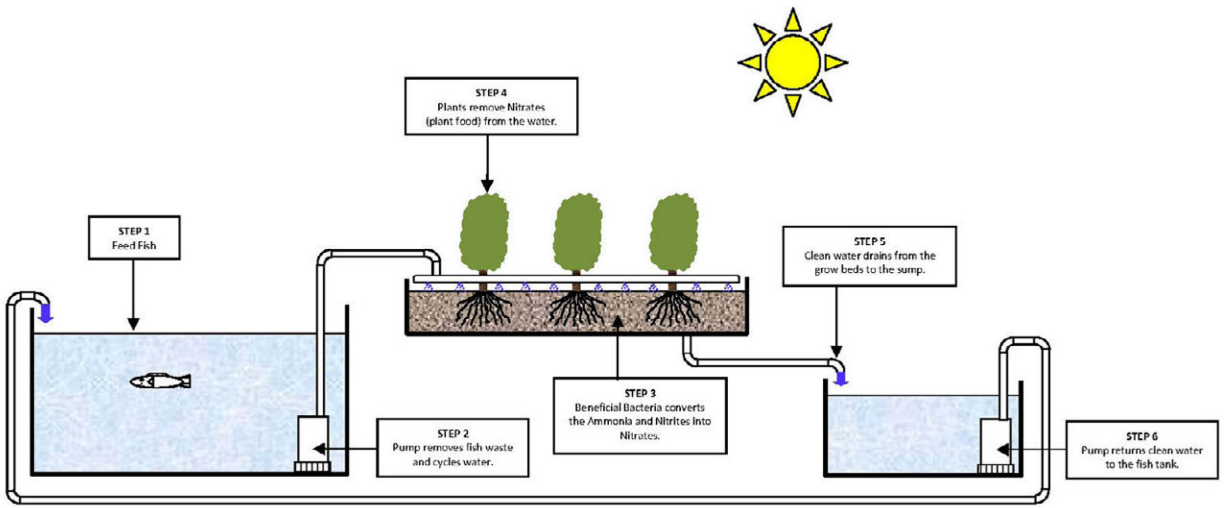


Fig 120 Steam Distillation (Salvari Enterprises, 2008)

3.10 Aquaponic System

Together with the proposed hydroponic system and the synergistic relationship with the aquaculture, a closed loop mutual beneficial aquaponic system will be formed.

Salvari Enterprice (2008) explains the complete system in the diagram (See Fig 120). This system is for a large multi bed system (or food farm) and will thus need a second (sump tank & pump) to function. The Steps are as follows:

1. You feed the fish.
2. Fish and fish waste produce Ammonia in the water. Ammonia is harmful to the fish and if not removed, it will eventually kill the fish.
3. Pump removes the fish waste and cycles the dirty water to the grow beds.
4. Beneficial bacteria living in the grow beds converts the Ammonia into Nitrites and Nitrites into Nitrates.
5. Plants (herbs) living in the grow beds remove the Nitrates.
6. Clean water drains from the beds, and is returned to the fish tank.

3.11 Aromatic Extraction

After harvesting of the plants, its extracts need to be collected. For some plants it need to take place early on, where as others should be allowed to dry. There are various way to extract flavours from plants. This depends on the type of plant as well as the use of the extract. Three ways of extraction will be used in the program and discussed below.

3.11.1 Infusion

Chandler (2014) mentions that the infusion method is the easiest method. The process is discussed accordingly in Fig 121.

STEP 1:
Cut up the flowers and herbs you wish to use. Six tablespoons is a good amount to start with, but it doesn't have to be exact.

STEP 2:
Fill a small jar about half-way with whatever herbs, flowers and spices you prefer. You can also add spices like cinnamon and clove to add a little extra fragrance. Don't be afraid to experiment with mixing and matching herbs and spices.

STEP 3:
Cover the cut flowers with a light aromatic base oil such as almond oil, olive oil or sesame oil. Make sure that all of the flowers and herbs are covered. How much oil this will require depends on the size and shape of your jar and how much plant matter you used, so just eyeball it.

STEP 4:
Put the lid on the jar and shake it gently to mix the flowers, herbs and oils. Place the jar in a sunny spot and leave it for at least 48 hours. Swirl the ingredients around gently every few hours.

STEP 5:
Line a funnel with fine cheesecloth and pour the oil through the cloth and into your second jar, if you want to make the essential oil stronger. Add fresh flowers and herbs, put on the lid and let it sit for another 48 hours. Remember to swirl the jar occasionally.

STEP 6:
Pour the essential oil into a dark-tinted bottle with a good stopper. Label the jar with the ingredients and the date, because essential oils lose their potency after six months.

Fig 121 Infusion Process (Author 2017, Adapted from Chandler, 2014)

3.11.2 Distillation

The main difference between distillation and cold pressing (see 3.11.3) is that with distillation one gets a pure essential oil, whereas by cold pressing one is left with the extracts of the plant (Planinz, 2014).

Planinz (2014) states that the essential oils that are obtained through distillation carries the medicinal qualities of the plant. Thought some essential oils are poisonous, the research in choosing plants for the proposed program only those were looked at that can in fact be consumed in food and drink.

Planinz (2014) explains that the liquid that is obtained through distilled off is called the plant essence and the very small amount of volatile liquid that is left behind is the *essential oil*. She explains that the process takes a large volume of plant parts to obtain a small amount of essential oil, which is why they are typically more expensive than regular liquid extracts.

Essential oils are generally used for therapeutic purposes, but they may also be used in aromatic diffusers, massage oils, compresses, spritzers or in therapeutic baths (Planinz, 2014).

3.11.2.1 The Process of Steam Distillation

Barnard (2015) explains that steam distillation is a technique employed to distil alcohol or the extraction of essential oils from organics by passing steam generated in a pot still through the plant material. It is said that this system is easily controlled.

It is also the process required to obtain a better quality essential oils and hydrosols[1]. Hydrosol World (2016) mentions that steam distillation is also a process which does not make use of chemicals in the process. It is thus said that steam distillation offers a purer, more natural way to create hydrosol products.

Barnard (2015) explains the process of steam distillation:

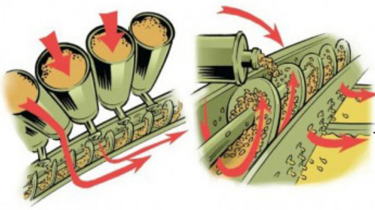
- Fresh or dried botanical material is placed in the plant or botanical chamber of the still. Pressurized steam is then generated in a separate chamber and passed through the organic material to remove the oils. (Barnard, 2015)
- Temperature sensitive compounds which would normally decompose through simple distillation vaporize at lower temperatures when subjected to steam in the vapour chamber or column of the still. This allows for the separation of essential oils, which tend to be less soluble in boiling water, from chemically complex materials. (Barnard, 2015)
- When the steam passes through the organic material, tiny pockets that hold the essential oils open to release the essential oil molecules without damaging or burning these delicate components. The distillate will contain a mix of water vapour and essential oils which return to their liquid form in the condensing recipient and are separated using a Florentine separator. Both the essential oils and the hydrosols are retained. (Barnard, 2015)

It is said that using steam for alcohol distillation permits the distillate to retain the more delicate flavours and aromas which would otherwise breakdown if subjected to high temperatures in a simple distillation. Barnard (2015) also states that this process is typically used to extract essential oils from aromatic plants to flavour liqueurs, and is one of the preferred methods in the manufacture of Gins.

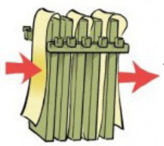
Fig 122 Steam Distillation (Barnard, 2015)

1 *Hydrosols, also known as "flower waters," are produced by distilling fresh leaves, fruits, flowers, and other plant materials. Unlike with essential oils, these aromatic waters are much less concentrated; with their aromas often softer that those of essential oils. This comes from the water soluble constituents in the plant material that are not present in the essential oil. (Mountain Rose Herbs, 2016).*

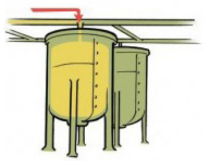
STEP 1:
Quality fresh fruits and seeds. Seeds can be storaged but also need to be cleaned from dust and husks.



STEP 2:
Cold pressed extraction (under 50°C)
The fresh products or seeds flow towards rotating screw mechanism of the press. The seeds are dragged by the mechanism that grinds it along the extracting cage in order to extract the oil. A natural heat is created from the friction, created by the grinding of oil seeds in the extraction cage.



STEP 3:
Filtration. The Extracted oil flows through minuscule holes all around the extraction cage. It then passes through a filter before being bottled.



STEP 3:
Storage in inox tank. Oils can be stored under the correct conditions if it requires so.

STEP 3:
The oil needs to be bottled in dark glass bottles to protect the fatty acids from light.

Fig 123 Cold Press Process (Author, 2017; Adapted from Maison Orphée, 2015)

3.11.3 Cold Press

Planinz (2014) explains that in order to obtain extract, the plant parts may be cold pressed, macerated or soaked in a liquid, such as alcohol in order to isolate, or extract a certain quality or flavour from the plant. The process of cold pressing will be used in obtaining the extracts in the project.

As mentioned previously, cold pressing is used to obtain extracts from plants (Planinz, 2014). It is stated that the extracts from plants are mainly used in perfumes, medicine or in cooking. Once again, the planting list provided looks at those plants that are specifically used for human consumption.

Maison Orphée (2015) expresses that the cold press process is a simple process but that one still requires a certain know- how to obtain the best results.

See Fig 123 for an explaining the process of cold pressing.

Fig 124 Sunlight Requirements

3.12 Lighting

Plant need plenty of light in order to flourish. One of the first obstacles one might encounter is how to provide efficient lighting (Green & Vibrant, 2017). It is said that nothing will ever beat natural light. The aim of the project will be to get as much natural light inside the building as possible and if it is needed. Artificial lighting will need to be introduced if the correct amount of light will not reach the plant. Or even be used at night times and turned off during the day to ensure faster growth, meaning better production.

Many herb types such as Basil does well in hydroponic system whilst the more hardy plants will be planted on site, outside such as the wormwood.

There are discernible benefits of choosing what kinds of light, how much and how long of lightning you expose to plants. Grow lights have been used widely over the world for large-scale greenhouse farms (Green & Vibrant, 2017). There are a lot of criteria to help to decide the best grow lights for your indoor garden.

- Colour (Light Photosynthetic Spectrum)
- How does light colour affect plant growth?
- The spectrum of light
- The light spectrum
- Source, etc.

The scientific detail behind each of these will not be covered here but the best lighting solution, if applicable, will be discussed in short.

For indoor growers, the specific band you should take into account is within 400 - 700 nanometres/PAR (Photosynthetically Active Radiation). We use different nanometres ranges for different growth phases of plants. Specifically (Green & Vibrant, 2017).

- Blue light, ranging from 400 - 490 nanometres, is used during the vegetative and foliage growth phase.

- The orange-red light, between 590 - 700 nanometres, is used during the flowering and fruiting phase.

Green & Vibrant (2017) states that plants grow best under 16-18 hours of light each day. It has not been found that exposure to more light improves the plant growth. Plants that indicate photoperiodism, namely the characteristics that make day length to trigger flowering, should be put under 12-14 hours of light once it requires flowering. The darkness cycle that follows and plants should be kept in total darkness to properly form fruit and flowers. A timer is used to control the duration.

Plant kinds and growth phase differ for most plants. At different phases, the amount of lights plants need are not the same (Green & Vibrant, 2017). One can in this case consider getting a full-spectrum grow light to make it convenient of all phase growing.

Green & Vibrant (2017) explains that with the placement of lights, if they are placed too far away from plants, the amounts of lights plants take, the heat arising will be little. Typically, each square foot of growing area needs 30 - 50 watts. A correct placement of light in your room is a vital element not to be ignored.

LEDs (Light Emitting Diodes)

LEDs are the most excellent, efficient growth lights device as they have a long-time use (Green & Vibrant, 2017). The initial price is high but make the best of money invested with cool operating and the longest lifespan, low electricity consumption and best of all, it produces great yields.

LED came to the market later compared to other lighting types, but quickly proved its worth by performing efficiently and displaying some discernible unique advantages that other grow light types cannot have.

Led grow lights are in popular use nowadays by hobby growers and commercial greenhouse farms alike. This is because LEDs are energy-efficient, does not give off much heat and do not require much maintenance. LED diodes can be customised to emit a specific light wavelength according to the plant's needs.

Pros:

- LEDs usually come with a built-in cooling that helps regulate heats around plants. So is no problems with ventilation and frequent checking for growers.
- Little heat emitted: You can place the LEDs close to plants, which affords greater versatility.
- Better lifespan: LEDs have an average 50,000 hours of lighting that can last up to 15 years as compared to 10,000 hours of HPs.

Cons:

- High initial set-up expense. But in the long run, LEDs do not cost more because of its efficient performance.
- LEDs need be spaced from the plants. Even though the temperature is cool, plants can be burned with too much light.

Environment temperature vulnerability. This only happens in places where the temperature is very high. The diodes of LEDs lights will depend on the ambient surrounding temperature for its performance. Too hot and the LED module can burn out.

Lighting Amount

Typically one needs a minimum of 320 watts per square meter, with 530 watts each square meter being optimal. Everything from room set up, growing style, reflector, surrounding environment may also affect the amount of lighting needed. It is necessary to observe plants' growth and adjust the light power respectively.

3.13 An Opportunity for Financial Sustainability

The Retail space will sell off some of the products that are produced on site and within the building. This will allow for exposure of the site and the program to the outside world. The products sold will include fresh herbs from the site, essential oils, infusions, hydrosols, alcohol and spirits, as well as items from the kitchen, such as baked goods made from the aromatic products.

The retail space could also act as an advertisement for distilling at home and could sell off small pot stills for people that came to learn and would like to continue to practice the art at home. The educational aspect of the program aims for people to continue the knowledge they have gained here and share it.

Program functions & Spacial Requirements				
Space	**Description**	**Functional Requirements**	**Spatial Requirements**	**Estimate Size***
Germination & Translocation Space (Propagation house)	*The Germination & Translocation space (Propagation house) is used to grow seedlings before they can be replanted into the bigger hydroponic system and on the site. The space will be a controlled environment that is separated from other spaces as it will be humid and temperature controlled.*	*Wet services pump drainage Working surfaces Heating pads for germination*	*Natural Light Controlled natural ventilation Active ventilation Climate control Double volume space for air movement*	*propagation & production 115 m² Storage 25 m²*
Hydroponics	*The hydroponic system will grow vertically within the building, on multiple levels. A system will be design to make it functional as well as practical as the building will be used as a public space. Water should thus not fall on the ground floor.*	*Wet services Drainage & flowing of water Drip Irrigation*	*Natural light Well Ventilated Artificial light will be introduced where & if needed Fans & extraction of air*	*∞ m²*
Washing, Drying & Sorting Space	*Harvested & delivered produce are washed & sorted into its various uses. Some produce are left to dry before it is distilled. Long term storage is thus necessary for the plants to be able to be left.*	*Wet Services Wash basins Proper drainage of water for treatment Linkage to other processes & circulation is very important Accessible to outdoor Industrial materials such as surfaces & floors to work on Distillers, Boilers, Presses Bottling & Labelling equipment*	*Large open space & volume Well Ventilated & lit Lighting where needed, dark where not Easy access from delivery zone as well as on site harvest Interaction and visibility with public*	*70 m²*
Distillation, Pressing & Infusion Space	*This will be a space with working surfaces on which the many small distillers (including boilers and pots), infusion and cold press equipment will stand. With the equipment being human scale there is no need for multiple levels where machinery can be accessible from different levels.*			*50 m²*
Bottling & Packaging Space	*This area will coincide with the distillation, pressing & infusion space, as the production will be on a small scale these can coexist and share services.*			*50 m²*
Delivery & Storage Space	*The space will be located in close proximity to where deliveries will be made; and directly accessible to the distillery. As such all the production processes happens within one area on site, making the working process more easy.*	*Dark Space for fresh harvest Open to outdoor for easy delivery. Surfaces for packing*	*Well Ventilated Cool space Dark space*	*44 m²*
Retail Space	*The retail space will act as a receiver from the public interface of Annette Road as well as the site. Products that are produced within the building will be able to be bought here. Some of the produce must be stored out of direct sunlight.*	*Storage/Retail shelves Access to the distillery Access to the main retort & the public.*	*Open space that allows for free standing movement of furnitures Natural light, avoiding direct sunlight where possible.*	*95 m²*
Restaurant, Bar Area & Kitchen	*Large open spaces that can be transformed for event space. Located to have a view over the site and still be part of the existing architecture. Space should be able to open and close completely depending on the weather and seasons. As a fully functional restaurant; permanent infrastructure will be needed to house all the new equipment for the cooking and preparation of food, etc.*	*Wet services Electric services*	*Well ventilated & lit space Transformable to an active ventilated space Accessible from both inside & outside Easily accessible Kitchen to have HVAC*	*250 m² Restaurant 55 m² for bar 95 m² kitchen*
Workshop/Master Culinary Classes	*Cooking classes will be held here for small groups of people/ students to partake in learning to work with culinary experiences and the use of extracts in making food and drink. It will be set out in a teacher student manner as one would expect a hotel school to be set out.*	*Wet services Electric services*	*Well ventilated & lit space Will most likely be used at night times & over weekends Open to outside for safety Accessible to retort interior*	*150 m²*
Offices & Staff Space	*Separate office space is needed for people on site such as the site manager, building manager, distil manager, etc. But also for some of the less frequent staff that work on site. The space will include meeting space, and a staff room for relaxation.*	*Wet service for kitchenette for staff*	*Well ventilated & lit space HVAC controlled*	*200 m²*

Fig 125 Spatial & functional requirements

**Some of the required spaces will in some instances be larger that would be needed as the project occupies existing space floor area.*

Staff Changing Facilities	*The physical work on site requires for workers to have facilities where they could shower and store their belongings throughout the day. There will be a designated space where the staff can cleanse themselves before departing after hours.*	*Wet services Lockers for personnel privacy for changing*	*Well ventilated*	*30 m²*
Information/ Reception Centre	*This space will act as a receiver from Annet Road where people can get information on the whole Gas Works site and act as a reception to the offices above.*	*Accessible from street edge as well as site Open for people using the lift shaft*	*Well Ventilated*	*100 m²*
Public Rest Rooms	*As a public park, public restrooms are needed and will coexist with rest rooms for visitors of the restaurant and culinary classes.*	*Accessible from park as well as building Wet services*	*Well Ventilated*	*30 m²*
Pump & Power House	*A designated space for mechanical equipment to run is needed to pump water from the Aquaculture into tanks to wet the hydroponic system.*	*Accessible from outside and inside*	*Well Ventilated High elevation for water storage.*	*90m²*

3.14 Program Space Requirement

In my correspondence with Dr Olivier from SEOBI (2017) she gave me a generic plan for a medium-sized stationary distillation plant. This is for a rather large capacity of 500kg of plant materials per pot.

One large still will not be viable for this program as there will be different materials that will need to be distilled, pressed or infused. A better option would be to invest in a number of smaller stills to handle the different input and process. Sourcing different stills from Distillique (2017) shows that they do come in various sizes. The 25 litre Premium Alembic pot still (See Fig 126), for instance allows one to distil a good 6 to 10 bottles (750ml each) of spirits at 43% alcohol per batch.

Having different stills to handle different plants and different spirits will allow for more than one distillation process to take place at any one given time. This, of course is dependant on the availability of the plant` material.

Production Possibilities

Alcoholic production
25l still - 6-10 750 ml bottles gin @ 45%Alch.

Lavender as benchmark
20l still - 1.5 - 2.0 kg matter - 5-15 ml essential oil/ 3-5 l hydrosol
40l still - 3.0- 5.0 kg matter - 20 - 50 ml essential oil/ 5-10 l Hydrosol

Fig 126 Essential oil 20L pot still (left) Alembic 25L pot still (Right) (Distillique, 2017)

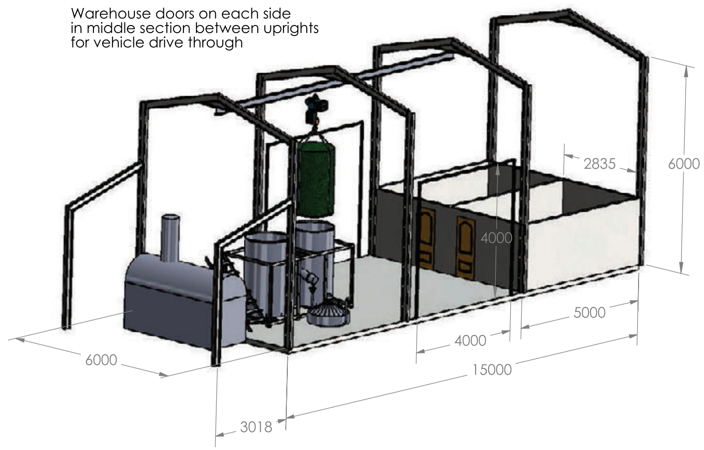


Fig 127 Warehouse layout by EDE (Olivier, 2017)


Wormwood *(Artemesia absinthium)*


Basil *(Ocimum basilicum)*


Bay leaves *(Laurus nobilis)*


Borage *(Borago officinalis)*


Caraway *(Carum carvi)*


Celery *(Apium graveolens)*


Chamomile *(Matricaria recutita)*


Garden chervil *(Anthriscus cerefolium)*


Chives *(Allium Schoenoprasum)*


Coriander *(Coriandrum sativum)*


Dill *(Anethum graveolens)*


Elder Flower *(Sambucus nigra)*


Fennel *(Foeniculum vulgare)*


Garden Sage *(Salvia officinalis)*


Ginger family *(Alpinia Galanga)*

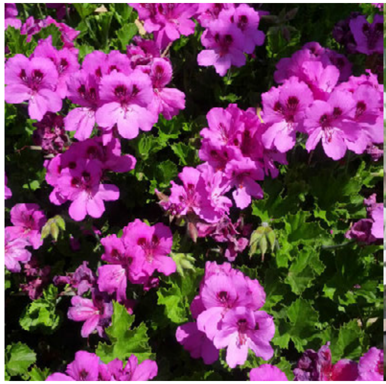

Horse radish (*Armoracia rusticana)*


Lavender *(Lavandula angustifolia)*


Lemon Balm *(Melissa officinalis)*


Lemon grass *(Cymbopogon citratus)*


Lemon verbena *(Aloysia triphylla)*


Malva *(Geranium pelargonium)*


Jasmine *(Jasminum multipartitum)*


Num-num *(Carissa macrocarpa)*


Oregano *(Oreganum spp)*


Rosella *(Hibiscus Sabdariffa)*


Linseed *(Linum usitatissimum)*


Rosemary *(Rosmarinus Officinalis)*


Tarragon *(artemisia dracunculus)*


Thyme *(Thymus spp)*


Wild Mint *(Mentha longifolia)*

3.15 Planting

	Parts Used							Type of Extract			Process of Extraction			Uses		
	Springs	Roots	Stems	Leaves	Flower*	Fruits	Seeds	Essential Oils	Hydrosols	Extracts	Distillation	Cold Press	Infusion	Food	Drink	Garnish
Wormwood (*Artemesia absinthium*)	●		●	●	●			●		●	●			●	●	
Basil (*Ocimum basilicum*)	●			●	●		●	●		●	●	●	●	●	●	●
Bay Leaves (*Laurus nobilis*)				●				●			●			●		
Borage (*Borago officinalis*)	●			●	●									●	●	
Caraway (*Carum Carvi*)		●		●	●		●	●						●	●	
Celery (*Apium graveolens*)			●	●			●	●			●			●	●	
Chamomile (*Matricaria recutita*)					●									●	●	
Chervil (*Anthriscus cerefolium*)			●	●										●		
Chives (*Allium schoenoprasum*)			●		●		●	●			●			●		●
Coriander (*Coriandrum sativum*)				●	●		●	●			●		●	●		●
Dill (*Anethum graveolens*)				●	●		●	●			●			●	●	
Elder (*Sambucus nigra*)			●	●	●	●		●			●	●			●	
Fennel (*Foeniculum vulgare*)			●	●	●		●							●	●	●
Garden Sage (*Salvia officinalis*)				●	●									●	●	
Ginger family (*Alpinia galanga*)		●		●				●			●			●	●	

	Parts Used							Type of Extract			Process of Extraction			Uses		
	Springs	Roots	Stems	Leaves	Flower*	Fruits	Seeds	Essential Oils	Hydrosols	Extracts	Distillation	Cold Press	Infusion	Food	Drink	Garnish
Horseradish (*Armoracia rusticana*)		●		●										●		
Lavender (*Lavandula spp*)					●		●						●	●	●	
Lemon balm (*Melissa officinalis*)	●		●	●										●	●	
Lemon Grass (*Cymbopogon citratus*)			●	●										●	●	
Lemon verbena (*Aloysia citriodora*)				●	●									●	●	
Linseed (*Linum usitatissimum*)			●		●		●	●			●			●		
Malva (*G. pelargonium spp*)			●	●	●			●			●			●	●	
Jasmine (*Jasminum multipartitum*)					●									●	●	
num-num (*Carissa macrocarpa*)						●				●		●		●	●	
Oregano (*Origanum species*)	●			●	●									●		
Rosella (*Hibiscus sabdariffa*)				●	●	●		●		●	●	●	●	●	●	
Rosemary (*Rosmarinus officinalis*)			●	●	●			●		●	●	●	●	●	●	
Tarragon (*Artemisia dracunculus*)	●			●									●	●		
Thyme (*Thymus spp*)	●			●	●									●		
Wild mint (*Mentha longifolia*)				●										●	●	

3.16 Regulations & Legislation

A plethora of legislation need be considered when working on a site such as the Gas Works. From its heritage value to the pollution caused. Newly introduced and promulgated regulations is something that continuously need be checked and considered in order to align it and adhere to the strict South Africa building regulations.

3.16.1 Legislative Requirements

Below is set out a synopsis of the legislation applicable to the development of the Gas Works site:

Water

- The National Water Act, 1998 (NWA) (Act No. 36 of 1998)

Waste

- The National Environmental Management Waste Act, 2008 (NEMWA) (Act No. 59 of 2008)

Development Planning

- The Spatial Planning and Land Use Management Act, 2013 (Act 16 of 2013)

Minerals

- The Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002)

Soil

- The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

Fire

- The National Forest and Fire Laws Amendment Act, 2001 (Act 12 of 2001)

Noise

- The Department of Environmental Affairs and Development Planning, Environment Conservation.

Air

- The National Environmental Management: Air Quality Act (Act 39 of 2004) - NEM: Air Quality Act
- Air Quality Management By-Law, 2016 Approved by Council: 31 March 2016 C14/03/16 Promulgated on 17 August 2016 Pg 7662; La 54049

Heritage

- The National Heritage Resources Act, 1999 (Act 25 of 1999)

Health & Safety

- The Occupational Health and Safety Act, Act 85 of 1993 as amended by The Occupational Health and Safety Amendment Act, Act 181 of 1993
- The South African Council for the Project and Construction Management Professions (SACPCMP) Registration Rules for Construction Health and Safety Agents in Terms of Section 18(1) (c) of the Act, 2000 (Act 48 of 2000)

Environmental Impact Assessment Regulations

- The National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
- R. 983 (Listing Notice No. 1) National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014
- R. 984 (Listing Notice No. 2) National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014
- R. 982 National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2014
- The Environment Conservation Act, 1989 (ECA) (Act 73 of 1989)
- The National Environmental Management Laws Amendment Act, 2013 (NEMLA) (Act 14 of 2013)
- National Environmental Management Laws Second Act Amendment Act, 2013 (NEMLA) (Act 30 of 2013)

3.16.2 SANS Regulations

The South African National Standards Regulations (SANS) will guide the design in terms of the minimum requirements required in designing a sustainable building.

As a multifunctional public space with many sub programs it is difficult to define a single class of occupancy according to SANS 10400-A (2010:43).

The requirements for each of these spaces differ, in some cases drastically so in light of the fact that many of these spaces are integrated. A compromise will need to be found to accommodate the difference in requirements.

Inclusivity

The aim would of course be to make the design as inclusive as possible in order to allow for access everywhere. Because the site is situated on a steep level, multiple ramps need be introduced. In some instances, a lift will have to be installed for those people who want access to the upper levels and also to allow for pedestrians crossing the road from annet, safe passage via the pedestrian bridge.

Provision need also be made for toilets for the disabled visiting the site as well as the building.

Space	**Occupancy** *SANS 10400 A (2010:43)*	**Population** *SANS 10400 A (2010:45)*	**Lighting** *SANS 10400 O (2011:)*	**Air Exchange** *SANS 10400 ... (201...:)*	**Fire** *SANS 10400 T (2011:)*
Restaurant	*A1 Entertainment& public assembly 250 m² (1 per m²)*	*250 according to SANS; Comfortable at 150 plus 13 Staff members*	*Kitchen - Hight Lux Restaurant & Bar- Low Lux*	*Kitchen 20 L per hour per staff/Customer*	*There must at least be two emergency routes; as well as an additional route because of the length of the building. As a public building the design will have many entrances and ways through 60min occupancy separator is required between spaces. Class 2 Fire doors will be required between spaces where applicable. All wall, floors and ceilings in emergency routes must have a 120 min fire rating. Provision for fire hydrants and portable fire extinguishers will be needed.*
Retail	*F2 Small Shop 95 m² (1 per 10 m²)*	*10*	-	*2 L per hour. Cross ventilation sufficient*	
Office	*G1 Offices 200m² (1 per 15 m²)*	*10*	*300 -500 Lux*	-	
Distillery	*D2 Moderate risk industrial 170 m² (1 per 15 m²)*	-	-	-	
Hydroponic	*C1/C2 Could be seen as a Exhibition hall/ Museum m² (1 per 15 m²)*	-	-	-	
Propagation house	*D3 Low risk industry 140 m² (1 per 15 m²)*	-	-	-	
Culinary Classes	*A3 Places of instruction 150 m² (1 per 5 m²)*	*10*	-	-	

Fig 128 MFO-Park(Archtonic, n.d.)

3.17 Precedents

3.17.1 MFO Park - Planting as Infrastructure

Zürich Oerlikon, Switzerland 2001-2002
Burckhardt + Partner and *Raderschall Landschaftsarchitekten AG*

The MFO-Park was created in 2002 as part of the 'Zurich-North Centre' development and as the second of four parks. It is distinguished by its modern and unusual design. The large 'park-house' is a double-walled construction, covered by a hedge-aid, a three-sided 'treillage' in an old garden-architectural style, which is enveloped by plants (Archtonic, n.d.).

The large hall is interrupted in the rear by four overgrown wire-loops. The water basin, planted with iris', stands on a lowered surface. The interstices of the double walls are interspersed with stairs, transitions and protruding loggias. The sun deck high above the roof offers a view over Zürich-Nord (Archtonic, n.d.). It is said that the four-storey brick building, originally planned for demolition, will continue to be used for the time being.

The MFO Park has various activities. Large events, open-air cinema, theatre, concerts, etc. are possible. The baroque parktheater with its back-cobblings can be found here. In the interstices small, silent garden rooms with a view into the hall - opera logs for reading, loving, dreaming, are created.

Oerlikon was characterized by industrial buildings until the 1990s. The park was used by Oerlikon (MFO) for over a hundred years. The 'Park-Haus' takes up the dimensions of the former factory buildings.

The precedent is a great example of how infrastructure can support green structures in a social setting that supports social activities

3.17.2 158 Cecil Street - Greening the Existing

Singapore 2011
AgFacadesign

Four additional floors, together with the replacing a 'unsightly mesh-façade', was part of the requirement in improving a bland and uninviting disused space behind it (WLA, 2013). Located within the prime Singapore Central Business District, the 1984 building is 10 storeys tall and was originally designed to be environmentally responsive with floors receding inwards with each lower floor. External RC Planters spanning across the building's 24m wide façade was meant for sun-shading.

The addition and alteration project, with its new mesh-façade and four massive columns along the road, formed an external Atrium space; juxtaposed neatly with the existing floor plates. The Atrium space needed to be naturally ventilated to comply with smoke extraction provisions. The architect was tasked in redesigning the façade and improve the Atrium space (WLA, 2013).

The idea was conceived of a 'hanging-garden'. To realize the concept, a unique 'layered-glass' façade was developed for natural ventilation and smoke disbursements. The existing elements were also exploited and transformed into green features. Detailed considerations were made for maintenance strategies, lighting systems as well as the overall aesthetics. The atrium space was transformed into a hanging garden by camouflaging unsightly elements with vertical and horizontal planting. Spatial connectivity was further enhanced by strategically locating the glass floors against the massive green-columns, enabling a visual experience of a 'cathedral of green' when viewed from the pavement (WLA, 2013).

The importance of this precedent lies in how new architecture could attach to the existing architecture in order to support green systems and infrastructure.

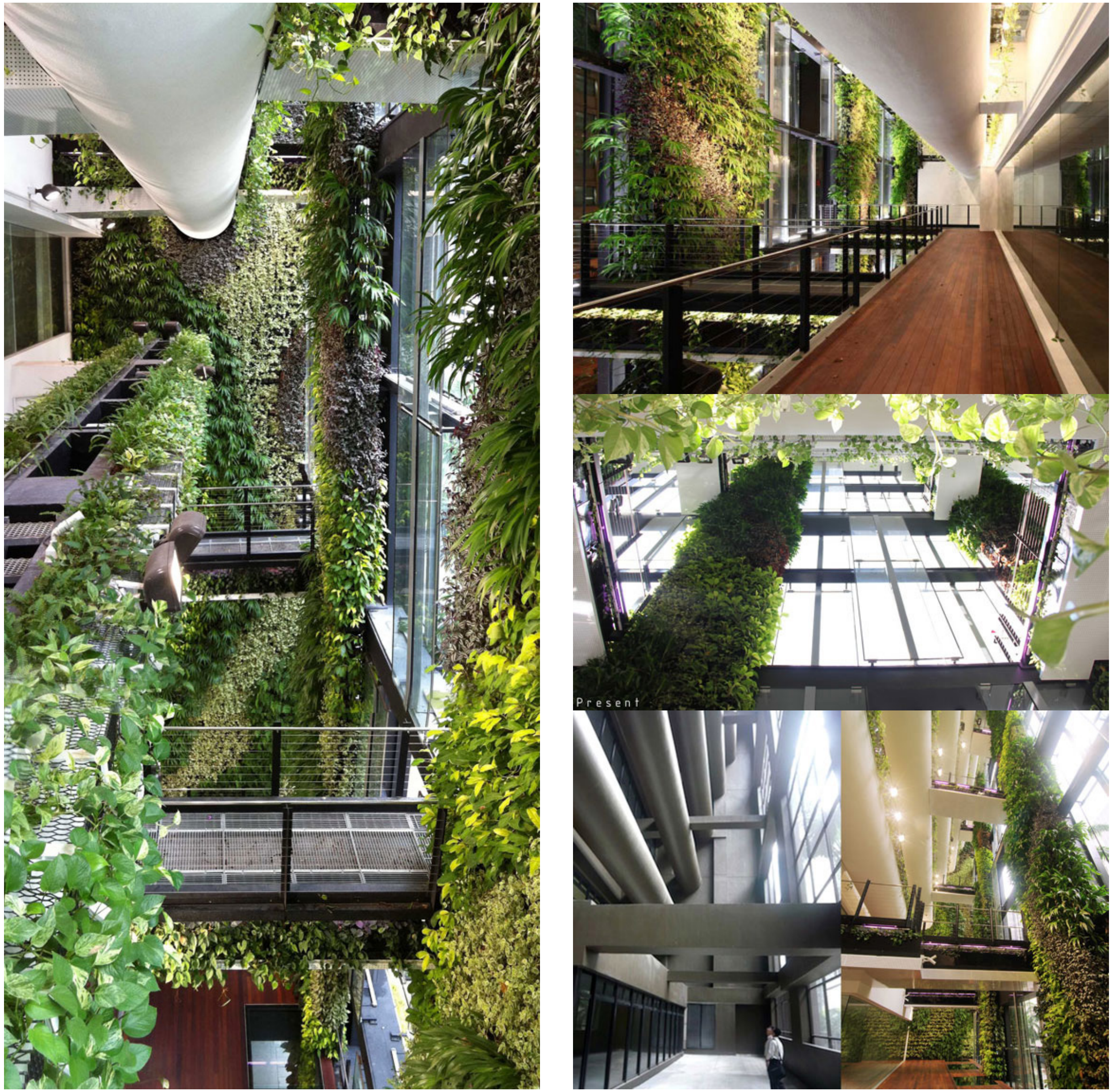


Fig 129 Cecile Street (WLA, 2013)

CONCEPT

Chapter 4

Fig 130 View down southern facade

4.1 Summary of Informants

4.1.1 Industrial Heritage

As a main informant in dealing with the isolated heritage that is associated with industry and its juxtapose within society, the privatised infrastructure has largely been unseen by society: the users. There is a challenge to connect this past industrial history with the present to make it part of a productive future in creating a celebratory design intervention.

4.1.2 Theory

Theoretical approaches help in defining what the architecture could potentially become, even as informative to what the programs need. *Hybrid architecture* will be looked at in terms of object, landscape and infrastructure; *palimpsest* as a way of layering new on the old, as a juxtaposition of polar opposite; *Heritage & Memory* as a way of approaching design in a celebratory way.

4.1.3 Social & Economic

Industrial architecture has always been disconnected from the public. Its produce is used, but the processes it involves, is not known. The user is blinded by the comfortable life it provides and in ignorance of not knowing its ecological effect.

Disclosing this past process to the public in an informative way and by making it part of an experience, a social experience, is imperative. This could inform and remind society why we need to make changes regarding the ecological landscape and industry.

Adding social activity to productivity provides potential of an economic and sustainable nature. Interaction with the public is important as consumers are becoming more conscious of where produce come from.

4.1.4 Experience

Experiences are what we remember: how we learn influences how we remember. Interaction, be it visual or sensory, provides pleasant experience.

In displaying the industrial architecture, by making it part of a new architecture and by making it part of an experience, makes it memorable.

4.2 Industrial Abandonment

Industrial architecture is usually designed with one function in mind. It is removed from society and hidden behind infrastructure. Process is what drives the Architecture, namely to generate the most output in the most cost efficient way. It is economically driven.

But what happens when this industry fails, or become of no value to mankind? What is left behind except for the scarred ecology, the Architecture that was specifically designed for this mono-functional purpose. Decay sets in. What was once a producer becomes no more that a relic. It is socially abandoned simply because it was never social to begin with.

By looking at ecological systems in nature, interaction and dependency is important. If one system fails, the other functions (or systems) helps it up again. It is a synergistic relationship where everything gives and takes, and lives and works together. No one thing stands alone.

Relationships within this system becomes important as it needs other systems to work; and in return gives to the other systems again. There are these relationships within the site, but also within the larger urban framework.

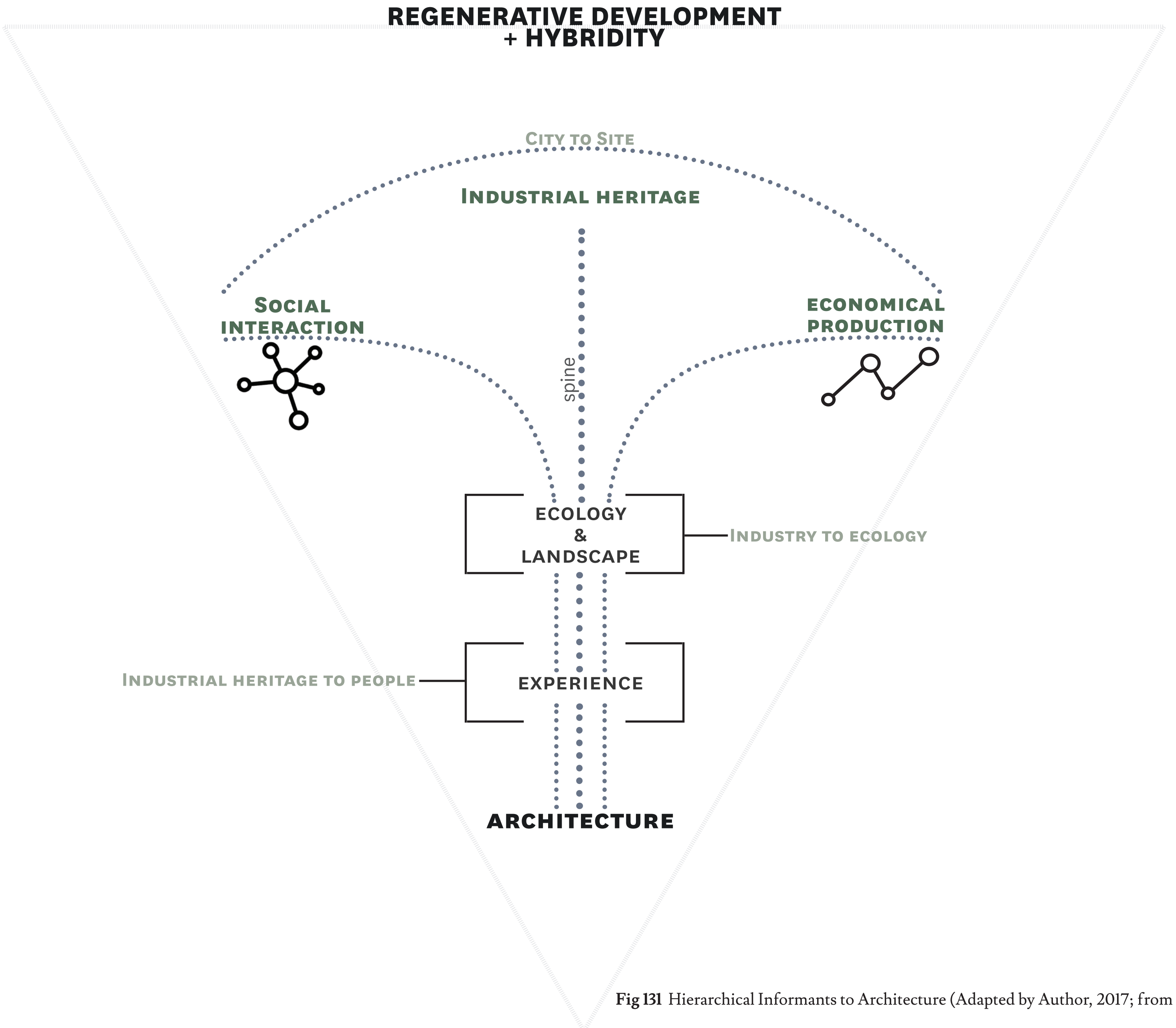
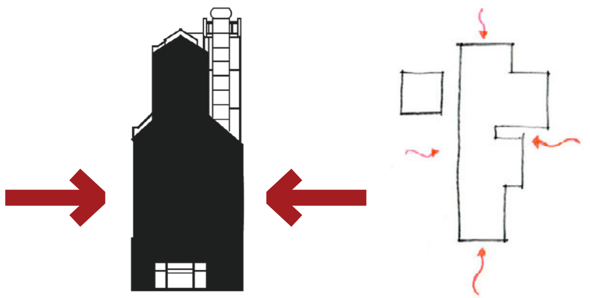


Fig 131 Hierarchical Informants to Architecture (Adapted by Author, 2017; from Buchner, 2013:93)

4.3 Intentions

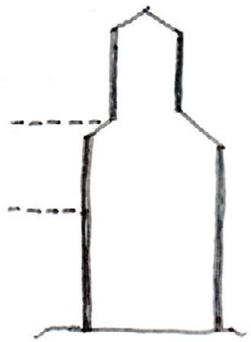
Parasitic architecture

Feeding of the other functions on site. Steeling energies from the different functions; but also giving in return.



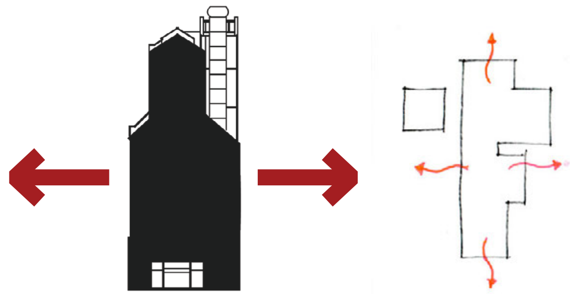
Recycling architecture

Using structures and infrastructure that exists on site to assist new interventions.



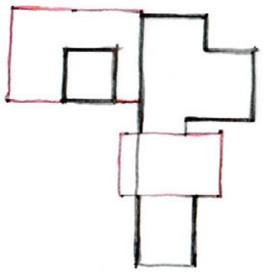
Regenerate

By using new program to restitute the relationship of industry and ecology.



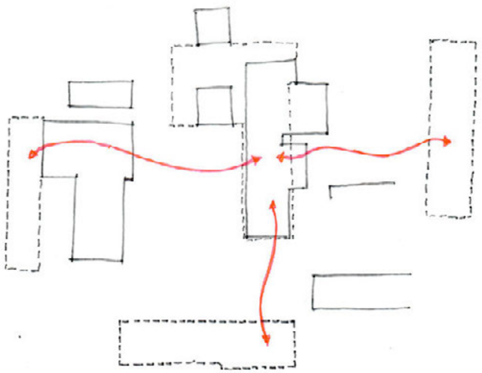
Interfere

Interfering with the existing structures on site. Cutting through, and attaching to the heritage.



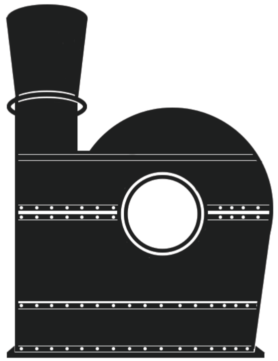
Systematic connection

Between the various proposed programs as energy feeder.



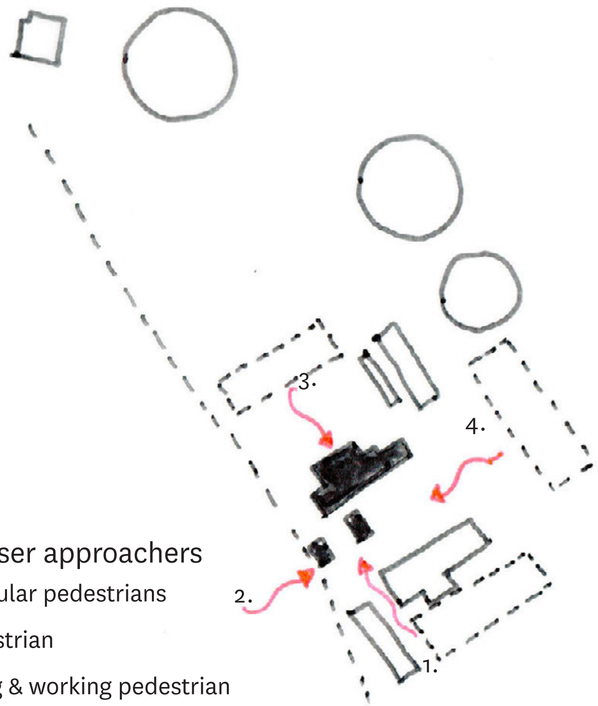
Display

By exposure of the industrial process and exhibiting it.



Connection

Connecting objects and users to create synergy by means of interface & interaction. Framing of spaces and movement.



Four user approachers

1. Vehicular pedestrians
2. Pedestrian
3. Living & working pedestrian
4. Wondering pedestrian

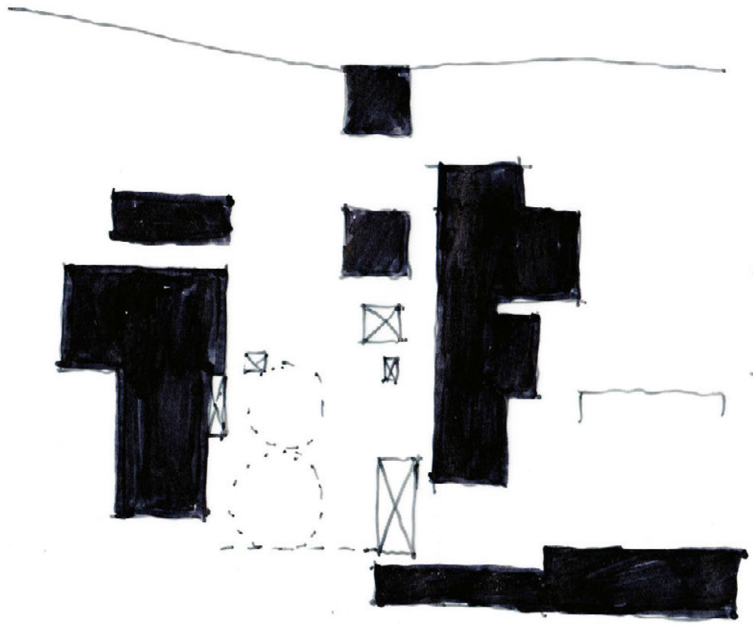
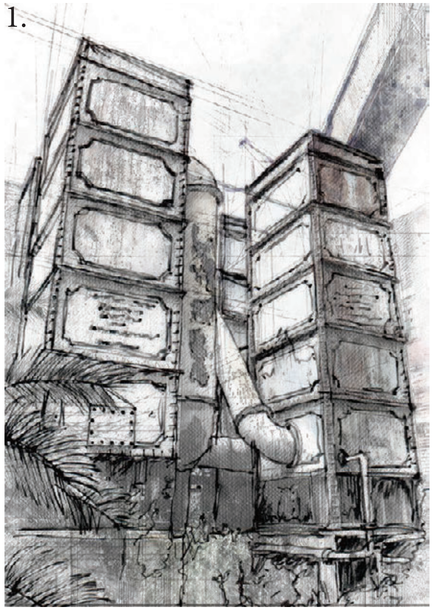


Fig 132 Important on site icons in foyer

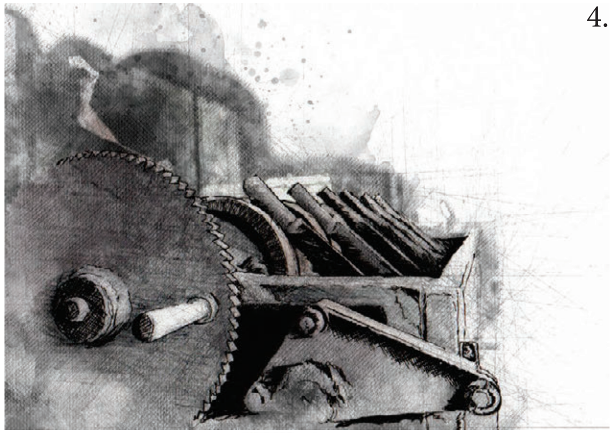
1.

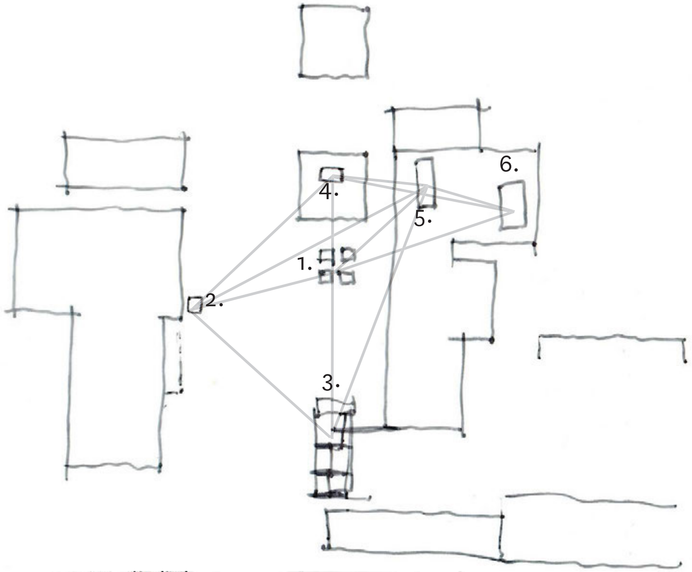


2.

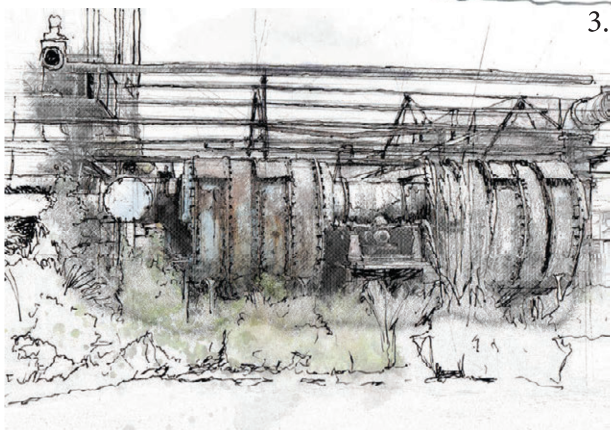
Fig 133 Important on site icons and their relation to one another

4.

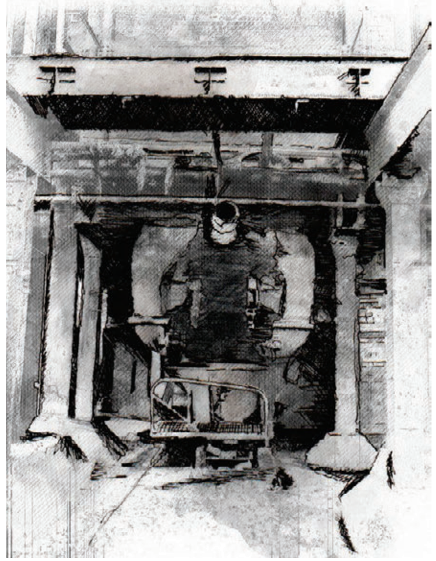




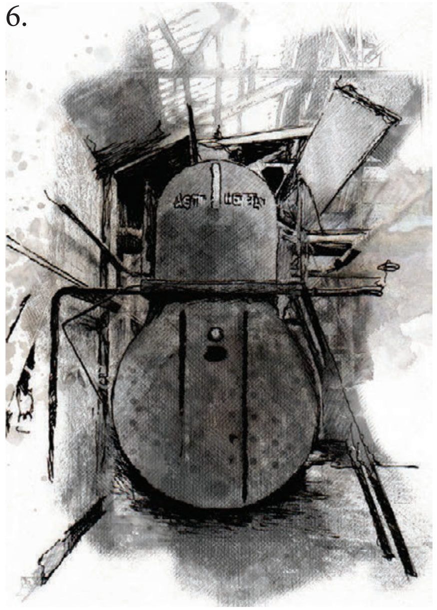
3.



5.

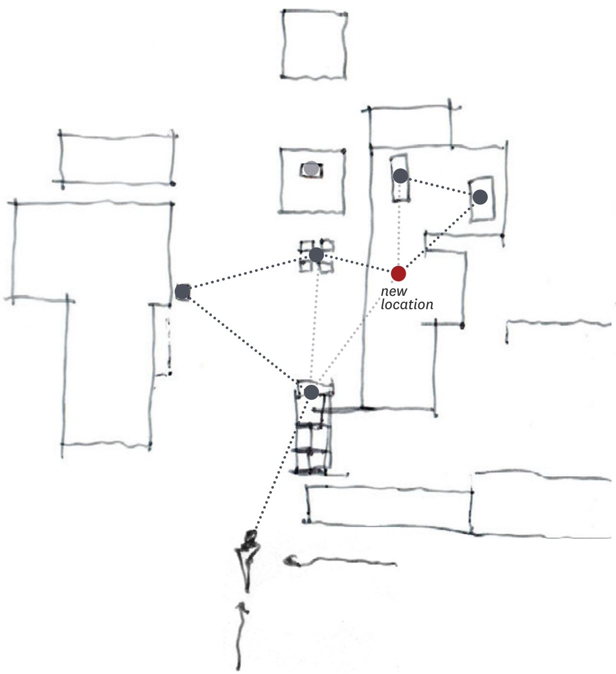


6.

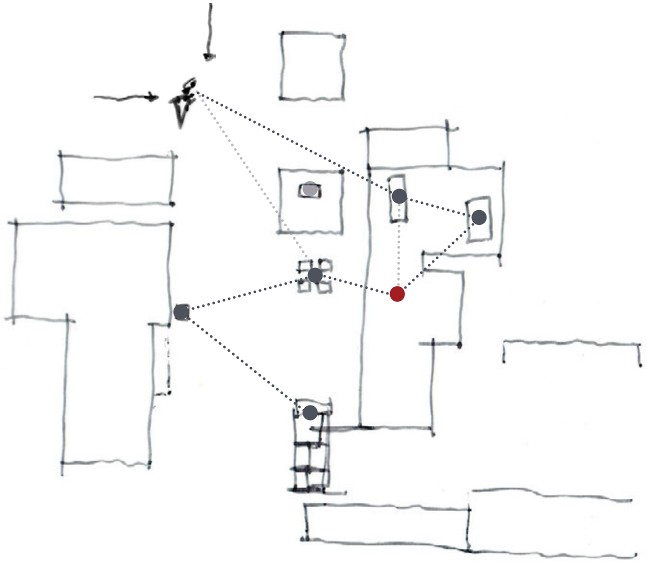


Three different types of pedestrians will mostly make use of the site and will approach the building from different directions. This makes it difficult to have one point of entry for the building.

Wondering pedestrians



Vehicular pedestrians & Outside pedestrians



Living & working pedestrians

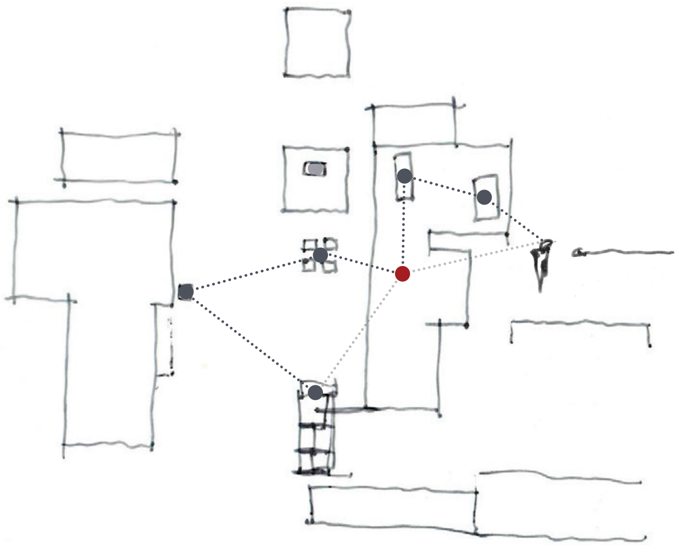


Fig 134 Types of pedestrians

The *wondering pedestrian* comes from within the site and has already experienced the park as whole. Coming from 44 Stanley and the business/education/residential nodes surrounding it, some of the users are only passing through on their way to the public transport nodes, whilst others come sees it as an end destination to see and experience what it has to offer.

The *vehicular and outside pedestrians* comes from either the formal parking area to the south-west, or crossing over from the UJ, or strolling along Annet road. These pedestrians are users that come to the park for its facilities and are not only passing through. This is the catchment area where it will be the first thing that they see when entering. It needs to draw the users in.

Living and working pedestrians comes from the Innovation hubs and residential areas of the park to the north-east. They are regular users of the site and its facilities.

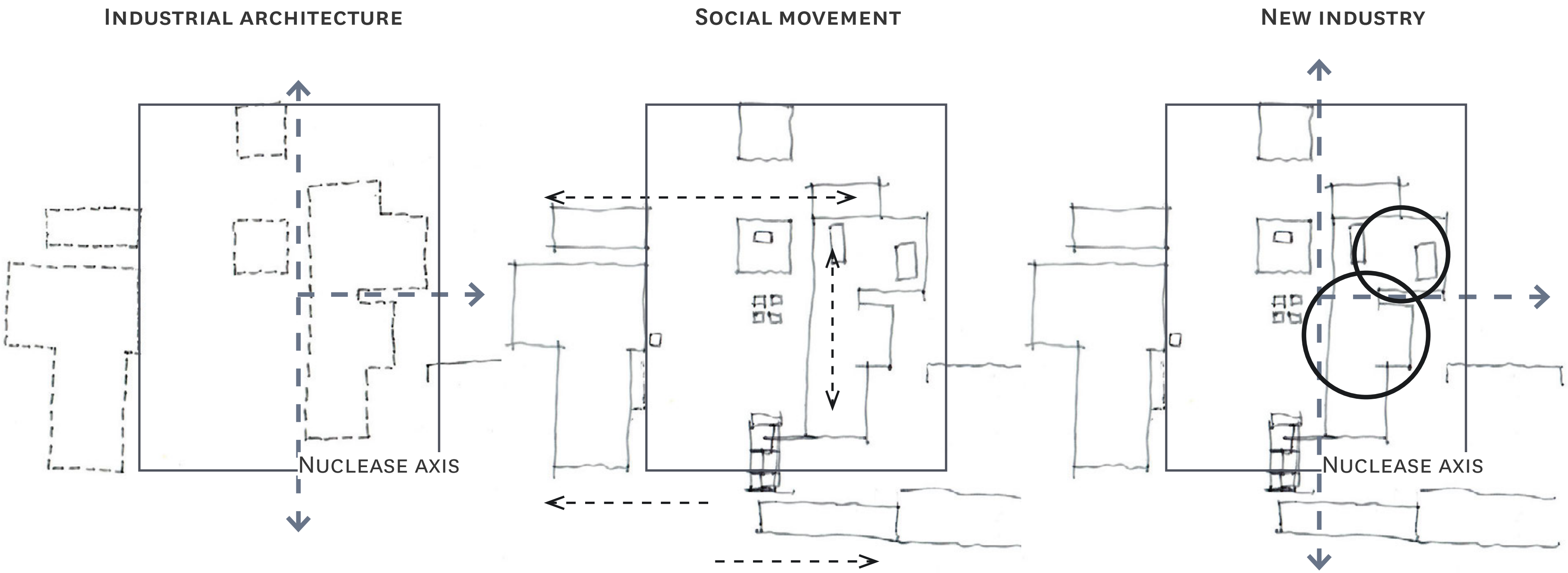


Fig 135 Social movement

Acting as the nuclease axis through the maze of industrial architecture on site, there are a number of different social paths that the users will take wandering off of it. This becomes the movement of learning and experiencing.

The new industry takes place around these paths as part of the experience. As the new architecture will happen within and around the old, spaces are grouped functionally in respect of its spacial requirements, but also as part of the previous processes that took part in the building.

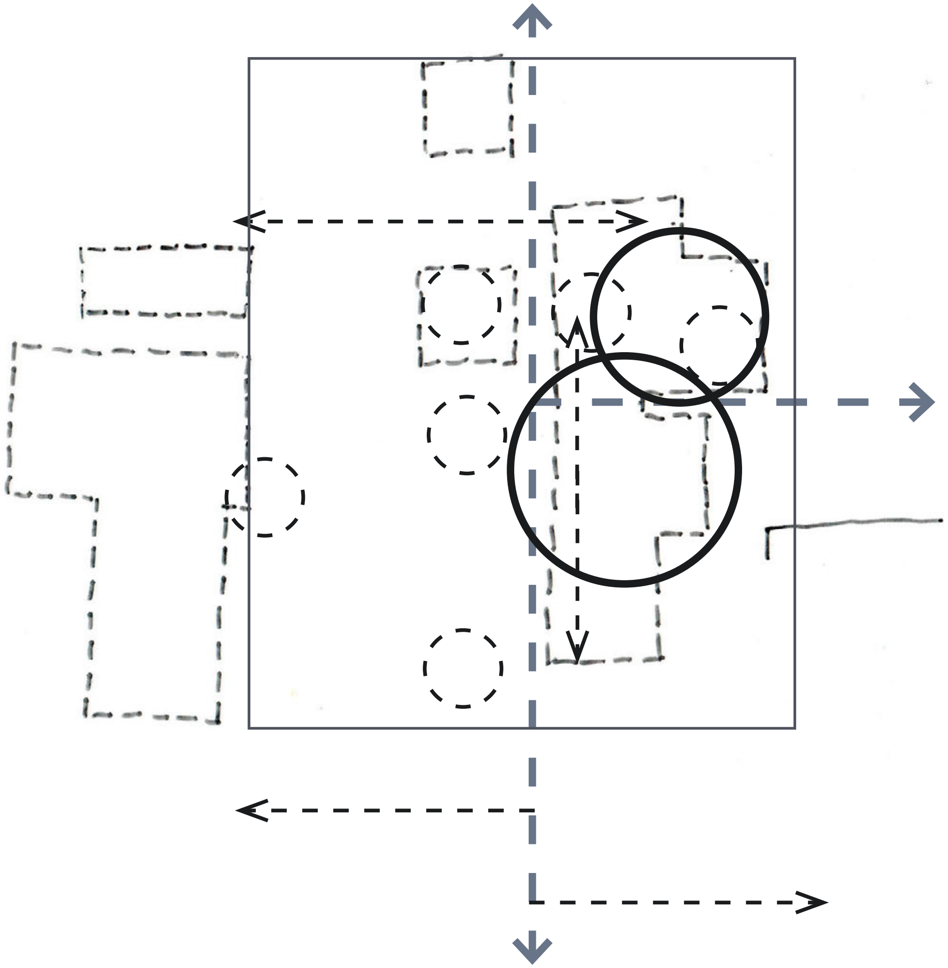


Fig 136 Overlaying the various layers of movement, experience and industry

Direct responses & problem solving

Sloping & Pollution

The site slopes at a rather steep angle towards the east. There is also tar pollution within the *foyer. This is not in the* extremes found at the bottom of the site, but still enough that it need be dealt with. The soil will have to be re-mediated as discussed in the urban vision.

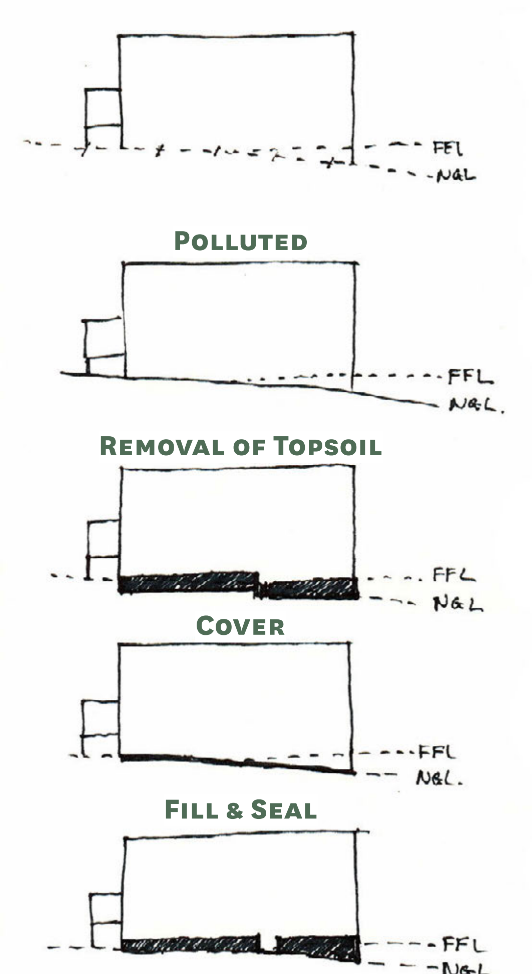


Fig 137 Dealing with sloped polluted foyer space

Tectonic

The existing structures are very symmetrical and precise with structural columns and beams that supports the brick infill in-between. This can be broken/analysed as a skeleton structure with repeating intersections. This aspect will be analysed in more detail in the following chapter.

Fig 138 Tectonic structure

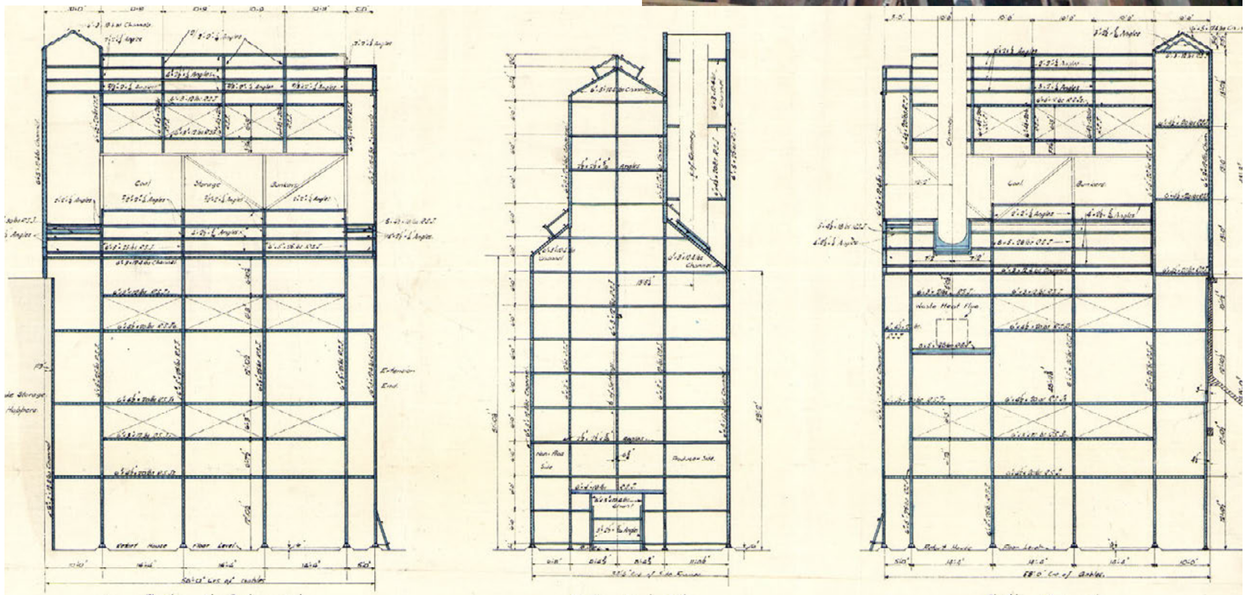


Fig 139 Retort 1 sections (Archives of Läuferts le Roux, 2017)

4.4 Objectives

The project will look at industrial architecture (as listed under objectives) in a manner that would achieve a multi functional inclusive space that binds with the existing architecture of the Gasworks.

- Integrate a contemporary form and function in an industrial landscape.
- Create Architecture that is both functional and aesthetic.
- To reactivate architecture from a past era and bring it to the present.
- Change the perception of place (perceived as being dilapidated, obsolete and dangerous) into a thriving well-functioning building.
- Stay true to the existing Architecture.
- Exposing the industrial process in a way that is informative and educational.
- Reactant industry and ecology by introducing programs into a previous destructive 88 building and connecting it with urban fabric.

The informants direct towards the reuse and restructuring of the existing infrastructure because it calls for architecture that serves a purpose on an ecological, socio-economical and industrial heritage scale.

In turn, a space that is socially binding and as productive as it is celebratory of the industry that once stood there - must be created. In its place, a productive architecture is needed that is restitutive of its past and intent on healing the environment it stands upon.

A resilience is present in the way in which the productive architecture works with the environment, forming a binding relationship between the two. When the one is dependant on the other, it should be mutually beneficial for all parties, otherwise the whole structure will collapse.

In relation to site analysis and the intents of this dissertation, it is clear that for this site to succeed the old needs to be re-appropriated and re-purposed to become restitutive in the future. A binding architecture is called upon to attach and extend out of the existing fabrics of infrastructure, whilst attaching to the historic Gas Works.

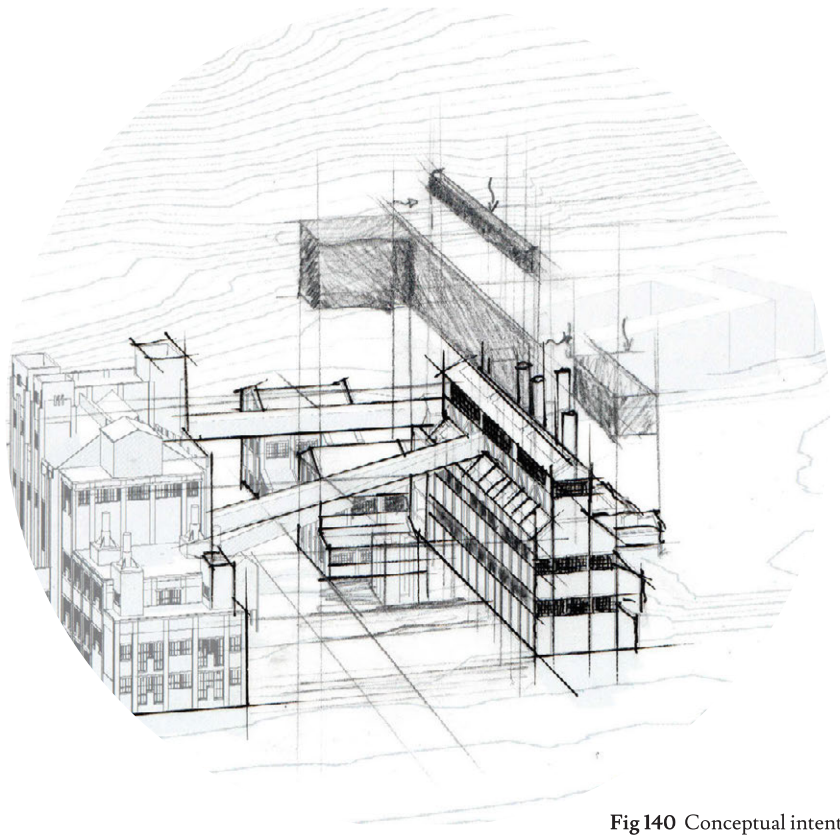


Fig 140 Conceptual intent of the new architecture

4.5 Concept

Restitution as an ecological enabler between industry, society & nature

From the intentions as well as the conceptual informants that was explored, a synergistic concept has come about where the architecture is seen as a restitutor between industry, society and the ecological environment, creating an ecological binding relationship between the entities. This can be done through the interaction between industry and ecology, society and ecology and society and industry. By allowing for these interactions to take place, it creates a machine where every part is as important as the other for the system to function correctly, creating energies that far outreach the site.

As an experience, the architecture needs to allow for movement between the entities whilst creating spaces where both production and social interaction can take place. In this manner, the new architecture becomes an enabler almost as a gatekeeper between the entities, the role-players being the existing infrastructure, societal users and the environment ecology.

- Society represents the city and its people where it was previously removed from industry and the processes associated with it. It now has a chance of connecting and learning from the it.
- The industry is a representation as a whole, where the past relationships of exploitation is re-evaluated to find alternative ways in which the entities can work together.
- Ecology entails the landscape and its systems that function without the interference of man. If it does in fact interfered with the ecology, it should not harm it; but rather tie into the system where each component benefits and work in synergy.

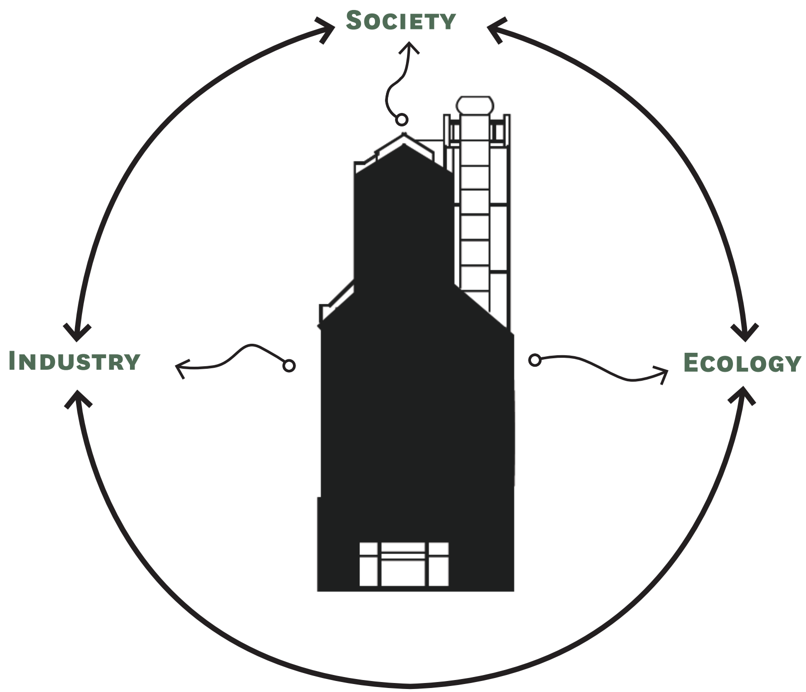


Fig 141 Conceptual model that frames the core of the historical nuclease of the site. The model aims to create a social space by framing the square where industrial heritage lays.

The intent of the new architectural intervention is envisioned to interact with the existing infrastructure in a way that is non destructive to its heritage and that which makes the structure so iconic. The new architecture forms will wrap around the existing structure, connecting lightly to the existing structure. It will penetrate the infrastructure as the landscape moves through it, absorbing the environment.

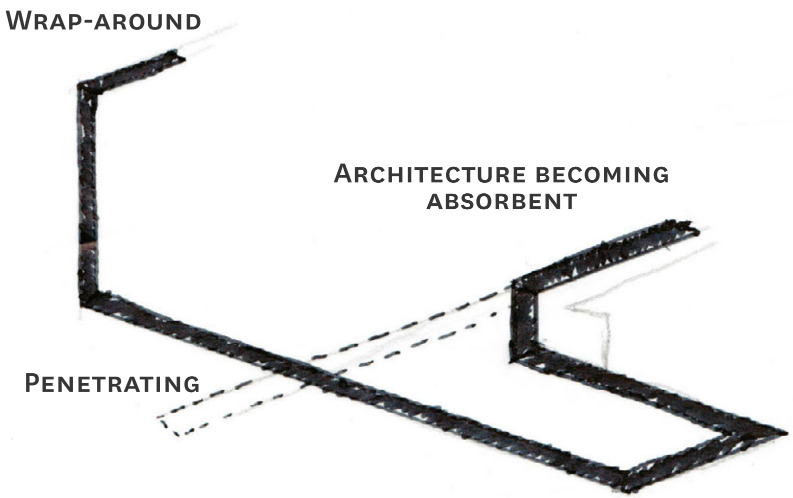


Fig 142 Intent of the new architecture

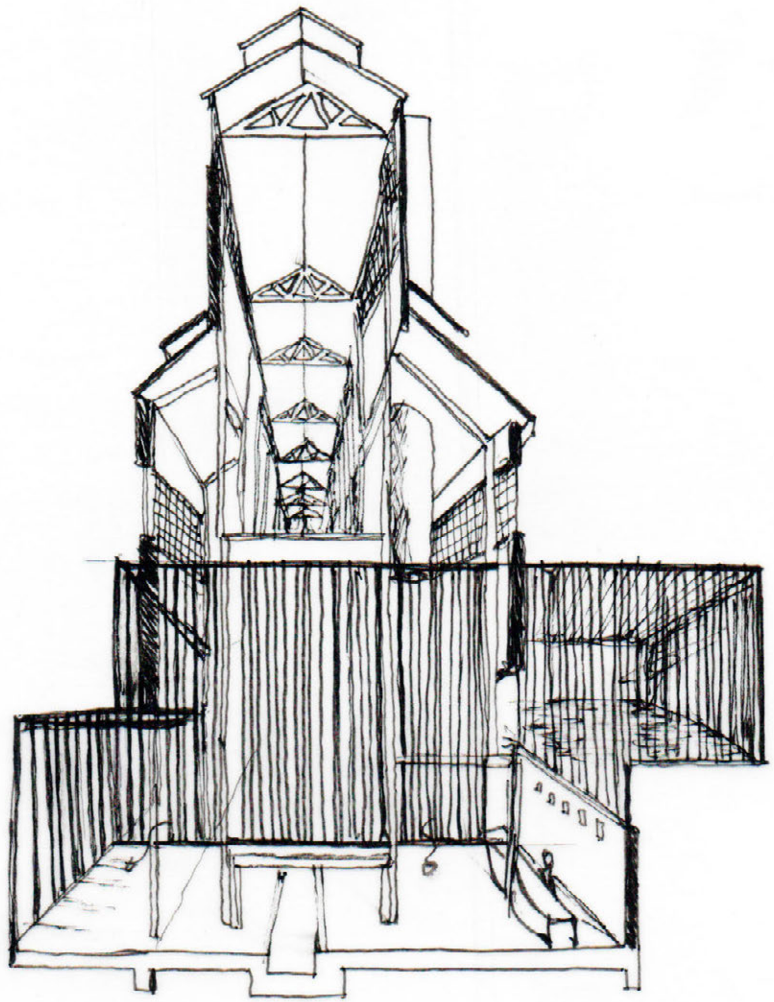


Fig 143 Conceptual interference penetrating the existing infrastructure

DESIGN DEVELOPMENT

Chapter 5

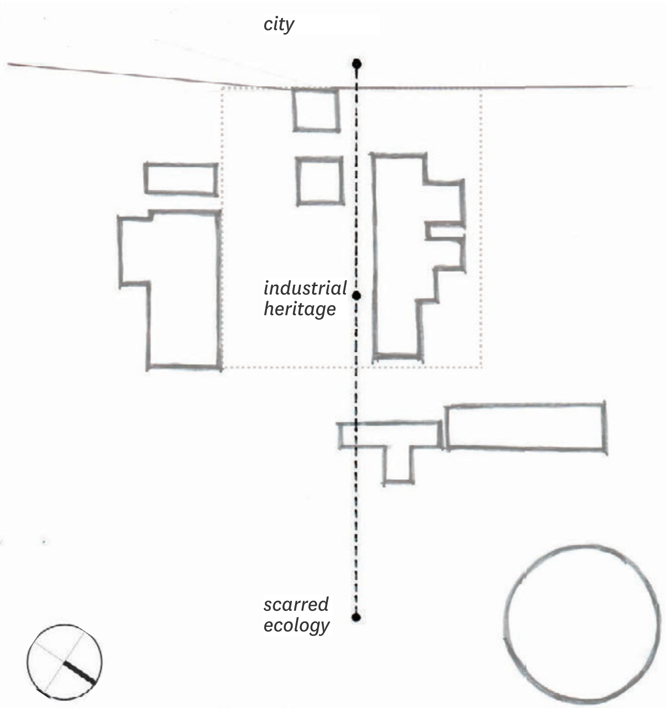
5.1 Framing the Intent

By going into the design phase of the project, the idea of hybridity as the balance between man, nature and industry will be consciously explored. The potential of Retort I will be explored by regenerating it into a well functioning social industrial space.

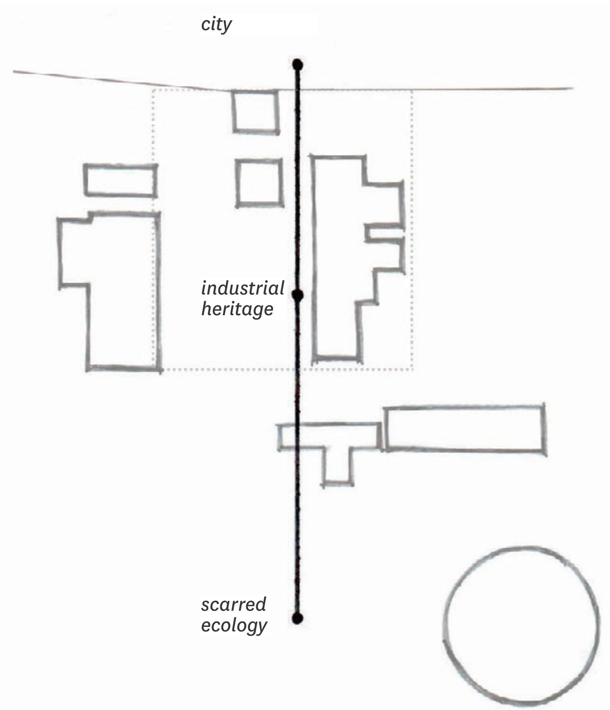
Dealing with heritage architecture with so many elements of importance, the idea would be to create a light, non-dominating architecture that connects to the old in a non intrusive manner. The surrounding landscape as well as the other heritage architecture of the site becomes an important connection.

In the architectural design, the goal is to regenerate and bind the landscape with the existing infrastructure and the new architecture. It is difficult to conjoin the two concepts because of the vast difference between the landscape and the existing infrastructure which in turn had a negative effect on it. Nevertheless, the aim is to create a singular hybrid object that reads as a piece and not separate entities.

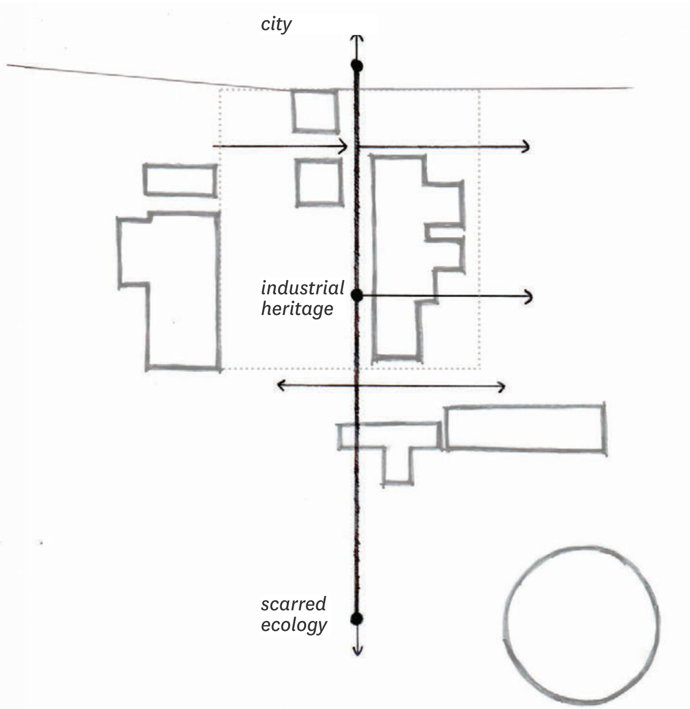
The synergistic relationship between the various programs on site minimizes the use of natural resources by exchanging shared resources to reuse on-site.



THE NON - EXISTING RELATIONSHIP BETWEEN THE CITY, INDUSTRIAL HERITAGE AND ECOLOGY



CONNECTING & CREATING A NEW RELATIONSHIP BETWEEN THE CITY, INDUSTRIAL HERITAGE AND ECOLOGY



NEW CONNECTIONS BETWEEN THE CITY, INDUSTRIAL HERITAGE AND ECOLOGY CELEBRATED AS AN EXPERIENCE

5.2 Cultural Informants

The informants exposed the most important aspects of the building, both tangible as well as intangible by exploring the spacial qualities that was experienced upon site visits and the historical analysis as well as the importance of elements.

5.2.1 Movement of Process

Movement becomes an experience as the user moves through and around the existing architecture and landscape. The way users move, ties in with the historical movement of resources to and from the gas making process (Chapter 5.2.2), reminding one of the past by making it part of the new process.

The diagrams (Fig 146) indicates a focus on movement aligned to axis of historical movement together with new movement allocated by the urban vision. The framing of views become important as the user approaches various parts of the infrastructure and the landscape. The interaction between the new architecture and the old infrastructure as well as with the landscape is a major informant in the design.

The process of materials and processes logically arranges movement as an experiential path whilst arranging and allocating the programs of spaces accordingly, the focus being on the experience of objects and processes past and present (Fig 172 on page 142).

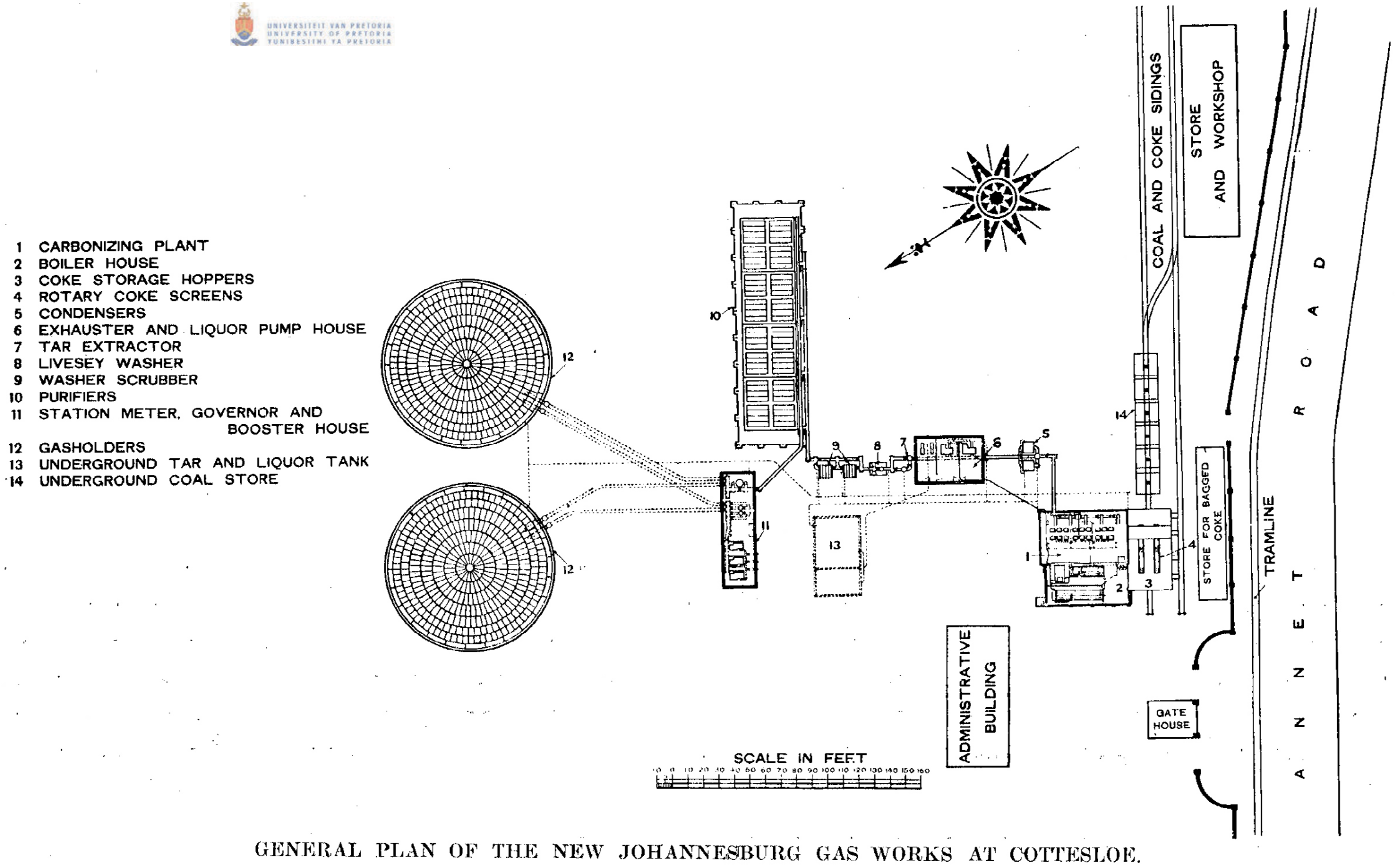


Fig 144 1928 General Gas Works Plan (Archives of Läuferts le Roux, 2017) indicating the flow of processes

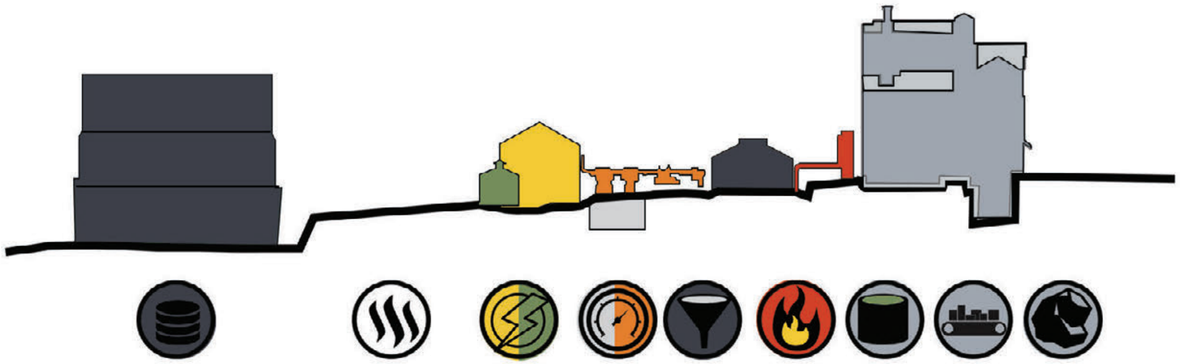
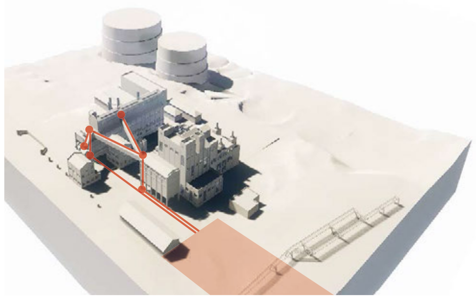


Fig 145 1928 General Gas Works Plan (The Gas Works Group, 2017)

5.2.2 The Gas Production Process

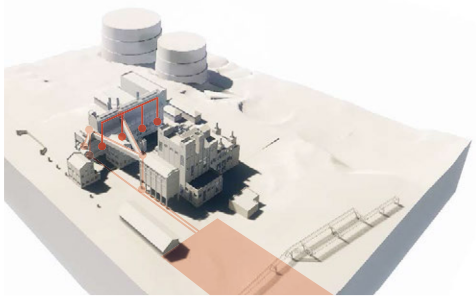
Ingress of Cole Stock

Coal arrives by rail in drop-side trucks.



Offloading to Storage

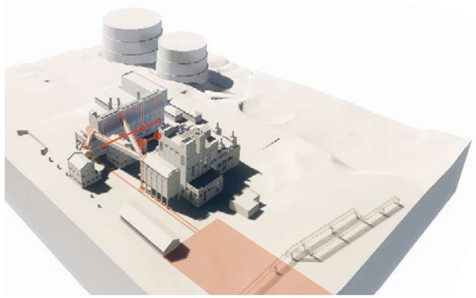
From here it is elevated by means of a bucket conveyor system to the coal bunkers at the top of the Retort House.



Extracting the Gasses

From here it gravitates down inside the retorts, where it is roasted out of contact with the air It first becomes soft and pliable, then, under the action of further heating, it breaks down chemically into 'foul gas', tar and coke. The rate of passage of the coal through the retorts is controlled by the coke extractors.

The coke accumulates in the coke chambers, directly underneath the coke extractors, and is removed at intervals by hand onto a rubber conveyor belt where it Is cooled by water sprays on its way to the Coke Grading and Screening Plant, situated at the top of the structure to the right of the Retort House. From here it falls directly into the coke bunkers, which are equipped with chutes from where it is loaded on to lorries for dispatch.

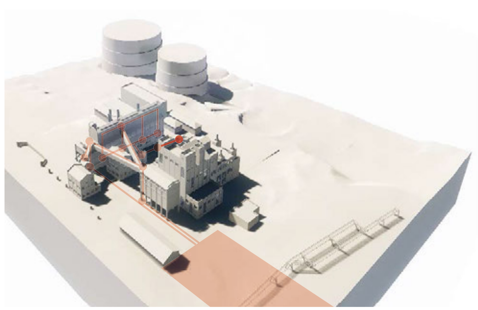


Transfer through Filtration

On leaving the Retort House, the gas passes through the condensers, where it is cooled right down to air temperature. Condensate, consisting of tar and an aqueous phase referred to as 'gas liquor', separates and joins the flow from the Retort House on its way to the tar and liquor well.

The gas then passes through the exhausters, which provide the pressure differential necessary to maintain the retorts at a negative pressure and to drive the gas through the remaining processes.

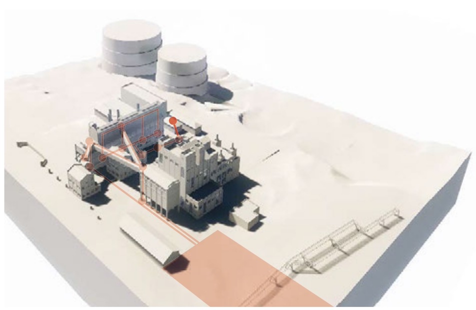
On the delivery side of the exhausters, the gas first passes through an electrostatic detarrer. This is a vessel containing a large number of taut wires electrically charged.



Washing the Gas

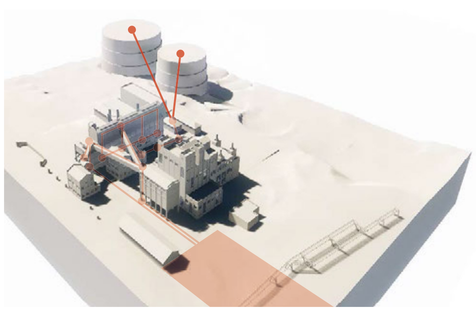
Next the gas passes through a series of washers, firstly the Livesey washers, then the rotary multi-film washers. Here, a measured counter-current flow of water is brought into contact with the gas. Being very readily soluble in water, the ammonia, present in the gas as an impurity, is removed. The ammonia-laden water leaving the washers joins the other liquid impurities on their way to the tar and liquor well.

The only remaining major impurity in the gas after it leaves the washers is hydrogen sulphide. This is a corrosive, highly poisonous and evil-smelling substance. Fortunately, it can be removed in the form of solid sulphur by mixing the gas with a small amount of air and passing it over an iron oxide catalyst supported on a suitable porous medium, such as wood shavings.



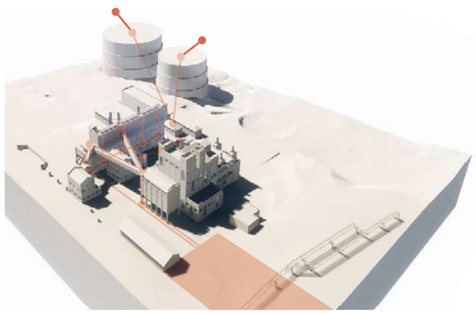
Testing the Flow

The gas flow is then measured by means of a station meter for accounting and record purposes.



Ingress to Storage Tanks

Gas moves into and are stored in the Gas Holders.



Distribution to Municipal Areas

From the Gas Holders the gas can follow two different paths. The first is via a governor to reduce the pressure to a value suitable for direct supply through a customer's meter into the customer's premises.

The second is via the boosters into the high-pressure system, which carries the gas to strategic points throughout the city, where district governors allow the gas to flow at a lower pressure into the low-pressure distribution system.

Adapted by Author from Läuferts le Roux & Mavunganidze (2016:23-24)

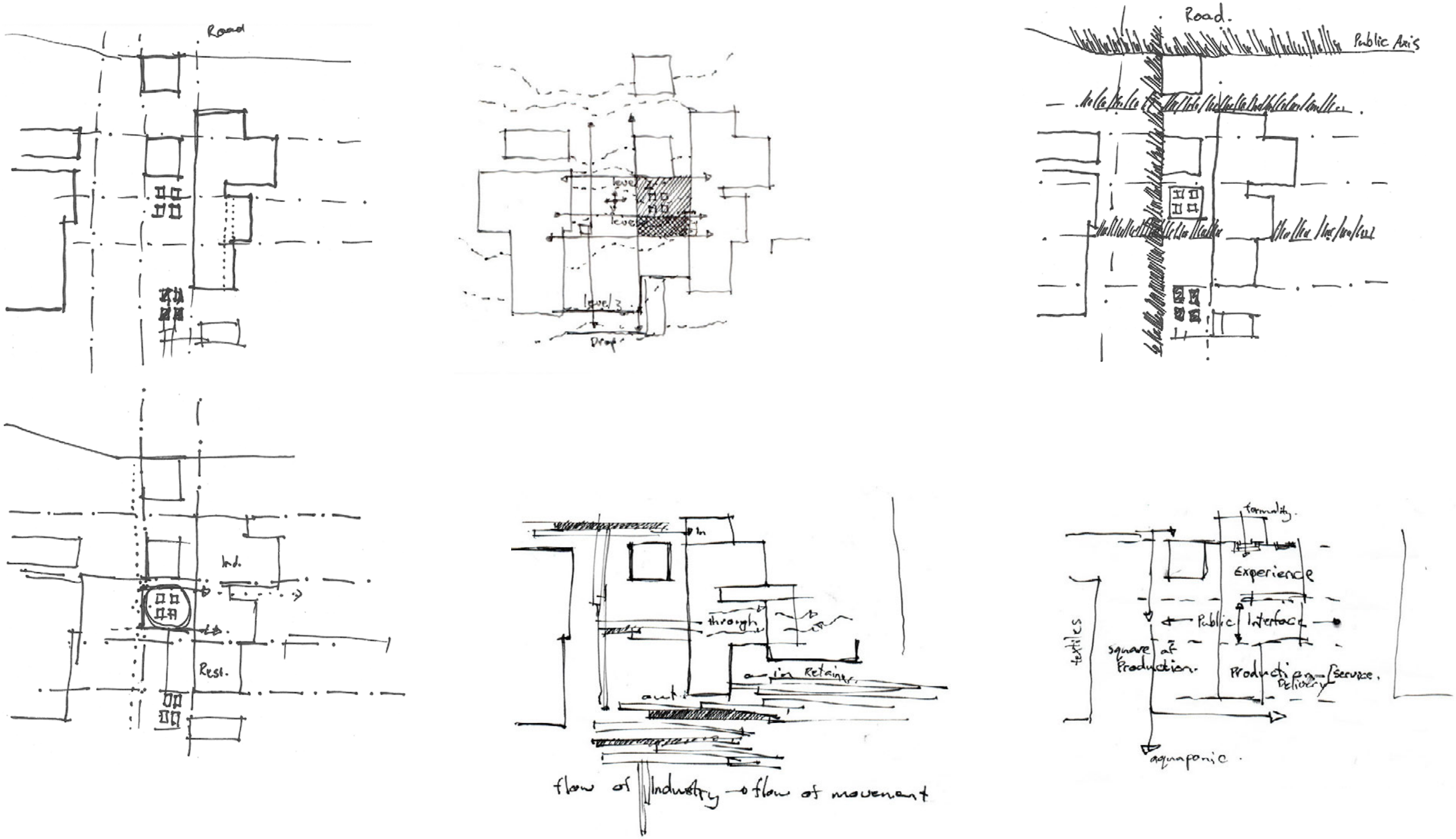


Fig 146 Exploring movement

5.2.3 Value assessment

Meurs (2016:49) is of the opinion that in order for one to design an intervention in a historic ensemble, it is useful to determine the cultural heritage value in advance. One should work out the relation to the meaning of the cultural heritage of the location.

Meurs (2016:49) argues for a system where, by means of colour codes, the value assessment drawings show the value of the architectural elements, from the tangible to the intangible (See Fig 148, Fig 149 & Fig 147). In doing this, Meurs says that it provides a great deal of information on a building and its physical condition - which parts should not be touched. It focuses on the existing material value as well as the sense of place.

For a cultural heritage analysis, Meurs (2016:51), a building or an area is researched from the perspective of both its material and its immaterial and associative relevance. This is also used as an assessment framework - but goes beyond the material reality of the age value alone. The emphasis is on the urban planning and cultural context from which the monument originated. Apart from the building itself, it is also about underlying philosophies, associative values and intentions, whether realised or not. The soul of the monument is exposed. The conclusions of cultural heritage research will identify and prioritise the different dimensions of the cultural value.

This will not only produce values to be preserved, but also themes for further or new developments. These can be added to the analysis in the form of recommendations. By implementing these assessment tools to that of the Gas Works, It becomes apparent what elements are important to keep and become focal points in the new project.

Architecture of high value is a very important elements that should not be destroyed in the process; these are mostly the iconic façades of the Retorts together with those of the CWG buildings. Many structures were later attached to the Retort and though they add to the processes that defined it and are still apparent in the new program, the architecture does not necessarily add to the original structures. They are however of positive value and could be altered in the new design.

Spatial qualities of the infrastructure are sometimes intangible because the space is usually defined by its surroundings, together with that of the envelope that defines some of the spaces. The interior spaces of the retort is almost, in a sense, cathedral like and should be kept as such whilst the outside space under the Coke Hopper has a sense of presence to it when standing there.

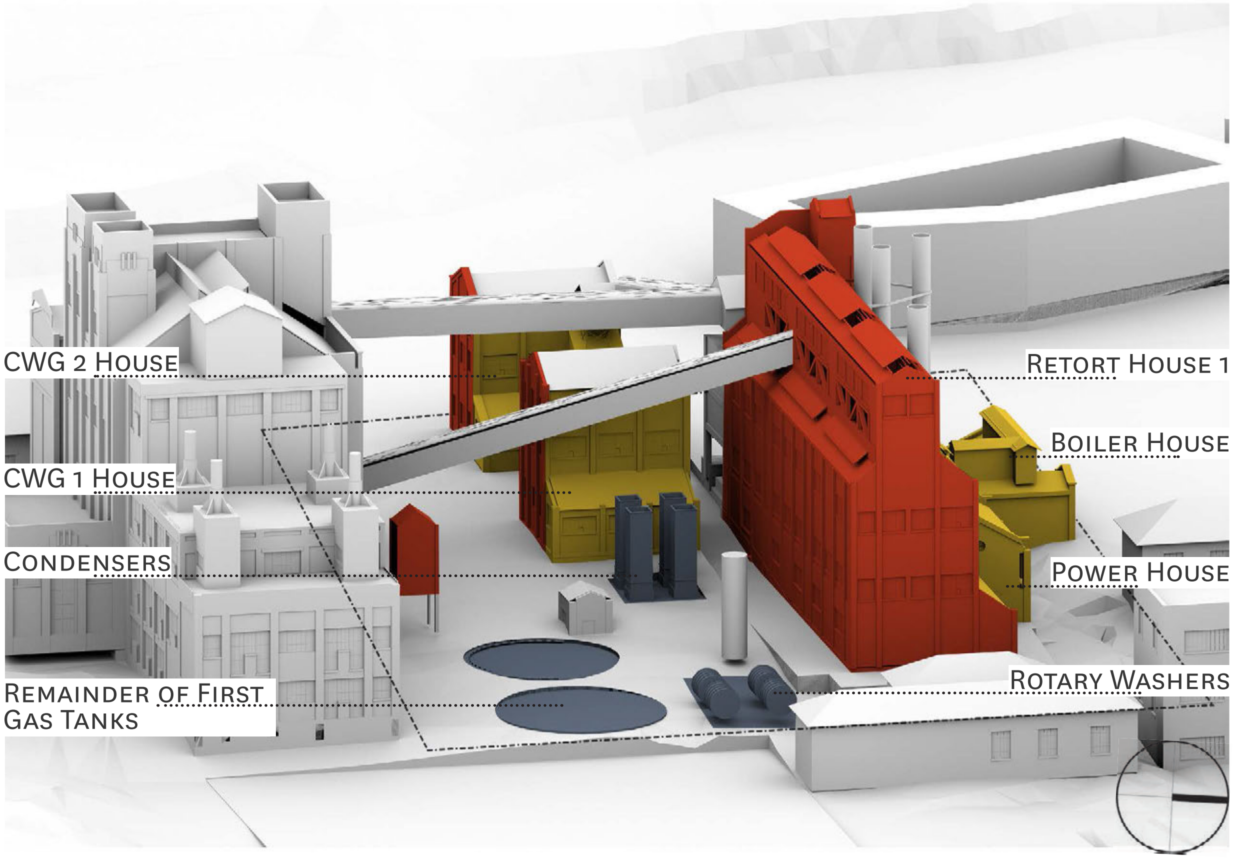


Fig 147 Value Assessment I

ENVELOPE
HIGH VALUE
Very important elements to keep

POSITIVE VALUE
Important elements but could be altered

SPATIAL QUALITY
HIGH VALUE
Very important spatial qualities to keep

POSITIVE VALUE
Important spatial elements; can be moved

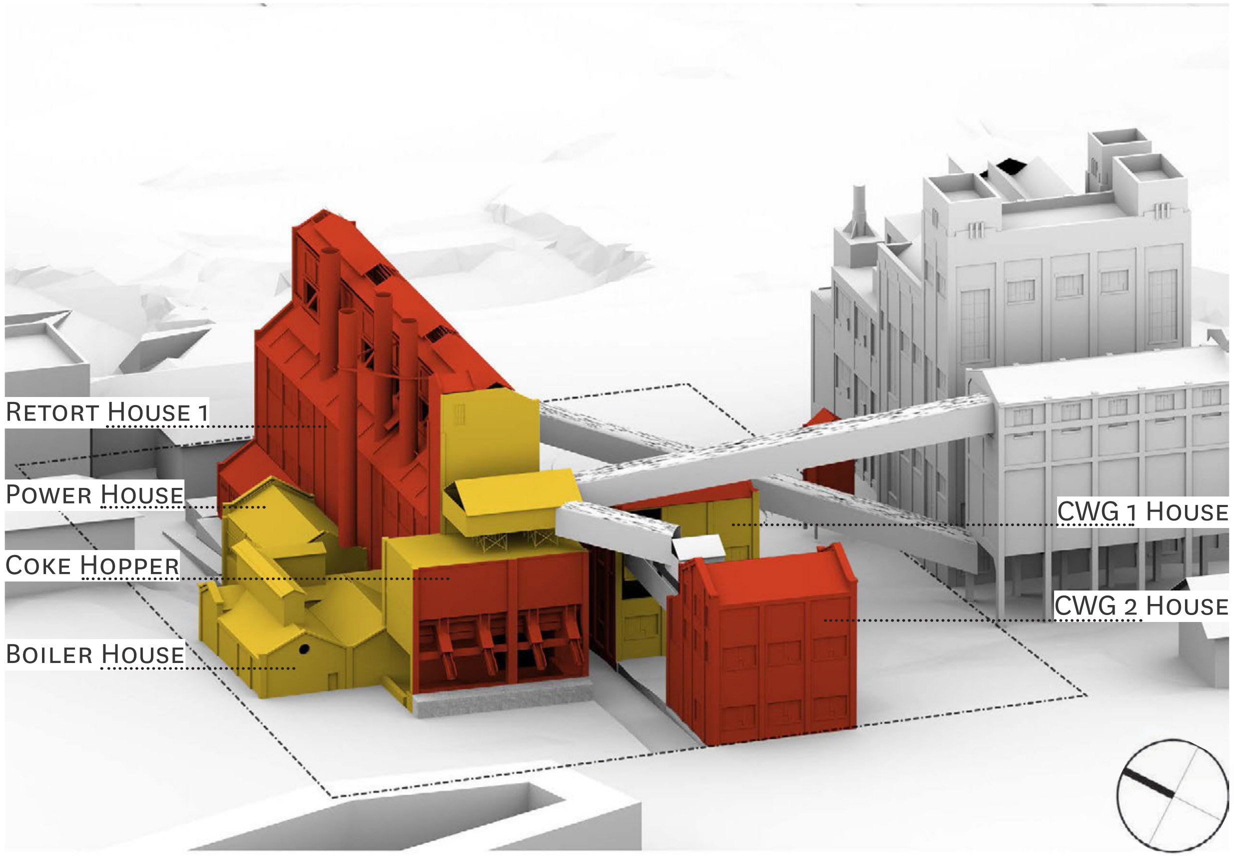


Fig 148 Value Assessment II

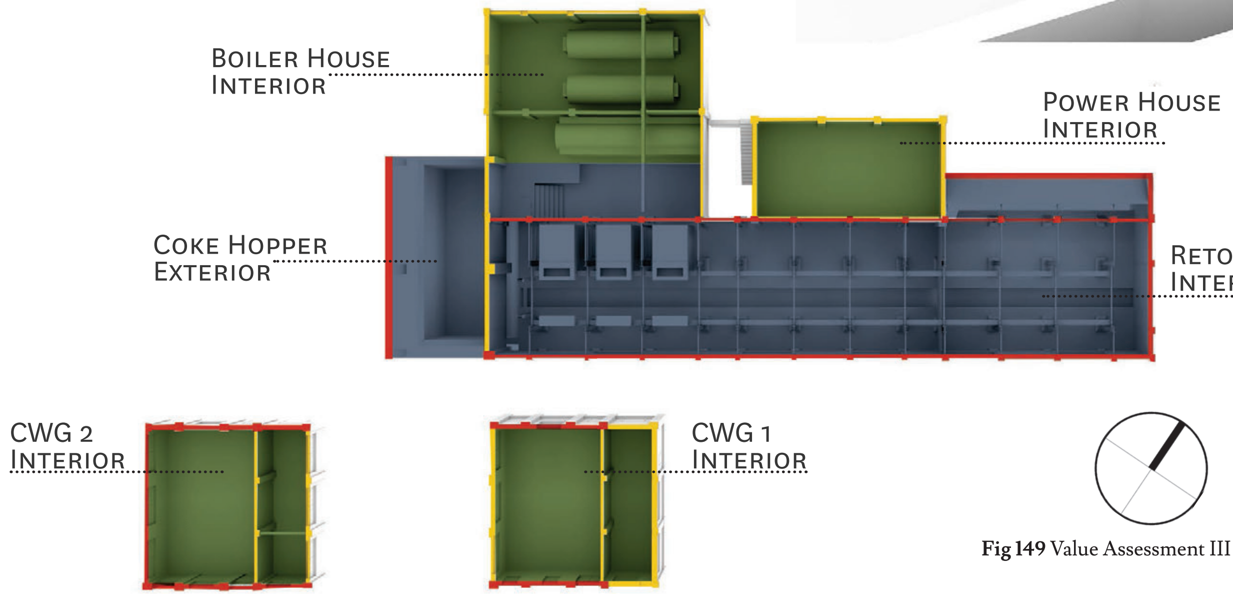


Fig 149 Value Assessment III

5.3 Intuitive Exploration & Modelling

Form-al Analysis

In analysing the existing structure, it is apparent that the building consist of three phases that were built in three time-frames from 1928 to 1956. Each phase was an almost exact copy of the first. This in itself, forms a maze of steel structure which is, to say the least, most confusing.

In the design, the three different phases will be incorporated as something to be remembered by celebrating and not by hiding its form, but rather articulating it and displaying its apparentness in the new architecture.

The repetition is also very important in the infrastructure, especially when designing a new architecture that need to tie in and bind with the existing; modularity and spacing becomes important in this instance.

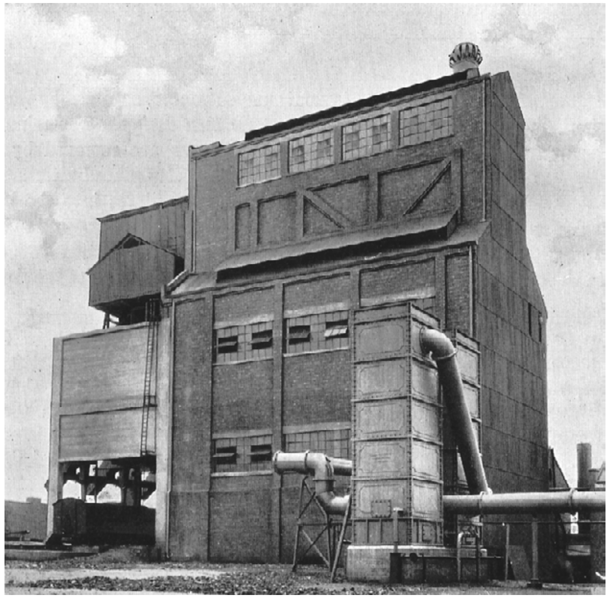
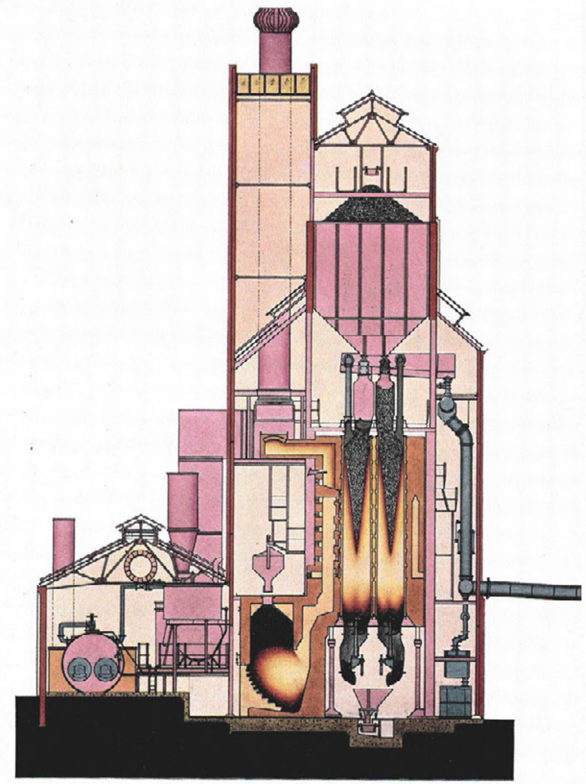


Fig 151 Phase I of Retort House 1929 (Archives of Läuferts le Roux, 2017)

Function informing form



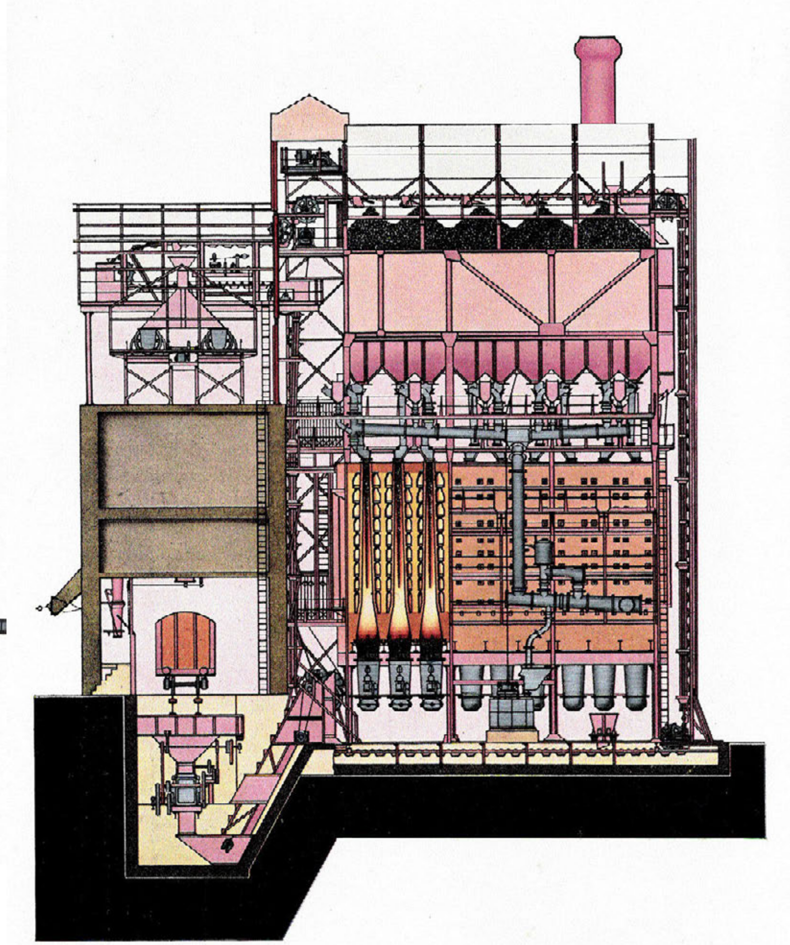


Fig 150 The gas process. (Archives of Läuferts le Roux, 2017)

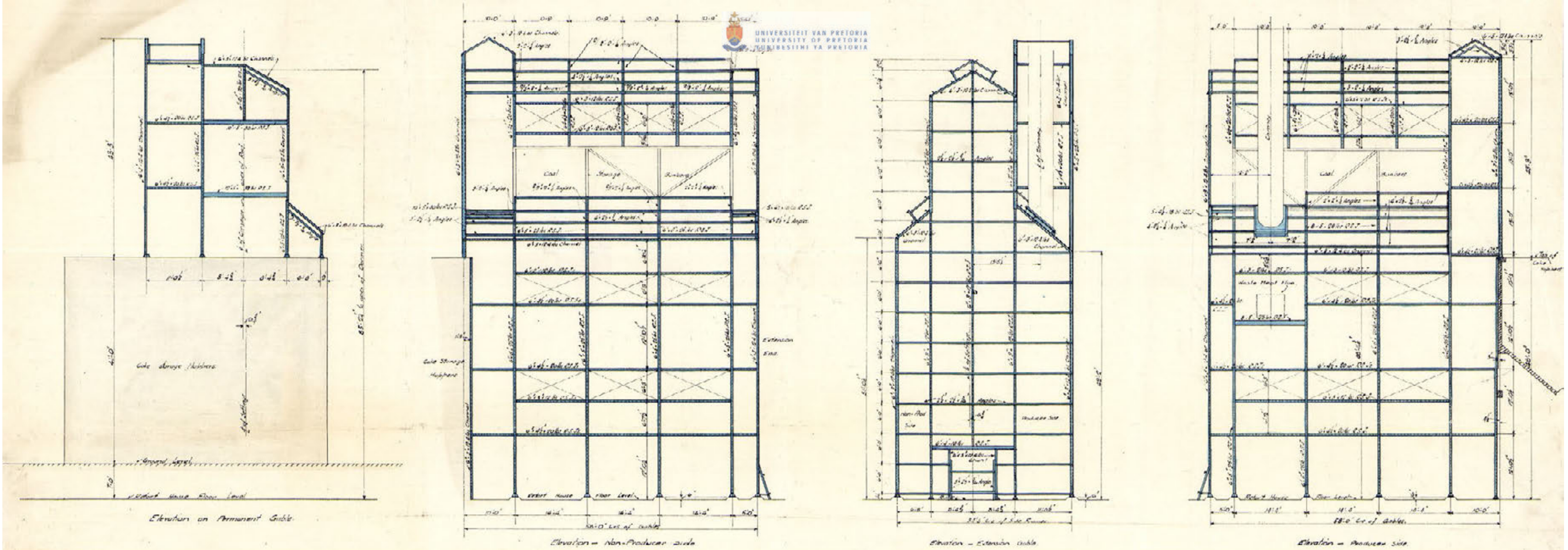


Fig 152 Retort House - Steelwork 1927 (Archives of Läuferts le Roux, 2017)

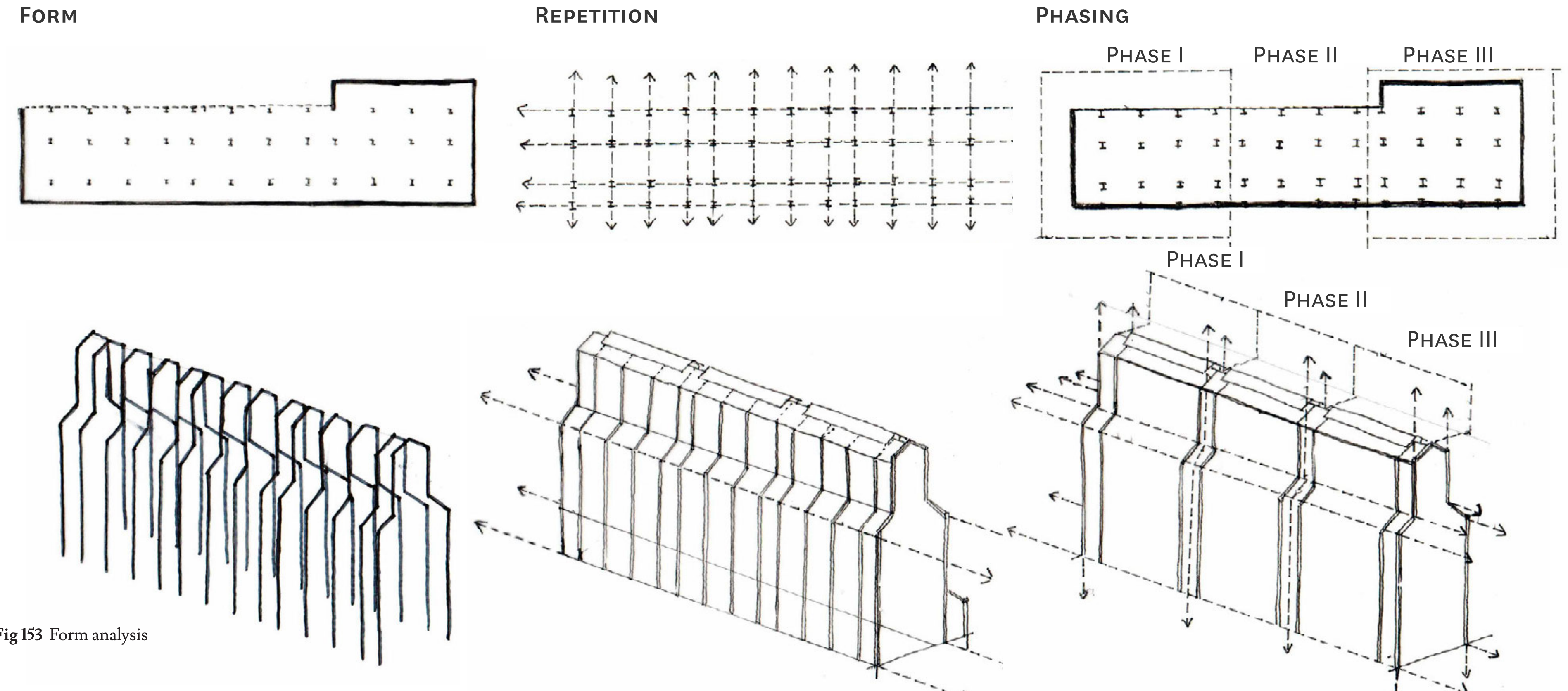


Fig 153 Form analysis

5.4 Heritage & the Cultural Landscape

Like the relationships that were identified in chapter 2; the new site also exists of various relationships within the landscape that stands in relation to one another. Identifying these landscapes is aimed at understanding the relation they have to and interact with one another.

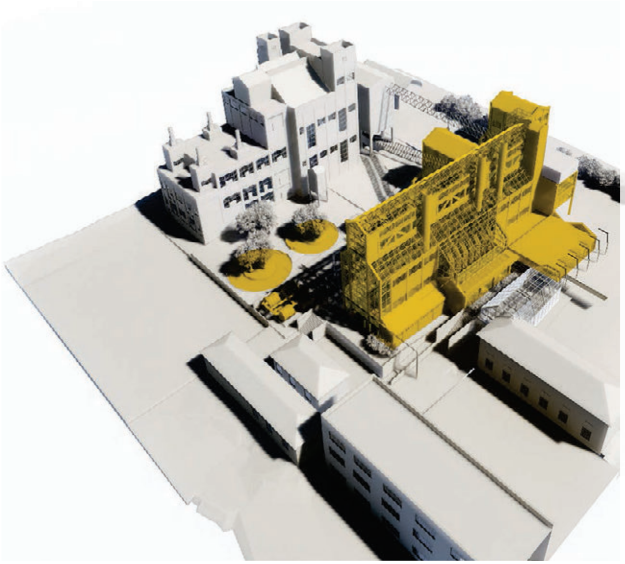


Fig 155 Historical Infrastructure landscape

Scarred landscape

The polluted soils around the Retort and the disrupted natural flow towards the Braamfontein spruit stands as a harsh reminder of the detrimental effect this industry had on the environment and ecology. As part of the program of the restitution in the urban vision, the aim is to correct some of the past mistakes. This can be done by correcting some of the wrongs of the past and by taking it back to a natural landscape with a working ecology. The landscape as such becomes a productive landscape within the ecological system.

By bringing the natural landscape back into the Retort, the aim is to create a vertical greenery whilst aiming to give back a new type of industry that is not exploitive, but rather enhances the ecology of the site.

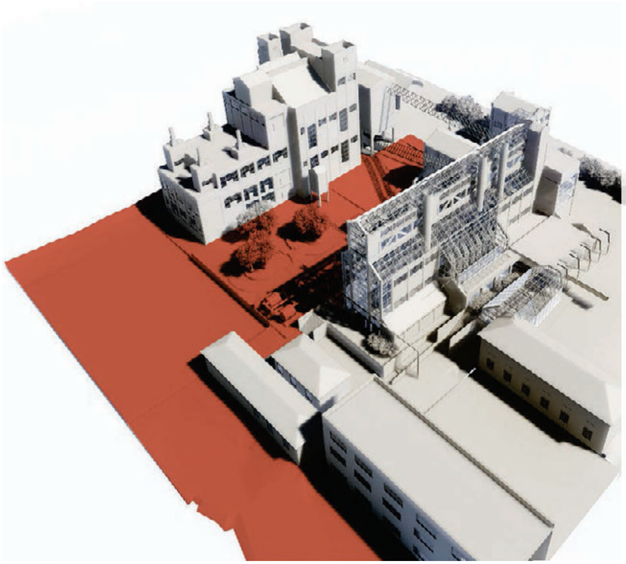


Fig 154 Scarred landscape (dramatised extent)

Historical Infrastructure landscape

The historical infrastructure exists as the remnants of the industry past and that exists in and around the Retort. The new architecture intertwines with the existing creating thresholds of old and new. The new industry and the infrastructure that it brings creates a new understanding of the context in which it exists, educating the visitors. The contrast of the new against the old aims to emphasise the original infrastructure in celebrating its existence.

By re-utilising the old infrastructures, it creates a space for it to grow with the times and exist well into the future. The existing architectural infrastructure becomes the base for the new spaces to develop from its mono-functional past; bringing a new interaction between the public and the inaccessible industrial past.

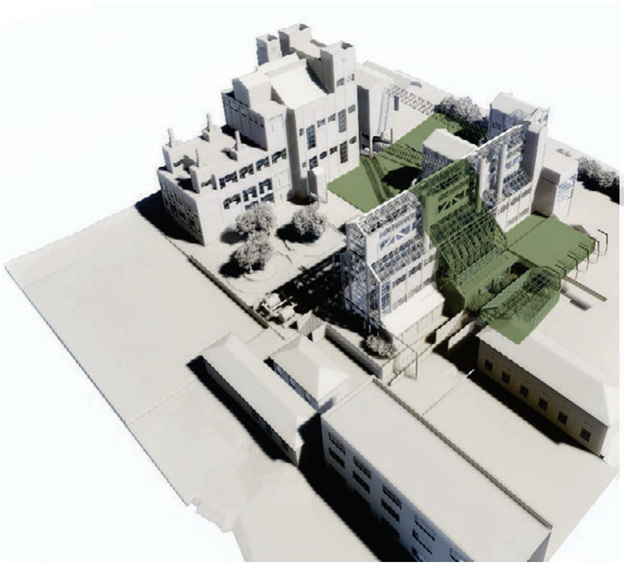


Fig 156 Productive landscape

Productive landscape

The productive landscape focuses on the main areas of productivity within the site and the building. Though production will take place all over the site but within the landscape of the park, the focus will be on the space surrounding the main intervention. This will be achieved by starting with the ground based production of the foyer space and then moving into a vertical growth within the Retort.

The processing and production through which this will go, takes place as a means of open productivity, as a learning experience to be used and tested by the users in it becoming the aromatic produce that will be used and sold.

The social aspects of the program flows throughout the productivity where the architecture becomes the binding factor between these different entities.

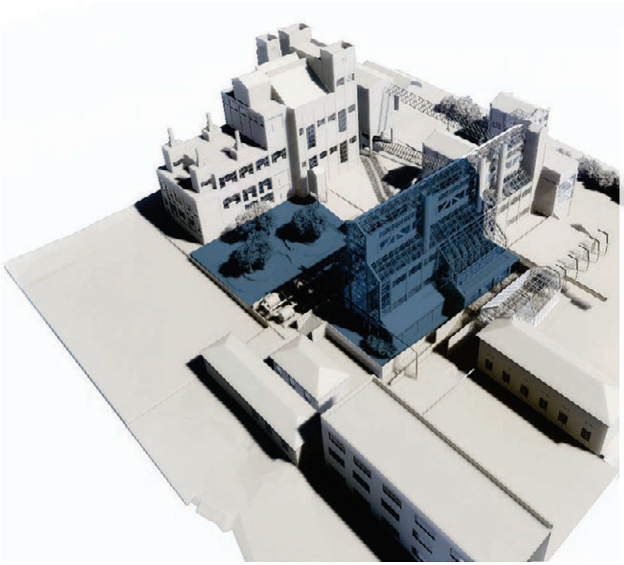


Fig 157 Social landscape

Social landscape

The social landscape (although it takes place over the complete site) focuses on the main spaces where social activities will take place within and the surrounding the building. The restaurant spills out into the foyer space. This becomes an extension of the restaurant and a social space for marketing goods produced on and off site. This foyer space, central to the larger park, becomes a space of gathering and interaction between the various proposed programs.

The culinary school, in turn, serves as a space of education on a social and entertaining scale. This is where visitors or students get an opportunity to get experience hands on whilst learning about the production of the culinary experience that this place provides - from germination to consumption.

The whole building and the happenings around it acts as a social experience. Every aspect of this program and the architecture becomes a *social production*, a *social industry* where visitors learn, experience, enjoy and entertain.

The whole experience takes place as a journey through the site and the architecture where one gets an opportunity to educate oneself on the past and the present of the Gas Works. Every aspect of the design is about the feeling visitors experience when they move through these spaces, making them part of a process they are so often removed from.

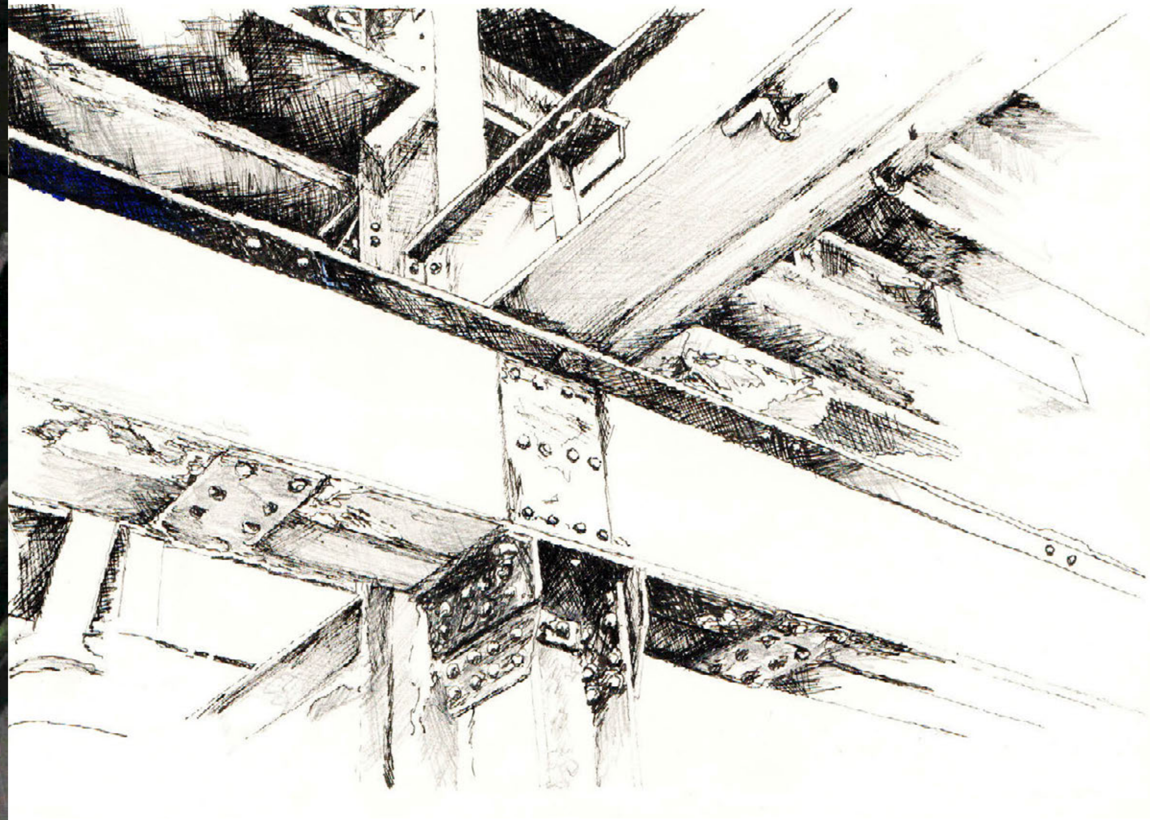
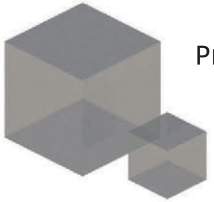


Fig 158 Sketch of interior steel structures

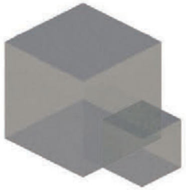
Approaching the existing

When dealing with the existing infrastructure, many opinions exist as to how one could react to it. In the design many of these options are explored and implemented in different ways to suit the programs needs.

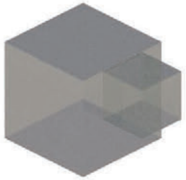
One should try to not interfere with the existing primary infrastructure by welding directly onto it. Rather, drilling and connecting with bolts is a more appropriate method which could later be removed, if need be.



Place Next to

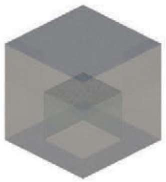


Place Against



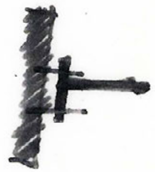
Raised

Cut into



Inside

Connected directly



Connected indirectly

Disconnected

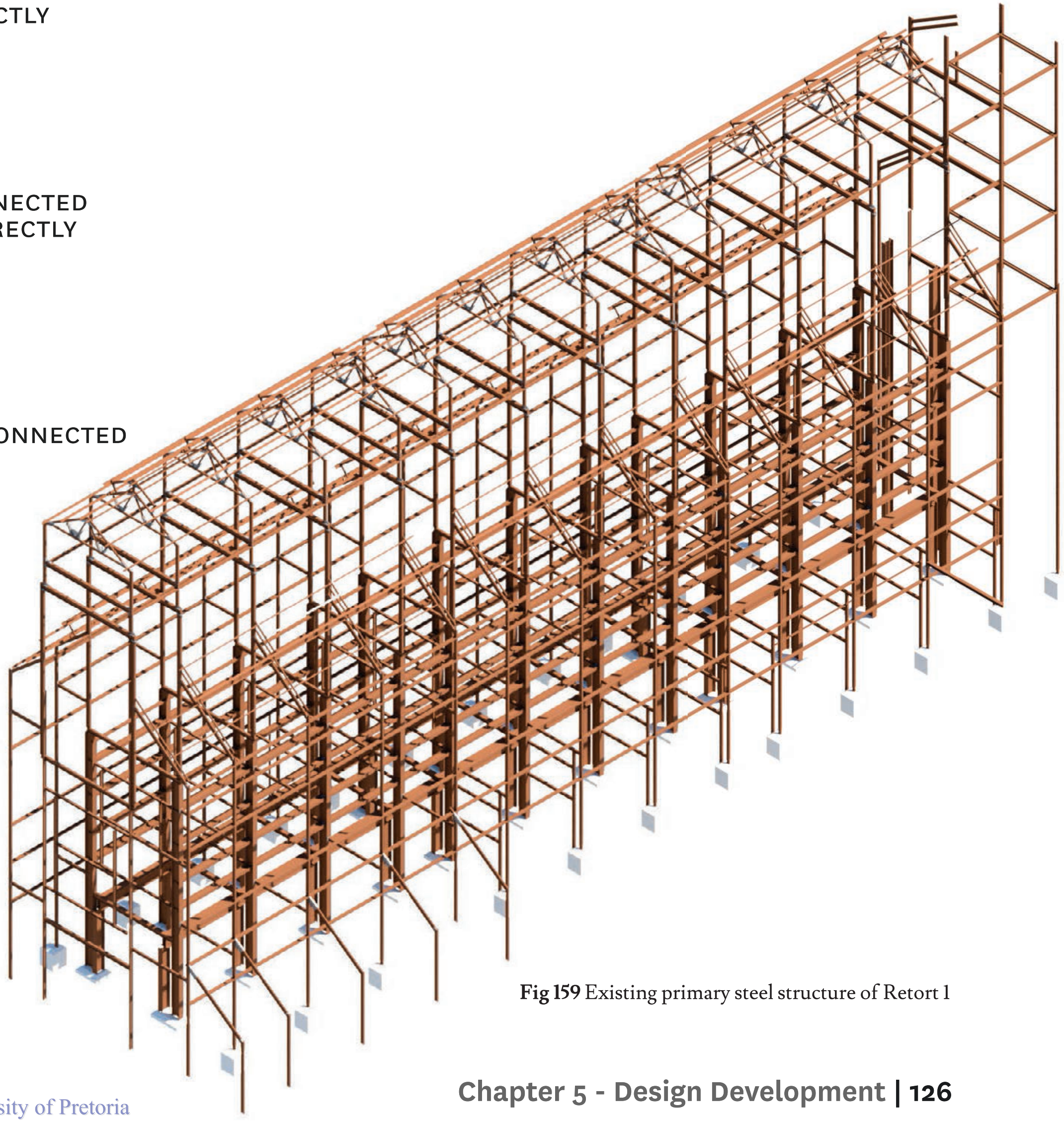


Fig 159 Existing primary steel structure of Retort 1

Intuition

As a strategy of hybridity, the exploration of connecting spaces onto and surrounding the Retort, were explored. This was done by creating new connections whilst keeping in line with the production of the past.

Model I initially explored spaces where new additions could be possible, whilst keeping the heritage of the architecture exposed. It looked at connecting directly with the existing infrastructure whilst exploring where potential entrances and interaction could take place.

Model II takes the concept of wrapping around the building to the level where connections are made on various levels and allows for movement in and around the building that guides the users. The new architecture guides the user in and around the historical artefacts of the retort. It looks at the approach of the user from the parking area to the foyer space as well as the building.

Model III starts to transform the structure into a shape that complements the existing structure whilst looking at different heights of connections. It looks at ways of binding with the landscape by opening up onto the foyer space and connecting with newly created infrastructure of the various other programs.

In the models the polluted foyer space is filled up to create a more even spread downwards. The idea being to keep the corridor to the interior on the same level as the foyer to make it pedestrian friendly and inclusive.

In Model IV, as the urban vision progressed, it was decided to include a pedestrian bridge that connects to UJ. The bridge need connect in a way that does not disrupt the view of pedestrians and other passers by. It was decided to connect it to the CWG 1 building with a lift which connects it to ground level in order to access the site as well as the information centre.

Again, form was played with in order to find proportion as well as create intricate spaces that pulls users to certain spaces, such as the entrance between the two CWG buildings. Public access and the visibility of process has been something that has been considered from the beginning providing transparency for all.

Model V began to take form from all the previous explorations as well as feedback received. This resulted therein that the idea began to form a cohesive, synthesis of exploration. Technology began to drive the architecture to form the functionality and aesthetics that came to be envisioned. The consideration of light into the building was a huge factor in the iteration for the hydroponics.

The models investigated the unity between the new and the old to create an architecture that does not overshadow the existing infrastructure, but rather adds to its complexity. Also that speaks to a new type of infrastructure - contrasting the old, but also working in unity.

Model I

Fig 160 Conceptual model

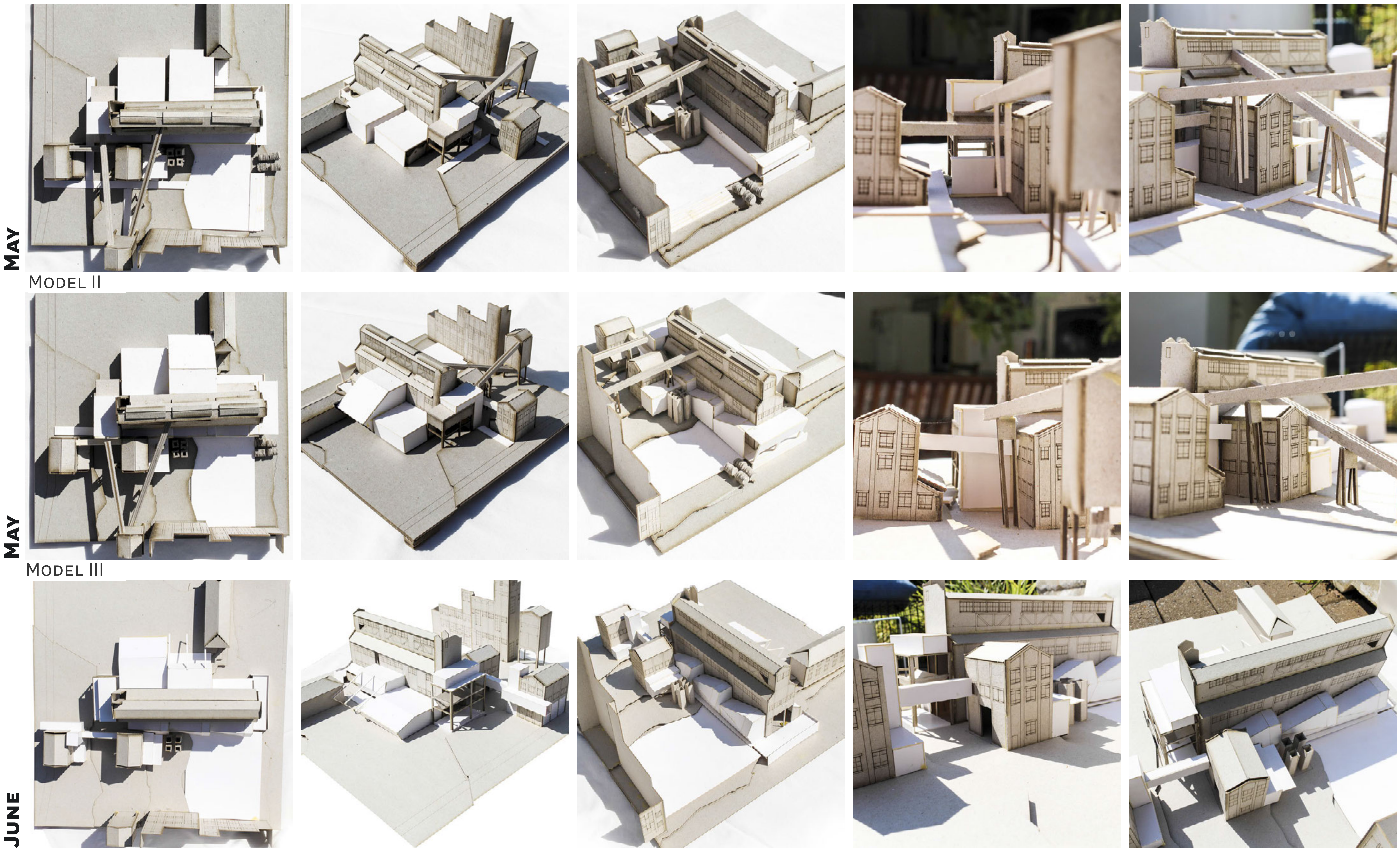
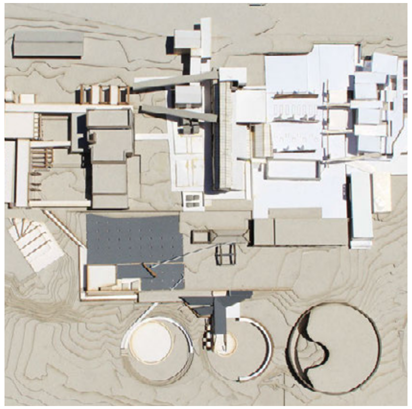
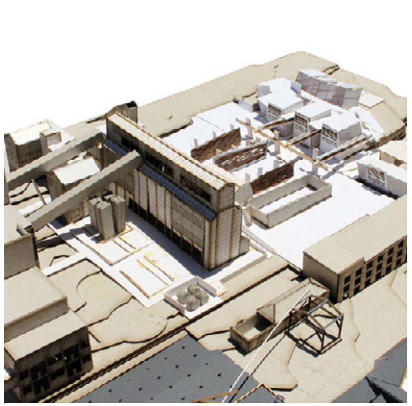
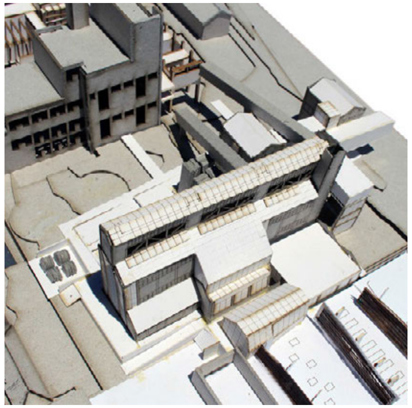


Fig 161 Model exploration

September



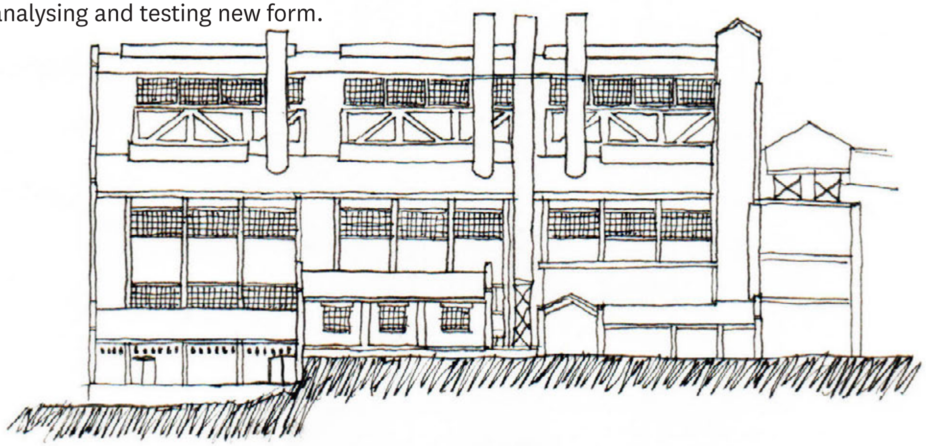

Model V

Form Exploration

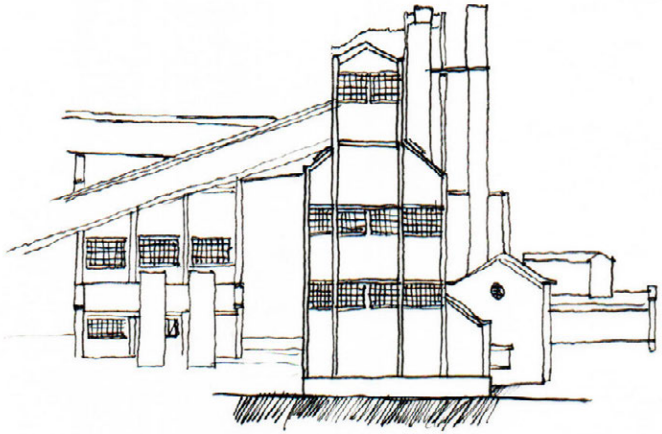
When locating the spacial architecture that would add to the architecture of the Gas Works, the process started by analysing and testing new form.

Existing Elevations

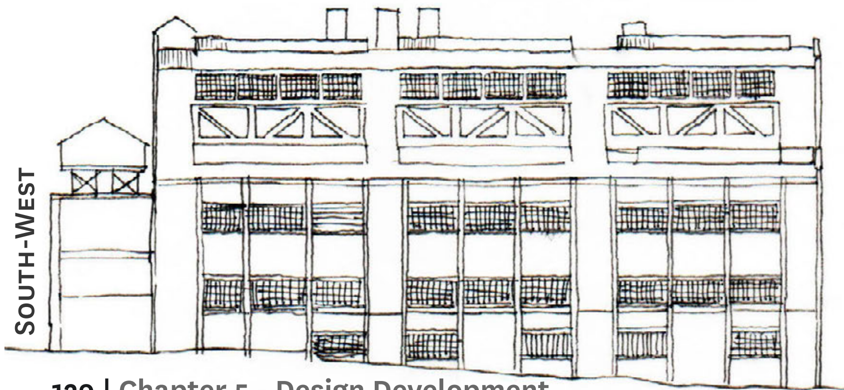
North-East



South-East



South-West



North-West

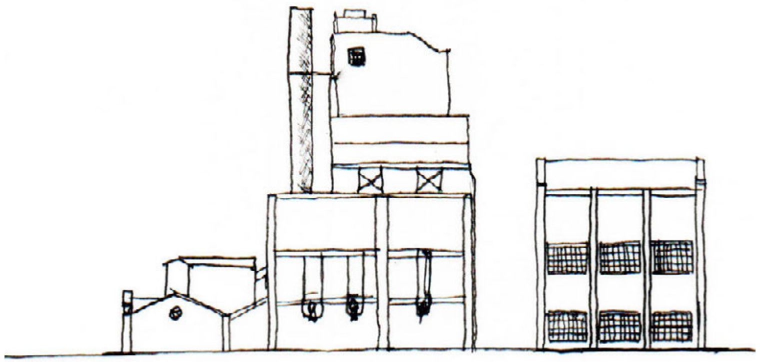


Fig 162 Existing elevation sketches

Testing New Form Against Elevation

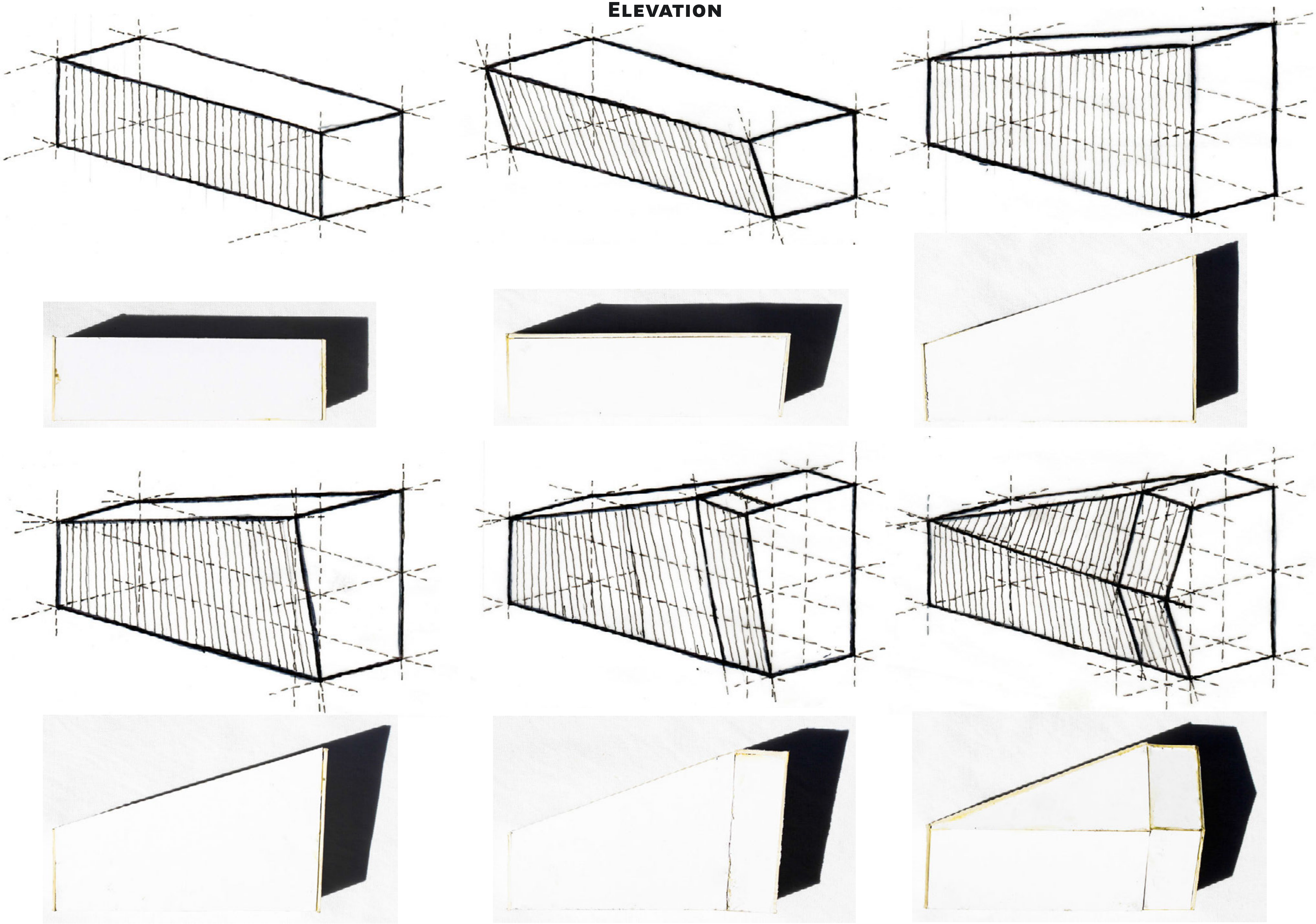


Fig 163 Testing new form

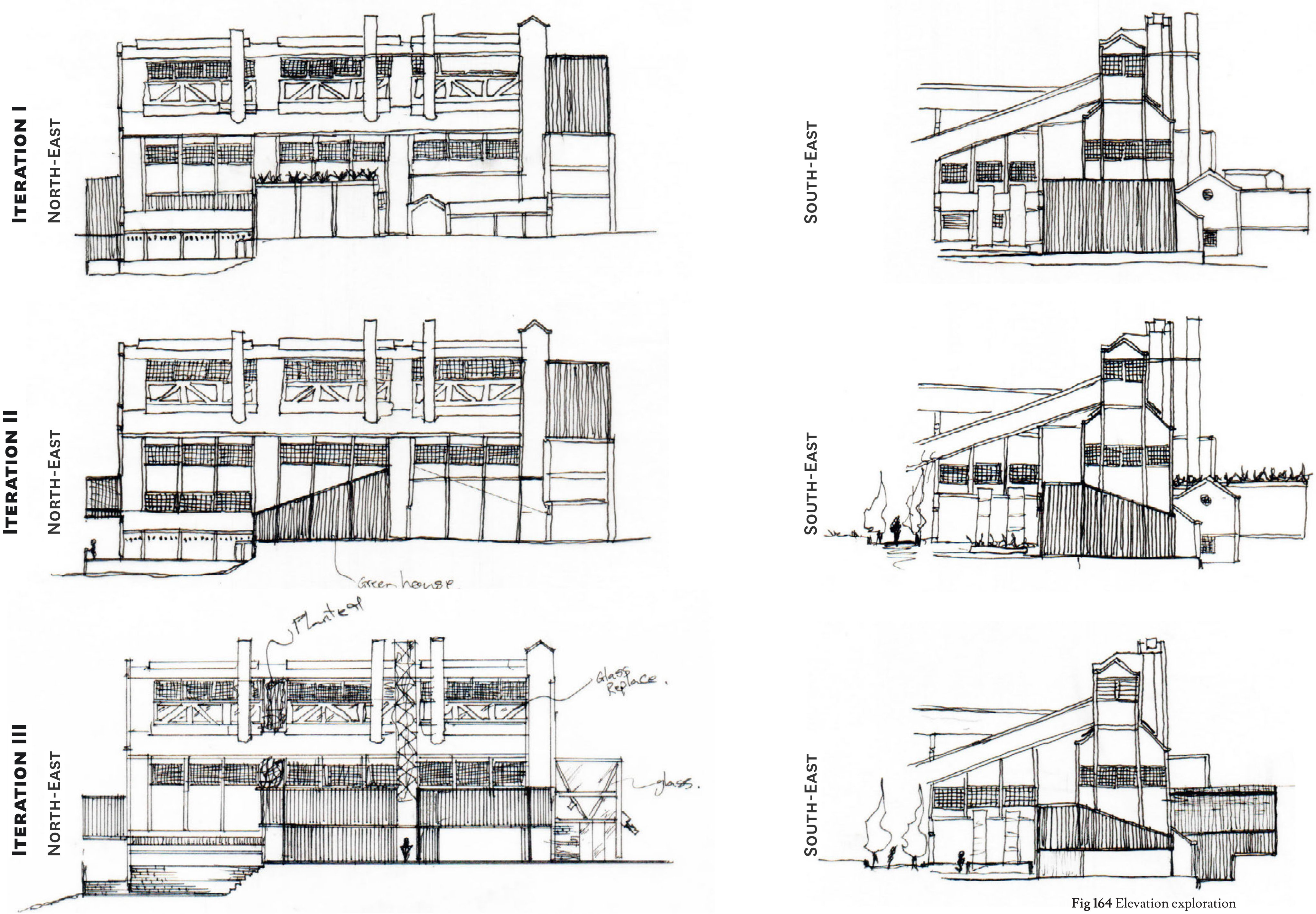
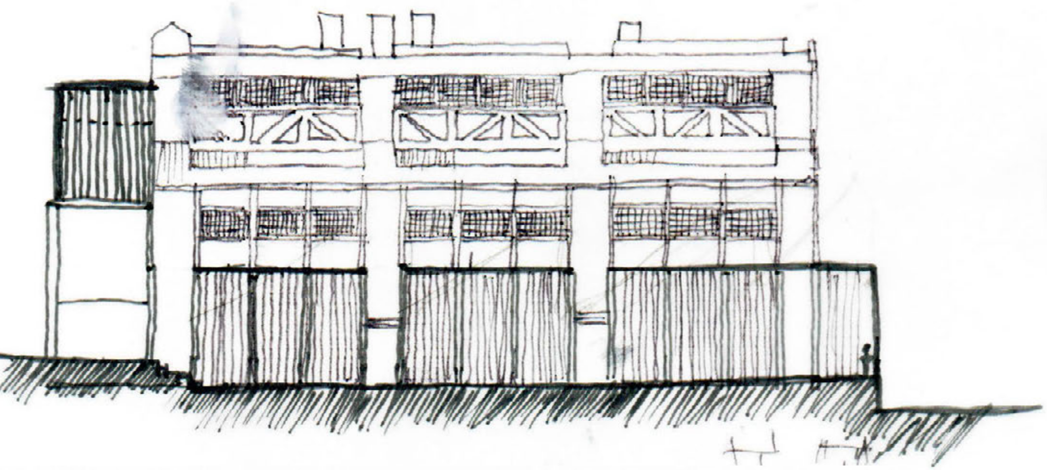
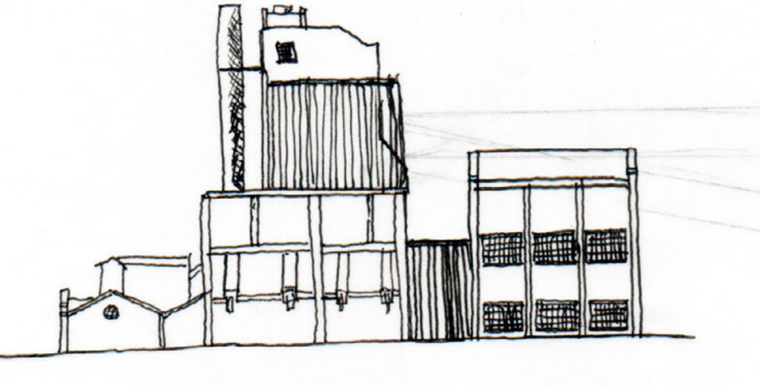


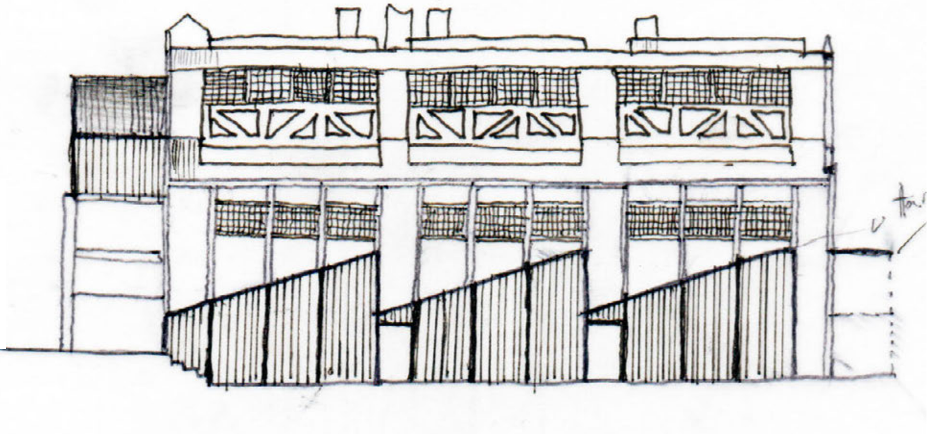
Fig 164 Elevation exploration



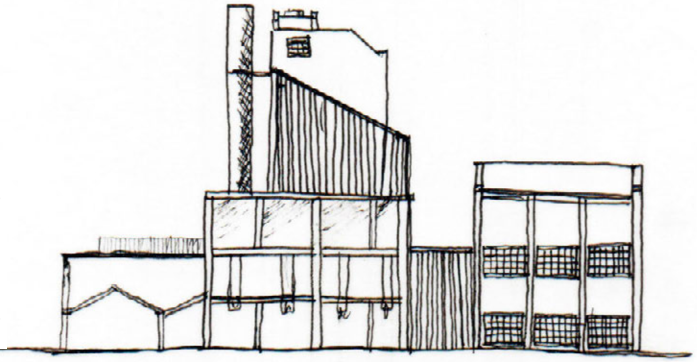
South-West



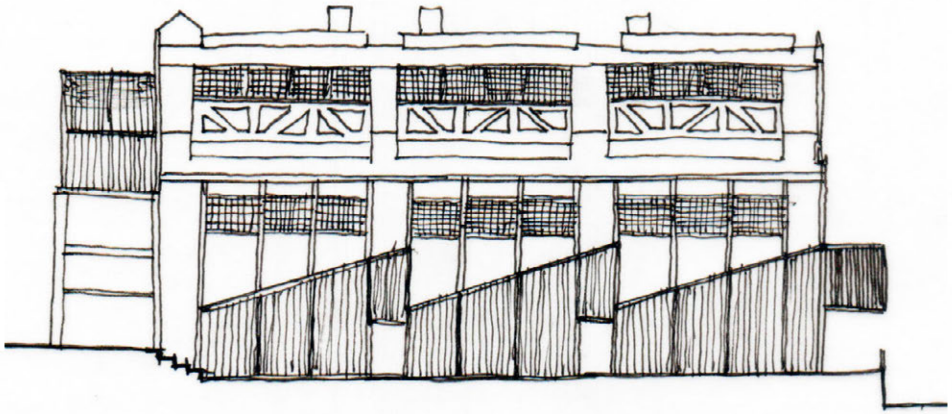
North-West



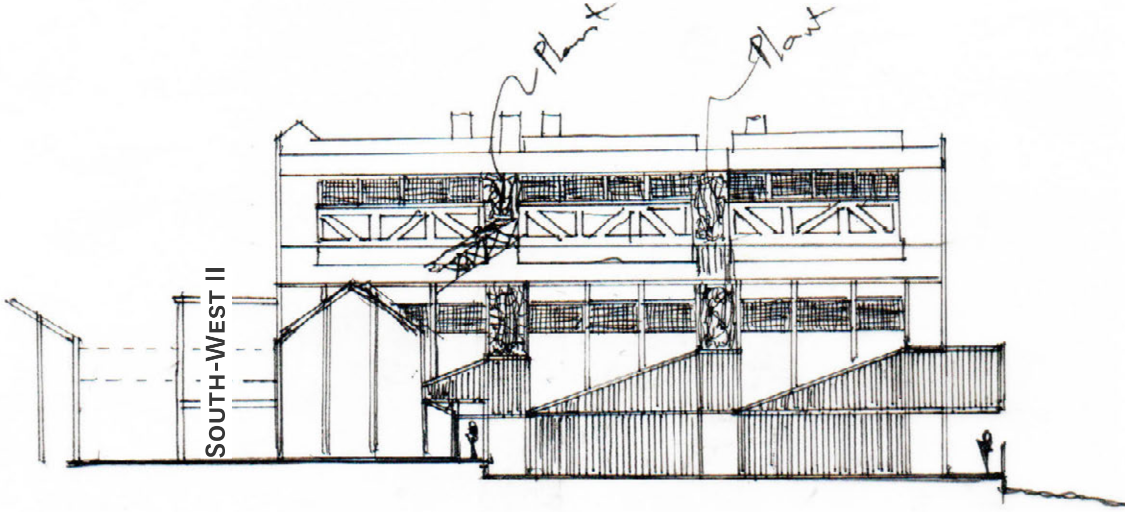
South-West



North-West



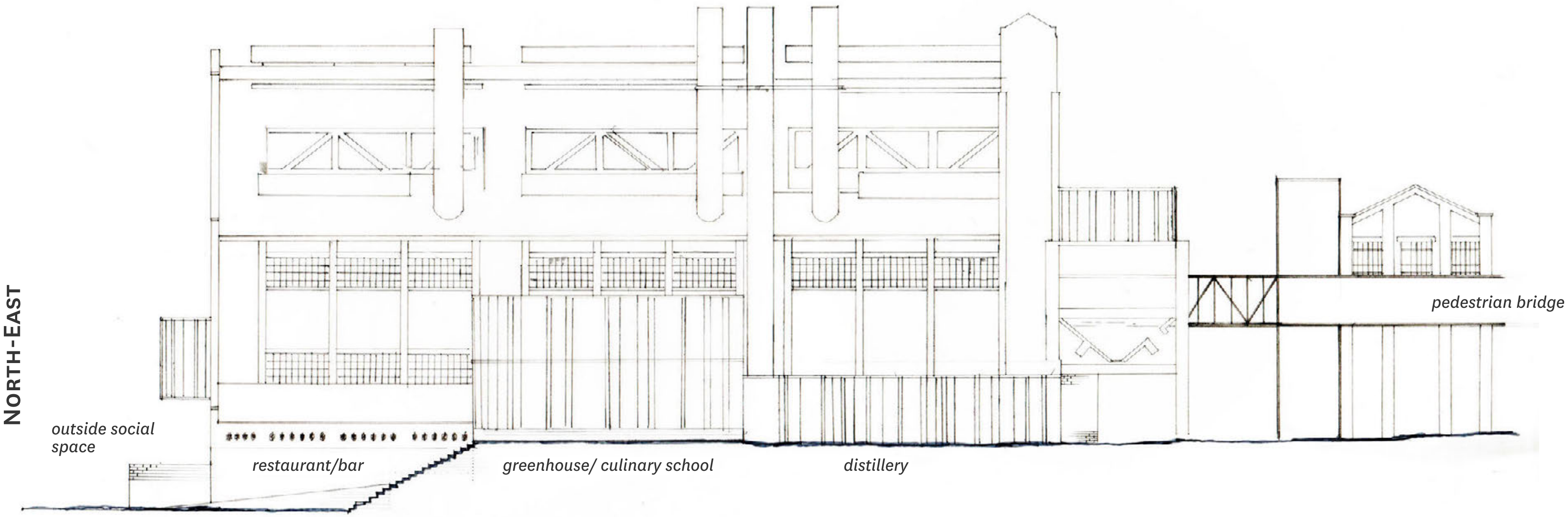
South-West



South-West II

Iteration IV

North-East



South-East

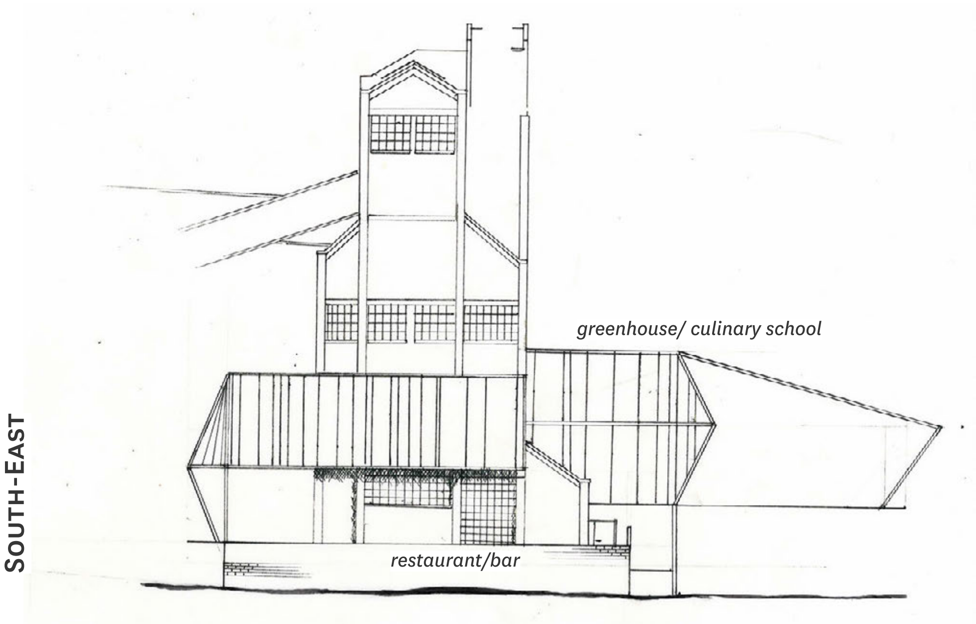
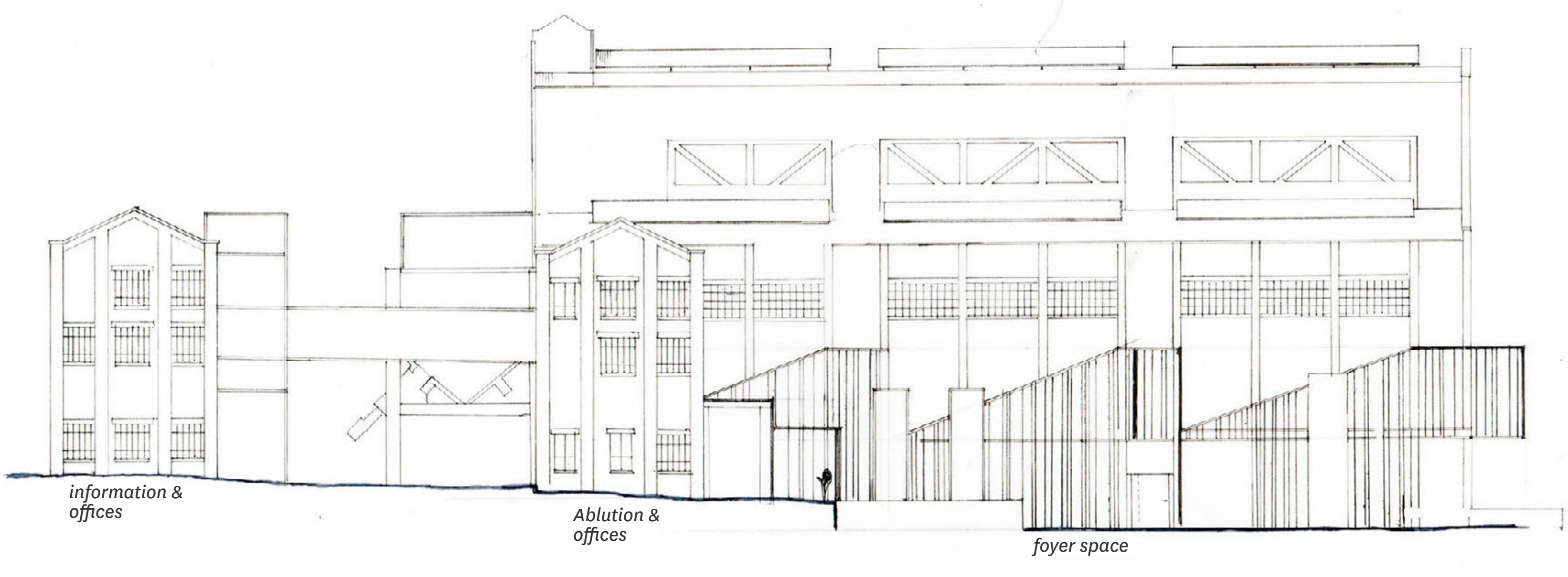
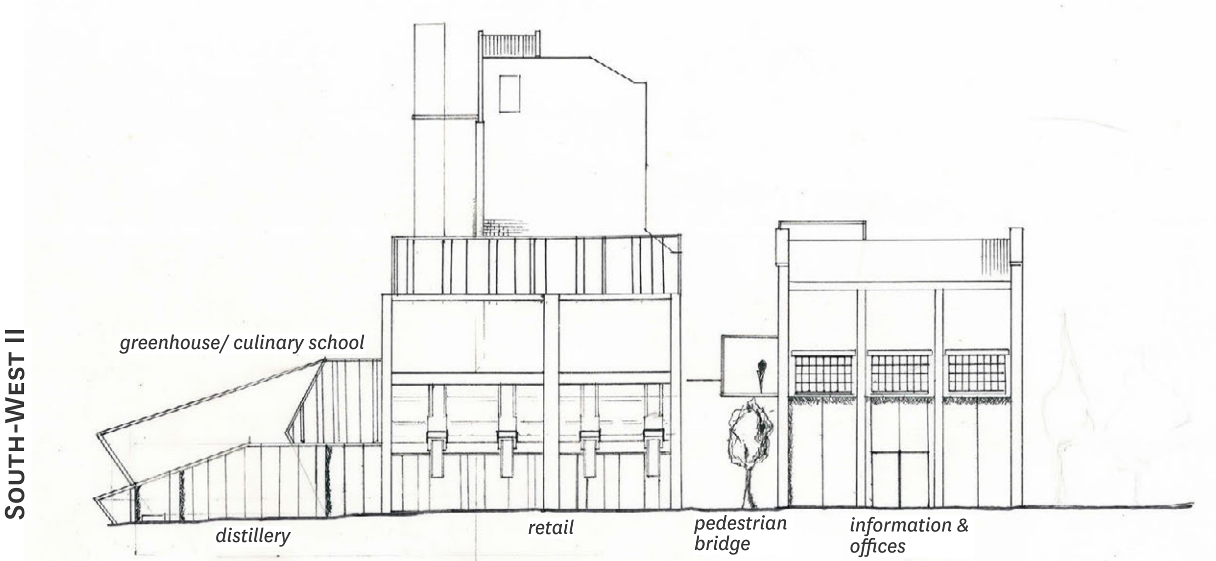


Fig 165 June elevation exploration

SOUTH-WEST



SOUTH-WEST II



Process Work

Showing the development of the elevations

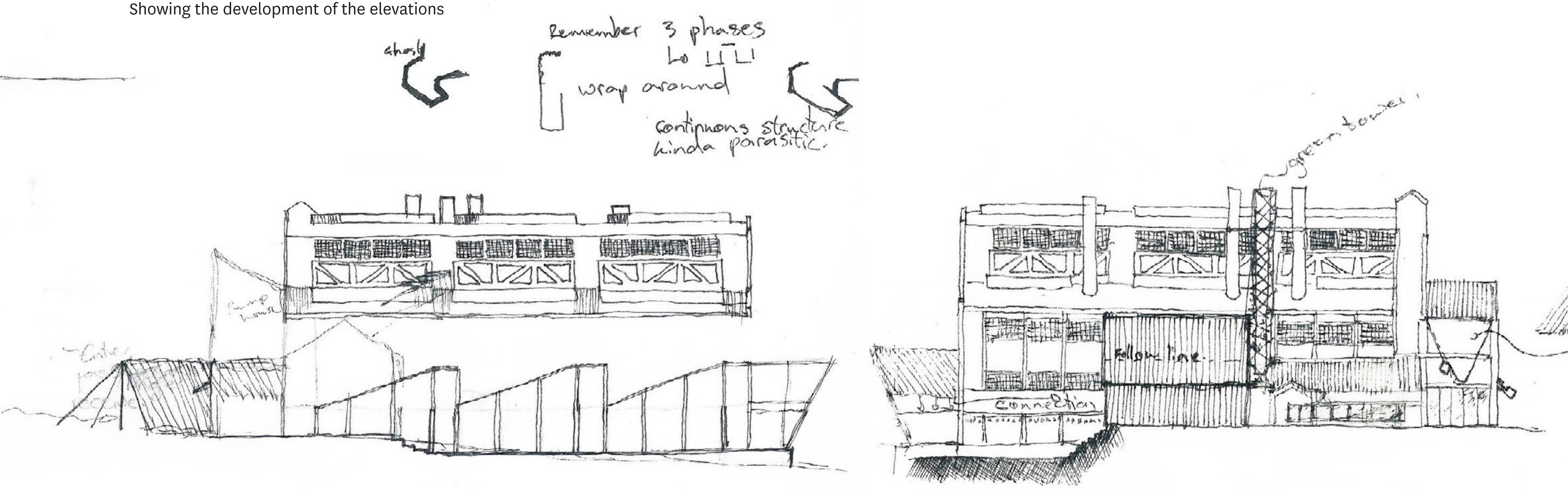
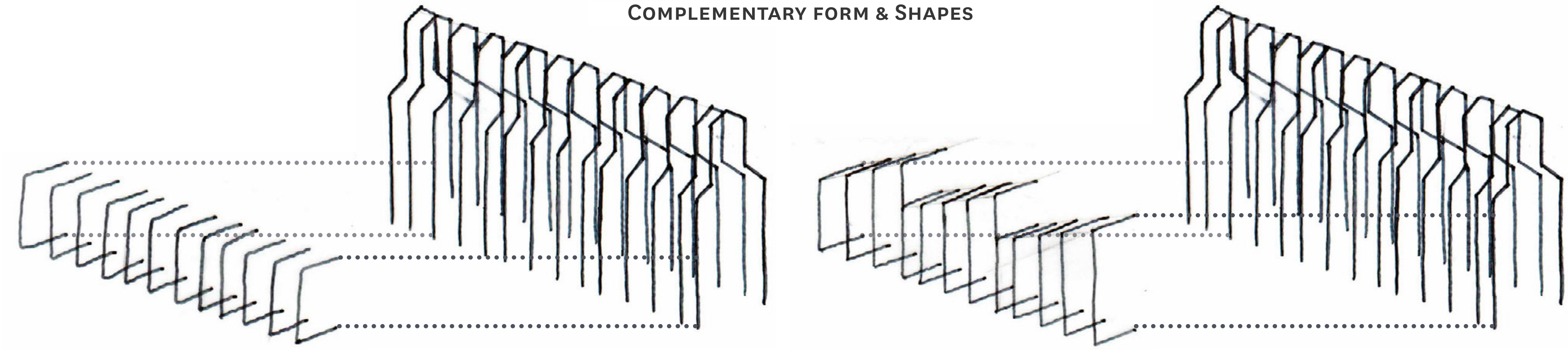


Fig 166 Process work I

COMPLEMENTARY FORM & SHAPES



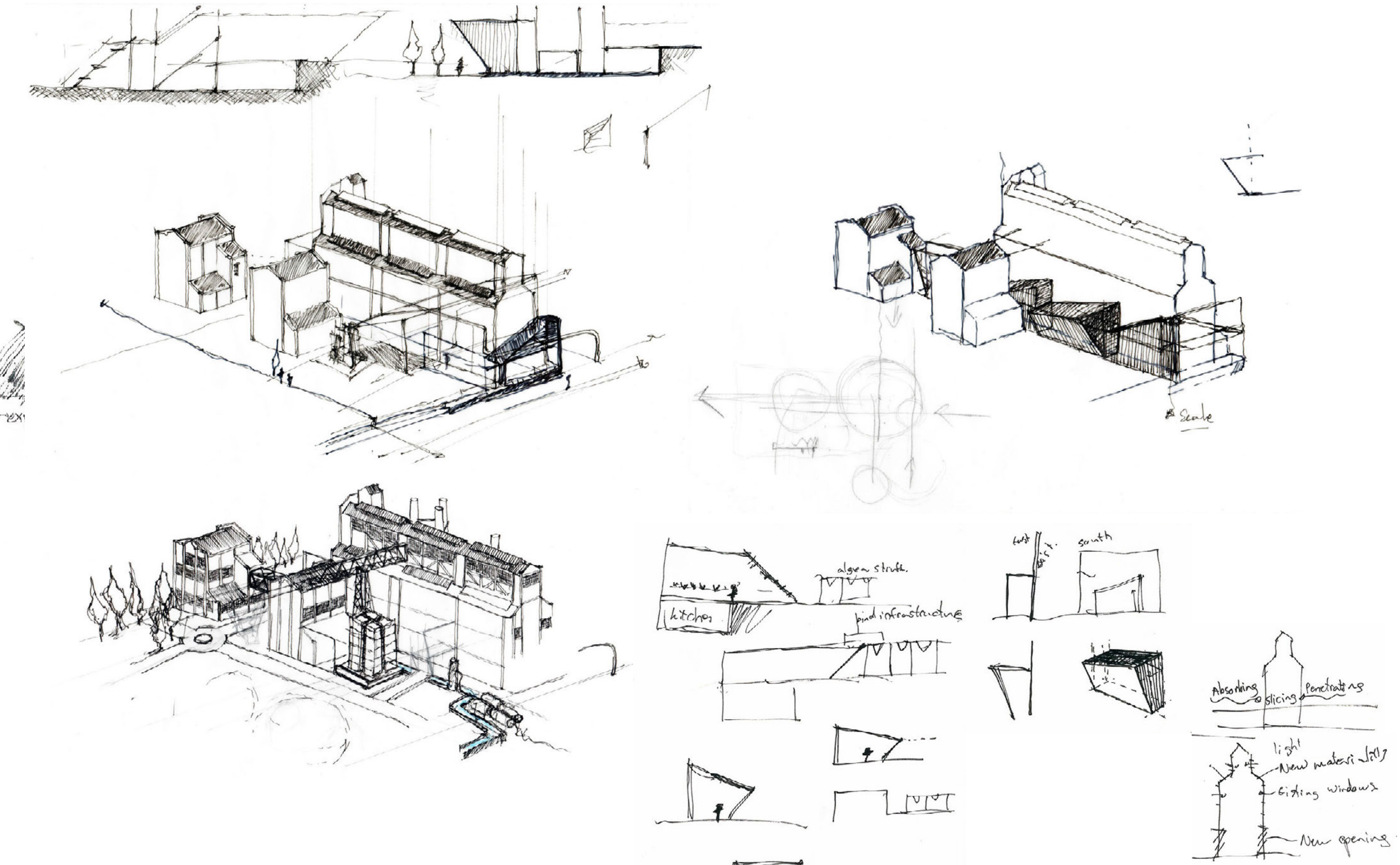


Fig 167 Process work II

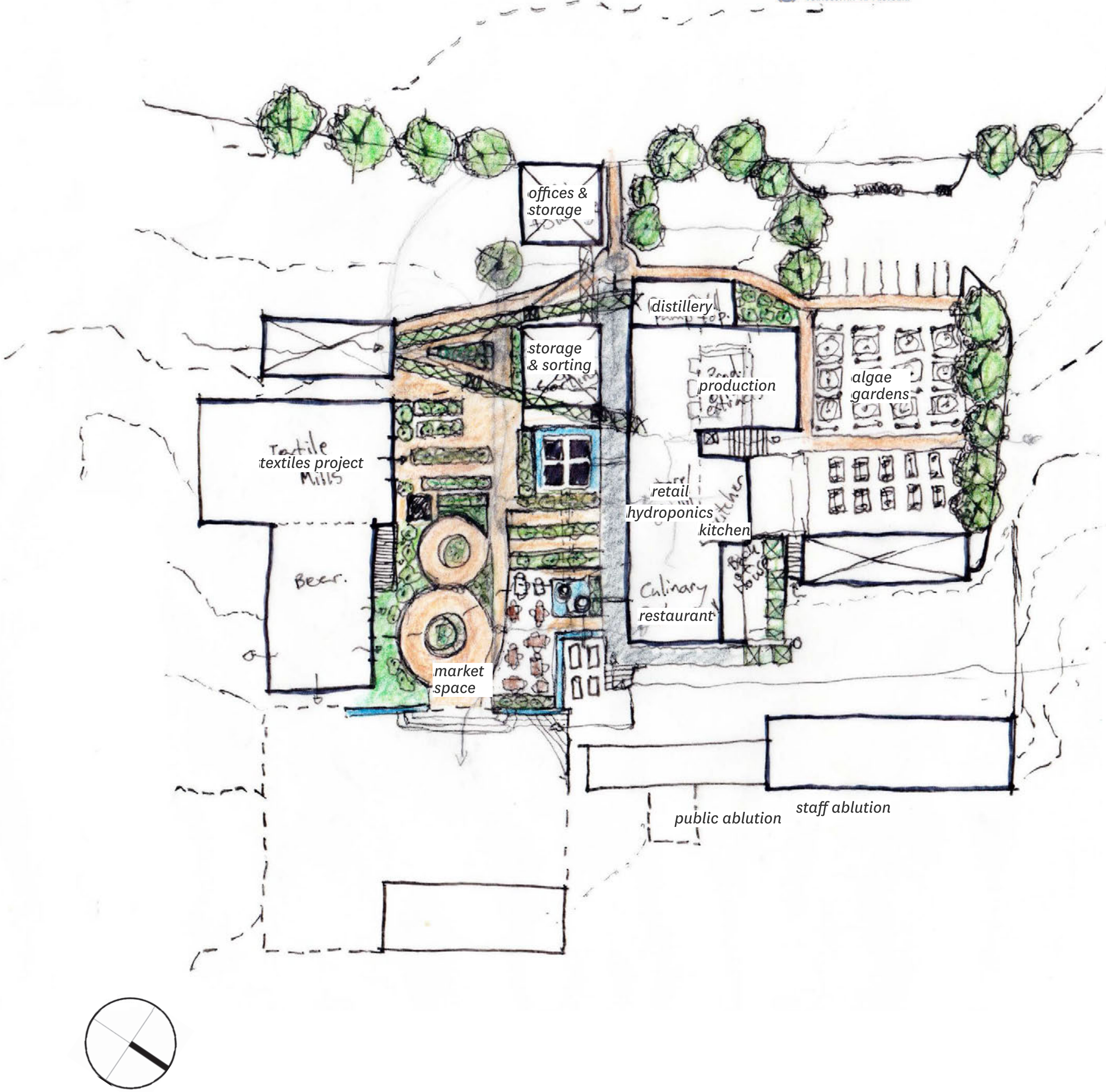


Fig 168 Site development I

5.5 Site & Plan Development

The site plan developed from the urban vision of the site as well as aspects of the other programs proposed by the other four masters students.

The first step was to define the foyer space between the two main retorts because this was to become a public square as well as the main axial route through the site. The dominating factor was that of movement. How people would want to move around was considered, as well as where they would want to go, something intangible that became clear when the site was visited. Linkage was an important, well considered aspect where walkways through the building connect various functions, programs and entrances to spaces.

The site design only became formalised and structured after movement in and around the existing site and after accessibility initially informed it.

Aspects of each design plan were kept when approaching the final development of the site and the architecture it contains.

In the plan on the left, the Coke Hopper space to the west was meant for the distillation space whilst the two CWG buildings were used for the drying and sorting of produce before it went to production on the north side of the building. These processes were a bit far removed from each other which would cause a lot of unnecessary movement in the production process. The retail space was also in the centre of the main Retort where it would cause a visual obstacle within the building and impact on the spacial quality of the existing infrastructure.

The restaurant was positioned to the east side of the main Retort so as to overlook the site as it slopes down. It is also a nice area for the restaurant to open up onto the foyer space whilst being conveniently positioned to the kitchen and bar area.

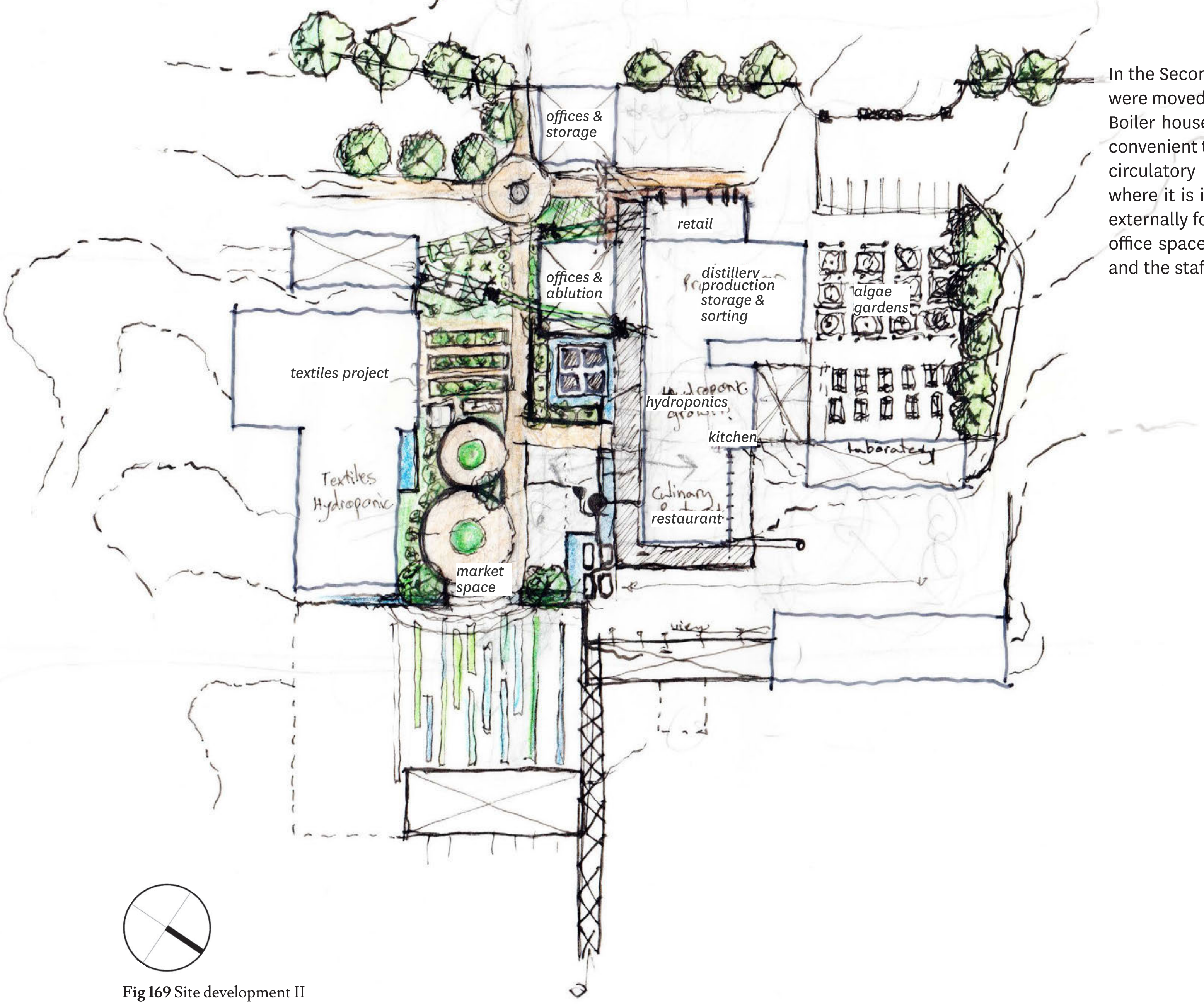
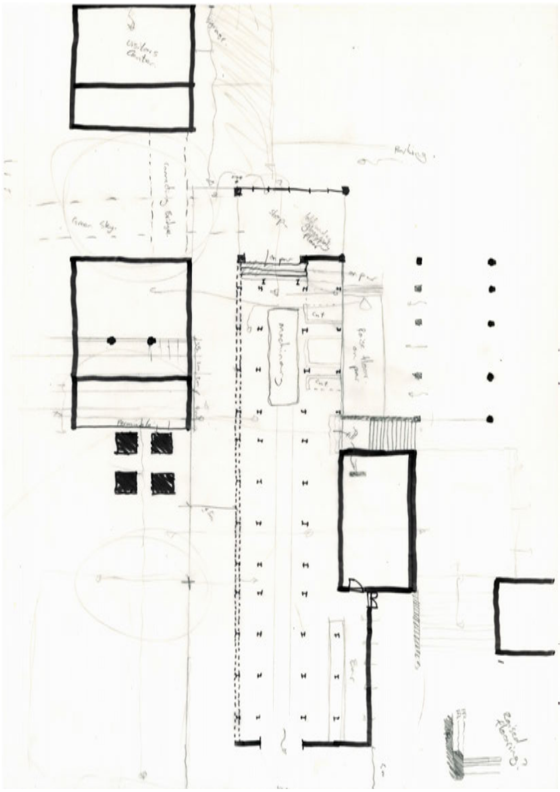


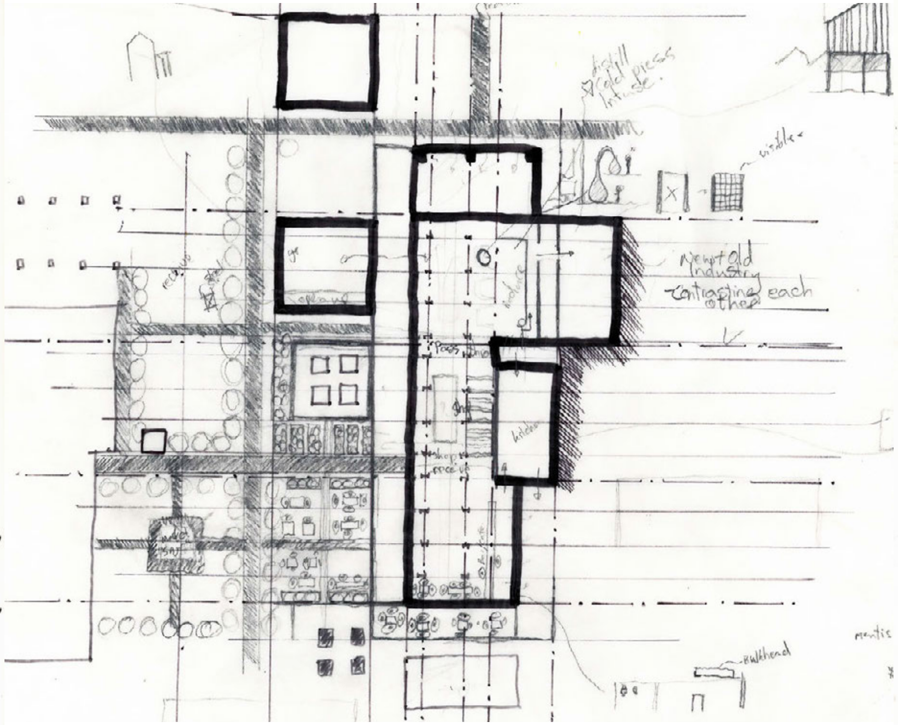
Fig 169 Site development II

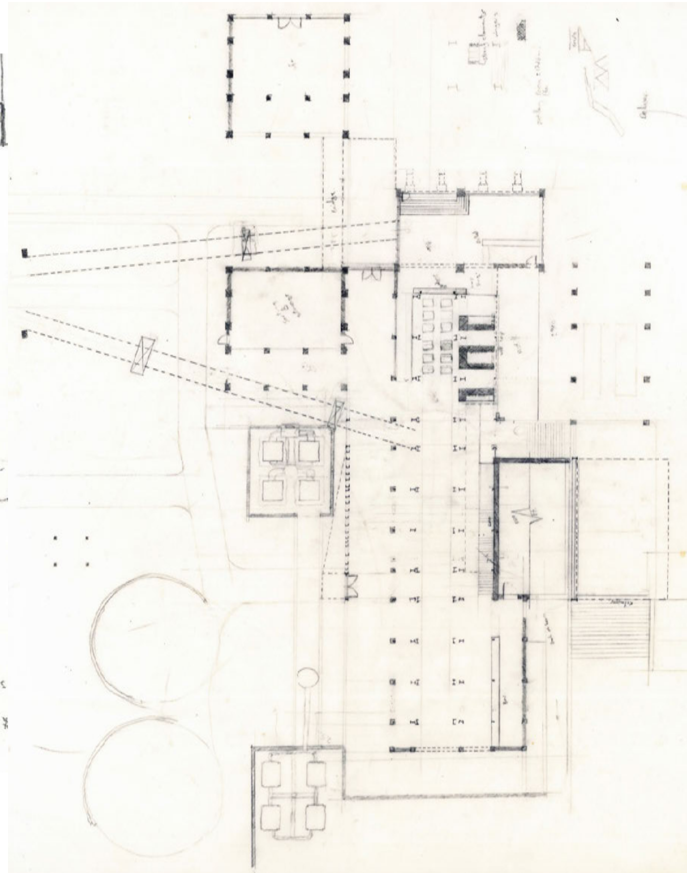
In the Second layout, the complete production processes were moved to the northern side of the building where the Boiler house used to be. By doing this, it becomes more convenient to receive external deliveries whilst enhancing circulatory processes. The CWG buildings were located where it is in order to be used as an information centre, externally for the site from Annette road and internally as office space and as an ablution for the site, the building and the staff.

Process Work

Showing the development of the site layout and spacial planning.







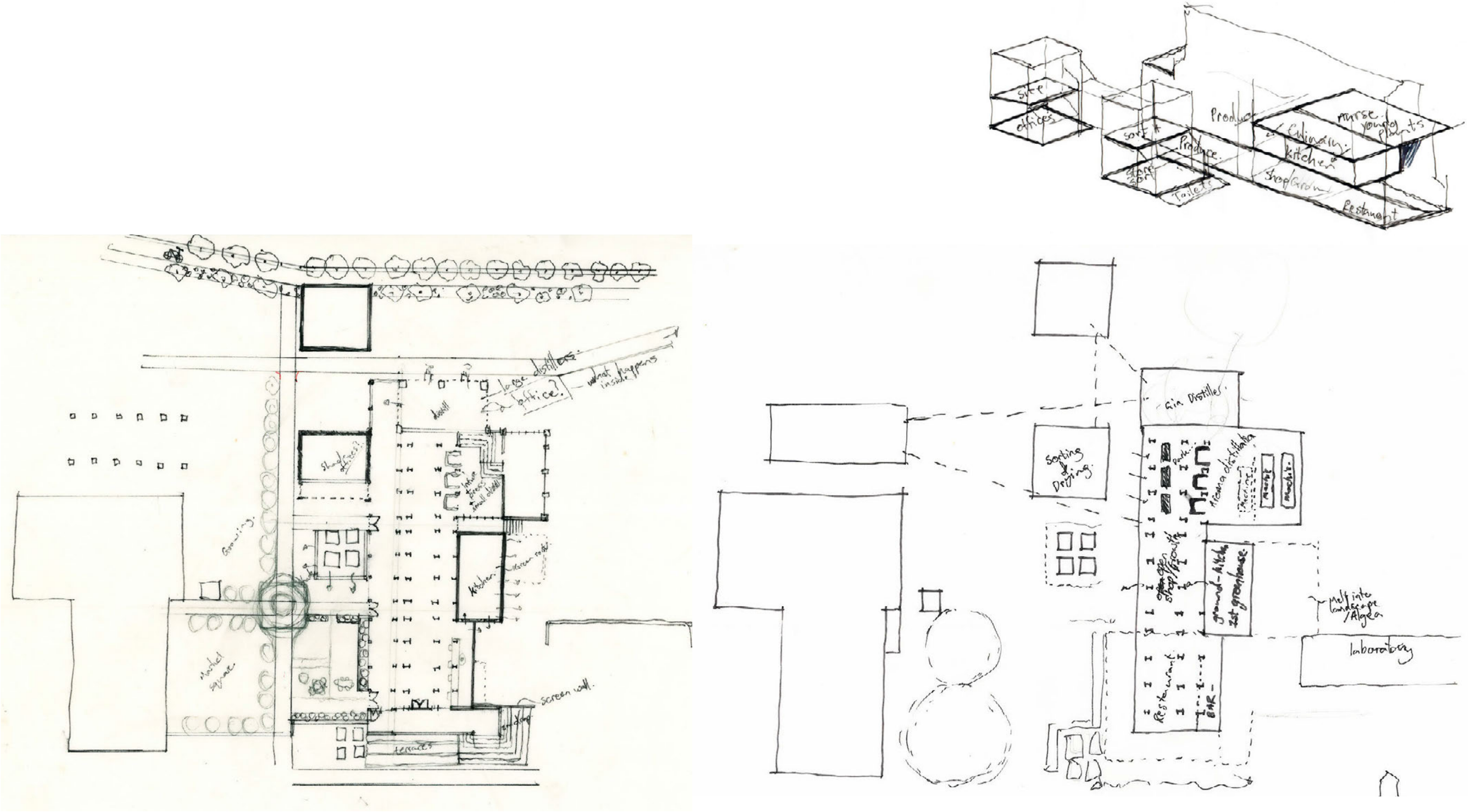


Fig 170 Process work III

Fig 171 June site development I

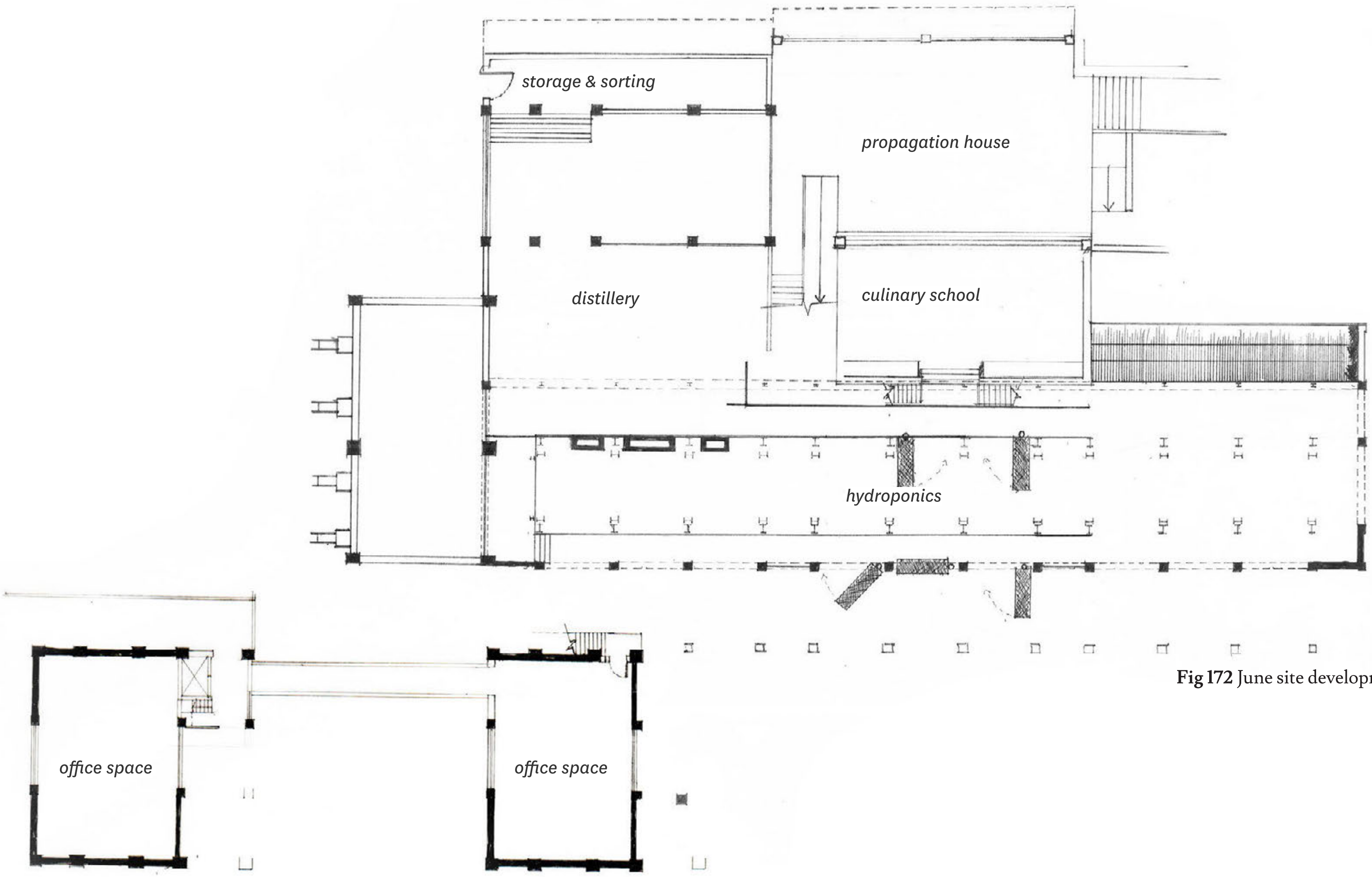


Fig 172 June site development II

Initially, the design of the hydroponic structures was envisaged to be a cantilever system that would hang over the atrium-like centre of the main retort, swinging back when harvesting takes place. (Fig 171 on page 141) After seeing which layout would produce the most output as well as not interfere to much with visibility.

In this design the previous layout was formalised and arranged spatially in its verticality to link the various functions. The Propagation House and the Culinary school was linked to make it easy for scholars to pick young sprouts in order to use it. This in itself would be problematic because the propagation house would need climate control and would have to be humid. The culinary school would also need access to the outside area in order to comply with the relevant fire regulations and its own climate control.

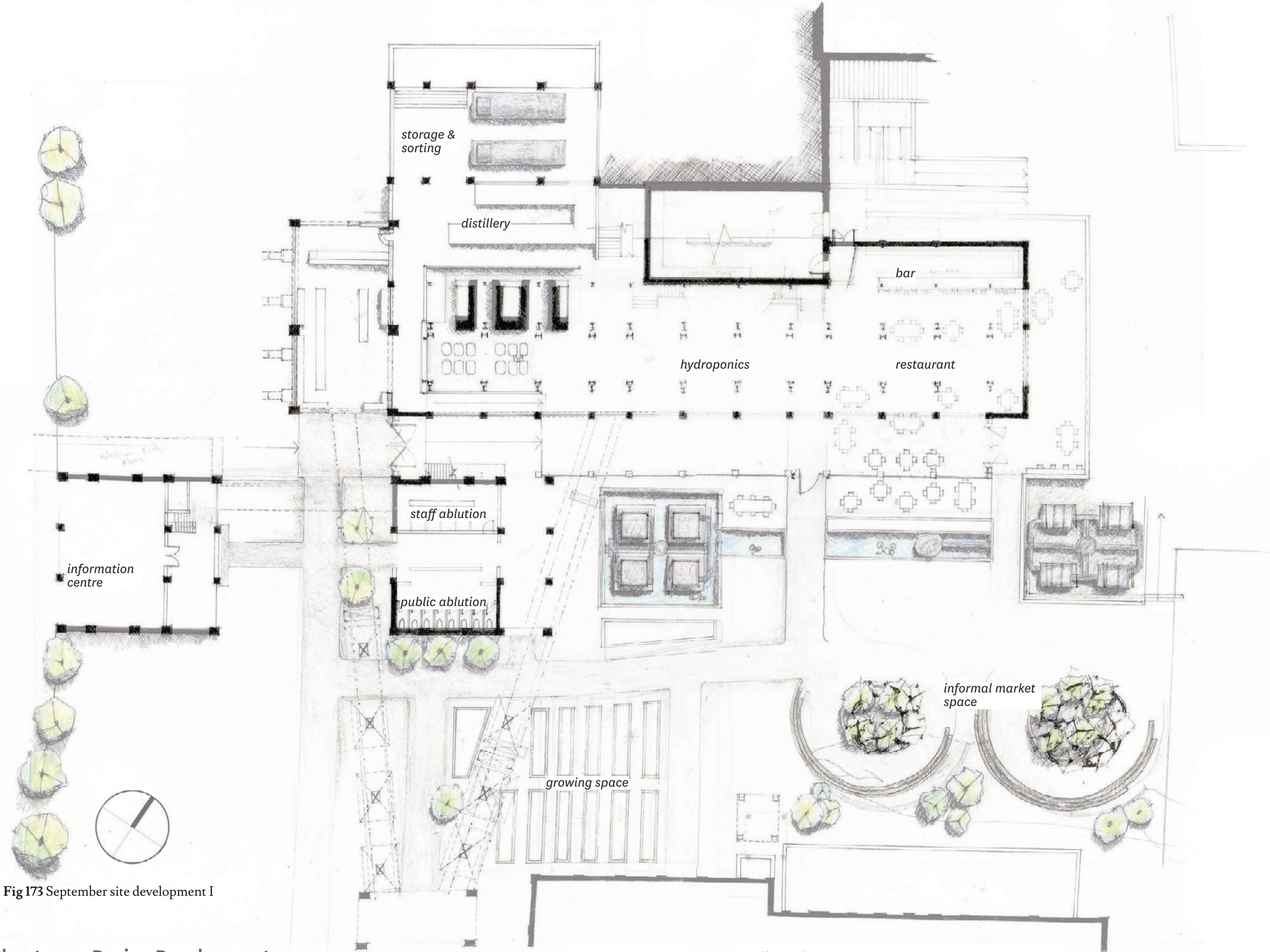


Fig 173 September site development I

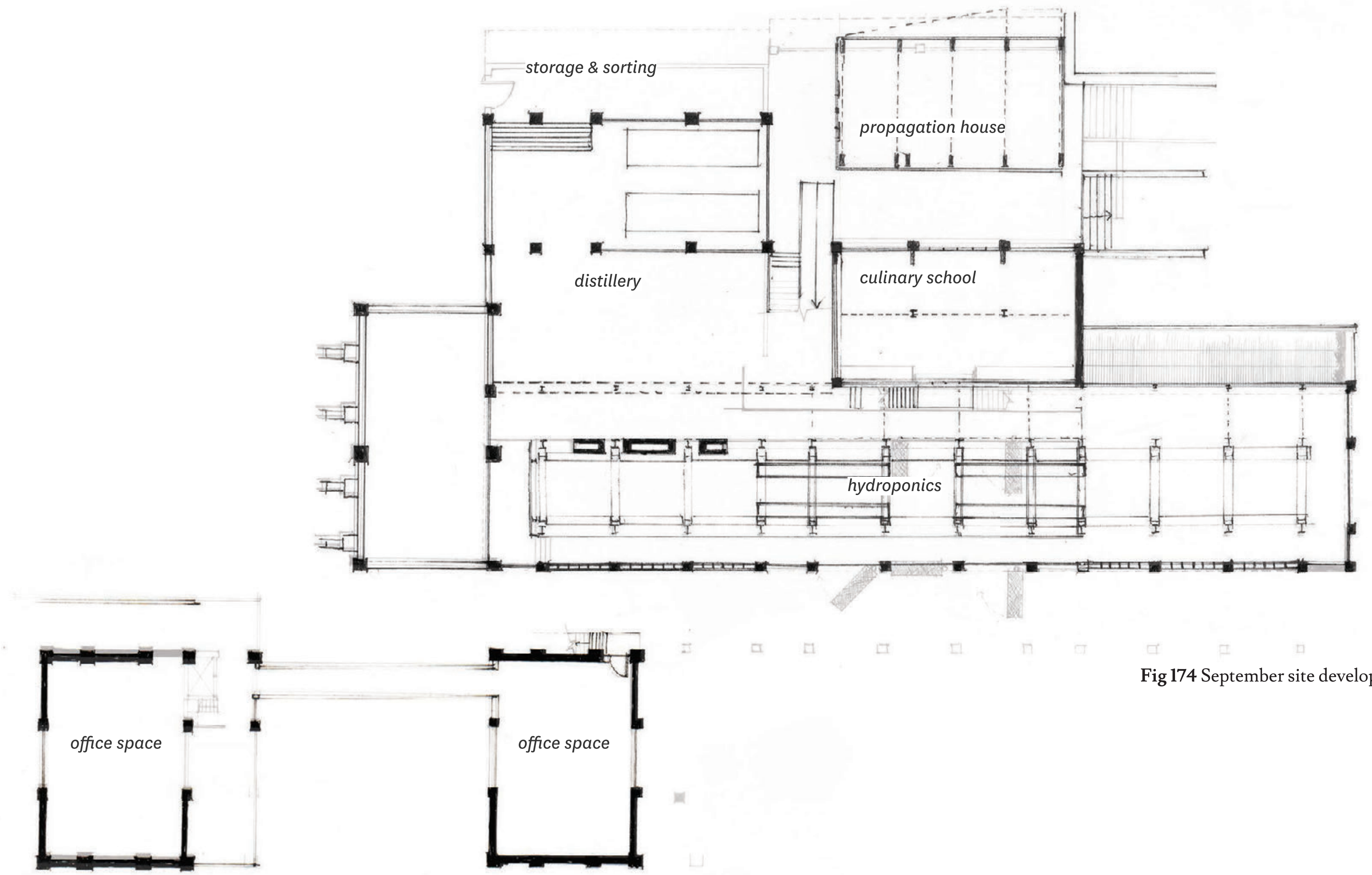


Fig 174 September site development II

In the final design, the propagation house was disconnected from the culinary school in order to stand alone. In addition, the hydroponic system was changed to a rigid system that would allow for more products to be produced whilst keeping the visibility of the Retort in its length undisturbed.

The design is meant to reflect a contrast between the processes of the past and the present on an environmental, as well as materialistic way.

Form looked at creating an experience between two different time-frames, one from an industrial and the other of a post-modern era. An inverse of industry of the past. Throughout the whole journey of the new architecture, form is used to express and celebrate the heritage of the industry past whilst accentuating it.

5.6 Levels of Control

Accessibility & Security

The diagram below indicate the level of security and accessibility around the building. Various levels of security is needed depending on the program it contains.

The proposed project aims to be as open and accessible to users as is possible. Although it would be ideal to leave everything open, the building will house expensive equipment, tools and machinery and therefore, some security must be introduces and incorporated.

Most of these spaces will be accessible during work hours. This will allow for public interface during the day whilst the site will be secured at night and when there is no interface.

Flow of Users

This diagram shows the formalised flow of movement of users of the space. The visitors can stray off the paths and move freely between the spaces. These are guiding paths which link up spaces. It is also a haptic experience, as indicated in Chapter 5.2, which follows the process flow for users to experience the sense of the program of past and present industry.

Delivery & Production Material Flow

This diagram shows formal paths of movement for the delivery and collection of material to and from locations such as the kitchen and the distillery.

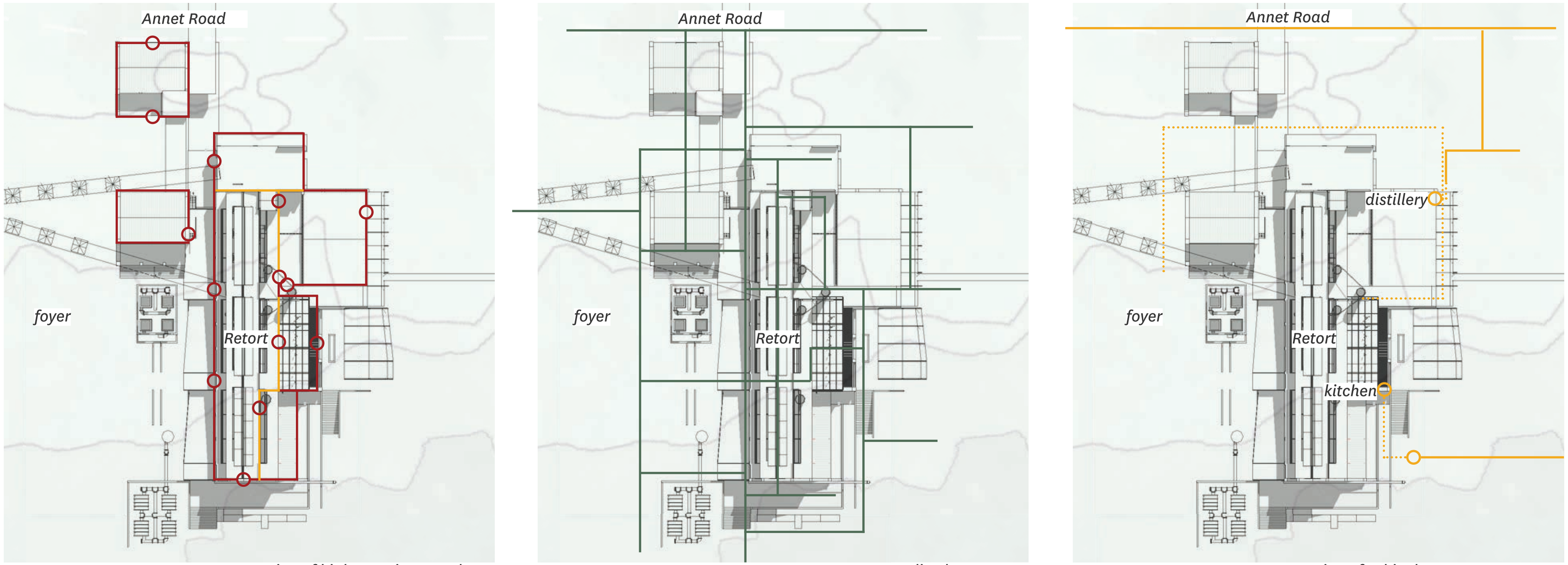
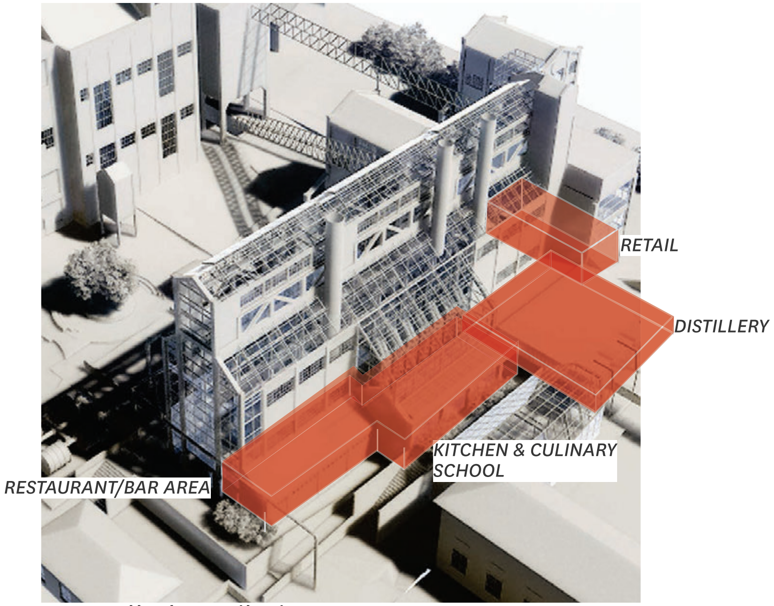
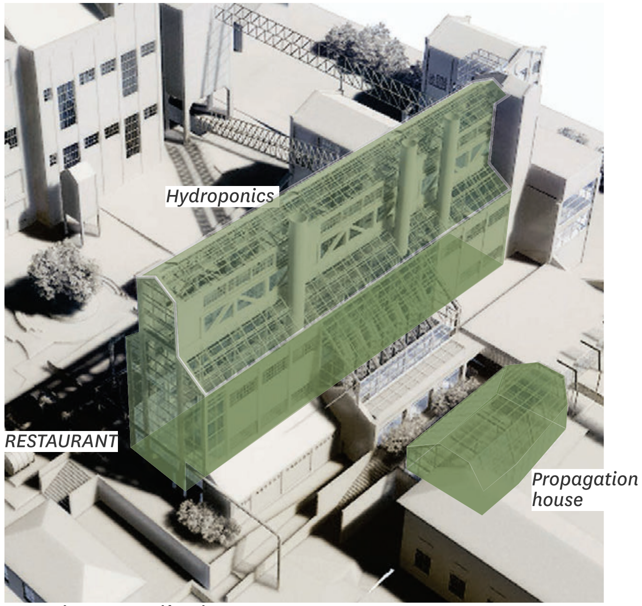


Fig 175 Levels of control



Controlled ventilation



Passive ventilation

5.7 Site Layout

The idea of the site layout mainly formed and focused around the processes of the gas production in the past combined with the movement of users through the site as is proposed in the urban vision.

Though the route follows a specific path, nothing stops the public users from straying off the path to explore the site on their own. The proposed park is an open space which does not (and should not) confine users to a formal layout. Users are however still encouraged to use preset paths to engage in and experience all that is happening within the site.

Outdoor Spaces

The outdoor spaces encourages growth and production in a productive landscape that bears produce instead of only being aesthetic and stagnant. It, in addition allows for change with seasons and times.

The building lives towards the outside, with all of the functions opening up into the landscape. This makes it possible for air to flow freely through the building whilst extending the landscape into the building.

The park as a whole limits the access of vehicles and promotes the use of public transport as suggested in the JMOSS and the urban vision (Chapter 2). There is a formalised parking lot with access for buses to the south-west of the site while there is a small parking space available for users in the evening who make use of the culinary school and the distillery to the north-west of the building. This space will also be used for deliveries to the building.

The spaces also act as a connection to the various other programs around the site. To the north-west, a sky bridge allows users to walk over the algae gardens of the energy research station. The corridor and main axis leading downwards to the aquaculture program as well as the foyer space leading to the public spaces and the foyer with its open market space connecting with the textiles program to the south, creates different nodes of interaction between these programs as a continuous space of a haptic experience.

Public Interface

The interface with the public exists in the space of approach which connects and link users from the UJ directly to the CWG building with a higher view of the retort and the corridor on the south-eastern side. The movement around and in-between the different points of interest creates an opportunity for education because one is confronted by the machines and infrastructure that exists within the program.

Every approach differs, depending on what one interacts with. This ultimately makes every exploration and interaction different whilst retaining the users' attention. In short, every aspect of each space is a different experience.

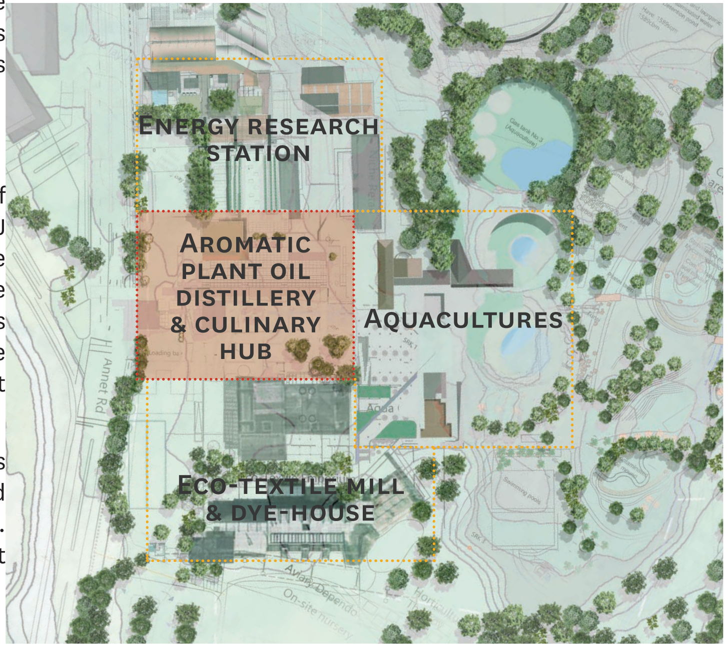


Fig 176 Programs proximity

5.7.1 Site Plan

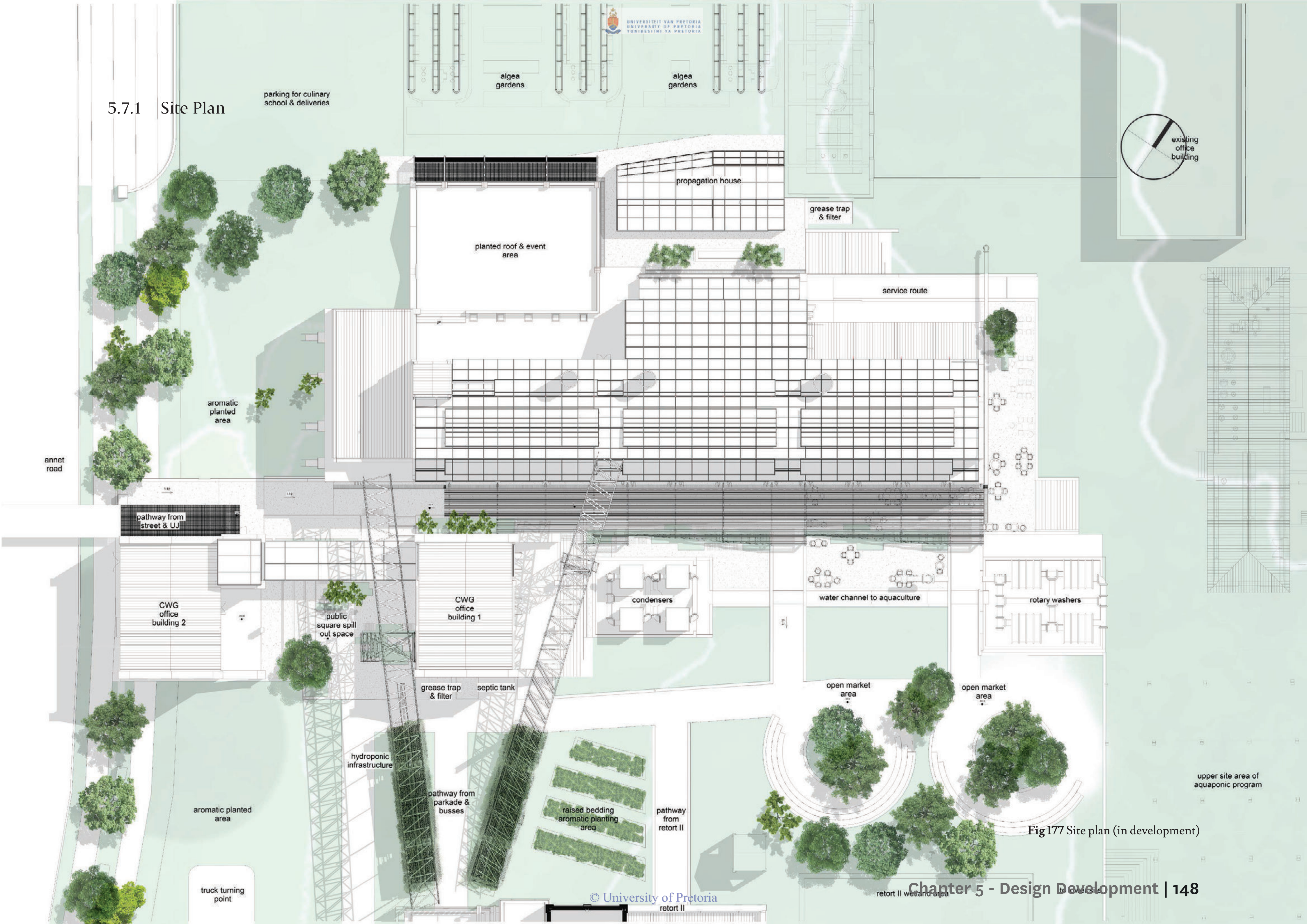


Fig 177 Site plan (in development)

5.8 Exploring Sections & Spacial Articulation

Exploration in sections was used to discover how the new architecture would correspond with the existing infrastructure and how it could bind with it to find height and proportion of the new.

Focusing on the idea of hybridity, what was envisaged was how the public interface would melt into the infrastructure and into the landscape. The foyer space has been connected to the interior of the Retort in a manner that is open and inviting, where the thresholds are not as obvious.

The interior in its verticality promotes growth of the hydroponics, of production in a non conventional manner - an extension of the productive landscape. To the northern side, the architecture extends into production in terms of the process of goods and the usage thereof (distil, restaurant kitchen and the culinary school).

Bordering to the north is the propagation house where seedlings are sprouted before they are introduced into the landscape, the interior hydroponics and for use in the culinary school.

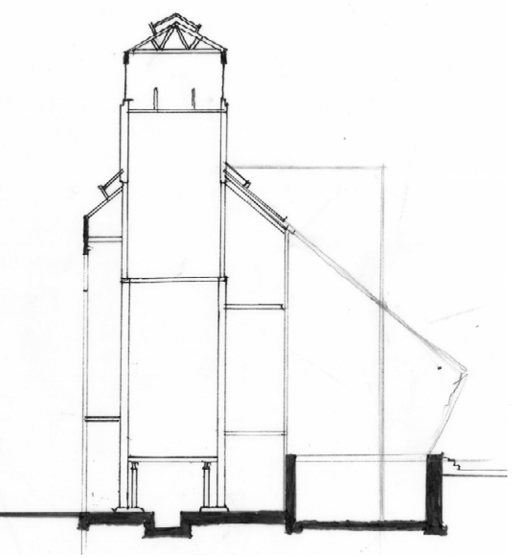
As with the plan exploration, the culinary school was first envisioned to be a part of the propagation house in order to allow for the harvesting and picking of sprouts for use in classes. Because of climate differences and control between the spaces however, it was decided to that it be separated from each other.

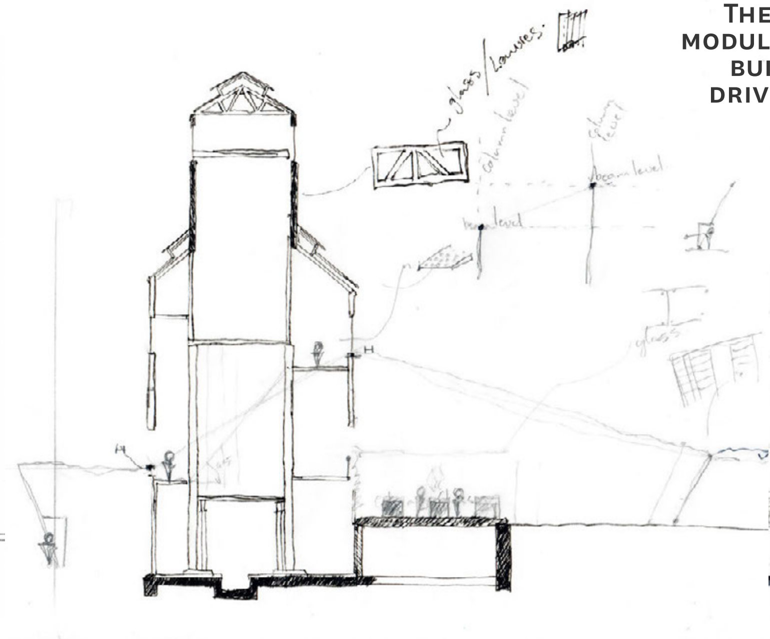
Leaving the building open in its height was a conscious decision throughout in order to experience the space and not block views, whether one is enjoying the restaurant, exploring the systems or partaking in the culinary experience.

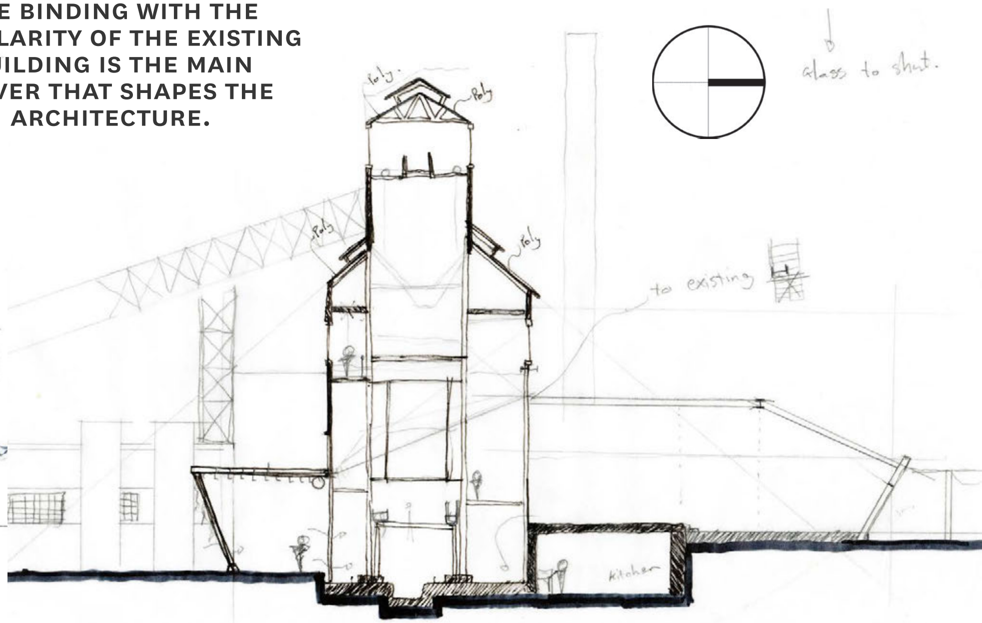
The restaurant is meant as a culinary, sensory experience of the production of the building where everything happens from start to finish. It is a process just like the architecture of the structure, a system on its own. The architecture lives out onto the landscape and overlooks the site as it slopes to the Braamfontein spruit.

The retail space acts as a receiving point, as a celebratory entrance to the Retort and as to what it has to offer. This is a start to the journey and the viewing of the industrial heritage.

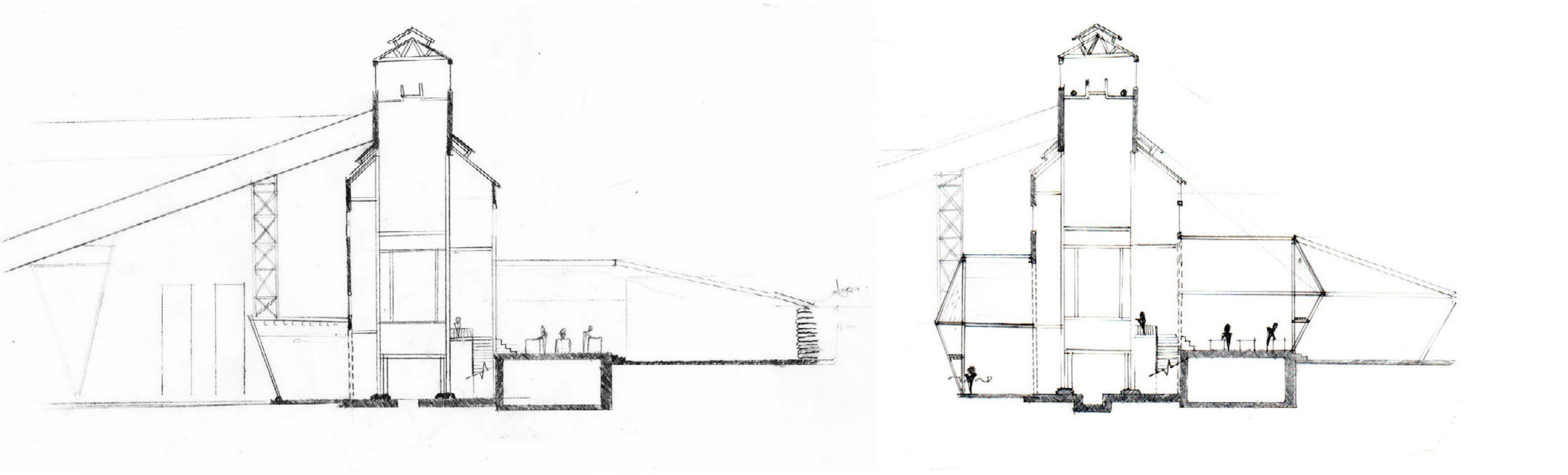
The user is allowed to explore on all levels, where walkways connect and interaction with the heritage infrastructure becomes possible. The transparency of process lead to the braking down of borders between user and industry.

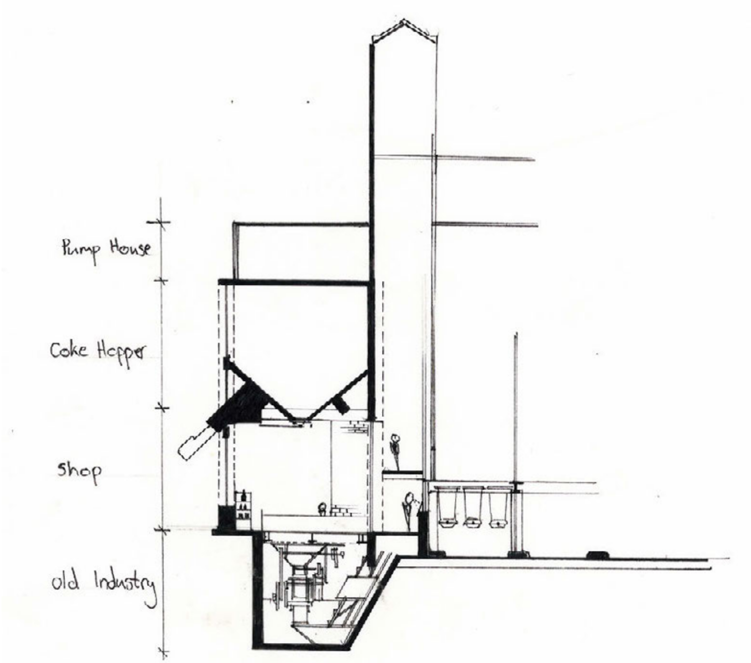






THE BINDING WITH THE MODULARITY OF THE EXISTING BUILDING IS THE MAIN DRIVER THAT SHAPES THE ARCHITECTURE.





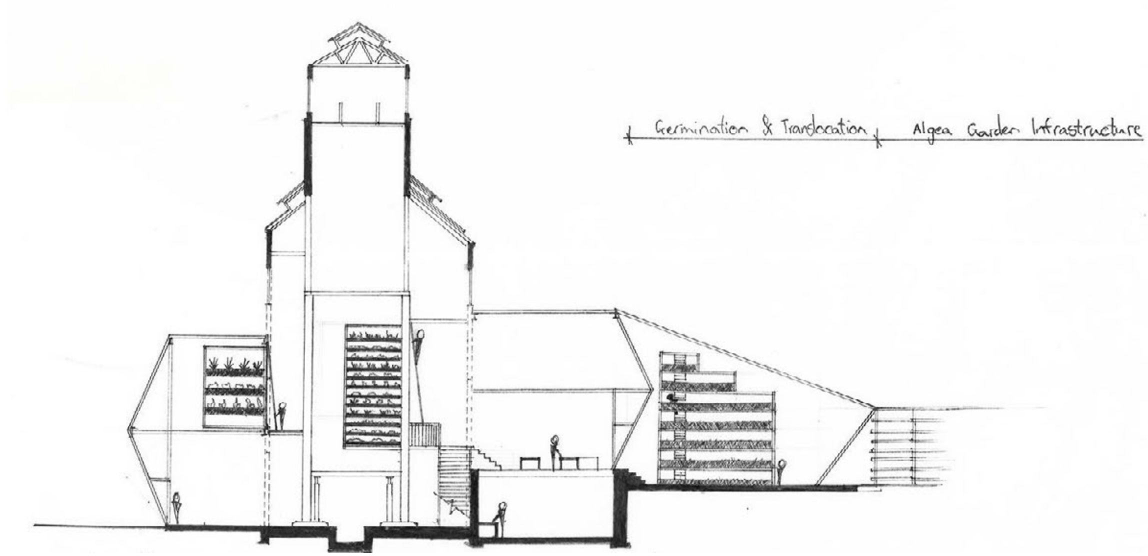


Fig 178 Section development

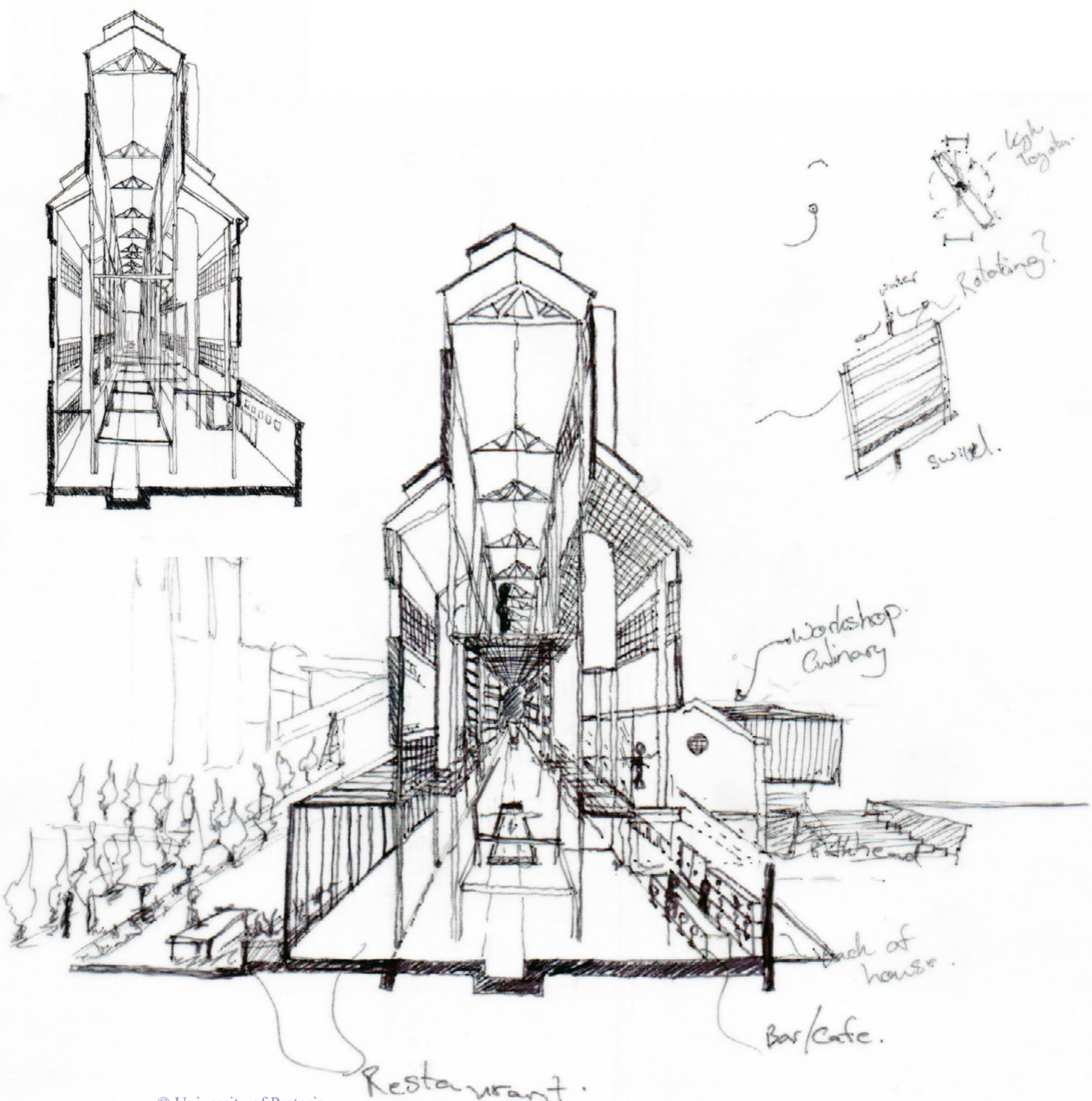
The following sectional perspectives explored the spatial experience, the levelling of the building and how users would move in and around the architecture as well as where the new will bind with the old.

When working with an existing structure, it is difficult to force some conventional spaces into the existing spaces. This was however part of the intent of the project. The question was broached whether architecture that was designed and built for such a specific function, could be altered to form a new type of architecture and then, whether it could be successful. One inevitably ends up, not only with larger and more space and volume than would otherwise be needed, but also enforcing new spaces that does not “talk” to the old structure. The end result: an unsuccessful intervention.

The volume also expresses a serene atmosphere for the user, such as the feeling one that would experience in a cathedral. More integrated programs are moved to the sides where lower volumes are possible to exist and climate control needs to happen on a more mechanical level.

The bar area exists against a beautiful backdrop wall with wall openings that creates a play of light. It is ideally placed next to the restaurant kitchen and with its indent allows for a part of the restaurant to be enclosed in times of extreme cold. Together with the restaurant, the bar lives outward, onto the balcony, overlooking the site which is perfect for events. This is facilitated by a facade that can open completely allowing for the free flow, not only of air, but people as well.

The existing infrastructure made it very difficult to incorporate new enclosed spaces and in finding materiality that can connect new technologies with the existing.



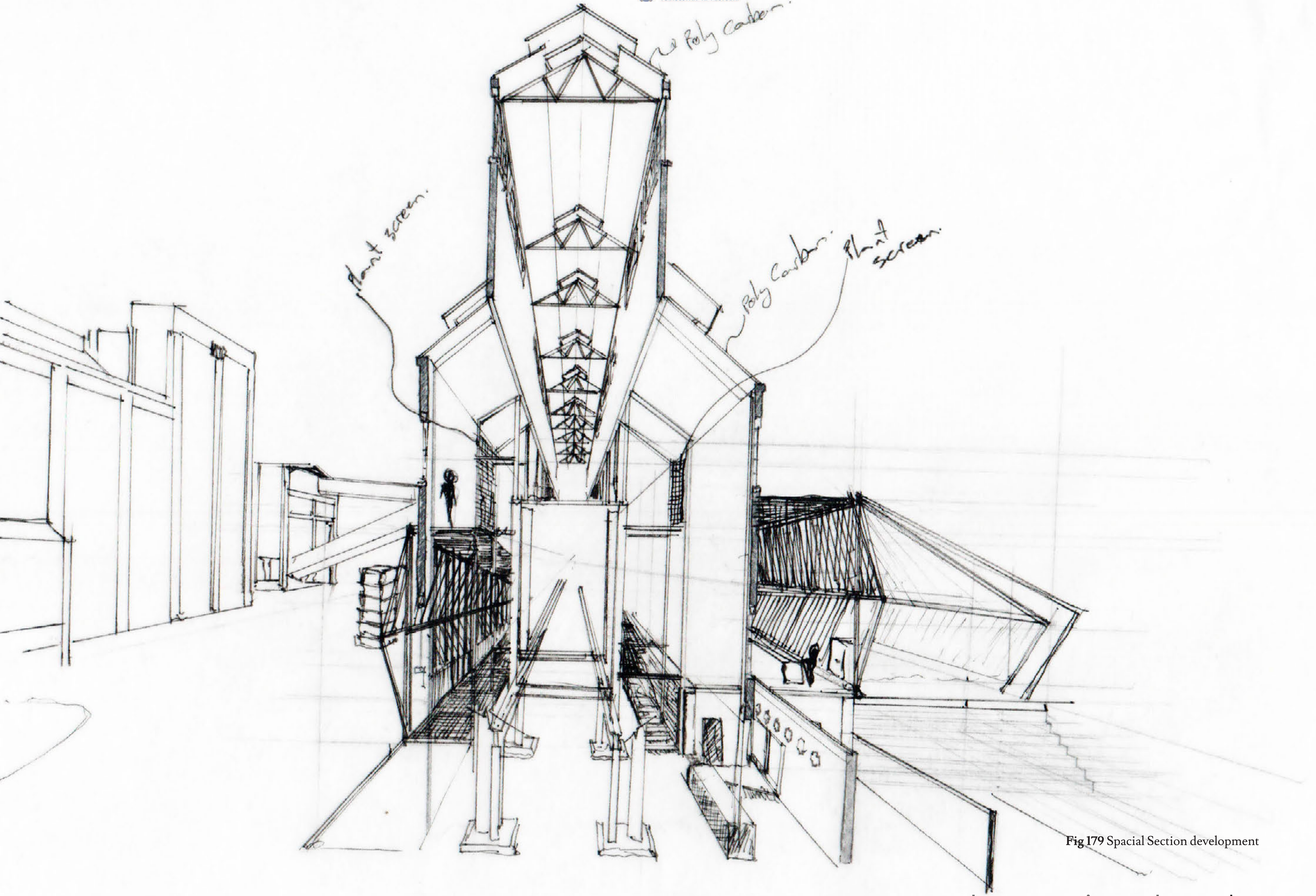


Fig 179 Spacial Section development

TECTONICS

Chapter 6

6.1 The Tectonic Concept

From the design concept as a synergistic architecture as restitutor between industry, society and nature; the tectonic concept looks at how the various functions interact with one another and how these interactions in turn creates spaces.

Focus is placed on the spaces where industry happens (past and present) to create the social aspect, a visual stimulation, as well as the linkage between these spaces.

Articulation of the spaces would provide for a better understanding of the processes that take place in the building, as well as that which used to take place in the past. The *process* forms the movements, which creates the formation of an experience for the visitors.

Visibility being key at all times, views and historical elements are en-framed by the usage of materials and design. Looking at how the building takes shape, the theory of hybridity is continuously considered where threshold between landscape, infrastructure and new architecture weave into the other, blurring the boundaries that once bound it.

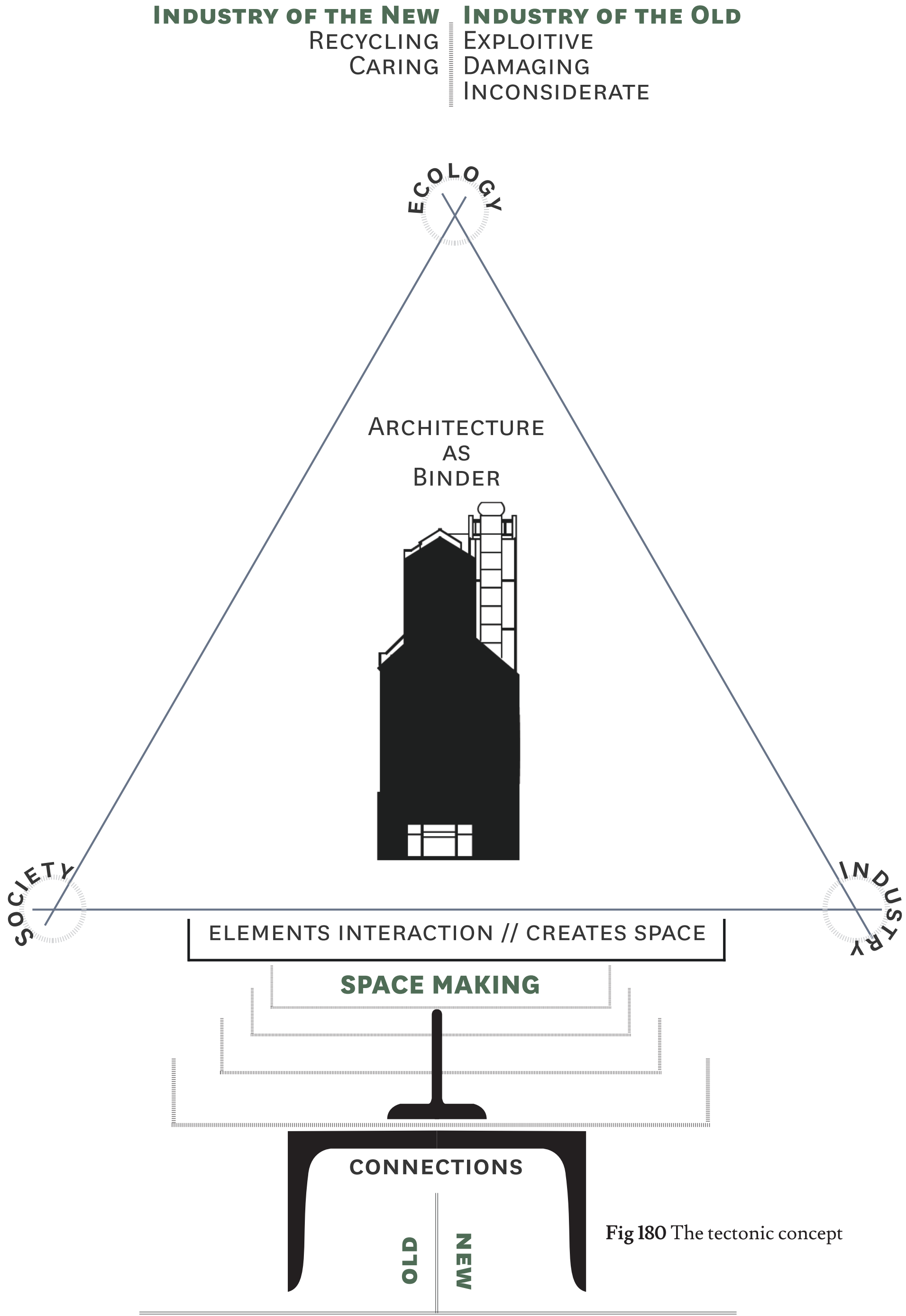


Fig 180 The tectonic concept

6.2 Materiality

The selection of materials were consciously considered in terms of the heritage approach and the design concept. Practicality also being key in both functions and haptic qualities.

Scattered within the landscape of the site are numerous small buildings that will have to be demolished with the new vision of the site. This will be done together with the parts that will be broken down for the project. The re-use of these elements are crucial within the new vision.

The reuse of bricks in the landscape as well as fill from other waste materials would substantially lessen the use and sourcing of other materials.

Adaptive Reuse

Complimenting the existing

The majority of materials on site exists of cast iron, steel sheeting, local facebrick and concrete, very much iconic to industrial architecture and the history thereof.

Structural infrastructure exists of steel frames with bricks built around it, forms the columns whilst the walls act as infill to the main structure which can easily be altered, where needed.

By analysing the existing materials to decide what materials will work best with the new structure as the concept suggests will contrast with, as well as compliment the original structures.

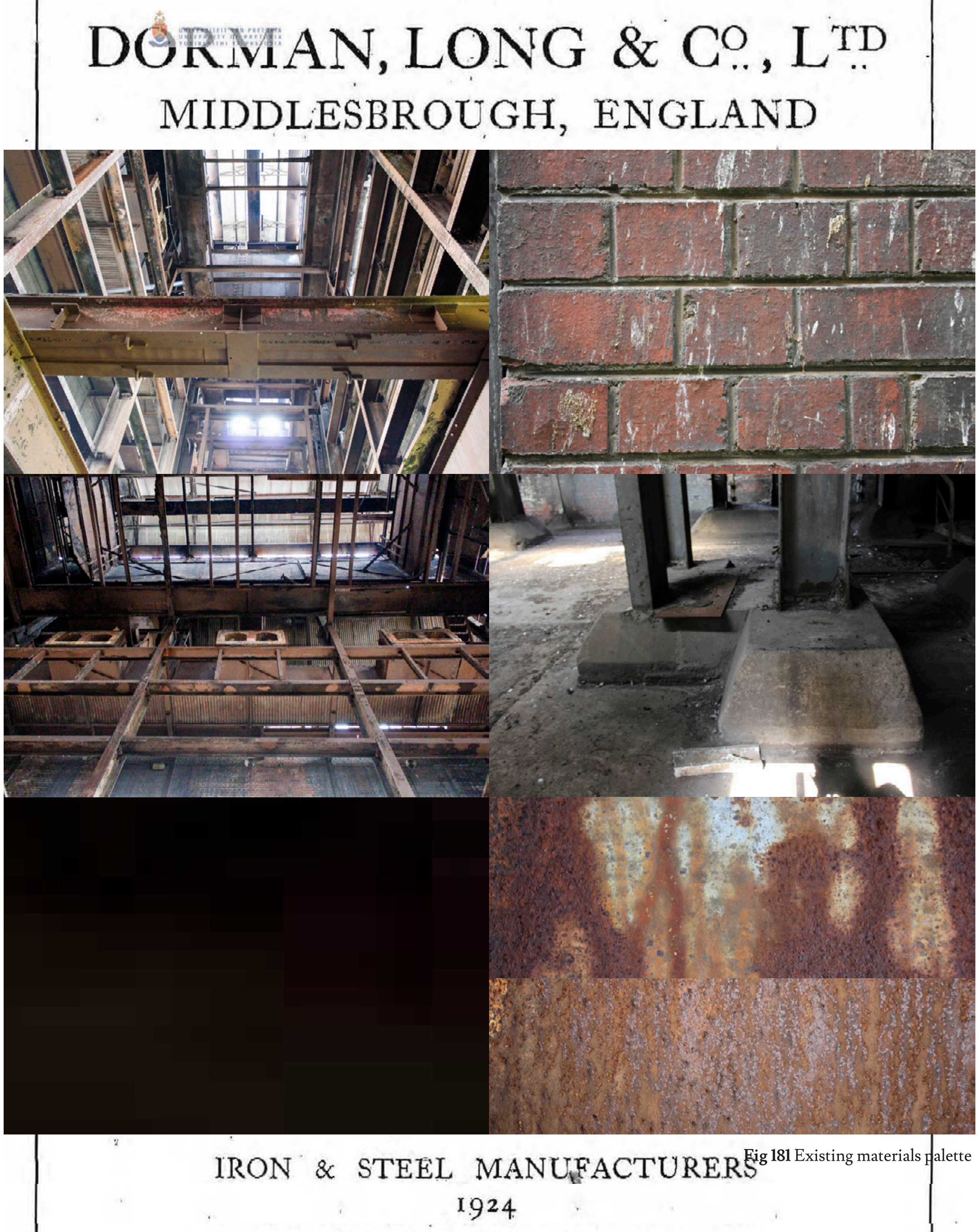


Fig 181 Existing materials palette

6.2.1 Spatial Continuity

The idea is to create architecture that is perceived as a unitary concept and not as a series of loose interventions with various interfaces. The building in itself acts as a core, as one service, both horizontally and vertically.

The prefabricated elements (such as the portal frames) can be built off-site. The difficulty will however be when the new structures have to be connected to the existing infrastructure. The selection and choice of materiality has been a vision from the start and which consisted of the selection materials that are both environmentally friendly whilst having a long lifespan. This aspect has been extensively researched to find the most viable materials for the program because it will be exposed to both sunlight and water.

Structural portal frames and other structural truss systems will be made from a mixture of aluminium alloys that fares well in wet, damp environments. This aspect, together with Particleboard laminated beams, treated with resin to make the timber resistant to water penetration, will form the main structural elements.

The secondary structure is largely glazed and allows for natural light to enter the hydroponic spaces. This new infrastructure will be fastened to the existing steel structures by means of newly added aluminium alloy profiles. The suspended floors and walkways are built from Mentis Grating (or similar). The choice of this product is done because of its longevity whilst adding to the productive landscape and visibility.

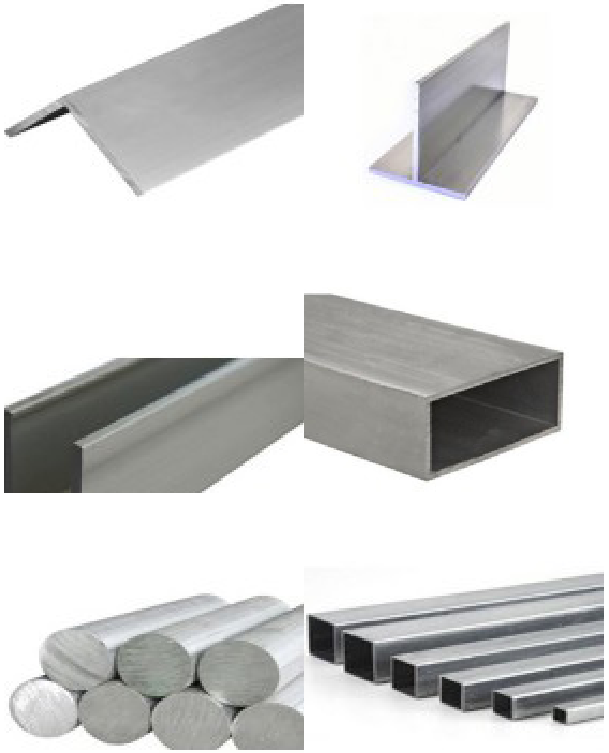


Fig 182 Profiles from Aluminium Alloys (Aluminium Alloys, 2017)

LIGHT

ADDITIVE

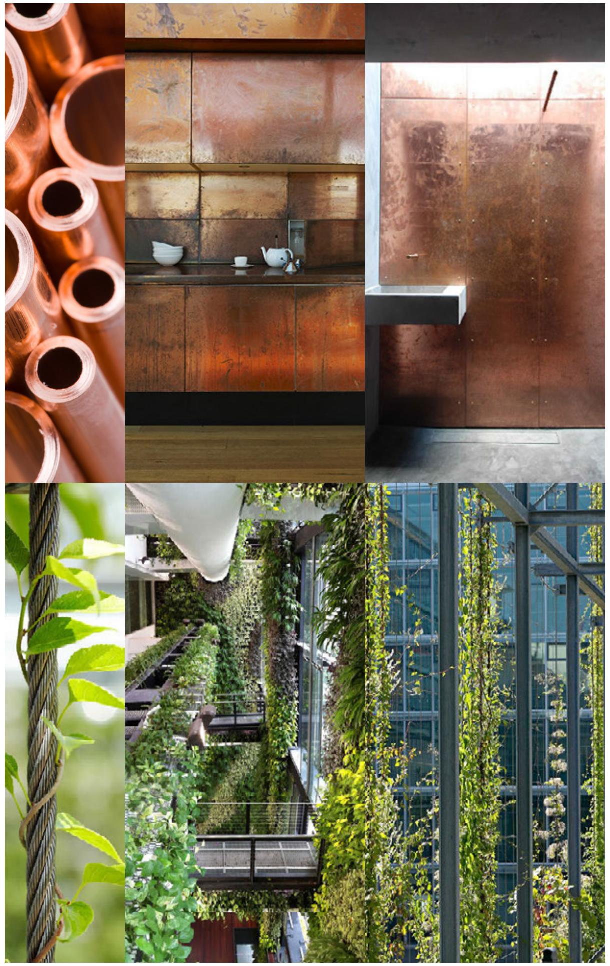
SWISS KRONO OSB/3: the Cost-Effective AlternativeContiFinish®, bonded with formaldehyde-free resin, CE

The Economic Alternative, Made from Mixed Wood

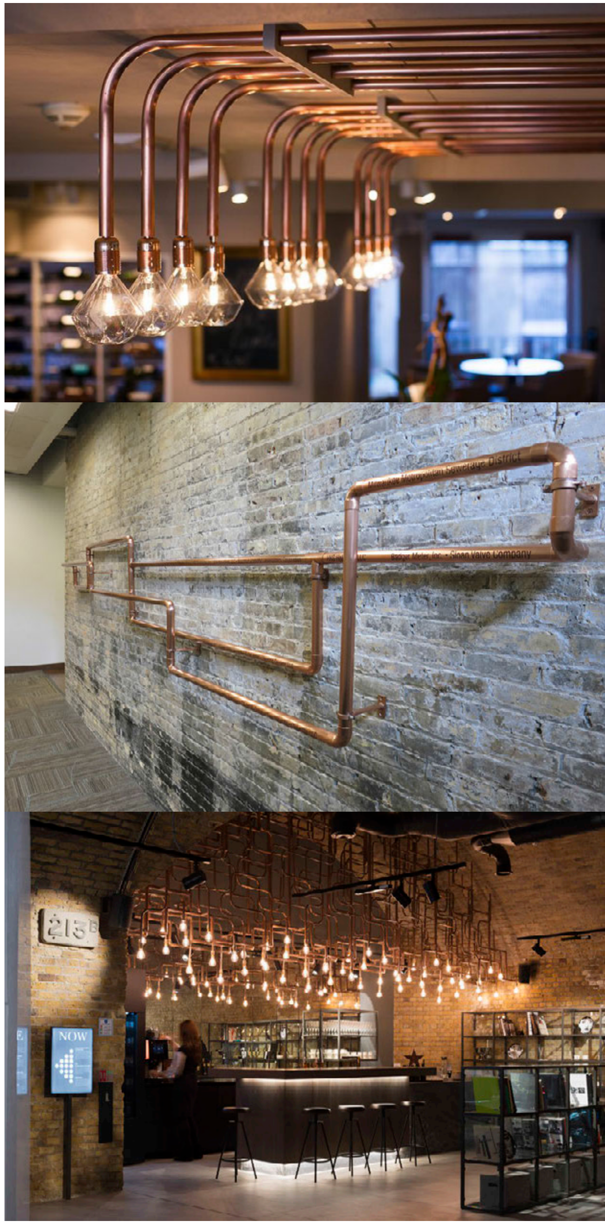
SWISS KRONO Kft. produces environmentally sound wood-based materials that are CE-certified according to EN 13986 and produced in compliance with EN 300. SWISS KRONO OSB/3 is an attractively priced yet strong alternative. This engineered wood product made from mixed woods lends itself for loadbearing and reinforcing purposes. Sporting a ContiFinish® surface, the sturdy panels are suitable not only for interiors, but also for use in moist rooms and exterior areas where they will not be exposed to the weather. SWISS KRONO OSB/3 excels with excellent dimensional stability and strength. The many advantages of OSB/3 include the fact that, unlike conventional chipboard, even relatively thin panels are quite strong. Besides reducing the weight of structures, which also facilitates installation, this saves material.

Fig 183 Swiss Krono (Swiss Krono, 2017)

FOCAL



PLANTING



6.2.2 Services

The flow of natural air and natural light is an important aspect of the design. It is key for the plants to flourish. Suction fans will be introduced in the existing chimneys which will aid in controlling the humidity within the building. Fans on the lower level will ensure that cool, fresh air is sucked into the building.

Services should always be visible and not chased into walls and roofs. Gulleys and gutters for the hydroponic water flow should be part of the new structure, together with lighting which is suspended in service trays which will be put inside copper tubing against walls to become focal points within the architecture.

It is a continuous flow of energy - moving around and interacting with one another. As with the site as a whole, water plays a very important role within the program. The flow thereof, the flow of process - as with the past processes, creates a tangible as well as intangible meaning to the architecture.

Fig 184 Envisaged new materials palette

6.2.3 Walls & Infill

As lighting plays a very important role in the project, transparency is needed. Light aluminium alloys framing will host the glazing which will selectively replace the original infill of the façades. This will allow for light to filter through the building which is reflective of the landscape and transparent to the interior.

Where new brickwork is visible, a light almost monotone brick will be used with a non conventional bonding pattern to contrast with the existing structure. This will however depend on the program materiality guides and the type and availability of space. The office space is intimate, lower in volume and more private than the open spaces that requires height, light and free movement.

No cladding systems are used to hide façades or services. The materiality should guide the architectural - rugged but elegant.

Manufacturers

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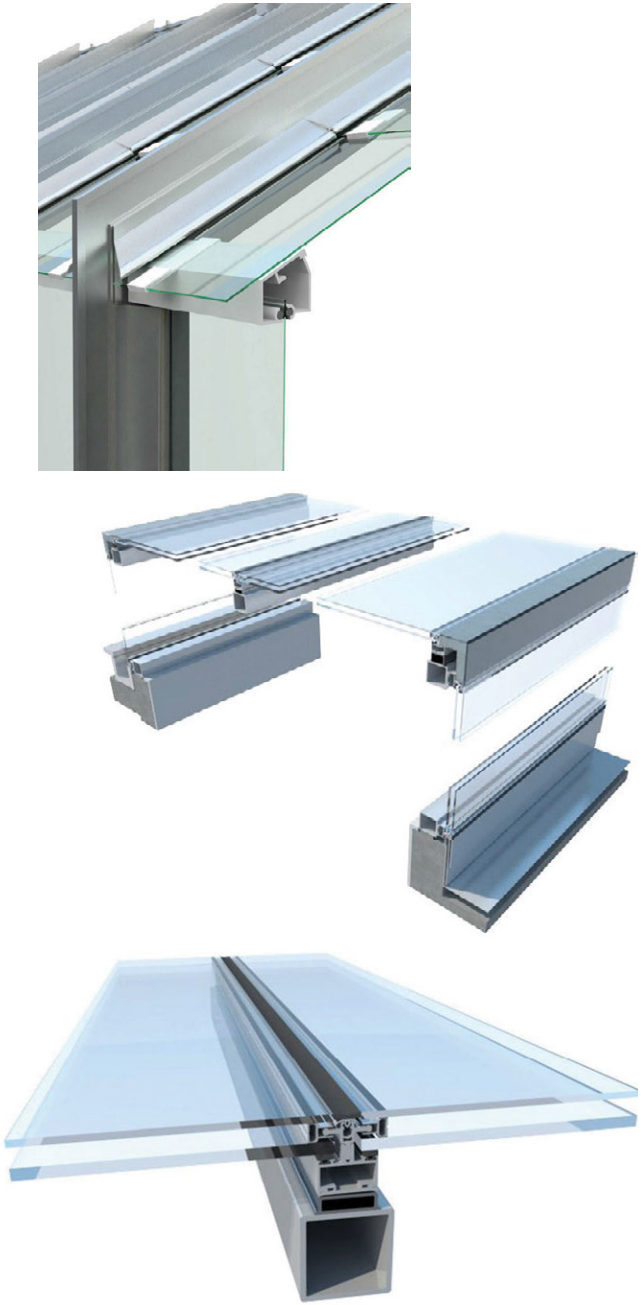
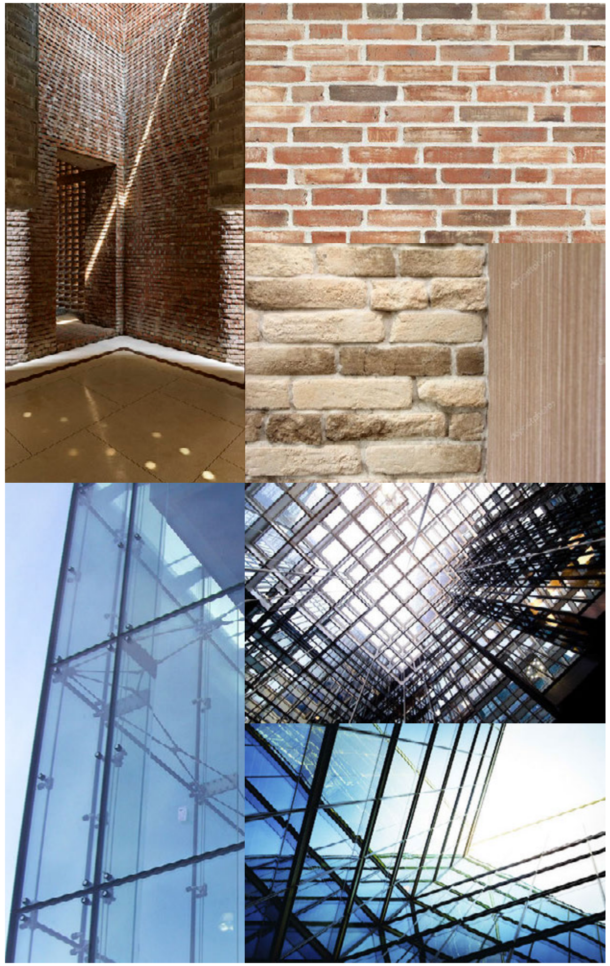


Fig 185 Glazed roofs & walls (Watts, 2013)

New pattern



Transparency

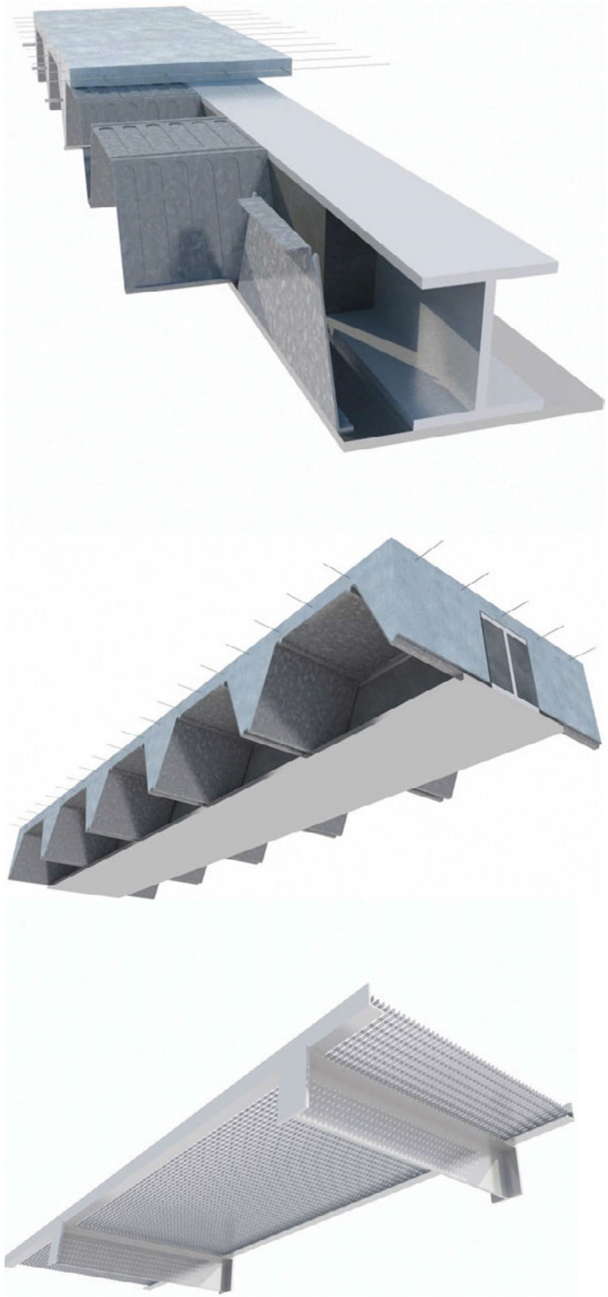


Fig 186 Steel composite & steel mesh floor (Watts, 2013)

Fig 187 Boiler house & unique detailing

Fig 188 Turbine Hotel (Leading Architecture, 2011)

6.2.4 Flooring & Roofing

New flooring will mostly consist of Mentis Grating or similar technology to allow for easy maintenance and to allow for the visibility of the verticality of the building.

Raised flooring was chosen to be used for the distil space to bring it to the same level. This was chosen in order not to disrupt the original flooring, its beauty and ventilation from below.

In moving away from the stereotomic architecture of the original infrastructure, a composite floor will be constructed rather than the required solid floors. This will be used mainly to separate the culinary school from the hydroponics above to prevent the water from entering the space. The two CWG buildings' floors will need to be installed in the buildings as there are only steel floors that are not built into the inside walls. This again, creates a vertical space. In addition, the height of the windows make it difficult to add floors in the conventional heights as it would run diagonally across the large windows.

For this reason, where new floors are introduced inside the existing structure, grating will have to be used. Similarly, where completely new structures are built, composite floors will be used.

As with the façades, the glazed walls will continue onto the roof to allow for the maximum light to penetrate the building. The roof of the distillery will become a green rooftop space that will add to the cultivating of some species of plants which can handle the direct and reflected heat from the building.

The roofing material of the office spaces in the CWG buildings will be replaced with new corrugated Klip-lok roofing.

In a sense the deconstruction of the existing building allows for the openness and transparency of the new architecture and the industry that it contains.

6.3 Structural Development

The development starts by looking at the connection of new technology with the old namely how one could interact with the materials in a mostly non-destructive manner that will leave the original material intact, in a sense, - by looking at the manners in which they connect e.g. attaching to and fastening with bolts instead of welds, lightly touching the existing, instead of breaking into it.

The chosen material is meant to enhance the structure and accentuate the existing materials where new materials are light, set against the dark rust and red facebrick of the existing structure.

The new structural framing of the corridor, culinary/hydroponic space as well as the propagation house are extensions of the existing proportions. The uniquely shaped portal framing binds with the existing architecture as an extension into the landscape.

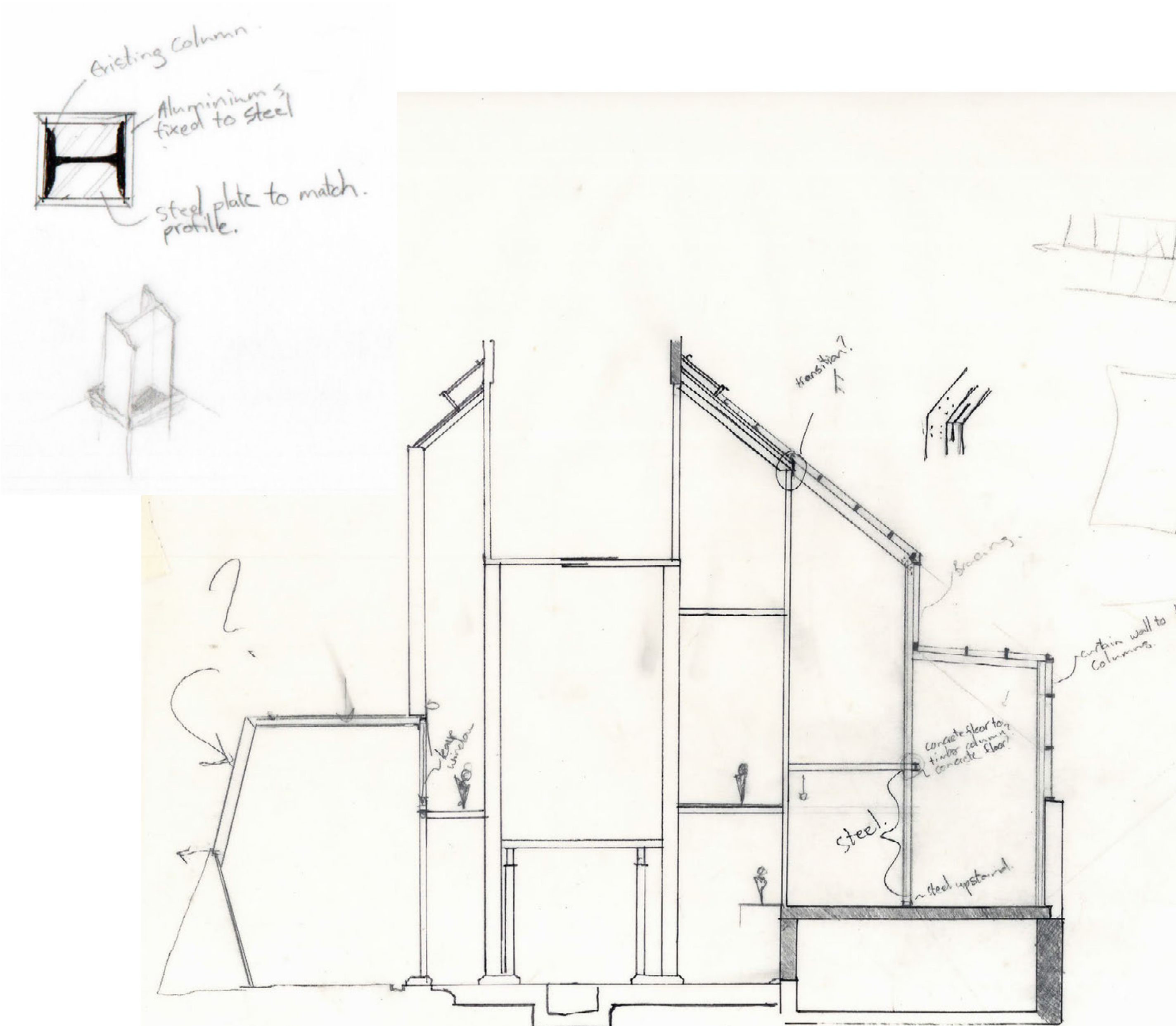
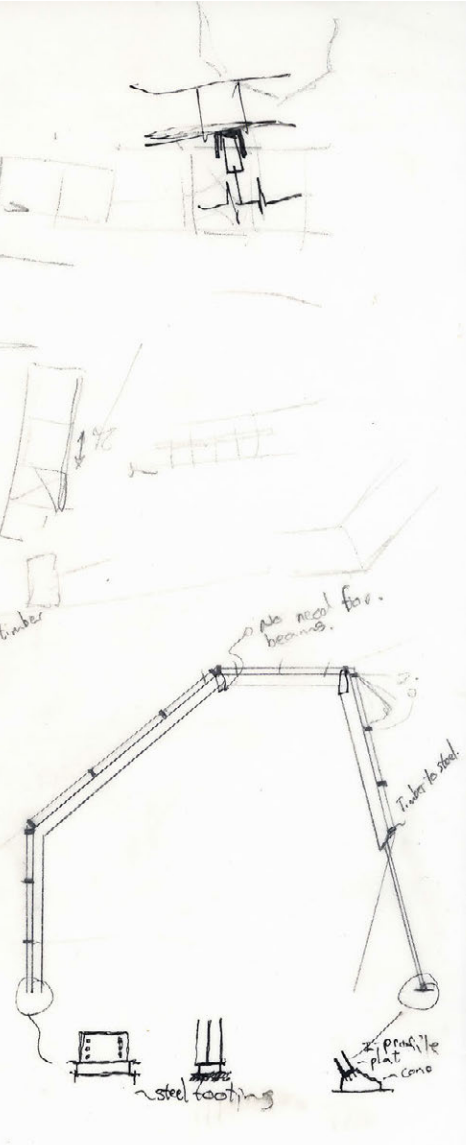
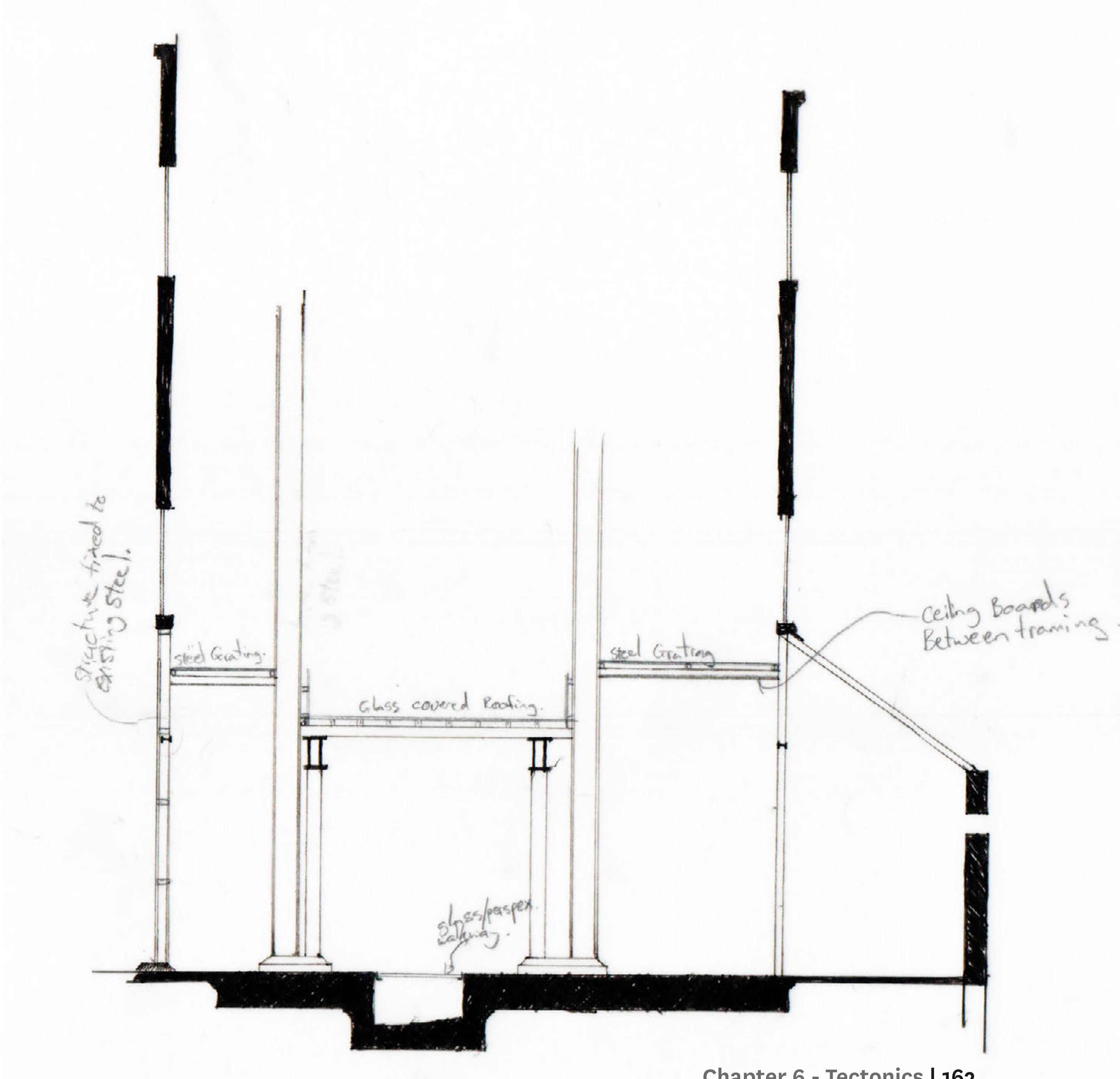


Fig 189 Technical development


no need for beams.
Timber to steel
steel footing


Structure fixed to existing steel.
steel Grating.
steel Grating
Ceiling Boards Between framing
Glass covered Roofing.
glass/perspex walkway.

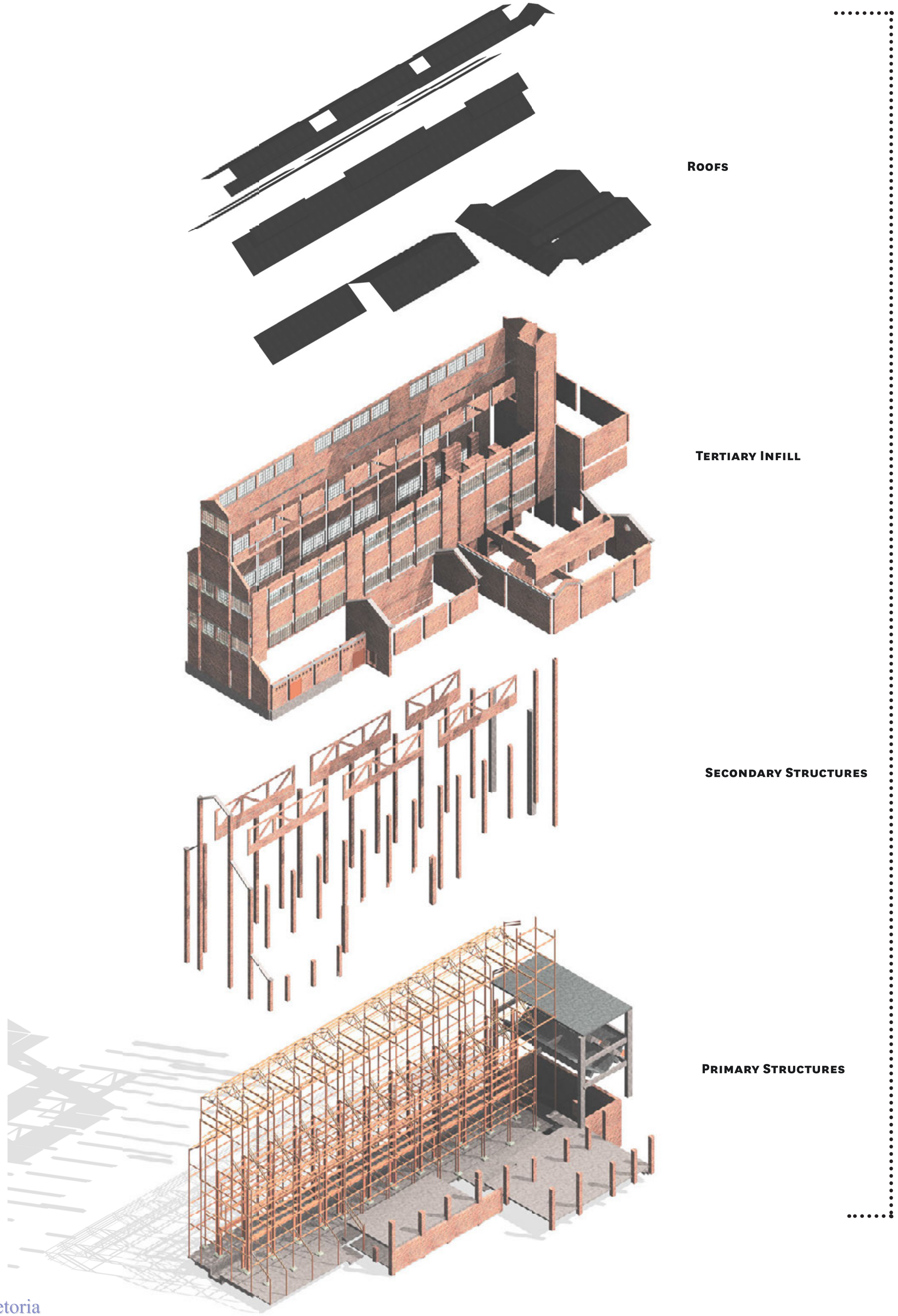
6.3.1 Primary Structure

In working with an existing building from the word go, this in itself, becomes the primary structure. It becomes a support structure for the new infrastructure in the literal sense although the new infrastructure is intended to support the old structure in the new implementation. This is meant to en-frame the Retort, add to it and not take away from it.

Newly added primary structures are made of aluminium alloys and Particleboard frames that differs in each implementation, adapting to its function.

6.3.2 Secondary Structure

The secondary structure is made up of various materials; with the red face brick being predominant in the existing. Newly added light aluminium alloys and glazed façades will complement the existing infrastructure.



Editing the Infrastructure

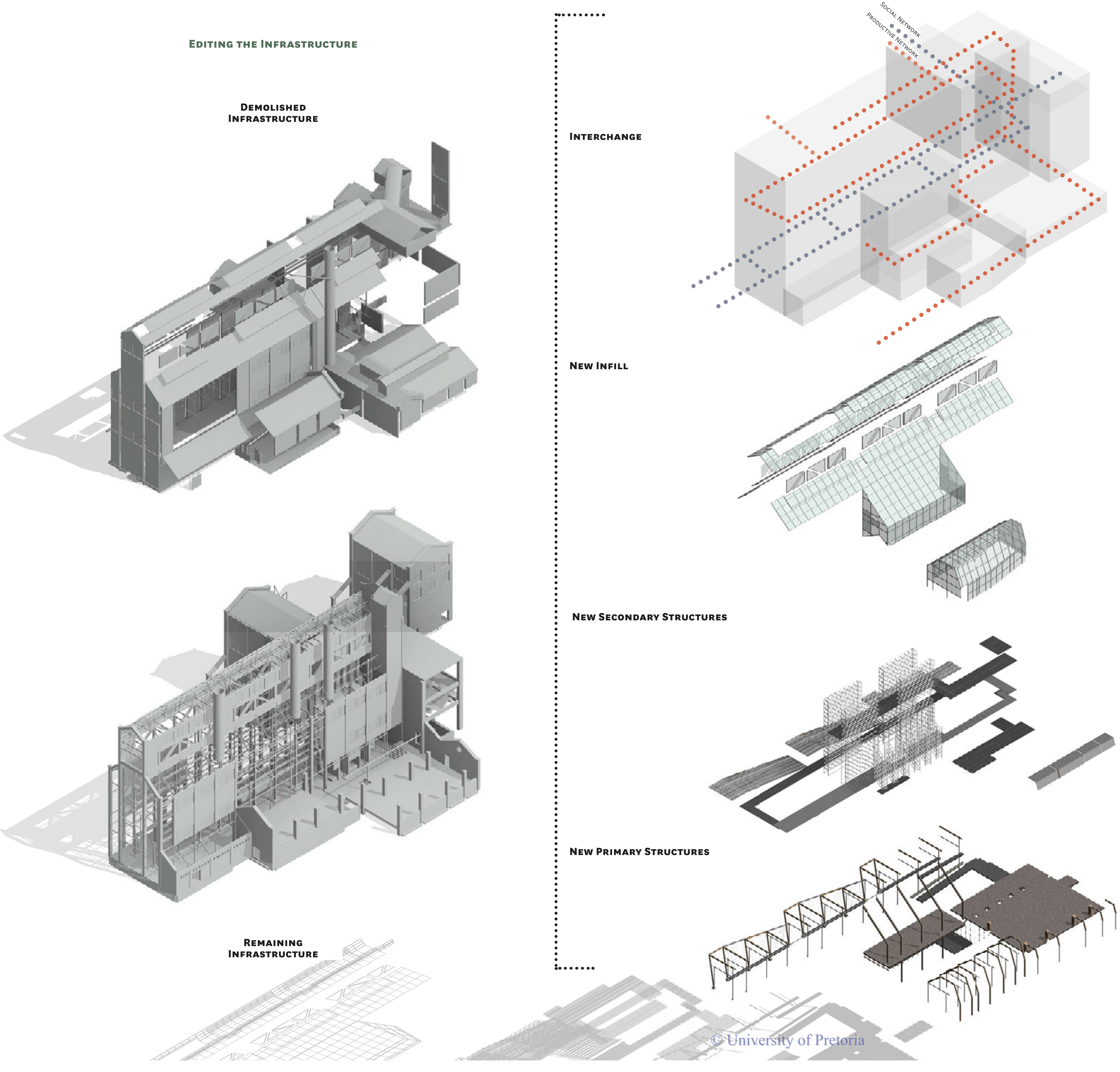


Fig 190 Structural components

6.4 Floor Plans

6.4.1 Site Plan

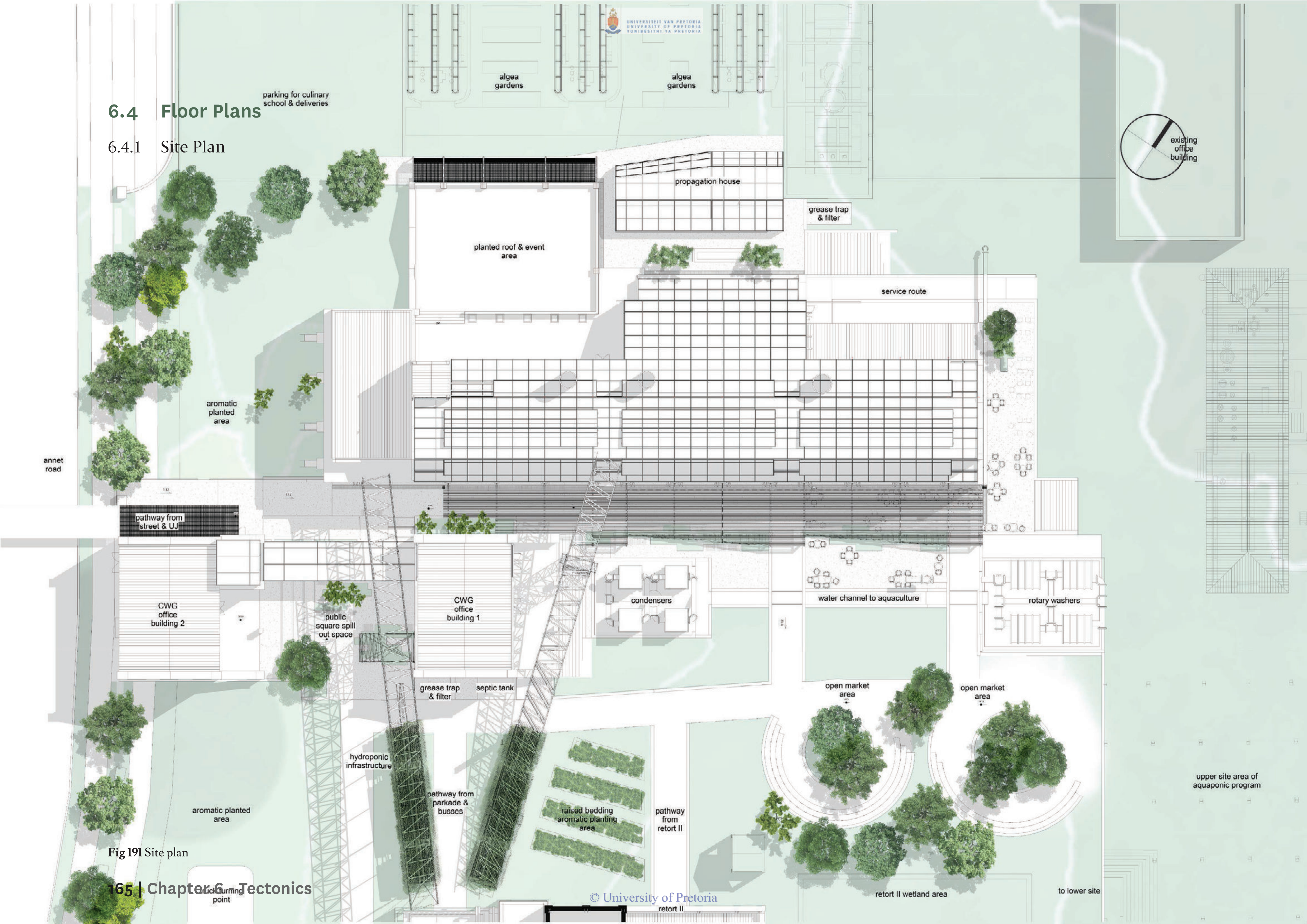


Fig 191 Site plan

6.4.2 Ground Floor Plan

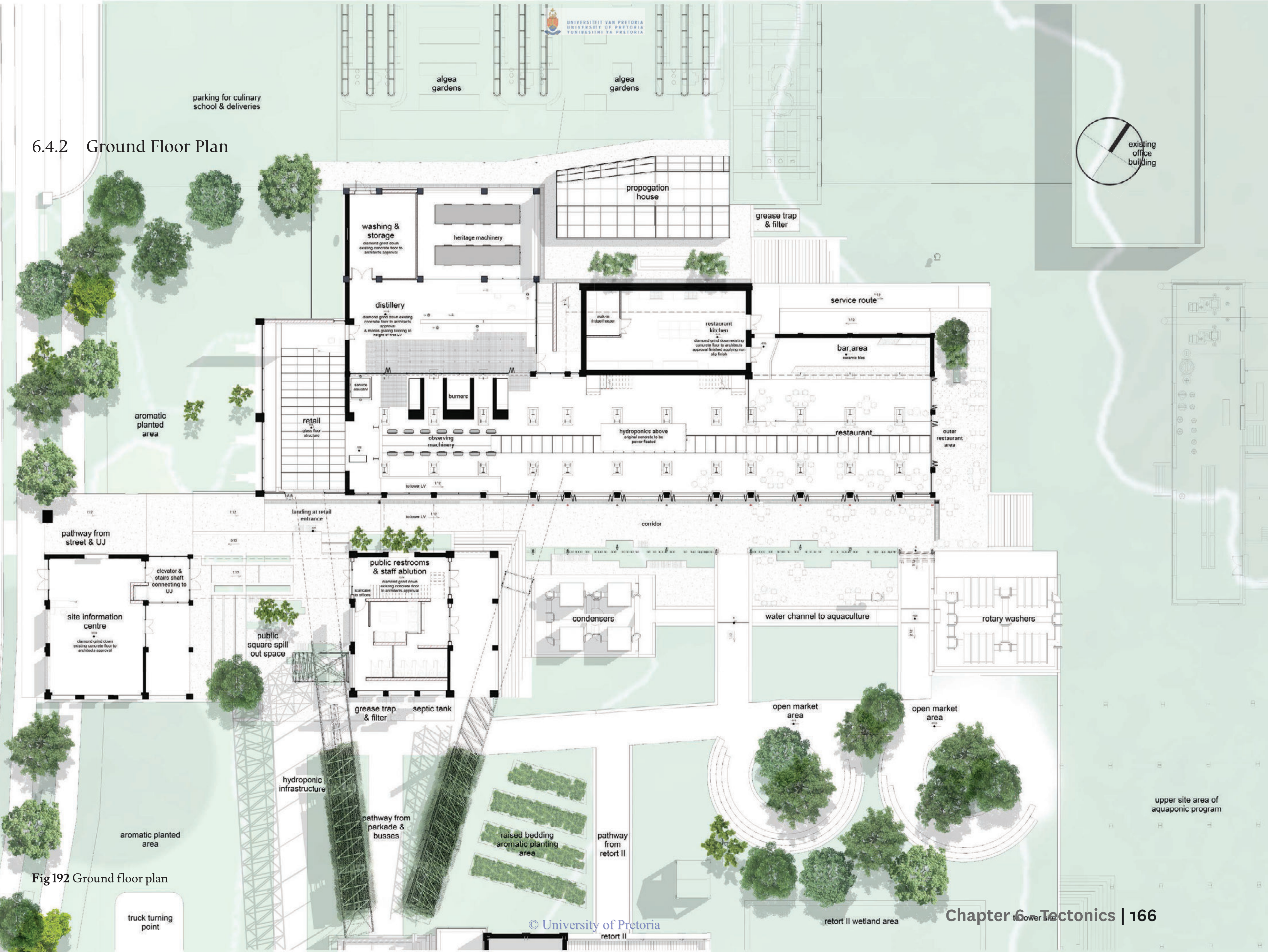


Fig 192 Ground floor plan

6.4.3 First Floor Plan

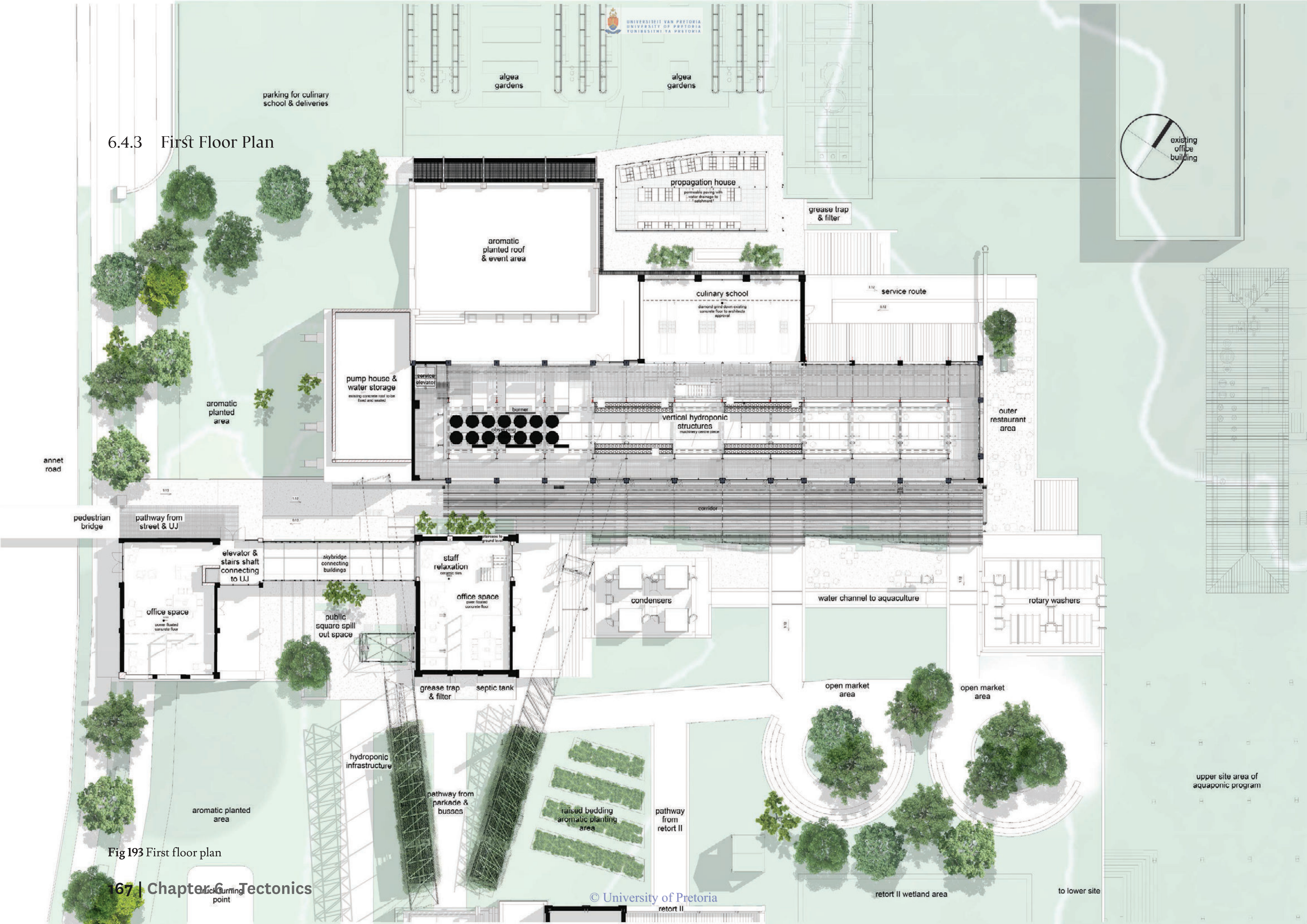


Fig 193 First floor plan

6.4.4 Second Floor Plan

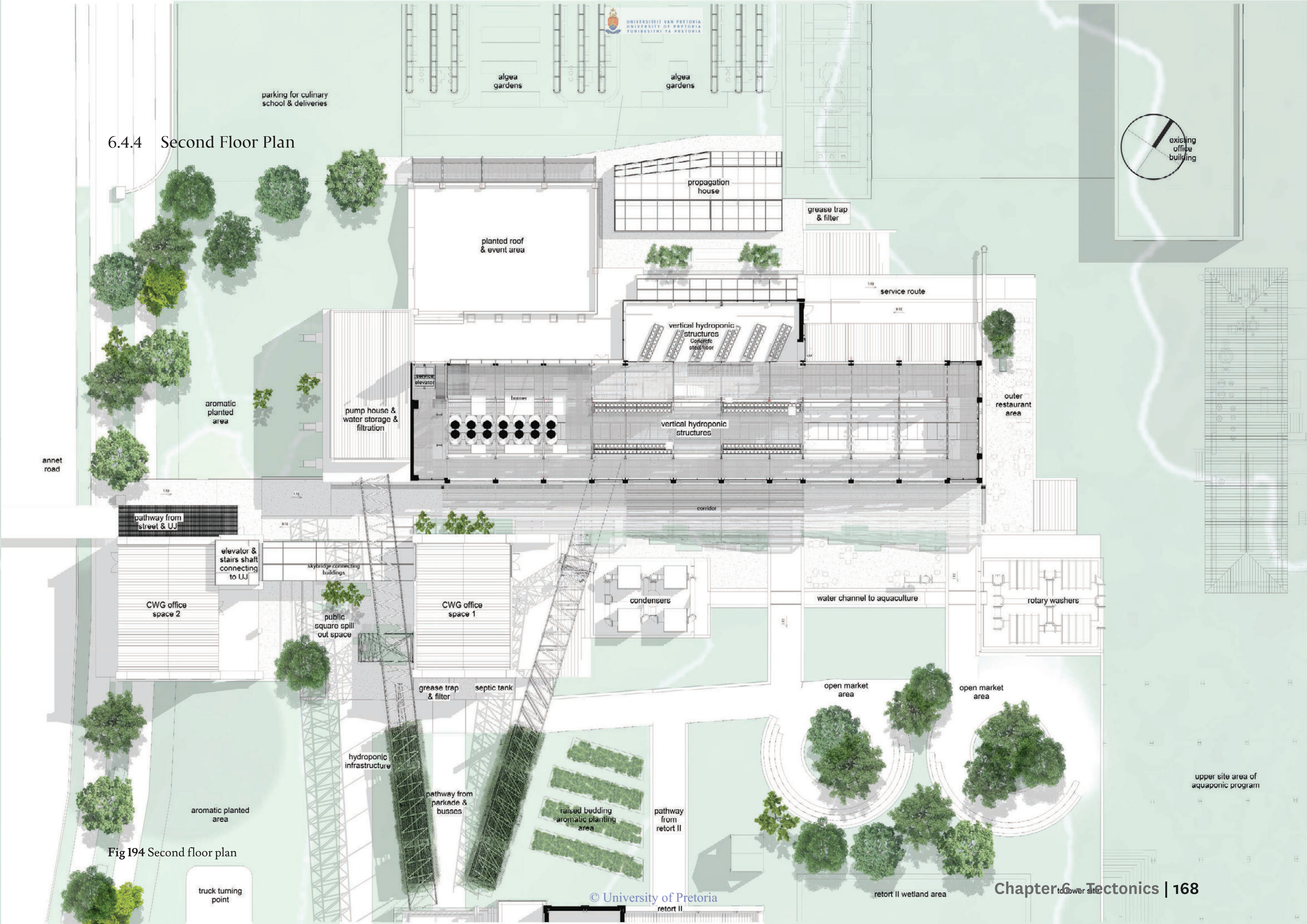


Fig 194 Second floor plan

6.5 Sections

6.5.1 Section AA

Section AA cuts through the central part of the building to indicate the foyer space leading into the Retort through the corridor with the hydroponics above leading up to the culinary school to the outside and through the propagation house into the algae gardens.

Fig 195 Boiler to be hung in central space

Central to the Retort is a suspended piece of machinery that stood in the boiler house.

The section also shows how the site falls from the northern side of the building to the southern side, it being almost a complete storey underground.

The submerged kitchen area would need mechanical ventilation for the services it contains because there would only be one entrance to the outside of the room and one entering the restaurant. With its monolithically thick walls and therefore thermal mass, heat gain will be minimal from outside sources whilst only excess heat from the inside would need to be extracted.

The kitchen which is a hygienic area, would need a cleaner floor surface rather than the rough concrete surface it currently has. The existing concrete will be diamond grind and sealed with a non-slip finish to ensure the safety of the staff as well as for ease of cleaning.

The floor separating the culinary space from the hydroponic space will need to be cast in place in order to ensure maximum water-tightness. It is a composite floor on open web joist beams made from aluminium alloys and the Particleboard members. The combination of materials will make the space feel lighter than only consisting of a heavy concrete floor. To the outside space, the ceiling steps to allow for the removal of excess heat through ventilation to the hydroponic space above. A louvred system under the glazed roof allows for dappled shading.

The culinary space opens up onto a courtyard space that acts as a spill out space as well as a central space that meets up after coming from different directions. This also ensures easy access to the propagation house for users of the culinary school.

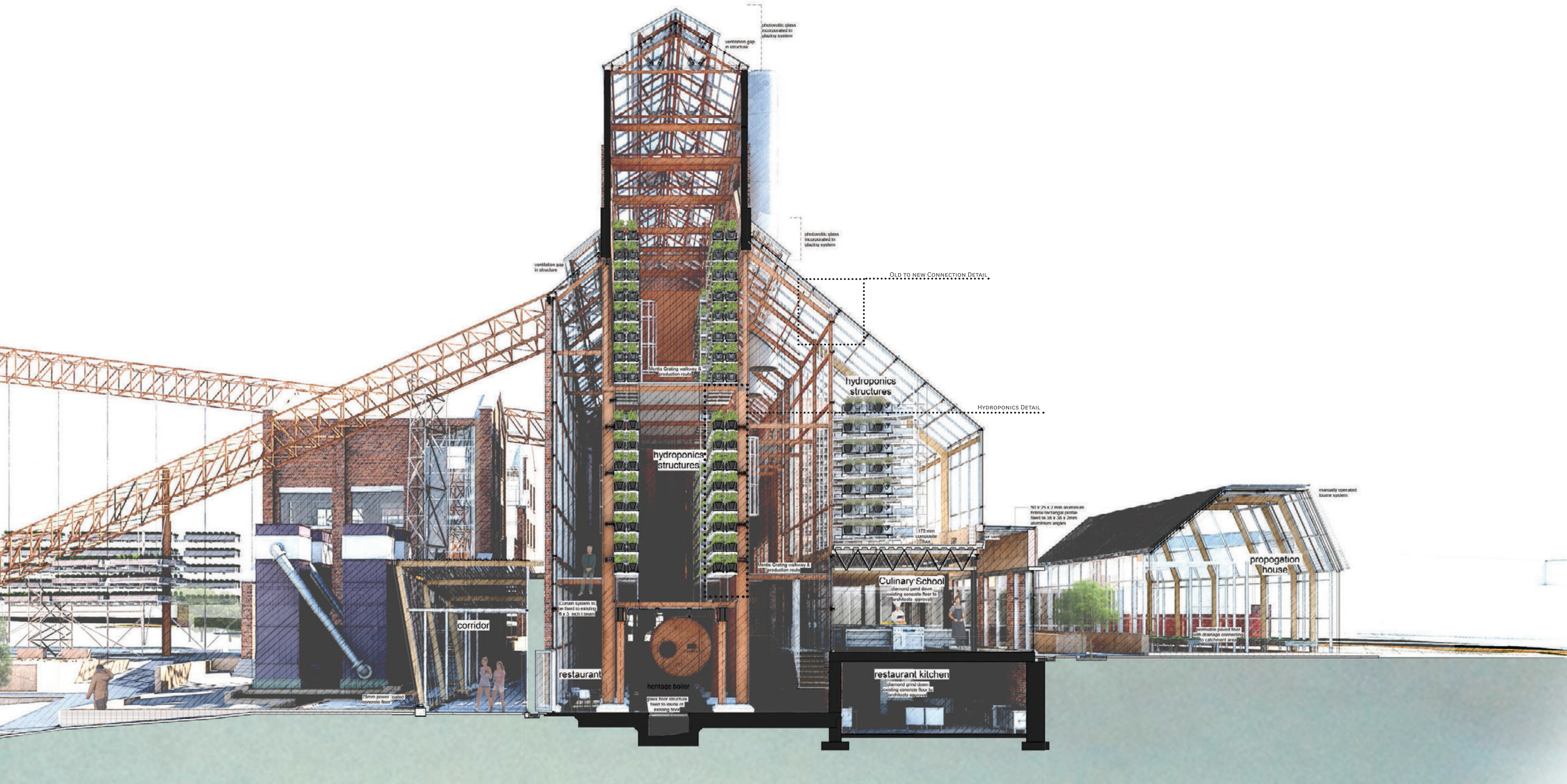
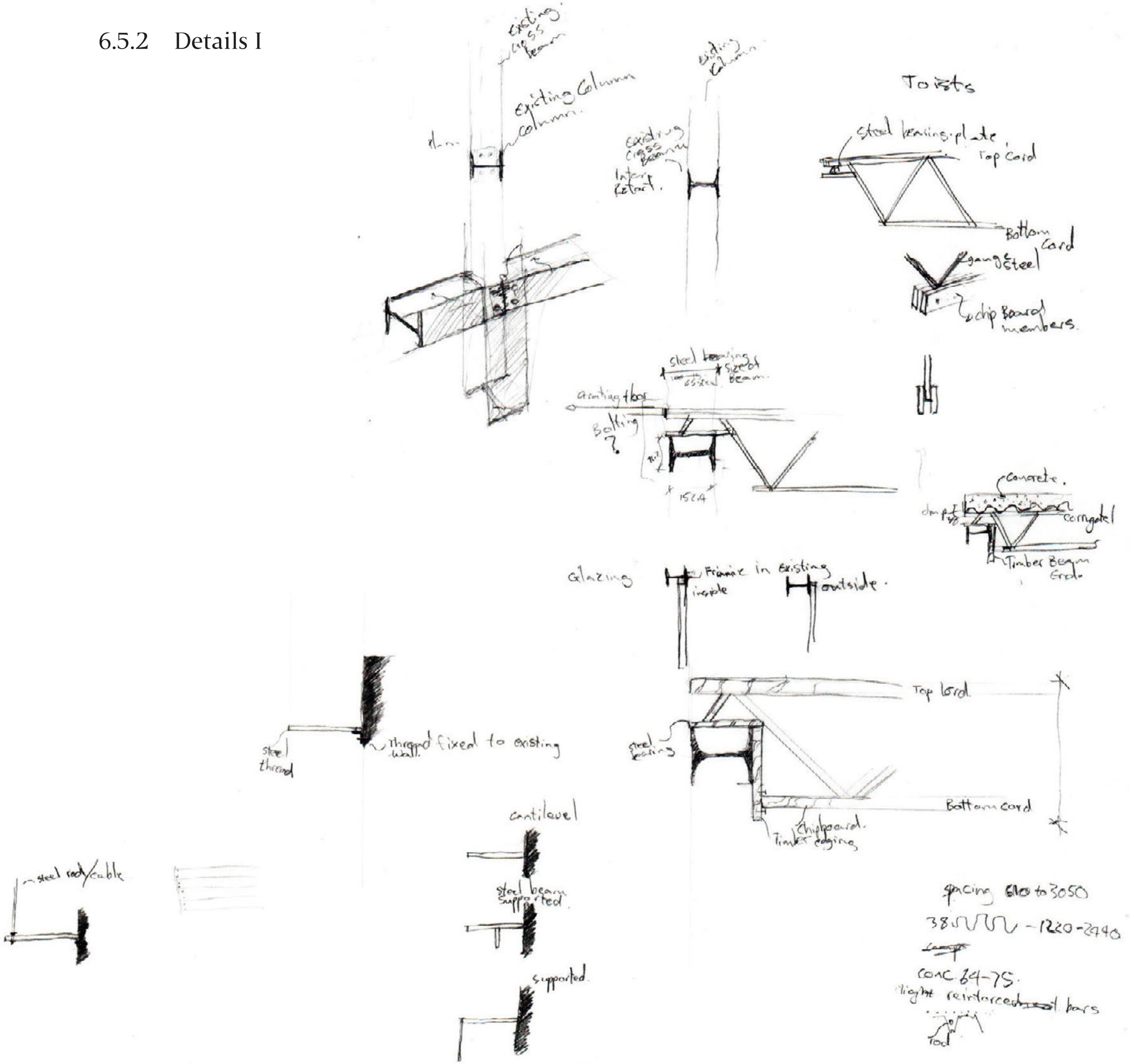
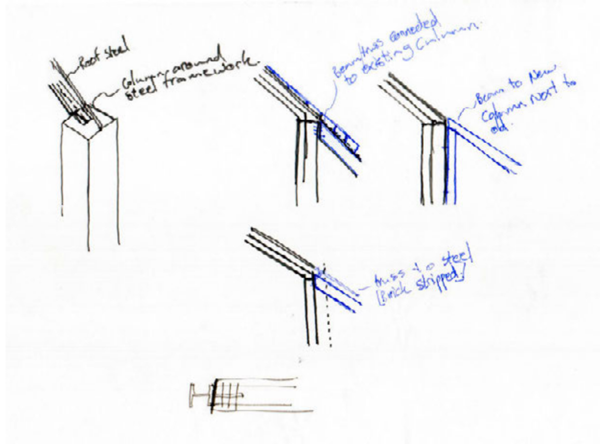


Fig 196 Section AA

6.5.2 Details I





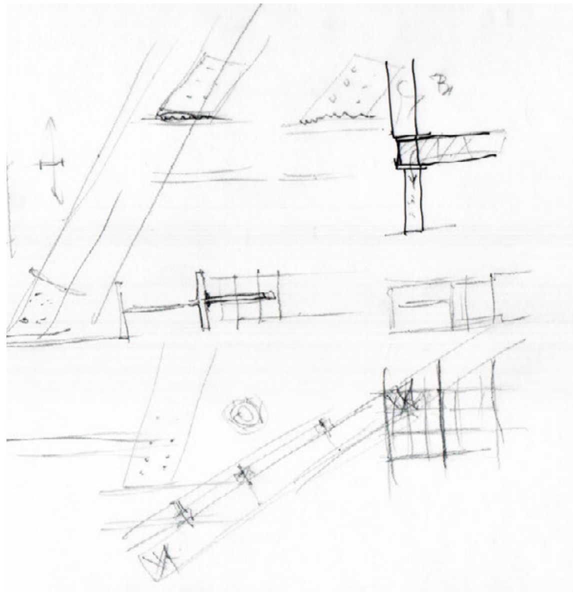


Fig 197 Detail development I

Hydroponics Detail

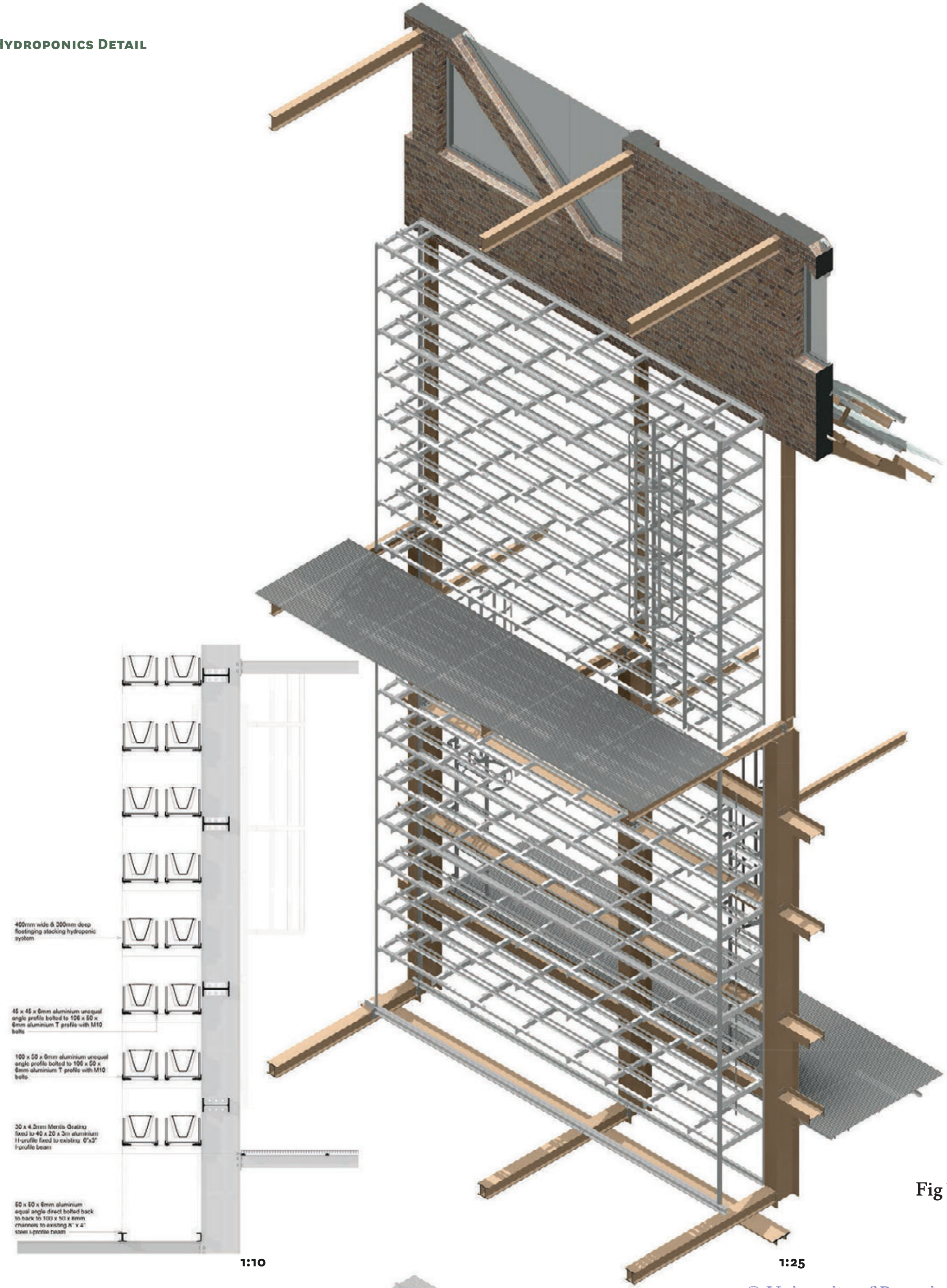


Fig 198 Hydroponic detail

Old to new Connection Detail

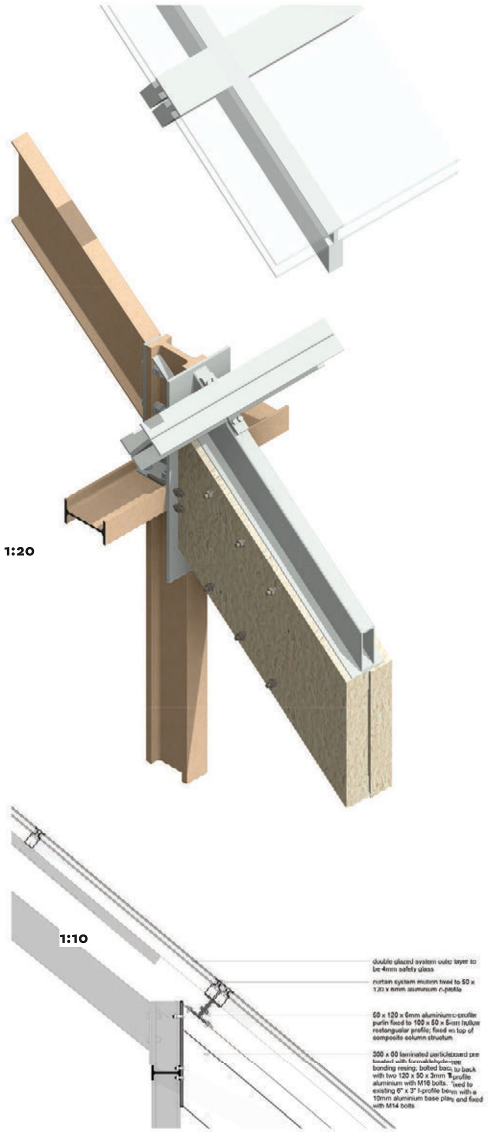
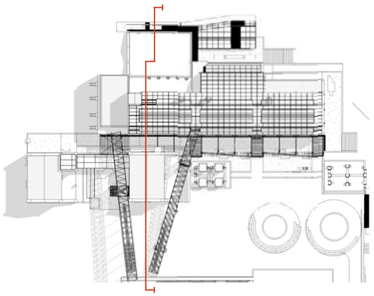


Fig 199 New to old detail



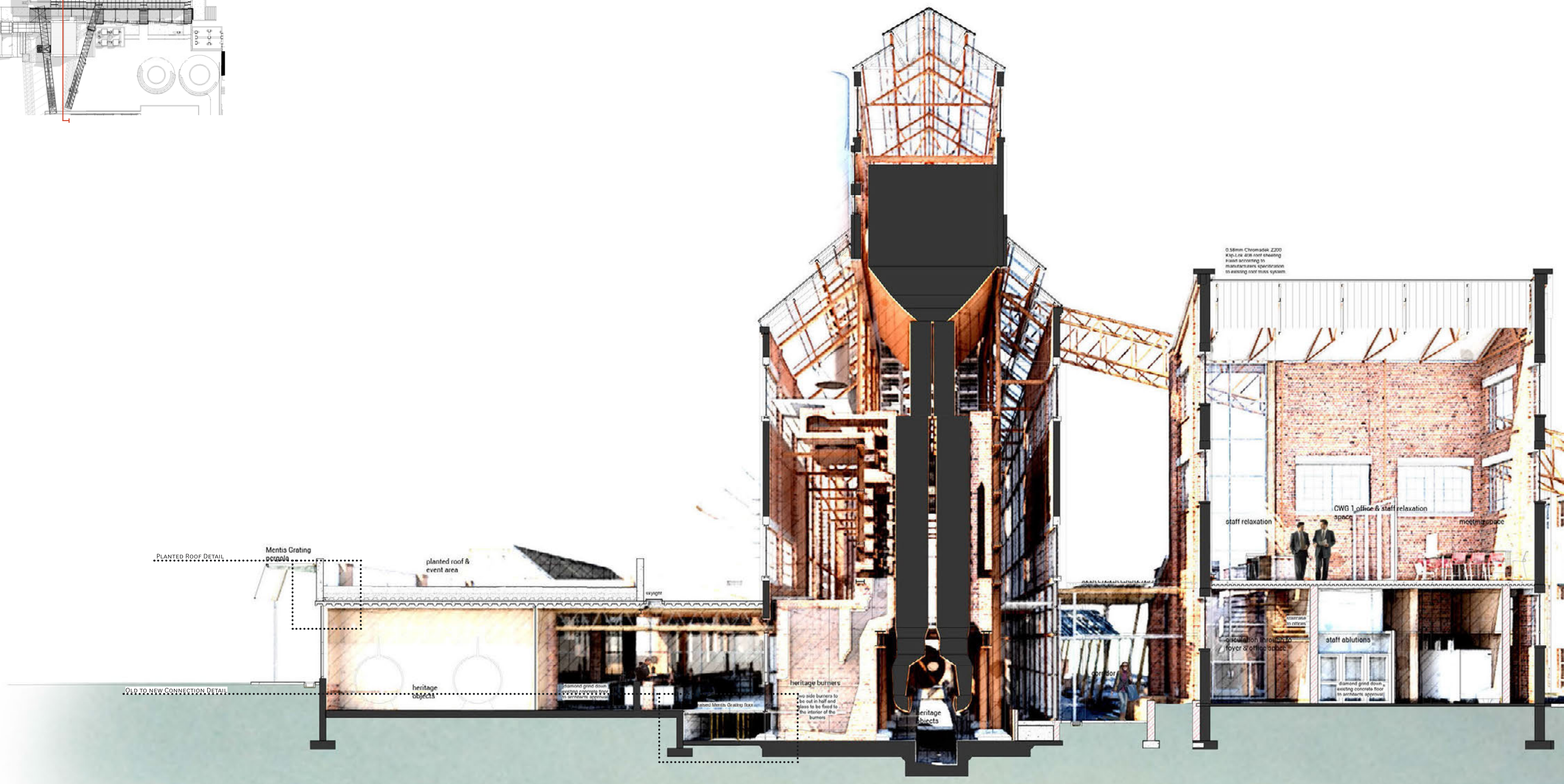


Fig 200 Section BB

6.5.3 Section BB

Section BB cuts through the distillery, showing the display of the old boilers and the space of distilling. The staff ablution and public rest rooms on the right shows how the new functions are inserted into the old CWG building. The centre of the Retort shows the heritage machinery with all its functions that used to dominate the interior of this building.

The distillery is set more to the interior of the building where it will not be influenced by direct light that will heat up the space. It is more monolithic than the other structures - with its planted and concrete roofs. The planted roof is an extension of the hydroponic system as a productive rooftop with planting that can handle the direct and indirect light.

The CWG building shows how the windows are placed oddly and at uncomfortable heights. On elevation, it matches the building proportionally, although when trying to insert a new function within this structure, the levels becomes an issue.

The display of the original boilers will be placed in view of the passers and in `view of users approaching the building from the algae gardens.

6.5.4 Details II

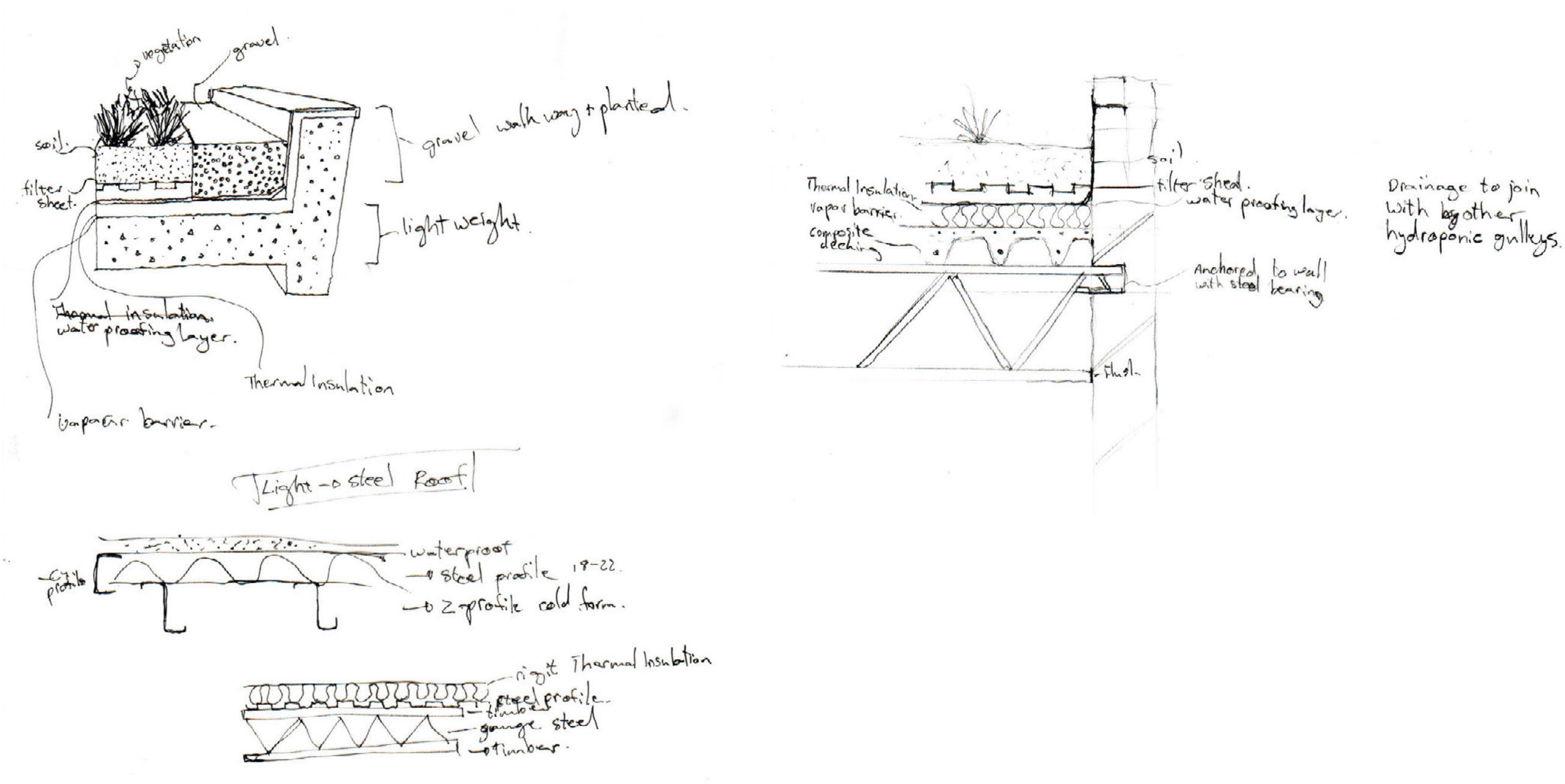
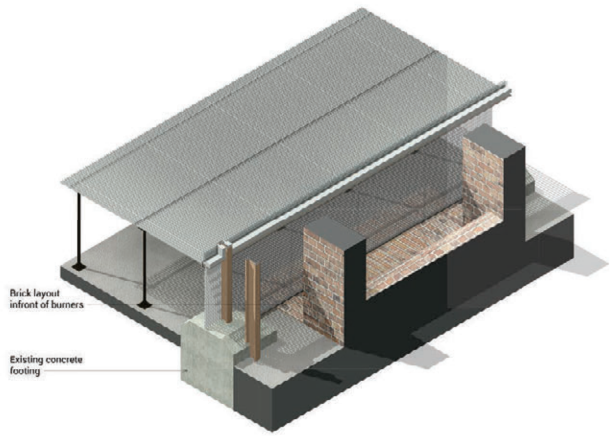
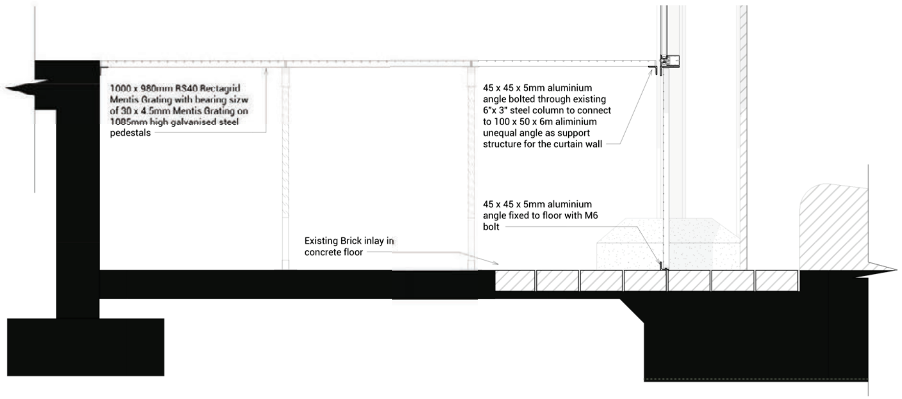
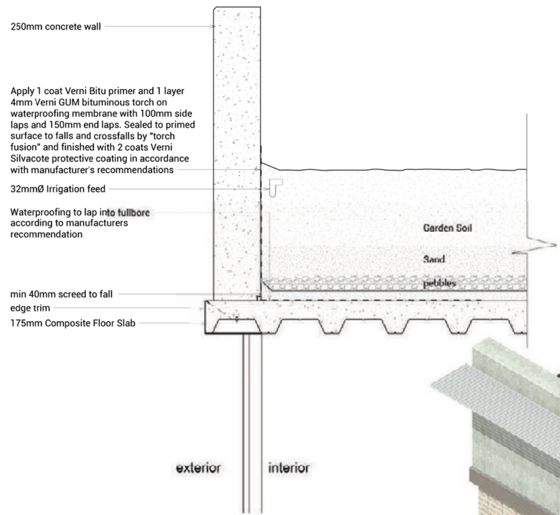


Fig 201 Detail development II

Raised Flooring 1:10







Planted Roof 1:10

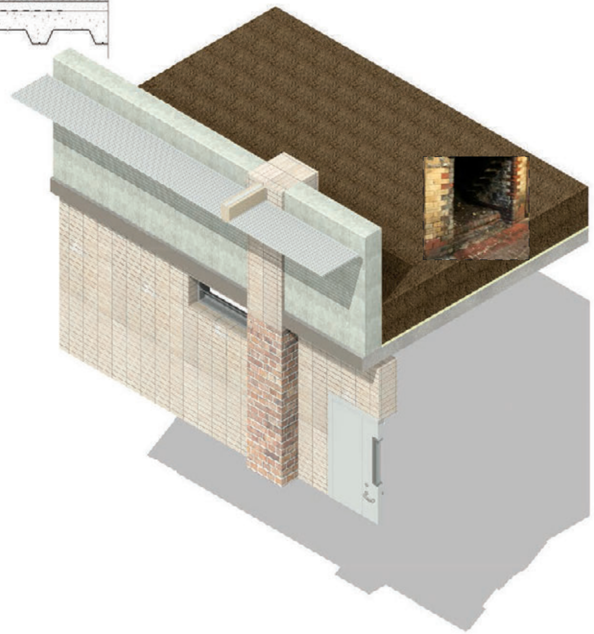
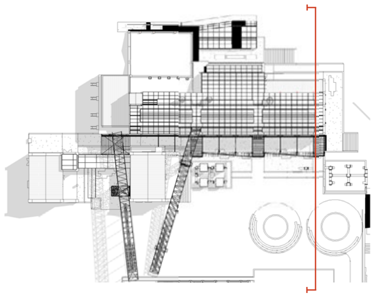


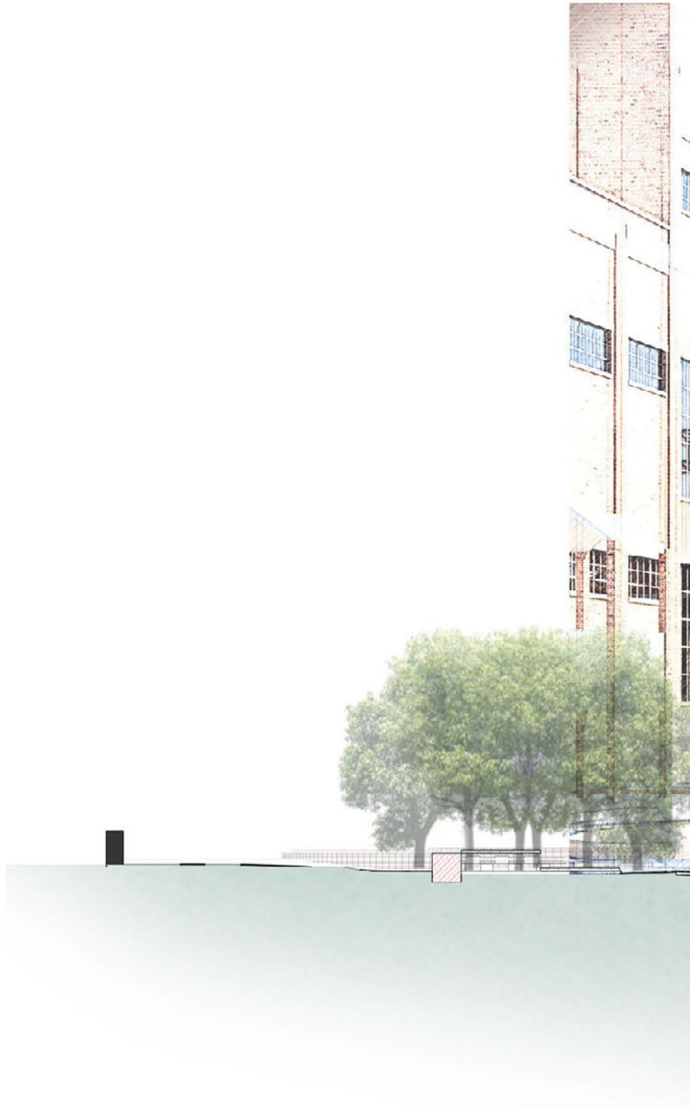
Fig 202 Raised flooring detail

Fig 203 Planted roof detail

6.5.5 Section CC

Section CC shows the bar area, the restaurant and the foyer space where the restaurant expands into the landscape. The informal market area of the foyer is on the left-hand side.





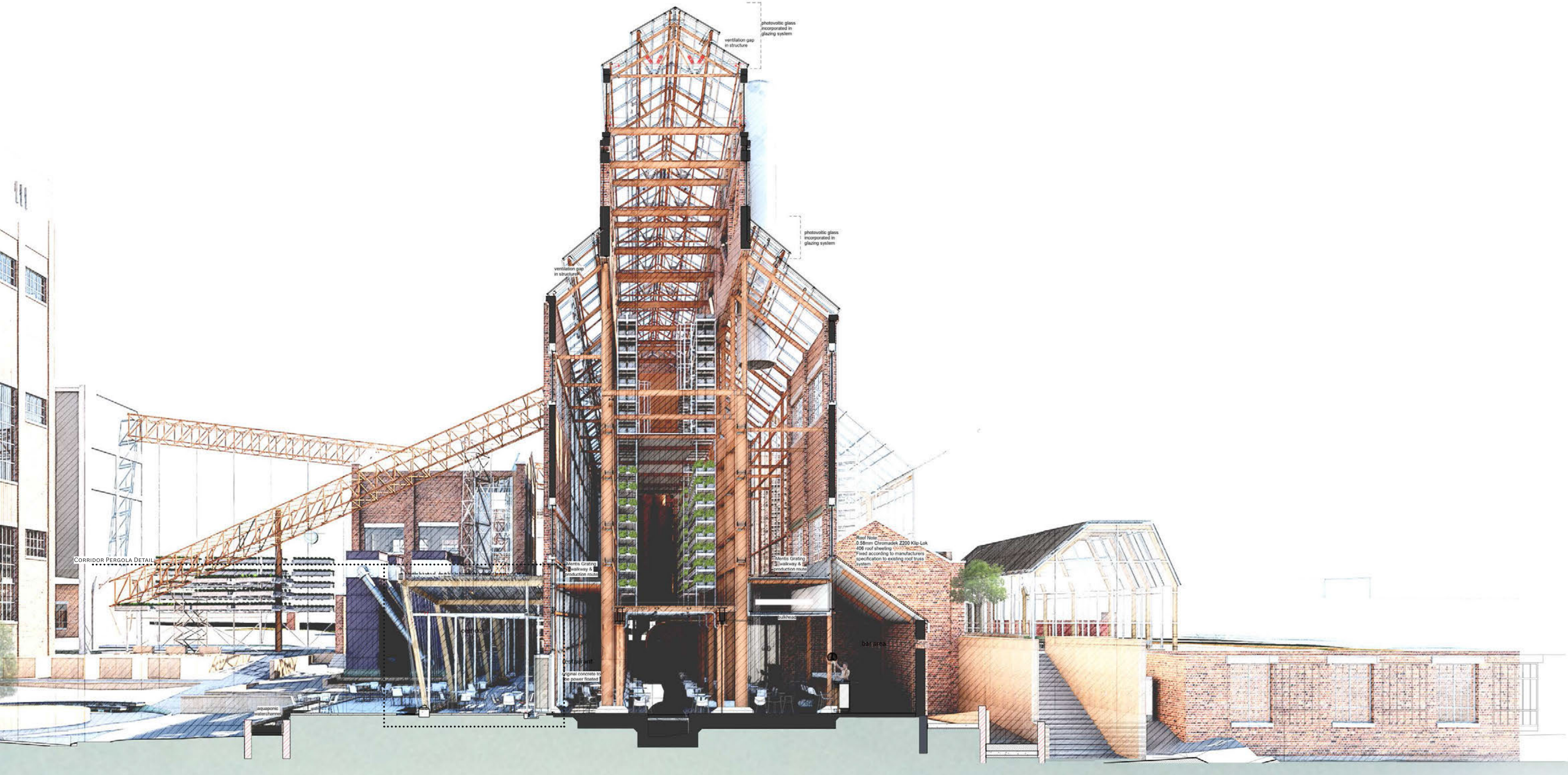
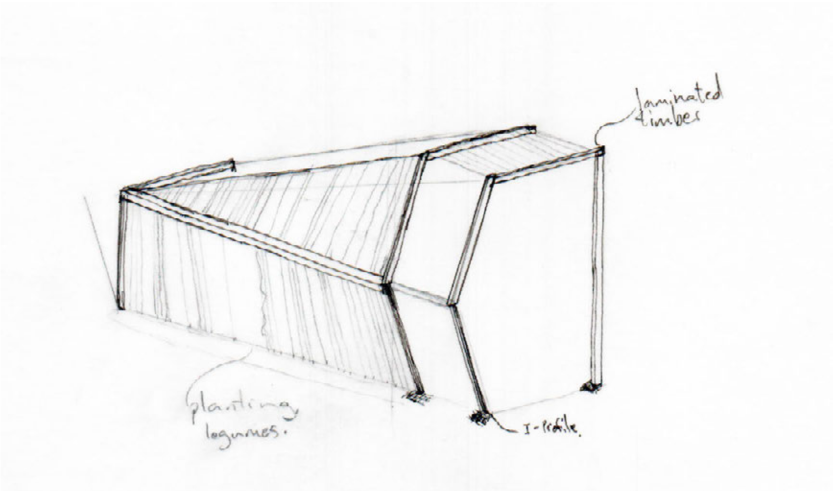


Fig 204 Section CC

6.5.6 Details III



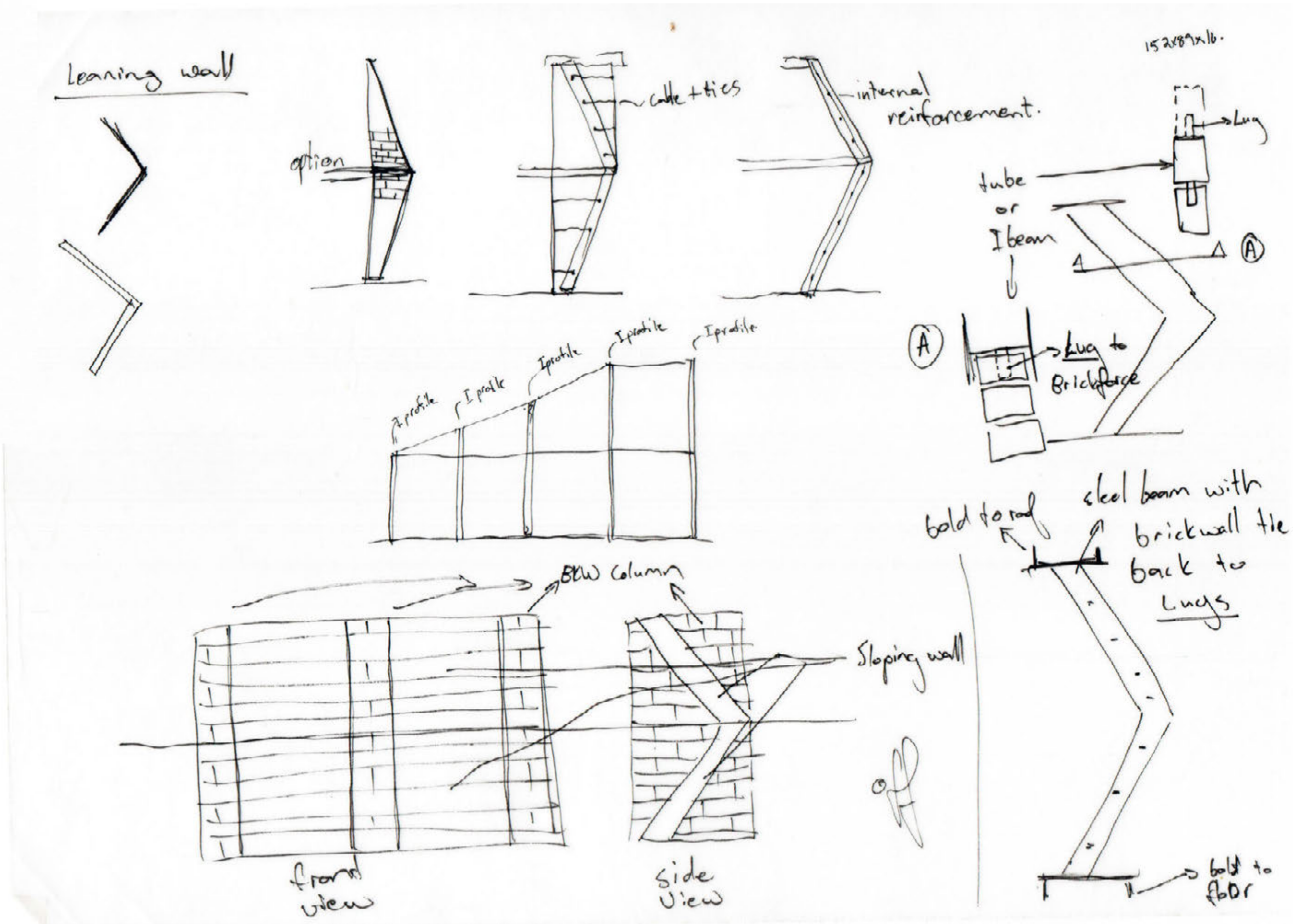
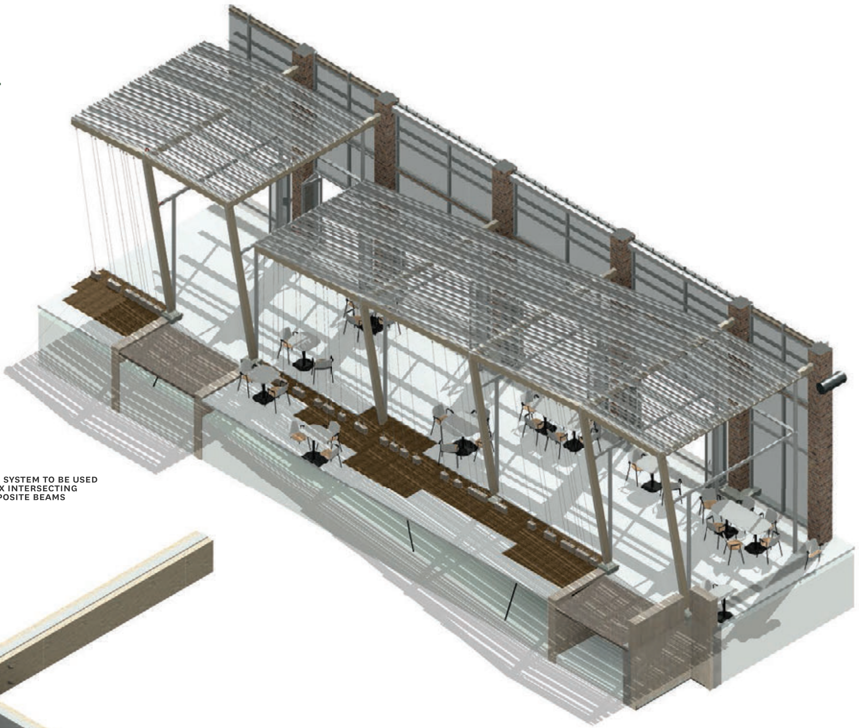
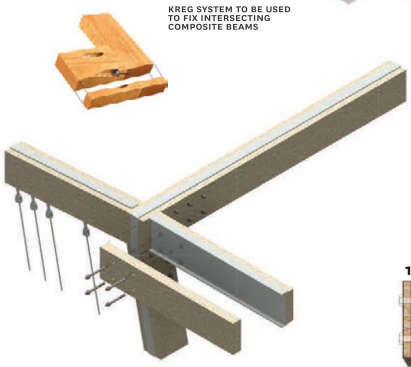


Fig 205 Detail development III

Corridor Pergola Detail





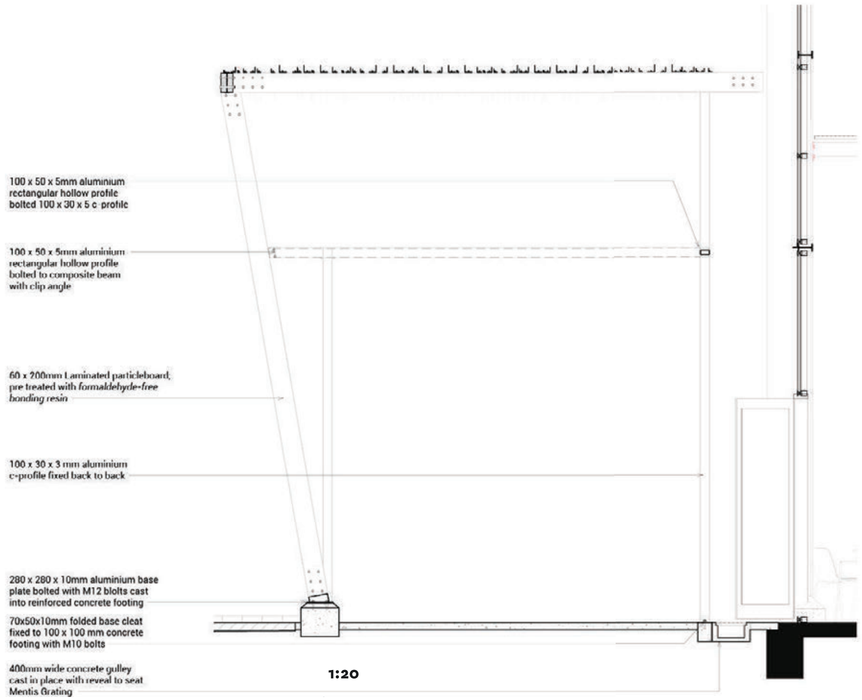
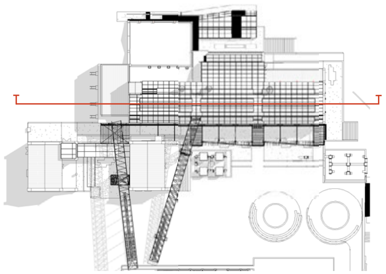


Fig 206 Corridor structure detail



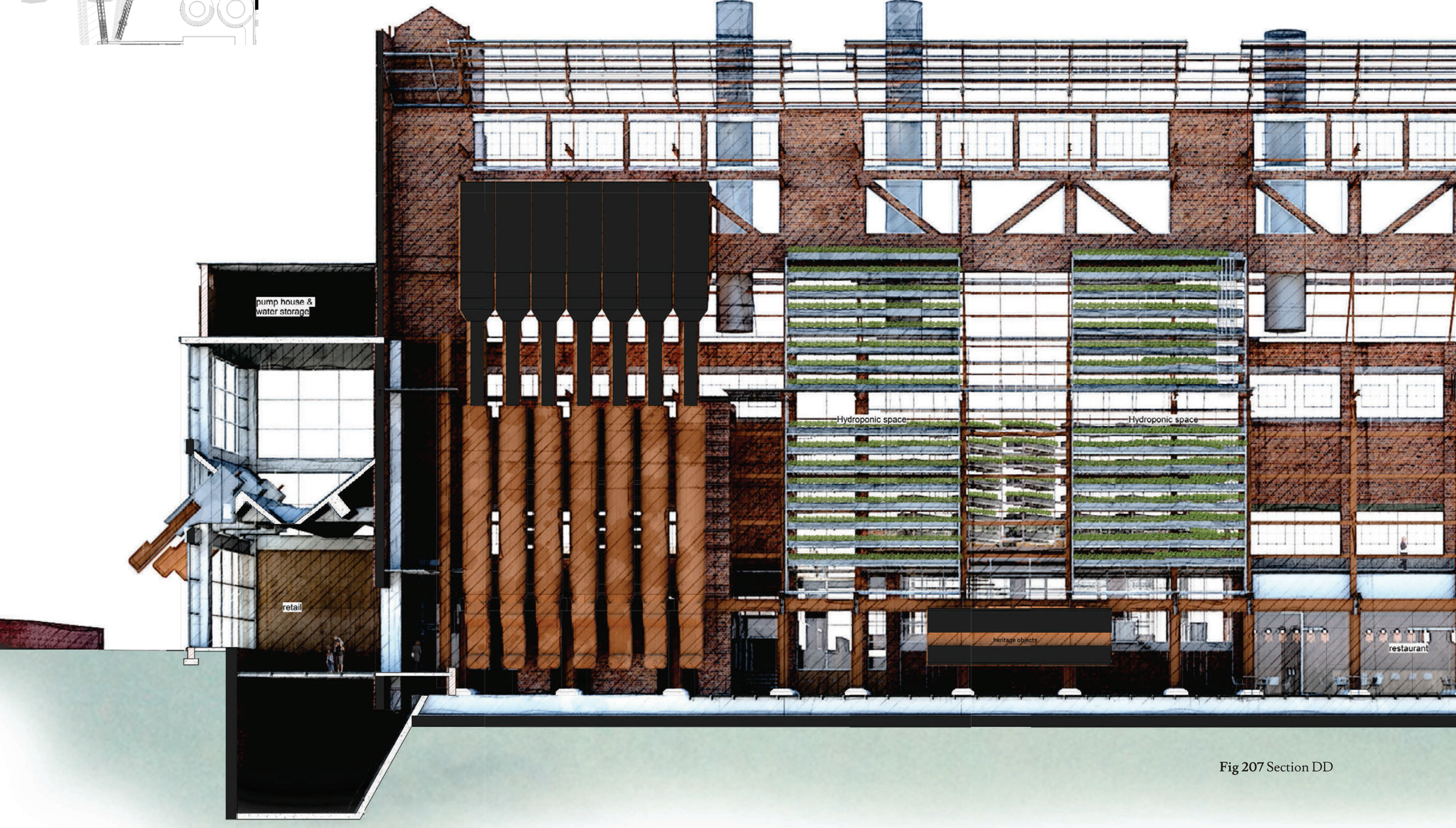


Fig 207 Section DD

6.6 Section DD

Section DD shows the building in its length with the bar area and the restaurant to the right. To the left the retail space sits below the old Coke Hoppers. The Hydroponic space rises vertically in the central space of the building.

Fig 208 View of the Hydroponic Structures

6.7 Systems

In deciding what type of systems to incorporate and what would benefit the program, the various functions of the program were considered to see what resources would be used and which would be left out.

- Retail space - input: energy
  output: inorganic waste.
- Offices space - input: energy; water
  output: grey water;
  organic & inorganic waste
- Ablution - input: energy; water
  output: grey & black water;
  inorganic waste
- Restaurant - input: energy; water
  output: grey water; 8
  organic & inorganic waste
- Distillery - input: energy; water
  output: water & organic waste
- Greenhouse - input: energy; water
  output: water;
  organic & inorganic waste
- Culinary School - input: energy; water
  output: grey water;
  organic & inorganic waste

The objectives of the project in terms of the needs of the functions according to the different systems would thus be:

- Energy - Minimize use of grid, using gas made from other program on site (JD)
- Water - Use as little water from municipality; not feed back into system; reuse on site
- Waste - All organic matter to Jan-Paul for composting
- Materials - Use demolished materials in new construction; Sourcing local products for other
- Lighting & Ventilation - Optimize natural light and ventilation (of old structure) - passive cooling systems; Kitchen & Distillery passive ventilation systems if possibly.
- Daylighting - Maximum use of natural light for plant growth as well as work spaces - Open existing façades.
- Ventilation - Make use of the already well designed structure; open lower ground to allow for cool air to enter and hot air to escape; close restaurant bar space for maximum control for users.

Fig 209 shows a summary of the exchanges between the different systems in the program and on the site. Many of these systems happen with the users as a didactic movement. Explored by the site with and explained as the user moves. Stopping to learn and understand as they move around and articulate in the architecture.

Intertwined systems sharing resources together with the programs that forms a synergy between them creates a closed loop system. The aim of this is to create a system that lessens the load of its national grid dependency

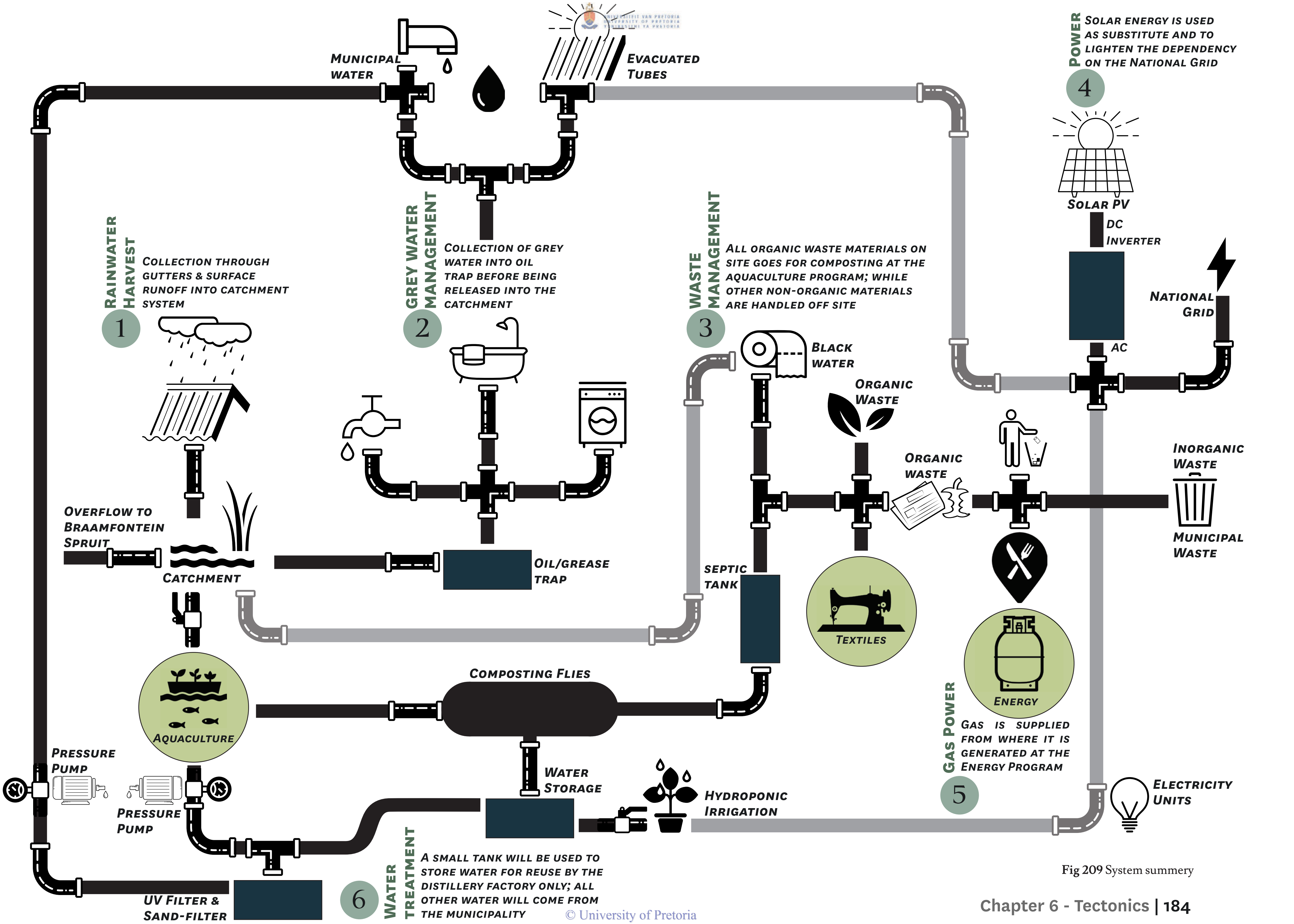


Fig 209 System summery

6.7.1 Water

Water has been a central theme throughout the project and plays an Important part in the rejuvenation of resources for many of the proposed programs. It continuously links back to the Braamfontein spruit, almost as a remembrance to it whilst also acting as a cleaner where it used to take in pollutants from the gas making processes.

Water will be used for various functions within the site. All the rainwater from the site will be taken to a large catchment area situated at the north-eastern part of the site from where it can be distributed for usage to the programs and the site. This catchment will be collected from all the roofs, the paving and the road runoff.

Water that can be used for potable purposes will pass through a purification system and into a tank that will be stored above the Coke Hopper from where it will then be distributed for usage.

The grey water from the site will be inserted into the catchment area for reuse. Flowing through an oil trap before it goes into the larger catchment, it will be ready for reuse when and where needed.

For the irrigation on the landscape around the Retort, the water from the catchment need not be filtered before usage. The irrigation system could easily be activated by means of a pressure pump with a switch.

Water to be used for the water closets, will come straight from the catchment. The black water from this will go into a composting system where the dried out waste can be introduced to the fly-compost making facility.

The hydroponic system will have its own flow of water, as the fish from the aquaculture program and the plants in the hydroponic forms a symbiotic relationship. The water will thus be pumped up to irrigate the hydroponics by means of drip irrigation. The water will make its way downwards and through the landscape and flow back into the aquaculture area from where the cycle starts again.

Water using appliances that will be implemented in the program will make use of water saving taps and sprays. Water will always be a precious resource that needs to be saved wherever possible.

The water from the hydroponics follows the path that the gas used to follow when the Retort was still in use. This becomes an important feature within the landscape and the program.

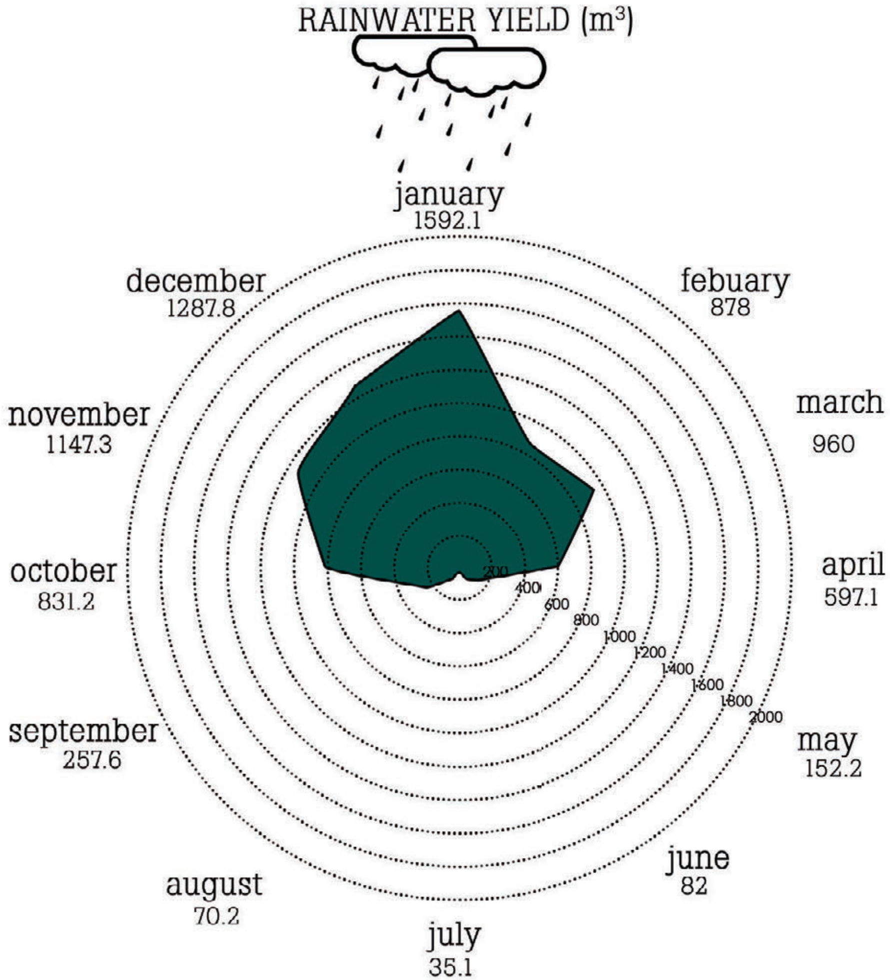
The water from the aquacultures will be used for the hydroponics & the propagation house. The Braamfontein spruit catchment area (Fig 211) will be used for the flushing of toilets.

Grey water from appliances will be filter from impurities before it moves back into the Braamfontein catchment. Black water will need to make use of a system that enables the faeces to be dried before it goes into the fly composting system at the aquacultures.

Water Yield

Huge amounts of water could be harvested from rainwater runoff because of the sheer size, the position of, and the steep angle of the site, By utilising the Braamfontein spruit, a large catchment area has also been allocated to allow for the amount of water to be stored and distributed to the various functions.

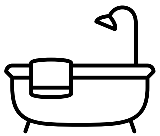
The water needs of the programs will differ depending on the time of year; e.g. less water will be used for irrigation in winter times. The grey water from all functions will also be return to the system.



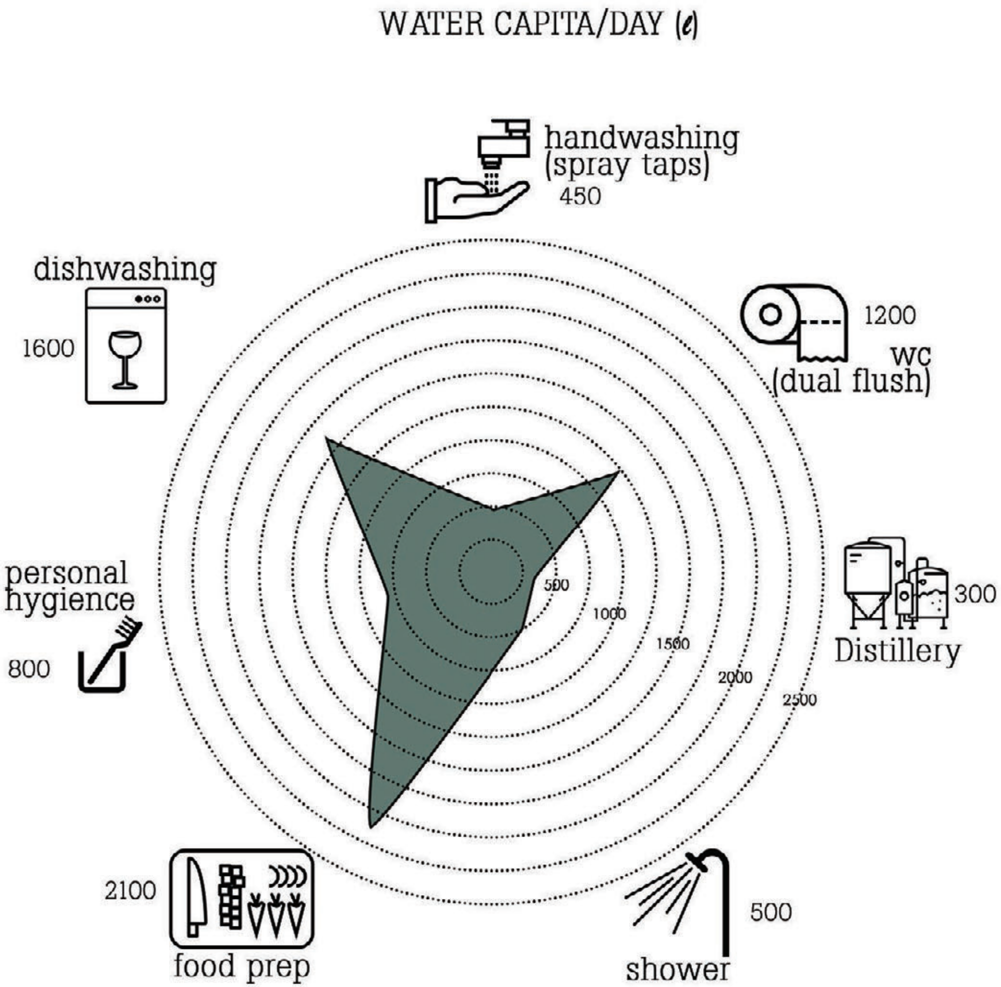
Black water	1200 ℓ	Per day
Municipal water	5750 ℓ	Per day
Grey water	5750 ℓ	Per day

Annual Rainwater yield 7890.5 m^3

All Water Used Over a Year



Annual Domestic demand 2536.8 m^3



Water Demand

The water demand indicates the volume of water the various functions within the program requires per day. The grey water from the distillery, the kitchen, the office spaces and ablution space will be treated before it flows into the larger catchment. Where from there it will go to its various destinations.

WATER DEMAND

Month	Irrigation Demand (m3)	Domestic Demand Grey Water (m3)	Total water Demand(m3)
January	432	37.2	469.2
February	432	33.6	465.6
March	432	37.2	469.2
April	360	36	396
May	144	37.2	181.2
June	144	36	180
July	144	37.2	181.2
August	144	37.2	181.2
September	360	36	396
October	432	37.2	469.2
November	432	36	468
December	432	37.2	469.2
	3888	438	4326

AVAILABLE WATER

Month	Rainwater Yield/ month (m3)	Grey Water/month (m3)	Evaporation Rate/ month (m3)	Total Water in System/ month (m3)
January	1577.168227	178.25	190.4	1565.018227
February	869.76189	161	166.6	864.16189
March	950.9396664	178.25	119	1010.189666
April	591.4380852	172.5	95.2	668.7380852
May	150.7587276	178.25	71.4	257.6087276
June	81.1777764	172.5	47.6	206.0777764
July	34.7904756	178.25	47.6	165.4404756
August	69.5809512	178.25	95.2	152.6309512
September	255.1301544	172.5	142.8	284.8301544
October	823.3745892	178.25	166.6	835.0245892
November	1136.48887	172.5	166.6	1142.38887
December	1275.650772	178.25	190.4	1263.500772
	7816.260185	2098.75	1499.4	8415.610185

ANNUAL GREY WATER RETURN 2098.8 M^3 +

ANNUAL EVAPORATION RATE 1499.4 M^3 -

ANNUAL IRRIGATION DEMAND 3888 M^3

ANNUAL GREY WATER DEMAND 438 M^3

MUNICIPAL DEMAND

Month	Working days/ month	Water capita/ day	Water capita/ month	Domestic demand/ month (m3)
January	31	5750	178250	178.25
February	28	5750	161000	161
March	31	5750	178250	178.25
April	30	5750	172500	172.5
May	31	5750	178250	178.25
June	30	5750	172500	172.5
July	31	5750	178250	178.25
August	31	5750	178250	178.25
September	30	5750	172500	172.5
October	31	5750	178250	178.25
November	30	5750	172500	172.5
December	31	5750	178250	178.25
				2098.75

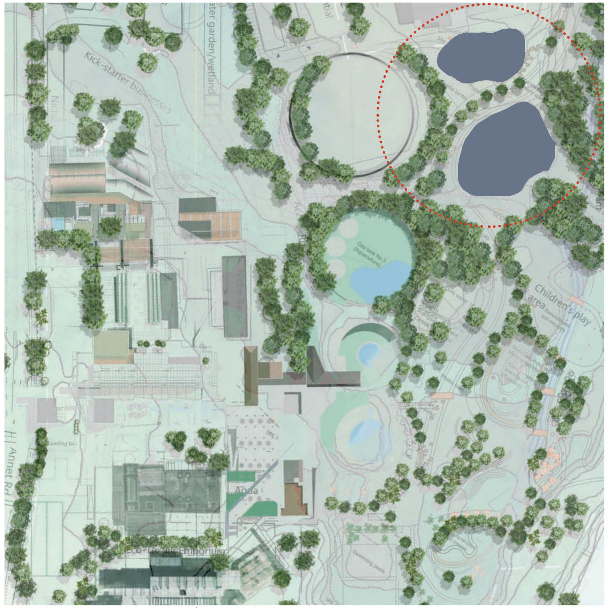


Fig 211 Site water catchment

WATER

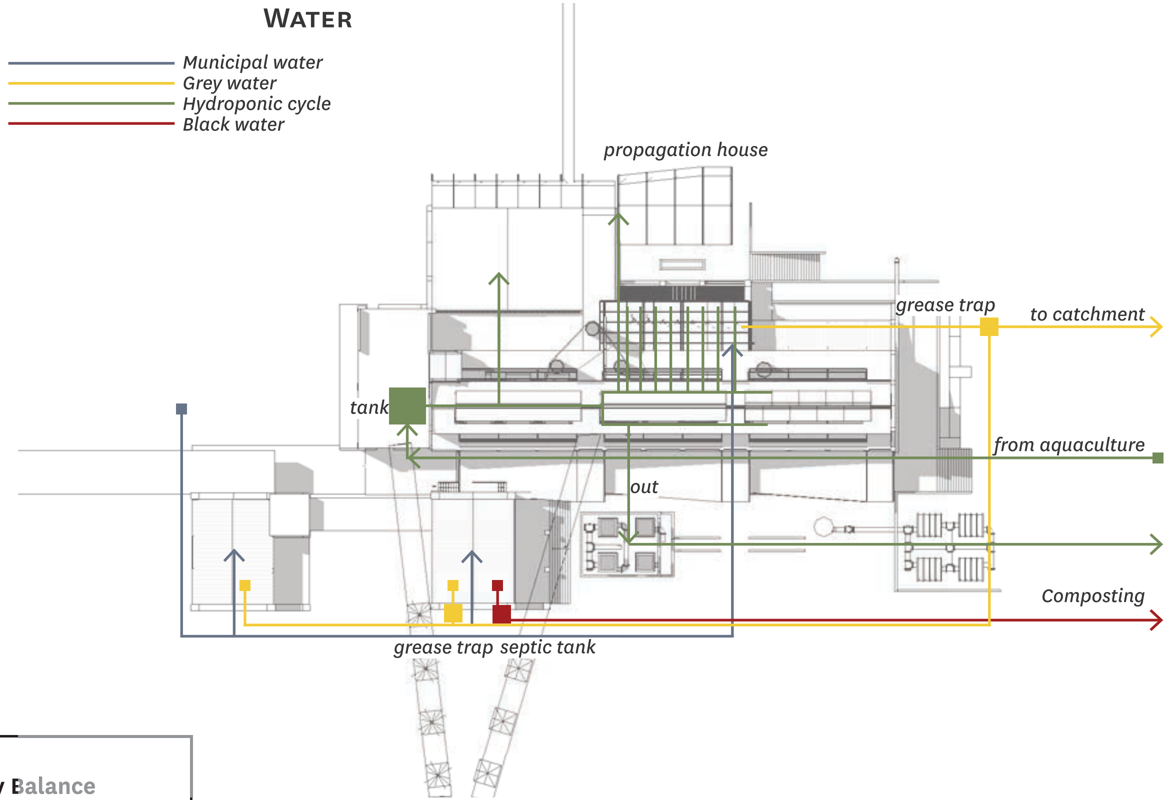


Fig 210 Water systems on site

WATER BUDGET

Month	+ Rainwater Yielded (m3)	- Total Water Demand (Irrigation & Household) (m3)	Monthly Balance
January	1577.168227	469.2	1107.968227
February	869.76189	465.6	404.16189
March	950.9396664	469.2	481.7396664
April	591.4380852	396	195.4380852
May	150.7587276	181.2	-30.4412724
June	81.1777764	180	-98.8222236
July	34.7904756	181.2	-146.4095244
August	69.5809512	181.2	-111.6190488
September	255.1301544	396	-140.8698456
October	823.3745892	469.2	354.1745892
November	1136.48887	468	668.4888696
December	1275.650772	469.2	806.450772
	7816.260185	4326	3490.260185

Water Budget

The annual rainwater measured was done around the proposed program. There will thus be more than sufficient water for the program. To see whether the building would break even with the amount yielded by its position, indicates that there would be a shortage in the winter months of, on average 110 m³ monthly.

[Sizing of potable water tank on roof and hydroponic tank)

6.7.2 Waste

Organics wastes will be taken to the fly composting system where it will be turned into compost to be used as fertilizer.

Inorganic, non-recyclables materials will go into the municipal waste infrastructure or make use of recycle programs for plastics and glass.

6.7.3 Water & Waste Systems

The rainwater will flow from the roofs and site towards the catchment on site by means of gulleys and gutters. Water will be pumped fro m the catchment area when and if it is needed.

- Potable water purification
- Grease trap
- Septic tank

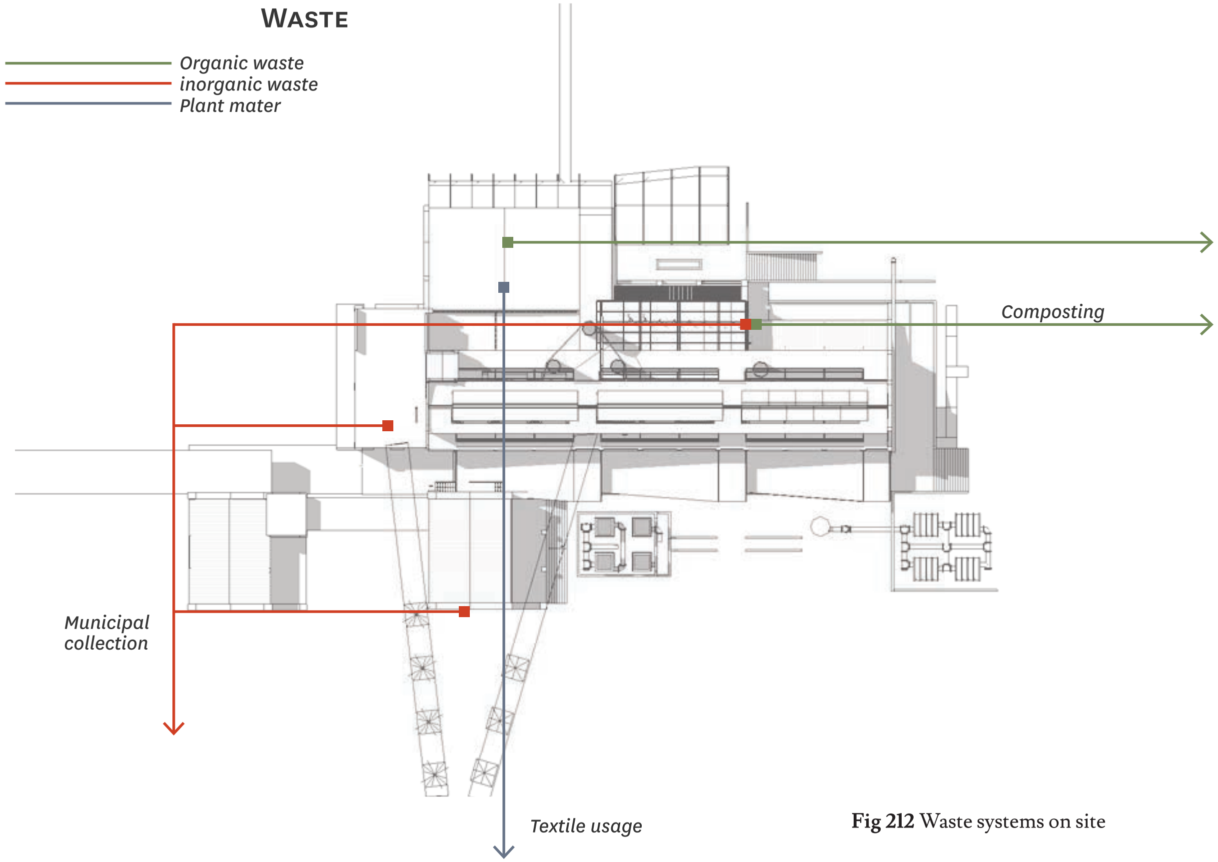


Fig 212 Waste systems on site

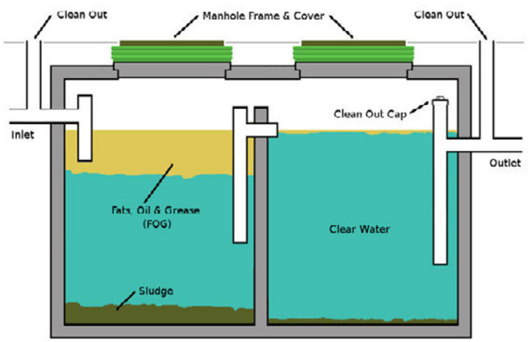


Fig 213 Grease tank (ESS, 2017)

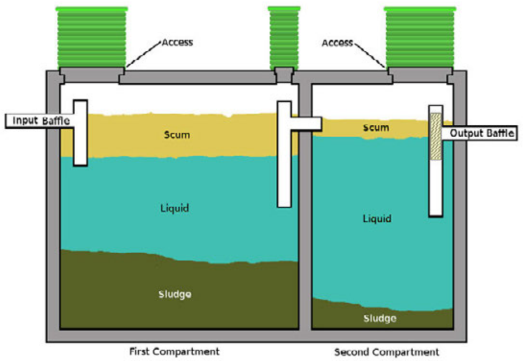
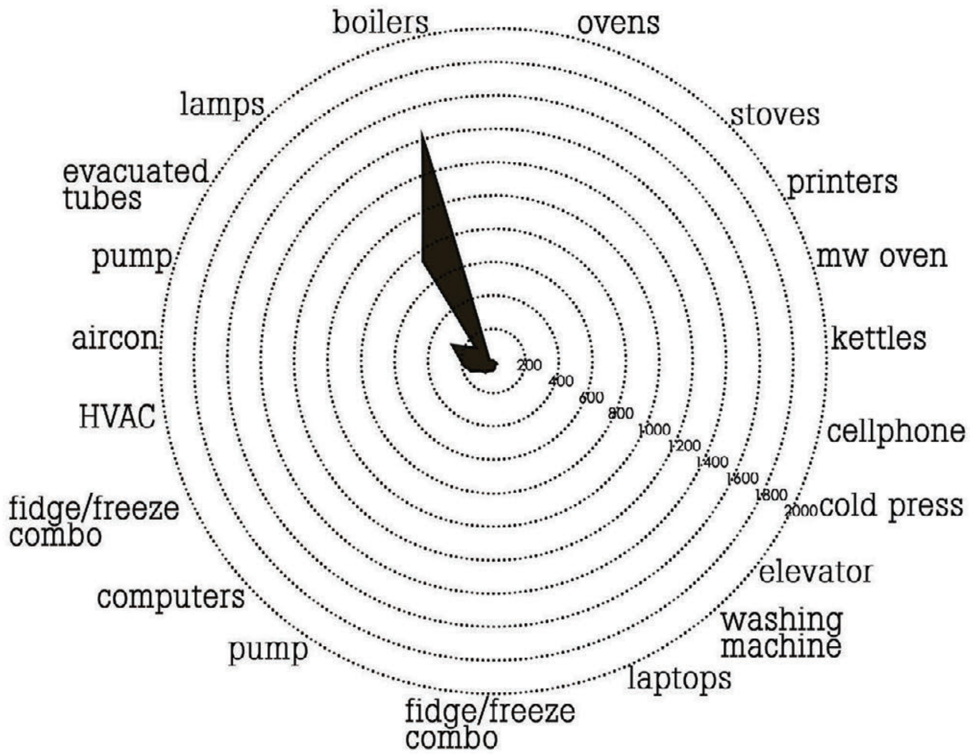


Fig 214 Two Compartment Septic Tank (ESS, 2017)

POWER CONSUMPTION (KWH/Day)

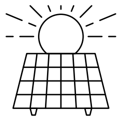


Lamps	Quantity	Watts	Hours Use	KWh/Day
Printer	4	120	4	1.92
MW Restaurant	4	1000	3	12
Kettle Restaurant Size	3	1500	6	27
Cellphone	40	10	8	3.2
Cold Press	2	540	4	4.32
Elevator	1	2260	2	4.52
Laptops	12	140	4	6.72
Restaurant Fridge	1	296	24	7.104
Sump Pump	1	1050	8	8.4
Computers	6	200	7	8.4
Office Fridge/Freeze Combo	2	296	24	14.208
Evacuated tubes	2	7200	1	14.4
HVAC Kitchen & Greenhouse	1	1500	12	18
Air Conditioner	2	1250	8	20
Dishwashing Machine	4	3000	2	24
Water Pump	1	2200	12	26.4
Ovens	7	2000	4	56
Stoves	7	2000	4	56
Lamps	1000	12	6	72
Boilers	4	1500	24	144
				528.592

ALLOWANCE - SYSTEM LOSSES	15%	79.2888
AC Watt Hours		607.8808

Annual Power usage

221876.5 KWh



300 Watt PV Panels

338 Panels *(to be able to be 100 % sustainable)*

Roof Area	Peak hrs	KWh/day	energy/ hrs	PV watts	no. of pannels	area of PV total [1,97m2]
200	6	607.8808	101.31347	300	337.71156	665.2917644

6.7.4 Energy

With minimal roof space for solar panels, these will be incorporated in certain areas (Fig 215) at the top of and as infill into the glazing system to allow for shading in mid-summer. The amount of solar panels that can fit into this space is not enough to sustain the program and a larger source will be needed. A space in the park has been allocated to syply the park as such.

Systems

Systems that will be used to create energy as to become less dependant on the national grid will include the following:

- Gas for cooking (generated on site)
- Solar energy on roof & solar field on site
- Evacuated tubing for showers ablution, offices and distillery

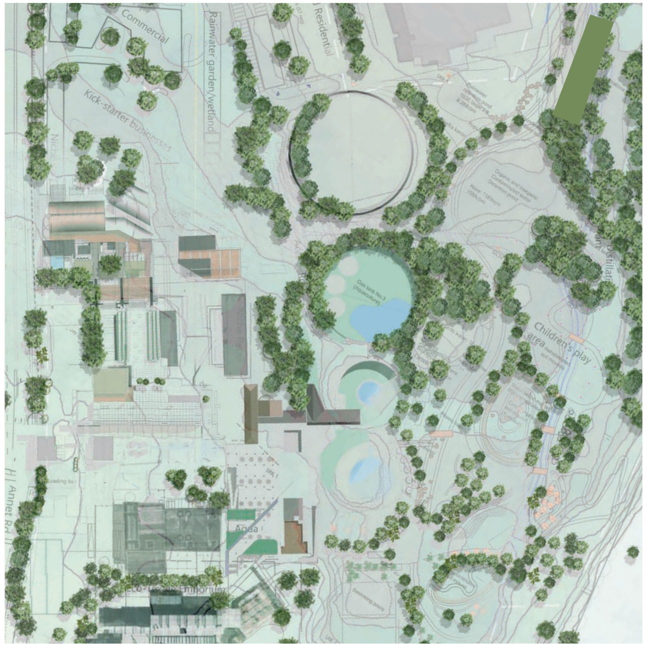


Fig 217 Site solar field

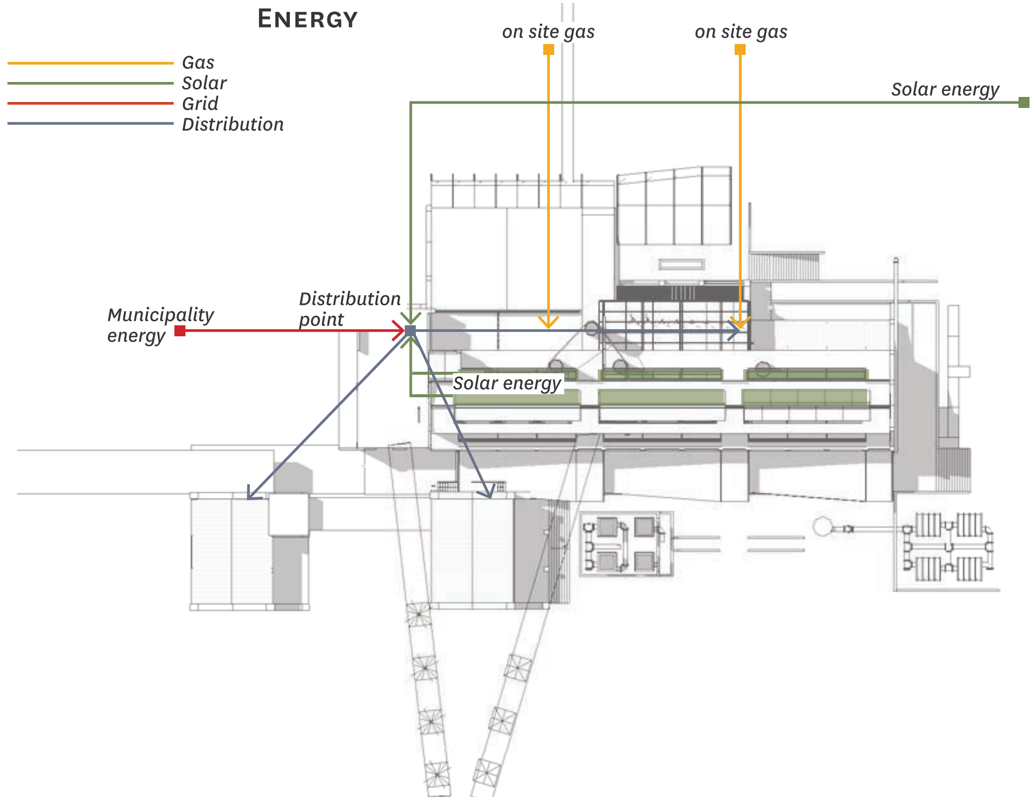


Fig 215 Energy systems on site

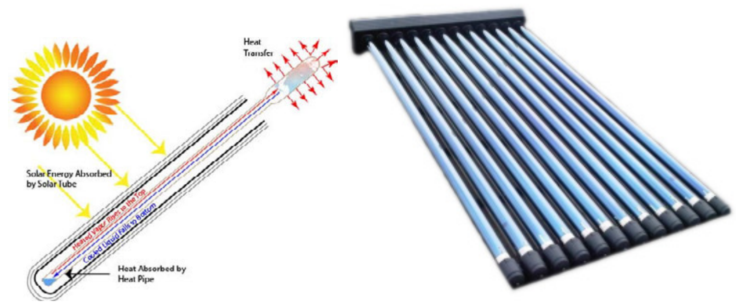


Fig 216 Evacuated tubing

6.8 Climatic responses

In dealing with the changes in climate, various implementations are needed in Johannesburg with its hot summers and cold winters. Here the different ways in which these climatic changes will be dealt with, were considered.

The building was designed to get rid of heat through the roof as well as its large chimneys. This is ideal for the airflow which the hydroponics need as well as to not overheat the ground floor restaurant and open space.

6.8.1 Cross Ventilation

With its long narrow shape and long open façades, it is ideal for cross ventilation. This allows for the natural cool air to enter the building and make its way up where it exists the vented roof structures or the fanned chimneys.

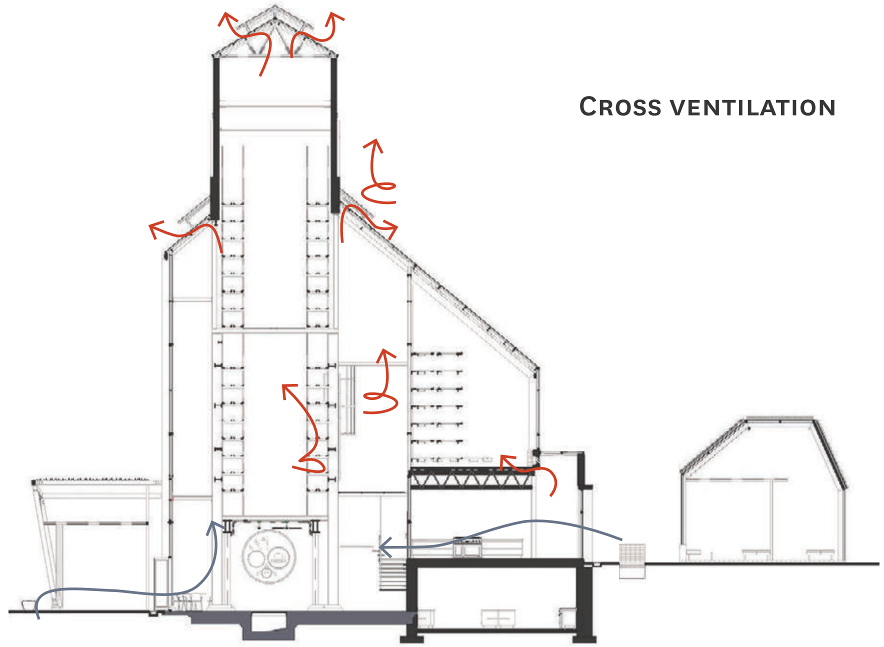


Fig 218 Cross ventilation

6.8.2 Overheating

In times when the interior does become too hot, fans installed on the lower level will deflect air upwards in order to flush out the heat. Extractor fans installed in the existing chimney structures will also suck out the excess heat.

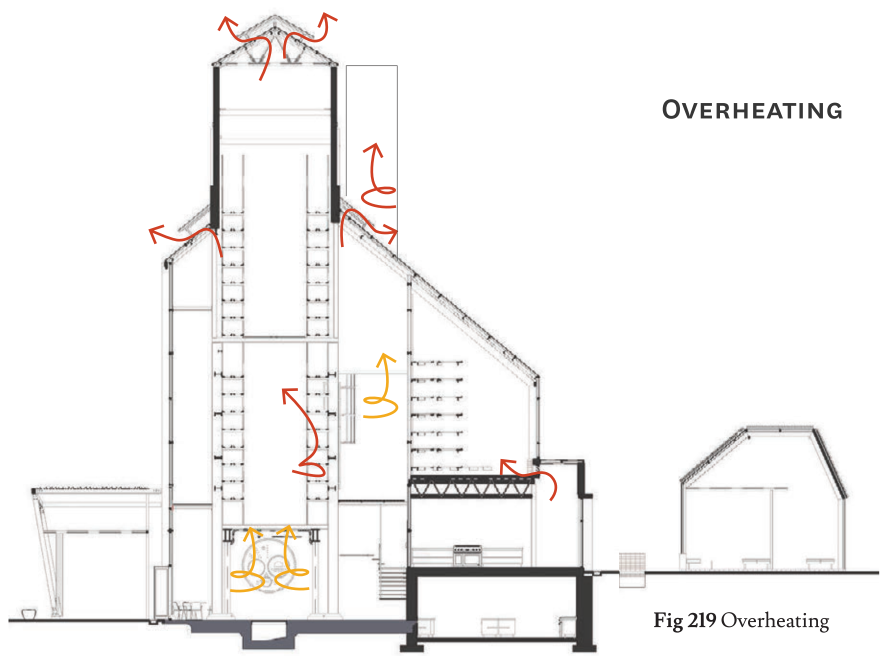
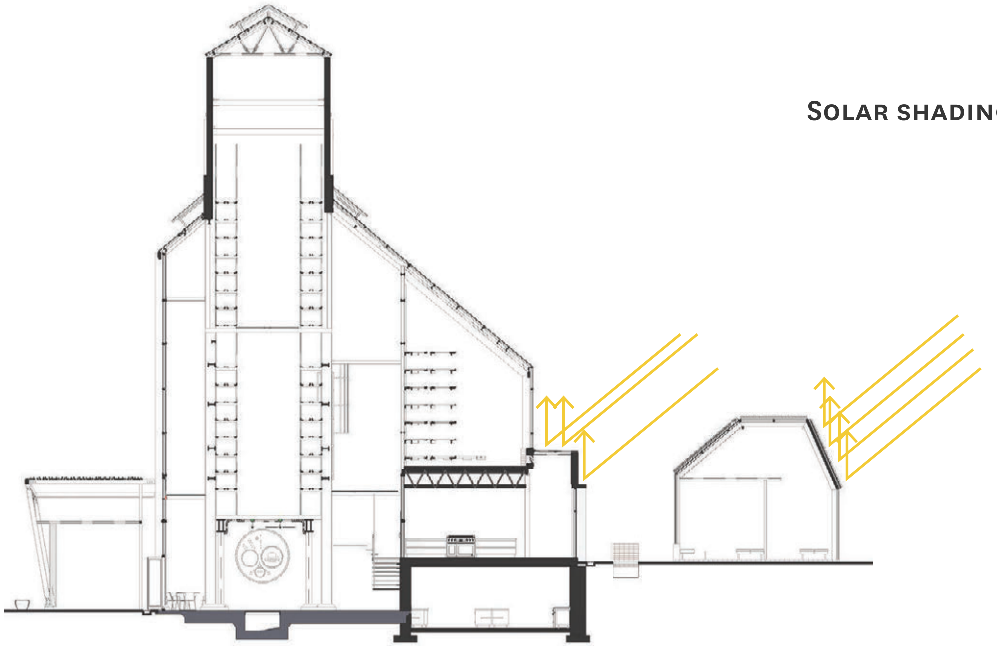


Fig 219 Overheating

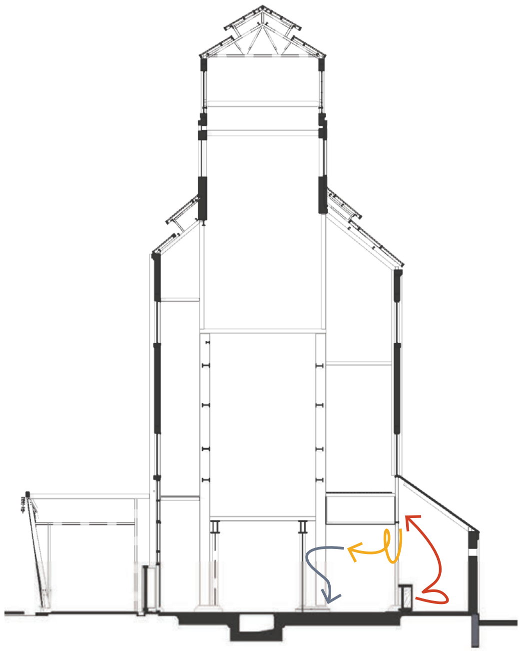


SOLAR SHADING

Fig 220 Solar shading

6.8.3 Solar Shading

Solar shading will be implemented for the propagation house as to protect the young plants from the harsh sun. By adding a louvred system to the northern facade of the propagation house it allows for it to be left open, or closed depending on the climate.



UNDER HEATING

Fig 221 Under heating

6.8.4 Under Heating

For climatic control in spaces such as the enclosed restaurant area as well as the distillery, kitchen, culinary school and offices mechanical heating, cooling and extraction will be needed. This would depend on the program in the space.

The restaurant could make use of gas heaters in the winter, where natural ventilation will be sufficient during the summer. The kitchen on the other hand would need more control to get rid of excess heat and would need a mechanical HVAC.

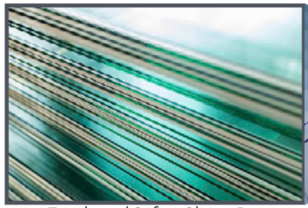
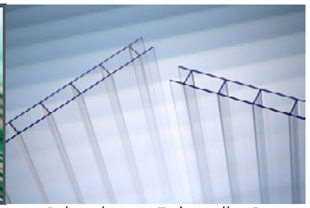
6.9 Lighting Analysis Prior to Final Design

The daylighting for the program requires a very high amount of light in order for the program to succeed. Though artificial lighting could be introduced if some of the hydroponic structures to not get sufficient light, the aim would be to get as close as possible to the amount of natural sunlight it would need to flourish. The building being one functioning social and productive space makes it difficult to separate the various functions and provide the correct lighting levels for each function. Various technologies have been introduced

From the analysis run by Autodesks new Insight 360 it is clear that the deeper parts of the distillation space will have an issue with daylighting. Skylights have been implemented to allow for natural light to enter these spaces.

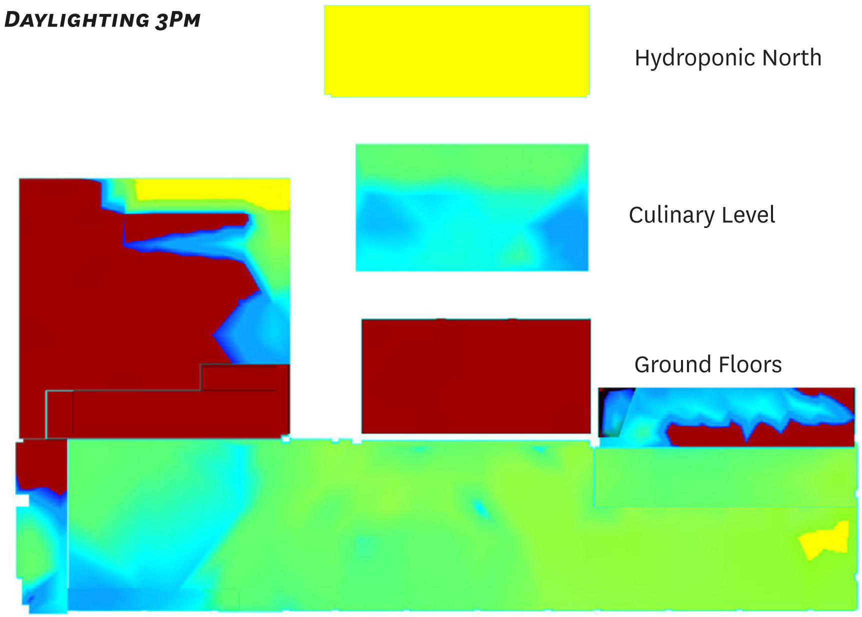
The hydroponic spaces which need the most light (Insight 360 only measures up to 6 000 lux respectively); a exact level could thus not be measured. But what can be concluded is that the deeper hydroponic structures would need some artificial lighting for the plants to flourish. Dependent on what the plants needs are; for pickings a lower lux would be sufficient; but to reach flowering a lux level of at least 20 000 lux would be needed.

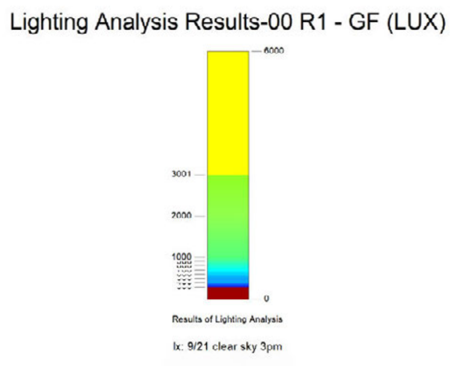
Safety Glass | **Polycarbonate**

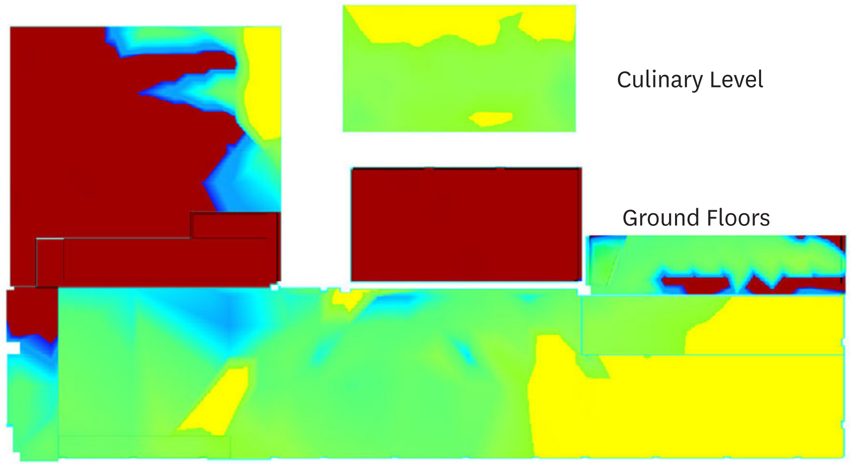
4mm Toughened Safety Glass R=1.00 *4mm Polycarbonate Twin-wall R=1.43*

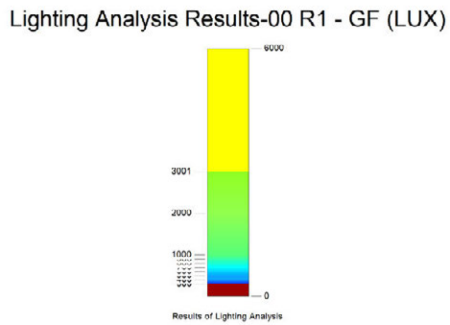
Daylighting 3pm





Daylighting 9am





6.10 Sustainable Building Assessment

The SBAT performance tool was used to calculate the performance of the building to see how the building would perform in terms of its sustainability. All aspects were include for the complete site with the various proposed programs - as resources such as gas and composting will take place in the other masters projects and shared between the various programs.

Being a largely regenerative architectural project, the project faired well under the aspects such as waste and materiality as well as local economy as to its location. Many of these aspects can further be improved by focusing on new initiatives that can take place within the precinct making it a fully functioning urban space.

SB	SBAT REPORT	4.4

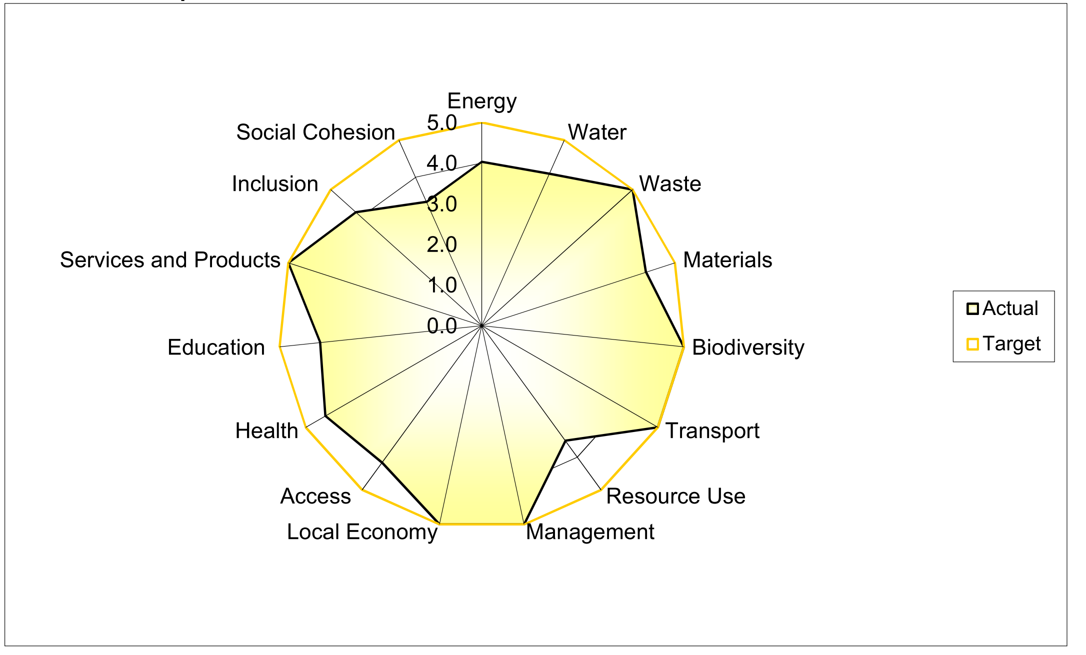
SB1 Project

The Johannesburg Gas Works

SB2 Address

Annet Braamfontein Johannesburg

SB3 SBAT Graph



SB4 Environmental, Social and Economic Performance	Score
Environmental	4.5
Economic	4.5
Social	4.2
SBAT Rating	4.4

SB5 EF and HDI Factors	Score
EF Factor	4.5
HDI Factor	4.4

SB6 Targets	Percentage
Environmental	89
Economic	91
Social	84

CONCLUSION

Chapter 7

7.1 Conclusion

The project started out with the aim to re-appropriate abandoned architecture in the City of Johannesburg. The chosen node was that of the Johannesburg Gas Works. The issue identified was the reuse of existing heritage architecture whilst posing the question as to why more is not done in re-purposing and preserving it for the future. The question was asked whether the project can become a successful precedent for South Africa as has been the case in other places around the world.

The intention was to focus on the manner in which past architecture could be re-purposed and re-imagined to contribute to the City and its people by working with the "obsolete" architecture at the site of the Johannesburg Gas Works in order to try to create a new interchange which has the potential to reconnect people and open new doors within the city.

In the process, theories of regeneration were identified by analysing the site in order to find ways that could liven up the site as a park and offer something for the good of the larger city and not only the urban surroundings. By identifying and analysing different energies within the city and the micro urban fabric, a space was envisioned that connects the educational and social spaces of its surroundings which would open a new open space for the City of Johannesburg.

The destruction of the industry of the past was a major theme to decide what the park should have become whilst correcting it for the future. What was envisioned was a new type of architecture to help users understand the rich heritage of the Gas Works.

In dealing with the heritage, a central theme of remembrance drove the projects. The idea was how this could inform a celebration of the industry (past and present) and how the two can intertwine to form a new type of celebrated productivity, a hybrid as such. The Issues at hand asks for the establishment of a relationship between industry and ecology that would allow for a beneficial coexistence where the one support the other, all the while celebrating the heritage that is the industry.

The Johannesburg Gas Works site and its historic infrastructure has been dormant for over two decades which left a polluted and derelict landscape. In addition, not much, if anything has been done to heal the scars of dereliction and dormancy. As with many past industries, the Gas Works is still disconnected from society whilst little is known about it except for the familiar iconic shapes that skeletons the skyline.

A regenerative future where the Gas Works restitute its somewhat ignorant past, has been envisioned by creating and introducing programs of a new and alternative industry. By using the resources of the site, it was possible to create a synergy between programs where water plays a mutual, central part in every aspect.

Secondary programs that attracts society to the park such as a restaurant, retail amenities, office space and relaxation, were introduced to make a complete park with the characteristics of a social space. This ties in with the vision to restitute the non-existing past relationships between industry and society and creates an understanding of the site as such: a public interface between the industry past and present which becomes a symbol of a monumental regenerative ideology.

The new architecture envisages a social industrial space of interaction with the historic infrastructure as an educational experience, all in the same environment. The architecture and the programs it contains is meant to become a social display of industrial heritage and not as a museum. It questions the way in which places of historical importance are traditionally presented to the public, by seeing a different industry, a social industry of discovery and experience. This creates a new experience where users will want to return to as it is not a one time experience.

By creating an ecological system that connects industry, society and heritage together, it allows for the ecology to reconnect with the site by reclaiming it. The new regenerative, restitutive architecture with its social economical possibilities allows for the future existence of the Gas Works and the ability to *right the wrongs* of the past - sealing those scares it has left behind. In creating possibilities of job creation whilst supporting local urban farming initiatives, the project aims to set an alternative to what similar nodes within the city could become.

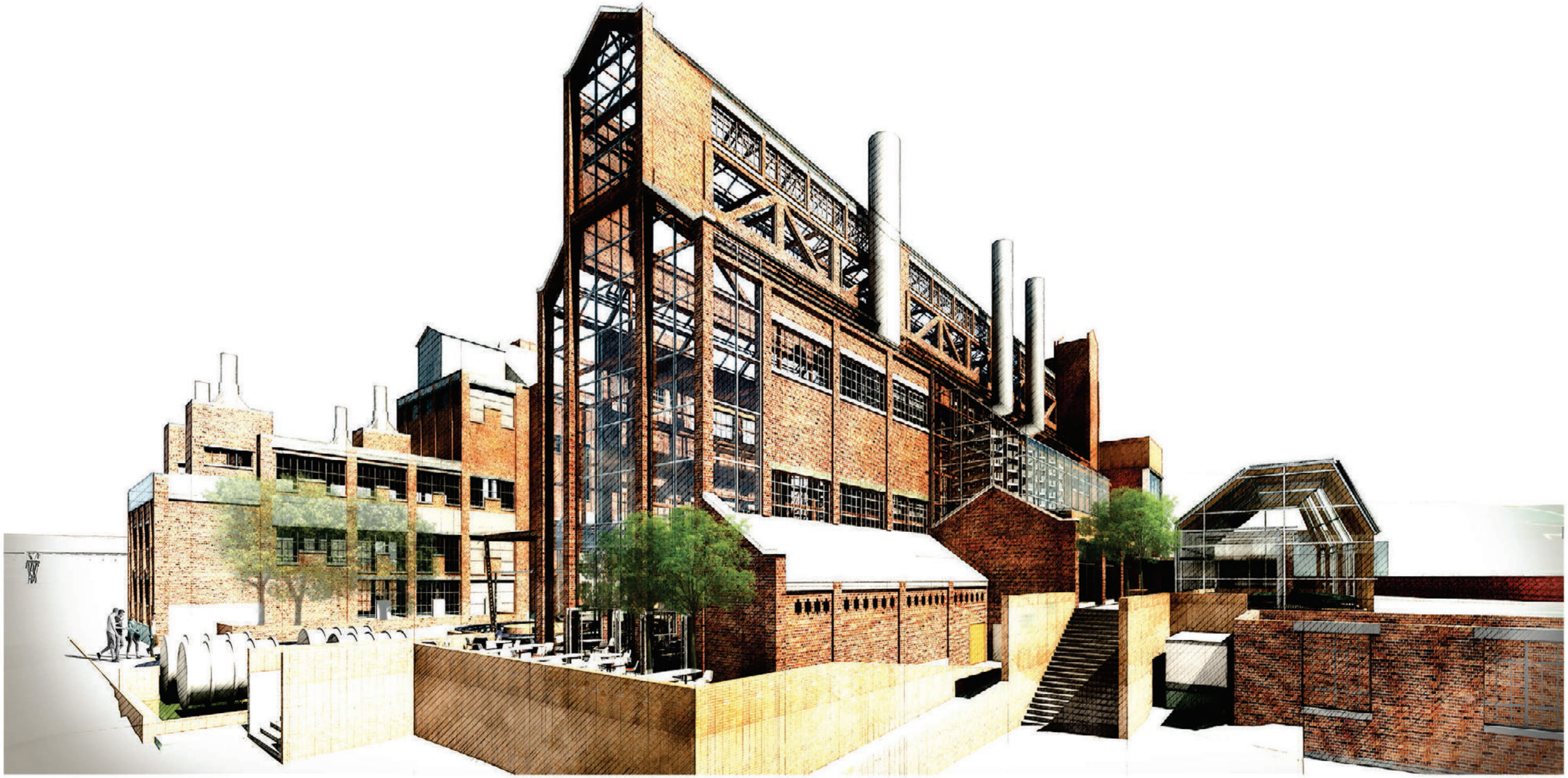


Fig 222 Northern Approach

Addendum

8.1 Final Work

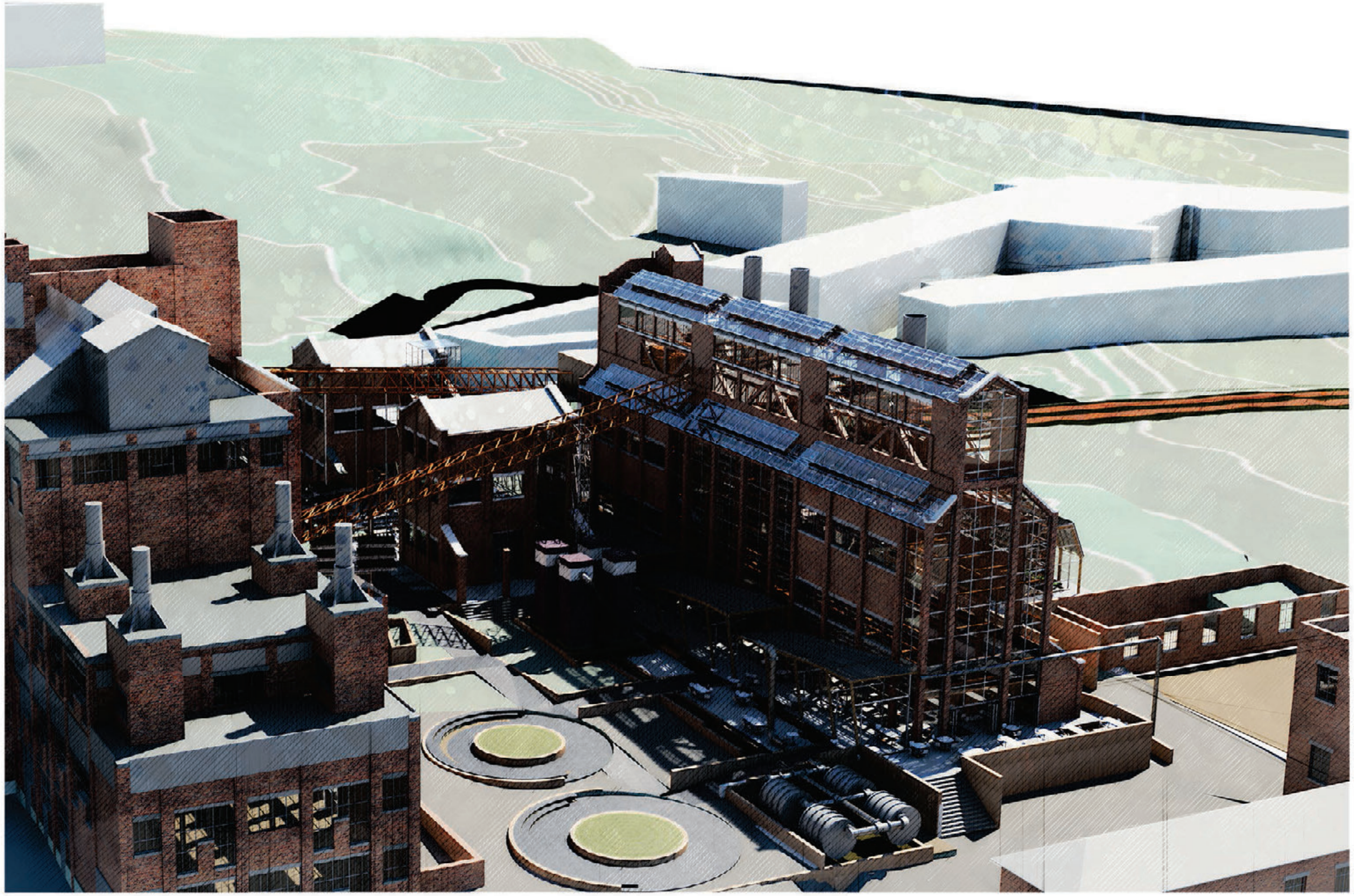


Fig 223 Birds-eye view of the site

Fig 224 Foyer space approach from Retort II

Fig 225 Site entrance from Annet Road

Fig 226 View of the corridor

Fig 227 Entering the building from the restaurant

Fig 228 View of the distillation space

8.2 The Final Model

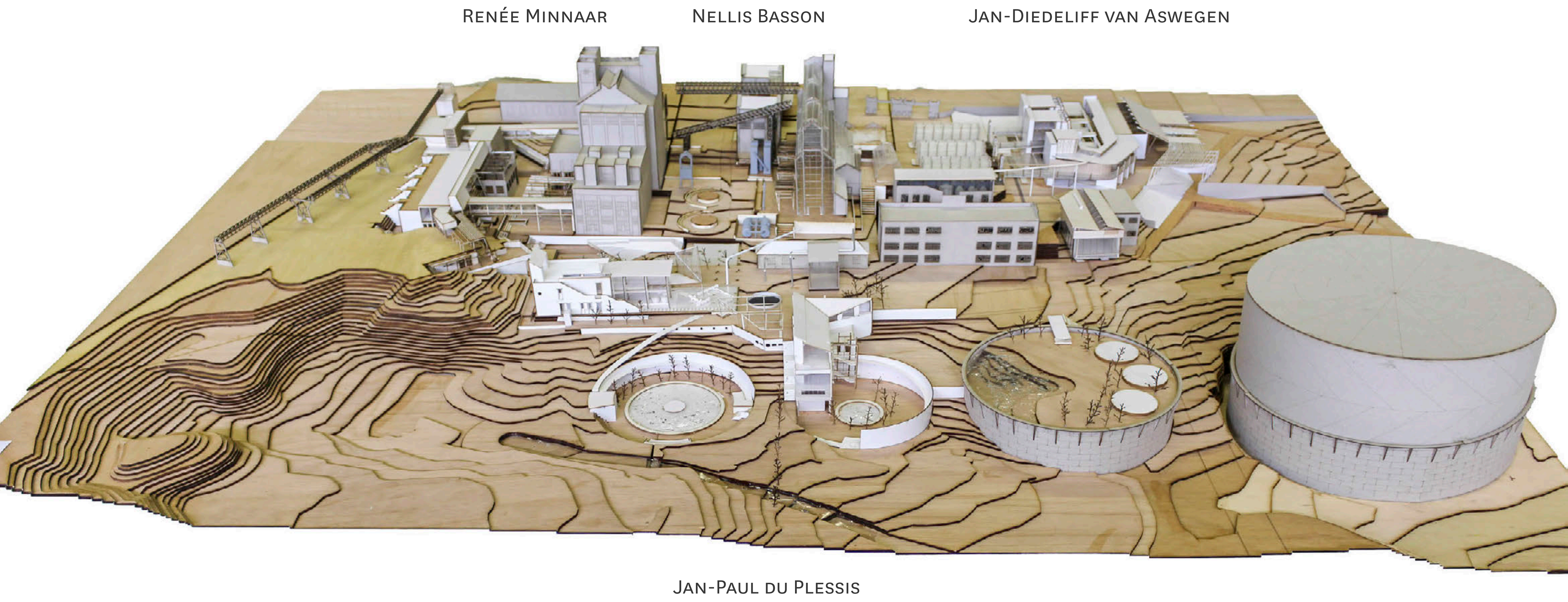
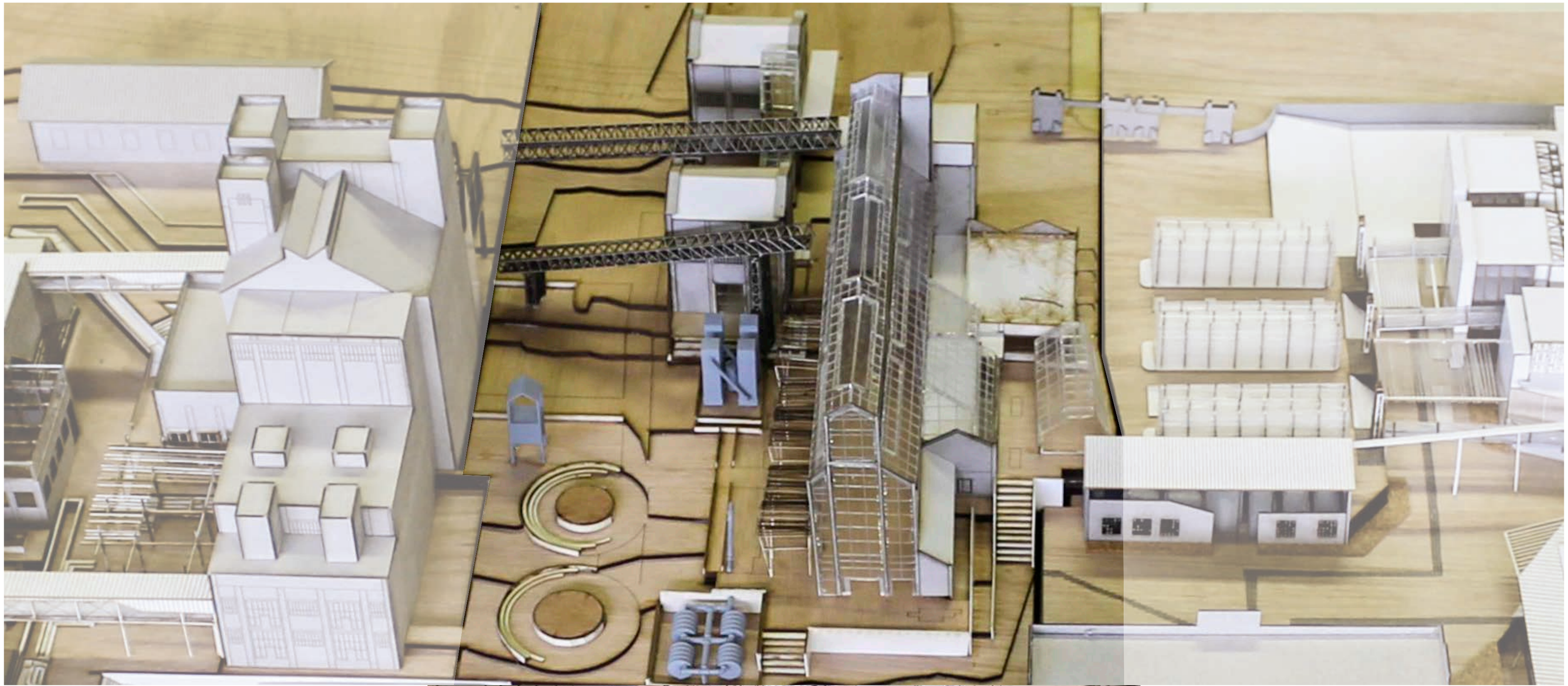


Fig 229 Final Group Model



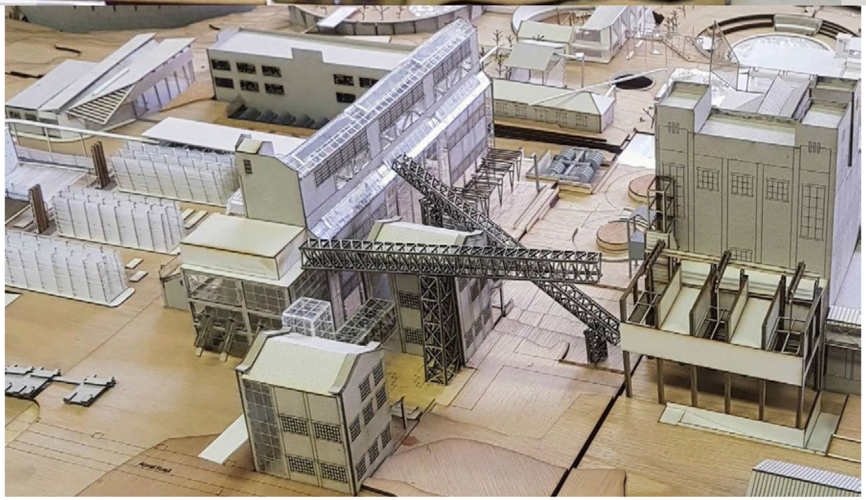


Fig 230 Final Model

8.3 The Final Crit

Fig 231 Final Work I


EXIT

Fig 232 Final Work II

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