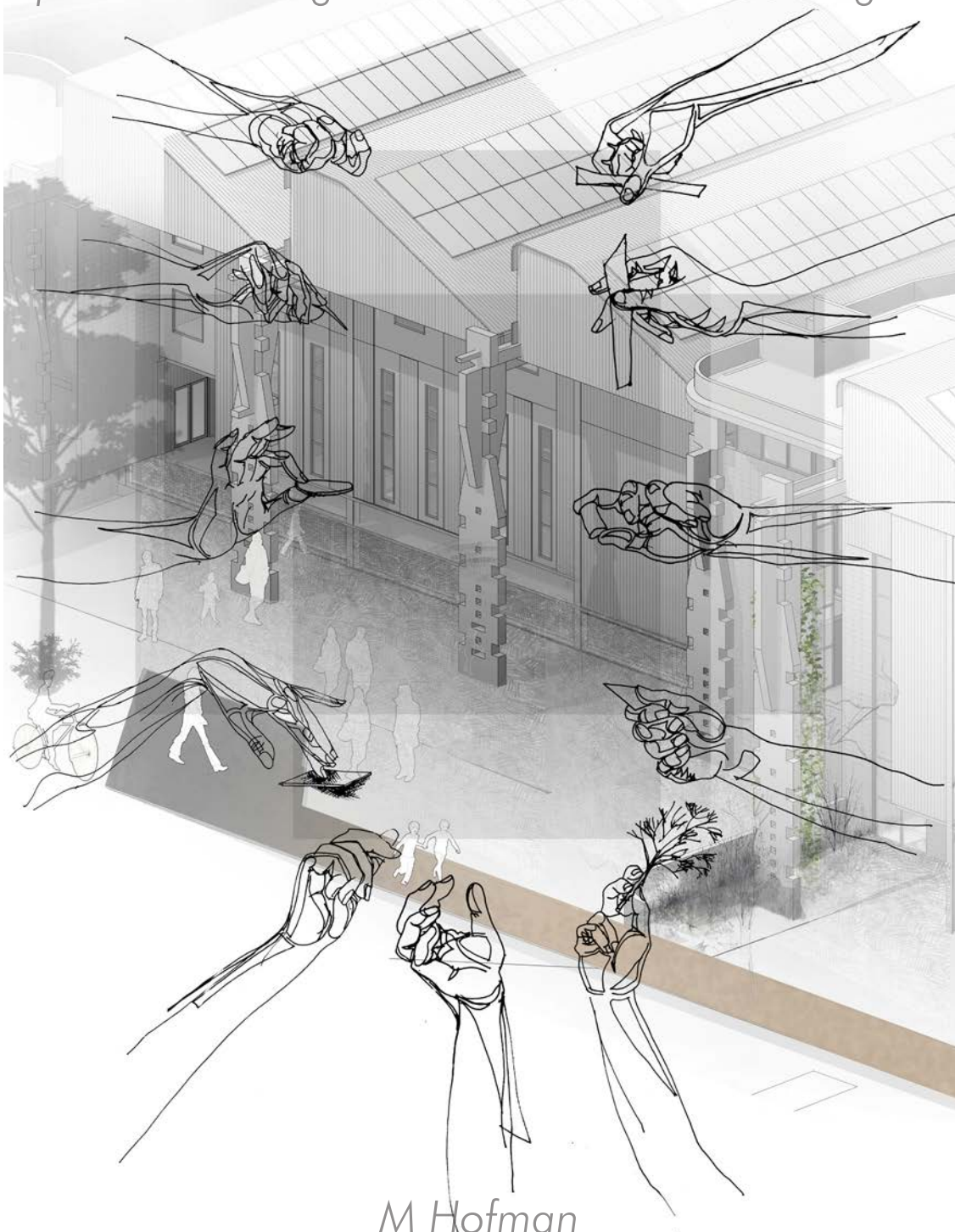


AN ECONOMIC ENABLEMENT HUB

An exploration through architecture as an enabling device.



M Hofman

2017



AN ECONOMIC ENABLEMENT HUB

An exploration through architecture as an enabling device.

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Human Settlements and Urbanism

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ABSTRACT

The question of context in architecture theory has become more complex and controversial as globalization, urbanisation and resource scarcity have added yet more layers to the debate (O'Donnell 2016:380). As these aspects increasingly enter every facet of our lives, its effect on architecture has resulted in a development approach that is exploitative of people, nature and culture (Fioramonti 2017:3). This study argues that working with scarcity in a productive manner could lead to an alternative approach for development.

A critical look at the continuum of architectural discourse and its engagement with issues of context will place the debate in a broad historical context which ranges from theories posed by Vitruvius to current theories on the vernacular, to establish the role of the architect as an enabler of social space.

An in-depth context analysis of the spatial logics found in Mamelodi East (City of Tshwane, South Africa) will consider the spatial relationship and rules of engagement that allow certain patterns of living and public exchange to emerge. This paper argues that there are key lessons to be learnt from this logic because of the way in which people are resolving daily problems under the construction of scarcity.

Till (2014:9) argues that scarcity will become an inevitable feature of modern life. However, these limits will not lead to the end of design or an emasculated version of it, but will rather open up new fields in which the designer may operate. The strength thus lies in defining a response to a vernacular through its understanding of scarcity and the rules of engagement in which new roles and opportunities through architecture can emerge.

SAMEVATTING

Konteks in argitektuurteorie word meer kompleks en kontroversieel soos globalisering, verstedeliking en hulpbronskaarste meer lae by die debat voeg (O'Donnell 2016: 380). Namate hierdie aspekte elke faset van ons lewe betree, lei dit tot 'n ontwikkelingsbenadering wat die uitbuiting van mense, natuur en kultuur tot gevolg het (Fioramonti 2017: 3). Hierdie studie is van mening dat die produktiewe omgang met skaarste, 'n alternatiewe benadering tot ontwikkeling kan wees.

'n Kritiese ontleding van argitektoniese diskoers en die dissipline se betrokkenheid by kontekstuele kwessies plaas die debat in 'n breë historiese konteks - van Vitruvius tot die hedendaagse teorieë - om sodoende die rol van die argitek as 'n fasiliteerder van sosiale ruimte te identifiseer.

'n In-diepte konteksanalise van die ruimtelike logika van Mamelodi-

Oos (Tshwane, Suid-Afrika), sal die verhouding en onderliggende reëls vir sosiale en ruimtelike interaksie ontleed. Dit is hierdie verhouding wat sekere lewenstylpatrone en sosiale interaksie moontlik maak. Hierdie studie beweer dat daar belangrike lesse uit hierdie logika geleer kan word, omdat mense, temidde van die skaarste aan hulpbronne, hulle daaglikse probleme oplos.

Till (2014:9) beweer dat skaarsheid 'n onvermydelike aspek van die moderne lewe sal word. Hierdie beperkinge sal nie noodwendig tot die einde van ontwerp of 'n magtelose weergawe daarvan lei nie, maar sal eerder nuwe uitdagings vir die ontwerper bied. Die waarde lê daarin om deur 'n studie van die volkstaalargitektuur wat op die skaarsheid van hulpbronne en die reëls vir sosiale interaksie gebaseer is, nuwe rolle en geleenthede vir formele argitektuur te skep.

DECLARATION

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

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

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

.....

Mia Hofman

EXPRESSION OF THANKS

My Heavenly Father who has entrusted me with creativity and determination.

Prof. Barker and Dr Combrinck for your valuable guidance and endless commitment.

My parents Tony and Marinda who set the standard really high and taught me to never settle for average.

Friends and fellow colleagues, for the early morning laughs, afternoon workouts and late night dance parties ...you made this year unforgettable.

Willem, for your generous heart, patience, compassion and support throughout the year.

Consider it a great joy, my brothers and sisters, whenever you experience various trials, because you know that the testing of your faith produces endurance. And let endurance have its full effect, so that you may be mature and complete, lacking nothing.

JAMES 1:2 CBS

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CHAPTER ONE

INTRODUCTION

1.1 _PREFACE

They are clear enough about the ugliness of the world they live in, and they are quite vocal about the dirt, the smoke, the heat, the congestion, the chaos and yet the monotony of it. But they are hardly aware of the potential value of harmonious surroundings, a world which they may have briefly glimpsed only as tourists or as escaped vacationers. They have little sense of what a setting can mean in terms of daily delight, as a continuous anchor for their lives, or as an extension of the meaningfulness and richness of the world.

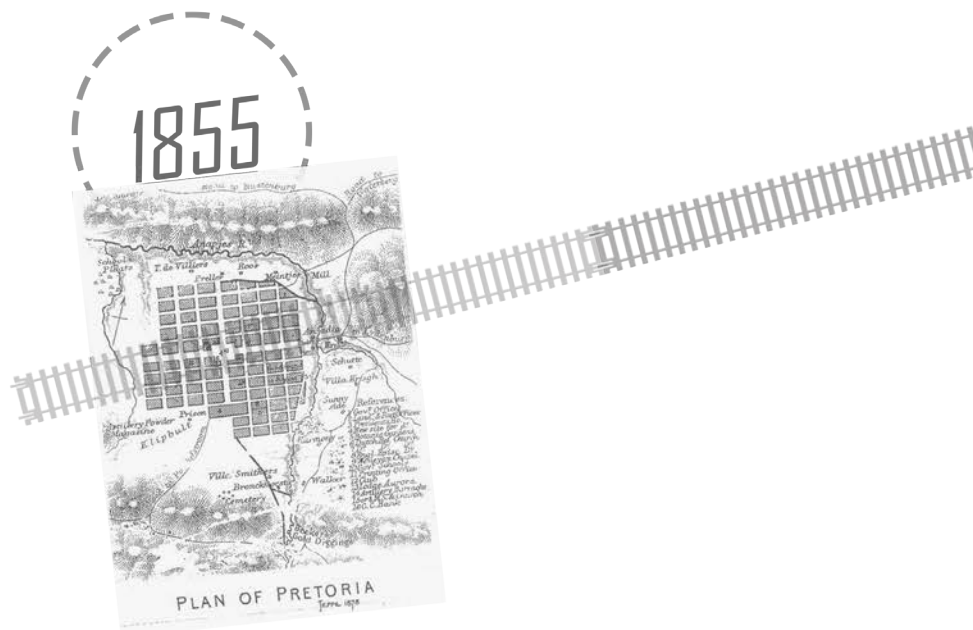
Kevin Lynch (1960:2).

1.2 _CONTEXT

The African city's identity has been weakened by the effects of globalization, urbanization and the imposition of the Apartheid city model. The search for appropriate spatial solutions in South African cities that could assist in the restoration of these faded identities, has been ongoing since the suppression of indigenous cultural expression during colonization (Barker 2015:19; Van Rensburg & Da Costa 2008:31).

Mamelodi is located on the periphery of the City of Tshwane. It is a township with a rich history and an integral part of the development of Pretoria. The settlement was established around 1860 when a group of indigenous people, seeking employment in the then newly established city of Pretoria, settled on the farm Vlakfontein. The first stop on the 1890 the railway line from Pretoria to Lourenco Marques (now Maputo) was at Eerste Fabrieken, providing the first economic impetus for the area. The settlement expanded to become a prominent black residential area, in terms of the Native Lands Act (No. 27 of 1913 (Nice & Walker et al 1991).

In the next few years, the first government-sponsored housing was built, modelled after the traditional *rondavel* typology. However, the use of a black vernacular dwelling typology through stylistic detail, was refused by the residents, as the houses were considered to be primitive



and insulting. The *rondavel* houses were later remodelled and used by the Bantu school education system.

The Group Areas Act was published in 1951. People of colour were deliberately removed from the inner city to townships that were separated by large distances, industrial areas or natural features. In 1962 the township was formally named Mamelodi (Nice & Walker et al 1991). After South Africa's first democratic elections in 1994, many expected rapid transformation to be reflected in the urban fabric of cities, but according to Du Plessis and Peres (2013:2) the country has not yet managed to transform its cities into integrated environments.

The inherited spatial legacy of fragmentation and separation still dictates how the City of Tshwane functions. Mamelodi continues to act as a peripheral zone for people who wish to move closer

to the urban centre for economic opportunity, and continues to experience urbanisation within the context of pervasive poverty and inequality and remains an indicator of the vast imbalances within the city (Du Plessis & Peres 2013).

Mamelodi East was selected as study area as it is now at a tipping point where it has almost reached its critical capacity for expansion. This phase of its adaptive cycle offers a window of opportunity, a threshold between an existing system state and, possibly, a new improved one (Du Plessis & Peres, 2013). This dissertation argues that for the current city environment to direct Mamelodi's socio-economic systems beyond the level of survivalism towards thriving socio-economic conditions, it is necessary to reconceptualise the reading and creation of social space within this context.



Figure 1.1: Collage depicting the history of Mamelodi Township in relation to Pretoria. (Author 2017).

1.3 RESEARCH PROBLEM

1.3.1 Urban issue

As typified in the apartheid city, Mamelodi was designed to control and oppress. Its peripheral location distinctly separates it from the developed urban infrastructure and as a result, one finds poor urban connections between economic nodes and the township and is economically limited (GAPP 2010:19). The distance between Mamelodi and the Tshwane city centre, forces the urban poor to live in cheap accommodation and commute extensive hours, over long distances at great cost. The functioning of the city continues to marginalize the poor, because of their dependency on pendulum migration (GAPP 2010:19).

The current single-use zoned residential typology causes urban sprawl, and spatial, social and economic fragmentation (Steyn 2005:1). The uncontrolled mono-use growth is causing rapid expansion towards the east and is polarising the location of new housing schemes and infrastructure upgrades (GAPP 2010:19).

According to Van Rensburg and Da Costa (2008:14), the current city environment displays the mere satisfaction of economic and technical efficiencies. It is suggested that to revitalise African urban space, a repositioning of architecture is needed to originate programmes that support the enablement of social space (Van Rensburg & Da Costa 2008:51). The opportunity exists to increase economic choice within the context of Mamelodi to initialise reversing the dependency on pendulum migration (GAPP 2010:19).

1.3.2 General issue

South Africa has been a poster child of the growth mantra. Its system of racial segregation, known as apartheid, was designed as a growth machine. Taking the cue from colonialism, apartheid built a powerful system of extractive industries, exploiting both workers and nature to achieve economic growth.

Lorenzo Fioramonti (2017:5).

Fioramonti (2017:6) has said that recent available statistics prove that poor, mostly male black South Africans between the age of 25 and 34 are less skilled and employable today than they were during apartheid. He further notes that the growth model has persisted throughout the past 20 years of democracy and its effects have been perpetuating the country's social and environmental problems. This crisis compels one to rethink the current development approach.

The range of residential, social, economic and commercial choices and opportunities are limited because Mamelodi's urban fabric is dominated by notions of necessity instead of social richness (Van Rensburg & Da Costa 2008:32).

How architecture can contribute spatially to the notion of economic enablement is a key theme for this dissertation.

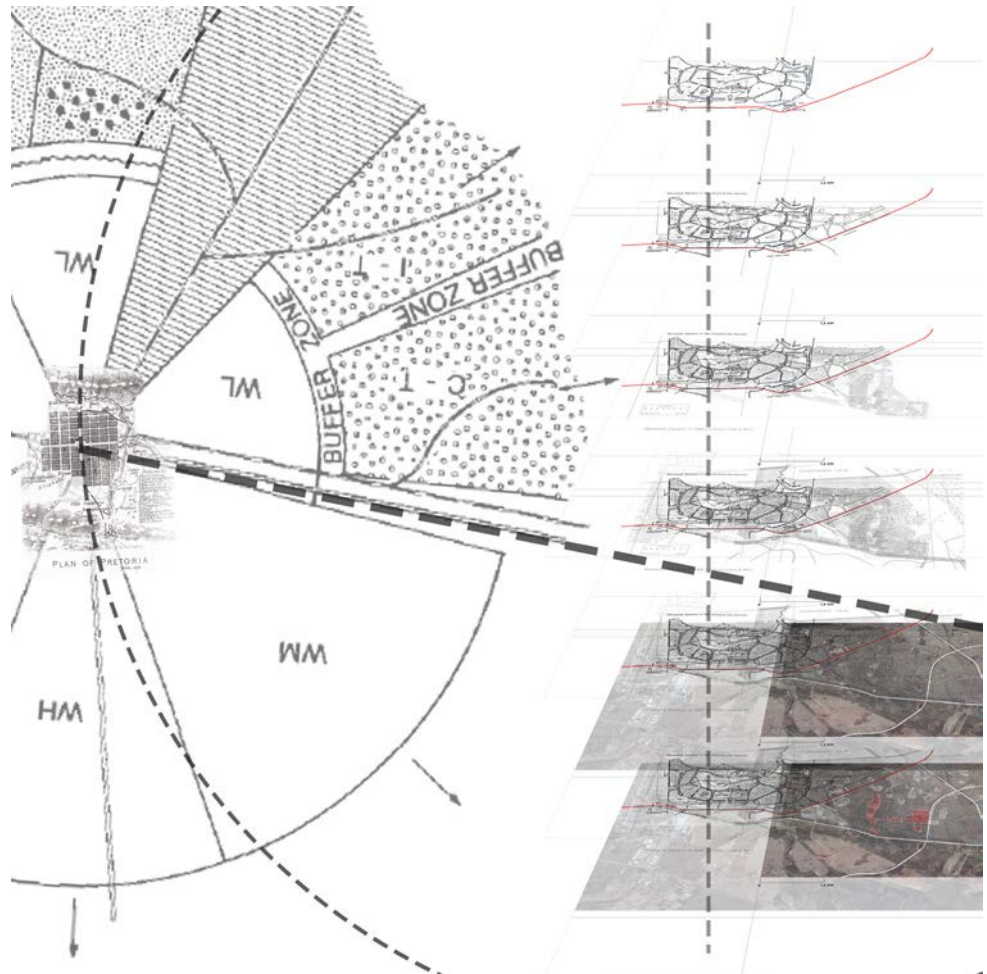


Figure 1.2: Mamelodi Township's development within its Apartheid spatial legacy. (Author 2017)

1.3.3 Architectural issue

According to O'Donnell (2015:239) architects are faced with unlimited choice and inspiration, as a result, recent development has tended to favour *decontextualized form* instead of *contextual logics* underpinning the transformations. As South African society increasingly opens up to the forces of urbanization and globalization the concept of place becomes *totemically important* (Van Rensburg & Da Costa 2008:30).

In her book *Niche Tactics*, O'Donnell (2015:244) suggests that the vernacular might be an appropriate model because it is an iterative process, rooted within its context and responsive to the available materials and technologies. However, some have made the

mistake to refer to the vernacular through the use of symbolic and monumental forms (Van Rensburg & Da Costa 2008:35).

This dissertation argues that within the context of Mamelodi some patterns and spatial responses indicate a productive relationship with scarcity and that these spatial consequences should be investigated to see how they can contribute to a novel approach to architectural form making. Van Rensburg and Da Costa argue that an appropriate strategy might be one of formal restraint to offer the user the *freedom to insert their own meanings and actions into the city* (Van Rensburg & Da Costa 2008:37).

1.4 RESEARCH QUESTION

How does one define an architectural response to a vernacular through its understanding of scarcity, in which new roles and opportunities can emerge, to secure its future value through supporting and facilitating change over time?

1.4.1 Sub-questions

Does an understanding of scarcity contribute to a novel approach to architectural form making?

Do these vernacular building traditions have the capacity to incorporate the knowledge of past generations, and long-term future possibilities such as maintaining and growing a building over time (Brand 1992:132)?

How much finite design should be done by the architect and how much should be facilitated?

What can be learnt from townships and informal settlements about their contribution to place and space making that is responsive to the context and environment with a specific reference to resource efficiency?



Figure 1.3: Fragmented Urban fabric of Mamelodi. (Author 2017)

1.5 RESEARCH METHODOLOGY

The following methods were applied to generate a contextually appropriate design strategy for the current context of Mamelodi Township.

1.5.1 Theoretical exploration

In support of the research question, the following theoretical concepts are discussed: identity of place, scarcity and agency, vernacular, informal settlements and open building strategy.

1.5.2 Analysis of the tangible and intangible context

Through a process of Participatory Action Research and participant observation the social and economic networks are outlined, to understand where and how to enter into a dialogue with the existing context.

A comparative study with the work done as part of the Honours (UP Arch) programme in 2016 is used to establish how an architectural response to certain scarcities have resulted in specific vernaculars in both Plastic View informal settlement and Mamelodi township.

Qualitative mapping and spatial studies of the physical buildings and their relationships with the surrounding context were done in order to interpret the vernacular that would enable formulating an appropriate design strategy.

1.5.3 Precedent studies

A selection of case studies ranging from conceptual, contextual, formal to programmatic are discussed in support of the argument and intentions of this dissertation.

1.5.4 Field research

The collection of qualitative data through participant observation guided the formation of perspectives regarding the context and the people who operate in the study area. As part of this strategy; transect walks, participant observation, mapping and desktop studies were implemented to expand on the constraints and opportunities within the context. The vernacular structures were observed, analysed and documented. Patterns regarding aspects and elements in the built fabric that demonstrated a clear response to scarcity were investigated in detail.

1.5.5 Developing a design strategy

...if you could predict what the end consequences would be from the application of these indices, the process would lose its power. If you knew where a set of rules was going to lead, it would already be deterministic.

Peter Eisenman (1997).

Since the strength of the mapping lies in its future interpretation, an opportunity exists where the designer can explore its potential. In translating an existing vernacular into an architectural expression that speaks to the collective it becomes necessary through design play workshops, as described by Habraken (2014) in his book *Conversations with form*, determine the role of the designer as an enabler of social space as well as how the design could play out.

1.6 _DELIMITATIONS AND ASSUMPTIONS

The selected study area (site) is located within the precinct vision as proposed in chapter three called UniverCITY. This vision proposes a decentralized university structure that functions as an *urban university*. This project can be holistically considered to be a single entity within this network and the design will focus on the incubator and automotive facility to illustrate the best response to the research problem.

This dissertation proposes an open building, which provides the base building/structure from which the architecture emerges. It is assumed that current business owners on site will take first ownership of the open building. It is also anticipated that the building will be constructed by the users with either new or found materials. It is proposed, however, that new materials must comply with the minimum requirements as stated in the SANS 10400 regulations and will only explore alternative materials in conceptual form.

This project aims to design an enabling framework that could facilitate economic enablement in a South African context. It is specifically appropriated to the context of Mamelodi East, thus the architectural outcome cannot be copied onto another site and expected to be a success. Rather it is suggested that it be used as a precedent, where the theoretical framework and approach could be applied to produce a unique outcome that is contextually appropriate.

This dissertation strives to develop a realistic outcome and solution to a real-world problem. The assumptions are made in relation to the proposed programmatic infill into an architectural framework. Therefore the programme will differ when the framework is used on a different site. This dissertation refrains from calculating economic, density or unemployment figures as an outcome to prove its success or failure.

1.7 _DEFINITIONS OF TERMS AND CONCEPTS

Urban sprawl: The uncontrolled and disproportionate expansion of an urban area into the surrounding countryside, forming low-density, poorly planned patterns of development ...characterized by a scattered population living in separate residential areas, with long blocks and poor access, often overdependent on motorised transport and missing well-defined hubs of commercial activity (UNICEF 2012:10).

Globalisation: ...a multi-dimensional process characterised by: the dissemination of common cultural values, but also the re-emergence of nationalism, cultural conflict and social movements (UNESCO 2017).

Networks: a term used in this dissertation to describe the complex relationship that exists in a social or economic group or community.

Spaza shop: informal convenience shop that could be loose standing or attached to an existing house, selling a confectionary and/or a variety of small household items.

RDP Housing: Reconstruction and Development Programme Government subsidized housing.

Scarcity: ...defined at core as a lack, would suggest the closing down of options in an effort to reduce production and consumption (Till 2014:9).

Scarcity Constructions: a highly contextual sociomaterial condition that ...operates at various scales from the geopolitical to the local. Scarcities arise out of, and are immanent within, complex, relations between social organizations, economic processes, psychological desires, existential needs and the geophysical flows of material, food, water and energy (Till 2014:9).

Design Agency: ... described as the ability of the individual to act independently of the constraining structures of society, structure is seen as the way that society is organized... and act determined by economic and social forces (Till 2011:31).

...often works most effectively at a smaller scale, and an accumulation of actions might then lead to a wider change (Till 2014:10).

Vernacular: commonly refers to a language or architecture which has local rather than foreign origins (Kellet & Napier 1995:7).

Open building: A term coined by John Habraken that suggests an approach to the design of buildings that is recognized internationally to represent a new wave in architecture, but a new wave with roots in the way ordinary built environment grows, regenerates and achieves wholeness (openbuilding.org/ob/concepts.html).

Regenerative design: A systems thinking approach that promotes a co-evolutionary, partnered relationship between sociocultural and ecological systems rather than a managerial one and, in doing so, builds, rather than diminishes, social and natural capitals. It facilitates positive connections to the social, economic and ecological context (Cole [sa]).



CHAPTER 2

THEORETICAL ARGUMENT



2.1 _INTRODUCTION

2.1.1 The City of Tshwane: a city shaped by segregation

One of the most devastating and ineradicable traces of apartheid will be its planning of the city. The marks apartheid left on human lives will fade in the course of time. But its spatial logic will continue to affect people's daily lives for generations to come (Bremner 1998:62).

The apartheid city model (South Africa 1950) provided for residential segregation, where people of colour were placed into neighbourhoods that were separated by large distances, industrial areas or natural features. Since the establishment of a democratic South Africa, the City of Tshwane has been experiencing rapid urbanisation within the context of ubiquitous poverty and inequality; this has resulted in a growing number of urban poor (Du Plessis & Peres 2013:4). As a result, we find informal housing solutions occurring on the periphery; this is often seen as a housing problem and treated as such.

According to Du Plessis and Peres (2012:1) the current political regime has yet to inclusively repair these disconnections in the city. In developing and implementing the Reconstruction and Development

Programme (RDP), the government's focus has been on the provision of houses to address the housing problem. However, low density housing solution draws heavily on non-renewable resources and perpetuates the construction of dwellings that are largely inappropriate to South Africa's cultures and climate (Combrinck, Vosloo & Osman 2017:32). It provides for an increasingly expanding urban periphery, thus the more houses the government delivers, the larger the spatial divide becomes. The current single-use zoned residential typology is not just causing urban sprawl, but also spatial, social and economic fragmentation, thus worsening the problem (GAPP 2010:19).

This begs the question: Does this perceived growth and progress represent an advancement of living quality? According to Fioramonti (2017), this has resulted in a development approach that is exploitative of people, nature and culture. This crisis compels us to rethink our development approach.

2.1.2 The era of no growth and scarcity

In the same way that the 20th century has been defined by rapid urbanisation, the 21st century will increasingly be defined by scarcity (Till 2014:9).

This study proposes an approach where working with scarcity in a productive manner can be seen as an alternative to current development approaches. What can be learnt from scarcity and how can this point of departure be used towards novel approaches to architectural form making?

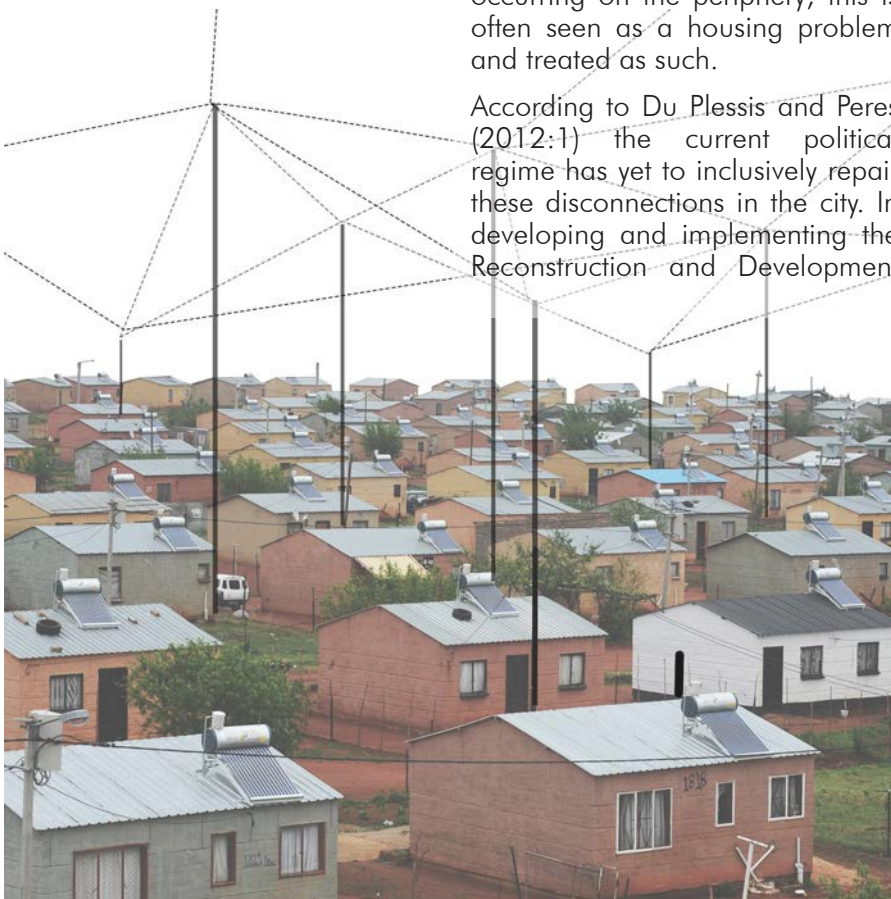


Figure 2.1: RDP residential typology causing urban sprawl toward the east of Tshwane. (Author 2017)

2.2 _ SCARCITY

Scarcity is often perceived as the antagonist in the human story, haunting future progress and growth. Scarcity by definition suggests an insufficiency or a lack, thus closing down options, reducing consumption or production. This is a complex and controversial topic because architects define and express their creativity through the creation of the new, thus scarcity strikes at the heart of design. In order to determine the alliance between scarcity and agency - with the potential for a new development approach - it is necessary to unpack some of the perceptions regarding scarcity.

2.2.1 Context

Till (2014:9) is of the opinion that scarcity is not neutral, natural or the same for everybody. He suggests that it is contextual and relational. For example, people feel the desire to need more simply if there is an unequal context. Consequently, the most common way to deal with scarcity is to control, limit and restrict. However, that perpetuates the idea that scarcity is absolute.

Therefore if scarcity is a contextual issue, an analysis of such a context will indicate how it originated and evolved, one can address the context that has produced that scarcity. This is an important notion for designers because if the object is the focus, one can only quantify and limit. However, if the focus is redirected to the *software* (processes) that makes it operate, the designer needs to engage with networks, the operations of procurement and the ways in which the programme is organised beyond just the building (Till, Habraken & Timm 2014).

2.2.2 Sustainability

The current understanding of sustainable building strategies and methods emphasizes the ways and extent in which buildings should mitigate resource depletion and environmental degradation

(Littman 2009:6). This is not so much an inadequate response but rather an incomplete one, as it aims no higher than to create *less bad architecture* (Littman 2009:1).

Designers need to look at an ecosystemic approach that responds to a specific context and that is dynamic at multiple scales. O'Donnell (2015:11) suggests an architectural bubble that points to an architectural organism which *perceives and responds* to a selection of external forces within the specific context. The architecture then becomes integrated into its niche as it reaches out, wraps around, and draws on many stimuli from its environment. It then abstracts what is useful and reacts to it, therefore becoming culturally, ecologically and economically relevant.

...the whole human development, at least up to now, has been a bitter struggle against scarcity according to Jean-Paul Sartre (in Dobson 1993:85).

2.2.3 Economics

Till (2014:9) argues that scarcity hangs over the market as the ultimate threat in the way that it depends on the growth model. Economic theory is thus defined by scarcity and becomes artificial construction.

Sartre refers directly to the scarcity postulate that human needs are unlimited and the means to achieve them are limited and scarce. Till's (2014:9) research challenges these assumptions. He questions whether human needs are in fact unlimited, and secondly he rejects the inevitability of scarcity. He argues that non-renewable resources are really running out – however, the way in which the effects are distributed are socially and politically constructed.



Figure 2.2: Woman recycling glass bottles as a way to supplement her income. (Author 2017)



2.2.4 *The design of Scarcity*

The design of scarcity appears to be an anomaly. According to Till (2014:10) design is inherent in the production of desire and obsolescence. Therefore, architecture and design is complicit in the production of scarcity in the way that most design starts with the construction of desire instead of the satisfaction of needs (Till 2014:10).

If scarcity is designed then one could argue that designers can stop or reverse the process. Till's (2014) argument explicitly states that design is not the answer to the problem of scarcity, but that it can be worked with in a productive manner. He suggests strategies that include optimising existing systems, designing for adaptability and upscaling of small scale initiatives. Design then becomes concerned with the temporal life of objects, with what comes before and after the moment of completion (Till 2014:10).

2.2.5 *Designing with scarcity as a new development approach*

Till (2014) argues that scarcity will become an inevitable feature of modern life. However, this limiting aspect will not lead to the end of design or an emasculated version of it, but will rather expose new fields in which the designer may operate. The engagement with scarcity as means of creating new forms of architecture holds great potential in a developing state such as South Africa. The key lies in defining a response to a vernacular through its understanding of scarcity and the rules of engagement in which new roles and opportunities through architecture can emerge.

Figure 2.3: Collage depicting the engagement with lack as a means to create new forms of architecture. (Author 2017)

2.3_VERNACULAR ARCHITECTURE BEFORE THE ARCHITECT

2.3.1 Theory

Some vernacular studies have perpetuated the myth of *naturalistic determinism* in vernacular buildings; these produce *exotic images* but omit fundamental information regarding the design method (Hubka 1979:27). The primary aim of this study is to learn from the vernacular, through critical analysis of buildings. It remains to be determined whether this understanding can produce a response to the vernacular that would result in an architecture better suited to the cultural and contextual issues whilst accommodating the user's changing needs (Davis 2006:1).

Architecture's productive engagement with context can be traced throughout history; from western theorist Vitruvius's (1914) *Ten Books on Architecture* written in 15BC, to Laugier's (1755) *Essay on Architecture* to the current theory posed by O'Donnell (2015) in *Niche tactics: Generative Relationships Between Architecture and Site*. Vitruvius opens the discussion about architecture being in nature, by placing this argument in an abstract conceptual form comparing *climatic variation in the human body with architectural variation* (O'Donnell 2015:50). He argued that architectural form has its origin in nature and human rationality.

On the contrary, Laugier's theory outlines an architectural idea into three essential elements: the post, beam, and the roof. He continues that it is the model upon which all the magnificences of architecture has been imagined. It can be argued that this expression is a reaction against the extravagances of Baroque and Renaissance architecture and that vernacular builders operate within a narrow field of possibility which is defined by culture and tradition.



Figure 2.4: A depiction of architecture being in nature by Vitruvius. (1914)



Figure 2.5: The Primitive Hut by Laugier. (1755)

2.3.2 Vernacular thinking

...start(s) with the unchanging and accommodate change. Folk builders share a common strategy for generating design ideas which can be described as a continuous process of composition and decomposition within a vocabulary of existing building forms (Hubka 1979:28).

To capture the essence of vernacular architecture, the way how *thinking traditionally* influences the design approach must be analysed (Hubka 1979:28). Dell Upton, from the University of California, has stated that vernacular builders are content to accept well-proven old solutions to old problems. Levi Straus (in Hubka 1979:28) compares the vernacular builder to the modern designer; vernacular method is defined by context and tradition, while the modern designer can move beyond *constraints of context* thus influenced by an indefinite amount of sources that can be combined into unlimited new forms. However, as stated by De Botton (2007:44), unlimited choice tends to lie not so far from outright chaos.

Do vernacular building traditions, as defined by Oliver (1997), have the capacity to incorporate past generational knowledge as well as long-term future possibilities such as maintaining and extending a building over time (Brand 1992:132)? The answer lies within its form. The inherent quality of vernacular architecture is form not style. Vernacular is deeply

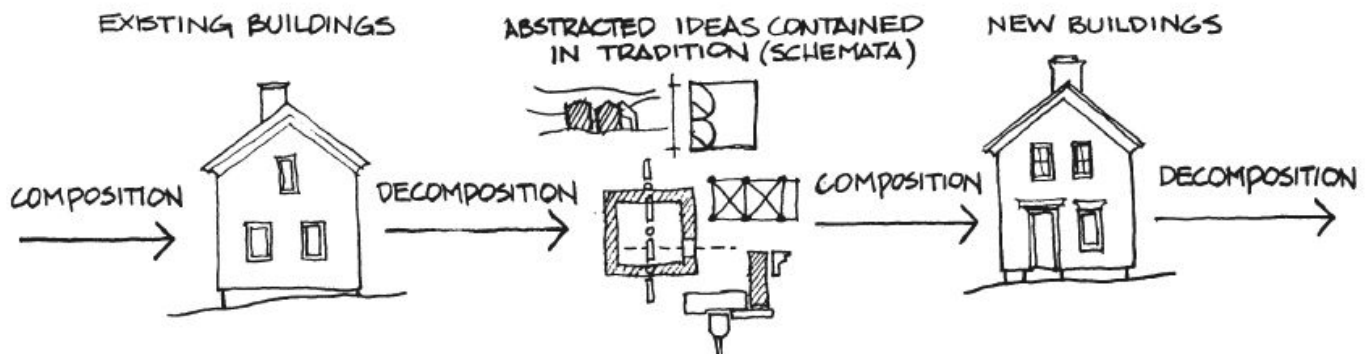


Figure 2.6: Generative process of the vernacular design process. (Hubka 1979)

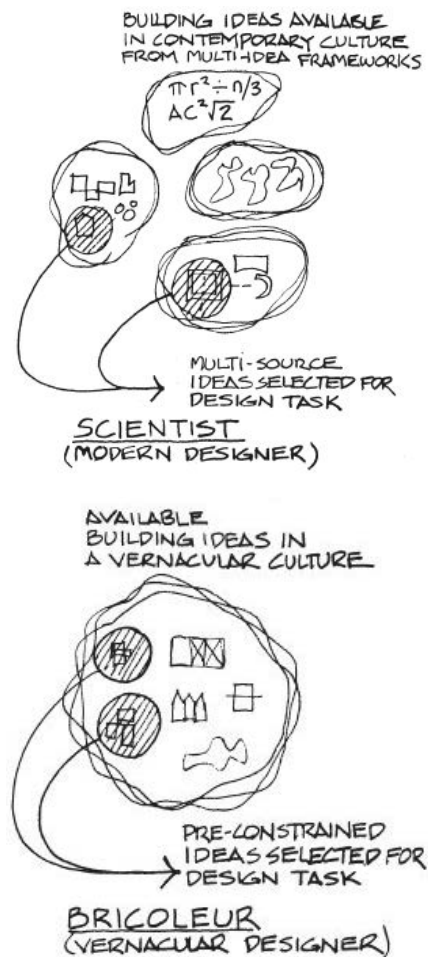


Figure 2.7: A comparison of the design ideas available to the vernacular builder and modern designer. (Hubka 1979)

thoughtful and imitative, expressing its culture and its region (Brand 1992:132,133). For this reason, one can never translate vernacular form as style, for the simple reason that the native form and its adaptivity to new uses will be left behind (Brand 1992:150).

The difference between style and form is the difference between a statement and a language. An architectural statement is limited to a few stylistic words and depends on originality for its impact, whereas a vernacular form unleashes the power of a whole, tested grammar (Brand 1992:155).

Hubka (1979) explains that this pre-constrained approach is not constrictive to the builder's creativity and individuality, but this approach releases them. In the same way an architect can learn from the vernacular builder and choose to limit their design influences to what is available in the immediate context, in order to focus on a skilful solution to problems rather than reinventing forms that already work (Hubka 1979:28).

2.3.3 Limitations and Globalisation

According to De Botton (2007:34) what breeds a strong local architectural identity is not common cultural vision, but a host of limitations. Rapoport (2006:180) is of the opinion that the vernacular cannot be analysed or fully understood in isolation, because the relationship between the vernacular and other environments contrasts and reinforces each other. The following limitations could be considered as the main determinants for vernacular architecture.

1. Climatic environmental conditions

Climatic challenges without technological solutions to resist it, leaves the vernacular builder with a limited range of options of how to most sensibly put up a wall, pitched roof or render a façade (De Botton 2007:33).

2. Material and resource scarcity

Vernacular design is practical about available materials and time, seeking the most suitable building for the least effort and cost (Brand 1994:134). In the past transporting materials over any significant rural landscape was too costly and difficult. This limited choice, obliged builders to use whatever was available: Stone, grass, timber, or mud (De Botton, 2007:33).

According to Till (2014), the age of abundance has passed and the effects of scarcity will increasingly affect our material choices. We need to look to locally available materials, but also see choice as part of socio-material and temporal relationships into which the designer may intervene.

3. Knowledge accessibility

Folk design method is carried exclusively in the human mind and maintained within its culture by tradition - the handing down of information by word of mouth, observation, replication and apprenticeship (Hubka 1979:28).

Vernacular buildings are of such a nature that they slowly evolve and adjust to climate and society, through the accumulation of native knowledge and shared experience (Brand 1994:132). De Botton (2007:34) reckons that folk builders within a particular radius construct their houses in a particular way, and that physical limitation cedes its ubiquity. However, as society starts to open up to the forces of globalization, cities, townships and farmlands merge as one (Deckler, Graupner & Rasmuss 2008:5). Similarly, O'Donnell (2015:245) noted that with the expansion of globalization and the deterioration of original local architecture, the term vernacular has almost become lost.

Publications such as the *A Pattern Language: Towns, Buildings, Construction* (Alexander 1977) and *Encyclopedia of Vernacular Architecture of the World* (Oliver 1997) assisted to define vernacular studies as an relevant and acceptable field of study and marked the end of what some call the first stage of vernacular studies (Rapoport 2006:179). However, Rapoport (2006:179) insists that vernacular studies need to move to the next *problem-oriented* stage, where comparative, integrative and more conceptual and theoretical realms can be explored. He suggests redefining the vernacular through use of *process* and *product* characteristics to include other environments such as spontaneous settlements.

The next section attempts to demonstrate why and how an understanding of informal settlements and townships must be revised in terms of vernacular theory. As a response to the study of vernacular tendencies, using the filter of scarcity, new roles and opportunities for architecture can be developed.

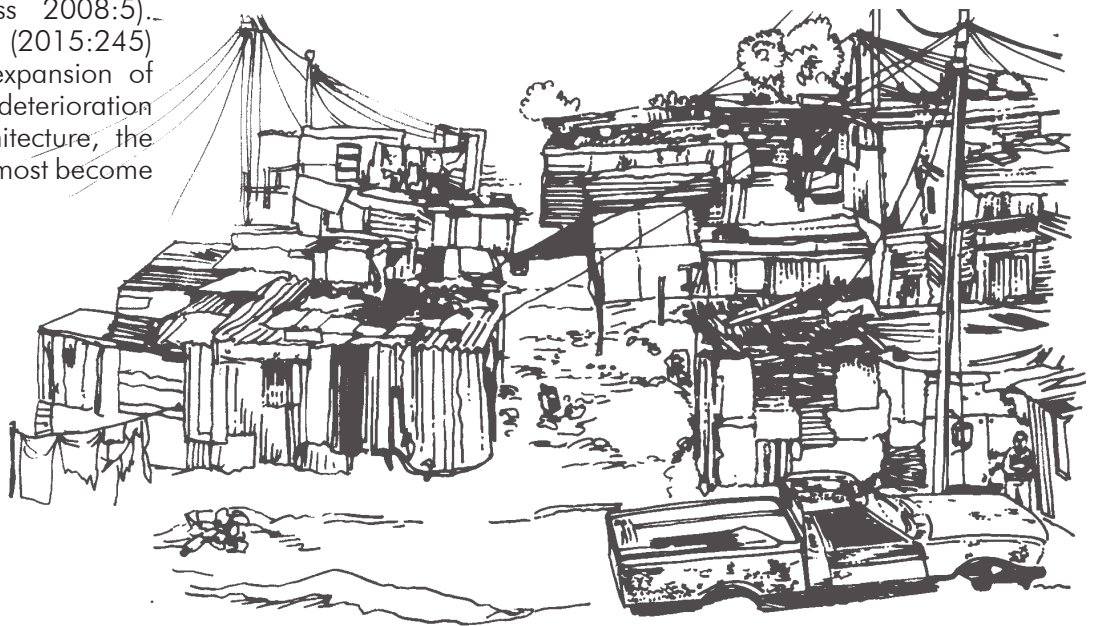


Figure 2.8: Informal settlements may be considered to be a contemporary vernacular. (Hubka 1979)

2.4 _THE EASTERN SUBURBS

According to Fioramonti (2017:3) urban sprawl and development have an exploitative approach to nature, people and culture. Over the last fifteen years, the City of Tshwane has experienced increased investment, commercial and residential development to the east of the city. This has resulted in an *estate typology* that caters for high- and middle-income earners (Du Plessis & Peres 2012:4). These gated communities have created inaccessible pockets within the city with leftover and neglected interstitial space that mostly consists of municipal grounds, servitudes and natural areas. These vacant spaces have stimulated fast-growing informal settlements where low-income earners have appropriated land in order to live near their places of employment. The residents include domestic workers, gardeners, construction workers and security guards. Bremner (1998:62) argues that a new landscape is emerging, one in which social and spatial fragmentation is being deepened.

An example is the informal settlement called Woodlane Village (Plastic View), located east of Moreleta Park (Tshwane, South Africa). In the early stages of the settlement's development residents lived in clusters in the open landscape, however, in 2008 the settlement, consisting of approximately 3 000 residents, were *organised* into a demarcated area of about nine hectares (Du Plessis & Peres 2012:8). The land was divided into 856 plots where registered

residents erected temporary shelters. The self-built shelters were constructed of materials found in the natural and urban landscape. Urbanization here is in the form of a bricolage loaded with textures, details and traces of the past that can be seen in the detritus of the informal settlement.

Mamelodi Township (Tshwane, South Africa), a dormitory suburb located 20km east of the city centre, has been evolving within its apartheid spatial legacy and currently functions as a buffer for people who wish to move closer to the urban centre for economic opportunity. Despite the fact that many consider the RDP typology to be inappropriate (Combrinck, Vosloo & Osman 2017:32) residents in Mamelodi have made physical additions over time. These additions represent a *laboratory* to scholars and researchers as it reflect a vast range of responses to problems pertaining to culture, site, climate, technology, resources, materials and ways of making a living (Rapoort 2006:181).

According to Rapoport integrative studies between vernacular and other environments are necessary, as spontaneous settlements and used environments are *essential and need urgent study*. He continues by saying that if one is to gain a better understanding of vernacular architecture it is necessary to examine the built form alongside the process aspects in a way that is *integrally anchored within specific contexts* (in Kellett & Napier 1995:10).



Figure 2.9: Aerial view of Plastic View's built fabric. (Author 2017)



Figure 2.10: Aerial view of Mamelodi East's built fabric

2.4.1 Methodology

According to Till (2008), expanded architectural research must include the processes that lead to the building, the representation of that building and the theories and interpretations towards the use. Within this framework, spatial production can be viewed as the result of interrelations constituted through the social interactions of the everyday (Van Rensburg & Da Costa 2008:30).

Participatory Action Research (PAR) values the knowledge and lived experiences of a community affected by the problem. It is thus considered an appropriate point of departure to redefine the problems and opportunities within both contexts. This methodology was

selected not only to produce new knowledge but also to generate concrete action or intervention for positive change (MIT Community Innovators Lab 2015).

As part of this strategy participant observation, transect walks and mapping were used to collect qualitative data regarding the urban fabric. This in turn would lead towards determining patterns of use and intangible networks. Photographs and freehand sketches were used to record the existing built fabric such as the use of materials, floor plans, sections and facades. These were then sorted into product and process characteristics.

As defined by Rapoport (in Kellett & Napier 1995:10) product characteristics include an understanding of the physical description of the built form such as the degree of place specificity, plans and sections, materials, textures, colours and effectiveness of response to climate. Process characteristics change the discussion from *what it is* to *what it does* (Kellett & Napier 1995:9). Process characteristics point to a shared model and describes the visual coherence found in these two settings (Kellett & Napier 1995:12).



Figure 2.11: Locality map of Plastic View. (Author 2017)

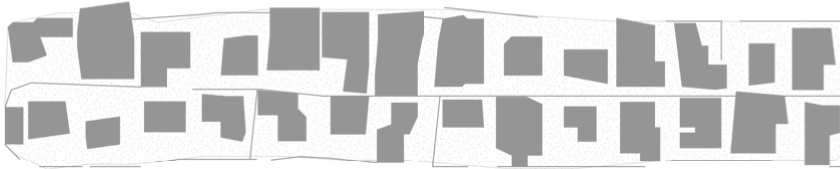


Figure 2.12: Figure ground study depicting Plastic View's mass to open space ratio. (Author 2017)

Original House
 Self built fabric
 Open space
 Open space to footprint ratio
 Plastic View 1:2.14
 Mamelodi 1:2.17

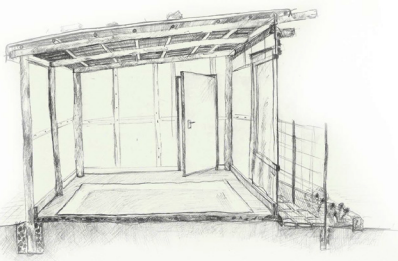
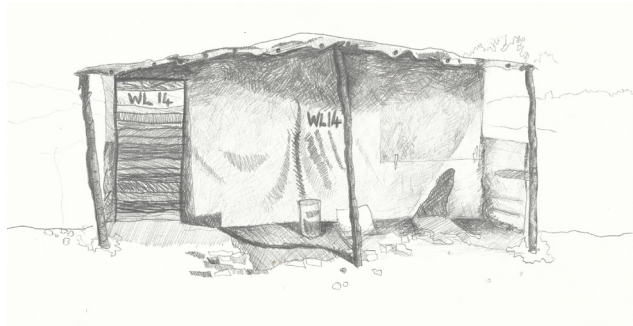
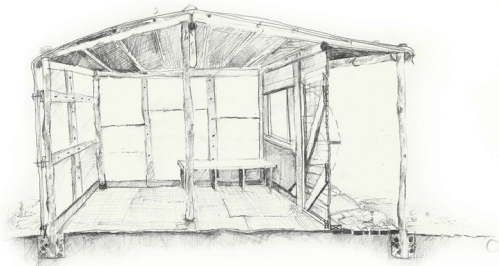
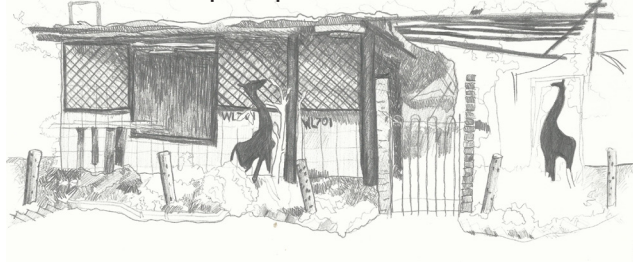


Figure 2.13: Series of sketches depicting Plastic View's vernacular in terms of material use construction details etc. (Author 2017)

Figure 2.14: Streetscape collage of a typical street in Plastic View. (Author 2017)

2.4.2 A discussion of research outcomes PRODUCT CHARACTERISTICS

Plastic view

Density: 112 units per hectare

The size of a typical plot is seven by seven meters, the location and size of the dwelling is left to the discretion of the owner. Single story dwellings are constructed with a timber structure and clad with recycled building materials ranging from chipboard to plastic. The exterior of the dwelling looks rough and unplanned but the interior space is carefully arranged.

Some residents have decided to supplement their income by transforming the front of their house into a restaurant, *spaza shop* or hair dresser to name a few. Dwelling units with shops would usually have some section of the front of the dwelling accessible to the public through an openable hatch or hole in the wire mesh covering the opening. These openings have an overhead plane to protect the customer from harsh weather conditions.

The residents explore the surrounding landscape for building materials from illegally dumped rubble. In many cases plastic sheets recovered from old billboards are used to cover the entire structure for added waterproofing. Canopies and umbrellas are used where less permanent services are provided.

The plastic covering offers a weak response to climate as it allows no ventilation due to safety and waterproofing issues. Some details have shown ingenious solutions to common problems such as the use of beer bottle screw caps that are used as washers to prevent the plastic covering from tearing and preventing water penetration through the puncture.

The grid layout parallel to the sloped site has caused problems regarding drainage and movement of water. This is partially solved by the residents by installing a geopipe or by sloping the street towards a



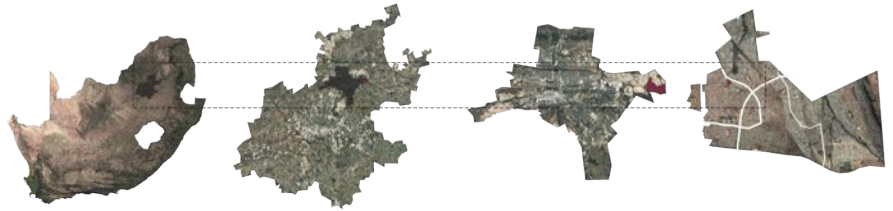


Figure 2.15: Locality map of Mamelodi East. (Author 2017)

shallow trench to lead water away from the houses.

Mamelodi

Density: 32 units per hectare

RDP houses consist of single story low maintenance structures constructed of plastered and painted concrete blocks with a corrugated iron roof. The interior layout is fairly generic: two bedrooms sharing a small bathroom, a kitchen and a living area.

Most RDP houses are located in the centre of the plot. Between eighty and ninety percent of the owners have made formal backyard additions to their homes. The additions range from a garage, carport, spaza shop, additional bedrooms to rent out or a small business that serves as an additional source of passive income.

Permanent additions are constructed with locally made concrete bricks. Where temporary or semi-permanent structures are erected, recycled materials such as timber pallets, shade netting or bricks are used.

No roof or wall insulation is installed in the RDP houses, thus providing little resistance to any extreme temperatures in summer and winter. Steel frame doors and windows offer adequate ventilation but offer little resistance to moist problems. Some temporary structures have shown practical solutions to everyday problems such as: where plastic shade netting is to be fastened to a sharp timber pole a milk carton is placed on the pole's end as a protector to prevent the netting from tearing.

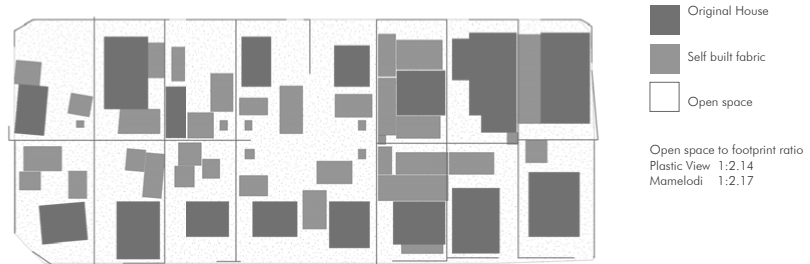


Figure 2.16: Figure ground study depicting Mamelodi's mass to open space ratio. (Author 2017)



Figure 2.17: Photographic study depicting product characteristics of the built fabric in Mamelodi. (Author 2017)

Figure 2.18: Streetscape collage of a typical street in Mamelodi East. (Author 2017)



PROCESS CHARACTERISTICS

Plastic View

A lack of visibility at night time has sparked an increase in violent crime after dark. Due to safety issues, passive surveillance between homes has become a central objective to organising the built form. The courtyard typology allows for as many as five units to face towards an open space where clothes can be washed together and where children can play safely. The façades facing the street are blocked off to increase safety.

Few permanent structures were identified and may be because of the uncertainty of the settlement's

future.

A pattern language was identified in the occurrence and spatial distribution of *spaza* shops, hairdressers and other facilities. This indicates the presence of some decentralised economic network. Some shops were directly related to traveling times of workers, while others were open throughout the day.

Multi-functional spaces were simply indicated by an open plot with or without a sheltering overhead plane. These were mostly used as a gathering space or as an open shop over weekends.



Figure 2.19: Photographic study depicting spatial responses to different programmes found in Plastic View. (Author 2017)



Figure 2.20: A Pattern Language looks to a decentralised economic network. (Author 2017)

Creative inexpensive marketing techniques are used along the street façade to draw passers-by.

Mamelodi

The rational modernist approach of the RDP housing has left little opportunity for shared space, community building and organic growth. However, despite this residents have added rooms to their dwellings to supplement their income.

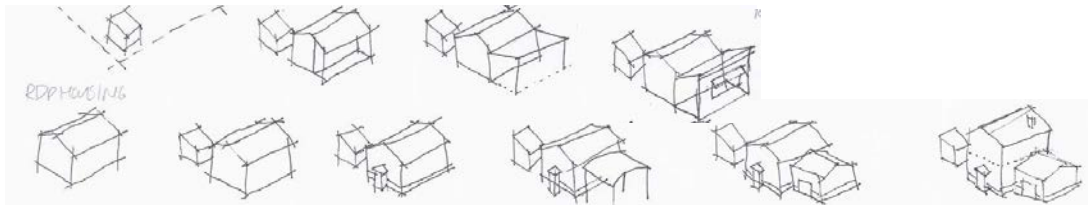
The secure tenure in Mamelodi allows for residents to obtain loans to make formal additions to their homes.

The layout pattern identified in Mamelodi is associated mostly with properties along the main arteries and most small businesses are located along the internal main roads. Most mobile *spaza* shops are dependent on commuters and

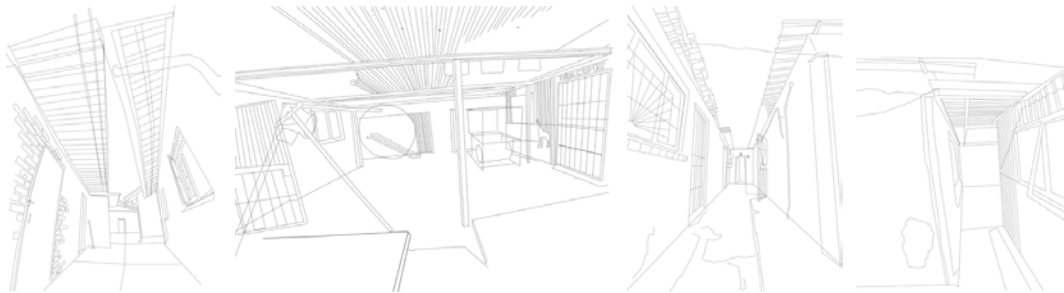
commuting times. They are easily assembled and dismantled and can be located either along the main transportation routes or near major pick up and drop off nodes.

Multi-functional spaces are characterised by the presence of a simple canopy structure providing a shaded area. These spaces are occupied by car wash businesses, informal restaurants or as recycling areas.

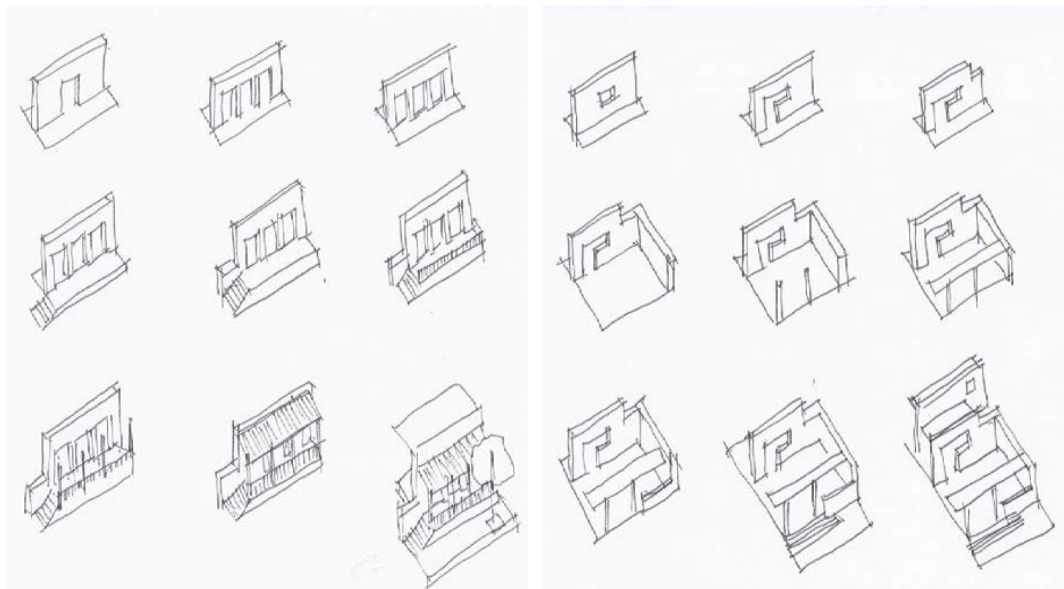
PATTERN OF CHANGE TO EXISTING RDP HOUSES



SPATIAL CONSEQUENCE OF ADDITIONS



CONDITIONS OF ACCESS & PRIVACY



BOUNDARY WALL AND ITS ATTACHMENTS



Figure 2.21: Graphic study depicting patterns of appropriation found in Mamelodi. (Author 2017)



Figure 2.22: Housing in Jakarta, Indonesia, built from waste found in a nearby landfill. (Roe & Taylor 2014)



Figure 2.23: Glass Chappel by Rural studio, constructed from recycled windscreens. (Rural Studio 2000)



Figure 2.24: A house in Plastic View constructed from dumped built fabric found in the landscape. (Author 2017)



Figure 2.25: Informal spaza shop in Mamelodi that is left open until peek traffic time. (Author 2017)

Most advertising is in the form of painted boundary walls along the street façade.

Concluding remarks

Mamelodi township (formal settlement) and Plastic View informal settlement represent indicators of the vast imbalances within the city. These contexts have traditionally been defined by what they are not, or do not have, when compared to the formal city. However, both contain unique spatial logics within the context of scarcity. This resulted in new networks that these people depend on. This reality challenges the utopianism of modernist planning where urban and rural, public and private, residential and business merge in indistinguishable new combinations (Bremner 1998:62).

In Plastic View the urban blocks are slightly longer than those generally found in Mamelodi, however, the open space to building footprint ratio for both study areas is 1:2.1.

In both study areas the more affluent residences have shown privatisation of the plot with additional attention to the garden and embellishment on the home.

In both areas less permanent structures were linked to earlier stages in the development process. In both cases the multi-functional spaces had at least one an overhead shelter (canopy). These structures can be compared to those referred to by Laugier, as each structure is reduced to the basic architectural elements: the post, the beam and the roof.

Both these vernaculars lie in the wake of post-industrial South Africa and are a reaction to the fallout of development. In other parts of the world similar phenomena occurred suggesting that a certain fallout has a certain reaction. For example, the landfill and wastelands of Jakarta, Indonesia display another aspect of the post-productive potential for creating new cultural landscapes (Roe & Taylor 2014:13). Scarcity is seen as a resource and the community creates a livelihood from the waste produced (Roe & Taylor 2014:13). Similarly, Rural Studio, a design/build programme

attached to Auburn University USA, constructed a glass chapel, not of consumption but, of recycled windscreens found at a local scrapyard (Rural Studio 2000).

If vernacular design is defined properly, spontaneous settlements can be shown to be its closest contemporary equivalent.

Rapoport (in Kellett & Napier 1995:12).

2.4.3 A new vernacular is emerging

The juxtaposition of informal and formal settlements in the east of Pretoria reflects two very different contexts, each with unique responses that can be considered new vernaculars. In developing contexts like these it is important to understand how change happens over time in order to appropriately respond to issues of place and space making to allow for emergence. How can a 'new' architecture be interpreted that is not reliant on new resources? How can an architect initiate processes instead of objects?

In her book *Niche Tactics*, O'Donnell (2015:10) develops an analogy between architecture and evolution. She proposes an architectural model that engages with its context on various levels. Particular emphasis is placed on *niche thinking*, on the premise that a niche is a subset of something specific and specialised. This oddity produces unique outcomes and yet fully enmeshed with its surroundings.

If we consider these questions relating to how and where the architect might begin to intervene, the question of authorship comes up. How much finite design should be done by the architect and how much should be facilitated?

2.5 _DISCOURSE OF ARCHITECTURAL AUTHORSHIP

Throughout the continuum of the architectural discourse, the issue of authorship in architecture has persisted. This tension between the architect as an artist and the architect as a social worker demands that the issue be broadened to assess how buildings relate to their context and the surrounding community. This, according to Adjaye (2011), is a provocative investigation, because it reflects on how the architect and the community connect in the practice of architecture.

As stated by Till (2014:9) normal definitions of design assume that the architect produces original and new buildings. On the other

hand, built environments represent organisms that are under constant transformation and renewal. According to Habraken (1998: 7), these built environments comprise not only of the physical forms but also the people acting on them. Thus the built environment is an organism by virtue of the people acting in them. From this angle, the question of authorship takes on a different dimension.

To establish the role of the architect, a critical look at the continuum of architectural discourse and its engagement with issues of context is necessary.

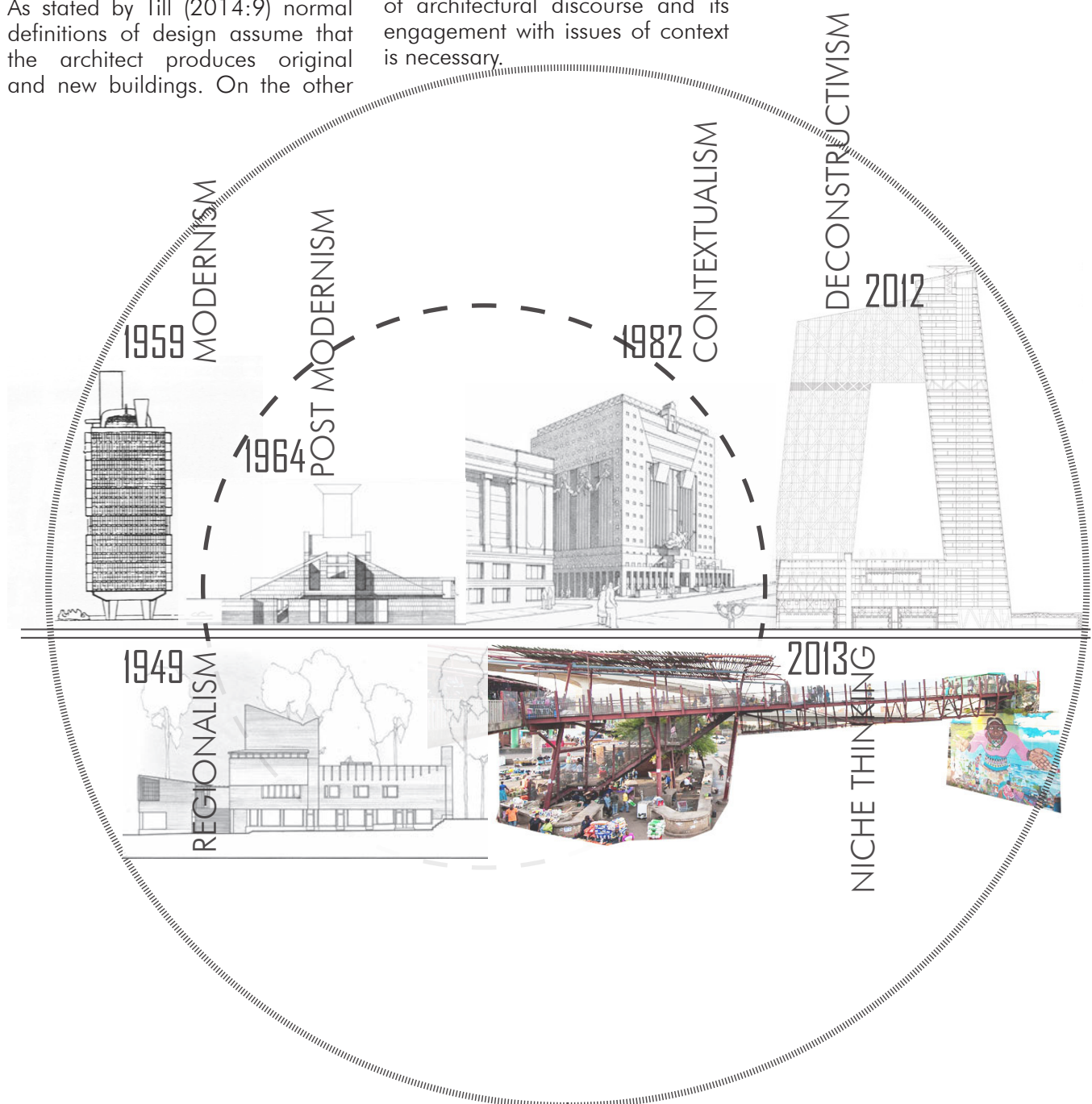


Figure 2.26: A graphic depiction of the architectural discourse. (Author 2017)
© University of Pretoria

2.5.1 Modernism

This bubble, is perfect and harmonious if the breath has been evenly distributed and regulated from the inside (O'Donnell 2015:200).

Le Corbusier famously compared architecture and the soap-bubble. This dominance of the interior would not permit the exterior conditions to determine the interior distribution. This statement clearly exposes architecture's reluctance to engage with issues of context during the Modernist era.

In the early 20th century the Modern movement diverted its attention away from context and its contingencies to the advocacy of standardization, mass production and functionalism (McLeod 1989:25). However, the attempt to overhaul architecture's economic and social role failed because its ideals became increasingly stylistic.

Despite the aspiration to essentialism, the architect's preference for internationalism over any *natural instinct* (O'Donnell 2015:244) led to an architecture

that was standardized and sterile. Its aim was to smooth out all uniqueness, diversity and responsiveness. Style became times fool and the conflict between the architectural bubble and the external world laid the foundation for the movements to follow.

2.5.2 Postmodernism, Deconstructivism and Contextualism

In its rejection of the Modern movement's formal and stylistic ideals, Postmodernism embraced a broader formal language that was figurative and historically eclectic. It aimed to express a sensitivity to the context of the building, but McLeod (1989:24) describes it as a mere *return to architecture as a primarily formal and artistic pursuit*.

Deconstructivism, often seen as the second string of postmodernism, rejected modernist principles through its deliberate denial of programme and function as generators for design. Architectural form is generated as an independent object through the manipulation of meaning within a cultural system. Here the significance is concentrated on the building's

hidden meaning as opposed to the overt meaning.

The contextualist movement initiated by Collin Rowe, allowed architects to selectively relate to their immediate context. Contextualism, however, referred only to architecture stylistically and later became a literal repetition of decorative details without any analytical inquiring (O'Donnell 2015:5). This movement has been described as essentially modernist with an extension of local references.

Postmodernists had a propensity to seek ideological justification, not in programme, function, or structure, but in the meaning of form (McLeod 1989:24). It managed to correctly point to the failures of the modern movement but remained a tool indifferent to social, economic and ecological factors. The movement remained a formal pursuit and reinforced the notion that the authorship remains in the hands of the architect. In retrospect, it seems that most postmodern buildings are qualitatively no different from their predecessors (Lefavre & Tzonis 2003:10).

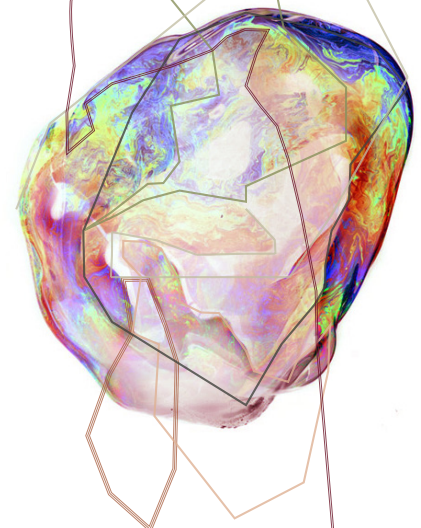
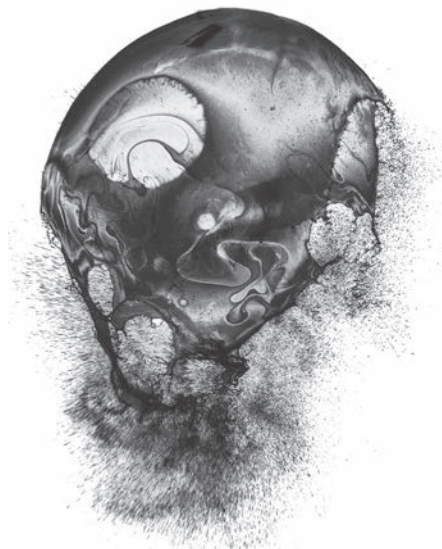


Figure 2.28: A new proposed bubble that draws on its context and reacts to it. (Author 2017)

Figure 2.27: A depiction of an architectural bubble coming into contact with its context and bursting. (O'Donnell 2015)

2.6 _READING AND RESPONDING TO THE VERNACULAR

In the Mamelodi project primary authorship is not the most important aspect to consider. Till's (2014) observation that there is a role for an architect as a different type of designer with a different design approach becomes more relevant. The role of the architect changes from a designer of form to a designer of processes that enables the creation of social space.

Joshua Prince-Ramus (2007) calls this *the lost art of productively losing control* where architectural authorship and the end result may be unpredictable as the conclusion may transcend convention. If this becomes a reality, the architect will start re-injecting agency back into architecture.

...the act of design agency is one that critically intervenes in wider societal structures in the name of, and for the benefit of, others (Till 2014:10).

Till is also of the opinion that in the face of scarcity, design agency often works better on a smaller scale and then, as it builds up momentum it leads to more extensive change (2014:10). Design agency endeavours to make the best possible sense of the competing conditions of scarcity.

In defining a response to the constructions of scarcity Till (2014:10) suggests a series of design tactics. Paired with some appropriate precedents the discussion expands on the way in which designers have resolved daily problems while constructing within the context of scarcity, and how it has allowed certain patterns of living and public exchange to emerge.

2.5.3 Critical Regionalism

In search of the *primitive*, the *purely local* Mumford proposed regional architecture as an alternative (Lefaivre & Tzonis 2003:20). He states that regionalism is not merely about using local materials and construction methods, but aims at a holistic rethink in architecture through the concept of region (Lefaivre & Tzonis 2003:20). The critical regionalist is expected to define the project within its particular physical, social and cultural constraints, with the objective of sustaining diversity while benefitting from universality (Lefaivre & Tzonis 2003:20).

Barker (2015:19) argues that regionalism is a self-conscious response to regional conditions, and therefore the architects will select what to respond to, simply because they can. Architecture thus accepts and resists, and this degree of mediation is dependent on the value ascribed by the designer. The authorship still mainly remains with the architect.

According to Barker (2015:19), the search for an appropriate architecture within the context of South Africa has been an ongoing quest since the sublimation of indigenous cultural expression after colonisation. Today the conflict between *globalization and international intervention* and *local identity and ethnic insularity* has become even more complex and prominent (Lefaivre & Tzonis 2003:10). Consequently this study argues that the reality and scale of the urban poor living in informal settlements in South Africa demand a practical hands-on response that surpasses the limitations of Regionalism (Kellett & Napier 1995).

1. Adapt

As the market continues to make redundant single-use objects, it produces scarcity in its wake. But, what if designers started designing things that could be made and remade, something made purposefully for adaptation? A good architectural example is the Open Building strategy, as suggested by Habraken in his book *The Structure of the Ordinary* (1998). It fundamentally recognises that a building is never completed and thus seeds authorship through the creation of a base building that allows for change over time. This strategy is arguably a response to the type of waste that resulted from conventional development's commitment to factionalism.

Next21 in Osaka, Japan, is an example of such a strategy applied in a housing project and sets a precedent as a living laboratory for how to design for adaption (Habraken 1998:76). The project demonstrates the hierarchy of dependence between architecture and infrastructure: the higher level sets the stage for lower level interventions (Habraken 1998:42).

2. Redistribute

Redistribution in material, social and economic terms holds the possibility of providing truly collaborative networks through which citizen-users can engage. This goes beyond companies like Airbnb and Uber and challenges design to explore new ways of intervening into these networks. This notion may be problematic for the design because designers define and express themselves through the production of the new. Design should start to intervene in the so called *software* and adopt an ethical dimension. In addressing these imbalances design agency becomes central to the argument

(Till 2014; Prince-Ramus 2007).

3. Optimise

Making existing systems and networks more efficient requires a certain sensitivity and responsiveness towards the context. A local example is Warwick Junction Urban Renewal Project in Durban, South Africa (Makin 2016). This project contains the potential of natural energy of ordinary people that, small catalytic enabling structures, may have immense consequences. The focus was on improving servicing and maintaining health standards while increasing the safety of local vendors and the public. Consequently it became necessary for the collaboration of various professionals, co-ordinated by Asiye eTafuleni NGO, to reach the best solution. The elementary infrastructure to achieve efficiency existed in the form of a spatial mismatch, a terminating freeway that had the potential to form a link across a busy traffic road. The new bridge almost served as an architectural stunt, opening an artery that aided in optimising the entire precinct in more ways than one (Makin 2016)

4. Redefine

Instead of solving a problem in isolation, scarcity requires a move away from solving through design. Instead it becomes necessary to redefine the problem by seeking the underlying construction of the problem that is often left untouched. A good example of this is the Waterbanks initiative developed by the architects David Turnbull and Jane Harrison finding a unique solution for addressing water scarcity in Africa. A school was designed with a strong focus on collecting and storing water.

...The scheme not only addresses seasonal fluctuations of water availability for local farming but also forms a community focus and educational catalyst, both of which were previously lacking says Till (2014:11).

2.7 _CONCLUSION

Vernacular architecture is found in all the world's cultures; ancient and modern, and, most importantly, it continues throughout the world today in various relationships to modern world culture—certainly not only the most primitive relationship (Hubka 1979:27).

Even though the vernacular design method is not a panacea for contemporary design problems, it does offer a *tough, thoroughly tested, approach to design* for architects today, says Hubka (1979:29). Accordingly Brand (1994:155) raises the question ... *what might be accomplished with their abundant intelligence and creativity if architects really studied the process and history of vernacular designs and applied that lore in innovative work?* By re-establishing what the vernacular implies and applying these valuable lessons, it is possible to gain a deeper understanding of the spatial logics of architecture found in specific contexts and therefore one can extend and expand the boundaries of architectural discipline as an enabler of space.

The aim of this study is not to rationalize poverty or romanticise sub-standard housing conditions of the poor, but rather to focus on facilitating emergence through architecture that is responsive to the specific vernacular tradition. The debate defends a specific approach, not encouraging the poor to erect their own structures according to their own time scales and resources, but fundamental structural changes that would address the imbalances in the distribution of knowledge and resources throughout society.

My optimism lies precisely in the alliance of scarcity and agency, because design agency in the broadest sense is well placed to address the relational, contextual, and contingent senses of scarcity, and with this, in turn, new roles and opportunities for architectural thinking and action emerge Till (2014:11).





CHAPTER THREE

CONTEXT

3.1 _PREFACE

This chapter addresses the theoretical and contextual drivers with the potential to effectively support and allow for a centre for economic enablement. The study area is located within an urban framework that argues for an in-situ upgrade utilising the identified strengths inherent in the context. A second precinct vision illustrates this project's contribution to the urban framework. At this point, a strategic site will be selected for this dissertation.

A comprehensive site analysis was done to investigate the tangible and intangible potential of the site. Aspects such as accessibility and edge conditions, site features, movement patterns, ecological features and entrepreneurial activities were investigated.

3.2 _BACKGROUND

According to Van Rensburg and Da Costa (2008:31) the effects of globalization and the imposition of modern urban planning are weakening the identities and characters of African cities. As a result cities, towns and townships such as Mamelodi township, are struggling to find appropriate solutions that could aid in reclaiming their identity that may be considered as a true African expression.

Van Rensburg and Da Costa (2008:47) propose a reconfiguration of the city that goes beyond architecture. Firstly in a physical way - a blurring of the boundaries, and secondly the boundaries that exist *between the design and the social disciplines*. An argument can be made to re-conceptualise urban spatial problems through a lens of everyday ritual and event, a dynamic approach where complexity in connectedness in social and economic networks are promoted.

According to Gehl (1987:11) the level of every day activity and social connection is reduced to a minimum, when street spaces are of poor quality. He discussed three types of everyday activities and their appropriate physical conditions. Firstly, essential activities are only to a limited extent influenced by physical conditions, secondly optional activities occur only where open spaces are in an optimal condition. The third type of activity includes social activities; these depend on public interaction and

evolve from the first two types. The same deduction made in this study: that by improving the quality of urban space, the necessary activities can be enhanced and translated into stimulating events of interaction and recreation (Gehl 1987:11).

Spatial development in Mamelodi continues to move eastwards but in recent years has reached its capacity due to the physical barriers found in the natural landscape. The northern and eastern boundaries are determined by the natural topography defined by the Magaliesberg mountain range. It is assumed that townships will not disappear and that most of the people residing in Mamelodi will continue to commute to work. It is proposed that to support the automotive network mixed-use nodes should be encouraged, with a specific focus on enablement through architecture.

In response to urban and general issues, an alternative approach is suggested where development does not expand, based on the exploitation of human and natural resources but through improving the quality and efficiency of human-to-human and human-to-ecosystem relationships, through supporting infrastructure and technologies (Fioramonti 2017:13). A decentralised nodal structure that responds to the uniqueness of place is applied as a starting point of exploration. The following precedents expand on the successes and failures of similar approaches in response to the abovementioned aspects.

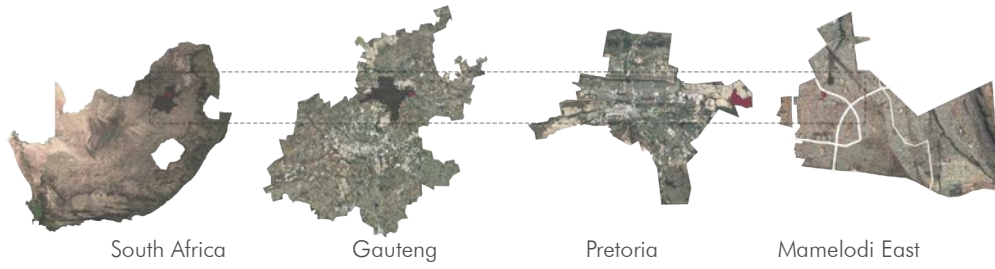


Figure 3.1: Mamelodi locality. (Author 2017)



Figure 3.2: Urban plan of Mamelodi East. (Author 2017)

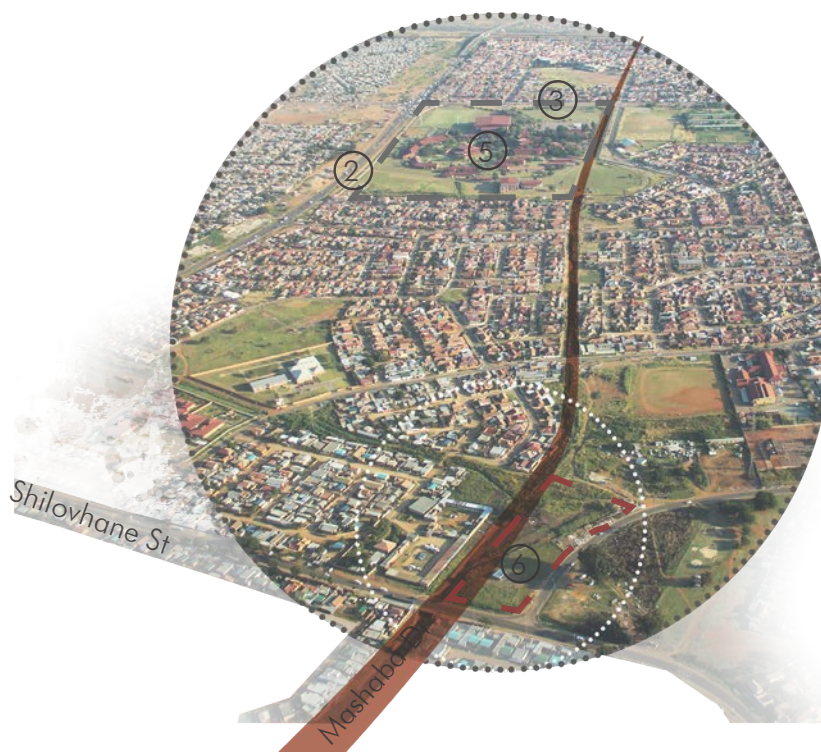


Figure 3.3: Site location. (Author 2017)

3.3 _PRECEDENTS

3.3.1 Mamelodi

Regeneration Strategy - GAPP Architects and Urban Designers

The Mamelodi Regeneration Strategy is a development proposal for the Pre-Appraisal Phase of the City of Tshwane's Neighbourhood Development Programme project, known as the Tsosoloso Programme (GAPP 2010:5).

The concept guiding the development proposes that the most effective way of stimulating economic activity, is to cluster appropriate land uses into hierarchical nodes, and link them with activity corridors that promote growth (GAPP Architects & Urban Designers 2010:21).

The intention of this strategy is to concentrate activities in order to make services and facilities available and accessible via public roads, pathways and other supporting infrastructure. It is assumed that its catalytic nature will *spill over* and provoke economic activity that offers investment opportunities (GAPP 2010:21).

What is lacking in this proposal is sensitivity towards the existing contexts. The initiators were unable to capture and respond to the uniqueness of this township's various contextual layers.

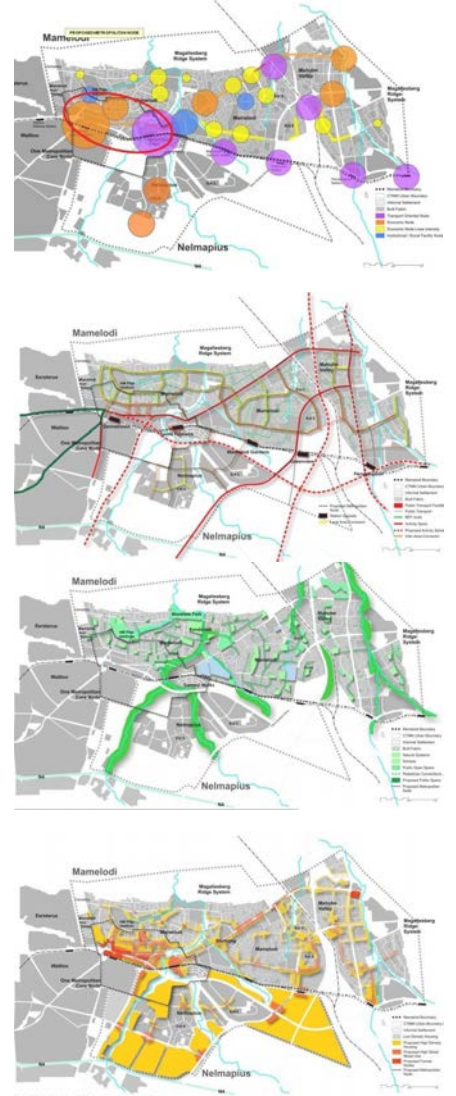


Figure 3.5: Collage of strategies depicting nodal development, vehicular movement, open space and housing density. (GAPP 2010)



Figure 3.4: Mamelodi Framework proposal. (GAPP 2010)

3.3.2 Violence

Prevention through Urban Upgrade (VPUU)

Programme_Khayelitsha

The VPUU programme is a holistic and participative initiative that focuses on urban interventions that *positively occupy perceived dangerous spaces* designed with the aim of crime prevention in the Khayelitsha informal township in the Western Cape (Cooke 2011:18). A thorough survey formed a part of the initial study to identify; perceived unsafe areas in need of upgrading, as well as available land and business opportunities that could be developed and enhance a healthy community life. Six broad urban principles were implemented to maximise protection and safe movement for its users:

1. Passive surveillance
2. Territoriality of public, semi-public and private areas
3. Defined access and safe movement
4. Image and aesthetics
5. Physical barriers
6. Maintenance and management

The architectural response to these generic principles resulted in the creation of an *Active Box* (Cooke 2011:21). This box is a three story multi use structure that acts as a watch tower from the top live unit but also contains shops on the ground floor that are owned by locals, thus instilling a sense of ownership. This structure can also host community meetings or as a place of refuge for someone threatened by criminals. It may be successful in integrating various uses during the day, thus increasing activity and passive surveillance through its active frontage. The architecture distinctly organises vehicular and pedestrian movement zones, thus increasing safety.

At the core of the VPUU is a

tripartite strategy to prevent crime in an integrate way. If this strategy is applied in another setting it must consist of situational interventions, combined with a wide range of social programmes and institutional programmes to collectively promote crime prevention. According to Cooke (2011:23) this strategy has proven to be successful and is being applied in five other informal settlements.

Its success is the result of the depth and understanding on how to approach the problem of reducing crime and also have a positive ripple effect that instils civic responsibility, instigates community cohesiveness, encourages economic activity and grants access to employment and training opportunities.



Figure 3.6: VPUU Active boxes (top). (Cooke 2011)

Figure 3.7: Harare VPUU urban layout (bottom). (Cooke 2011)



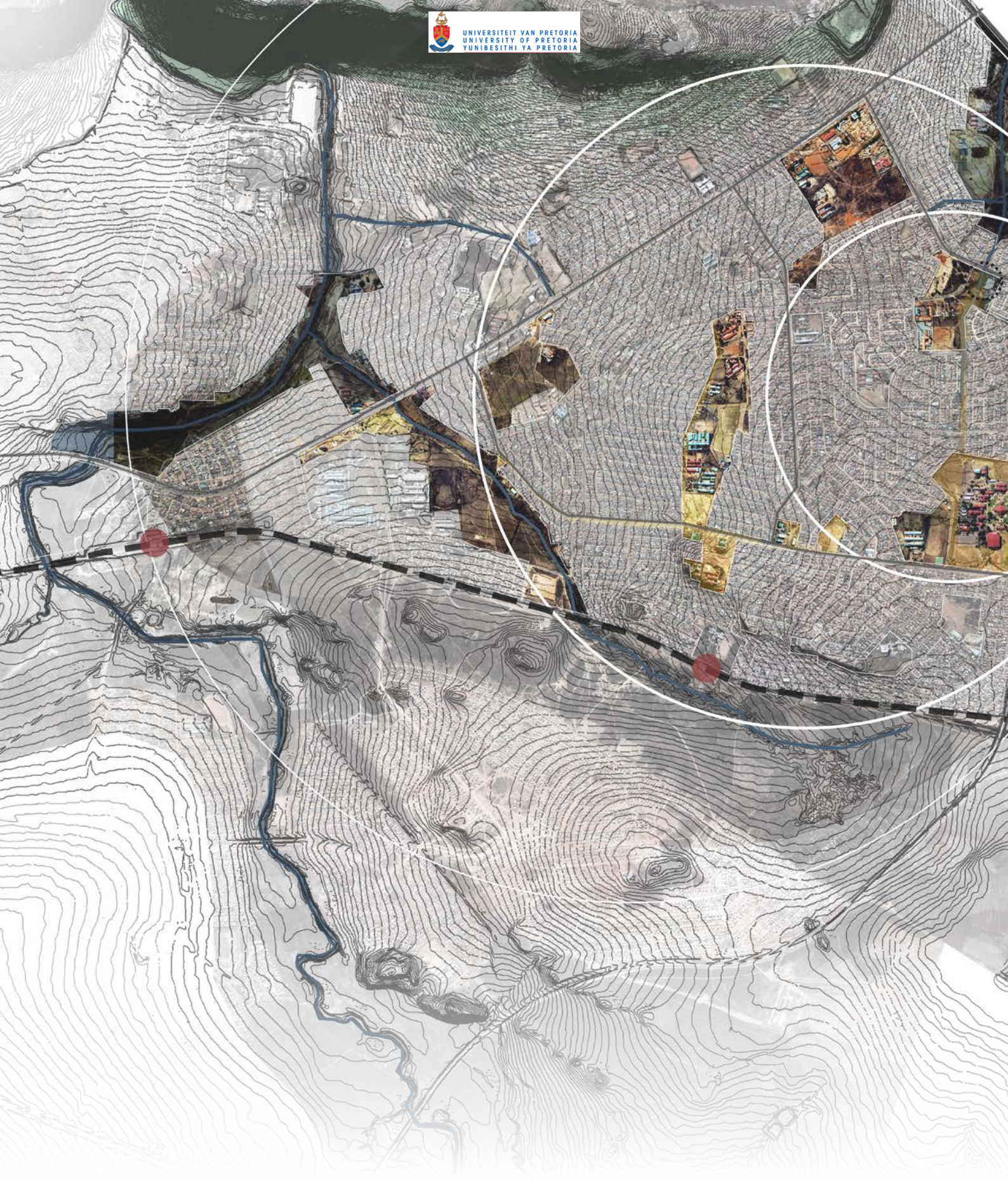


Figure 3.8: Proposed urban vision map. (Author 2017)

3.4 _URBAN FRAMEWORK_ EMERGENTCITY

The urban analysis used four lenses to determine the latent potential of the area: historic and urban development, education and economic. From the initial site visit clear indications of pendulum migration and economic dependency was visible. Some economic networks were outlined and confirmed and resulted in distinct building typologies (UP Arch [Honours] 2017). There was a clear indication of a need for increased safety. The unprecedented sprawl in the form of informal settlements was also recorded. Conclusions that were made include: a high unemployment rate, high reliance on public transport and a high quantity of formal backyard additions (UP Arch [Masters] 2017).

In response to these issues this study focused on the strengths identified during the mapping process that may guide the location of new nodes of development that could increase accessibility, offer economic choice and increase public safety. This urban framework aims to combine the strengths found in both the GAPP framework with a VPUU method, and to arrive at a more appropriate framework: a nodal strategy with corridor development that preserves the most significant characteristics of the contexts but at the same time challenge a new way of urbanism - an in-situ upgrade.

Four broad principles were applied:

- To strengthen networks
- To celebrate uniqueness
- To densify and diversify
- To upgrade infrastructure

By applying these principles and using existing pedestrian routes and land uses, it is proposed to create key multiuse nodes along the development routes. This is a speculative, open ended study, but with realistic outcomes within the setting. Interventions must be introduced in phases, starting with smaller catalyst projects and then moving towards projects with a larger impact. Through the use of collages, existing street settings in Mamelodi were reimagined for the future.

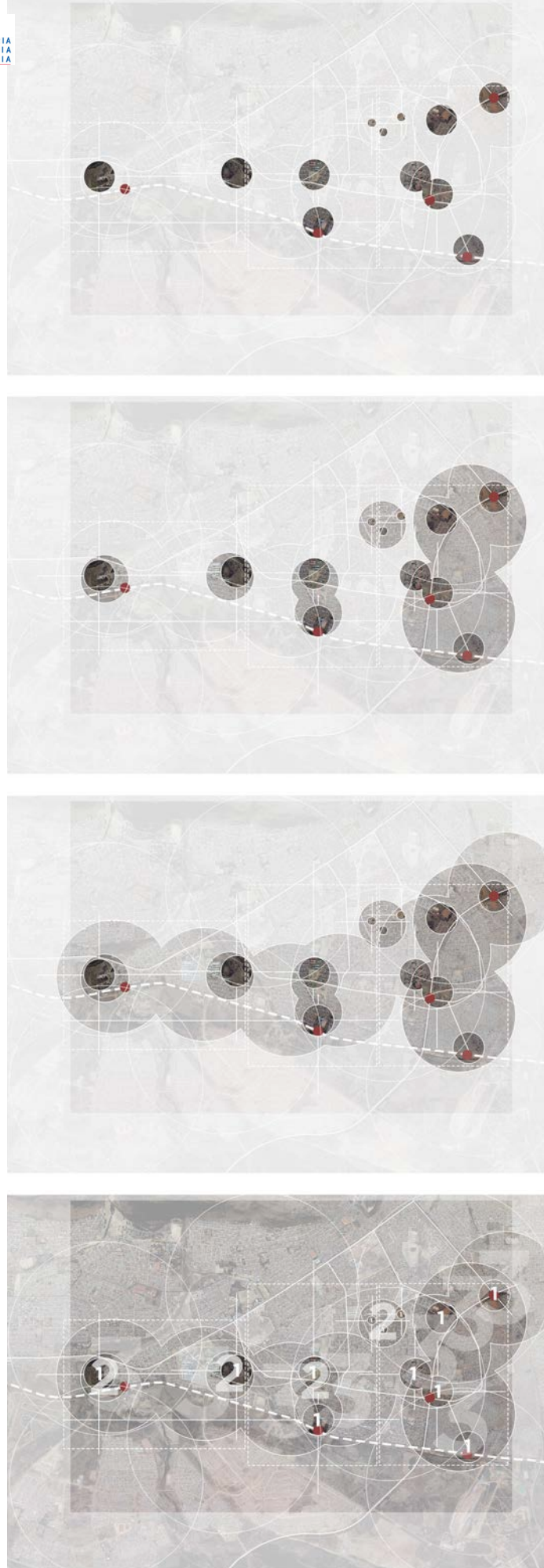


Figure 3.9: Proposed phasing of the urban vision. (Author 2017)

3.5 _PRECINCT VISION UNIVERCITY

The precinct vision is based on the urban framework but with a specific focus on the knowledge economy. It is reinforced by the presence of the Mamelodi campus a satellite of the University of Pretoria. This quality characteristic engages with the public realm and function as an *urban university* (Rodin 2005:237). According to Rodin (2003:237) knowledge institutions not only have the capacity but also the obligation to *take on roles of civic leadership* that could look for new ways in which the combination of knowledge and practise could assist in solving the socio economic problems experienced locally.

This vision argues for a decentralised approach that integrates the campus with its context assisted by the redevelopment of residual spaces to form an activated walkway that could facilitate economic development and stimulate social engagement. This vision builds on the strengths of the VPUU programme and aims to link the current perceived unsafe spaces with the *urban university* vision. The aim is to expand Mamelodi's emerging economy to the next level of scale by stimulating internal growth through catalytic sustainable development (UP Arch [Honours] 2017).

The following principles are implemented (UP Arch Honours 2017):

- Optimise exiting networks
- Reclaim identity
- Unlock potential
- Enhance social capital

The activity route and pedestrian walkway will connect the identified open spaces from the university with the culminating point of the wetland. Small businesses would form the active frontage facing the pedestrian pathway with insertions of furniture at regular intervals and lighting as additional passive surveillance. Where the activated pathway crosses the street the surface character will be altered in order to slow cars down.

Some of the green areas will be left open for urban agriculture to serve as potential economic stimulus for people who currently do not have the space or means for the production of products on a small scale. To encourage biodiversity and enhance the human ecosystem relationship, a wetland will be constructed. It will also add value to the greater *well-being* of the community.

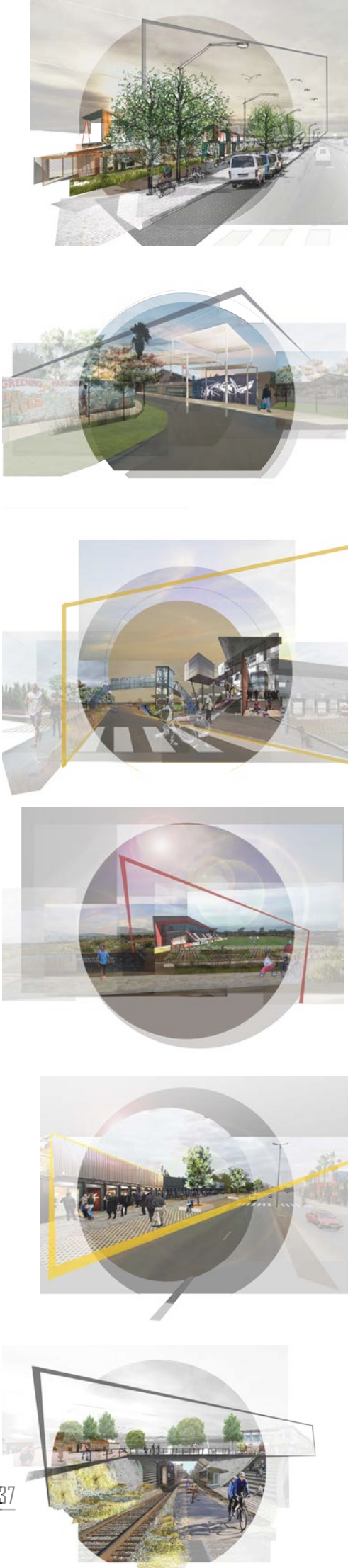


Figure 3.10: Urban vision collages depicting real street vies re-imagined for a future Mamelodi. (Author 2017)



Figure 3.11: Precinct framework plan. (Author 2017)

3.6 _SITE SELECTION AND ANALYSIS

The study area is located along one of the identified secondary routes on the corner of Mashaba and Shilovane Drive in Mamelodi East, Pretoria. It forms part of the culminating point of the activated path as proposed in the precinct vision. This site forms part of the

identified open space earmarked for future development during the mapping and urban vision process. The site is located at the starting point of a wetland with a 50 year flood line along the eastern periphery of the site boundary. It is strategically located where

an economic node is suggested but still retains its relation to the university's campus serving as an anchor for the development. This project will specifically interact with the precinct's automotive network, its economic factors as well as environmental considerations.

3.6.1 Site choice

The site serves as a converging point between a principal vehicular route and pedestrian route, while presenting possibilities for informal urban agriculture and economic activities that could be harnessed. It is a corner site with ample street edges to allow for proper access, but it also has a distinct connection with the natural setting.



Figure 3.13: Chosen site. (Author 2017)

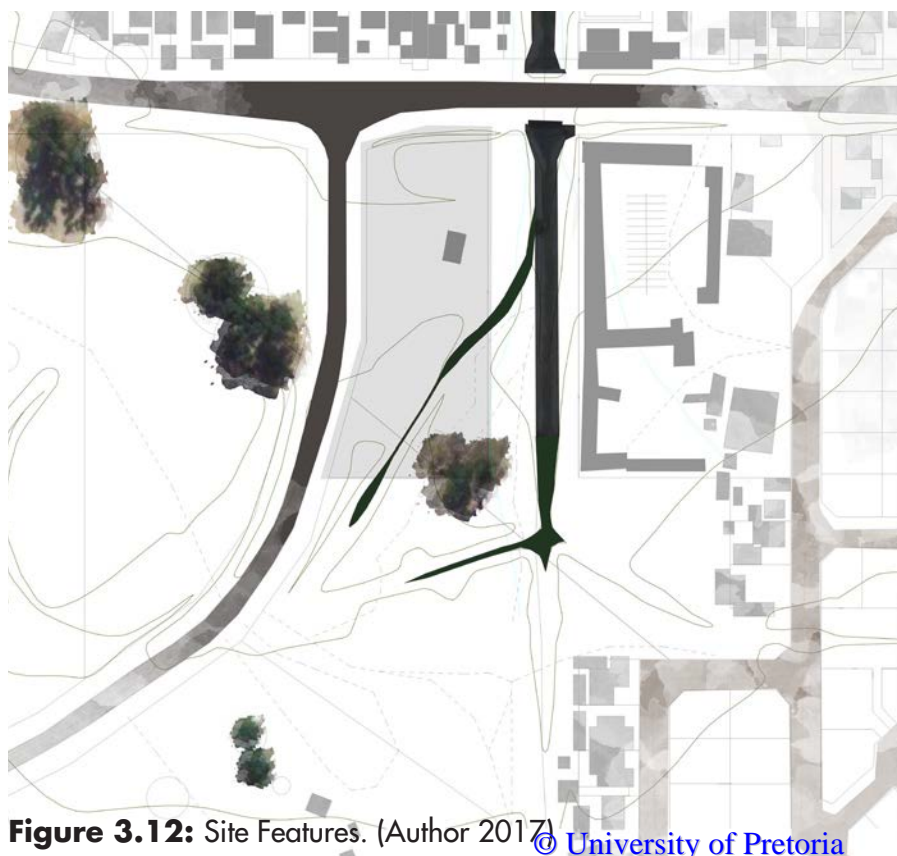


Figure 3.12: Site Features. (Author 2017)

3.6.2 Site features

The site is largely underutilised, presenting opportunities for economic development and ecological restoration when a natural wetland is included along the eastern boundary of the site. To the south, neighbouring the site, are areas reserved for nature conservation, parks and more automotive shops. The RDP houses across the northern boundary may stimulate the creation of many small businesses managed from home as a way to supplement income. The site is mostly flat, with tall trees along the southern boundary. This allows ample opportunity for breakout spaces that would allow for informal engagement.



Figure 3.14: Damage to the site. (Author 2017)



Figure 3.15: Accessibility on site. (Author 2017)

3.6.3 *Damage to the site*

Degradation of the site is mostly the result of littering and small scale oil spills by mechanics and due to washing of vehicles on the site. Surface erosion may be the result of damaged vegetation.

3.6.4 *Accessibility and edge condition*

The site is currently inaccessible as it is enclosed with a wire fence. There is no pedestrian movement through the site and people are forced to use the vehicle routes or to walk inside the current storm water channel. The adjacent northern and eastern sites are enclosed with brick walls and provide for little interaction. The precinct vision proposes that these sites become more permeable for safe pedestrian movement.



Figure 3.16: Entrepreneurial activity. (Author 2017)

3.6.5 Entrepreneurial activity

The northern adjacent stands contain some formal and informal trading and social activity. Activities increase during peak commuting times. Many vehicle related businesses are located along the eastern and southern boundaries. A facility manufacturing concrete blocks forms part of this cluster - as indicated in orange. These businesses have the potential to serve as a hub harnessing the existing entrepreneurial energy, linking with the existing pedestrian routes and related economic activities.



Figure 3.17: Site hydrology and ecology. (Author 2017)

3.6.6 Site hydrology and ecology

The presence of the wetland serves as an edge and buffer between urban and natural zones. It allows another experience from the street, providing an opportunity to draw in the energy. It also has a 50 year flood line - indicated by the light blue.



3.6.7 Movement

patterns and desire lines

The current intensity of the vehicular movement is indicated, reflecting little regard for pedestrians moving along and across these roads. The informal desire lines (in green) indicate how pedestrians navigate the difficult terrain. These lines also indicate where people are dropped by taxis and how they move through the landscape.

Figure 3.18: Movement patterns & desire lines. (Author 2017)



3.6.8 Design

possibilities

The following diagram indicates the design possibilities based on the analysis.

The proposed axes may already inform the design process regarding aspects such as orientation and position. Possibilities relating to the harnessing of energies and linking the existing pedestrian routes correlate with the site's natural contours and may inform the manipulation of walking surfaces. Orientation towards the north would provide the natural framework for harnessing the appropriate sunlight for natural energy as well as passive design strategies.

Figure 3.19: Design possibilities. (Author 2017)

3.7 _CONCLUSION

The true heirs of this apparition are now claiming it, built as it was from the blood and sweat of their countless grandparents and parents. With the sobriety of true pioneers, they are pushing the city-without-boundaries through its last boundary: itself (De La Porte 2015).



CHAPTER FOUR PROGRAMME



4.1 _PREFACE

This chapter addresses the contextual drivers for the proposed programme: a business incubator that focuses on economic enablement in the automotive industry. Through various platforms of engagement, this programme consists of business skills development, practical skills development in vehicle collision repair, tyre retreading and research on how to reuse car parts in the automotive industry.

Due to the recent economic downgrade (Statistics South Africa 2017) low economic growth may become the norm. The promise that abundance is around the corner is simply delaying our capacity to look for new alternatives and innovate solutions. Fioramonti (2017) argues that South Africa needs a new economic strategy that places small businesses at the core of the development strategy, to build the necessary skills and entrepreneurial capacity.

A brief background of Mamelodi in relation to the automotive industry will be discussed in order to understand the different aspects and contextual influences that have informed the programme. A comparative precedent study is introduced to determine the programmatic need and how to accommodate it in an environment of flexibility. These aspects of investigation will give expression to the programmatic intention and requirements of the facility.



Figure 4.1: Photographic study of automotive programmes found on the streets. (Author 2017)

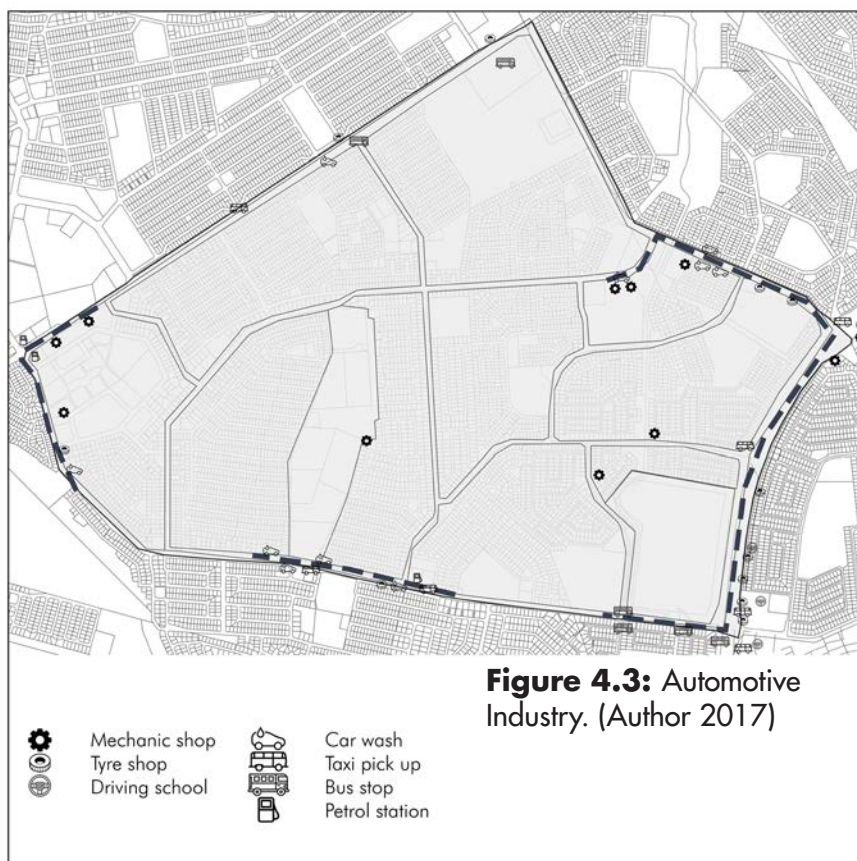
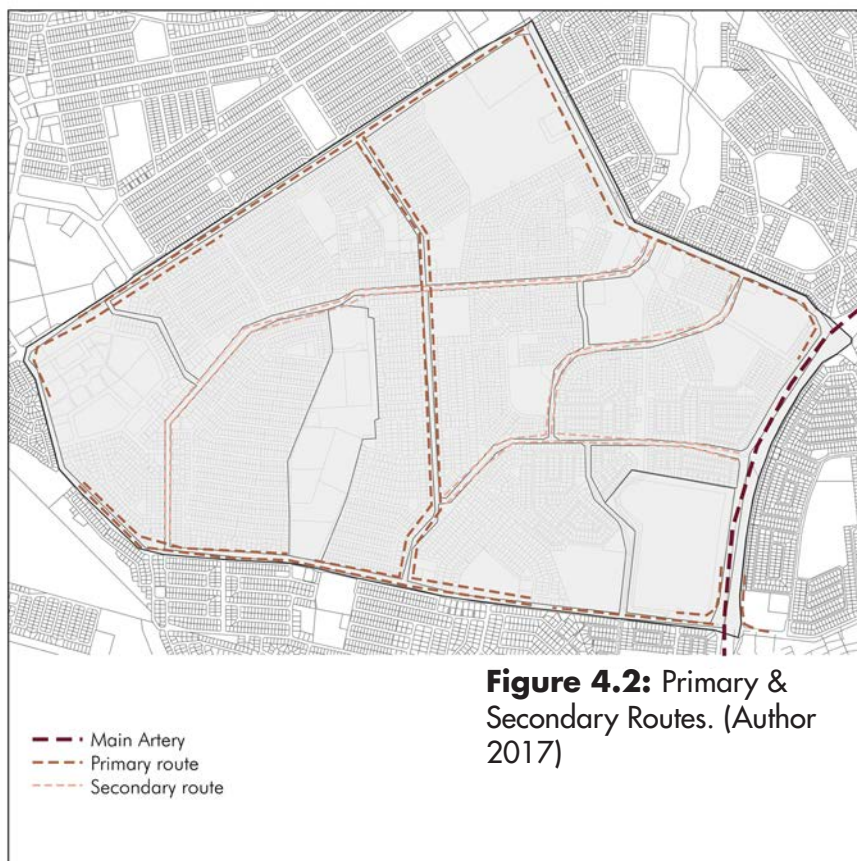
4.2 CONTEXT AS DRIVER

4.2.1 Urban mapping

The dependency on pendulum migration has persisted throughout the development of Mamelodi and has rendered its economy mostly dependant on external systems (Mokoena 2017). It resulted in vast networks of emerging informal economic activity (Mokoena 2017). Here necessity directed the reinvention of the street-scape by entrepreneurs and consumers in order to cater for their immediate needs.

During the initial site visit (reference to field research), it became evident that economic interventions tend to be located at important vehicle nodes. This network supports the vehicular and taxi industry with affordable tyres, small-scale panel beating and electronic and mechanical work. After a brief discussion there appeared to be larger networks of mechanics. They are registered at the Department of Trade and Industry. However, upon closer inspection, it seems as though these businesses struggle to thrive in the current context because of lacking support facilities.

The field research (as introduced in chapter two and three) provided a better understanding of the current spatial interaction in Mamelodi. The following section will discuss



further conclusions drawn from this research and how it has informed the decisions regarding programming and spatial outcome.

The positioning and functioning of the informal automotive facilities have a strong association with the transportation and taxi networks in the area and can be found at major intersections as well as along the primary and some secondary routes.

According to oral evidence there are intangible networks between these businesses regarding facilities and skills. These businesses are often supplementary businesses to other sources of income. In one instance a brick-making business, glass recycling and mechanic business are managed by one family on appropriated municipal land. The more permanent businesses are registered at the Department of Trade and Industry.

The mechanics expressed concern about their future security in the industry seeing as though they are not the legal owners of the properties where they operate.

The spatial manifestation of these businesses ranges from temporary to permanent and mobile to fixed.

The range of automotive related ranged from mechanic shops, tyre shops, driving schools, car washes, panel beating to electrical services.

Small businesses seem to group together as a way of forming economic nodes. They are located along some of the main pedestrian

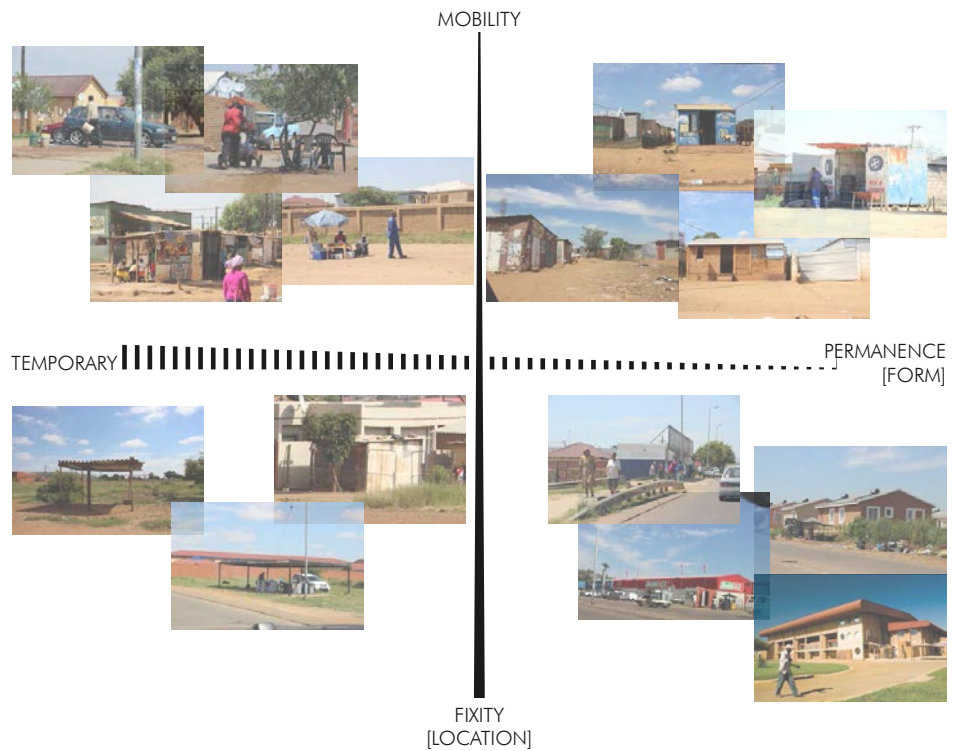
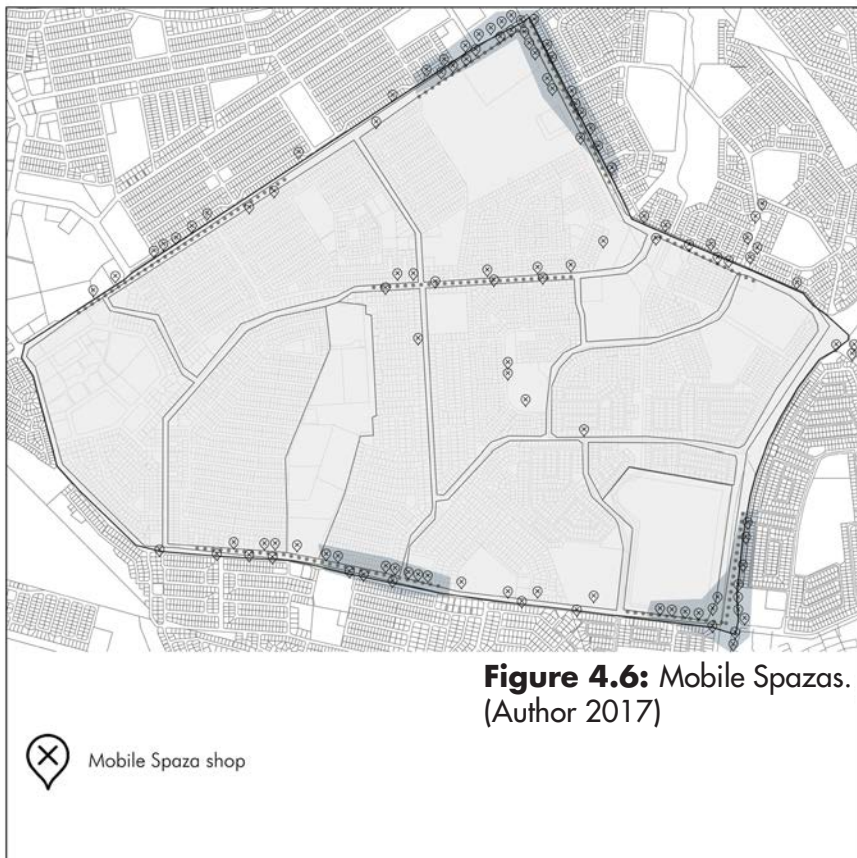


Figure 4.4: Diagram depicting the method of emergence. (Author 2017)



Figure 4.5: Family managing a range of programmes on a single site. (Author 2017)



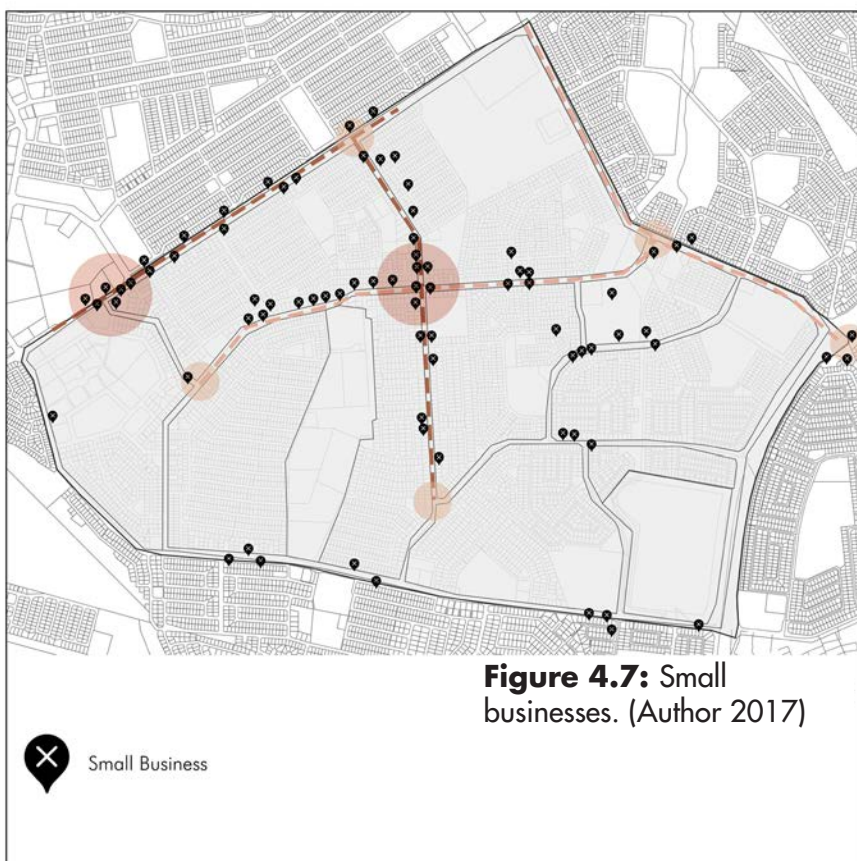
routes forming an active frontage thus aiding in passive surveillance.

The mobile *spaza shops* (tuck shops) have a strong reliance on the pick-up and drop-off times of the existing bus and taxi networks. These temporary structures cluster at large intersections or at activity points and often change programmes (locations) during the day.

In conclusion, the field research indicated that most of the economic opportunities exist within the trades sector (UP Arch [Honours] 2017). This dissertation proposes that more opportunities need to be created in other sectors (retail, service, manufacture) to expand and increase economic opportunities.

A perception exists that the small size of South Africa's informal sector can be attributed to the lack of skills, entrepreneurship and access to credit (Bisseker 2011, Fioramonti 2017). A study by Demacon (2010:32) suggests that key industrial activities need to be incorporated into mixed-use nodes in the form of incubation and small, medium and micro-enterprise (SMME) centres.

The new programme, as a direct link to the previous functions found in the context, provides the missing link for a synergetic mixed-use node that supports the automotive industry. It needs to be determined what kind of innovation is needed at automotive workshops to complement the innovation introduced by the incubator.



4.3 _DEFINING THE TRIPARTITE PROGRAMME

4.3.1 Client

As a university and industry-driven program this facility acts as a mediator in enabling the transfer of knowledge and skills related to the automotive industry. However, the programme also aims to find innovative ways through research that looks to ways of addressing scarcity in the industry. The building provides a central neutral platform that would allow the facilitation of sharing knowledge and skills in order to enable economic activities.

In terms of social and economic feasibility of the project, the two major clients are identified: firstly the local community's business owners as agents and secondly the University of Pretoria's Mamelodi business clinic as a facilitator. This facility would serve as a satellite node, linked to the Mamelodi campus. It would function as an urban university focusing on hands-on engagement. This could assist the university in expanding on Participatory Action Research that will produce new knowledge and generate action for positive change (MIT Community Innovators Lab 2015). This change can stimulate economic activity creating jobs and opportunities for service learning, enriching theory in application (University of Pretoria).

The secondary stakeholders include the Department of Trade and Industry and the City Council (as the owner of the property) and the automotive industry as the primary financiers.

The programme takes the form of a tripartite reciprocal relationship that resonates with the intent of the design.

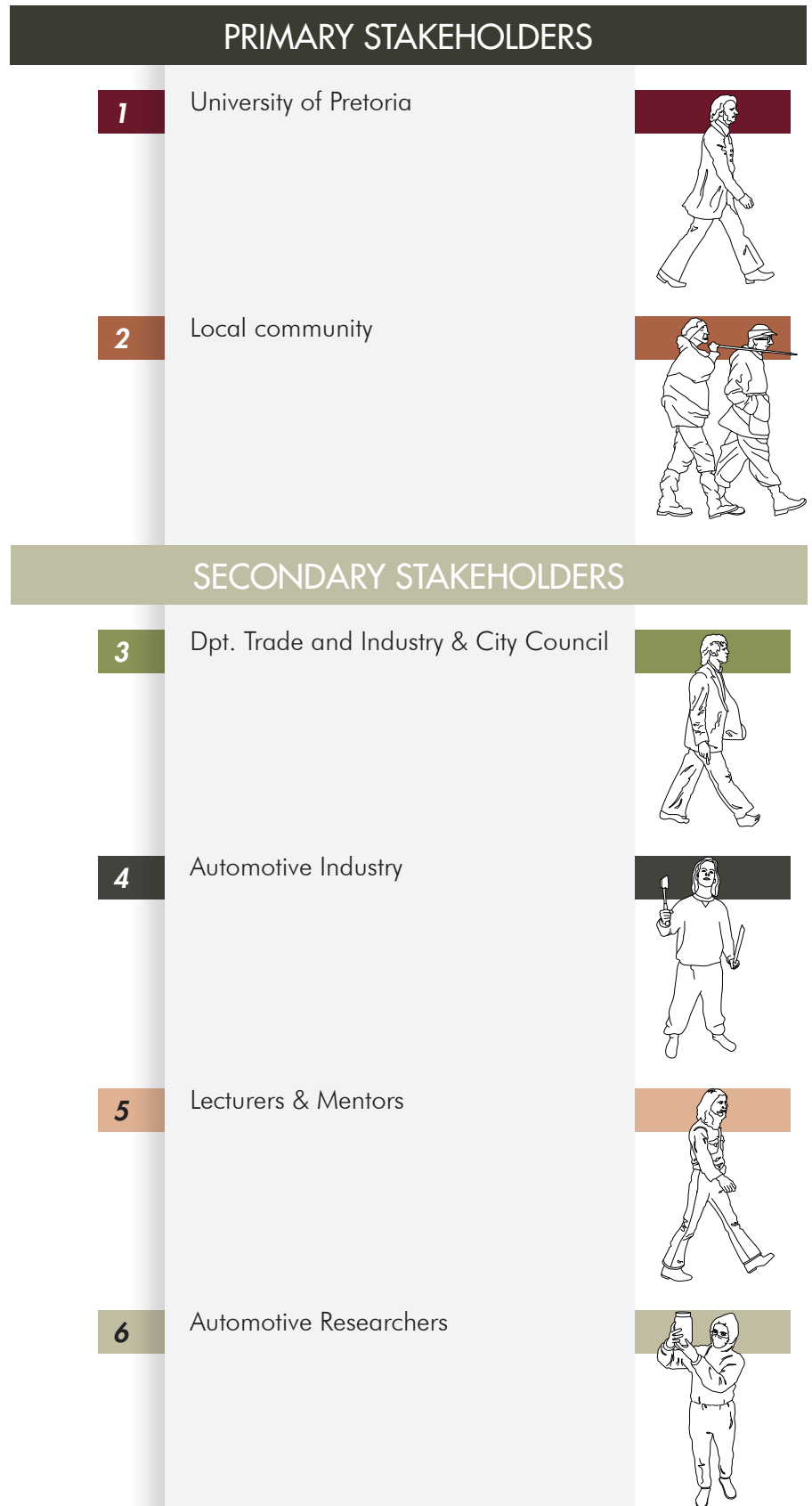


Figure 4.8: Diagram of stakeholder involvement in the programme. (Author 2017)

4.3.2 Part 1: Incubator/ impact hub

The incubator will aid in the provision of appropriate supporting structures for the community to participate in a global network of active changemakers (Fioramonti (2017:12)). The intention of this program is not to replace any existing function related to the automotive industry, but enhance it by providing a niche service that the network cannot provide for itself. The local business owners can enrol in the internship programmes to learn practical skills on selected days and attend business development classes on alternate days.

4.3.3 Part 2: Automotive workshop and innovation lab

The workshop and innovation lab would work in symbiosis to in still

forms of business and production processes that emancipate people from the passive role of consumerism and reconcile human needs with natural equilibria (Fioramonti (2017:12)). This dissertation proposes something different from the growth economy, but focuses on reuse and recycling in the automotive industry.

Instead of being simply concerned with limiting the use of resources, as happens in many sustainable architectural projects, design becomes concerned with the way in which the scarcity of those resources is constructed (Till 2014:9).

The workshop would focus on tyre re-reading and collision repair processes, and operate as a collective business, facilitated by the University of Pretoria's community engagement structures. In support of this, the research facility/innovation lab will contribute to research through the recycling of

car parts and liquids with the aim of creating innovative solutions that are environmentally and economically viable. The research could be funded by industry and executed by researchers from the Department of Mechanical and Aeronautical Engineering and corresponding international counterparts.

4.3.4 Part 3: Platforms of engagement

Engagement would be accommodated along the threshold and outside of the building. It would encourage systems of social organisation at the local level that reconnects individuals with their communities and ecosystems (Fioramonti (2017:12)). It could create ample space for social engagement through the provision of a well-lit safe walkway, seating and breakout spaces. As part of this strategy, informal stalls are proposed here.

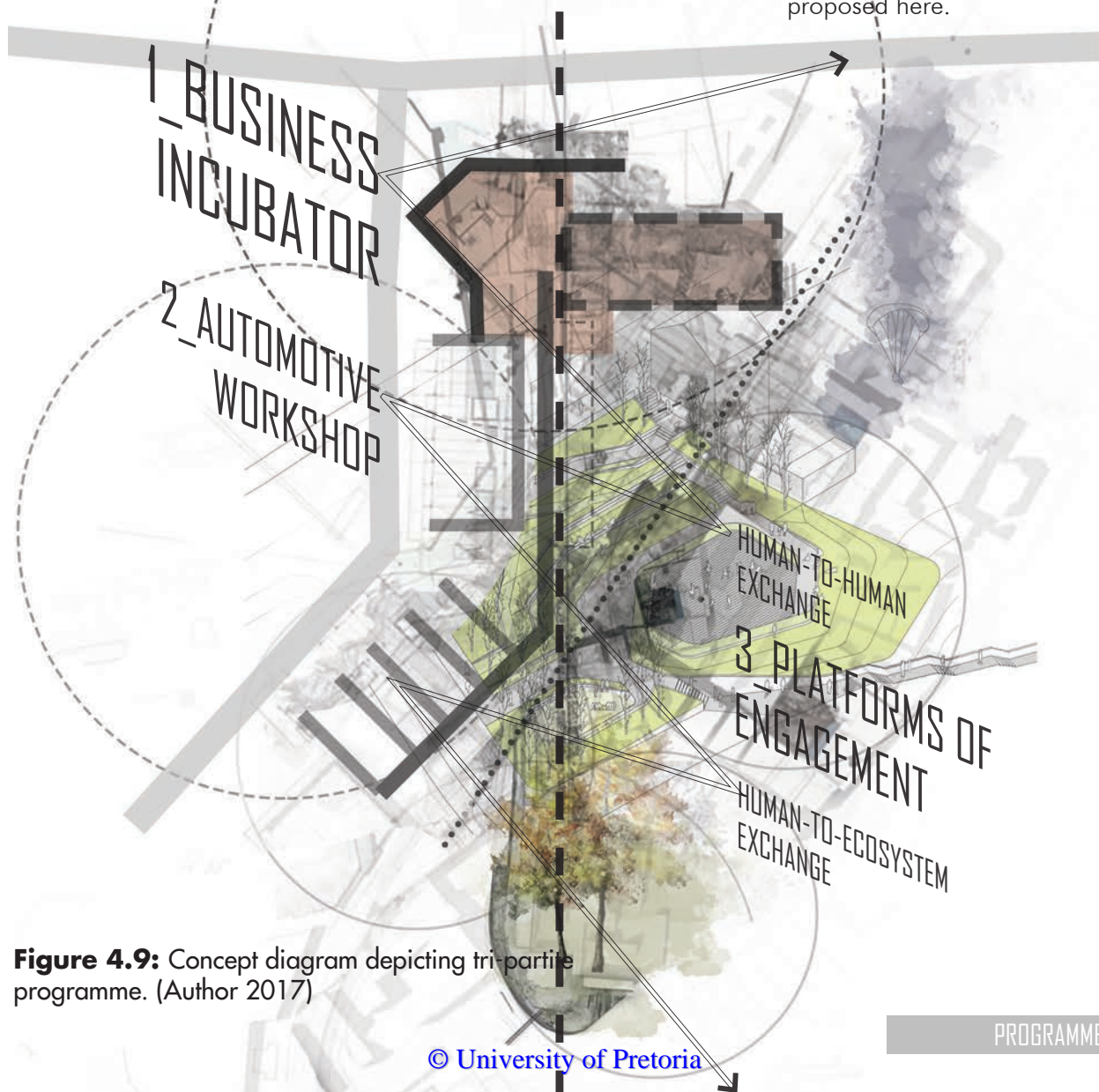


Figure 4.9: Concept diagram depicting tri-partite programme. (Author 2017)

4.4 _PROGRAMMATIC PRECEDENTS

Incubators

Awethu project_Incubator as business

Location: Constitution Hill, Johannesburg, South Africa

Date: 2014

Architect: Local Studio (Interior)

People tell me I'm from a previously disadvantaged background, but the entrepreneur in me would like to disagree. I believe I'm from a previously unexplored market (Pienaar Awethu Project [sa]).

This incubator is an example of a for-profit business incubator that invests in entrepreneurs from underprivileged communities. It is an example of a bottom-up incubator that identifies, incubates and invests in local entrepreneurs (Randera-Ress 2014). The procession through this space is a physical manifestation of these three activities. First one walks through an exterior space that encourages informal social engagement through the provision of soft surfaces, shaded seating areas and covered walkways;

then one enters on a lower level that accommodates the hot desk spaces as well as the interactive lecture room. This lower space is where potential entrepreneurs are identified and to some extent incubated. Then a significant part of the incubation process happens in the field through mentorship and guidance provided by Awethu as well as external business partners (Randera-Ress 2014).

The success of this project consists of the agents involved. They have personally invested in each entrepreneur and through a lengthy process of mentorship and guidance, the entrepreneurs are able to run successful businesses within their contexts. The variety of spaces offer the entrepreneurs ample opportunity to develop their business knowledge through day-to-day interaction with like-minded business people, mentors and entrepreneurs.

Mamelodi business clinic_ Incubator as service learning

Location: UP Mamelodi campus, Tshwane, South Africa

Date: 2011

Architect: Unknown

The business clinic is located in an existing building on Mamelodi campus. It houses a reception desk, two offices, three meeting rooms and one communal room equipped with six computers. Because this programme is underpinned by theory relating to service learning, this facility acts as an assembly point for students and entrepreneurs enrolled in the programme.

It has been determined that this facility is too small, lacks proper supporting structures, variety in space for social engagement, proper ventilation and space for expansion. But, it is ideally located to intensify its involvement in the community (as suggested in the urban framework). This study links with the existing structure of this programme.

Red Bull Amaphiko Academy_ Incubator as event

Location: Mamelodi community center, South Africa

Date: 2017

Facilitator: The Trinity Session

This Red Bull sponsored event is a platform for social entrepreneurs to launch their businesses but also make a positive impact on their communities. It is an international event that has been presented in the USA, Brazil and in Mamelodi, South Africa in 2017. This ten-day event was held in April in the Mamelodi Community centre to help aspiring entrepreneurs to connect with local businessmen and investors, and share their stories.

The Trinity Sessions in association with local artists transformed the interior space into an incubator that promoted Mamelodi as an up-and-coming-force in Tshwane. The central idea was to transform the interior to accommodate various spaces for engagement, for intimate one-on-one conversations to relaxed collective discussion. The transforming of spaces was successfully done by the introduction of vertical screens and moveable furniture (this relates to the ideas of Habraken 1998 providing different levels of engagement to allow the user to manipulate space).

Impact hub_Globally connected, locally embedded incubator

Location: King's Cross, London, United Kingdom

Date: 2009

Architect: Architecture00

Kings Cross forms part of an international group called the Global Hub Association and provides social entrepreneurs with a platform to make an impact locally and internationally. This hub is situated in a *Grade II Listed* brick building that dates back to the period of the Industrial Revolution. The aim of the design was to provide a multifunctional design that could accommodate meeting, conference, event and exhibition space as well as a café bar with a *drop-in* workspace (Architecture00 2009). This intervention was a unique response to the existing context as it respects the building's heritage whilst accommodating multi-functionality (this approach fuses with ideas around open building strategies as suggested by Habraken 1998).

All of the abovementioned projects were accommodated inside existing buildings. This dissertation also proposes designing an open building as long as it meets the minimum requirements for social and communal engagement and supporting facilities such as ablutions, technology and proper ventilation.

By comparing these incubators, it becomes evident that a business incubator can take on many forms and spatial expressions. Its success is dependent on the provision of proper supporting infrastructure through the correct agents. These projects all reflect a sensitivity to social cohesion in the workspace and should provide for a wide range of spatial qualities that accommodates a variety of social and work configurations. The facility should allow for day-to-day interaction between mentors, entrepreneurs and staff to guide their business development.

4.4.1 Workshop Eldan Autobody shop

This local business is situated in Pretoria West and was used as a precedent to determine the minimum programmatic requirements for the workshop facility. Because the workshop was not constructed for vehicular functions and did not allow for proper flexibility in its structure, many makeshift solutions were introduced to solve problems regarding ventilation, water reticulation and storage. The building has a simple and basic layout and accommodates vehicle movement in one direction through the building.

4.4.2 Research facility International Center for automotive research at Stanford in combination with Volkswagen Automotive Innovation Lab (<https://cars.stanford.edu/about/about-us>)

The Center for Automotive Research at Stanford (CARS) brings together researchers, students, industry, government and the community to enable a future of human-centered mobility.

This research facility reflects an understanding of how people and machines function together to successfully support educational experiences for students and provide the supporting infrastructure for research to explore new fields of sustainability in the automotive industry.

Local Vehicle Dynamics Group (VDG) (<http://www.up.ac.za/vehicle-dynamics-group>)

Vehicle Dynamics Group (VDG) is a formal research group and forms part of the Department of Mechanical and Aeronautical Engineering. The group's focus is multi-faceted and ranges from the improvement of vehicle safety, occupant safety, comfort, reliability and efficiency to the realisation of new technologies and the demonstration thereof. The VDG has strong collaborative links with industry and academia on a local, national and international level.

4.5 PROGRAMMATIC REQUIREMENTS

As a result of the above-mentioned precedent studies and theoretical framework, this dissertation proposes the possibilities of managing different programmes concurrently. It will influence the structural approach as it has to make provision for adaptability to allow the programme to flow. This postulation is underpinned by the theoretical argument based on the context and at the same time challenges future possibilities. The hypothesis is that this niche opportunity (fully integrated with its surroundings) can be accommodated in a building that allows for flexibility in form to produce a unique outcome.

The programme is further organised into a *compartmentalised flexibility* solution. This idea (as suggested by Prince-Ramus 2007) would suggest that where a programme's evolution can be predicted with some certainty one can customise the design and group it with other predictable programmes. In this project, these programmes are accommodated in the core structures. Programmes that cannot be predicted, would be best accommodated in flexible areas with the minimum supportive structures. The precedent studies have indicated minimum spatial and programmatic requirements and these have been developed as indicated in the following tables.

4.6 SUMMARY

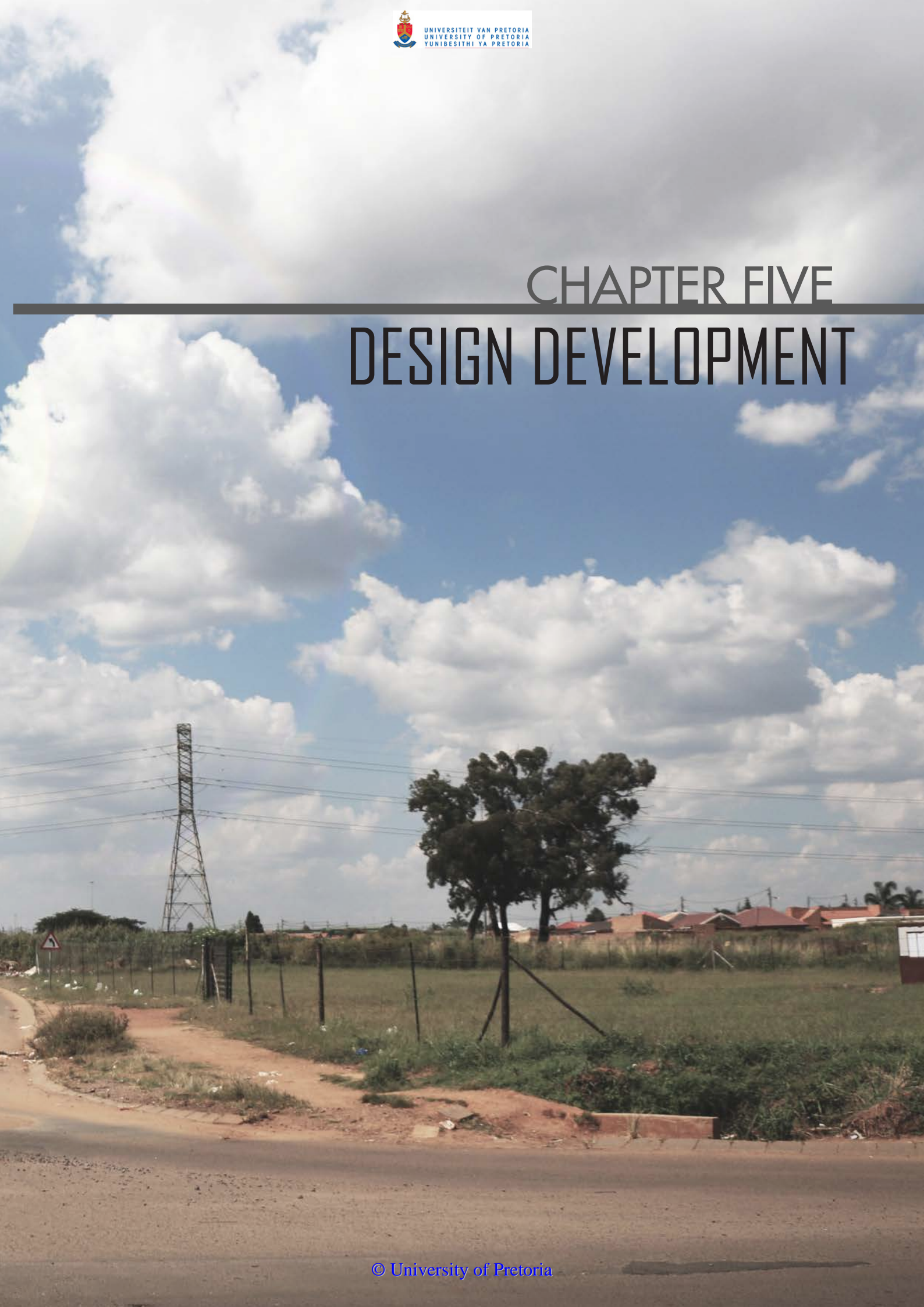
The intention of this programme is not to replace any existing function related to the automotive industry, but to increase economic choice and diversification by providing a niche service that the network cannot provide for itself.

This dissertation aims to re-evaluate the programmatic layout in the current context, and translate it into a solution that relinks them with the introduction of the central missing function. The proposed programme does not only form part of the practical intervention on the site but also underpins the theoretical premise.



CHAPTER FIVE

DESIGN DEVELOPMENT



5.1 _PREFACE

This chapter translates the programmatic and contextual informants into an architectural expression that is embedded in the theoretical framework. Firstly, the incubator as a concept is introduced in relation to the core intentions of this dissertation. Precedents relating to the theory and intentions are discussed to illustrate its application in other contexts.

An architectural response is evaluated with regard to the intentions, to determine how it achieved economic enablement through architecture, flexibility and adaption over time. Those aspects not achieved in the design intentions are developed and refined.

Revisions in the design reflect changes in the theoretical approach. These have influenced the development of the design in plan, section and various scales of detail and are discussed and synthesised towards a holistic design resolution.

5.2 _CONCEPT AND INTENTIONS

The incubator serves both as a programmatic and a conceptual informant. According to the Oxford dictionary, to incubate is to *(in a laboratory or other controlled situation) keep (eggs, bacteria, embryos, etc.) at a suitable temperature so that they develop or give support and aid the development of (a new small business)*. In both these descriptions, it is evident that the incubator arranges and maintains the conditions or environment that would promote development or growth of some kind.

A building – as an incubator - of the future cannot be a mono-functional building. Using this theoretical framework it is evident that to define a response to the existing vernacular, new roles and opportunities through architecture must emerge. Such a building must contain and create the optimal environment for public exchange and economic enablement through architecture. The design approach should resonate with the project intention, which is to aid in the enablement of:

...forms of business that reconcile human needs with natural equilibria; production processes that emancipate people from the passive role of consumerism; and systems of social organisation at the local level that reconnects individuals with their communities and their ecosystems, while allowing them to participate in a global network of active change makers.

Fioramonti (2017:12).

The design process was informed by the following generators: understanding of the context, understanding and interpretation of the vernacular, site conditions and the programmatic requirements.

5.2.1 Architectural intentions

Change and renewal are key aspects in understanding the built environment. *To use built form is to exercise some control, and to control is to transform* (Habraken 1998:7). It is assumed that there is no absolute distinction between those who use and those who create. This relates to the argument that the creation of space is the result of everyday social interaction.

For the architect architectural intent is to enable the user to define and satisfy his spatial needs. Given the theoretical argument of this dissertation, it only seems fit that the architecture refers to the context by interpreting the vernacular. A deeper interpretation of the vernacular is thus needed to go beyond the functional towards a poetic architectural translation.

The strategy is to *break up* the vernacular into its basic elements to expose its essence and then reassemble these elements into a more holistic architecture. The architecture bound to its niche, having abstracted what is useful and reacted to it, becomes culturally, ecologically and economically relevant.

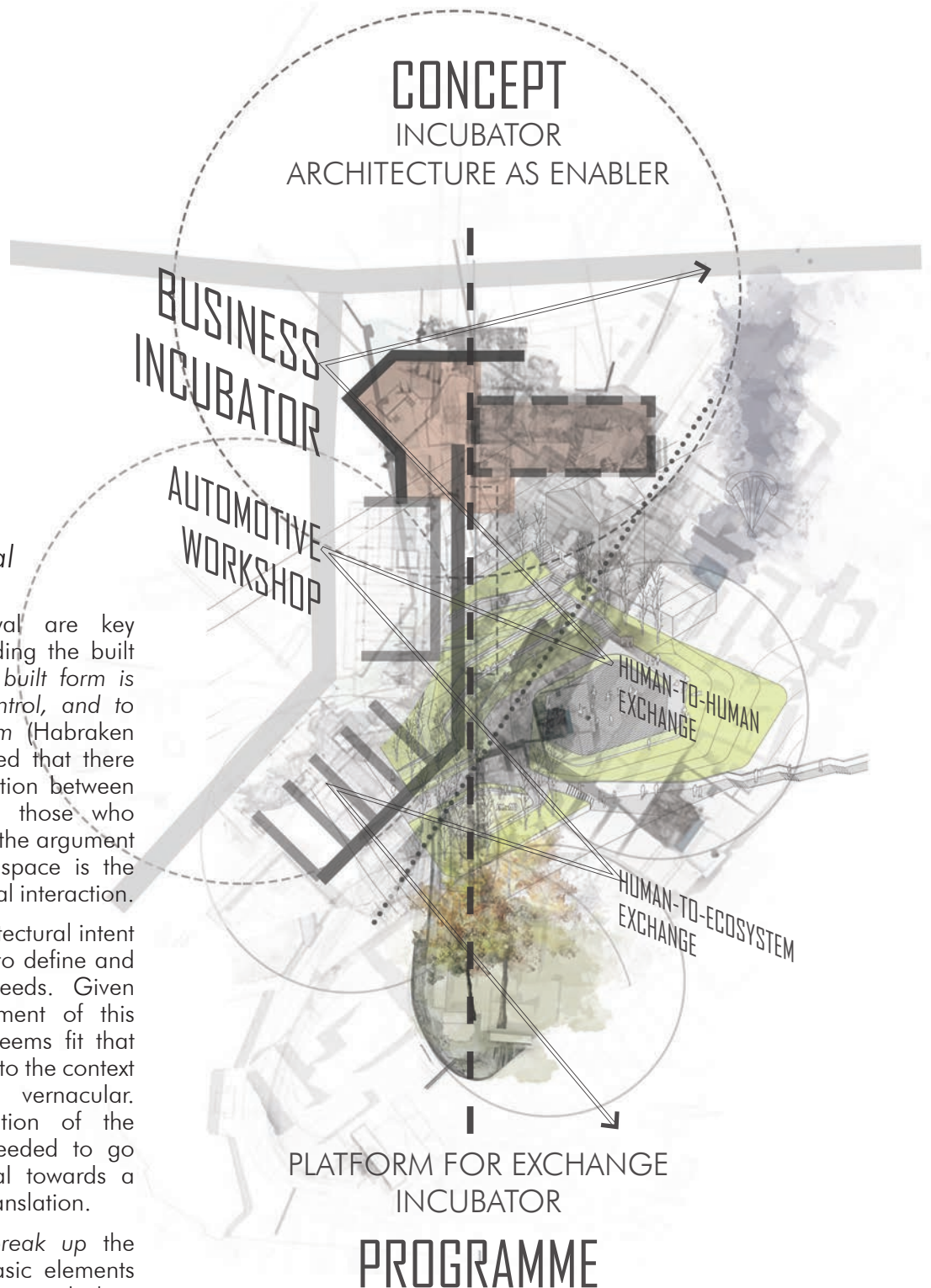


Figure 5.1: Conceptual exploration of the incubator as concept and programme on plan. (Author 2017)

5.3 DESIGN PRECEDENTS

5.3.1 Slime mould_a conceptual growth model

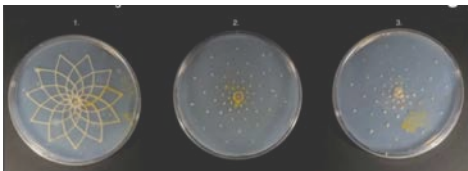
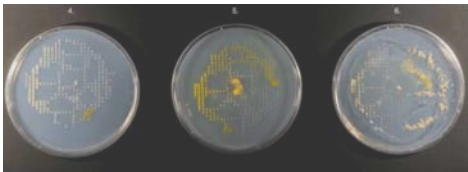
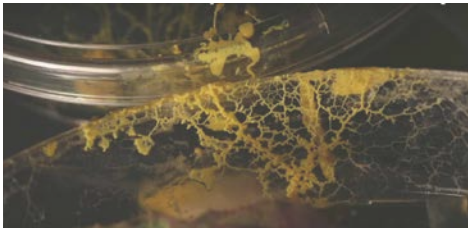
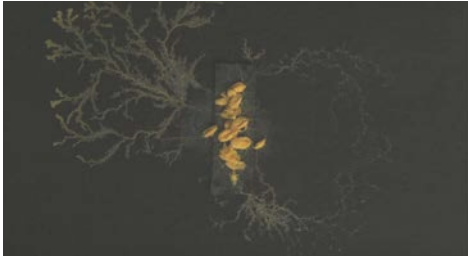
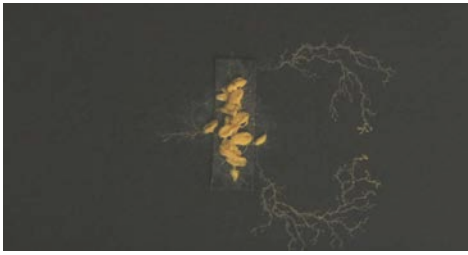
The slime mould as described by Barnett (2014) is a collective entity with primitive intelligence. It can organize itself, learn and find ways to solve problems. By understanding how it functions, its behaviour can be predicted and its movement can be pre-empted.

It can be argued that if the slime mould's pattern is predictable, other patterns as experienced in the urban environment could also be learnt from and predicted. If urban development is guided in a certain direction (as suggested in the urban vision) the existing scale, density and street thresholds can be predicted and manipulated.

This approach relates to the interpretation of the vernacular and when a specific architectural element is introduced future outcome can be predicted. For the purpose of this dissertation the slime mould model is used as a conceptual driver, a way of engaging with ideas of community, of collective behaviour and cohesion. It is believed that this would enable social space that would allow for engagement on various scales. It also suggests ways of exploring design possibilities and how to accommodate the vernacular in architecture.

Figure 5.2: Collage of slime mould. (Barnett 2014)

Figure 5.3: Collage of maps depicting urban growth patterns in Bologna, Italy (Cipriani & Ballabeni 2011)



5.3.2 The Arcades of Bologna_an urban regeneration tool

Location: Bologna, Italy

Date: 15th century

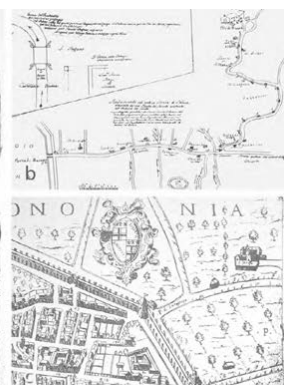
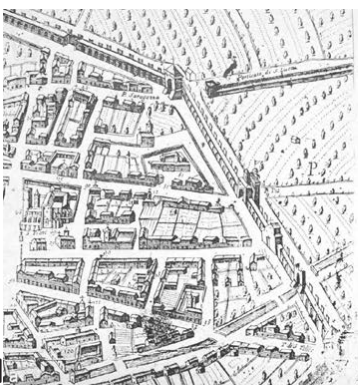
Client: The city of Bologna municipality

Keywords: Urban regeneration, Growth patterns, Mode of intervention/engagement, Collective identity

During the 15th century, the city of Bologna needed a redefinition of and maintenance of urban spaces. The porticoes/arcades in Bologna were implemented by the government to focus on the regeneration of the urban environment. The arcades were successful because they managed to pre-empt the city's growth patterns as well as responded to different needs and requirements of the existing built fabric.

The implementation and successful growth of the urban fabric around the arcades evolved over centuries. The areas behind the portico structure were predominantly commercial destinations and established a mode of intervention that Bologna used for the next 400 years.

These perspectives and *rules of the game* can be applied in the current context of a city to regenerate the urban life while maintaining the existing and historic layers of architectural fabric. (Cipriani & Ballabeni 2011:387). Regeneration is a successful tool to instil a sense of collective identity and community engagement.



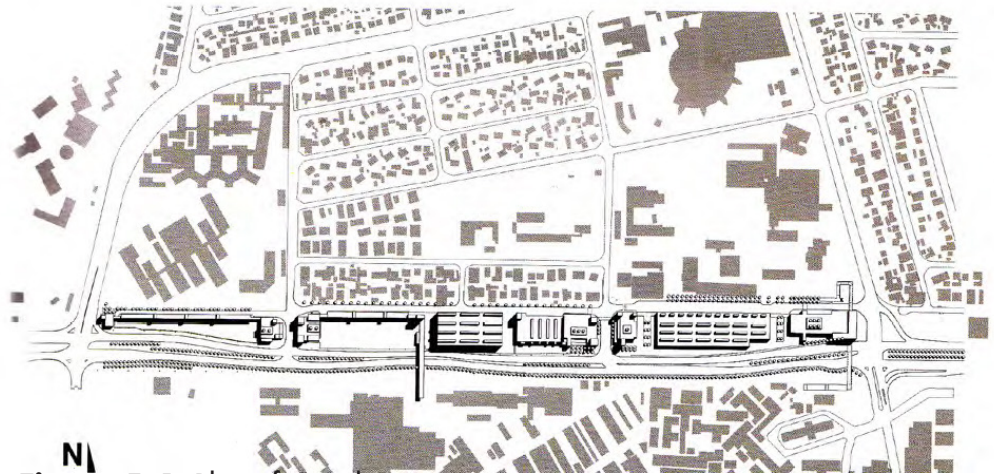
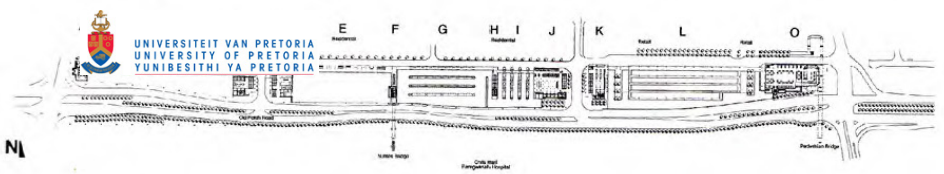


Figure 5.4: Plan of interchange and the informal surrounding context. (SA Digest 2006)

5.3.3 Baragwanath Transport Interchange_ redressing past spatial inequality

Location: Soweto, Gauteng, South Africa

Date: 2003-2008

Architect: Ludwig Hansen Urban Solutions Architects and Urban Designers

Keywords: Accommodating informality, Accessibility, Identity, Ownership, Catalytic

The key success of this urban development is embedded in employing aspects of informality in its planning and structure and the improvement of accessibility between Soweto and Johannesburg (Deckler, Graupner & Rasmuss 2008:65). The upgrading of this transport interchange aimed to combine the requirements of the various parties involved (bus companies, minibus taxi associations, street traders and officials) into a single holistic design resolution. These requirements were identified during a series of workshops and negotiations.

The planning principle revolved around the provision of an arcade as a *structural spine* along one of the primary routes between the city of Johannesburg and Soweto, Potch Road (Deckler, Graupner & Rasmuss 2008:67). This concrete structure is the binding element that pulls all the functional requirements together culminating in a sculptural tower, an artwork created by local residents signifying a sense of identity and ownership (Deckler, Graupner & Rasmuss 2008:67). It also provides a robust, permanent structure that acknowledges the permanence and importance of the building.

The intervention successfully accommodates at various scales from the 22 bus ranks, 650 minibus taxi holding and ranking bays to the 500 street traders. The success of the facility as a *public catalyst* presents an opportunity for future development of new urban spaces and fabric in once underdeveloped and marginalised environments to learn from its integration (Deckler, Graupner & Rasmuss 2008:6).



Figure 5.5: Collage depicting focal points and interior space of the market. (<http://archidatum.com/gallery?id=4227&node=4196#>)



Figure 5.6: photographs depicting the open ended character of the architecture to allow for informality. (<http://www.archidatum.com/gallery?id=10929&node=10924>)



5.3.4 Refilwe Urban Upgrade_ an open-ended strategy

Location: Refilwe, Metsweding, Gauteng, South Africa

Date: 2012

Architect: Holm Jordaan

Keywords: Permeable edge, Framework, Spatial patterns, Robustness

Refilwe forms part of an *urban network* of upgrades in the Metsweding area (Holm Jordaan 2012). The building consists of a covered area with basic amenities such as water, shelter, seating and ablutions. The open-ended framework leaves space for a series of programmatic intervention present in the precinct such as car washes, waiting areas, taxi drop-offs and hawker accommodation. The robustness of the design allows for change over time and aims to accommodate the informality associated with the precinct.

Holm Jordaan (2012) has used an open-ended approach to urban upgrading by simply formalising public space through the use of a simple yet robust structure. The building gives back to the street through its permeable edges creating a place for programmatic appropriation. The building demonstrates the ability of architecture to create meaningful city spaces through simple design solutions.

5.3.5 Warwick Junction

Market Precinct_ an architectural stent

Location: Durban, eThekweni, South Africa

Date: 1997 to present

Architect: Various co-ordinated by Aslye eTafuleni NGO

Keywords: M i c r o entrepreneurship, Social networks, Informality

Warwick Junction is a mixed residential and commercial area characterised by its inefficient, unsanitary and unsafe conditions that have evolved over time due to an increase in the taxi and street trading activities. This area is a primary transport node for approximately 460,000 commuters travelling to or from the Durban CBD daily, and also accommodates 5,000 street traders. The project includes developing appropriate infrastructure for traders, spatial upgrading and recycling initiatives (Awan, Schneider & Till 2011:104). The key element to achieve efficiency was a spatial mismatch in the form of a terminating highway. The principal architectural intervention, a pedestrian bridge, served as a stent to open an artery to allow pedestrians to safely cross a busy street.

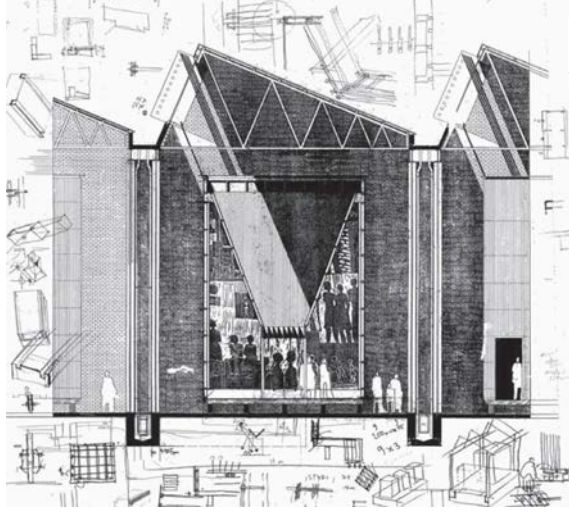
This deeply contextual yet unusual response demonstrates how through catalytic enabling structures the natural energy of a particular context can be harnessed and amplified.



Figure 5.7: Collage depicting the informal market spaces at Warwick Junction. (<https://thinkingcity.org/2015/08/13/durban-inclusive-spaces-trade-warwick-junction/>)

Figure 5.8: Warwick Junction bridge, acting as an architectural stent. (SAIA 2016)





5.3.6 Red Location

Museum

Location: Port Elizabeth, Eastern Cape, South Africa

Date: 2005

Architect: Noero Wolf Architects

Keywords: Informal settlement, Memory vs history, Commemoration through use

The Red Location museum, includes an auditorium, offices, library, an art gallery and a memorial space.

According to Deckler, Graupner and Rasmuss (2008:45), the formal drivers for the project were extracted from the surrounding neighbourhood. The prominent saw tooth roof draws the inspiration from a recurring theme found in the trade union posters of the 1980s. The material pallet contains references to the surrounding context. These were given new dignity by its unconventional use. Even though the building design is based on the context as its guiding reference, the scale of the intervention seems disconnected and inappropriate.

The exterior of the building is designed in such a way to form the scaffolding as a robust backdrop for people to act out their everyday lives. It draws on contextual clues and creates places for play, gathering, entertainment and trading. Instead of allocating large quantities of new material to provide a formal museum and art gallery, more could have been done to contribute to its immediate context. Till (2014:10) asks the question *What if, instead of adding, one redistributes what is there already?* This statement provokes questions regarding new modes of design that redistributes, restarts and optimises what is already there.

Figure 5.9: Collage depicting spatial relationship with the buildings informal surroundings and how it has responded in articulation. (Wolff Architects <http://www.wolffarchitects.co.za/projects/all/inkwenkwenzi/>)

5.3.7 Kent InterAction Center_ dynamism in architecture

Location: London, England

Date: 1972-1977

Architect: Cedric Price

Keywords: 'Plug-in' structure, Mobility, Flexibility, Modular

...the addition of a building is not necessarily the best solution to a spatial problem.

Cedric Price (in Awan, Schneider & Till 2011).

Price often questioned institutions and their desire to use buildings as a means of consolidating power (Awan, Schneider & Till 2011:189). His *time-based approach* explored the possibilities of dynamism in architecture through conceptual explorations. The implementation of this concept in his InterAction centre allows for transformation over time. He passed the control back to the user to accommodate his or her personal changing needs.

This project is one of few built projects by Price and consists of a sophisticated consolidated roof structure with specialised modules designed for mutability, and constructed of industrial materials. Because it was designed for optimal flexibility, the primary structure consists of a robust steel frame with movable prefabricated modular infill panels, stairs and cranes. Its large truss allowed for almost any interior configuration and its linear geometry provoked the possibility of indefinite horizontal expansion. This project overcomes the *utopian idea* and presents a realistic possibility of flexible architecture. The building was demolished in 2013.

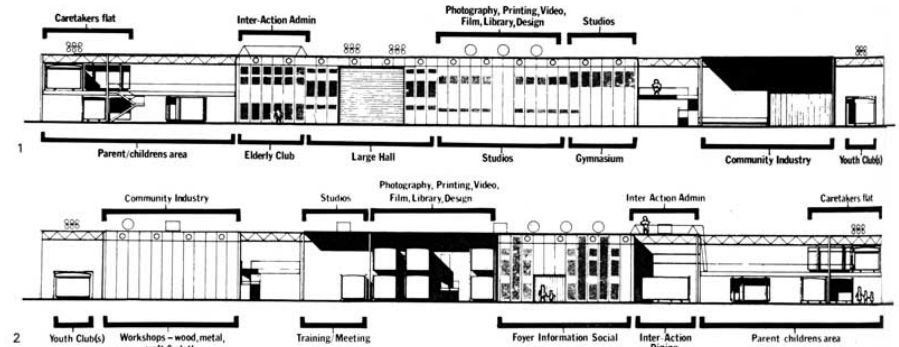
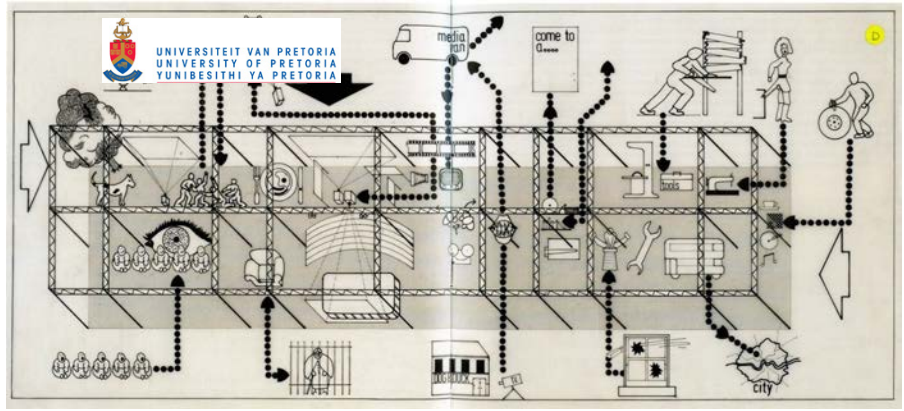


Figure 5.10: Images depicting conceptual exploration of flexibility in architecture. (<http://www.hiddenarchitecture.net/2017/02/interaction-centre.html>)

Figure 5.11: Elevations depicting the changeability of the programmes. (<http://www.hiddenarchitecture.net/2017/02/interaction-centre.html>)

Figure 5.12: Photograph of the buildings manifestation, hinting to an industrial typology. (<http://www.hiddenarchitecture.net/2017/02/interaction-centre.html>)

5.4 _ARCHITECTURAL RESPONSE

5.4.1 Site conditions and orientation

The constraints and opportunities identified on the site determined the basic layout and orientation of the building. The site is sandwiched between Mashaba drive along the western boundary and the 50 year flood line along the eastern boundary. These constraints informed the north-south orientation of the building. This is not ideal in terms of passive design strategies, but provokes the theoretical idea of finding a way of working with scarcity in a productive manner. The spaces that require the most thermal control are placed on the northern edge of the site to make the most of the passive control potential in the building.

As an intuitive response to the site restrictions and opportunities, the programme requiring the most interaction with the public was positioned on the northern corner of the site. A tower was located on the corner as a way to signify the building's importance and define the urban fabric. Interaction between the pedestrian and vehicle movement is concentrated at this point resulting in the placing of the incubator and offices. The northern edge is an engaging porous edge that harnesses the energy from the street to activate the incubator.

Further south the workshops are placed on the street edge to accommodate the automotive programmes along this edge (similar to current vehicle patterns) without them having to enter the site. This section of the building (like the boundary wall) separates the vehicle movement from the pedestrian walkway.

The eastern edge of the site was designed to provide for pedestrian movement along the banks of the proposed constructed wetland and the green strip. The walkway is experienced as a series of *push* and *pull* spaces with varying spatial qualities to enable different interactions.



Figure 5.13: Initial concept model, as an exploration response to context and vernacular. (Author 2017)

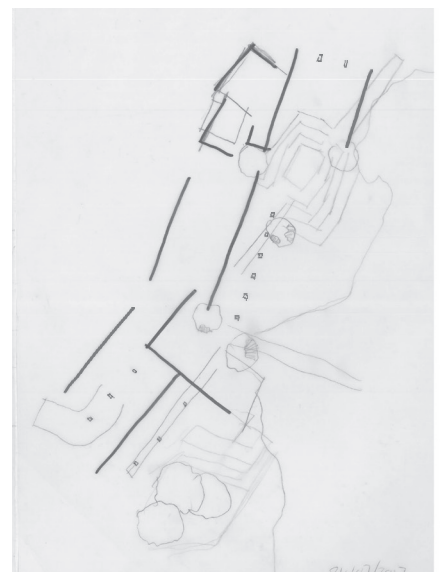
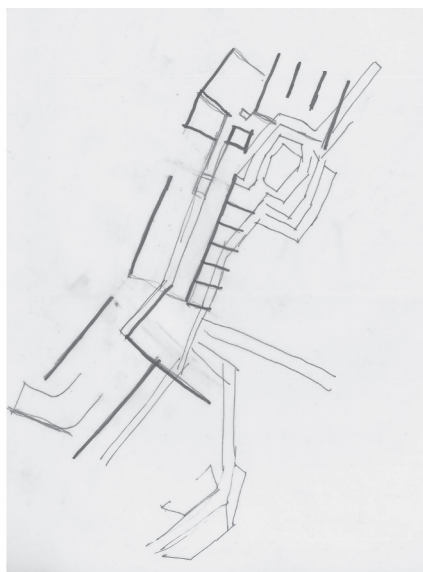
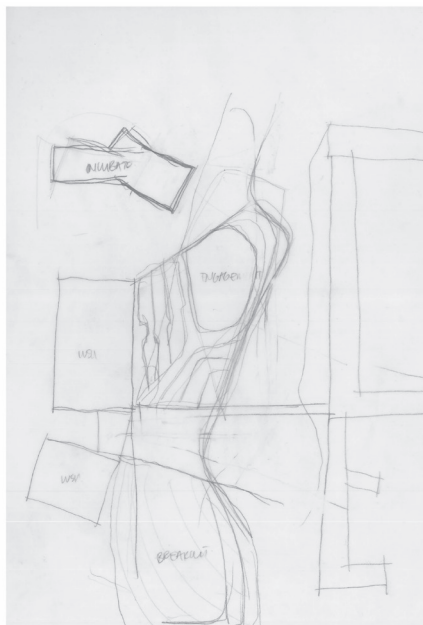
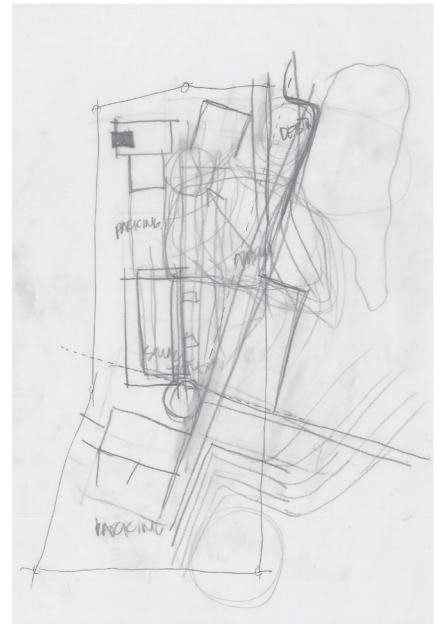
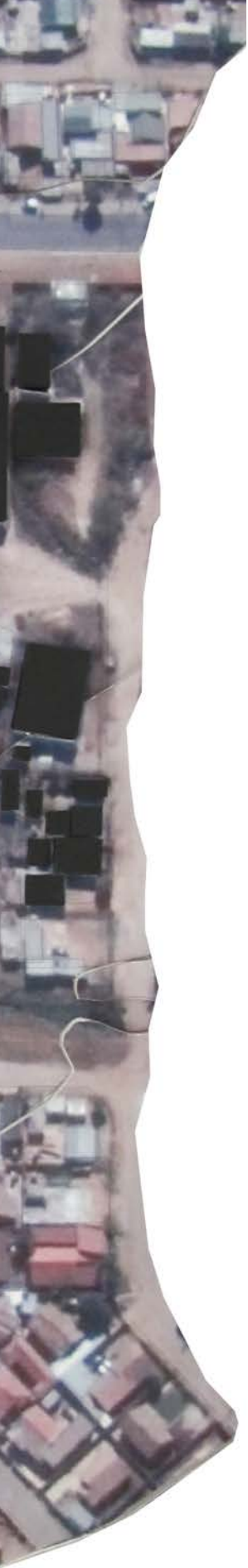
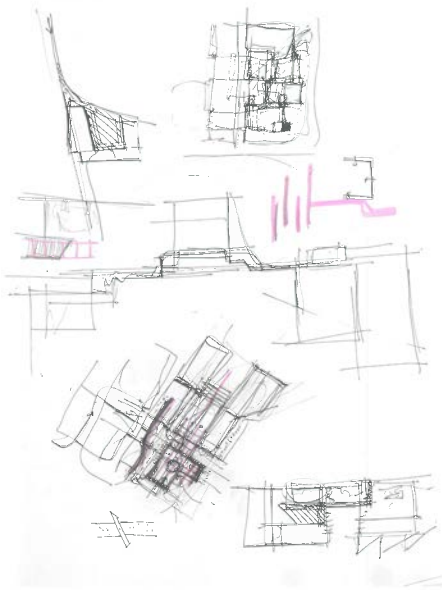


Figure 5.14: Development of the response to site into the final parti diagramme. (Author 2017)



5.4.2 Vernacular as form generator

The theoretical and contextual informants allowed several points of departure to the design process. The interpretation and translation of the vernacular were considered an appropriate starting point to generate forms.

The **boundary** wall was the first point of departure. The site investigation determined that the boundary wall acts as a primary interaction element that both accommodates and facilitates but also separates. The boundary wall is broken up into its elements (the roof, the wall, the column and floor surface) as a means to signify the various functions. What is needed is to activate the edges of the building for interaction and engagement on a social and economic level.

Mamelodi is characterised by a low-density suburban **scale** with informal economic activities. By enhancing the current economic activities (as stated in the urban vision) it is argued that an enhanced built form can accommodate any escalation. The study suggests that the architectural scale is increased to a maximum of four stories along Shilohane Street.

The design's **ordering system** is based on the mass to open space ratio (as discussed in the article) of the current suburban fabric. The northern edge mirrors the appropriation patterns found on the opposite side of Shilohane Street but scales it up as expressed in the building's grid. This ordering system is used throughout the building to form a base for enablement.

In terms of **form hierarchy**, the corner is the most important point where pedestrians and vehicles meet and from where the circulation

tower becomes prominent. The incubator then pivots around this central point forming an elevated enclosed cube inviting the visitor into the building. The remaining building then expands to the south and is characterised by the rhythm reflected in the structure and roof line.

The manipulation of the **ground plane** is vital as it aims to accommodate platforms for engagement but also allow for a variety of spatial qualities along the activated walkway. The ground plane steps from the walkway as a datum upwards to the circulation tower to create a platform for engagement that allows the user to enter into the landscape directly from the landings of the staircases. From the walkway, it then steps down toward the structured wetland to draw the user closer to this natural feature and facilitate the reconciliation between people and the natural equilibria.

The grid is drawn up to form a **vertical expression** by walls and columns that are *feathered out* into the landscape as to form a gradual threshold. The residual space then offers an opportunity for the user to start appropriating space.

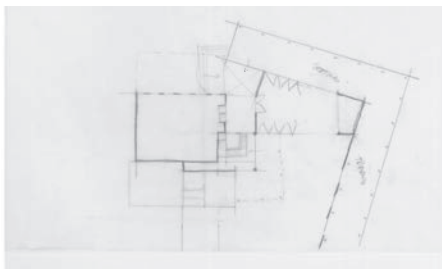
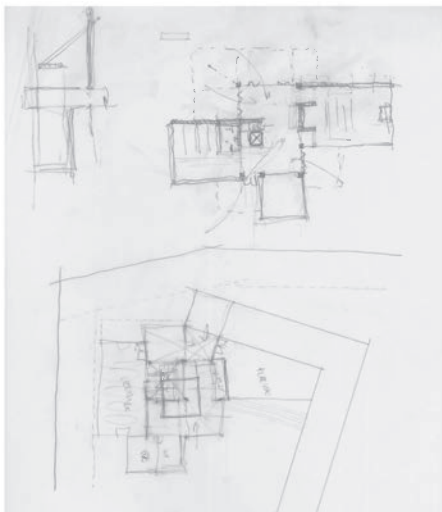


Figure 5.15: Plan development in response to the vernacular. (Author 2017)

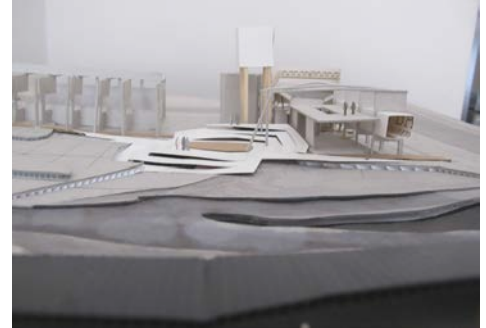


Figure 5.16: Photographic documentation of design model, showing a clear response to scale and context. (Author 2017)

5.5 _DESIGN REFLECTION

The first conceptual model expressed a good response to the conceptual intent and showed continuity in form and an ability to change over time. However, in the final response, the model showed a relapse back to an architecture of objects that allowed for no change or flexibility.

In retrospect, a disconnect exists between the theoretical and contextual informants and how it was expressed in the building. The building was presented as an open-ended building but was not developed to the extent where it could be evaluated in terms of a *finished/useable* building. It had to be determined how much finite design was needed to successfully facilitate the production of social space.

Concern was indicated regarding the living units, because of their position above the noisy workshop as well as their east-west orientation. It was decided to exclude them from the dissertation's programmatic parameters and place live-work units on the opposite side of the constructed wetland (as part of the precinct vision).

The interior circulation space needed to express more generosity to act as the *connective* tissue between the various programmes. Similarly, the potential of the incubator space's auditorium had to be more flexible to accommodate other programmes.

A concern was expressed regarding a convincing argument for an architectural language. The balance had to be negotiated between finding a vernacular vocabulary, greater flexibility and responding to the context's scarcity.

5.6 _DESIGN EVOLUTION

5.6.1 Theoretical development

A building is not a building. A building, in the sense of walls, floors, empty spaces, rooms, materials, etc, is the only outline of a potential: it is only made relevant by the group of people it is intended for.

Giancarlo de Carlo
(2005:22)

The concept and theory were developed to recognise the fact that the sole authorship of the architect is not the primary consideration when arguing for a building that is mostly influenced by the vernacular. In this context the architect, as a different type of designer with a different design approach, should not solely be concerned with form, but also the design of the process that will facilitate people to create this facility together.

An *open building* (as suggested by Habraken 1998) that is receptive to new design possibilities - in stylistic terms - as well as in social behaviour is a valid option towards a solution. This fits the original concept but structures the idea into distinct levels of intervention where the higher level defines an environment for the lower level to transform when needed. In this project the primary structure and two core elements form the higher level (minimal change over time); the secondary level is the infill panels (changes regularly) and the tertiary level is defined by the furniture and equipment (changes on a daily or weekly basis).

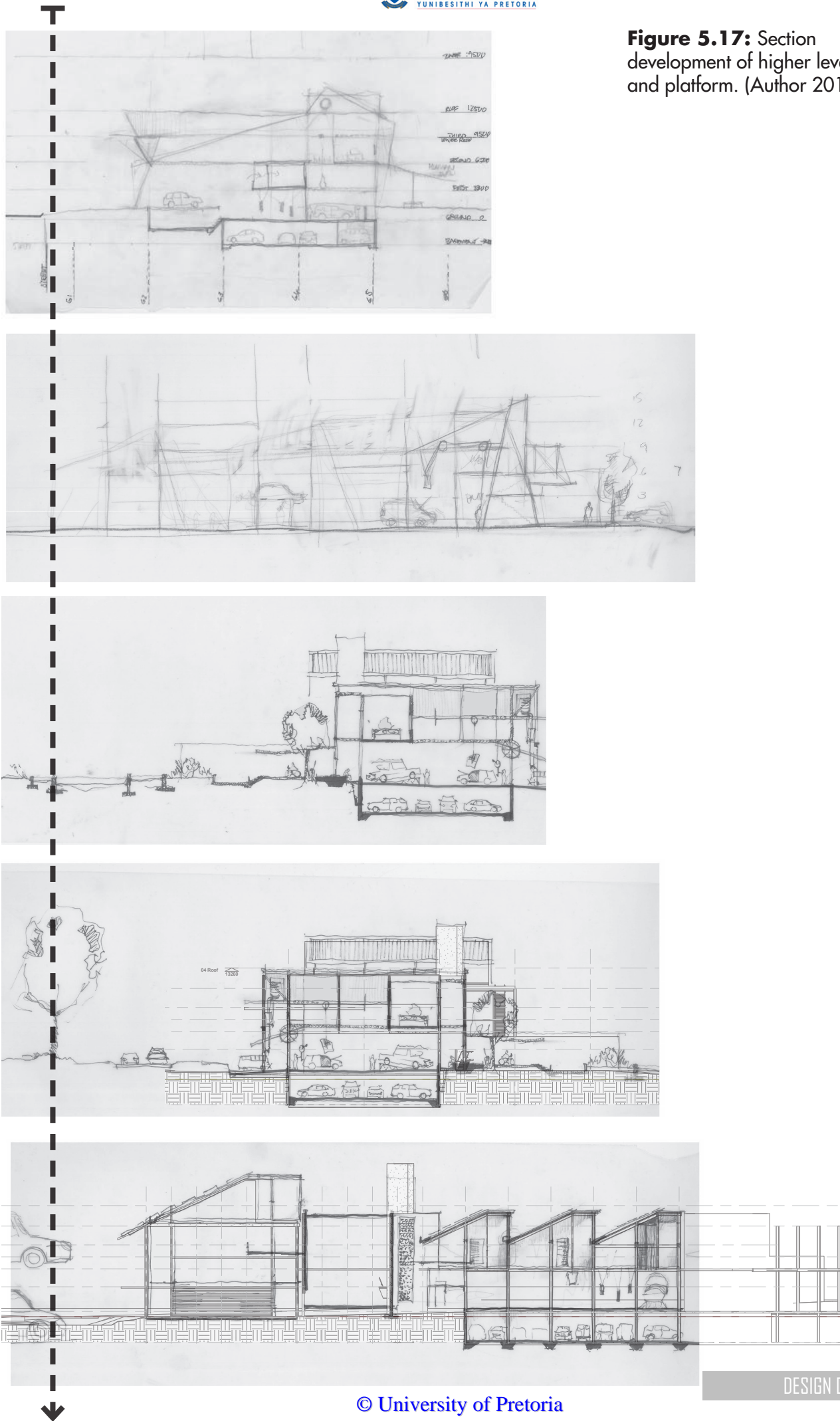


Figure 5.17: Section development of higher level roof and platform. (Author 2017)

While exploring the themes and principles regarding *open buildings* Habraken (2014) suggests *design plays*. Each starts with a playing field, pieces and rules of the game; however, the play is never won or lost (Habraken 2014:33). To explore design and form alternatives, a studio workshop was held with three participants. The aim was to establish the spatial outcome of the building as well as the variations in understanding these levels through the manipulation of drawings.

5.6.2 *Parti diagramme*

After the design play, it became evident that the design needed to be simplified to its essential parts. The transition from the first to the second parti diagram indicates a clear spatial intention of what is considered permanent and what can change over time. The two core elements are permanent anchor points (accordingly built with concrete blocks) and accommodate permanent functions (such as vertical circulation elements and ablutions). With these elements in place, the structure is able to accommodate change as the rest of the architecture develops.

5.6.3 *Strengthening conceptual and formal ideas*

It was decided to develop the *higher level* towards including the roof structure as the formal collective statement and the manipulated floor level as the platform of engagement. This concept refers to a local tradition of erecting an overhead plane, in conjunction with a floor surface, as the first spatial indication of an upcoming event (such as a local funeral, carwash or informal stall). These two architectural elements allow for complexity in-between.

After investigating the vernacular, the footprint started to indicate the relationship between private and open space as well as built form and self-built additions and the resultant in-between spaces. By applying this ratio and scaling it up, the threshold between outside and inside and the in-between linking space between that which is given and that which is appropriated, became of paramount importance. This is expressed in the building's envelope and how it can be transformed to accommodate activities inside.

By rotating the auditorium to align with the grid and moving the building closer to the street edge, an opportunity for a more intimate relationship with the street was created. This threshold expresses generosity and accessibility through the use of pivoting doors along the western and northern edges and draws the pedestrian in and allows for interaction between the building and the vehicles outside.

5.6.4 *Programmatic and site development*

In accordance with the concept, the building's programme should be able to change over time. For this to happen it was decided to draw the column grid through the entire building, to allow for as much flexible floor space as possible. This change allowed vehicles to move freely within this space as well as the complete transformation of the auditorium space to draw in activity from the streetscape.

The surrounding site needed further development to allow for a synergetic relationship between the building and its surrounding functions. Therefore, (in accordance with the urban vision) it was seen as an appropriate strategy to develop the existing activities on site, enhanced through an increase in activity and accessibility provided

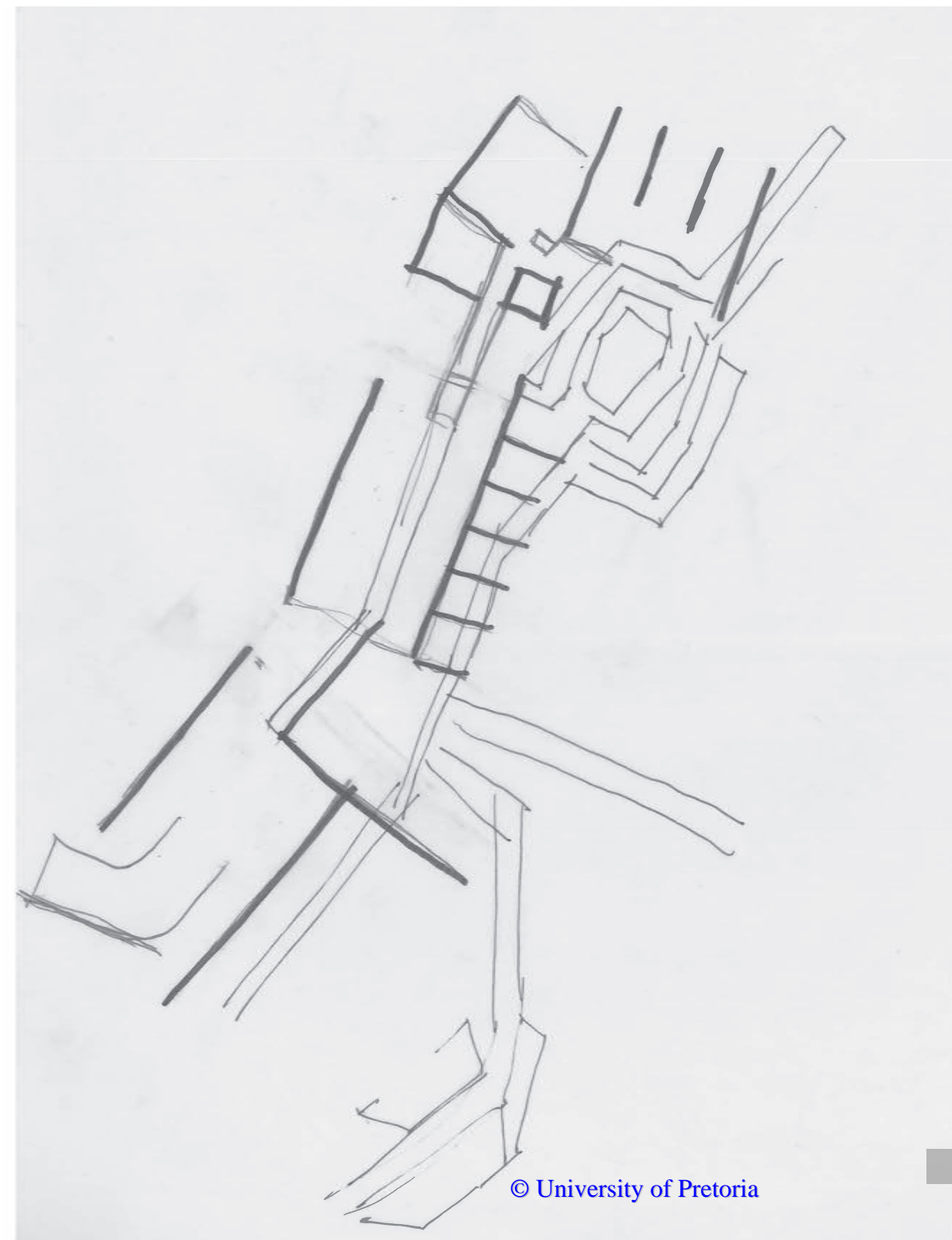
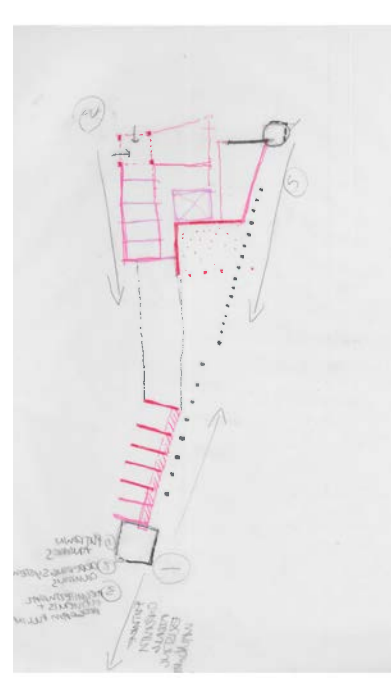
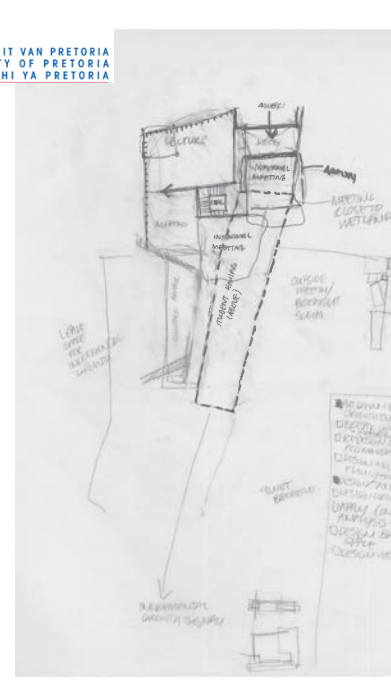
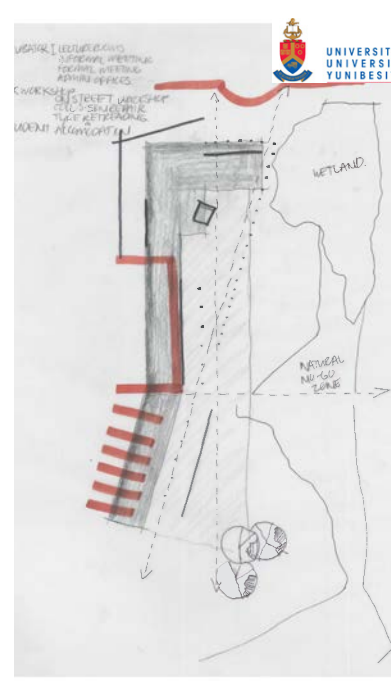
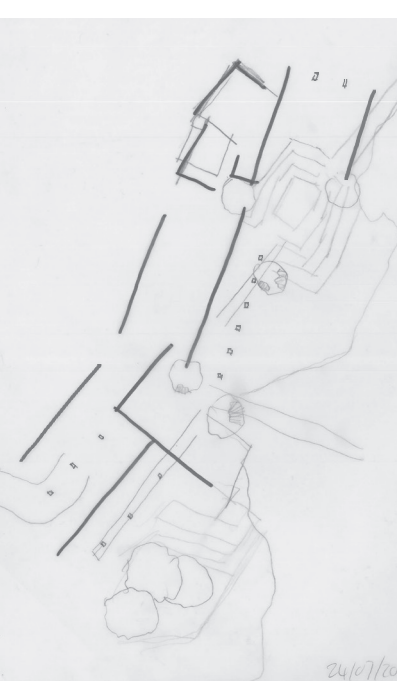


Figure 5.18: Design workshop as a means of establishing the spatial outcome of the building. (Author 2017)

by the activated pathway.

A public transport pickup zone and its associated economic activities can be accommodated on Shilovhane Street just east of the site. This connects directly with a farmers market that produces local fruit and vegetables south of the site, as part of a strategy to rehabilitate the damaged part of the site. As part of the rehabilitation and environmental enrichment of the area, it is suggested that a constructed wetland form part of this area to further enhance the experience along the pathway and bring people into equilibrium with nature.

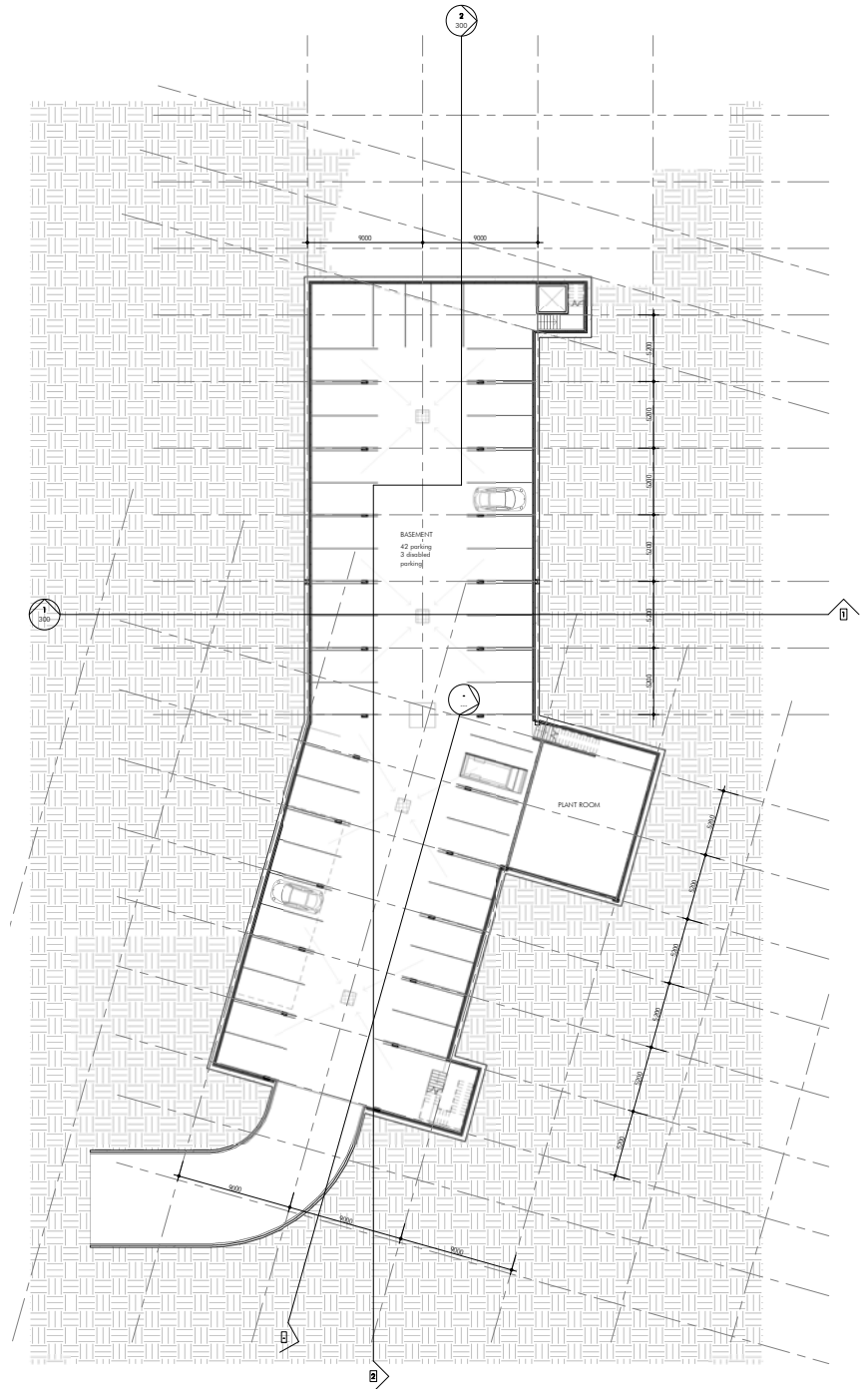
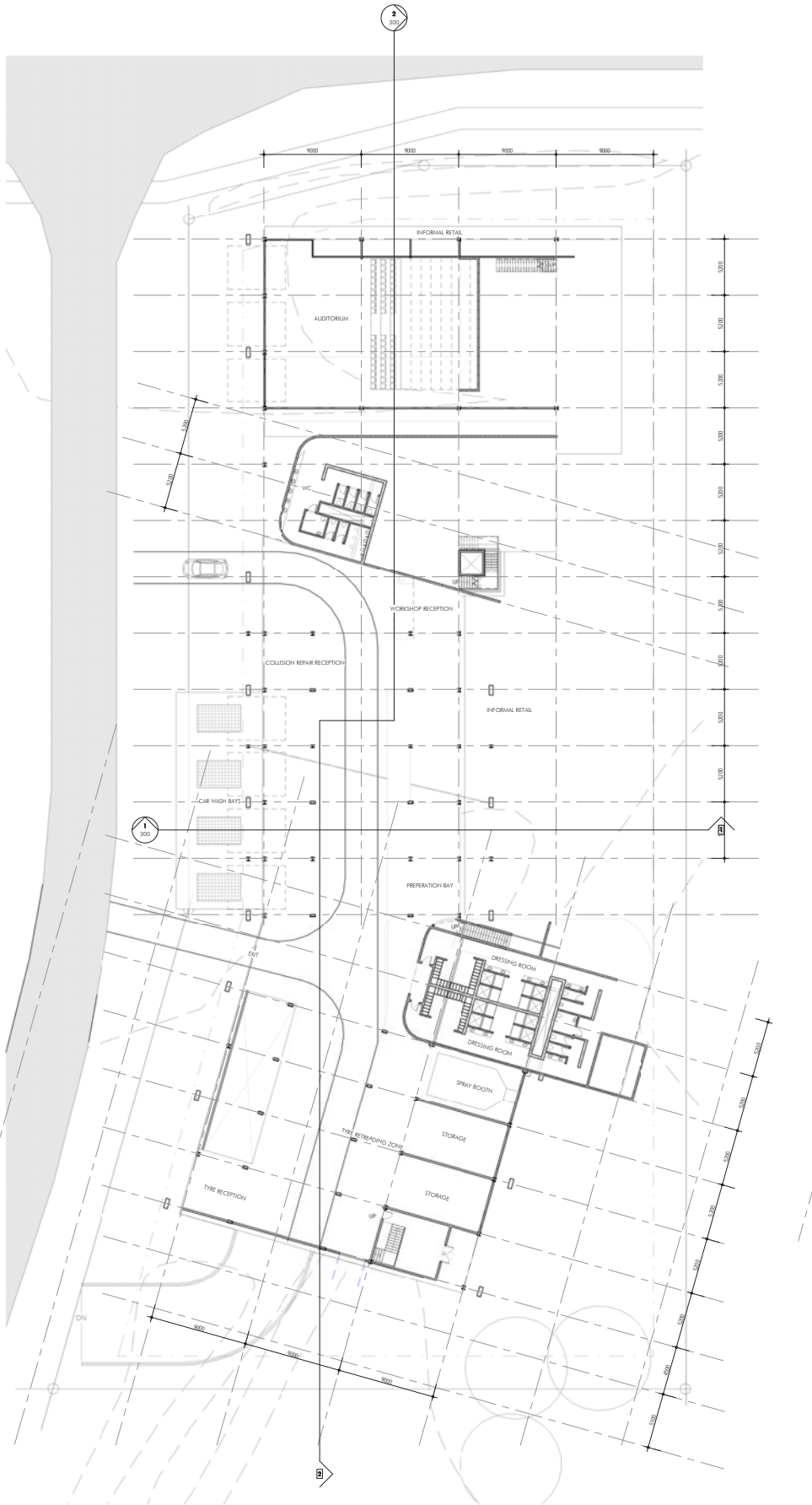


Figure 5.19: Basement and Ground floor plans exploring the manipulated platform as a means of setting up a higher level. (Author 2017)



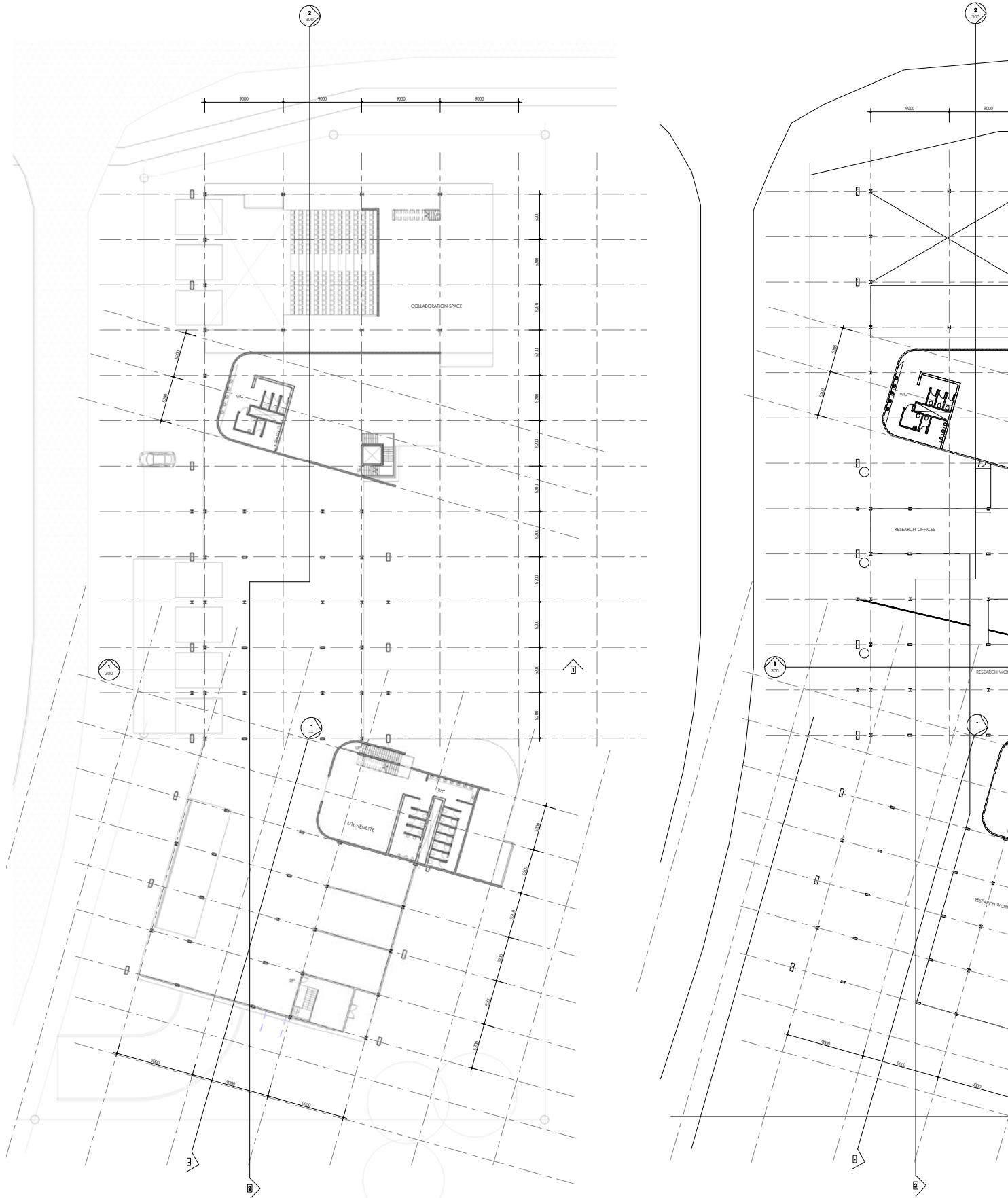
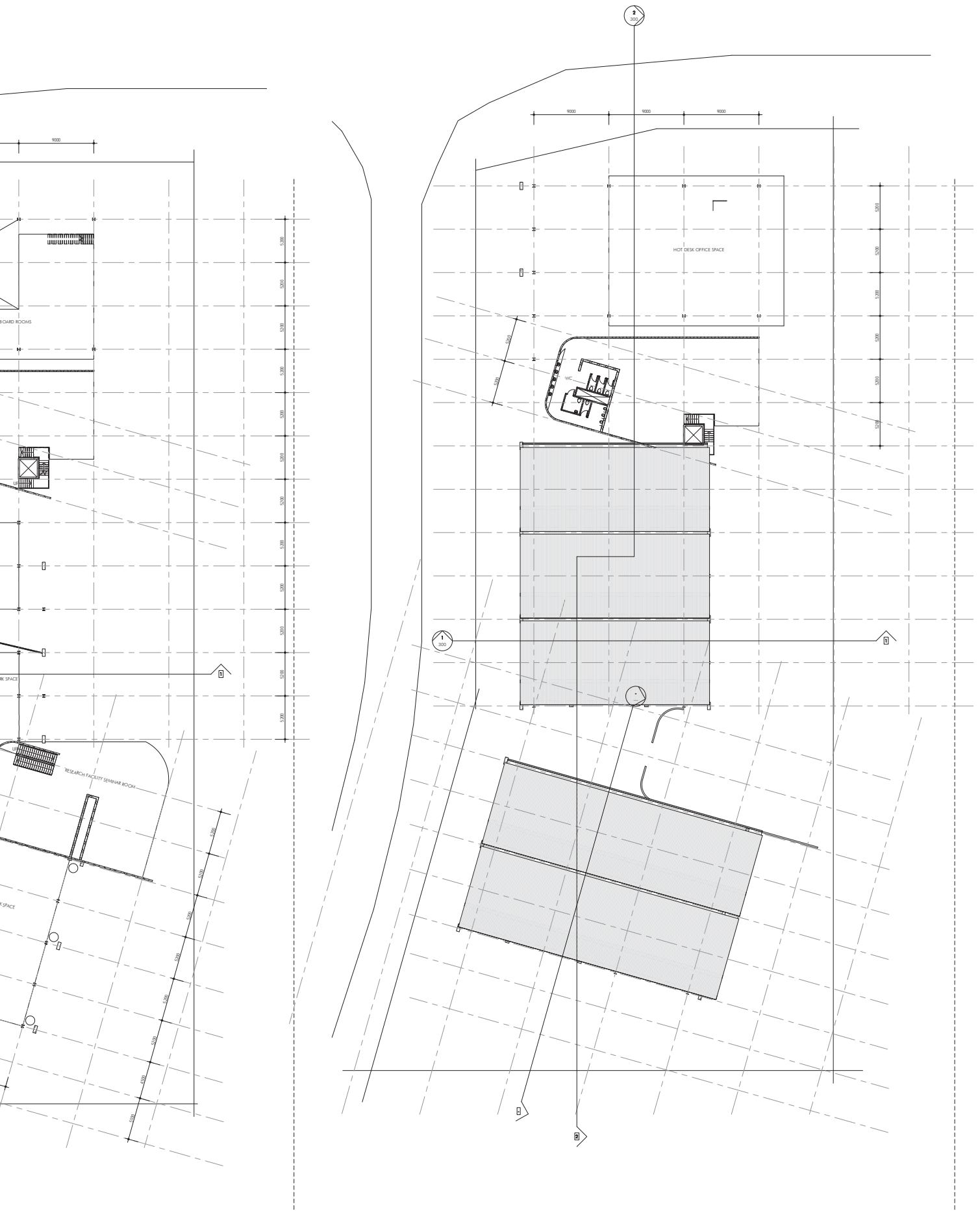


Figure 5.20: First, Second and Third Floor Plans. (Author 2017)



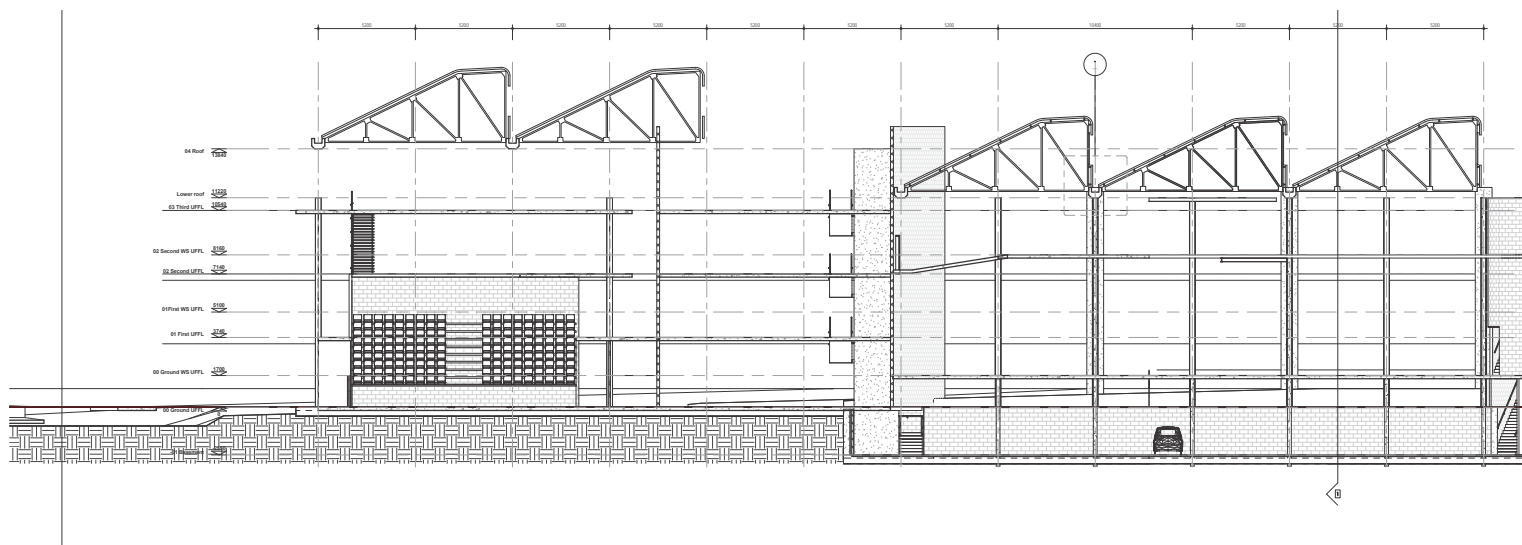
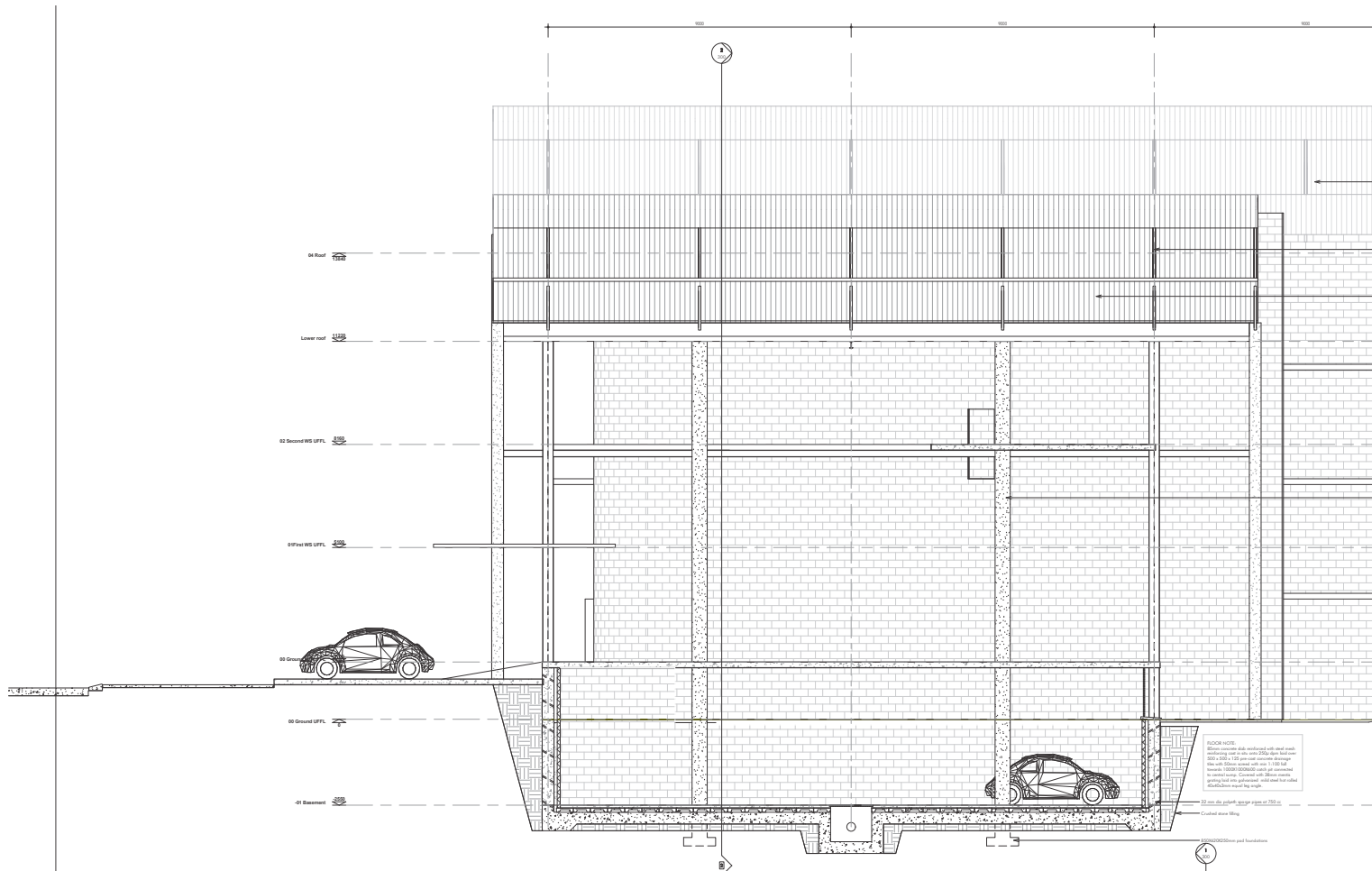


Figure 5.21: Sectional explorations showing the relationship between the various levels of engagement. (Author 2017)

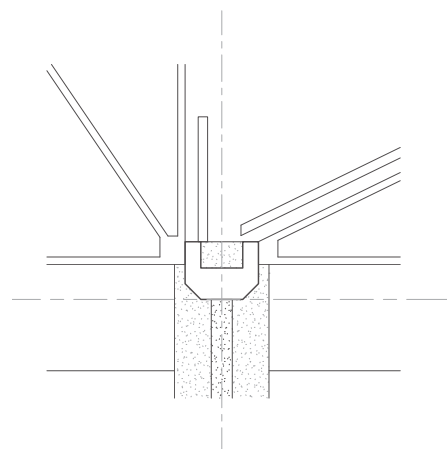
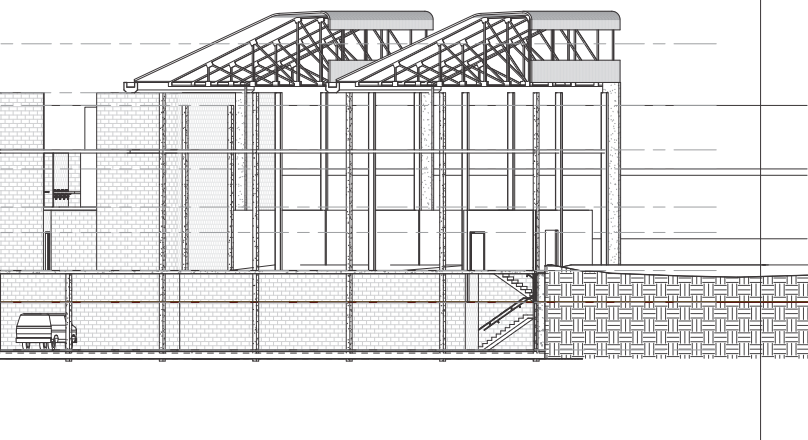
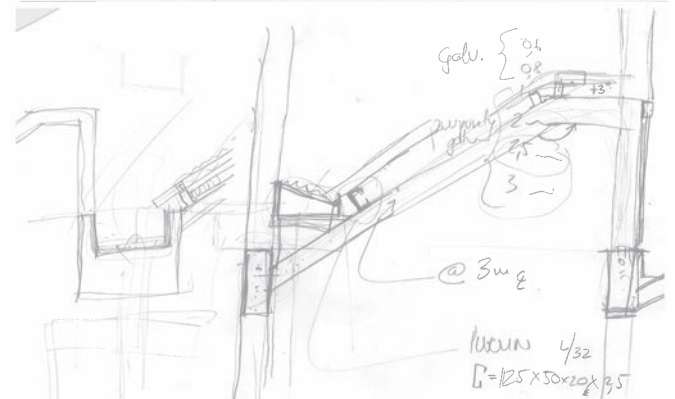
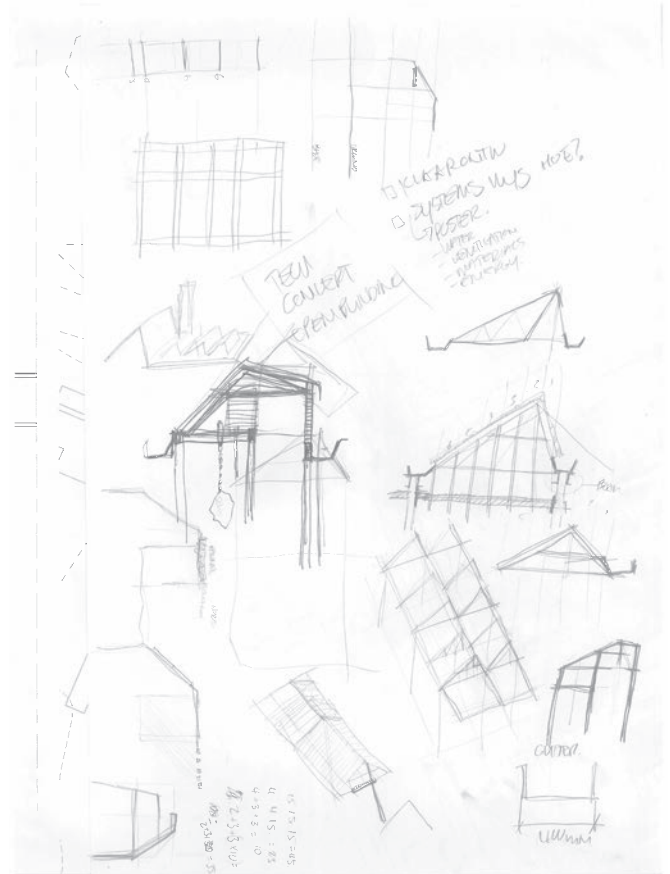
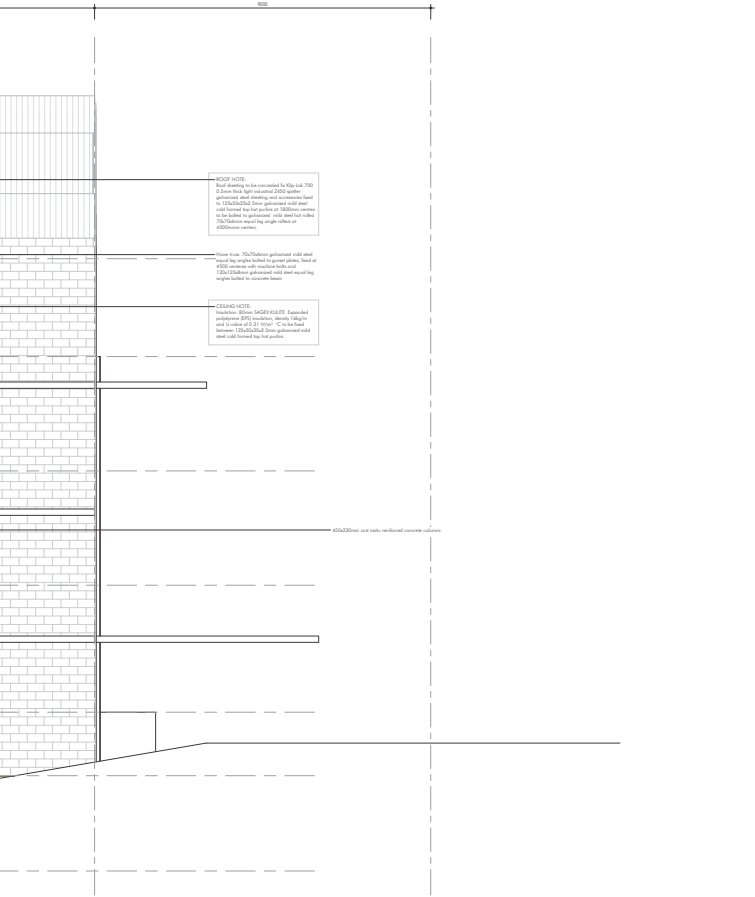


Figure 5.22: Internal roof gutter detail development. (Author 2017)



CHAPTER SIX

TECHNÉ



6.1 _PREFACE

In Scarcity and Agency Till (2014:9) argues that scarcity opens up new fields for design. This final chapter aims to translate the theoretical and design intentions into coherent technical resolutions. The technical concept underpins all tectonic decisions regarding structure, materiality, systems and technology. The application of environmental strategies and passive systems are discussed as it relates to the building and its surrounding context.

6.2 _TECHNICAL CONCEPT

The tectonic approach is rooted in the theoretical background, as it resonates with the key feature of the design to incorporate past generational knowledge and the long-term future possibility of maintaining and growing a building over time (Brand 1992:132). Framed within this background the concept developed from a theory suggested by Habraken (1998:20) regarding *open buildings* as an anomaly for playing an *architectural game*. This *game* is based on observing configurations and then deducting the rules from such observations. Mamelodi provides the context that defines the rules of engagement (as discussed in chapter 2).

In addition to this, it is necessary to establish the *playing board* or *higher level* that provides the unchanging, stable background for the movement of pieces. This is architecturally expressed through the provision of a platform and a consolidated roof structure that favours the user on a *lower level* to manipulate space according to their immediate needs (Habraken 1998).

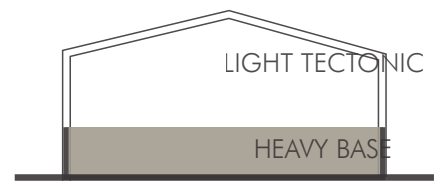
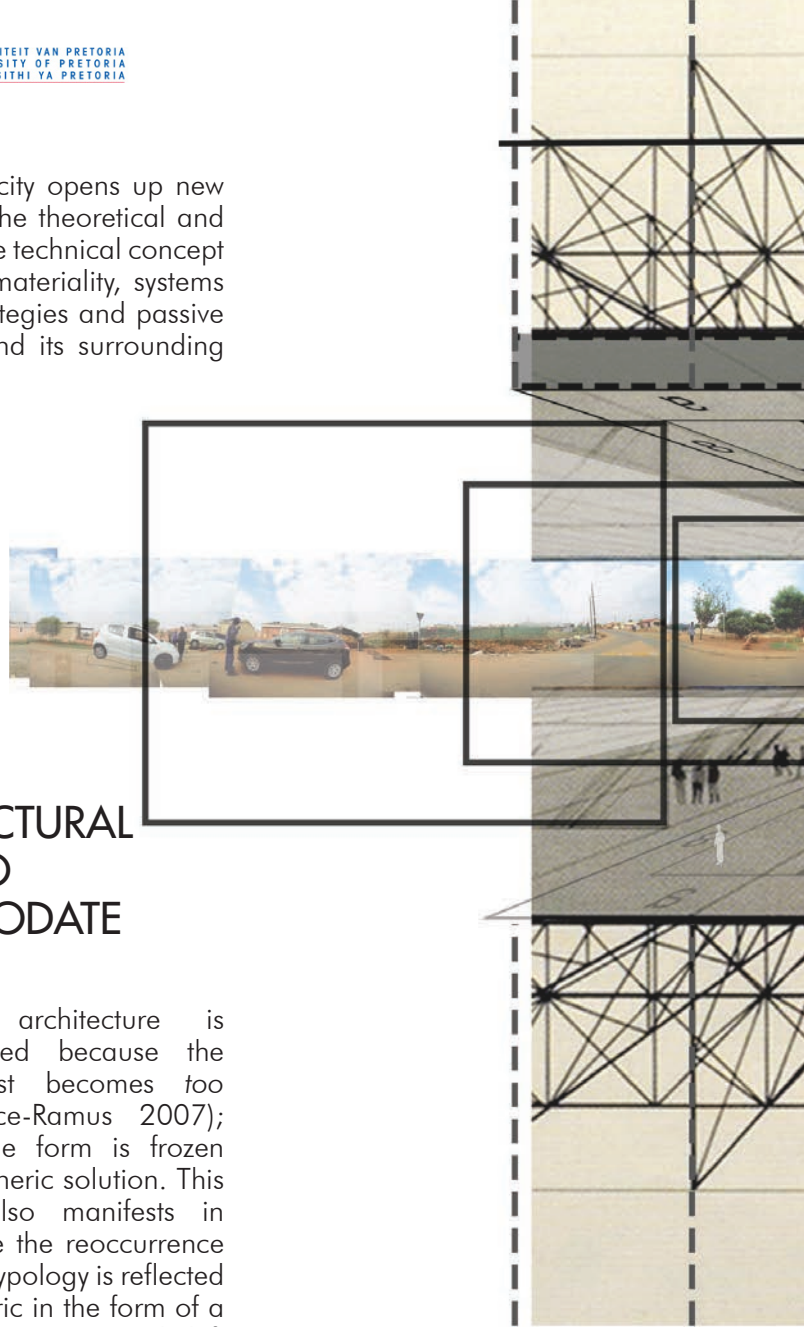
This project proposes an open building that translates the industrial typology into a flexible fragmentary solution.

6.3 _STRUCTURAL SYSTEM TO ACCOMMODATE FLEXIBILITY

Flexibility in architecture is often disregarded because the operational cost becomes *too expensive* (Prince-Ramus 2007); consequently, the form is frozen into the most generic solution. This phenomenon also manifests in Mamelodi where the reoccurrence of the industrial typology is reflected in the urban fabric in the form of a *portal frame* that is temporarily left empty until filled in at a later stage.

The technical investigation aims to provide the same spatial freedom in the new building as experienced in the street-scape of Mamelodi, by reinterpreting the industrial typology. The traditional industrial building accommodates services in its heavy base, covered with a light tectonic structure. However, this project recommends that the services be moved up into the roof and pressed down into the ground so that the rest of the space becomes provisional.

In support of the tectonic approach, flexibility and enablement are illustrated through a combination of two complementary structural systems each allowing for flexibility on the *lower level* (as suggested by Habraken: *The Structure of the Ordinary* 1998).



TYPICAL INDUSTRIAL TYPOLOGY

Figure 6.1: Diagram depicting structural intent. (Author 2017)

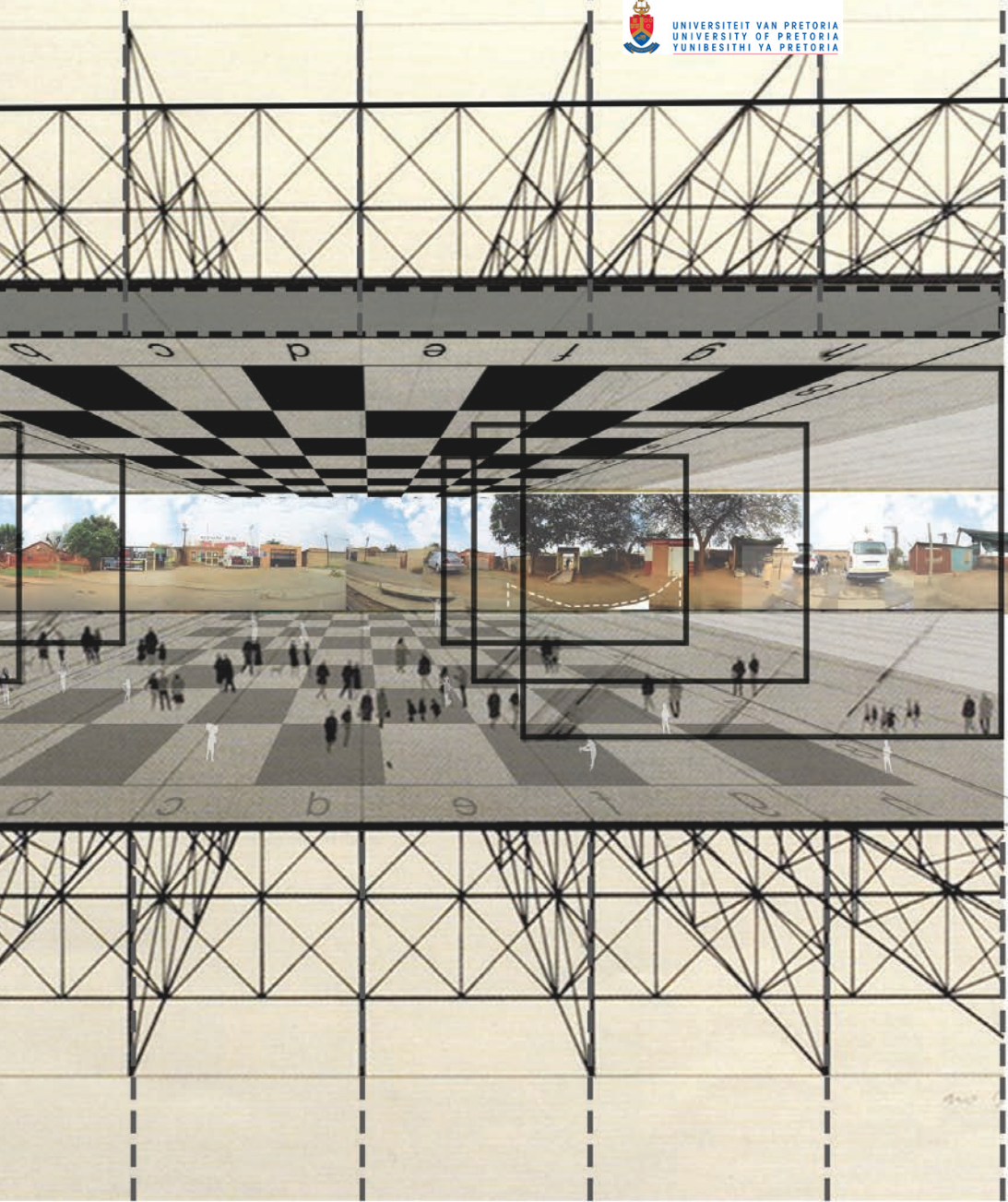
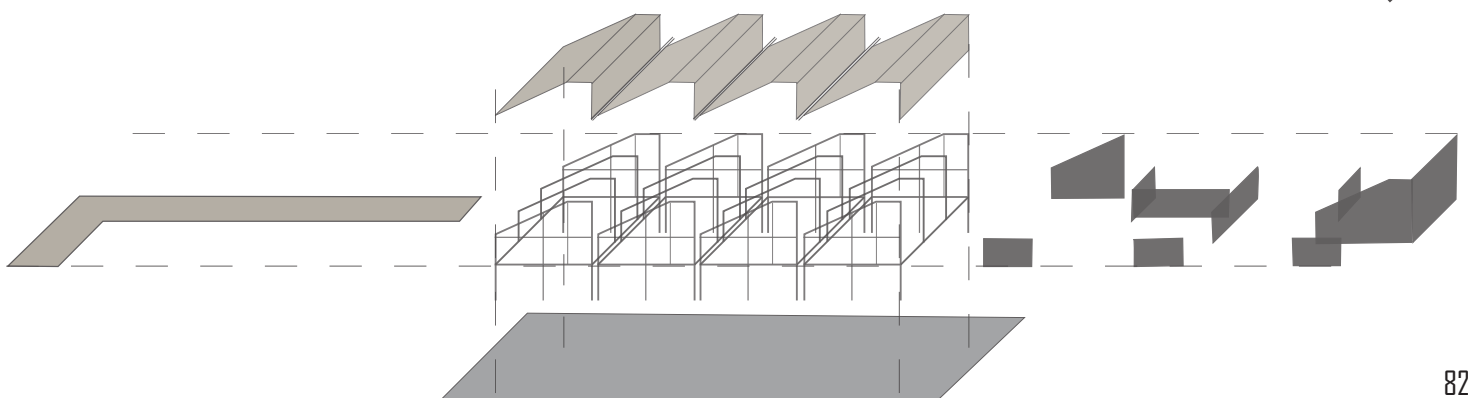
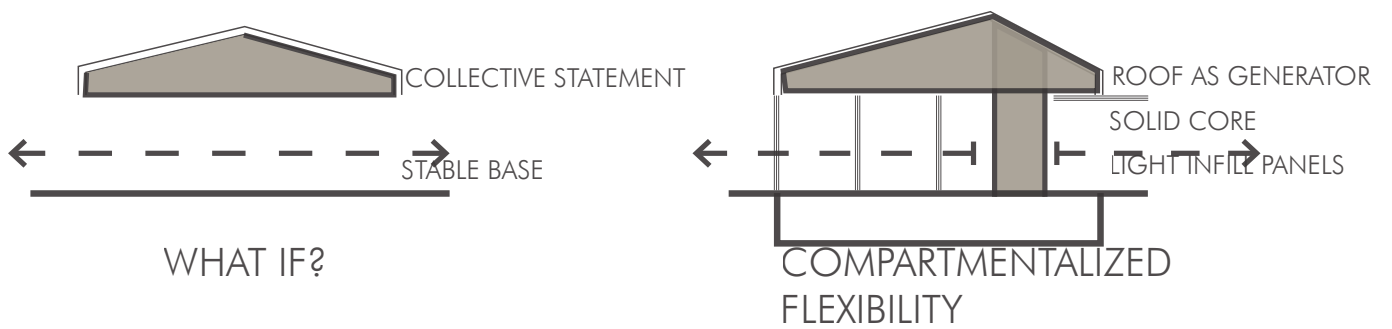


Figure 6.2: Technical concept. (Author 2017)



6.3.1 Primary

Structure

The substructure forms of a robust reinforced concrete base that holds the basement and the manipulated ground plane. The stereotomic quality of the substructure complements the tectonic superstructure, which is essentially a robust steel portal frame that signifies various future spatial possibilities. The permanent functions of the building are located in two core structures and are distinctly separated and contrasted by their materiality as well as the exposure of the connection between the permanent and the flexible. The combination of these elements forms the *higher level* that facilitates emergence on the lower levels of the building (Habraken 1998:23).

6.3.2 Secondary

structure

Particular emphasis is given to flexibility aspects and opportunities how to make the building manually operable. A light gauge steel structure forms the secondary structure. Because it is structurally stable, versatile in form and compatible with other cladding materials, it is ideal for the use in this response to the vernacular.

Through an iterative exploration of the roof structure, a light steel truss proved to be the most economical thus resembling the very idea of responsiveness to scarcity. The roof's profile is a pragmatic response for optimal water catchment and energy efficiency.

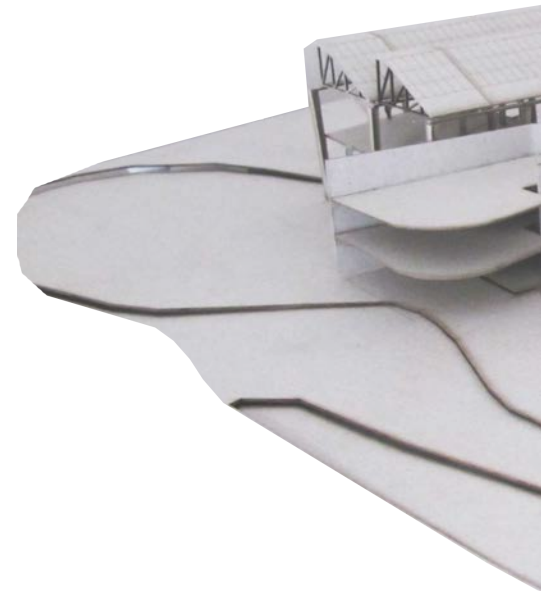
6.3.3 Connections

This concept of setting up a *higher level* to allow modification on a lower level can be translated on various scales: from an urban scale to the detailing of material connections. The connections become important to provoke further possibilities of enablement. This is visible where opposing materials meet. For example, where the steel column meets the concrete platform, a portion of the concrete is elevated to form a bench or informal stall.

The alignment of wet and electrical services are exposed through wall mounted solutions and cable trays suspended from the primary structure. This enhances the idea of changeability in architecture and would provoke the user to partake in the production of space through architecture.

The idea is not to test new expensive technologies, but rather respond to the context and use well tested manual solutions that have been in use for decades. For example, a block-and-tackle pulley system will be incorporated into the design to lift heavy objects, retractable seating to transform the auditorium space, pivoting doors to allow the streetscape to become a part of the interior or to move large objects into the space. The success of the tectonic approach is largely subject to the selection of materials based on the argument of scarcity and how those materials meet.

These connections are still in the process of being explored and will be refined within the final weeks before the examination.



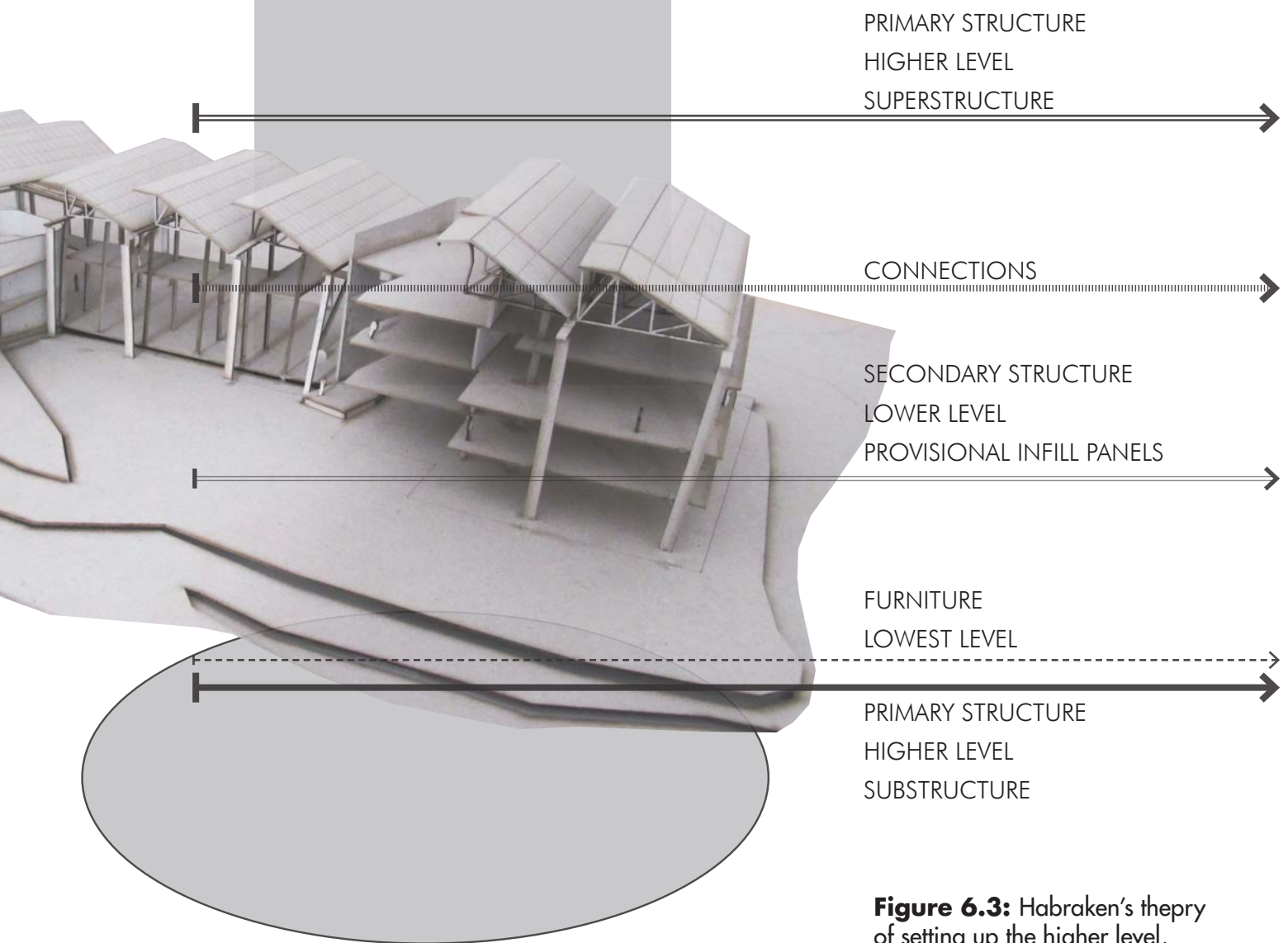


Figure 6.3: Habraken's theory of setting up the higher level, manifested in the architecture. (Author 2017)

6.4 _MATERIAL USE

Till (2014:9) continually confirms the reality of scarcity and that non-renewable resources are really running out, but in some instances it is also a relational construction, where one person's scarcity can be another's abundance. With this understanding of scarcity, the technical exploration will aim at finding a balanced solution that acknowledges resource scarcity but also provides for flexibility with the use of robust durable materials.

In Mamelodi, the project does not discard materials that have a high embodied energy but rather proposes that the embodied energy should be minimised by using recycled material in an economical way. Materials used at a *higher level* should be of durable and robust materials such as concrete with recycled aggregate and recycled steel, to lower the embodied energy as much as possible.

The soil excavated for the basement will be used in the ground manipulation and formation of the exterior amphi.

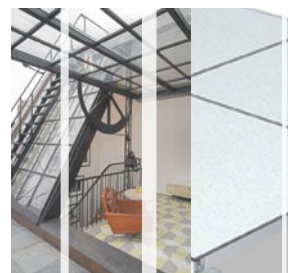
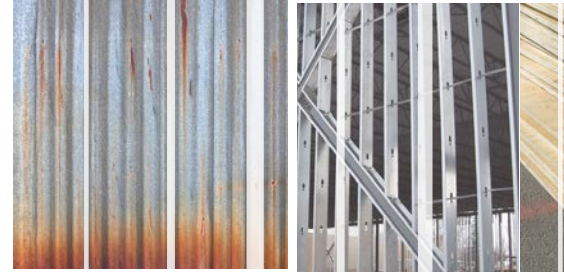
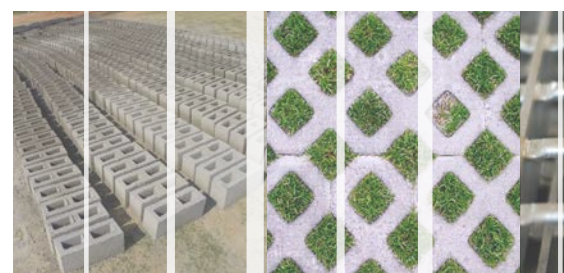
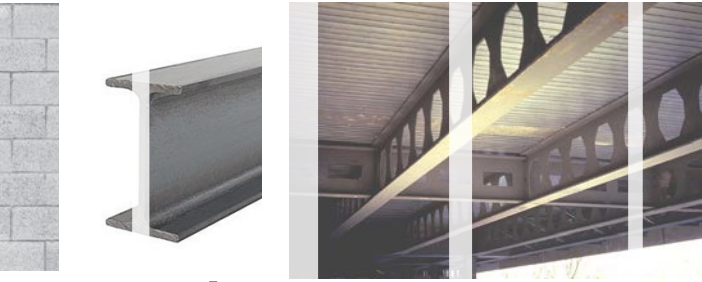


Figure 6.4: Materials pallet depicting a sensitivity to issues of scarcity and flexibility. (Author 2017)v





PRIMARY STRUCTURE

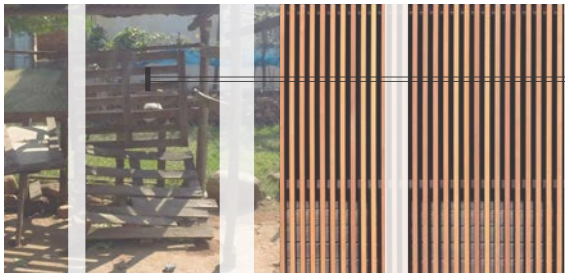
HIGHER LEVEL

SUPERSTRUCTURE
CONCRETE BLOCK CORE
STRUCTURE
HOT ROLLED MILD
STEEL COLUMNS &
CASTELLATED BEAMS



CONNECTIONS

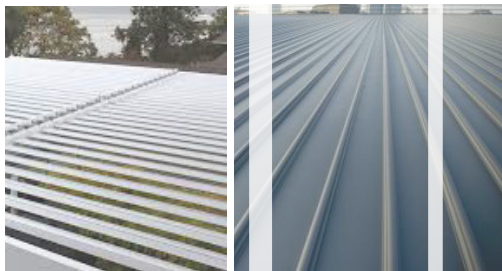
MILD STEEL MENTIS GRATING
MARINE GRADE PLYWOOD PANELS
EXPANDED POLYSTYRENE INSULATION
GALVANISED CONCEALED FIX KLIP-LOK
WALL CLADDING



SECONDARY STRUCTURE

LOWER LEVEL

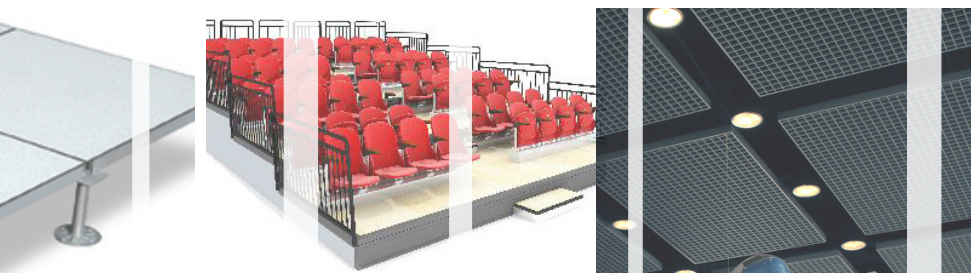
PROVISIONAL INFILL PANELS
FACE BRICK SCREENS
SALIGNA SHADING
PANNELS
COLD FORMED MILD
STEEL LOUVERS
GALVANISED
CONCEALED FIX KLIP-LOK
ROOF SHEETING



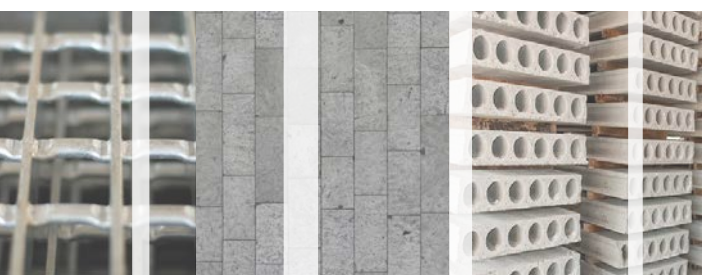
FURNITURE

LOWEST LEVEL

MANUAL PIVOTING
DOORS
ACCESS FLOORS
RETRACTABLE SEATING



HUNTER DOUGLAS
[ACOUSTIC PANELS]



PRIMARY STRUCTURE

HIGHER LEVEL_ SUBSTRUCTURE

LOCALLY MANUFACTURED CONCRETE
BLOCKS
PERMEABLE PAVING
MILD STEEL MENTIS GRATING
LOCALLY MANUFACTURED CONCRETE
PAVERS
PRECAST HOLLOW CORE CONCRETE
SLABS

6.5 TECHNICAL RESOLUTION

6.5.1 Climatic situation

Pretoria is located in the temperate interior zone which means that the city experiences short dry winters and long hot rainy summers. The city experiences high volumes of solar radiation throughout the year, presenting the ideal opportunity to harness that energy.

Combining the climatic context of Pretoria with the theoretical argument for working with scarcity, it is critical to implement environmental strategies that support the overall argument for the architecture: to facilitate through the understanding and productive relationship with the surrounding context. In this dissertation, the environmental strategy aims to accommodate the energy and water requirements on site. These aspects will reach refinement within the final weeks before the examination.

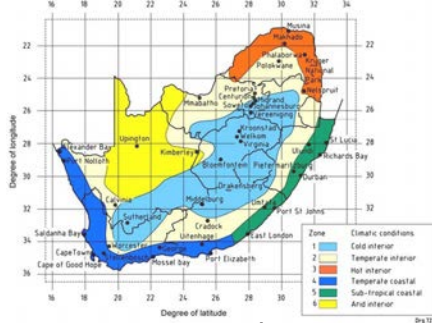


Figure 6.5: Map depicting climate zones for South Africa: Pretoria Zone two, temperate interior.

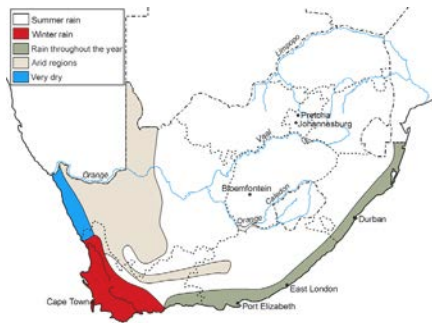


Figure 6.6: Rainfall areas: Pretoria summer rainfall.

Month	Temperature (°C)				Precipitation		
	Highest Recorded	Average Daily Maximum	Average Daily Minimum	Lowest Recorded	Average Monthly (mm)	Average Number of days with ≥ 1mm	Highest 24 Hour Rainfall (mm)
January	36	29	18	8	136	14	160
February	36	28	17	11	75	11	95
March	35	27	16	6	82	10	84
April	33	24	12	3	51	7	72
May	29	22	8	-1	13	3	40
June	25	19	5	-6	7	1	32
July	26	20	5	-4	3	1	18
August	31	22	8	-1	6	2	15
September	34	26	12	2	22	3	43
October	36	27	14	4	71	9	108
November	36	27	16	7	98	12	67
December	35	28	17	7	110	15	50
Year	36	25	12	-6	674	87	160

Figure 6.7: Average annual rainfall in Pretoria. <http://www.rainwaterharvesting.co.za/>

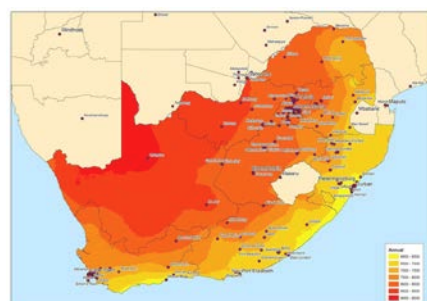


Figure 6.8: Average annual radiation for South Africa. <http://www.rainwaterharvesting.co.za/>



Figure 6.9: Wind Rose for Pretoria. https://www.meteoblue.com/en/weather/forecast/modelclimate/pretoria_south-africa_964137

6.5.5 Design response

1. Passive solar principles
2. Maximise north facing walls and glazing especially in living areas with passive solar access
3. Minimise all east and west glazing
4. Use adjustable shading
5. Use cross-ventilation and passive cooling in summer
6. Use convective ventilation and heat circulation
7. Use reflective insulation to keep out summer heat.

Schmidt, S (ed). 2013. *Architecture, Building Construction Standards for South Africa*. Johannesburg: Active Publications.

6.5.2 Water

Even though the study falls within a summer rainfall region with an average annual precipitation of 674mm (<http://www.rainwaterharvesting.co.za/>), the recent drought has proven that water scarcity is a concern for people living in South Africa. The water management plan includes harvesting rainwater from all roof surfaces and from the paved areas. The water is then filtered through a series of appropriate filters according to the need, which ranges from potable water needed for the canteen and showers, to water needed for irrigation. This water is stored in a water tank with a booster pump that ensures the water remains under constant pressure.

Greywater collected from the showers and hand wash basins will be sent through a grey water purification system to reuse in water-closets, urinals and car wash bays.

Blackwater and water that cannot be reused as grey water, will be directed into the municipal sewer system.

6.5.3 Electricity and lighting

Within the context of economic enablement, the roof was designed to act as an energy collector to provide electricity for small appliances as well as all the interior and exterior lighting. Because the building's programme can change over time, it would be impossible to determine the energy demand. It was therefore decided to minimise the energy use as far as possible and design the workshop in such a way that it can operate on the municipal system.

The roof surface is slanted to 26° north to maximise the energy that could be harnessed by using Photovoltaic panels (PV panels). At the same time, this roof profile allows smooth southern light to enter through the roof and filter down towards the workspaces. Battery rooms located at two central positions are equipped with proper insulation and ventilation.

6.5.4 Passive design ventilation

The proposed programme for an automotive workshop and incubator creates different needs regarding ventilation and both functions had to be addressed separately. Firstly because the building is oriented perpendicular to the prominent northeast wind direction. This provides an opportunity to include natural cross ventilation in the workshop area by introducing small openings located at the lowest point of the space. The roof then provided the opportunity to incorporate sections that could stay open permanently to allow the hot toxic air to escape from inside. The basement is also naturally ventilated on two sides.

In the auditorium, the ventilation had to be treated sensitively due to its habitability. As the temperature underneath the building has a very small diurnal variance, this presented an opportunity for earth tubes to form part of the ventilation strategy. A wind scoop is used as the air inlet and located near the constructed wetland, facing towards the prominent wind direction to harness fresh air and prevent high quantities of smog entering the building. The air is sucked through the earth tubes to cool down or heat up sufficiently. It is then distributed throughout the auditorium through displacement ventilation.

An iterative process will determine whether a mechanically assisted ventilation strategy will be necessary to adapt to the high volumes of people in the space.

Achieved

SB SBAT REPORT

3.5

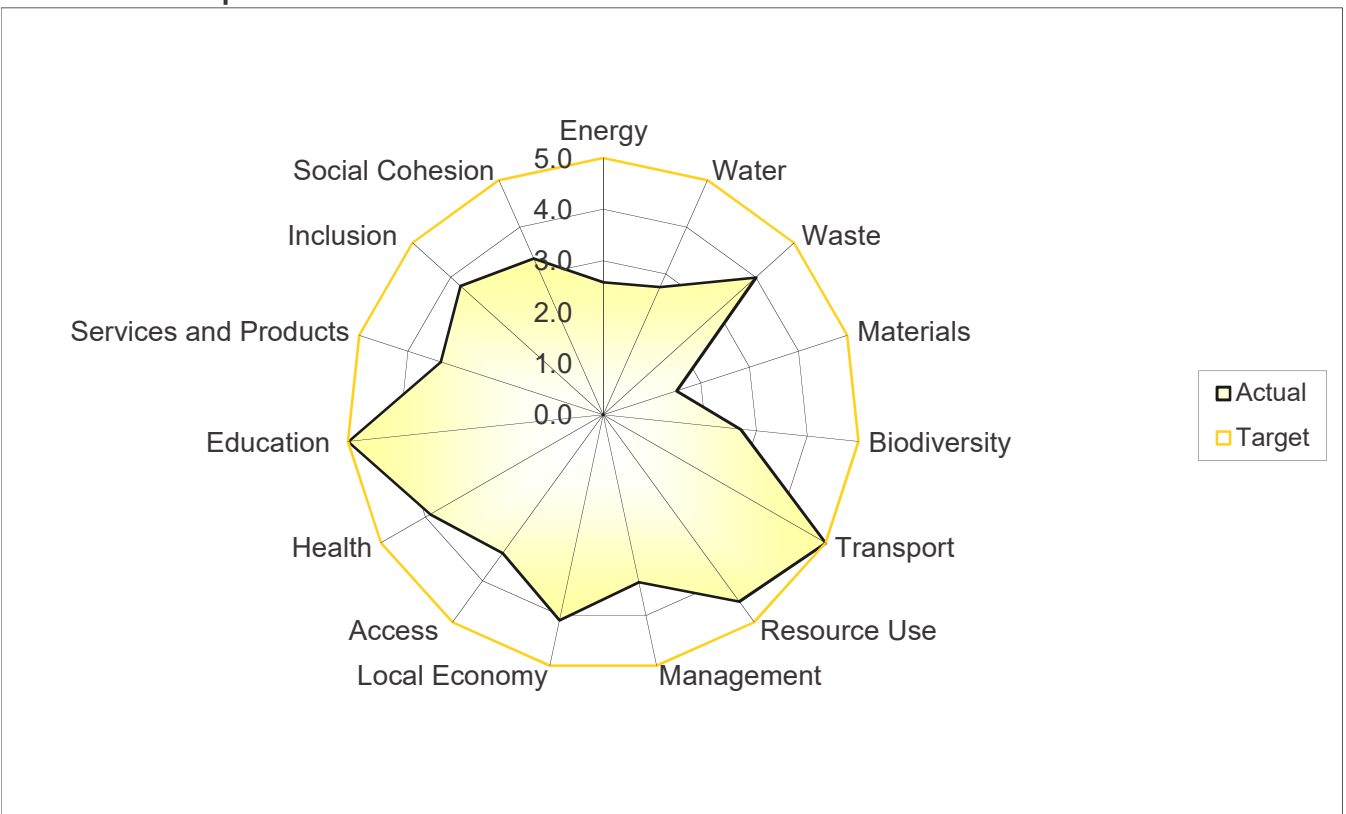
SB1 Project

An Economic Enablement Hub

SB2 Address

-25.710541 & 28.398542

SB3 SBAT Graph



SB4 Environmental, Social and Economic Performance

Score

Environmental	2.7
Economic	4.1
Social	3.9
SBAT Rating	3.5

SB5 EF and HDI Factors

Score

EF Factor	3.4
HDI Factor	4.2

SB6 Targets

Percentage

Environmental	54
Economic	81
Social	77

CHAPTER SEVEN

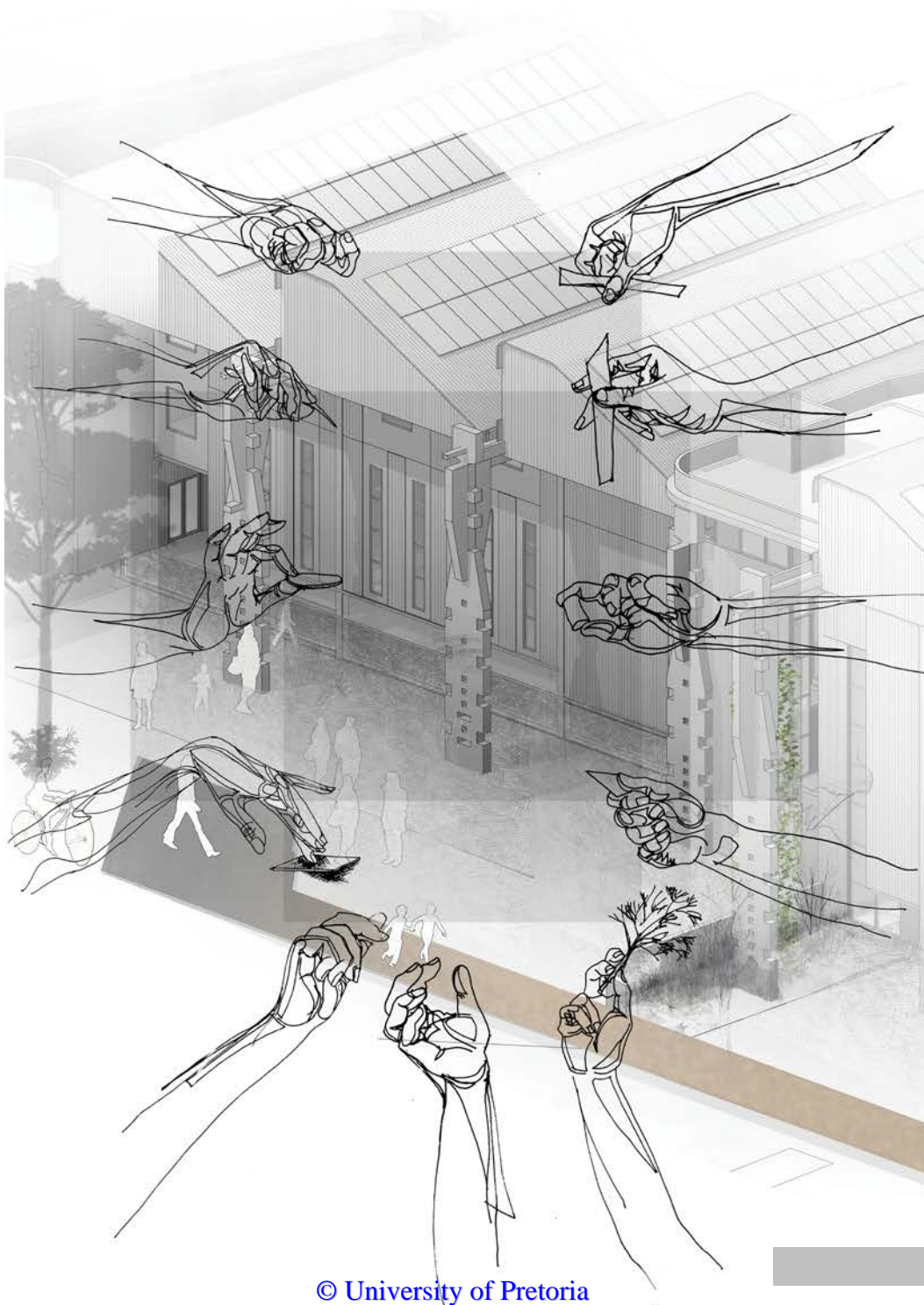
APPENDIX

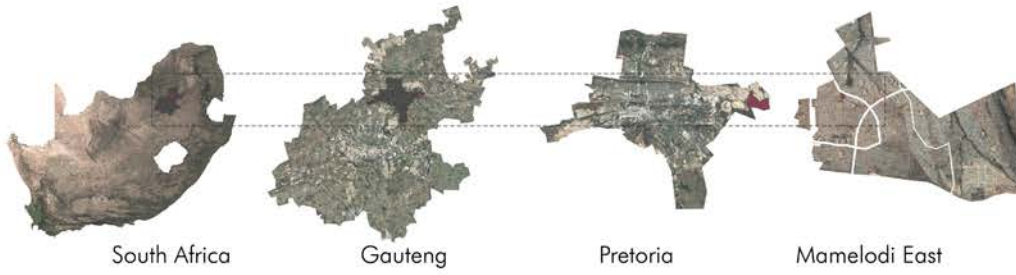
Final Presentation & Models

AN ECONOMIC ENABLEMENT HUB

AN EXPLORATION THROUGH ARCHITECTURE
AS AN ENABLING DEVICE

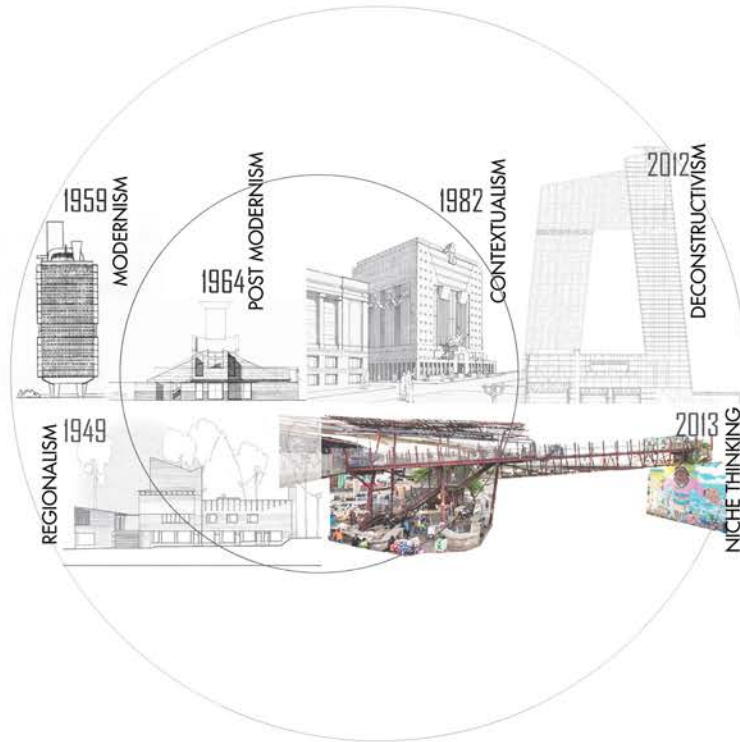
CORNER OF SHILOVHANE STREET AND MASHABA DRIVE
MAMELODI, PRETORIA, GAUTENG
GPS: -25.710541 & 28.398542
BY
MIA HOFMAN





MAMELODI EAST LOCALITY





THE CONTINUUM OF THE ARCHITECTURAL DISCOURSE



O' Donnell, 2015



O' Donnell, 2015



THE ARCHITECTURAL BUBBLE AND ITS RELATIONSHIP WITH CONTEXT



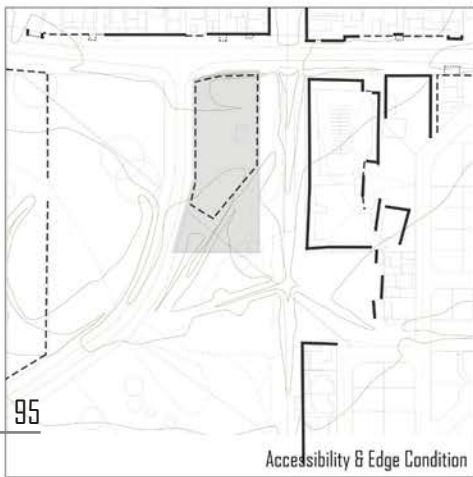
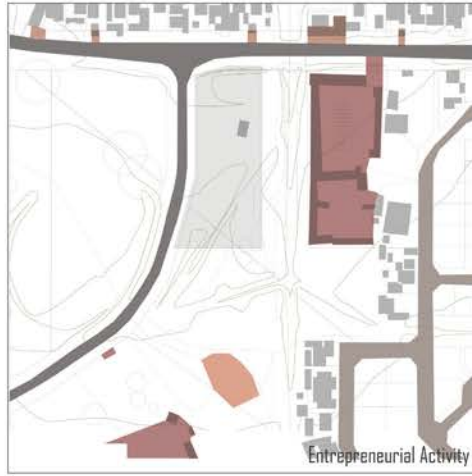
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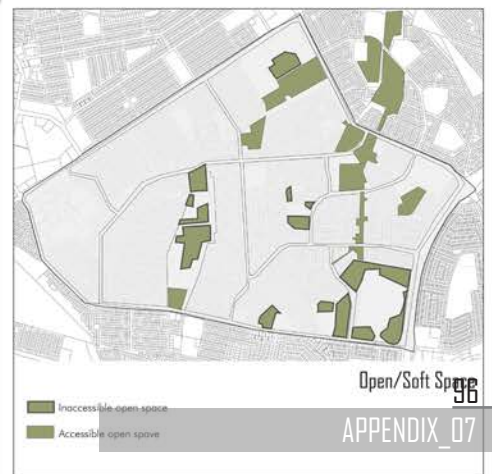
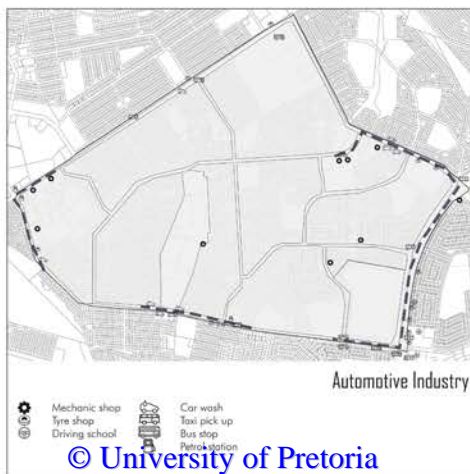
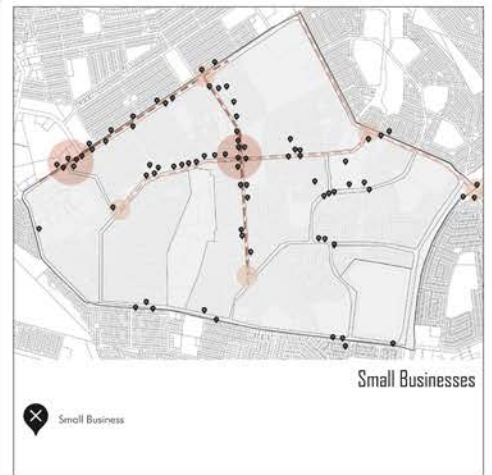
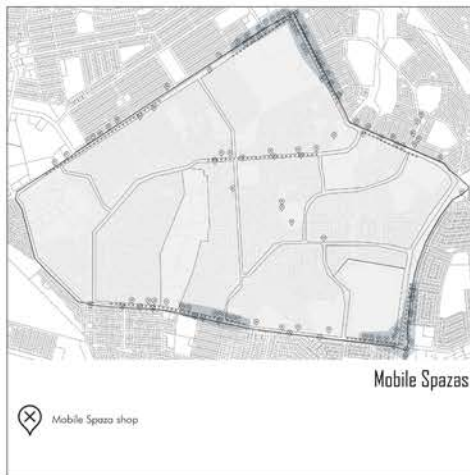
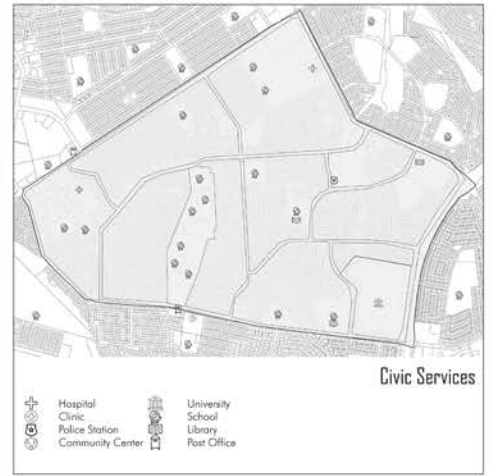
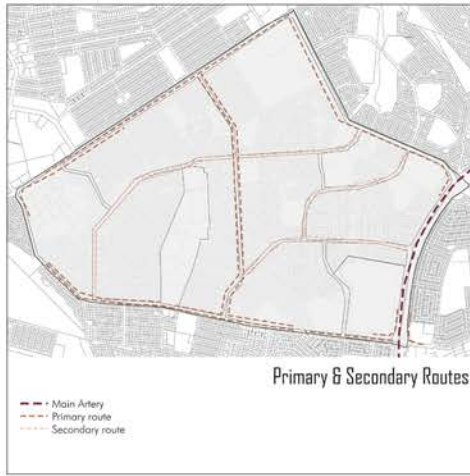


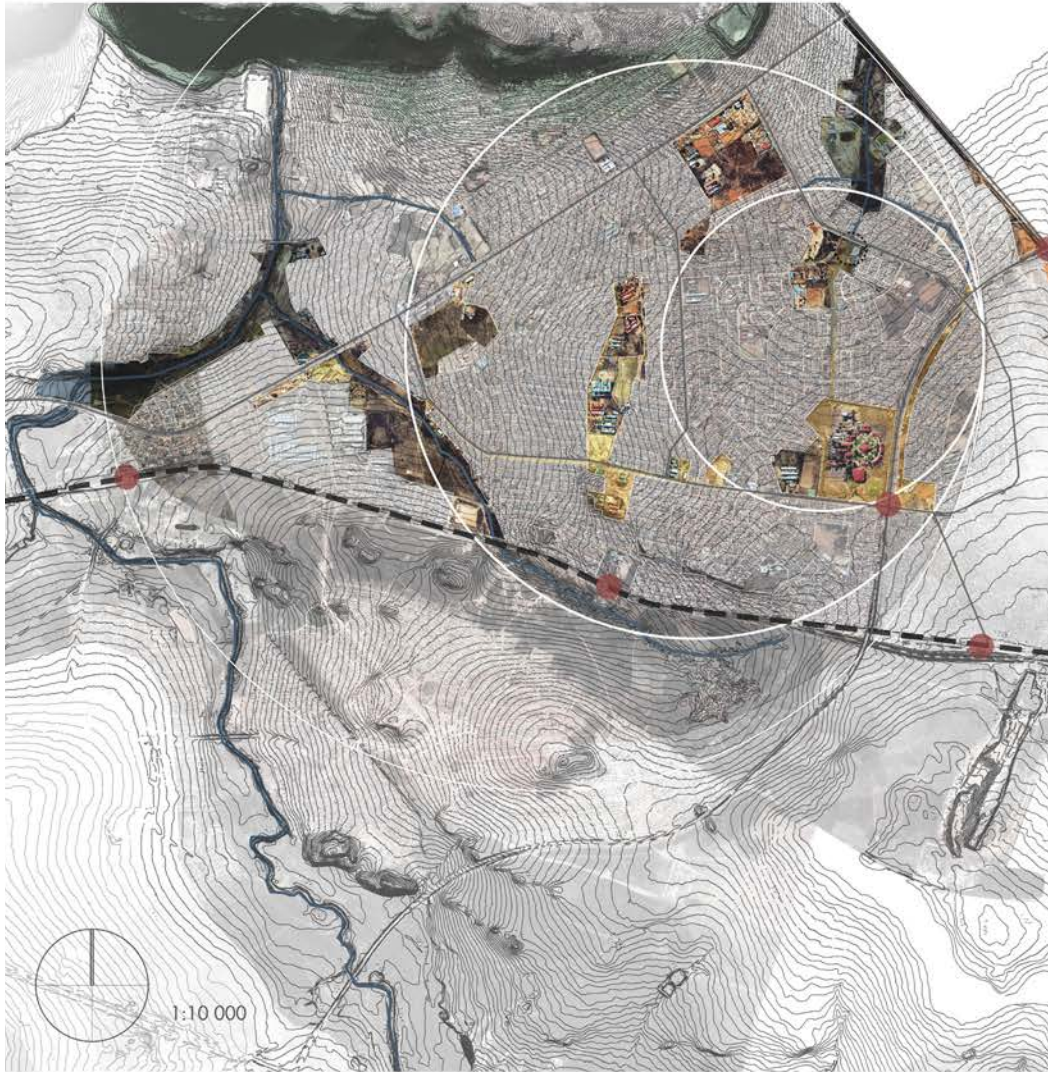
M.A LAUGIER



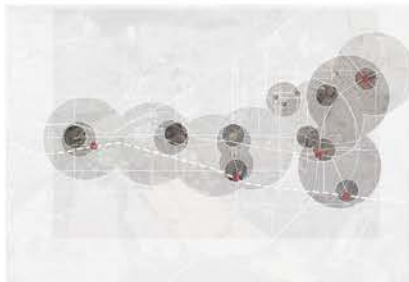
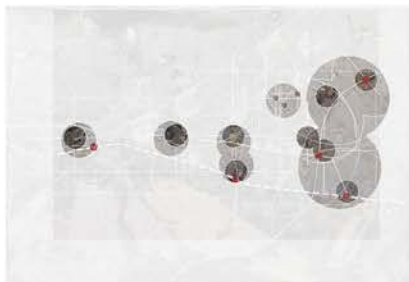
A_RAPOPORT







URBAN DEVELOPMENT PHASING



URBAN PRINCIPLES



STRENGTHEN NETWORKS



DENSIFY & DIVERSIFY



INFRASTRUCTURE UPGRADE



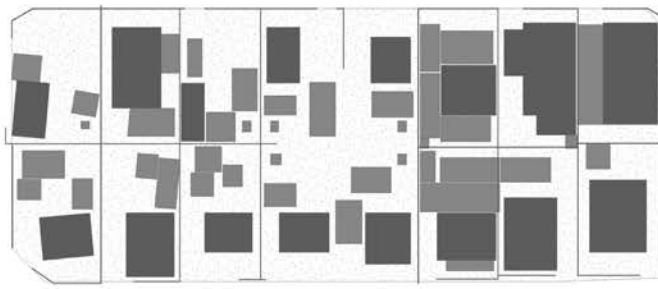
CELEBRATE UNIQUENESS



1:2000

PROPORTION OF MASS TO BUILT FABRIC

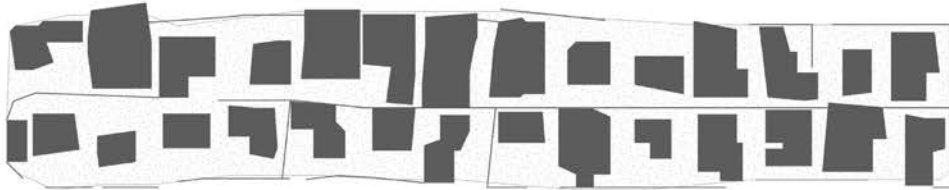
Typical suburban block in Mamelodi East Township



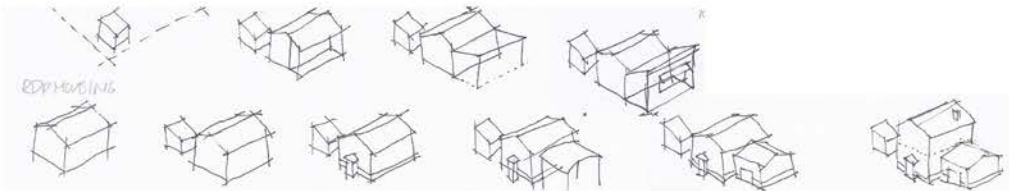
- Original House
- Self built fabric
- Open space

Open space to footprint ratio
 Plastic View 1:2.14
 Mamelodi 1:2.17

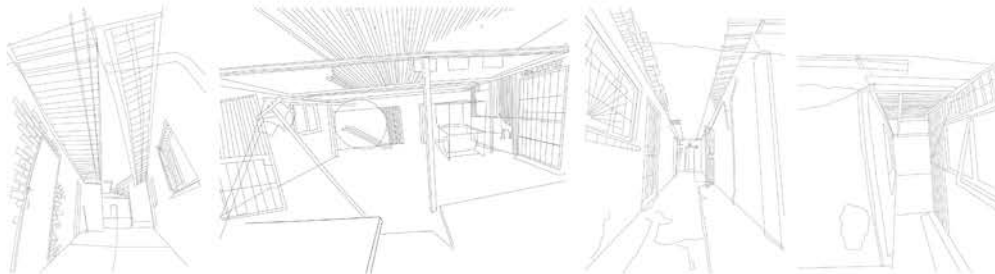
TYPICAL SUBURBAN BLOCK IN PLASTIC VIEW INFORMAL SETTLEMENT



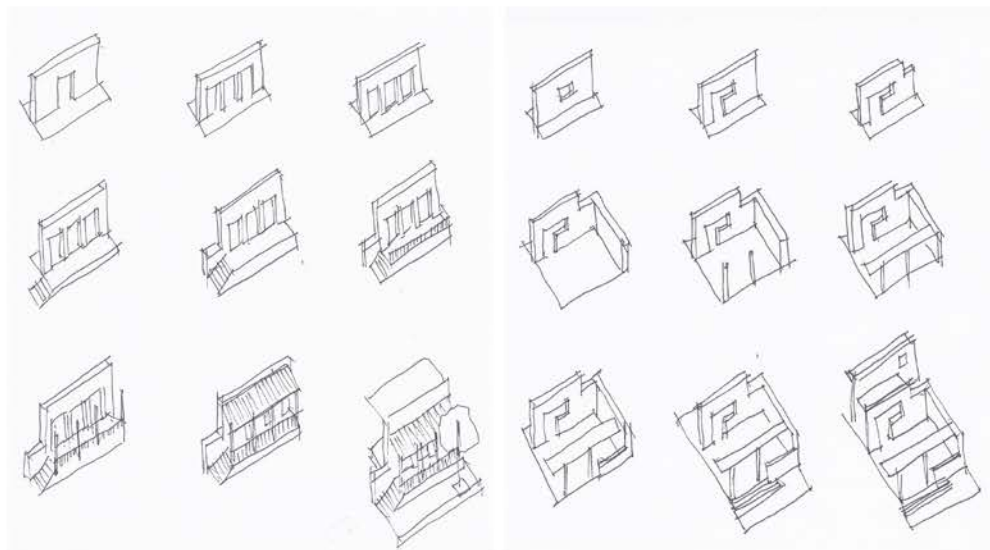
PATTERN OF CHANGE TO EXISTING RDP HOUSES



SPATIAL CONSEQUENCE OF ADDITIONS



CONDITIONS OF ACCESS & PRIVACY



BOUNDARY WALL AND ITS ATTACHMENTS





TEMPORALITY FIXITY

MOBILITY



TEMPORARY



PERMANENCE
[FORM]



FIXITY
[LOCATION]
OVERHEAD PLANE



OPENINGS

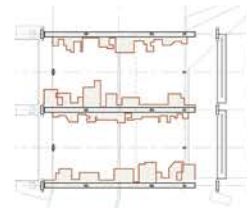


TEXTURE



MATERIALITY

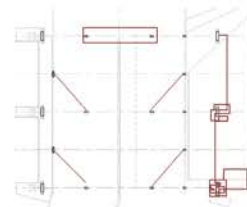
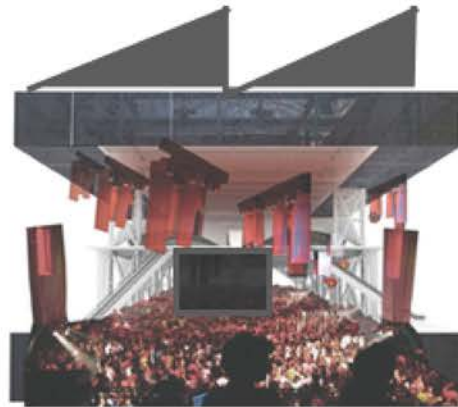




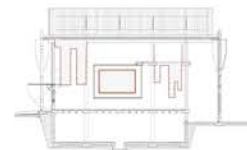
PLAN



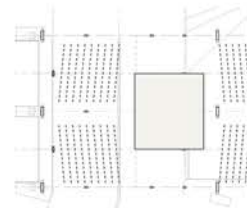
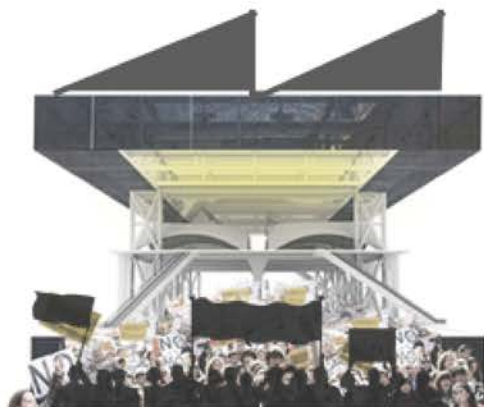
SECTION



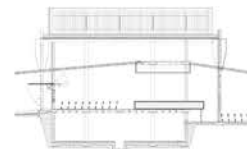
PLAN



SECTION



PLAN



SECTION



1316

1312

1313

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1318

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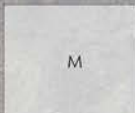
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1319

1318



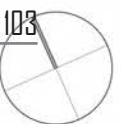
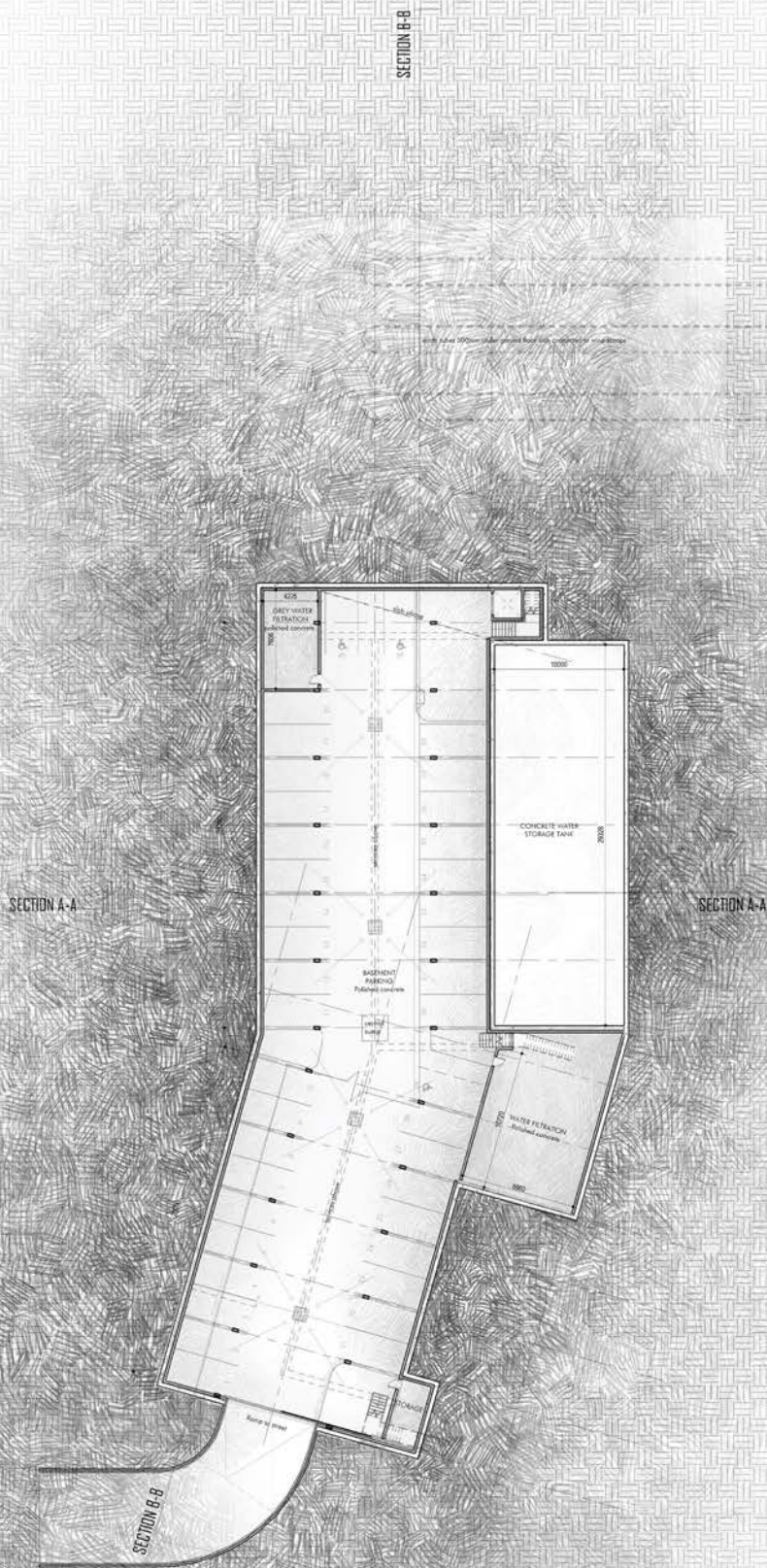
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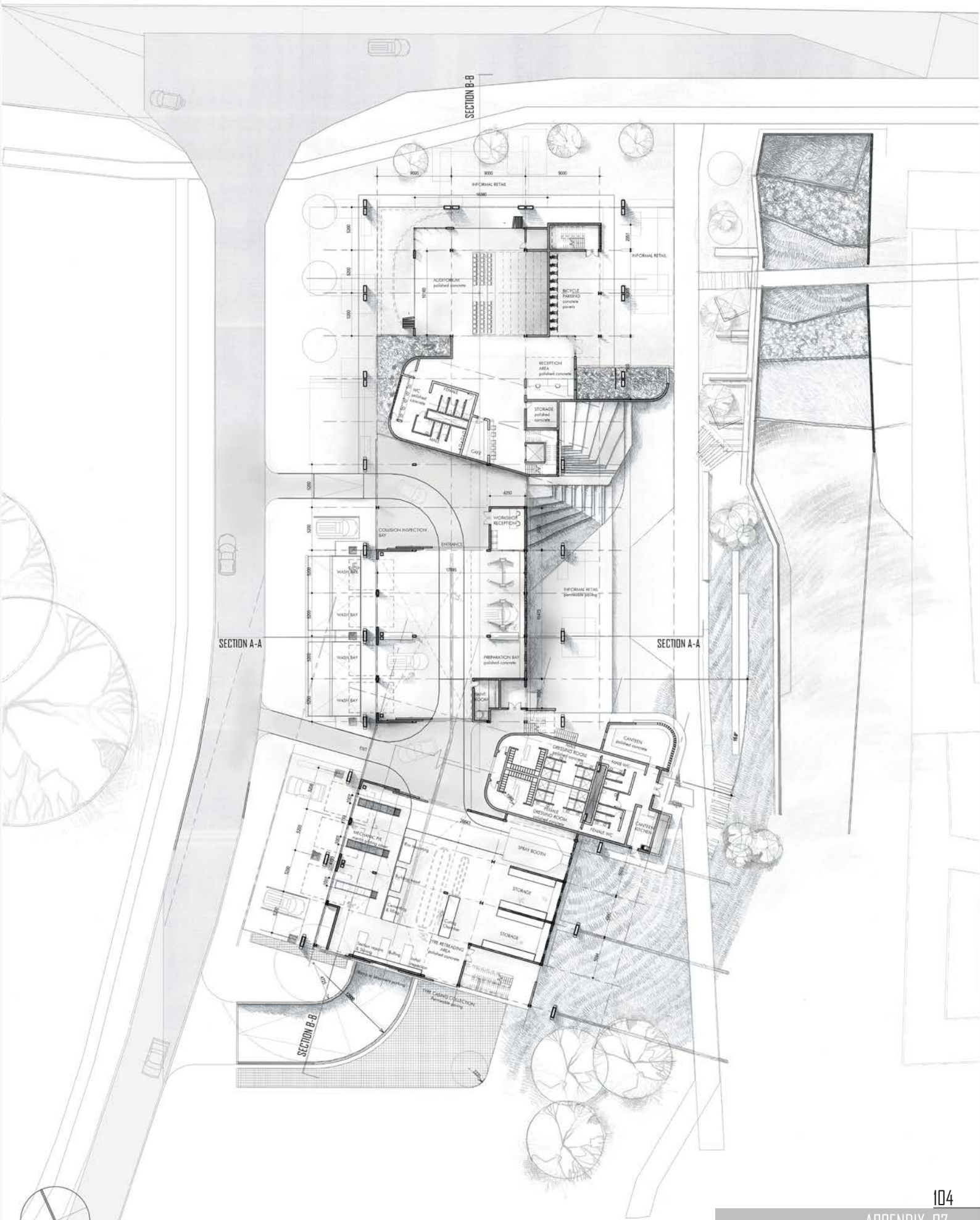


M

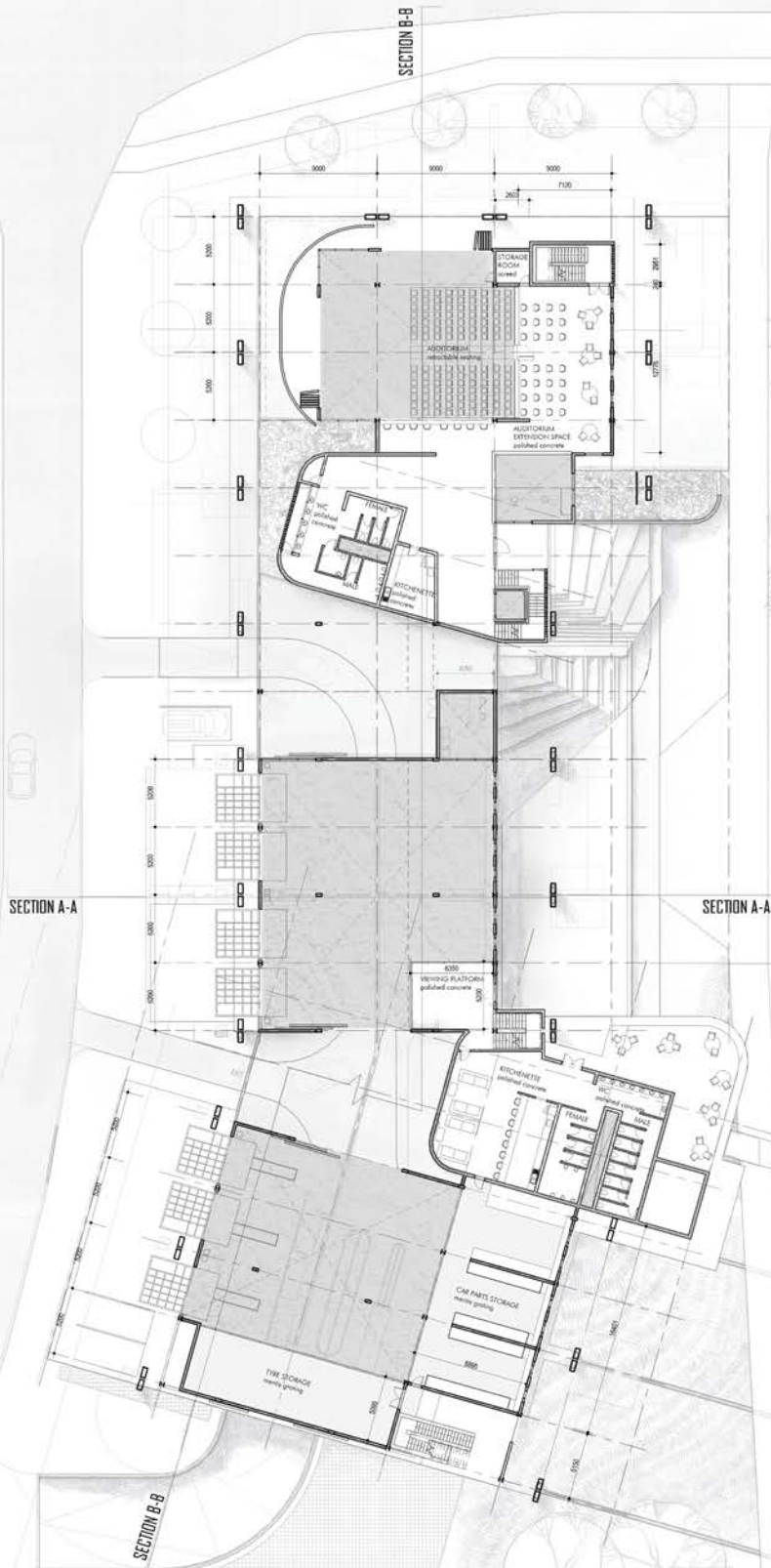
SITE LEGEND

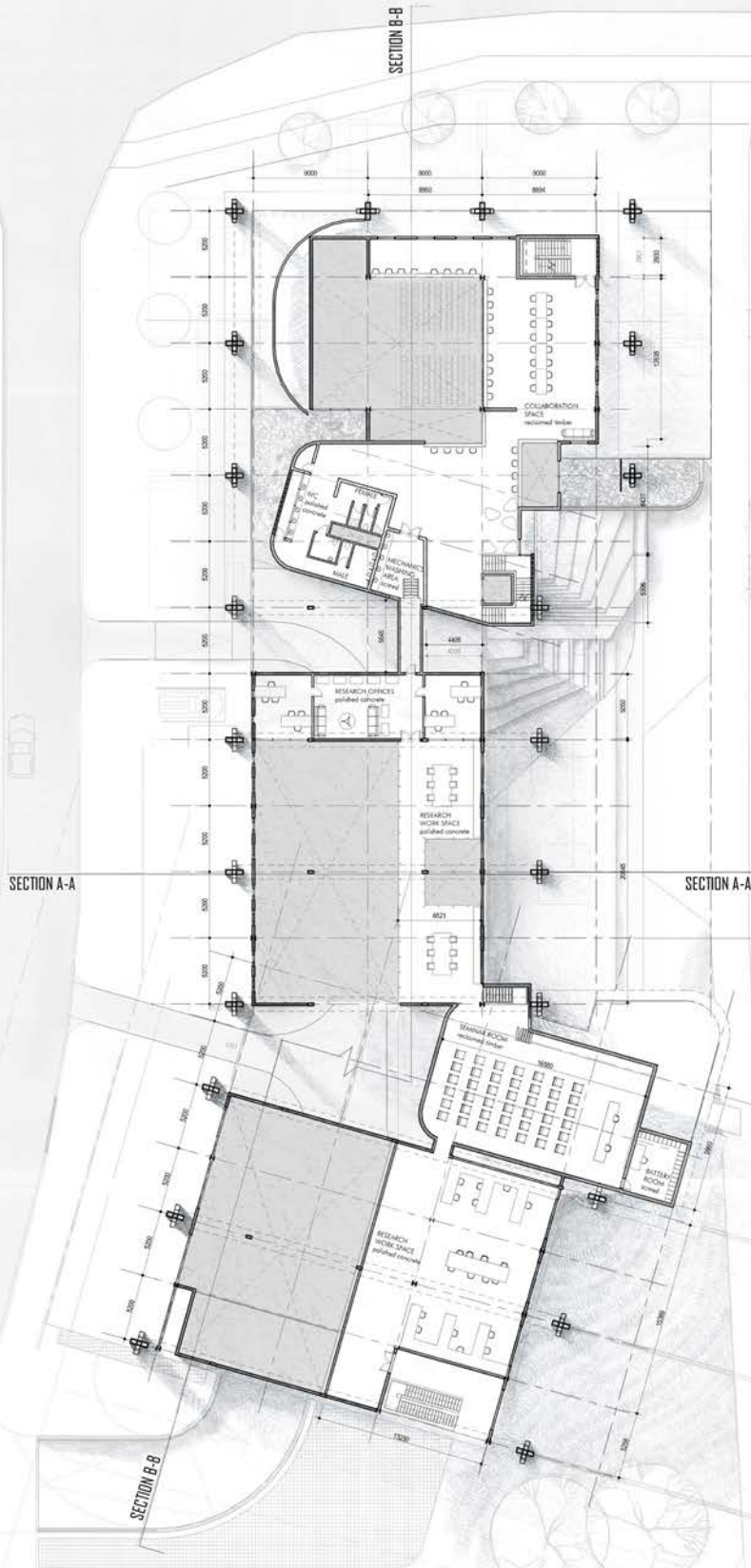
- Proposed buildings
- Existing buildings
- Proposed roads
- Existing roads
- Proposed paths
- Existing paths
- Proposed green spaces
- Existing green spaces
- Proposed water features
- Existing water features
- Proposed public spaces
- Existing public spaces



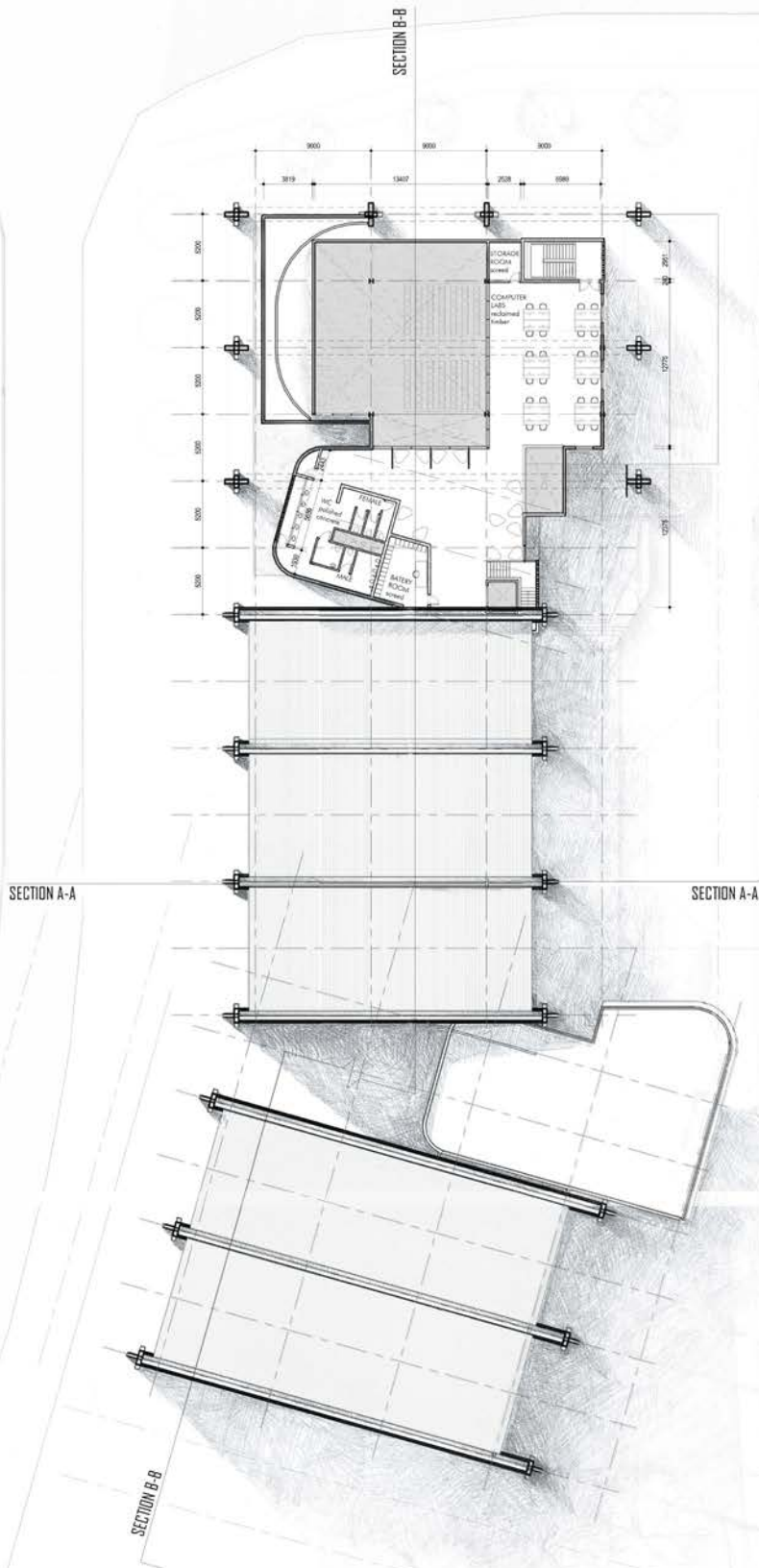


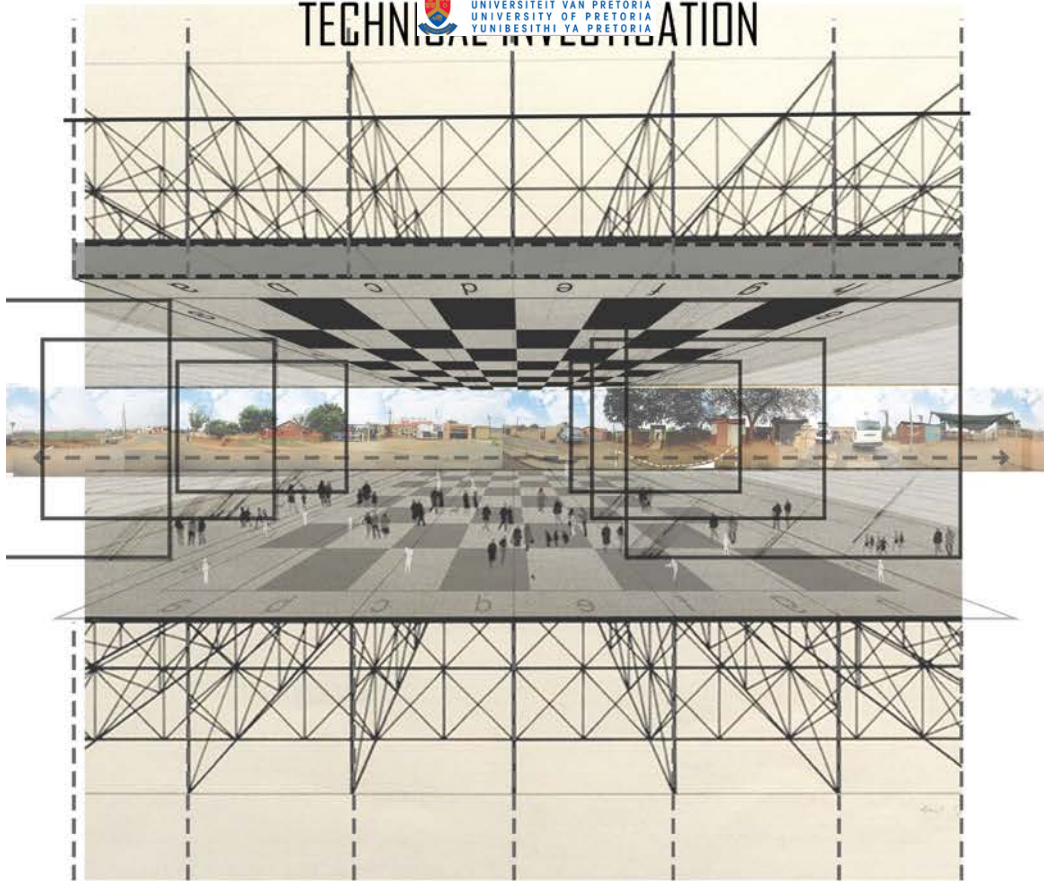
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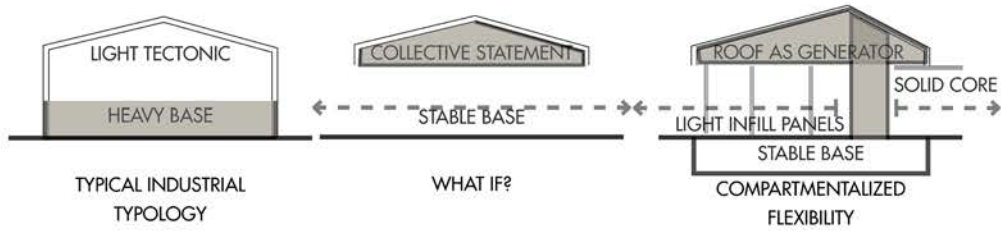


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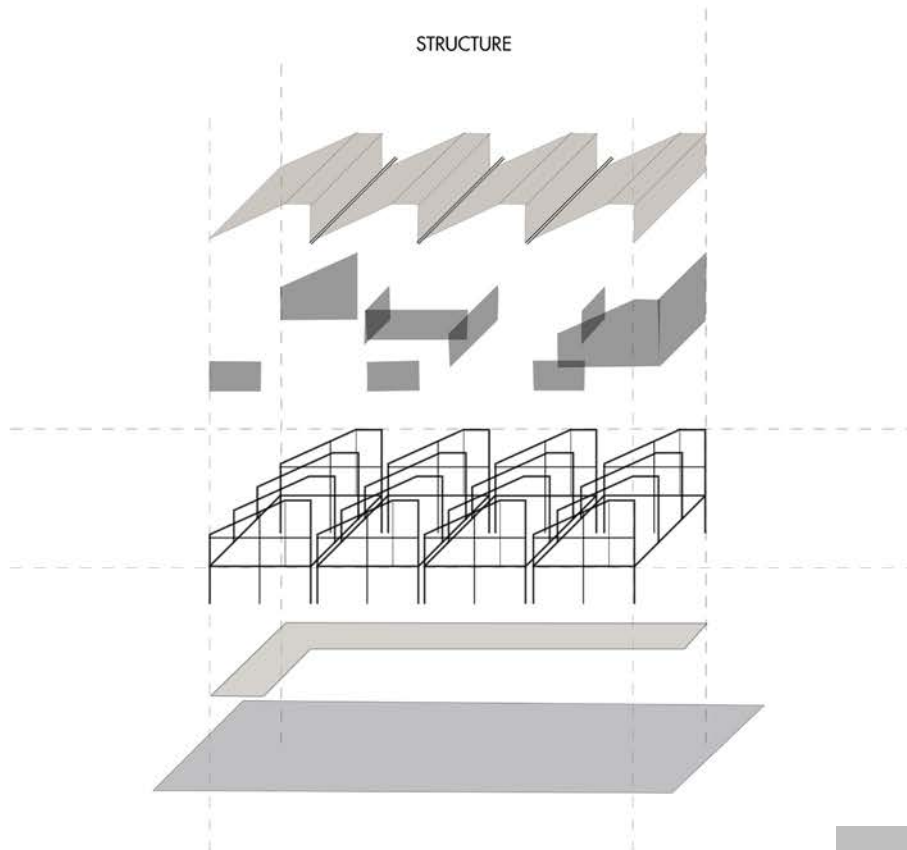




TRANSLATING THE INDUSTRIAL TYPOLOGY

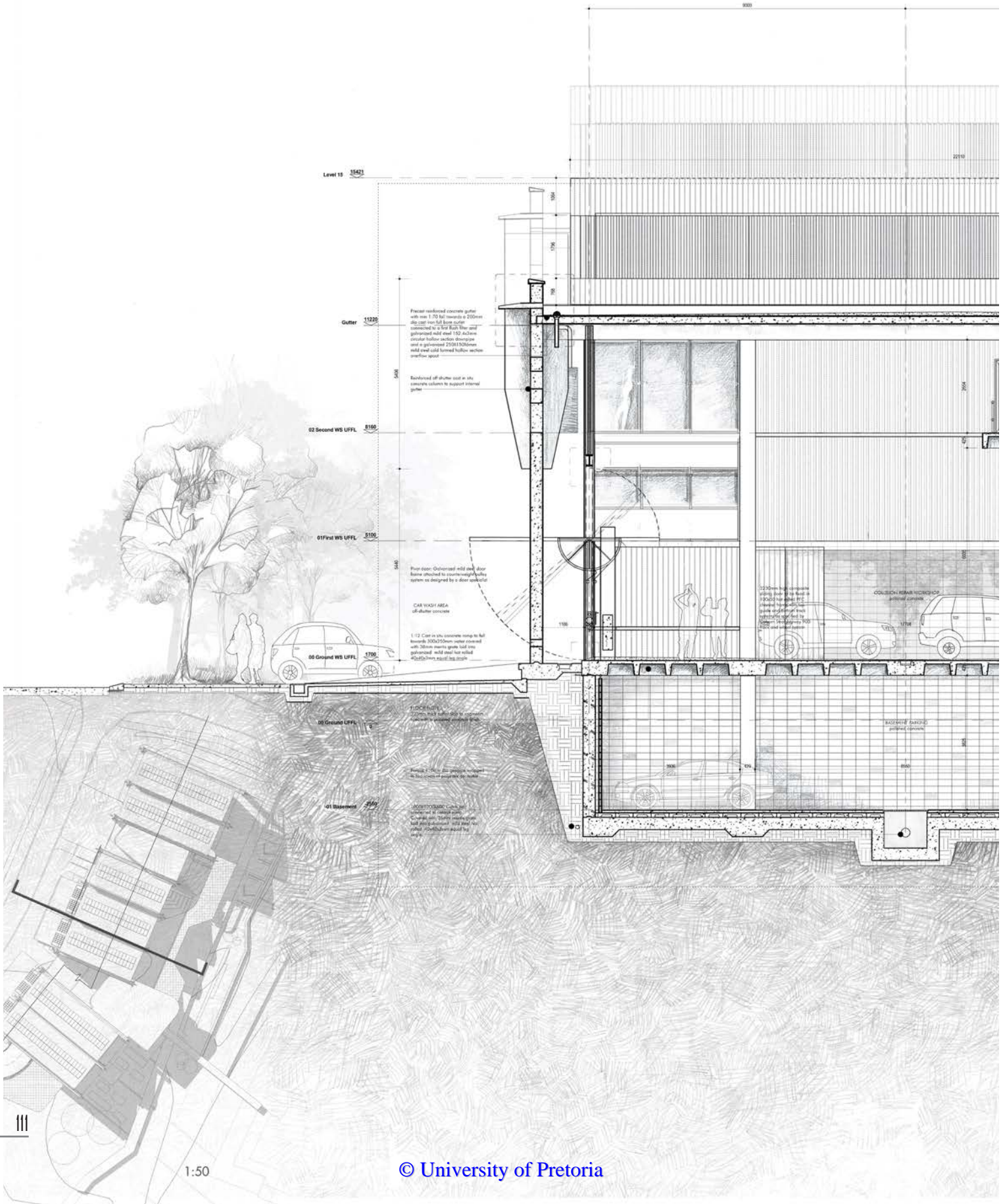


STRUCTURE













EXTERIOR FLOOR NOTE:
A combination of 600x600x30mm Perennia concrete pavers grained with 1200x200x100mm black travertine concrete.

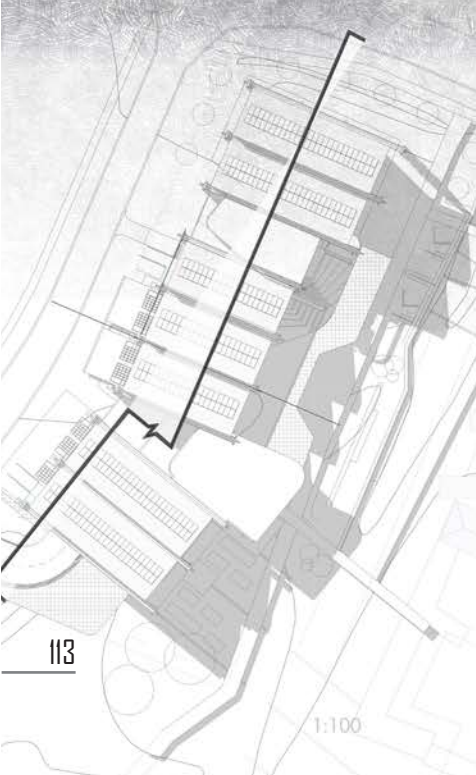
WALL NOTE:
Light gauge steel wall with 120mm thick roller slab to strengthen slab with a insulated concrete block.

FLOOR NOTE:
120mm thick roller slab to strengthen slab with a insulated concrete block.

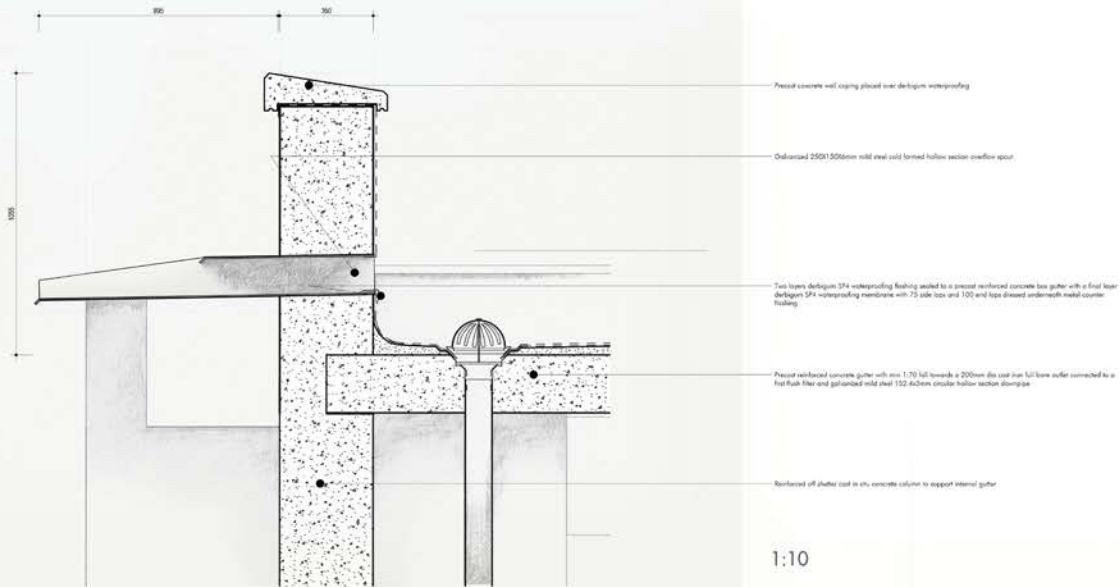
WALL NOTE:
Light gauge steel wall with 120mm thick roller slab to strengthen slab with a insulated concrete block.

MECHANIC WORKING AREA NOTE:
Mechanic working area with a 120mm thick roller slab to strengthen slab with a insulated concrete block.

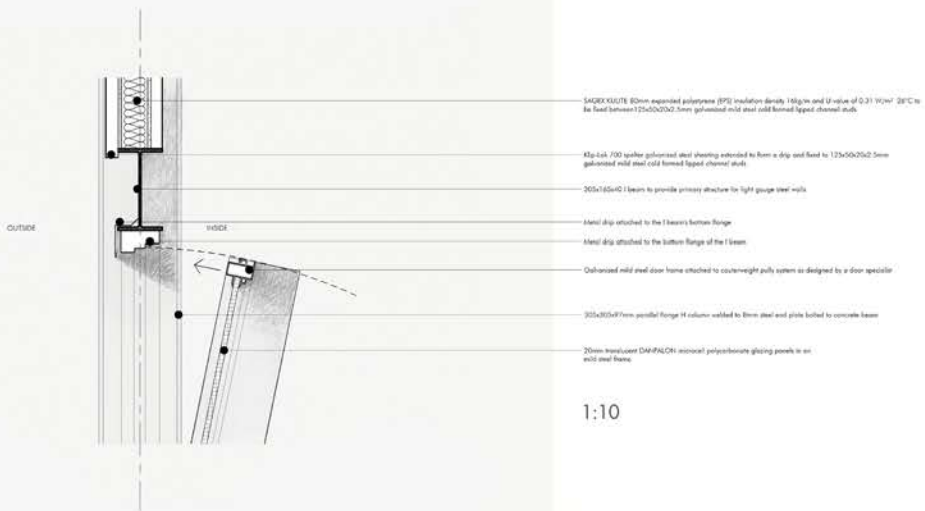
FLOOR NOTE:
120mm thick roller slab to strengthen slab with a insulated concrete block.



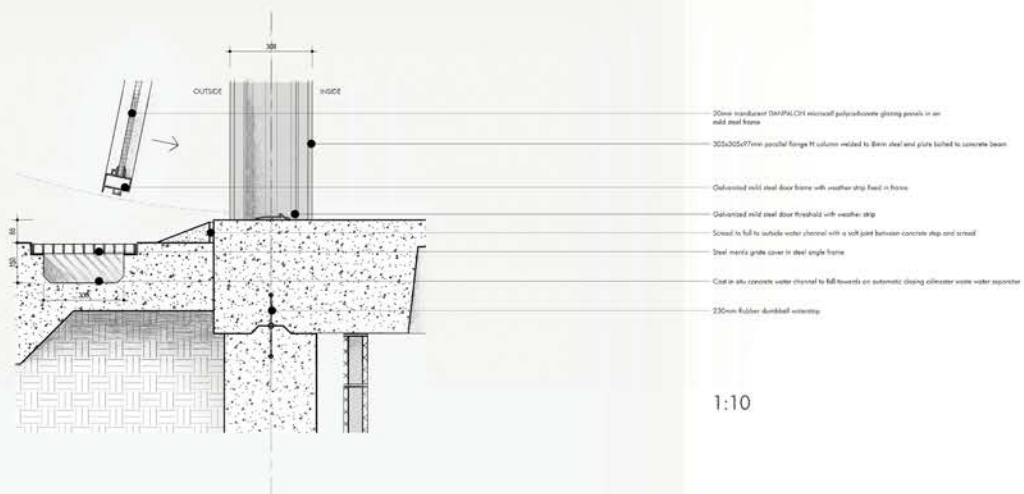


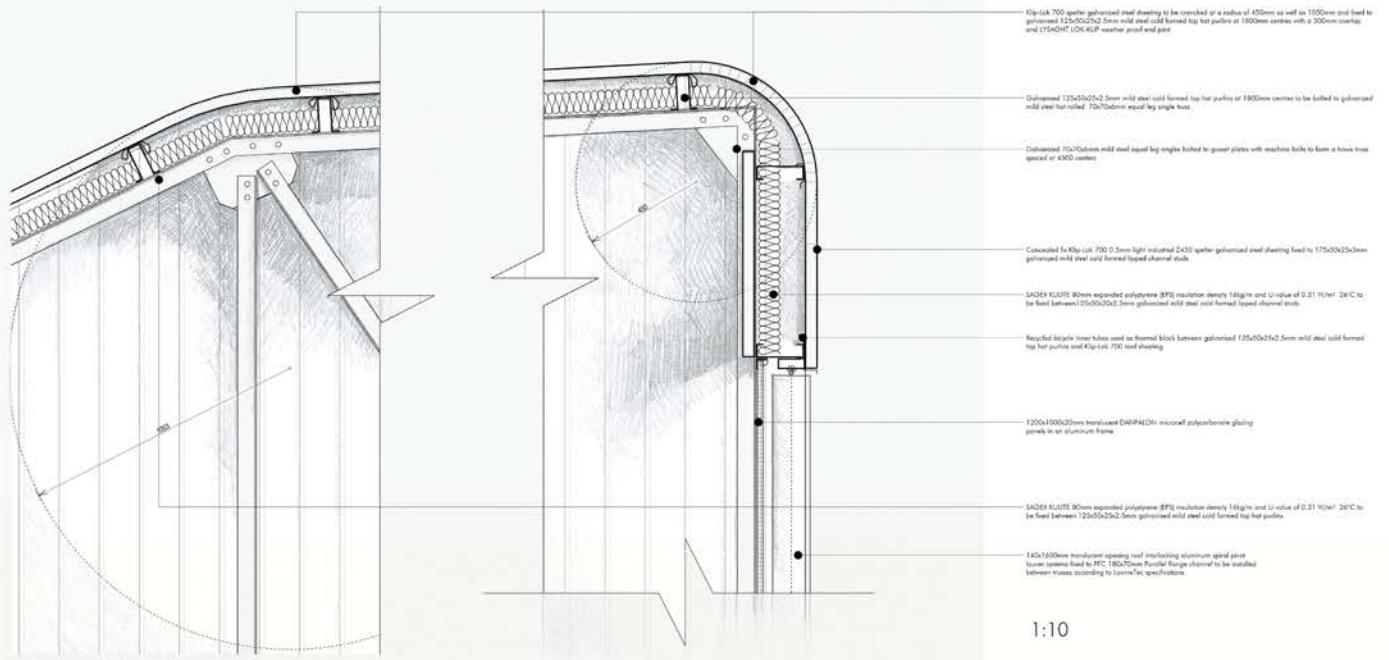


PIVOT DOOR DETAIL

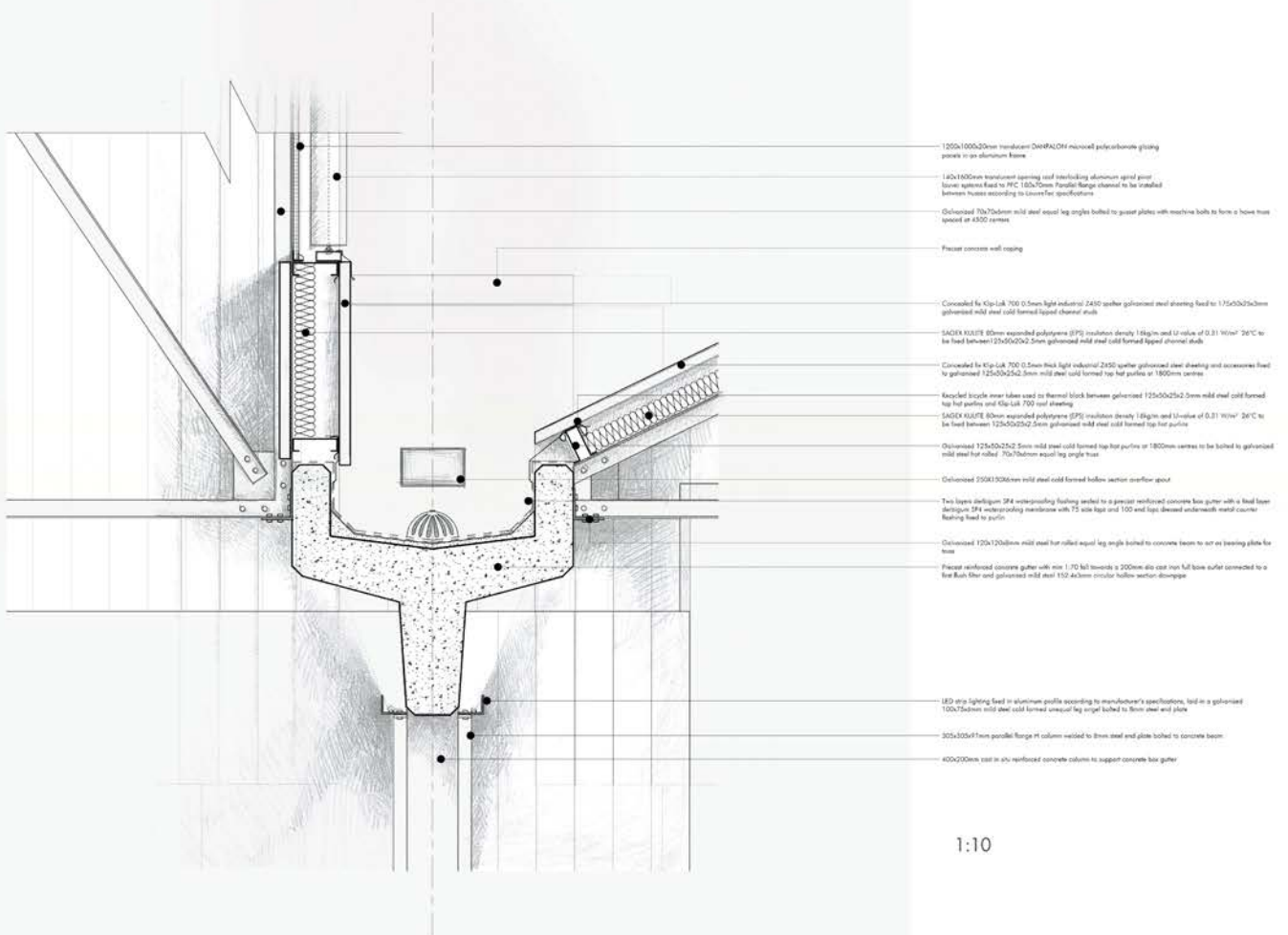


PIVOT DOOR DETAIL

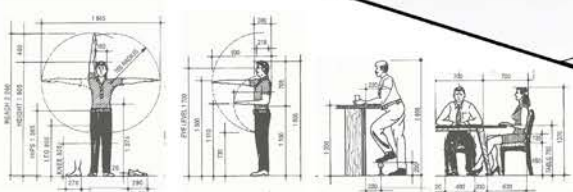
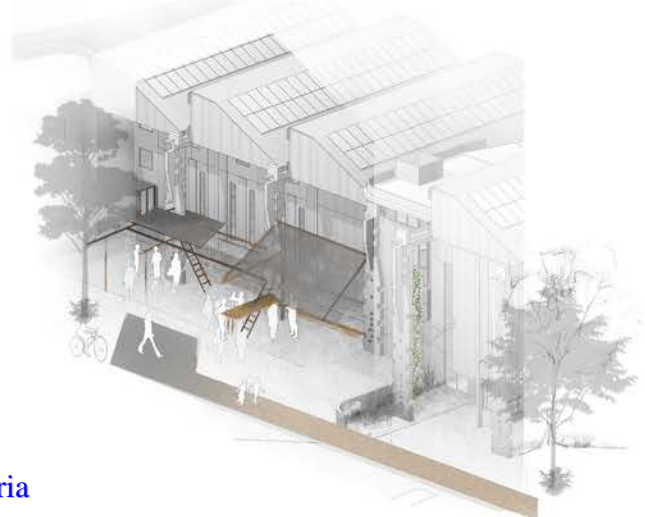
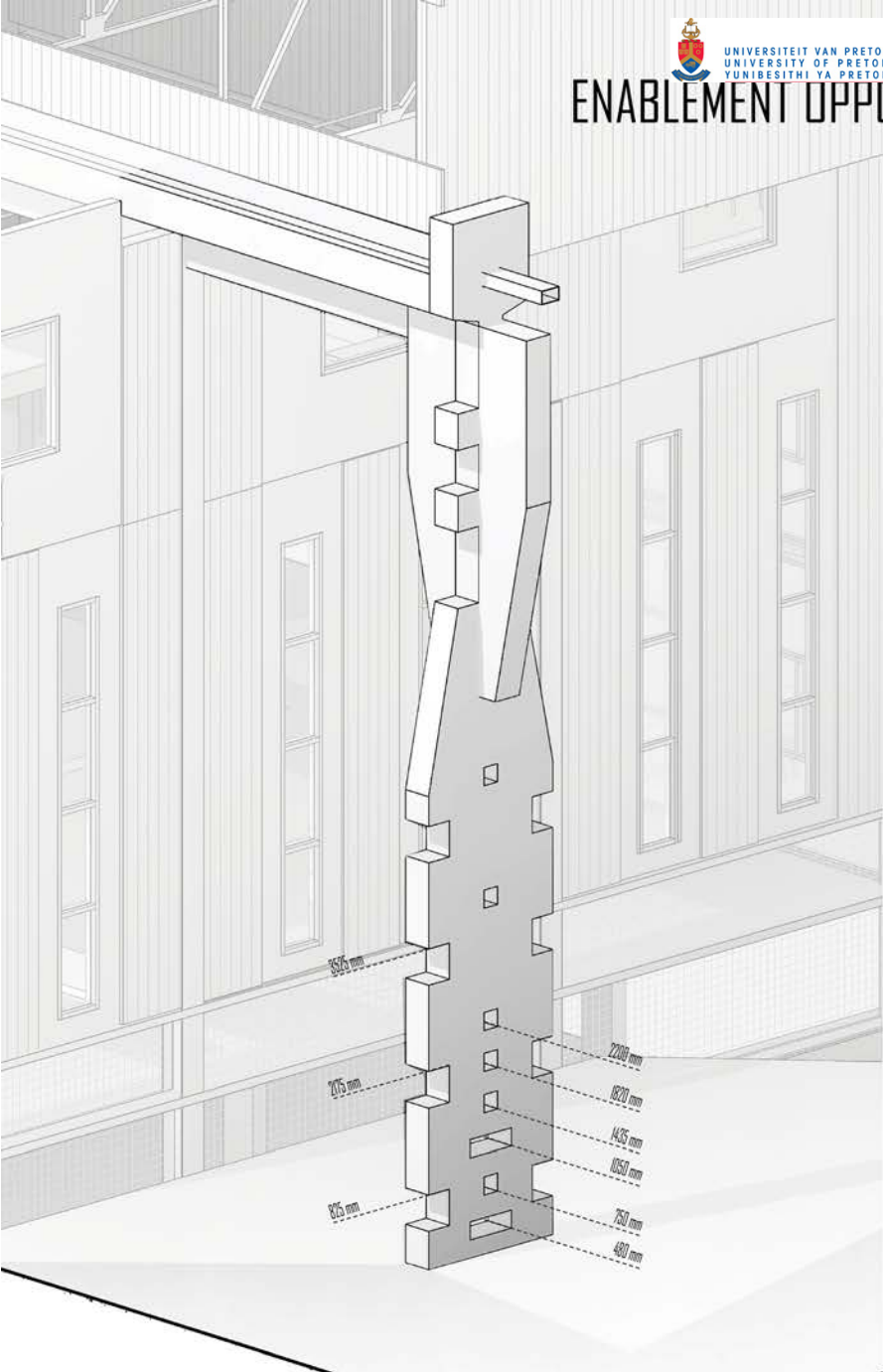




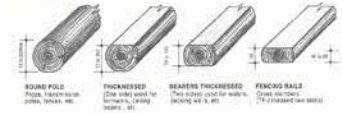
INTERNAL GUTTER DETAIL



ENABLEMENT OPPORTUNITIES

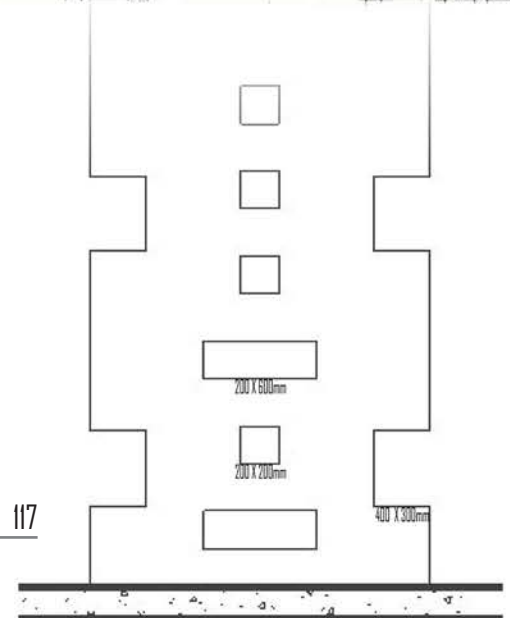
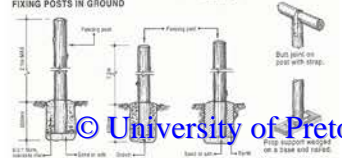


POLES FOR CIVIL ENGINEERING, INDUSTRIAL, MINING, FARMING AND FENCING



NOMINAL DAWN SIZES (FAR = Flattened all-round sizes)

Size	Round	Flattened	Beams Flattened	Fencing Rails
14.0	140	140	140	140
15.0	150	150	150	150
16.0	160	160	160	160
17.0	170	170	170	170
18.0	180	180	180	180
19.0	190	190	190	190
20.0	200	200	200	200
22.0	220	220	220	220
24.0	240	240	240	240
26.0	260	260	260	260
28.0	280	280	280	280
30.0	300	300	300	300
32.0	320	320	320	320
34.0	340	340	340	340
36.0	360	360	360	360
38.0	380	380	380	380
40.0	400	400	400	400







locally manufactured concrete blocks
permeable paving
mild steel mentis grating
locally manufactured concrete pavers

BUILDING ENVELOPE



mild steel mentis grating
marine grade plywood panels
expanded polystyrene insulation
galvanised concealed fix clip-lok wall cladding



Concrete block sun screens
reclaimed wood shading panels

ROOF



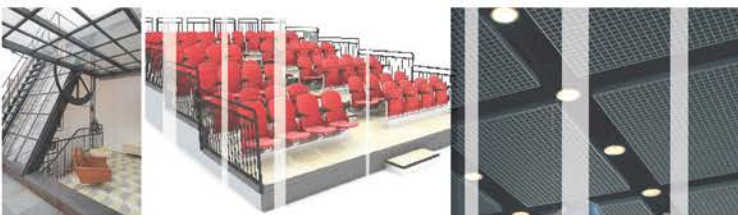
cold formed mild steel louvres
galvanised concealed fix clip-lok roof sheeting

CORE & STRUCTURE



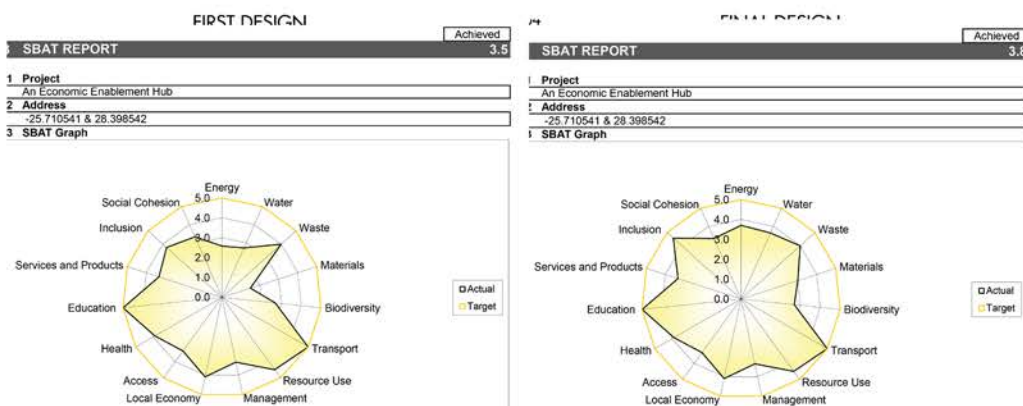
concrete block core structure
hot rolled mild steel H columns & I beams

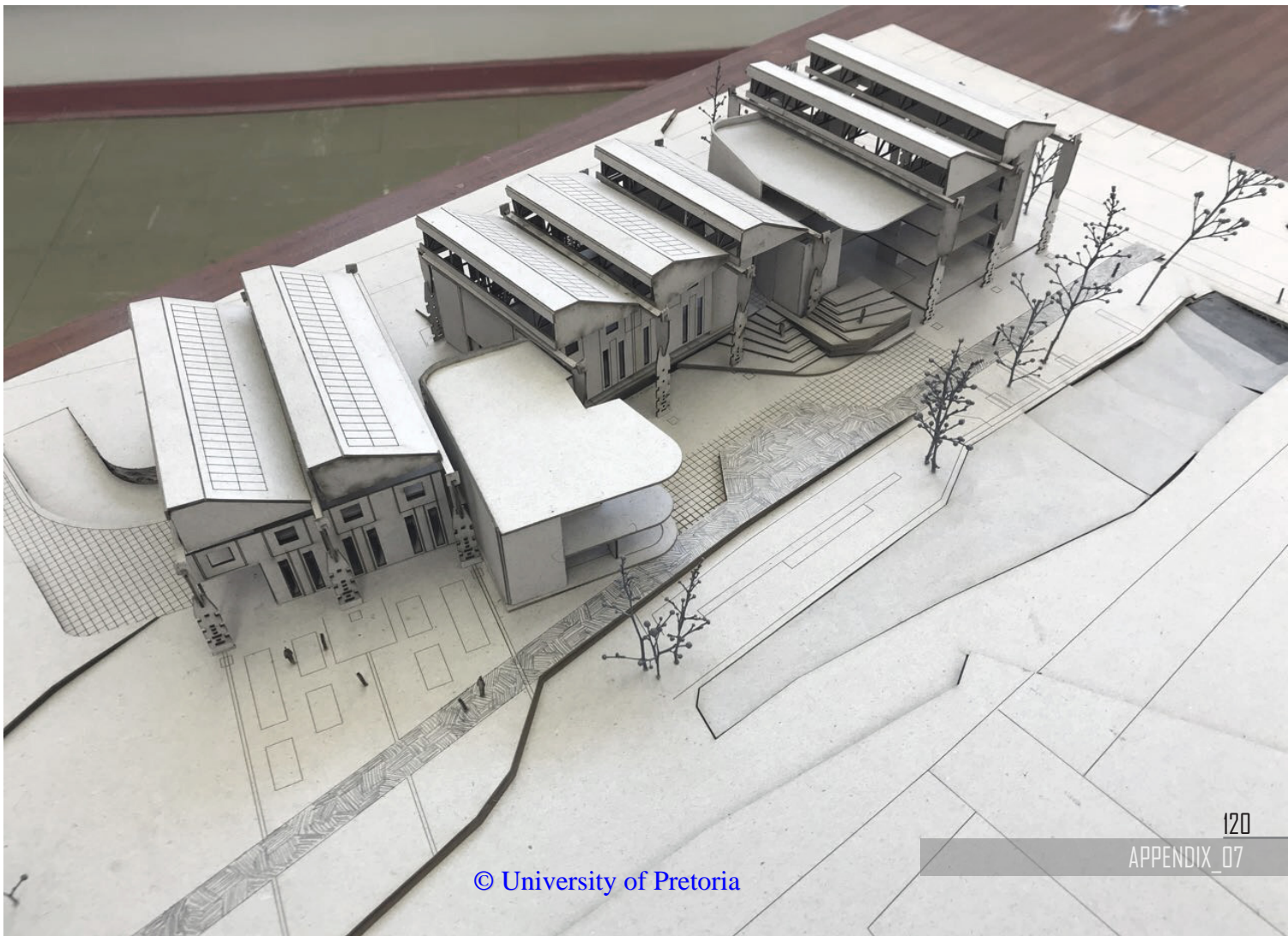
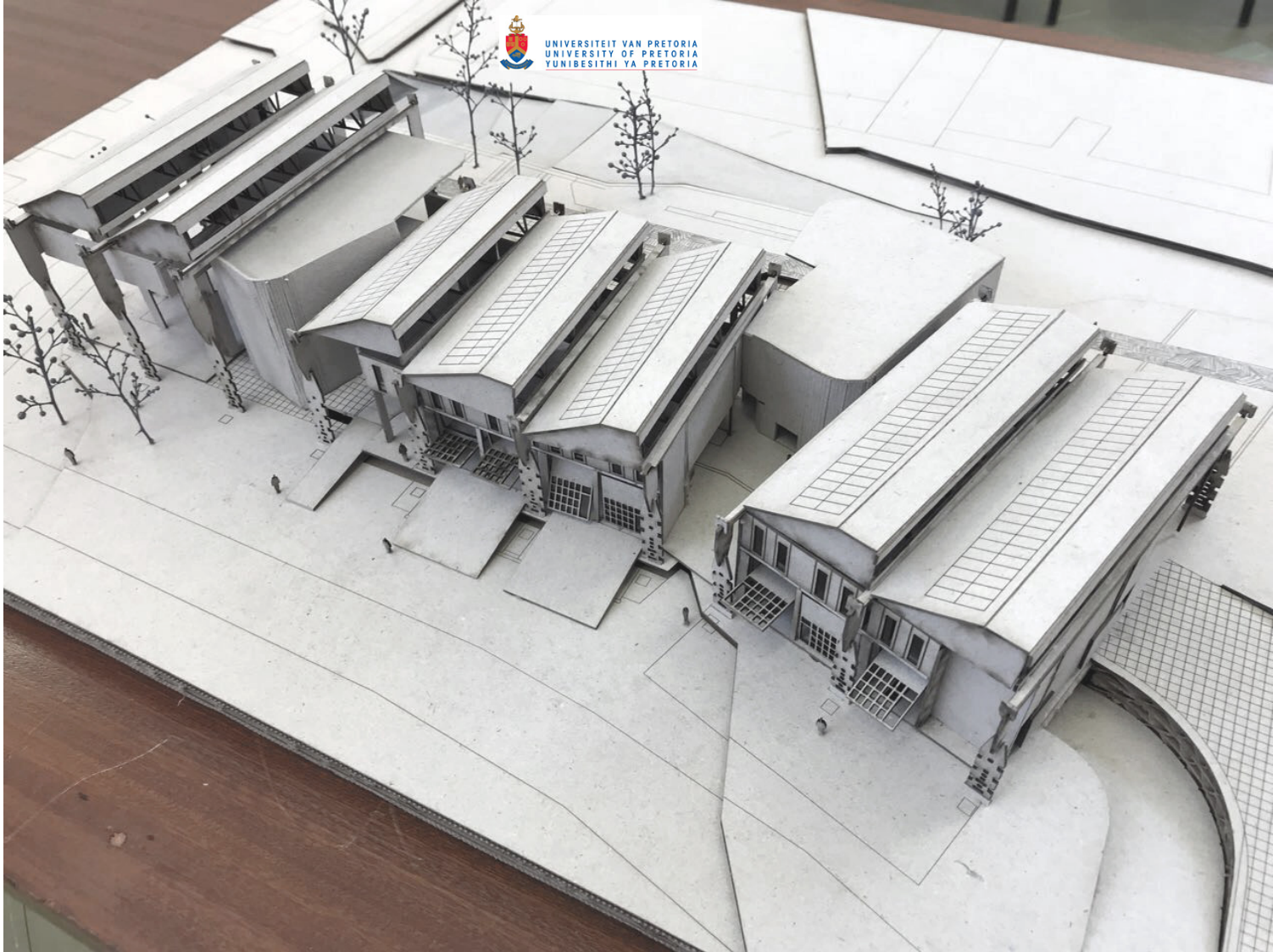
INTERIOR & FLEXIBILITY



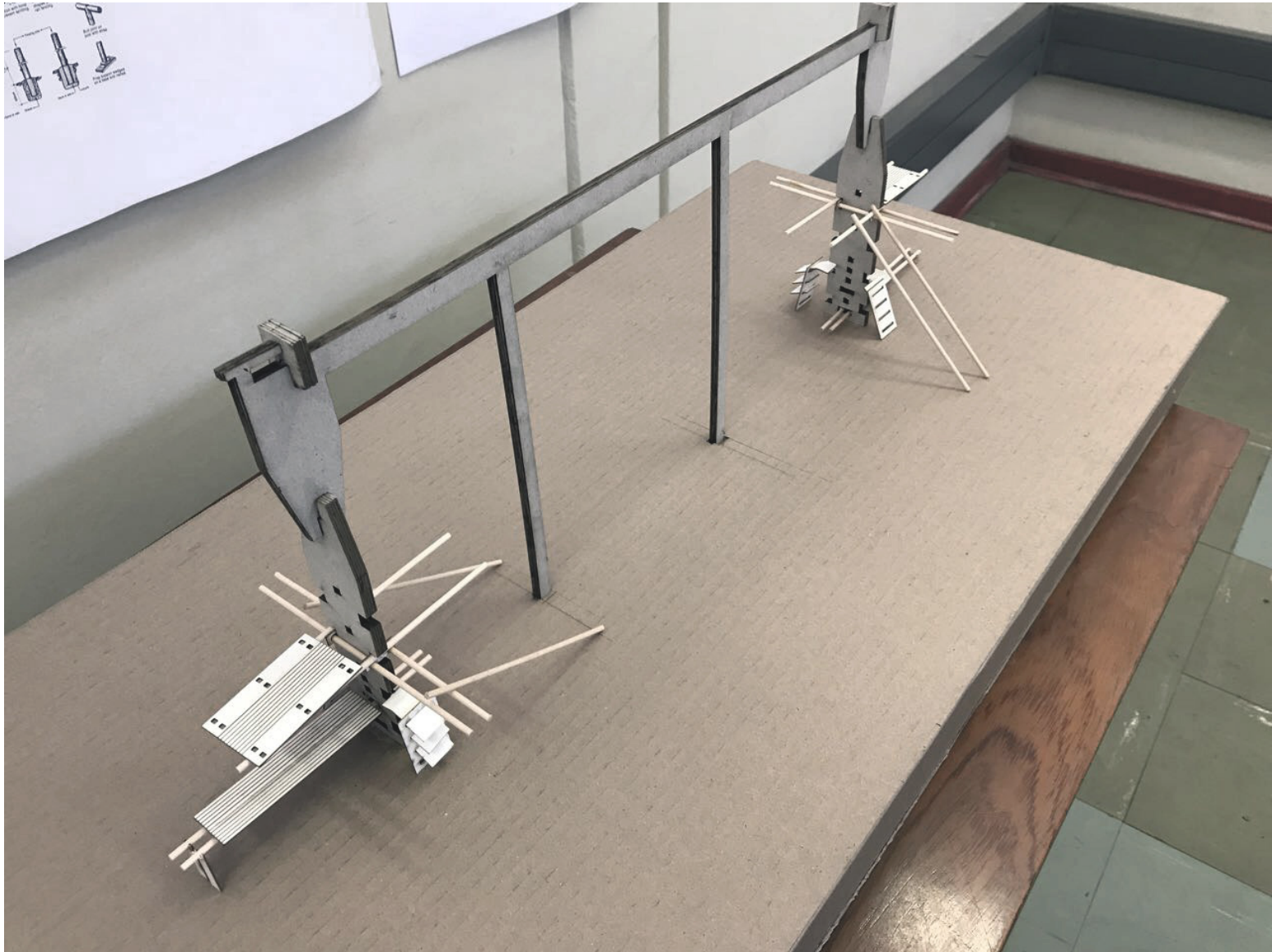
manual pivoting doors
retractable seating
accoustic pannels hung from roof structure

SBAT RATING













CHAPTER EIGHT

CONCLUSION



As aspects of globalization, urbanisation and resource scarcity increasingly enter every facet of our lives, its effect on architecture has resulted in a development approach that is exploitative of people, nature and culture (Fioramonti 2017:3). This study argues that working with scarcity in a productive manner could lead to an alternative approach for development with a focus on the architect as an enabler of social space.

An in-depth context analysis of the spatial logics found in Mamelodi East (City of Tshwane, South Africa) considered the spatial relationship and rules of engagement from which key lessons were extracted and applied in the design. Thus by defining a response to a vernacular through its understanding of scarcity and the rules of engagement it became possible to expose new roles and opportunities through architecture that aid in the creation of social space that promotes:

...forms of business that reconcile human needs with natural equilibria; production processes that emancipate people from the passive role of consumerism; and systems of social organisation at the local level that reconnects individuals with their communities and their ecosystems, while allowing them to participate in a global network of active change makers.

Fioramonti (2017:12).



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