



'The tell-tale city.'

An Urban journey through time and space.

Our City

Our city is painted with
thoughts and feelings
Walls unkempt and overrun
with expression
Made to fit movie screens
with their perfection

Our city is lit by lovers and
dreamers
They hold hands without
caring and kiss in the daylight
Unlike me, they wouldn't mind
who was staring

Our city is a film still in my
memory
Growing more valuable with
time

Re-Interpreting the **Invisible Boundaries** Of Bloemfontein.



“To be human is to be aware of the passage of time; no concept lies closer to the core of our consciousness.”

Dan Falk, In Search of Time.

The white becoming a little
more golden with age

Our city is a privilege to me,
a sacred moment
Not a city anymore but a
nostalgic pang of laughter
and a dull awareness of
Seconds.

By Olivia

Acknowledgements

MArch Prof 2019...

I would love to express my deepest and sincerest gratitude to my lecturers, Jan and Petria Smit for their continuous assistance, lessons and critique. I would also like to thank Jan Ras and Annemarie Wagener for the support and clear direction throughout the duration of the degree.

And, I would like to especially thank my cubicle mates for their humour, honesty and critique. The late nights would have been unbearable without you.

My greatest indebtedness goes to my family, for supporting my dreams and ambitions as a young boy in a small town and for their unparalleled belief and support throughout the duration of my degree(s).

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I wouldn't have come this far without all of you.

Yours truly and sincerely

Ketumile

God Bless the child that hold his own- Jermaine Lamarr Cole (J. Cole)

Cover

Title: Re-interpreting the Invisible Boundaries of Bloemfontein.

Subtitle: Transforming the unconscious edges of familiarity into liminal spaces through architectural influences.

Research Question: How can we redefine the familiar edges of Bloemfontein into meaningful and memorable spaces by the using architectural interventions?

Student

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Master's Design Dissertation | MArch. 2019

University of the Free State

Buildings should not only affect and enhance the immediate environmental and social context, rather improve the quality of life in which they are placed.

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Declaration

I, Ketumile Mojanaga declare the dissertation submitted for the Qualification M. Arch. (Prof.) 2019 at the Department of the Architecture, University of the Free State fulfils all the necessary requirements of the degree. All the work contained in this document is my own except where stated otherwise.

UNIVERSITY OF THE FREE STATE

Faculty of Natural and Agricultural sciences

Department of Architecture

2019

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Ketumile Mojanaga

Signature:

A handwritten signature in black ink, appearing to be 'K. Mojanaga', written above a horizontal line.

Preamble

The dissertation was derived from a concept on the geographical analysis of the Bloemfontein context. The investigation came to a realisation that there are invisible boundaries in the city that are created by its residents/inhabitants. These boundaries are formed when the inhabitants primarily participate in specific segments of the city. This is often a result of the day-to-day needs which are sustained by utilities including stores, filling stations, markets, etc. The city is divided into various communal districts, to distinguish between sectors and to aid orientation.

Today, 54 percent of the world's population occupies urban development globally. A proportion expected to increase to 66 percent by 2050 (United Nations, 2014). Concurrently, this particular phenomenon increases the vehicular use in the city context and consequently affects traffic cascade and efficiency.

The effortlessness of daily commute around and within a city has a considerable effect on its participation, tourism enticement, daily enterprise and the quality of life. Bloemfontein has established a commuter bus system that assists the daily transitions of its dwellers. However, the system has not adapted to modern-day transit. With the increased automotive transport in the city, the roads have gained congestion since the inception of the system and have therefore lengthened the process of moving from point A to point B. Secondly, the city appreciation and unique experience have depreciated over the years, primarily due to the constraints of vehicle manoeuvre. This escalating phenomenon eliminates the narrative the city can tell, relinquishing the precious gems of Bloemfontein.

With regard to the above-mentioned scenarios, the dissertation proposes a Bus Rapid Transit system. Utilising this type of system, the citizens can discover other parts of the city other than the ones they are familiar with. They can appreciate the visual treasures Bloemfontein offers, in the comfort of a transit system.

Particulars of project

Client:	Interstate Buses Bloemfontein.
Proposal:	Bus Rapid Transit system (BRT) for Bloemfontein.
Proposed Interventions:	Head Office Transit stations- for the purpose of the dissertation, three (3) stations will be demonstrated.
Storage of buses:	Interstate depot, OR Tambo Drive/Church Street, Bloemfontein.
Routes:	The proposed BRT system will be adopted to the current Interstate routes. In addition, proposed routes will be implemented to the system depending on the need.
Bus lanes (BRT):	In Bloemfontein, not all roads can afford to be expanded. Therefore, specific lanes will be reserved for buses during certain times of the day to prevent interruptions by traffic.
Interstate System (proposed):	The prevailing commuter bus system will only transit users from surrounding areas of Bloemfontein into the city centre and vice versa.
Interstate Control Office:	The organisation will retain the Control Offices in Bloemfontein and Thaba Nchu.
Interstate bus storage:	Interstate utilise will retain the bus depot in Thaba Nchu.

For a more comprehensive description on the implementation of the two (2) systems, please refer to the Technical Resolution, Part 4..



INTER STATE
Bus Lines

INTER STATE
Bus Lines



(Figure 1: Illustration of the local bus system/client, Author. 2019)

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Introduction

Thoughts, feelings, and memory are often lost in the habitual assiduity of everyday commuting, particularly for the automobilist. The constraints of manoeuvring a motor vehicle through the intricate entanglement of the city can sometimes abduct the experiential narrative of transit. Bloemfontein is gently becoming more valuable with time, from the inception of the first transportation system, the train station, to the prevailing bus transit system it has adopted. Over the years, the inhabitants of the city have unconsciously conceived boundaries within the urban structure which limit the individual's perception and narrative of Bloemfontein. The investigation will, therefore, encompass a methodology that will re-interpret and re-appropriate these perceived edges in the city construct into liminal, appreciative and nostalgic spaces by use of a contemporary bus system.

In addition, the dissertation intends to award the inhabitant with the opportunity of exploring unfamiliar territory and unveiling the neglected treasures of the city through the daily commute. The architectural interventions which are proposed for the urban context will not only enhance the micro, meso and macro context, they will also restore the appreciative qualities of transiting in Bloemfontein by creating a sequence of multisensory (haptic) and visual experiences of the daily commuter.

The theoretical investigation begins by discussing the hidden layers which exist in the city of Bloemfontein. The perception of hidden layers in a city is substantiated by the reading, *The Exposed City* by Nadia Amoroso. The investigation further elaborates on narratives in a city which refer to the publication by Paul Ricoeur's *Time and Narrative*, and the nostalgic presence of the urban precinct. The monograph motivates further on the theoretical stance of the dissertation by referring to the notions of Haptic senses, *A Theory of a Good City Form*, and Liminal spaces to support the dissertation's overture for a BUS Rapid Transit system in Bloemfontein.

The theoretical monograph will be substantiated by the following main sources:

- The Exposed City by Nadia Amoroso,
- Time and Narrative by Paul Ricoeur,
- Die Onstaan van 'n Stad 1846- 1946 by Schoeman, K.
- A History of Baroque Music by George J. Buelow,
- Haptic senses
- A Theory of Good City Form by Kevin Lynch.
- Liminal spaces

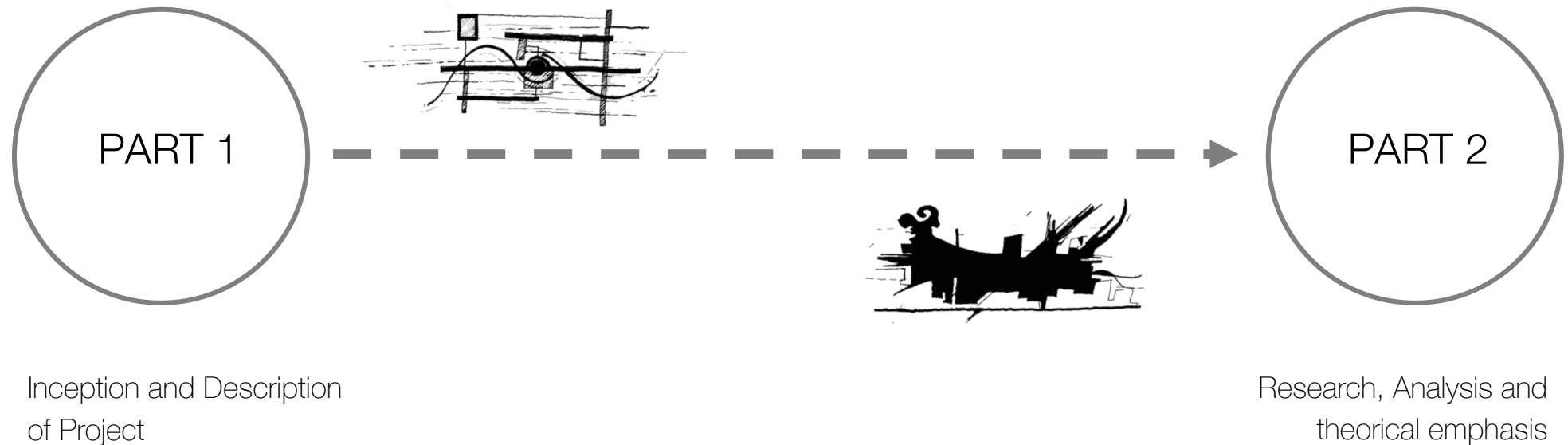
The discovery of Invisible Boundaries in the Bloemfontein.

- What theoretical and perceptual lens are we using to discuss these Invisible Boundaries?
- How are they formed within the city?

After a thorough investigation and analysis of Bloemfontein, the dissertation arrived at the ideology of invisible boundaries within the city. The research apprehended that the perceived edges are formed by the inhabitants themselves. According to the book, *The Exposed City* by Nadia Amoroso, there are a considerable amount of layers that exist within a city and every individual perceives them in a disparate manner. Below, are some glimpses of the Bloemfontein topography which are often undervalued.

Document Framework

The dissertation underwent a convoluted design process that formulated the document structure. The organisation demonstrates the chronicle rationale process of the thesis design. The theoretical assessment of Bloemfontein guided the proposal of a BRT system in the city. A comprehensive analysis of the topographical layout was conducted to guide the design process. Therefore, the design reacted to the needs and behavioural patterns of the city.



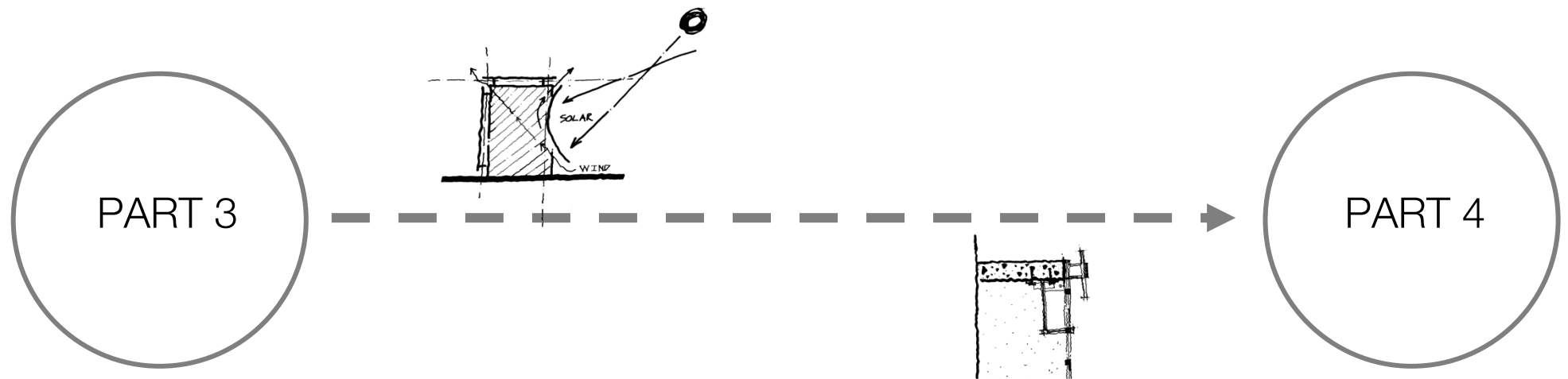
Inception and Description
of Project

Research, Analysis and
theoretical emphasis

Typology: The proposed design is a BRT system which comprises a Control Office, Transit (Boarding) spaces and a bus depot. This type of system can be located in Johannesburg, Pretoria, Bergen (Norway) and other parts of the world.

Topology: The adopted sites for the architectural interventions are located in various regions of the city. The proposed Control Office is placed at the corner of Charlotte Maxeke and Fichardt Street, further, the transit spaces are positioned in Bayswater, Universitas, and Willows. Lastly, the dissertation will adopt the client's depot premises which is located adjacent OR Tambo Drive/Church Street.

Morphology: The form of the building (Control Office) emulates the language of the CBD's street vendors, which is that they assemble their place of trade in the midst of dawn and dusk. The transit spaces are then adapted to the social and immediate context constraints of their proposed locations (will be discussed further in the document: Part 3).



Project requirements, development and rational

Technical process, resolution and documentation

Tectonics: During the process of the investigation, the dissertation adopted an unoccupied building in the CBD. This building is only utilised on the ground floor, for the purpose of enterprise. The CBD has a high occupancy level for public buildings, therefore, ventilation and natural light transmitted into the building will be imperative. Finally, the marriage of the existing structure and proposed will be paramount.

Research Methodology

The chronicle research methods were formulated by the ideology of invisible boundaries in topography of Bloemfontein. Further, the dissertation explored the essence of the project and the kind of impact will induce on the micro, meso and macro context. This led to the discovery of the proposed site (Control Office), which was guided by the premise of high occupancy and accessibility in the city. Through various methods, the thesis identified the language that inhabitants of the CBD portrayed and strategies to implement into the design. Finally, diverse technical resolutions were explored to substantiate the concept, premise of boundaries, morphology and tectonics of the building.

The **Touchstone** was derived from the perceived invisible boundaries after an investigation of the behavioural habits of dwellers in the city. The object is an abstract interpretation and representation of the discoveries. Additionally, the purpose of touchstone was to navigate investigative design procedures and ground the exploration from the infinitude of design.

The **Concept** is the heart of the design explorative measures. It defines the contribution of the BRT system on the macro context and the re-appropriation of the boundaries formed by the juncture of two (2) or more spaces.

The **Conceptual Framework** comprises:

- The establishment of Invisible boundaries.
- The Investigation on the city construct.
- Narrative of topography
- The commuter's diurnal skirmish within the city.

The **Analysis** encompasses various investigative proceedings of the macro, meso and micro context. Furthermore, it involves a historical examination of the events and structures within the immediate context of the proposed site (Control Office).

- The Site(s)
 - Control Office- Corner of Charlotte Maxeke and Fichardt Street
 - Transit 1- Bayswater
 - Transit 2- Universitas
 - Transit 3- Willows

- Historical features of the precinct
 - Bloemfontein Train Station
 - Train station Offices
 - Charlotte Maxeke Street

- Precedents
 - Re Ya Vaya Bus Rapid Transit, Johannesburg
 - Bergen, Norway

A **Case Study** was conducted to demonstrate the skirmishes of the disparate commuters of the city.

The **Theoretical Rationale**- Supporting the design process through writings

- *Time and Narrative* by Paul Ricoeur
- *The Exposed City* by Nadia Amoroso
- *A Theory of Good City Form* by Kevin Lynch
- *Haptics and Vision* by Jasmien Herrensens
- *Looking for liminality in the Architectural Space* by Catherine Smith
- *Liminal Space in Architecture: Threshold and Transition* by Patrick Troy Zimmerman

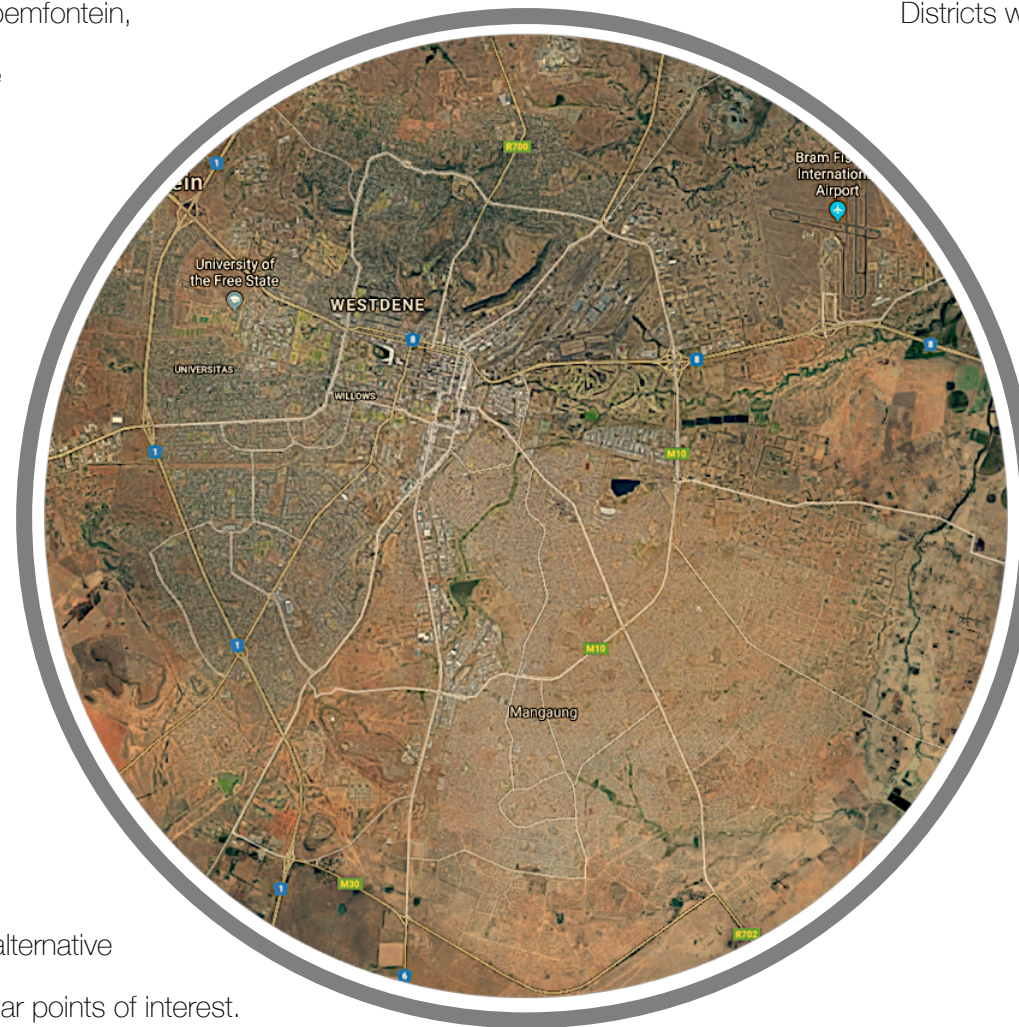
The supporting writings: Time and Narrative expresses the conceptual ideology proposed for the micro context, Haptic sense emphasises the need for telepathy between the commuter and the city, and the notion liminal spaces will explore the possible architectural spaces that will be generated by opposing spaces and the design process.

The images below depict some of the self-choreographed visual telepathies neglected by citizens. The proposed routes of the BRT system will assist with the appreciation of these 'lost treasures'.

The Bloemfontein topography subsists of a construct of complexities that occupy and aid fabricate the character of the city.

Figure 1 illustrates the topography map of Bloemfontein, the edges described in the preambular of the monograph can be demonstrated by the following projection. The peripheries will be further elaborated in the document.

The topographical image of the city also reveals the organisation of interwoven roads and the city layout. These fundamentals compose a complex city fabric which deserves receptive and adaptive ways of commuting. The map further illustrates the accessibility of different districts and various alternative routes that could be used to connect dissimilar points of interest.



Districts which compose the city include:

- Batho Location,
- Bayswater,
- Pellisier,
- Etc.

(Figure 2: Map of Bloemfontein, 2019. Google Earth.)

Figure 2 depicts the scenery of the urban landscape as seen from the Naval Hill. These are the types of moments which serve visual delight. Captured junctures at a point in time. Moments which 'hide in plain sight'. And, at times, these could be the 'missing pieces' that could enrich the Inhabitant's visual experience. A catalyst which could contribute a chapter to the commuter's narrative of the city.

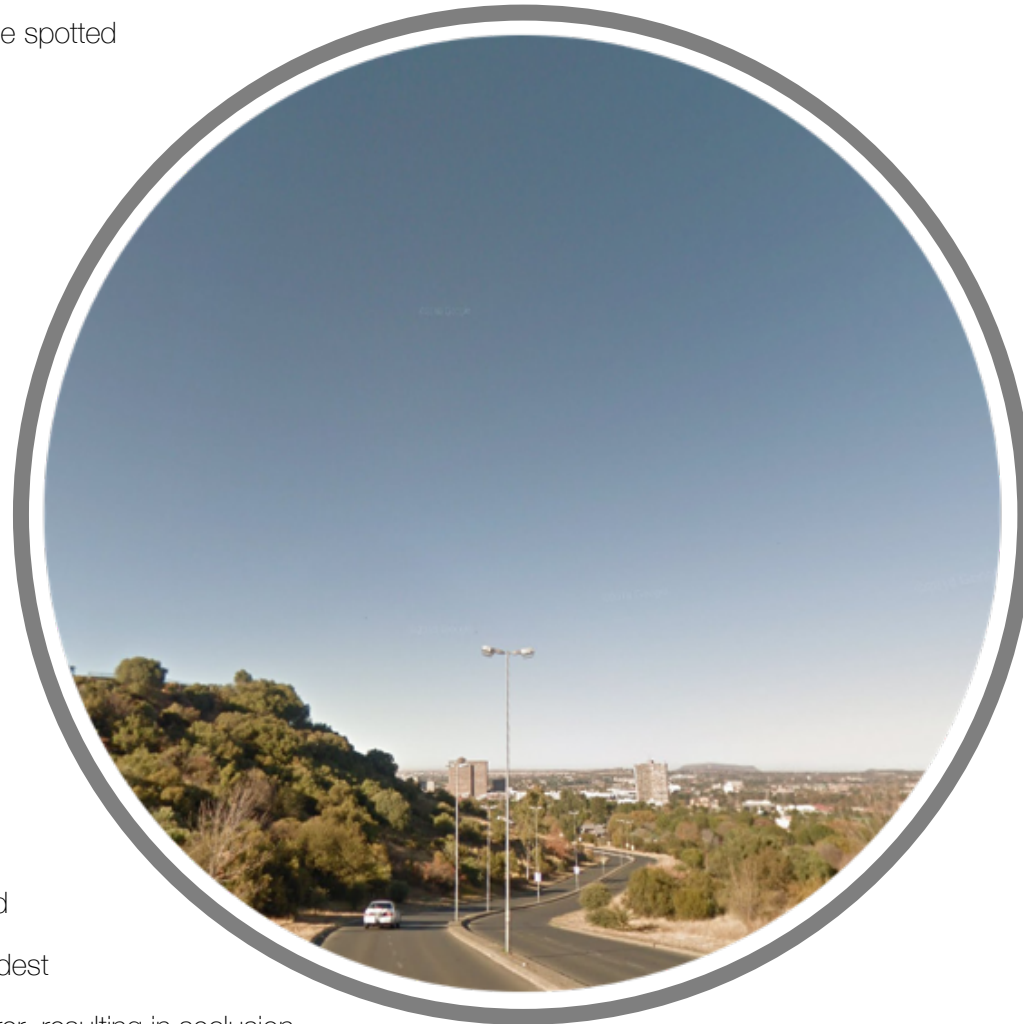
These hidden visual treasures not only comprise the architecture, they consist of a juncture of events and dialogues which culminate in a self-choreographed image. And the majesty in these emulated moments isn't that they are lost in the depths of time, rather how they prevail in the nostalgia of commuters, as tales of the city.



(Figure 3: Image of the Bloemfontein city landscape, 2017. SABC.)

Figure 3 frames a captured glimpse at a romantic setting on a hill often referred to as 'Liggies'. The location can be spotted on peripheries of First Avenue and Bayswater. The sighting is primarily endorsed as a nightfall viewing platform, purposefully for appreciating the scenery of the synthetic city luminescence. This is proof of the uncharted visual affluence the city possesses.

Although, the hill is currently undergoing nocturnal restrictive measures, it still retains its diurnal visits, primarily through its alluring and delightful qualities. The inaccessibility of the modest terrain diminishes the scenic allure of the wayfarer, resulting in seclusion.



(Figure 4: Google Image of the Bloemfontein city landscape 2, 2019. Google Earth.)

The inner city (CBD) can be overwhelming now and again.

It is undoubtedly the most populated fragment in Bloemfontein. This anomaly in the topography consists of an amalgamation of diverse personalities. In this particular part of the city, the occupants bear the burden of arriving at a point of interest expeditiously. This plunders the citizen's right to indulge in an Urban context.

For this part of town, the safety of individuals becomes imperative. This issue does not grant the dissertation leeway to mitigate the comprehensive security of the proposed interventions in perceived 'safe' areas. The safety of all proposed structures will be unquestionably paramount.



(Figure 5: Google Image of Bloemfontein 2, 2019. Google Earth.)



(Figure 6: Illustration of Bloemfontein's popular places, Author: 2019)



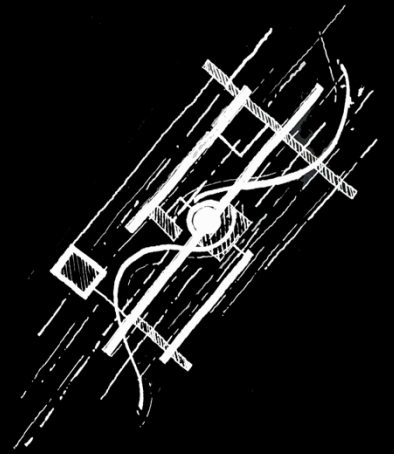
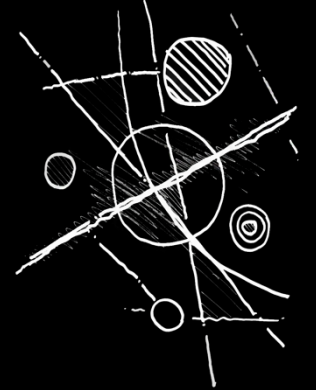
Part 1: Conceptual framework

- Discovery Invisible Boundaries
- The Commuter's experience
- Theoretical emphasis: Paul Ricouer's
Time and Narrative



Our City

Our city is painted with thoughts and
feelings
Walls unkempt and overrun with
expression
Made to fit movie screens with their
perfection



The citizen observes the city in a manner that does not expose the perceptively disassembled areas, rather they visit their places of familiarity and refrain from the curiosities of the uncharted territories. While this is typical for most, the investigation unravels the existence of invisible boundaries that mildly disconnect Bloemfontein.

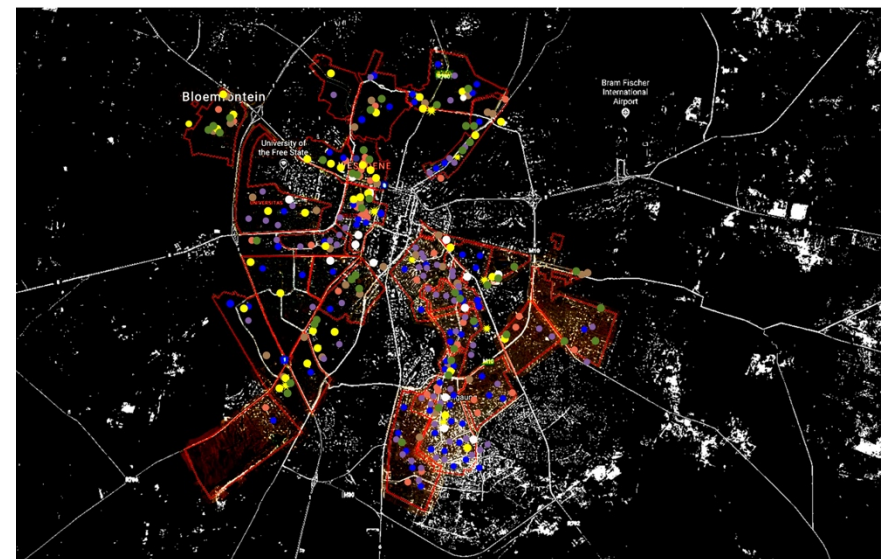
These identified boundaries are intensified by social status of individuals. Most people reside in specific areas as a result of cost constraints. An additional factor could be their affiliation to their loved ones. Nonetheless, the local authority assigned names to distinguish between contradictory places of residence. With ongoing city development plans, each district will or have the following facilities:

- Shopping Centre(s),
- Take away store(s),
- Place(s) of worship,
- Place(s) of Institution,
- Police Station(s),
- Filling Station(s),
- Refreshment restaurant(s), and
- Health Facility(s).

This process of institute enables residents to convenient access of basic necessities. Subsequently, the inhabitants have less reason to explore beyond the perimeters of their familiar terrain. This restricts the individual's narrative of the city.

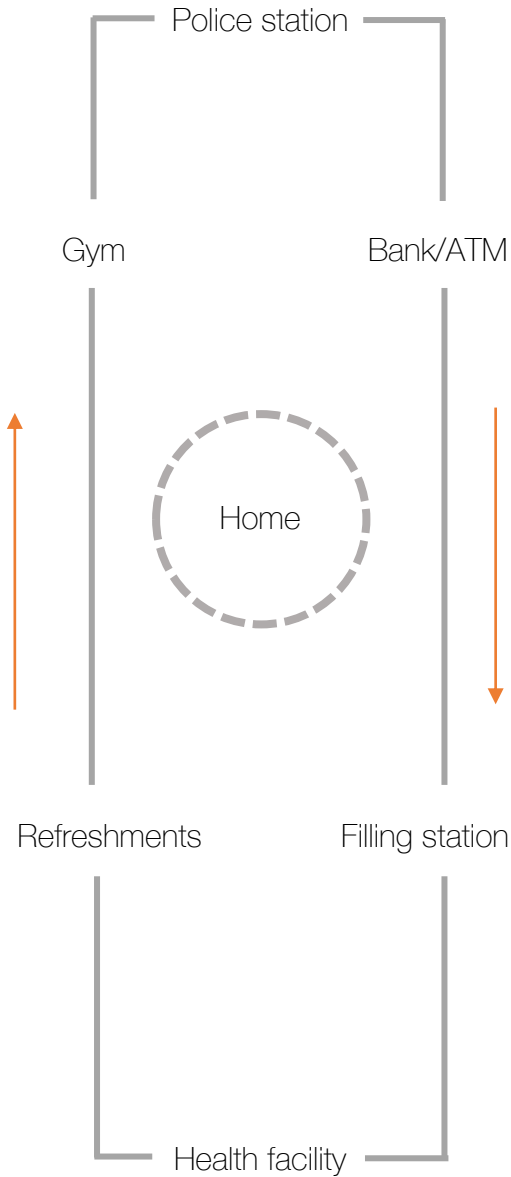


(Figure 7: Perceived Invisible boundaries in the city, 2019.)



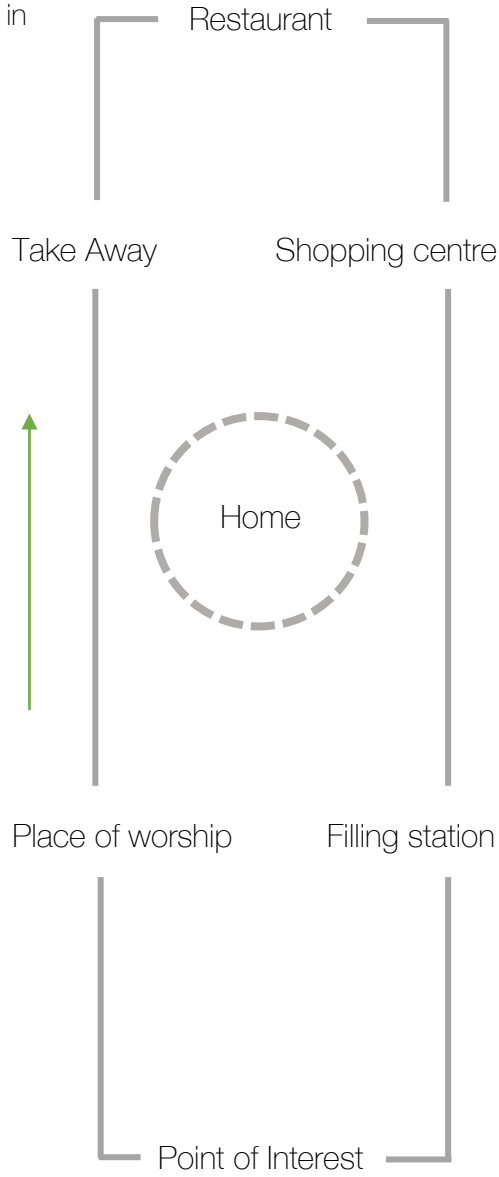
(Figure 8: Marked out facilities in each districts Invisible boundaries in the city, 2019.)

Weekly



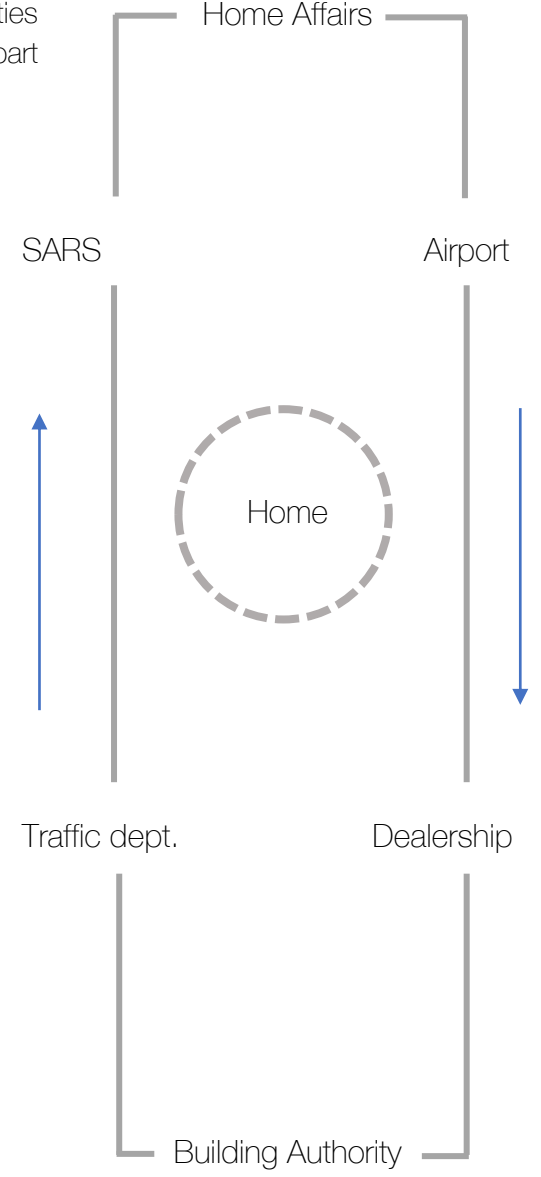
Factors that strengthen edges in the city.

Weekend



A diagram of habitual activities citizens take part in.

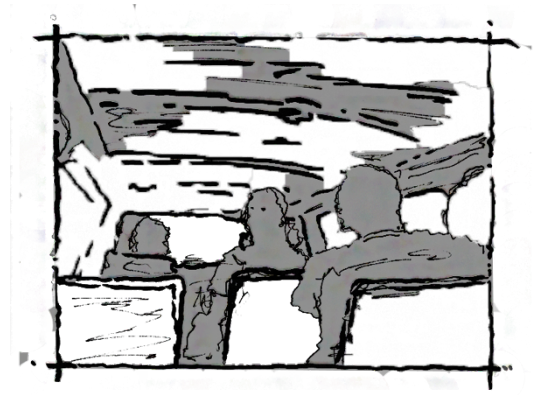
Occasionally



Below are individuals that exhibit disparate experiences of being a diurnal commuter in Bloemfontein:

Taxi commuter

“Arriving at the Bloemfontein taxi rank in the early hours of the morning, one can often find themselves in an elongated queue. This is an area whereby the constraints of time dissolve. Additionally, one can find themselves in the bewilderment of money tallying or the argumentative dialogues of perceived ‘time-wasting tactics’. The aggravation of the entire process is the return home, walking to a particular street or designated area to spot a taxi while placing importance for one’s own safety.”



(Figure 9: People utilising a local taxi, Author. 2019)

Bus commuter

“Buses in Bloemfontein exclusively stop at allocated places within the city. This assures some level of certainty to the user. Although, the system adopted sheltered transit spaces, they don’t grant immunity from the threats of the street. The aggravating aspect of the local system is that the commuter’s tag can only be loaded at the Control Office. Alternatively, cash payments are acceptable though drivers do not always have change. The one advantage of the system is its moderate punctual qualities even though it is available at specific times of the day. “



(Figure 10: Interior of a local bus, Author. 2019)

The Wayfarer

“Walking is a taxing and time consuming process. The gratifying aspects of it lie with the admiration of events taking place while in transit. As Bloemfontein citizen, walking in between two opposite nodes of city is an absurd endeavour. Furthermore, it is often difficult to apprehend the destination or route a bus/taxi is going.” This is an essential aspect the two (2) local transport systems fail to communicate.”



(Figure 11: Illustration of a pedestrian in a city bus, Author. 2019)

The Mobilist

“The convenience and efficiency attributes of vehicular use have frequently proven to be fruitful. Although, over the years, humanity succeeded in re-inventing the automotive as a necessity rather than an affluence. This particular phenomenon escalated traffic beyond reasonable measure, resulting in a tedious manner of travelling.”



(Figure 12: Illustration of a pedestrian in a city bus, Author. 2019)

The representation below illustrates the daily unfolding of a Re Ya Vaya bus system in Johannesburg. The buses have a more casual seating arrangement that contributes to the self-choreographed visual telepathy between commuter and the elements.

Figure 13: The interior of Re Ya Vaya (BRT) bus (Johannesburg), Author. 2019)



The following illustrates the safety aspects of the system, it has a convenient card system which restricts the entrance to commuters and staff.

(Figure 14: The interior of Re Ya Vaya (BRT) system 1 (Johannesburg), Author: 2019)



Whilst the apprehension of the direction/route of the taxi is lacking (page 27), the BRT system demonstrates of the ease of commuting. The buses are clearly marked with the route of which they transit. The map of the various routes are available at every station.

(Figure 15: The interior of Re Ya Vaya (BRT) system 2 (Johannesburg), Author: 2019)



To comprehend these newly discovered invisible boundaries, the dissertation used a lens that transcends the human eye's perception. As stated in page 26, there are instances whereby the inhabitants cross their familiar territorial edges.

This anomaly unravels the sequence of mysteries and self-composed street narratives that inhere the distance between a place of departure and a desired destination. These discovered visual valuables can be appreciated by moving through the trail designed by time and space, which is this case, '*The tell-tale city*'. It's between these points that the commuter can admire the influence of time on the textures, nature, architecture and human dialogue of the city. A rudimentary summary would be: Time and space telling a story through movement in the city.

Paul Ricoeur elaborates on this particular phenomenon in the book, *Time and Narrative* which will be addressed further in the document. The basis of the argument is that every being has a particular narrative of the city experience. This is a construct comprising their daily observations, emotions, nostalgia, and rituals. The same could be said about the Bloemfontein city, every part has a potential narrative to express, however it is diminished by the constraints of manoeuvring a car, crossing the road, being vigilant or being accustomed to a singular route. Hence, some narratives remain hidden in the undiscovered faceted topography.

The book, *The Exposed City* elaborates on multi-layered cities. The writing states that people perceive the city as a map and utilise specific places as nodes of orientation. The transit through a city by an inhabitant, not only awards viewing opportunities, it uncovers narratives taking place in a particular time. The city dweller's experiences of changing conditions with the passage of time is often scenic, from what was to what will be, sunrise to sunset, grey to brown, and the human interaction with surroundings. "Time telling a story through a day" (N. Amoroso, 2010; 7-9).

This does not merely change the commuter's perception of diurnal transiting, however, it constructs a journey, from one point of the city to another. It also generates a strong image within a given observer that reveals the urban topography's character (N. Amoroso, 2010; 7-9). This scenario then leads to Paul Ricoeur's writing on *Time and Narrative*.



Discovered Invisible Boundaries in Bloemfontein
(Figure 7)

Paul Ricoeur's *Time and Narrative*- The story told by movement through the city.

- How does time and movement influence the inhabitant in the city?
- What narrative is being told by the city?

The writing commences by expanding further on the unfolding of narratives in an environment. Time becomes a prominent fundamental for the subsequent. Time is the compass in which humans use to navigate the vast parameters of past, present and future. The flowing stream of time in which space and all complexities exist. For Christianity, the significance of time can even transcend to eternity (Ricoeur, 1984). However, for this argument, Paul Ricoeur asks that the word 'eternity' be removed from the parameters of time, which means time is temporary, in all facets (Ricoeur, 1984).

The temporariness of time emphasises the importance and meaningfulness of the entity. For, the investigation it provides a clear indication of the significance of meaningful space, its self-induced memories and the value of a moment. After all, ' the train of time only passes once'.

Life in itself is temporary and less of it needs to be exhausted on endeavours of commuting. Our daily travels consist of a series of moments, from the time a citizen leaves a dwelling, as far as the desired destination. These moments continuously take place each day, culminating a narrative which could potentially affect the commuter's feeling of the day and inception of nostalgic imagery.

Although, everyone has a story of their experience of Bloemfontein, even the city itself has hidden tales, however the individual's narrative is dependent on the journey the topography can depict. The sun rising over the Bloemfontein train station horizon, birds singing over the Kingspark pond, the poetics of pedestrian routes between Mimosa, Waterfront and CBD are events taking place daily, a reminder that with every passing second, narratives demonstrate the capability to forge choreographed realities.

For a person driving a car, the leisure of admiration and visual telepathy with the topography is emitted by these self-propelled 'awareness-slayers' called vehicles.



(Figure 16: Illustration of the passage of time, from the Bloemfontein station to the proposed BRT system. Author. 2019)

An Illustration of historic to contemporary in Bloemfontein

Proposal of a BRT SYSTEM in Bloemfontein- Capturing the moments of the city in a single time stream.

- How will the BRT System capture scenic moments in Bloemfontein?
- How will the insertion of the BRT System make it worthwhile for the city dweller and improve public transport?

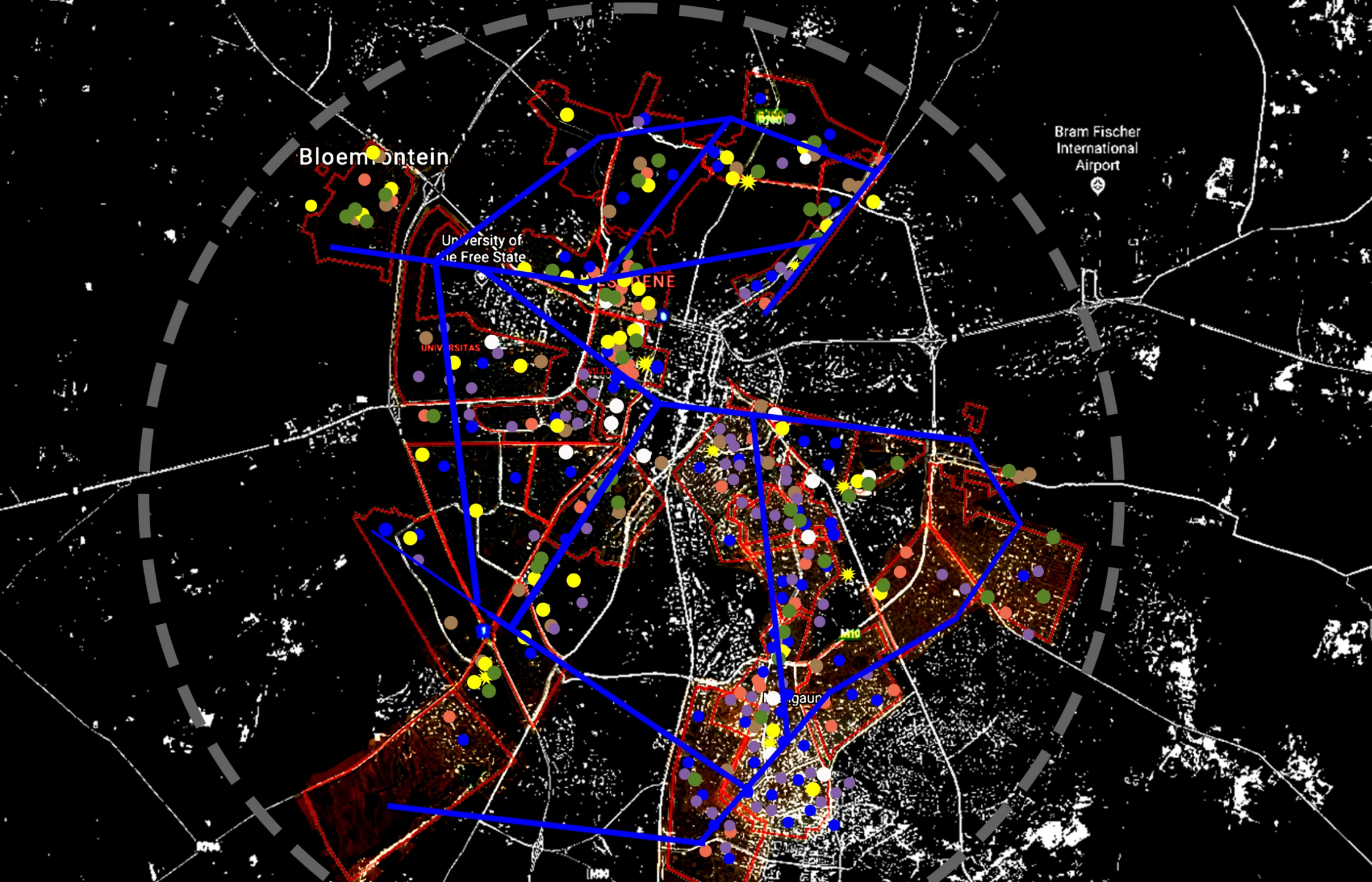
Public transport comes with the reward of city scenery, whether the citizens are conscious of it or not. The timeline of old to new, dawn to dusk and concrete to steel, memories that deserve a place in the library of nostalgia. It all begins with the user arriving at the transit station, unfolding experiences within the space, using the bus service, observing the human interaction in the city, and feeling integrated with the place. This leads to the culture, significance and atmosphere of that place being emphasised in the consciousness of the inhabitants. The bus takes a specific route to reach particular destination, before it returns to its point of origin. Within this bus network, the transit stations aid in the intersection of routes, this is to enhance the efficiency, safety and orientation of public transport. The purpose of intersecting stations is to make it easier for the inhabitants to orientate themselves if they are set astray, and establish alternative routes to reach desired destinations. An commuter can change buses at different intersecting stations whilst being charged for a single trip. This only works if the user does not exit the transit station.

Furthermore, the BRT system does not merely improve commuting in the city, it improves the quality of life and concerns of safety.

The Control Office for the BRT System is placed in a site which portrays the change of time, the precinct consists of historic, modern and contemporary buildings.

Proposed Bus Rapid System

- A Control Office
- Depot for buses
- Transit stations for bus pick-ups and drop-offs



Proposed BRT system linking Boundaries in Bloemfontein.
(Figure 8)

Advantages of the Bus Rapid Transit system:

- Transit station cater for various weather conditions,
- Buses routes Interlink and rotate in an orderly fashion,
- Easy orientation if a commuter may fall astray,
- Buses have their own lanes,
- Efficient daily commuting,
- Efficient payment system,
- Caters for disabled people,
- Safe transits spaces, and
- Maps are available (Arrivealive, 2019: online).

Control office:

Basement- storage for:

solar panels,

maintenance equipment,

toilets,

generators and batteries.

The **Basement** is to designated for the storage of equipment which is the solar panels, rechargeable batteries, glass panels, computers, monitors, automatic ticket gates and self-service machinery. The floor will also house the emergency generator and inverter.

The **Ground Floor** will have self-service stations, along with retail spaces, a book shop, a coffee shop, ATMs and service ducts (deliveries). This floor is predominantly designated for public use by virtue of the high populated perpendicular streets on the periphery of the building.

The **First Floor** is design to accommodate the ticket sales services along with a information desk, reception, boardroom, kitchenette, safe (money), cleaners facilities and ablutions.

The **Second Floor** consists of the offices, training facilities, classrooms, ablutions, a boardroom and a kitchenette.

The **Third Floor** accommodates the management offices, administration, kitchenette, IT servers and ablutions.

The **Fourth Floor** comprises a social roof garden, communication facilities, surveillance rooms and circulation.

The **Transit Stations** consist of ticket sales, automatic ticket gates, social spaces, waiting areas, snack bar, queue spaces and storage for rechargeable batteries.

Ground floor- Self service
Toilets
Deliveries
Book shop
Retail space
ATMs

First Floor- Ticket sales
New cards
Info outlet
Toilets
Customer Administration
Managers
Boardroom
Kitchenet
ATMs
Safe storage for money

Second Floor- Company Administration

Marketing
Boardroom
Toilets
Kitchenet

Third Floor- Classrooms
Training facilities
Multifunctional

Fourth Floor- Communication
Surveillances

Transit spaces:

Boarding/ Queuing space-
Ticket Sales-
Social space-
Waiting area-
Snack bar-



(Figure 15: Illustration of the Bloemfontein BMW dealership, Author. 2019)

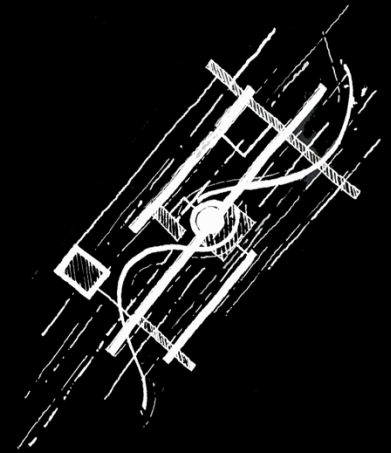
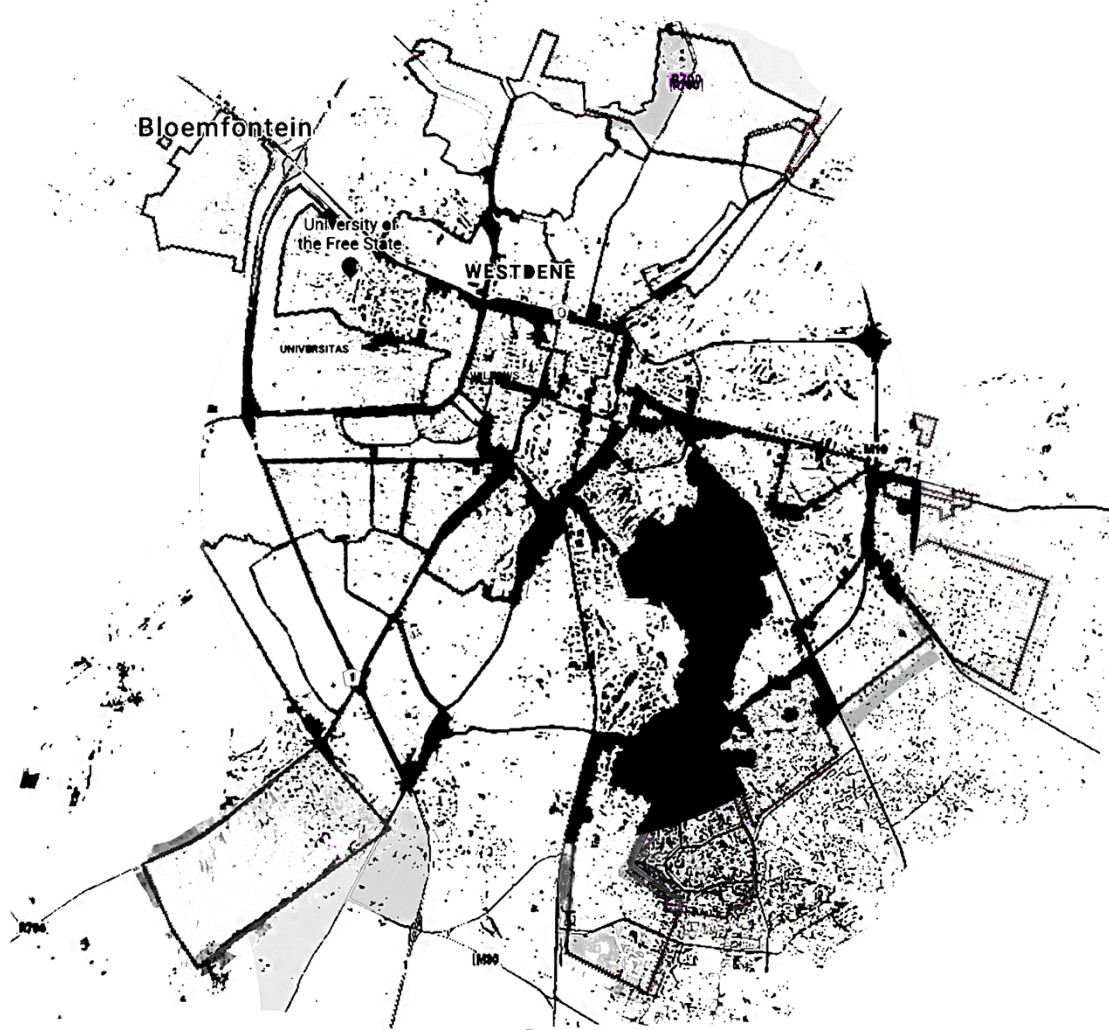
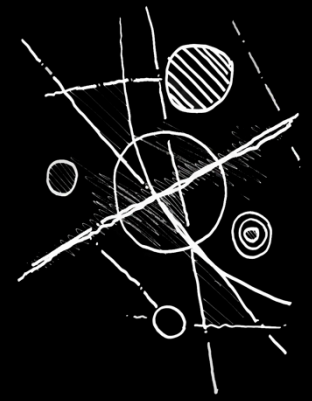


Part 2: Research and Grounding

- The proposed site
- Haptic Sense
- Historical essences
- Theoretical emphasis: *A Theory of Good City Form* by Kevin Lynch
- *Liminal Spaces*



Our city is lit by lovers and dreamers
They hold hands without caring and
kiss in the daylight
Unlike me, they wouldn't mind who
was staring



The Proposed Site(s) for Architectural Interventions

The designated site are be located in the Bloemfontein CBD, adjacent the Post Office office block. The site is located on the corner of:

- Charlotte Maxeke Street and,
- Fichardt Street.



(Figure 16: Map of Bloemfontein, 2019. Author)

The site is comprised of predominantly commercial buildings. The investigation of the site has revealed that the ground floor of most buildings in the area is used for retail purposes. Then the upper floors are used for accommodation or office space.

The proposed site also lies between two historically prominent buildings. Hoffman Square and the old train station. The historical significance of these buildings will be discussed further in the document.

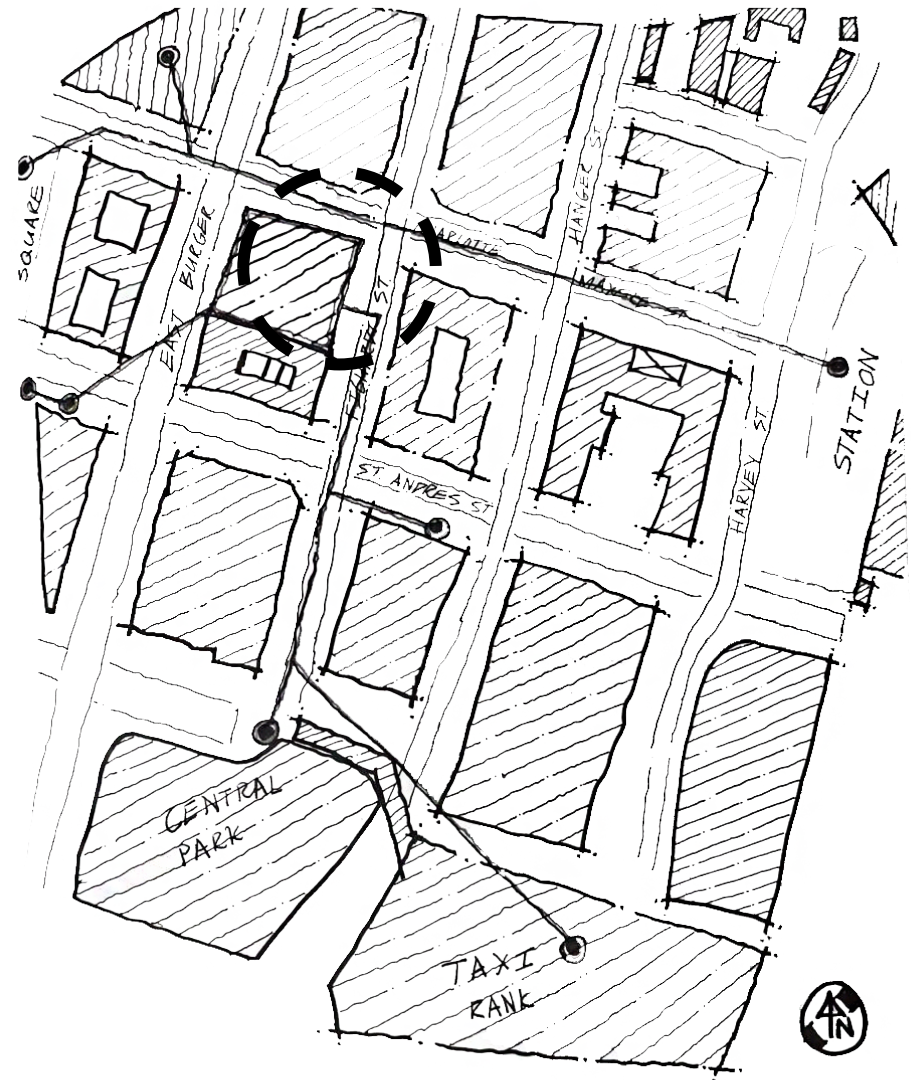
The dissertation will utilise an existing building for the Head Offices of the proposed Bus Rapid Transit which is in the vicinity of alternative transport systems of Bloemfontein.

The ground floor of the building currently serves as retail space and the upper floors are vacant. There is no evidence of the intended space usage for the upper floors. The building also has a vacant basement level which can only be accessed by means of stairs or elevators.

The building has a strong column and beam structure that will be used for the proposed the design. This will result in the removal of non-load bearing walls and windows. Columns, beams and floors will be re-purposed. (Refer to Annexure A).



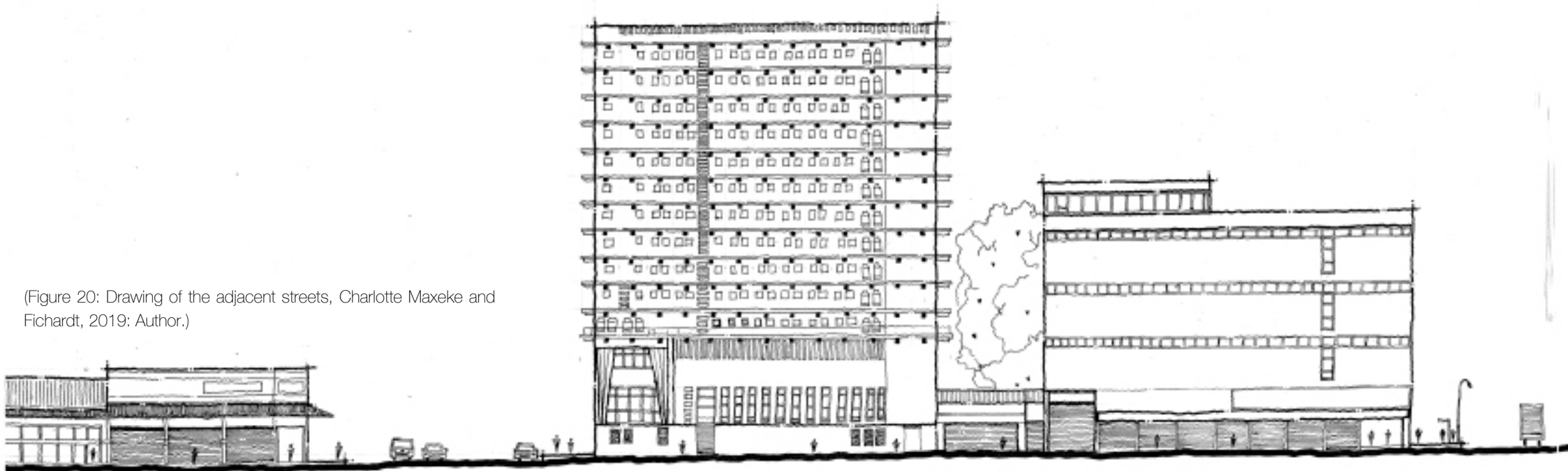
(Figure 17: Designated Site in Bloemfontein CBD, 2019: Author)



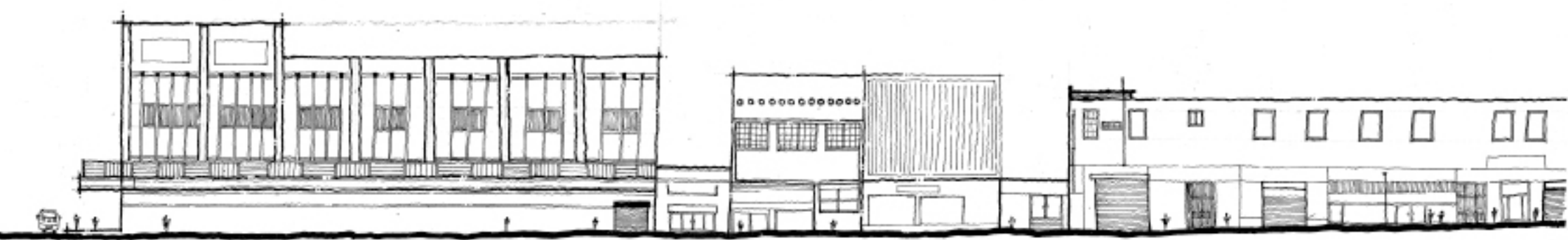
(Figure 19: Illustration of proposed site relative to alternative transport systems, 2019: Author.)



(Figure 18: Street Views of the Site, 2019: Author.)



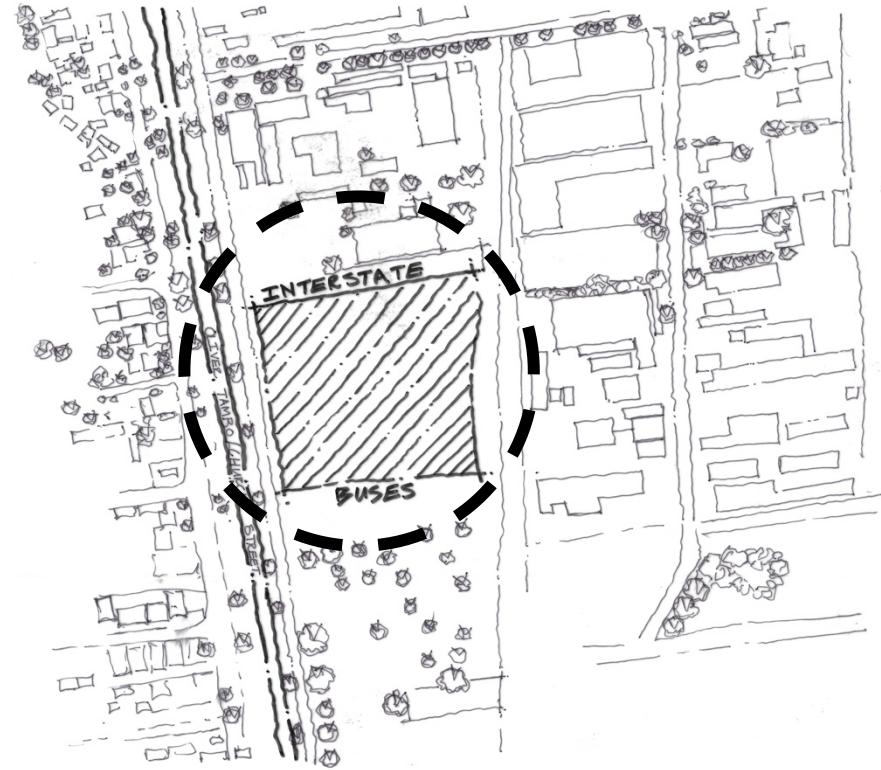
(Figure 20: Drawing of the adjacent streets, Charlotte Maxeke and Fichardt, 2019: Author.)



Location for Bus depot in the city

The dissertation proposes that the existing bus storage facility (depot) be reused for the proposed BRT buses. The Bus depot is located in Church Street/OR Tambo Drive. This facility can store more buses than its predecessor in Thaba Nchu.

The facility already has sufficient resources to be reused as a bus depot. Church Street is a main road and is easily accessible. This site will not cause delays or interruptions in bus schedules. The bus depot currently has facilities such as offices and security that will aid in the maintenance and safety of the buses.



(Figure 21: Drawing indicating the proposed depot the new bus system, 2019: Author.)

Location of transit spaces

The types transit spaces were selected based on a variety of scenarios demonstrated by the current bus system. They respond to three (3) dilemmas of drop-off stations in Bloemfontein.

Problems:

- The existing stations do not adhere to various weather conditions.
- Disabled people cannot utilise the system.
- Certain areas do not have stations, therefore the users queue on the pavement.
- The liaison between the university premises and the rest of the city is absent- commuting of students.

With most bus-stop interventions, they have a modular quality to them. The investigation intends to use this principle partially, the structure of the transit spaces will be modular.

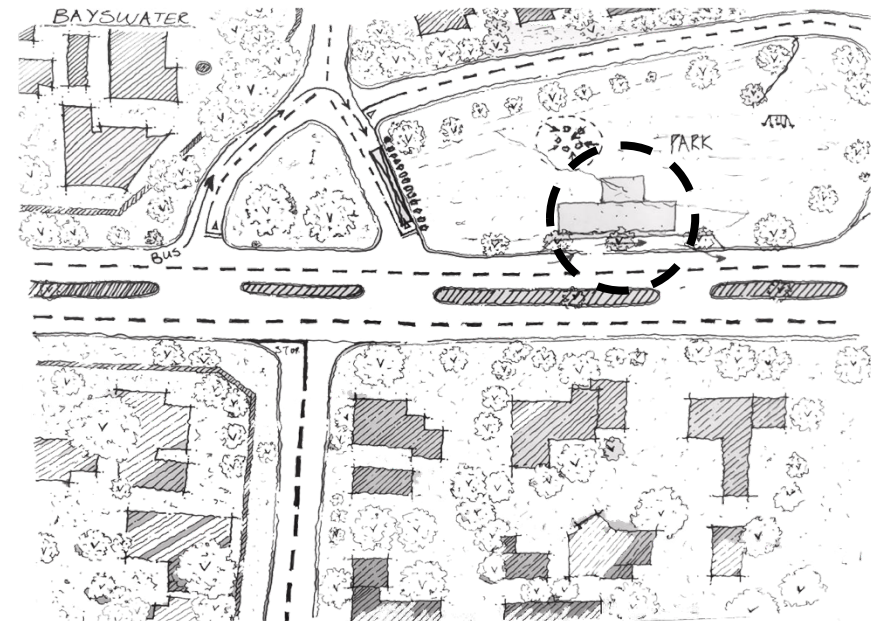
On the other hand, the design of the stations will react to the context. The entrance, facades, pay points, storage etc. will be distinctive according to the context on which they are in.

Transit station 1

This transit space reacts to the need of shelter and an easy payment and boarding process. It is located in Bayswater. The station will predominantly benefit from domestic workers who are employed in the area. The queues for the bus become overwhelming hence the need for a station.

Residential area: Near Bays Village, Bayswater.

Between Koning Williem Street and Wilcocks Road



(Figure 22: Location of Bayswater transit station, 2019: Author.)

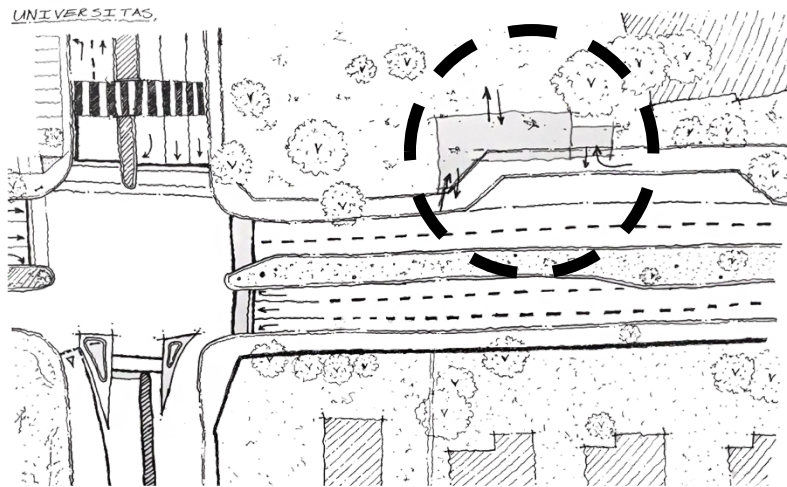
Transit station 2

The second station is proposed on the UFS campus. This will aid the collaboration between the University and the city of Bloemfontein. There is an existing bus stop at the proposed site. For this scenario, the dissertation is improving the standard of the transit station.

Institutional and residential area: Near the medical gate, Universitas.

D F Malherbe Avenue

The station lies on the boundary of Institutional and residential.



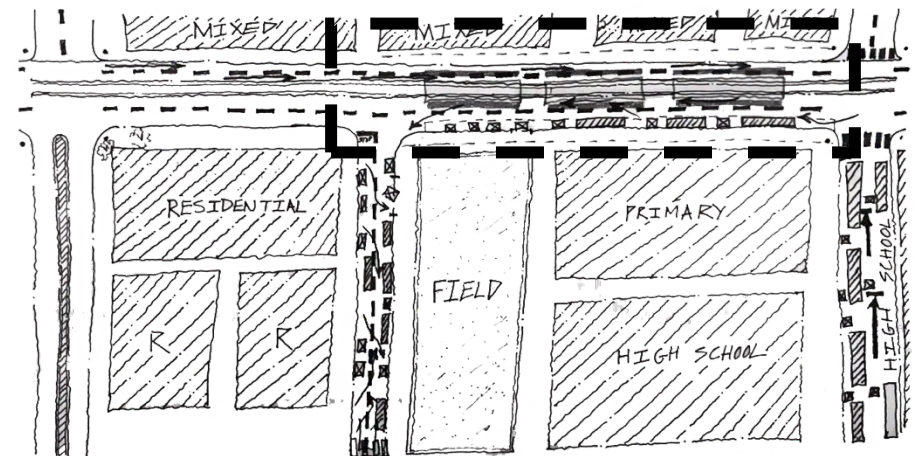
(Figure 23: Location of UFS transit space, 2019: Author.)

Transit station 3

The third station is on the island which lies on Victoria road in willows. The transit station will be surrounded by a primary and high school. The area is predominantly a student residential area which includes tourism centre (for long distance buses) and the Vodacom stadium.

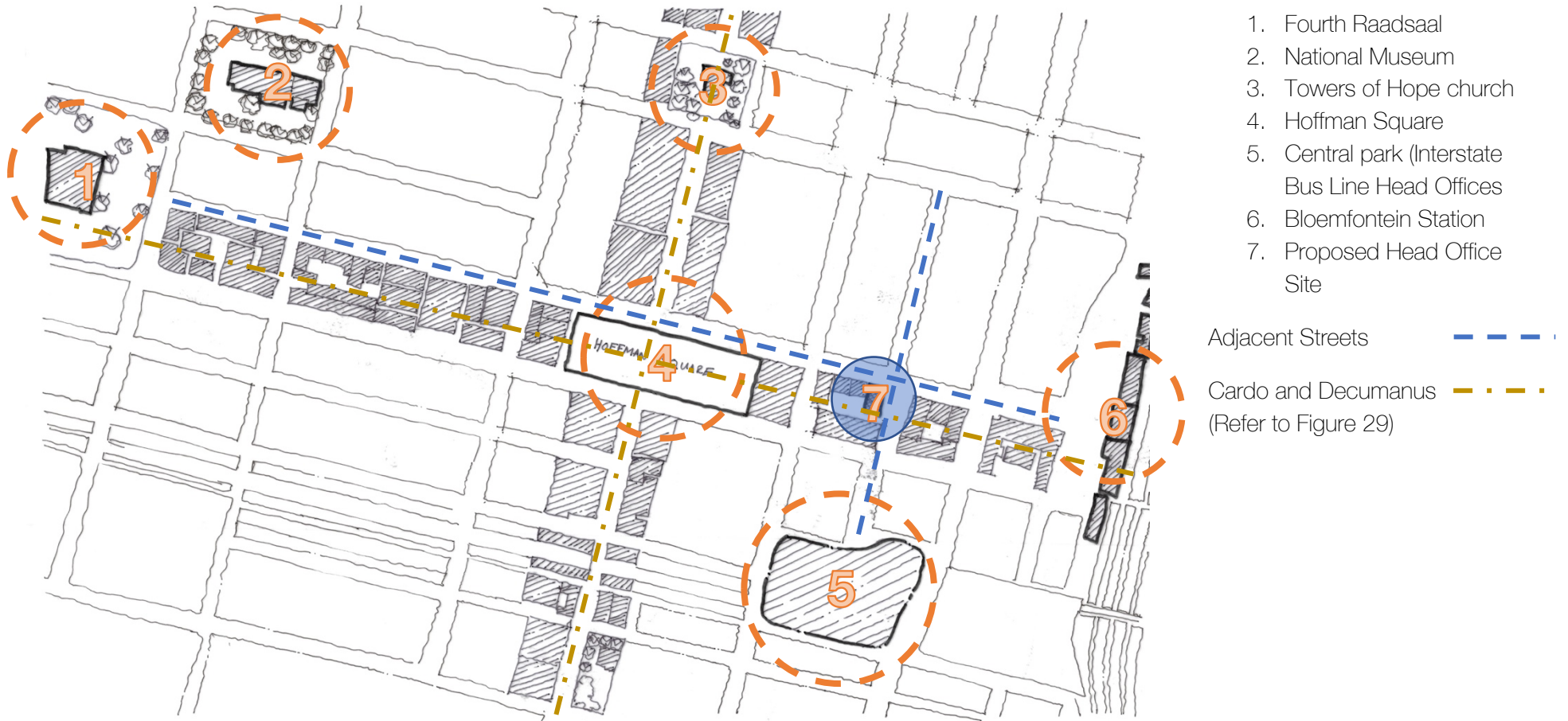
During peak hours, buses, cars and taxis congest the street as a result of scholars departing for their destinations.

Residential and institutional area: near Ella street, Willows



(Figure 24: Location of Willows transit space, 2019: Author.)

Location of prominent buildings



(Figure 25: Map of CBD precinct illustrating prominent buildings, 2019: Author.)

Historical view Charlotte Maxeke Street

The narrative of the Street as it stands in the archives of history.

- What aspects influenced the street?
- How the city grew over the years?

Charlotte Maxeke was born on the 7th of April 1874 and received a missionary education at the Edwards Memorial School in the Eastern Cape. She and her family moved to Kimberly in 1885 after the discovery of diamonds.

After an education in the United States, she returned to South Africa in 1901 as one of the country's first black female graduates. She and her husband attended the launch of the South African Native Nation Congress (SANNC) in Bloemfontein, which would later be known as the ANC.

She also founded the Bantu Women's League of the SANNC in 1918. Then, she was involved in the women's rights movements and the struggle against apartheid until her death in 1939.

Maxeke was often honoured as 'Mother of Black Freedom in South Africa', and had an ANC nursery school named after her in Tanzania.

Maxeke died in Johannesburg in 1939 (South Africa History Online, 2016: Online).



(Figure 26: Image of Charlotte Maxeke, South Africa History Online, 2016.)

History has proved that Charlotte Maxeke played a very important role in the empowerment of women in South Africa. As we discussed earlier about the two historical sites (see page 21), we now elaborate further on these aspects.

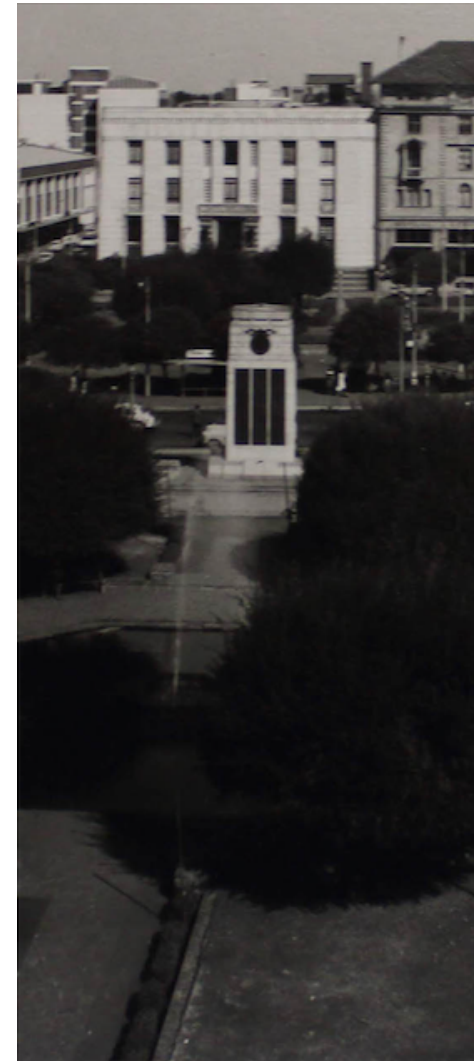
Hoffman Square was established in the early 1930's and was named after the first President of the Orange Free State.

Hoffman Square was originally established as a market square and was the centre of the commerce in Bloemfontein (Schoeman, 1987: 24).

The square has underwent a number of improvements over the years. One being the most recent re-development by the city of Bloemfontein. The re-development was part of the plan to enhance the city with green spaces and pedestrian friendly (The Citizen, 2013: Online).

The re-development of the square included planting more greenery, paving the streets surrounding square, new paving between the facades of the Head Post Office and the SA Reserve Bank and creating shaded spaces for pedestrians (The Citizen, 2013: Online).

Hoffman has become a very integral part of the CBD, it is one of the few city spaces which offer green spaces and a pedestrian friendly space. It even provides bus and taxi shelters to accommodate city dwellers whom utilise public transport.



(Figure 27: Hoffman Square in 1966 as seen from the Head Post Office.)

The development of Hoffman Square, also known as the Market Square, was formed by two main axis which also develop the city. The square was dissected by the axis created by Church Street (today known as OR Tambo Drive) together with the first Dutch Reformed Church. These two key elements in the city form a Cardo and Decumanus (see figure 11) (Auret, 2017).

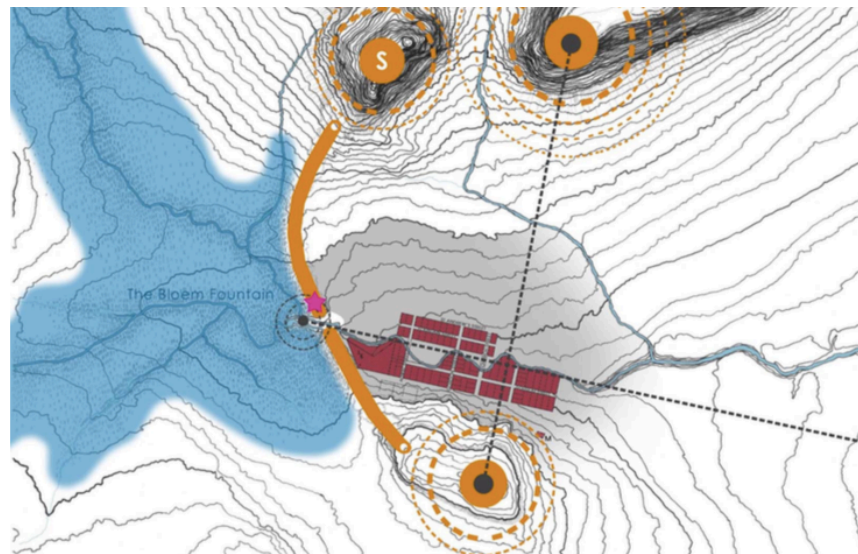
The layout and development of the city was influenced by four key elements, which is Naval Hill, Signal Hill, Fort Hill and the dolerite ridge (Auret, 2017).

This discovery in history reinstates the importance of the proposed site for the Head Offices. The site is placed near the Bloemfontein (train) station which is also a prominent structure in the history of Bloemfontein.

The station is the first railway line which connected Bloemfontein to Cape Town, Kimberley and Port Elizabeth (Schoeman, 1987: 24). It is located on the corner of Harvey and Maitland Street (today known as Charlotte Maxeke street).



(Figure 28: Image of Hoffman Square, 2014. Online)



(Figure 29: Map of Bloemfontein showing the origin of Hoffman Square, Auret, H. Online)

The station today, stands as one of the most historic and prominent buildings of Bloemfontein. President F. V. Reitz successfully choreographed the construction of the train station after the suggestions of his predecessor, President Brand (Schoeman, 1987: 110).

This phenomenon was propelled by the discovery of gold in Johannesburg. Another incentive was because the Cape had decided to forge a railway line to Johannesburg via Kimberley, Northern Cape. This was mainly because the OFS (Orange Free State) then, wouldn't let the Cape colony create a railway route which passed through their perimeters (Schoeman, 1987: 110).

But, gracefully, in 1889 The OFS voted to bring the railway to Bloemfontein to its quarters (Schoeman, 1987: 111). Not only did this signify change within their sector, it also offered advantageous tax and tourism benefits.

The construction of the railway route occurred over a duration of 2 years. This took place a few years after the first railway in 1862 between Cape Town and Wellington. Then the route later reached the orange river in 1884 (Schoeman, 1987: 110).

The implementation of transport in the Free State had immense benefits of the development of the city and its people. Therefore, also having a new transport system in the city can assist in fabricating an efficient city grid circulation. Also resulting in economic benefits.



(Figure 30: Image of the Bloemfontein Train station, 2011: SAHO.)



(Figure 31: Image of the Bloemfontein Train station 2, 2011: SAHO.)

Site analysis



(Greg McQueen; 2018: 22.)

Pedestrian comfort



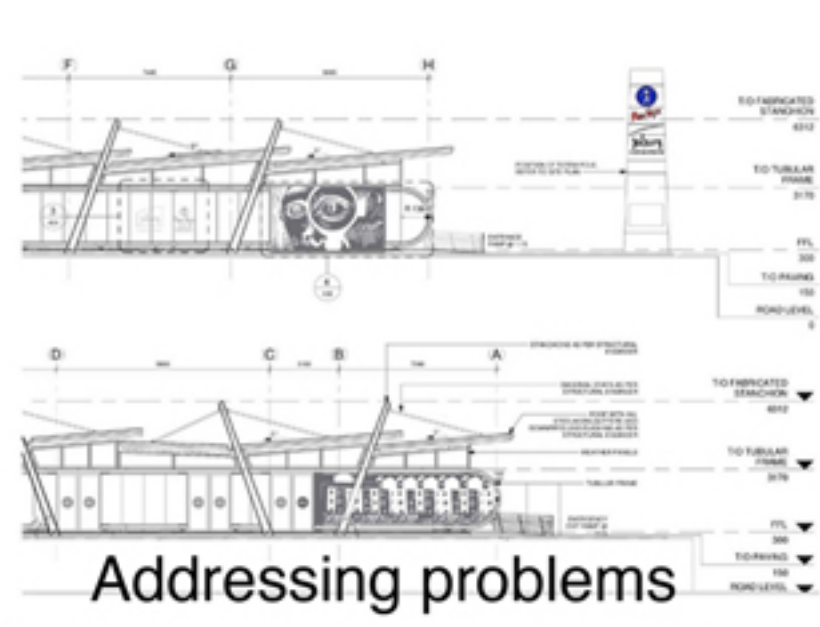
(Greg McQueen; 2018: 22.)

(Figure 32: Illustration of the Re Ya Vaya system in Johannesburg, 2019: Author.)

Johburg



Rea Vaya



(Figure 33: Illustration 2 of the Re Ya Vaya system in Johannesburg, 2019; Author.)

Precedent study 1

Bergen, Norway

Project : Collective Terminal Lagoon
BRT SYSTEM

(Figure 34: Illustration of the Bergen BRT system Norway, 2019: Author.)





The project is combined with a city railway system.
The DESIGN connects with the terminal.

The investigation looks at the RELATIONSHIP
between:

Public space
Private space
Private

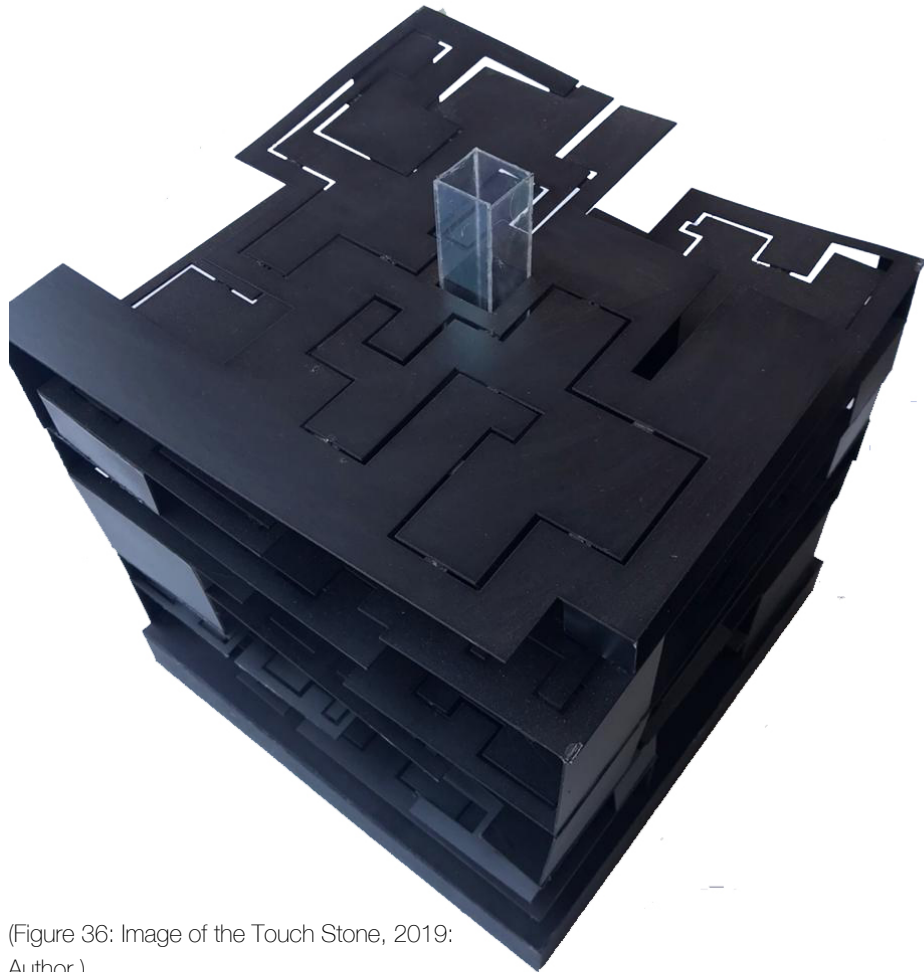
The Cubus Architectural group

Project : Collective Terminal Lagoon
Client : Light Rail Office
Place : Bergen, Norway
Type : Bus Interminal
Size : 1000 m²
Year : 2013

Precedent study 2

(Figure 35: Illustration 2 of the Bergen BRT system Norway, 2019: Author.)

Touch stone

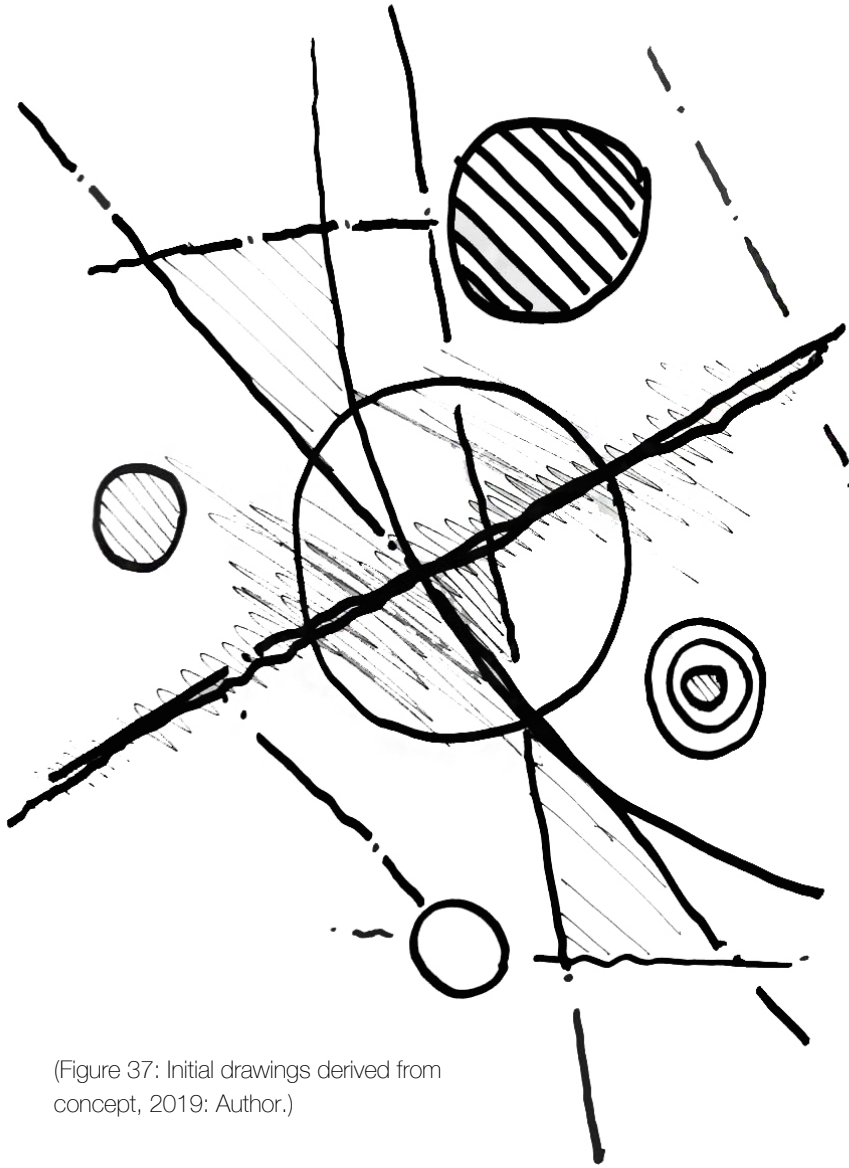


(Figure 36: Image of the Touch Stone, 2019:
Author.)

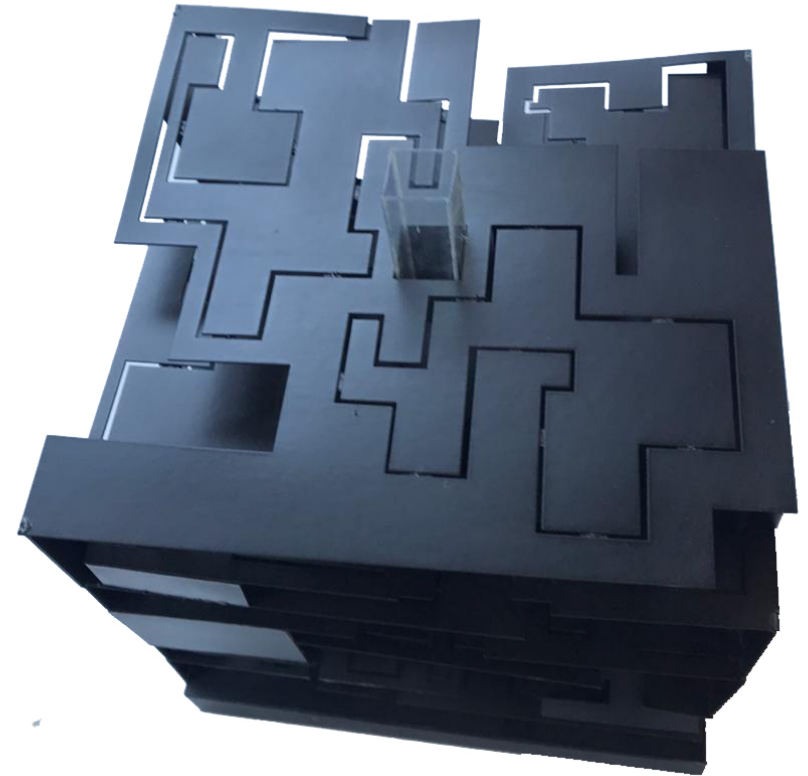
The Touchstone represents a re-interpretation of the analysed Bloemfontein topographical layout. The transparent lines that are imbedded within the black platform represent the unnoticed invisible boundaries.

The transparent square tube within the centre of the object represents the light and connectivity the BRT system brings to the city. All the patterns are distinct and unique as they are perceived on the landscape. The formed boundaries are induced by the behavioural patterns of the disparate districts, hence they portray particular characteristics.

Touch stone



(Figure 37: Initial drawings derived from concept, 2019: Author.)



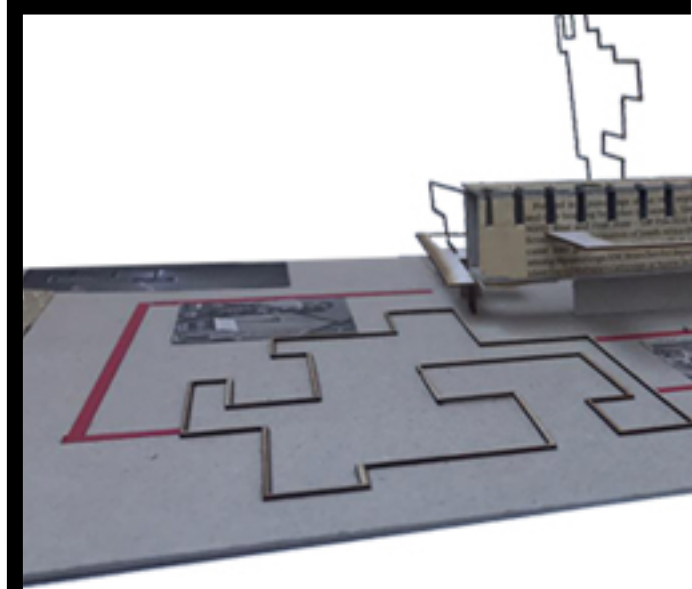
(Figure 38: Image of the Touch Stone 2, 2019: Author.)

Concept 1

Represents the amalgamation of old and new. The dialogue between the existing and the architectural interventions proposed both with the proposed building and the macro context.

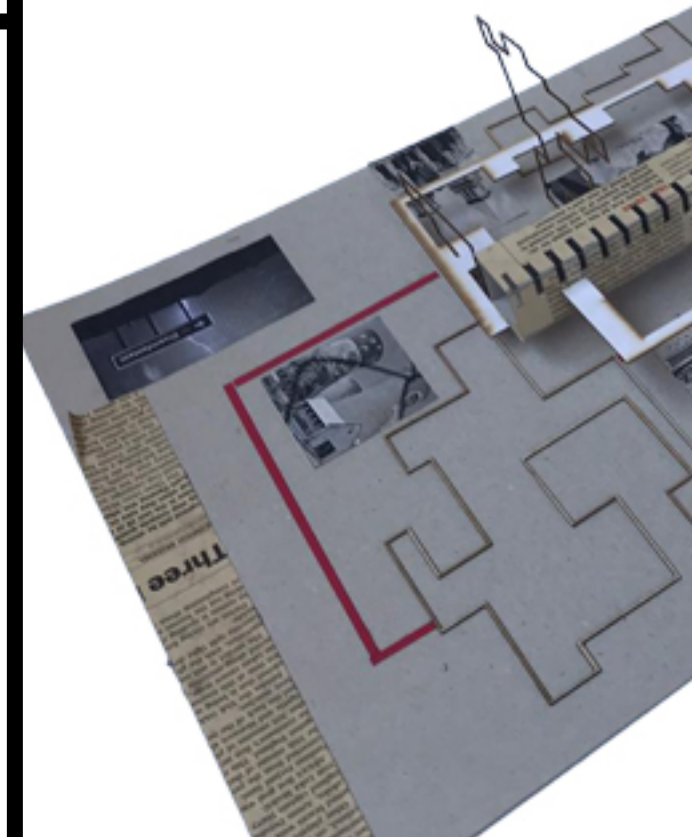


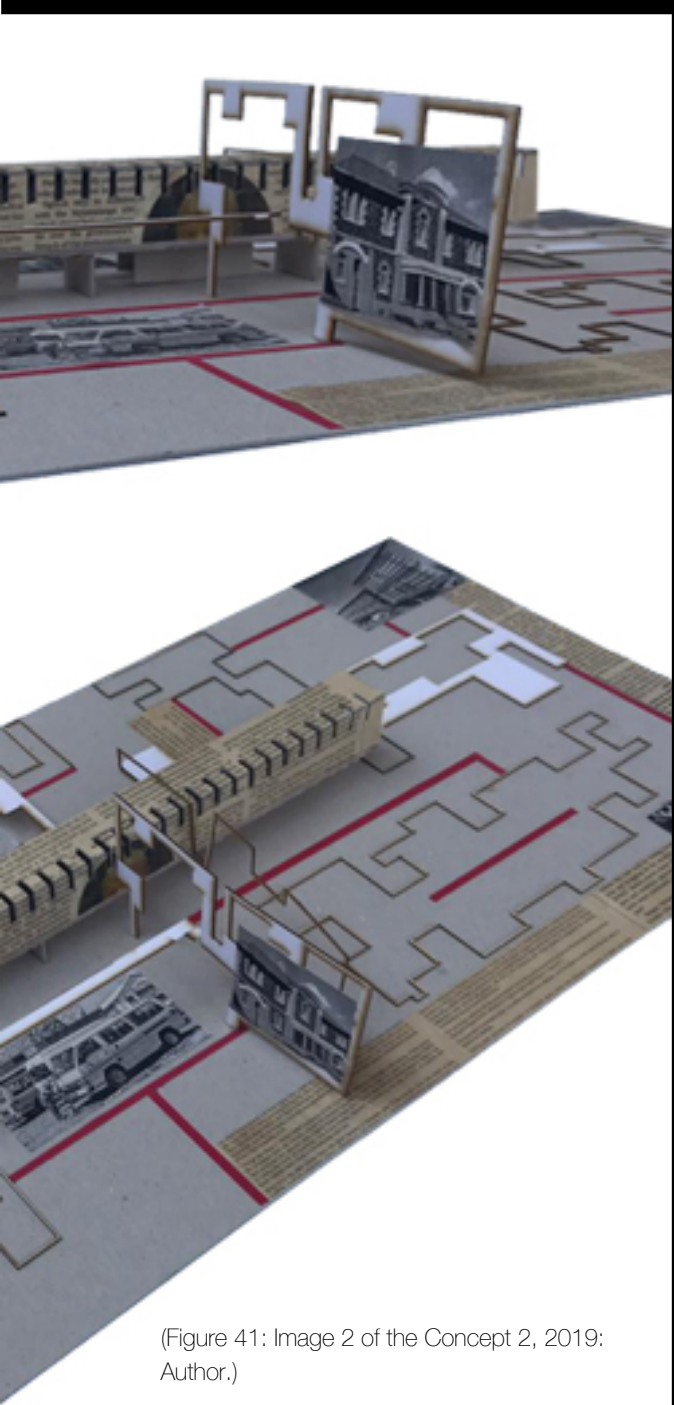
(Figure 39: Image of Concept 1, 2019: Author.)



(Figure 40: Image of Concept 2, 2019: Author.)

Concept 2

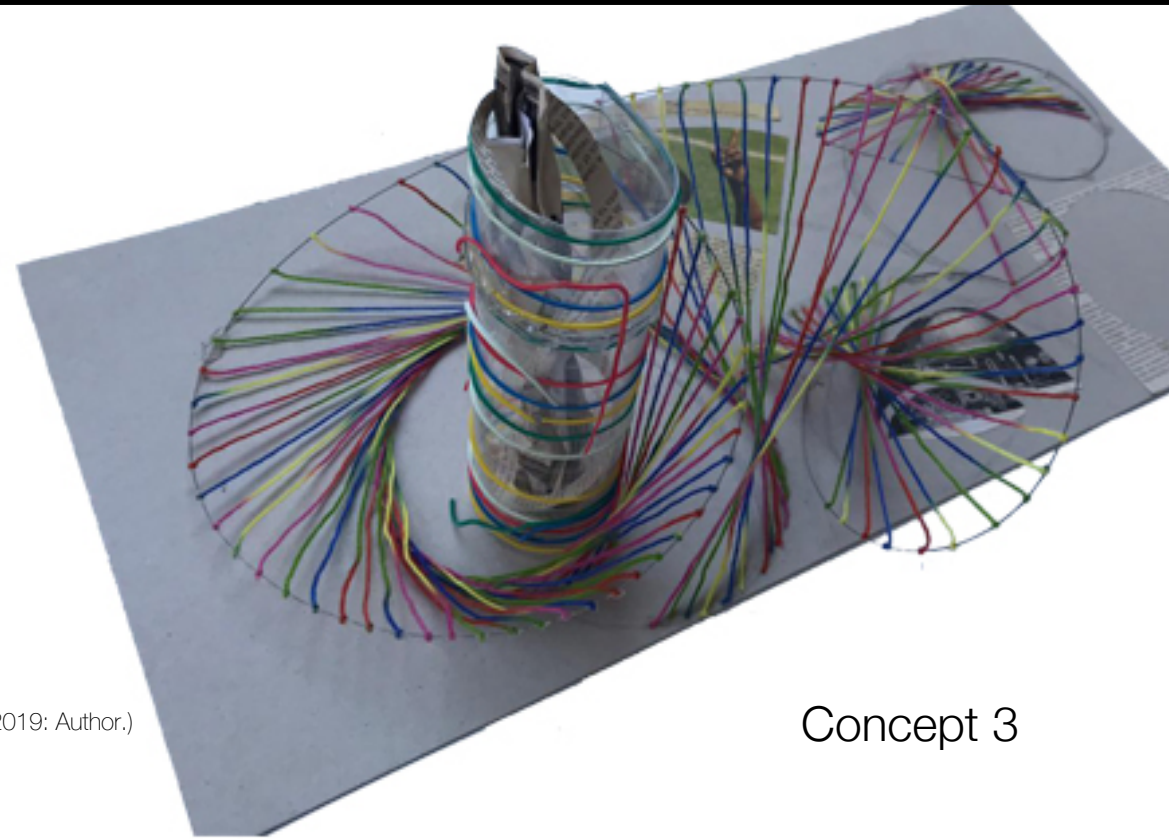




(Figure 41: Image 2 of the Concept 2, 2019: Author.)

Selected

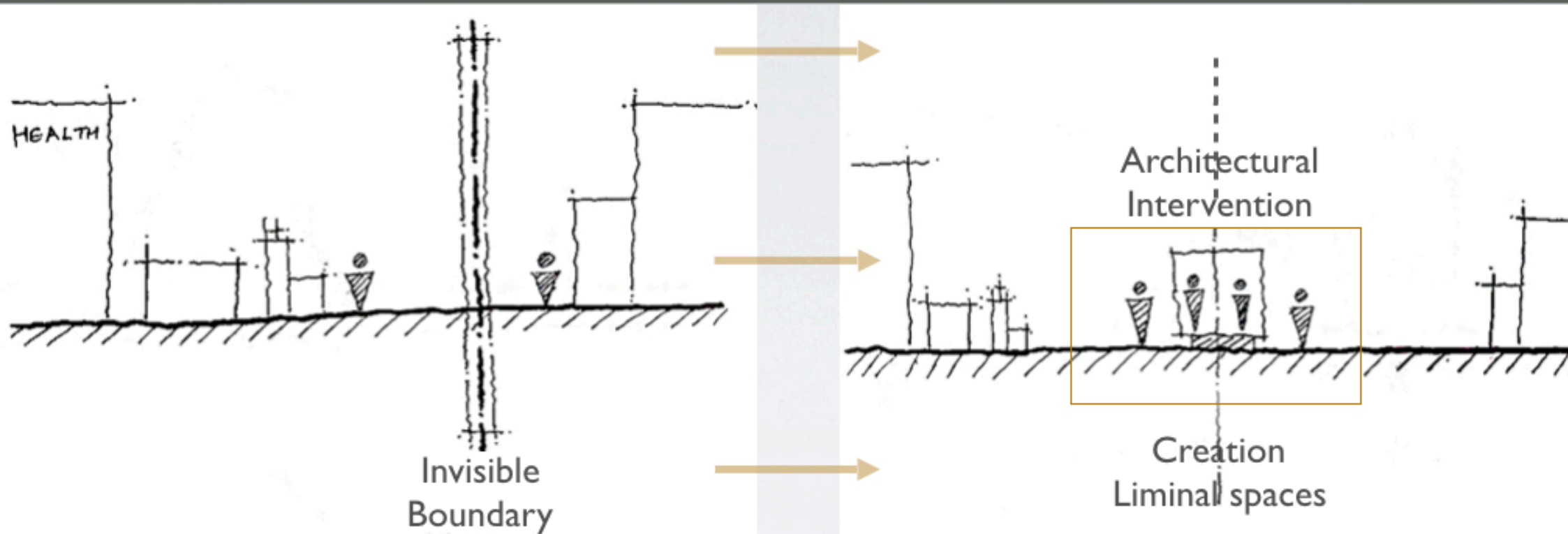
Represents the culmination of all the elements that composes the city construct being merged by proposed BRT system to make a better city outcome.



(Figure 42: Image of Concept 3, 2019: Author.)

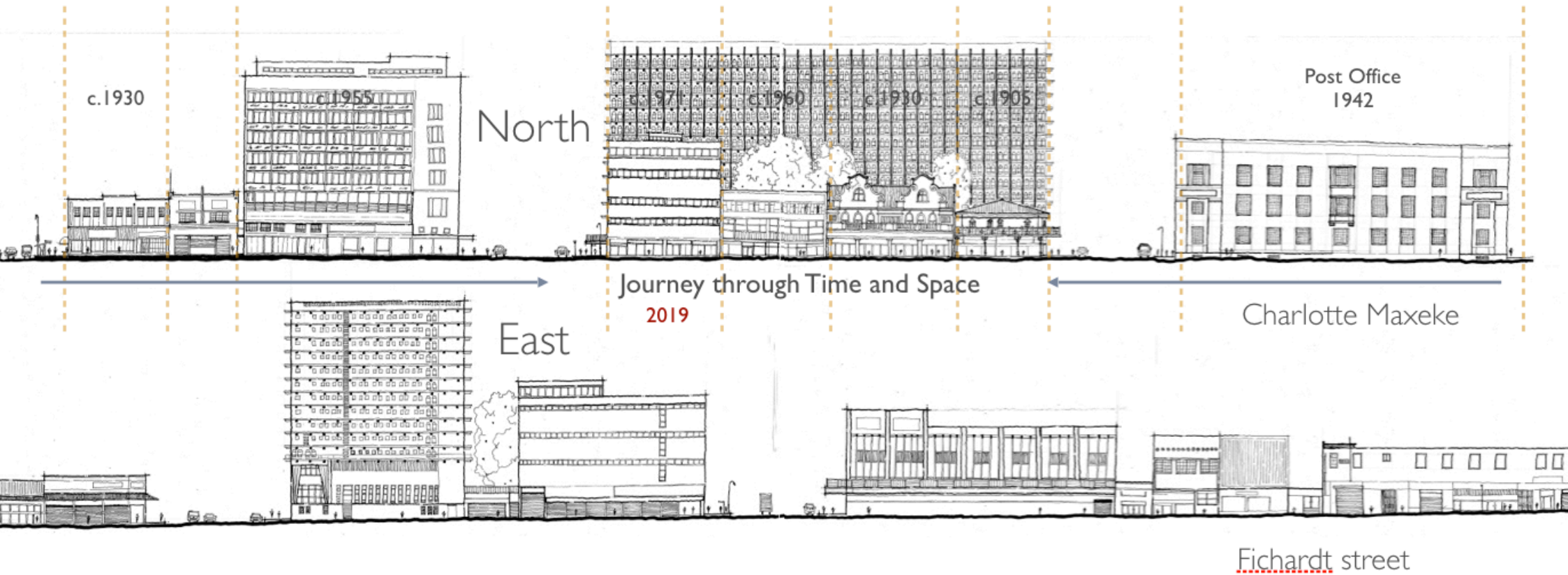
Concept 3

Why is the focus on Boundaries?



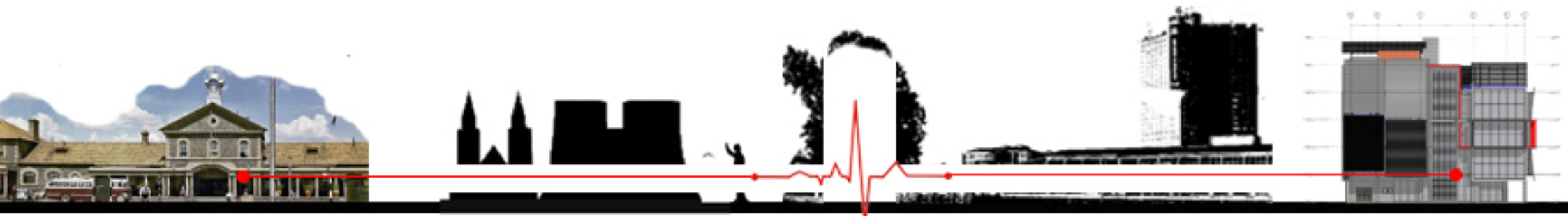
The city's Invisible Boundary
Socially Induced
People use facilities
closest to HOME

Interactive possibilities
created by Architectural
intervention

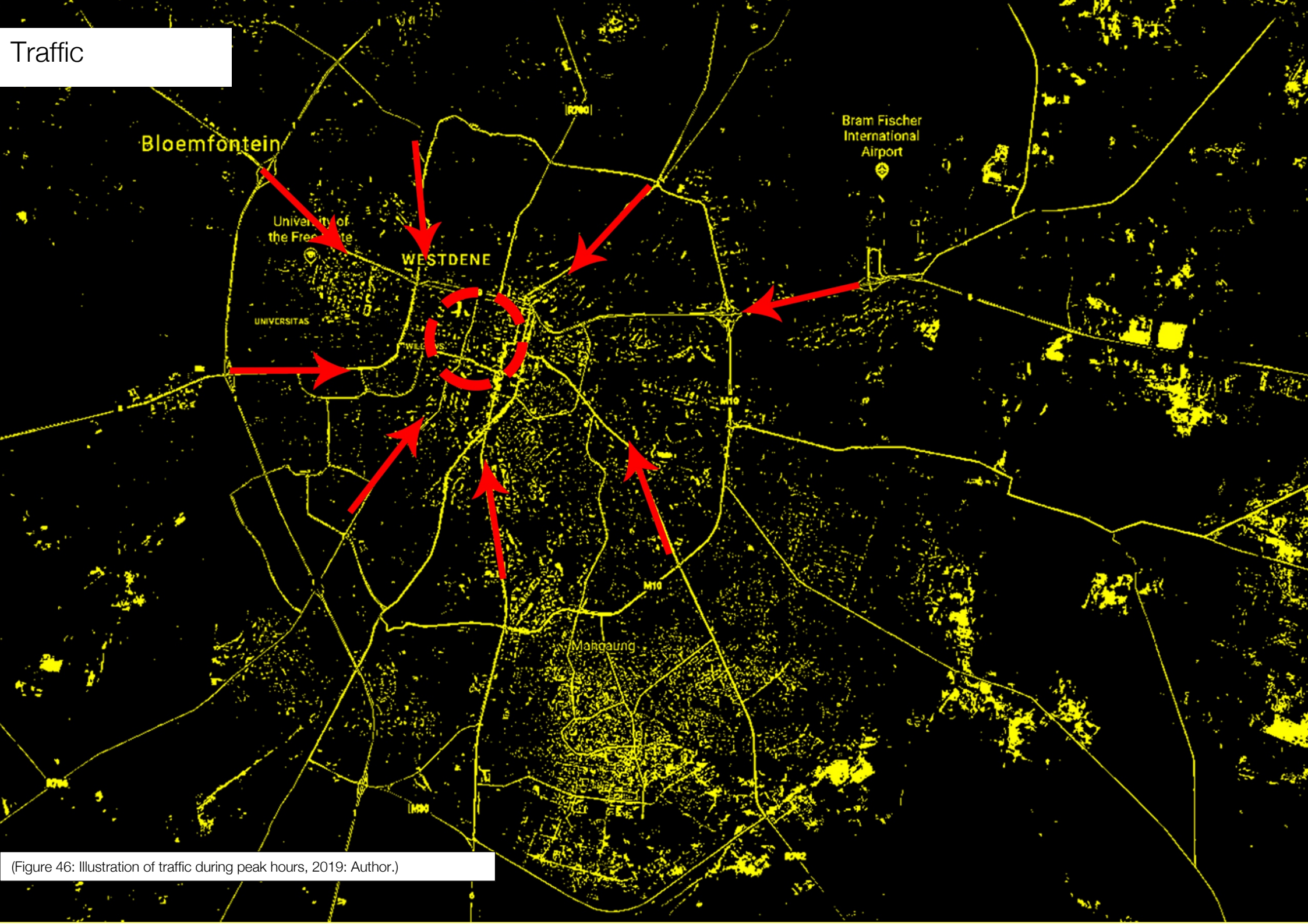


(Figure 44: Illustration of timeline, 2019: Author.)

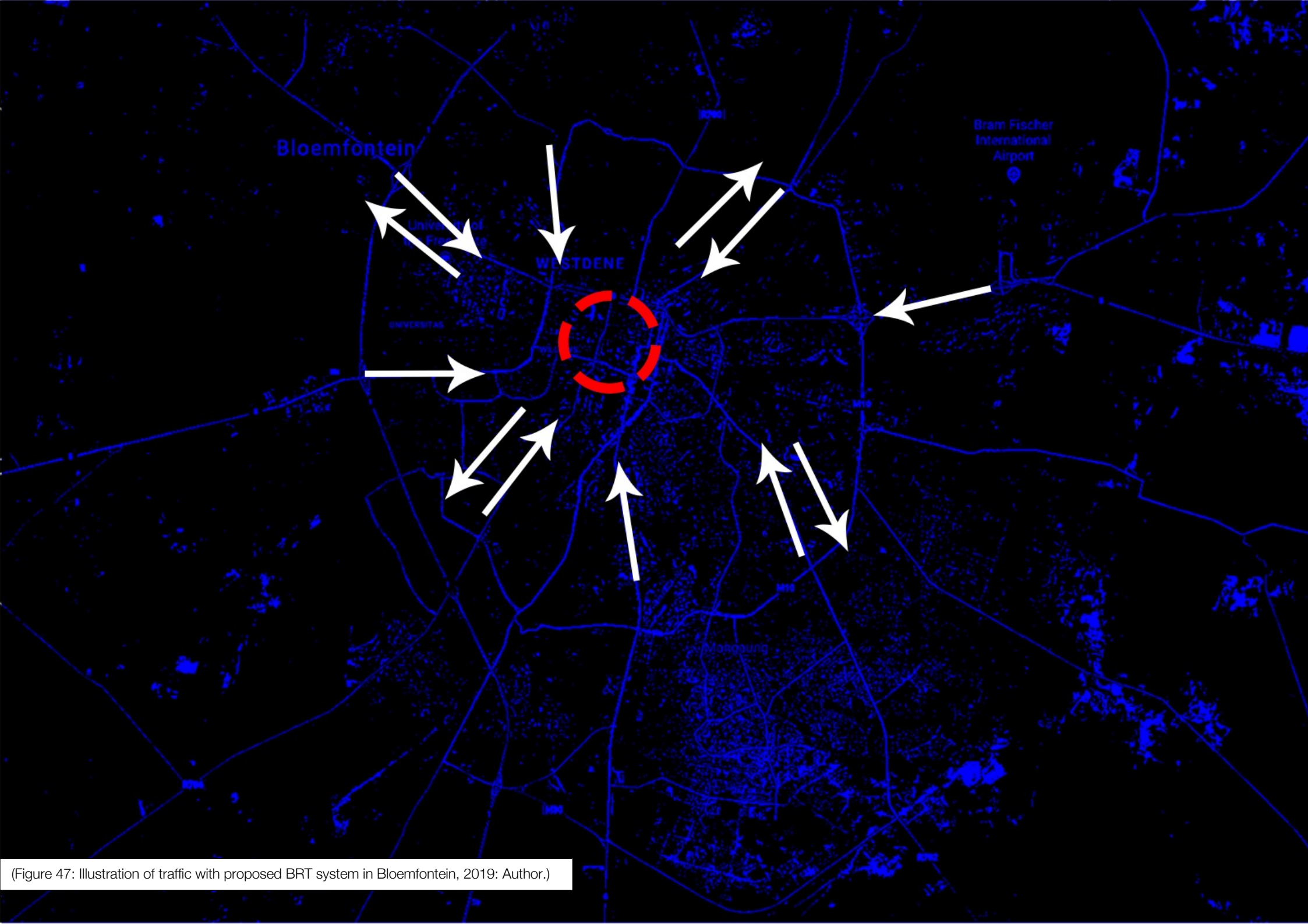
(Figure 45: Illustration of the passage of time, 2019: Author.)



Traffic



(Figure 46: Illustration of traffic during peak hours, 2019: Author.)



(Figure 47: Illustration of traffic with proposed BRT system in Bloemfontein, 2019: Author.)



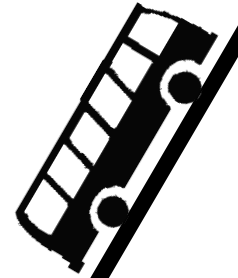
(Figure 48: Image of one of the scenic moments in Bloemfontein, 2019: Author.)



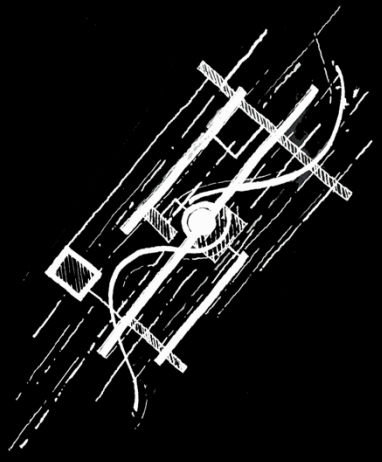
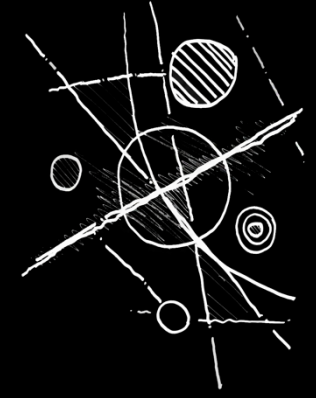
active

Part 3: Project rational

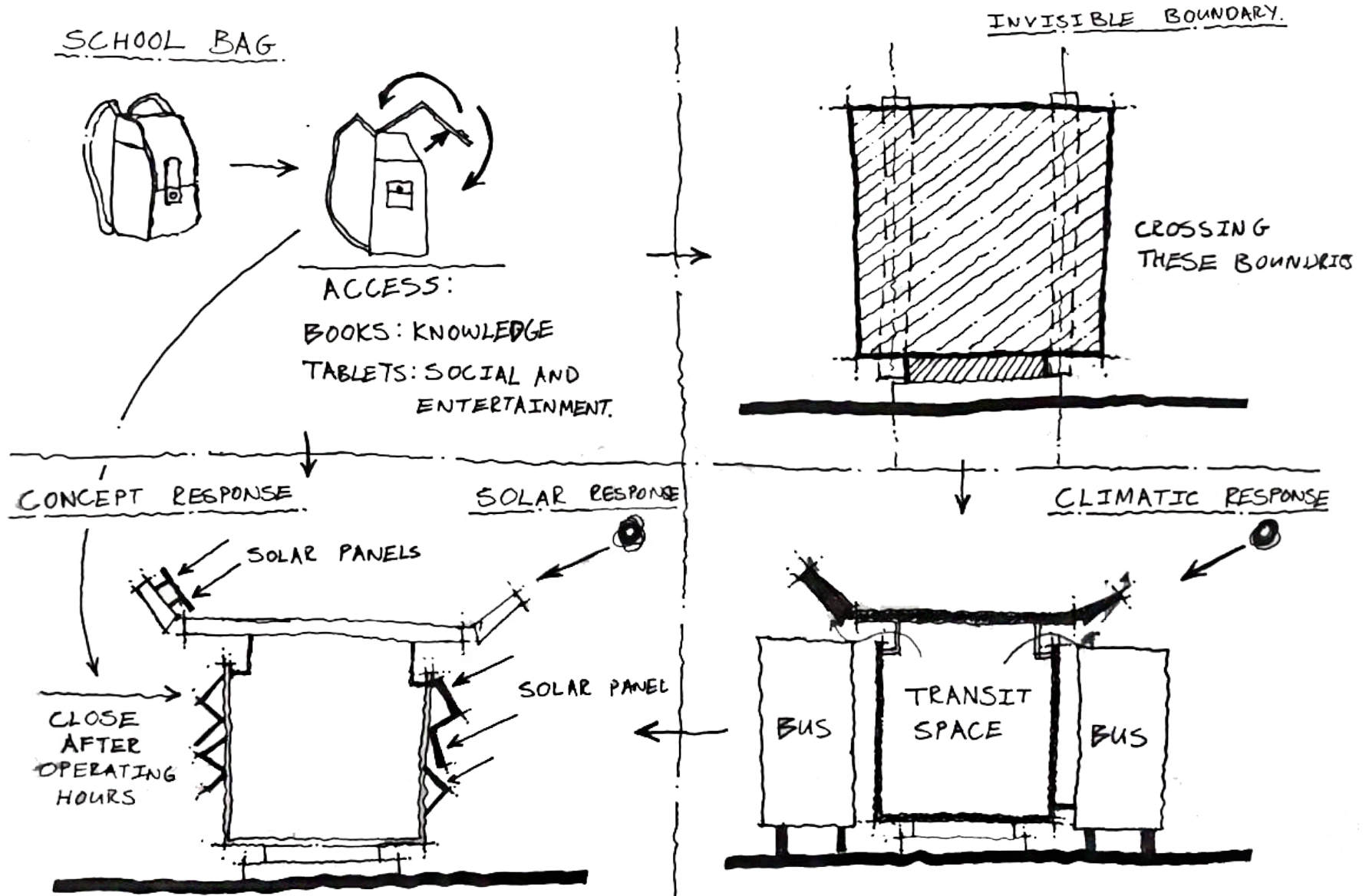
- Inception and Thought Process
- Maturity of Design
- Spatial Planning
- Concluding Result- Ongoing



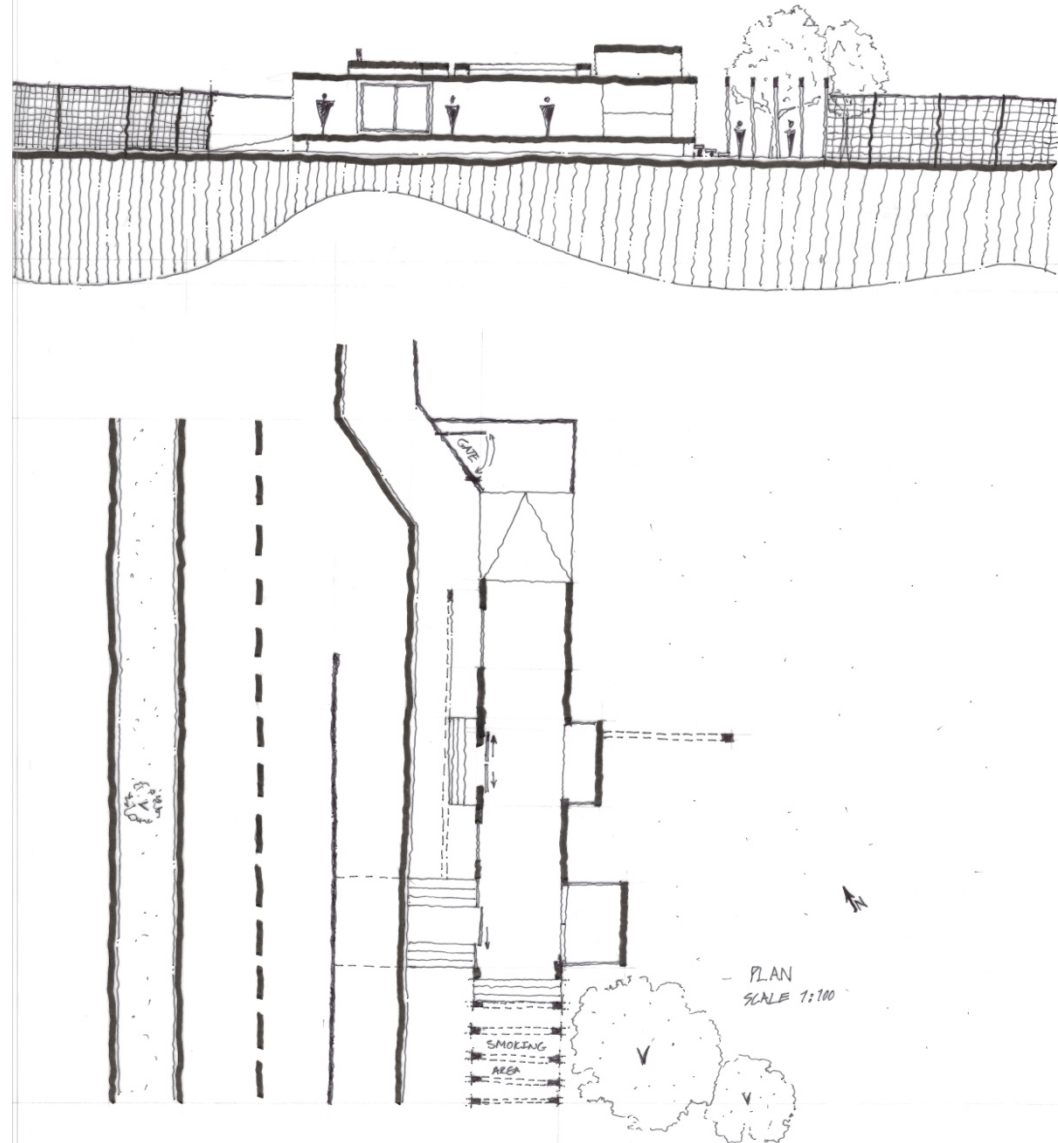
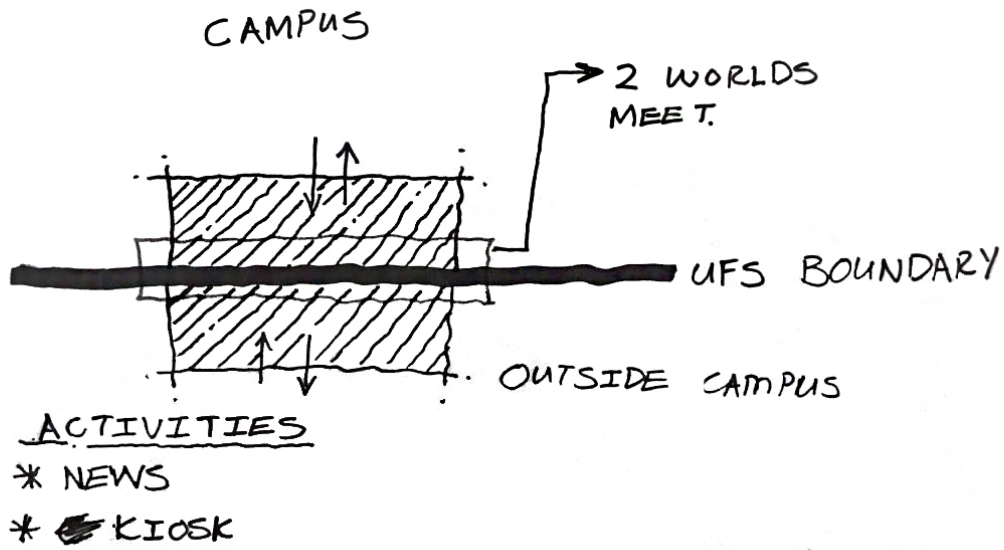
Our city is a film still in my memory
Growing more valuable with time
The white becoming a little more
golden with age



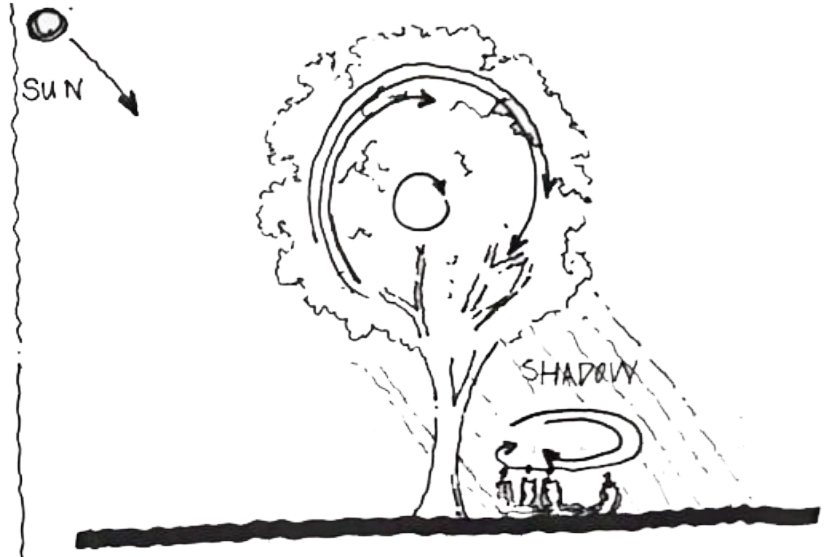
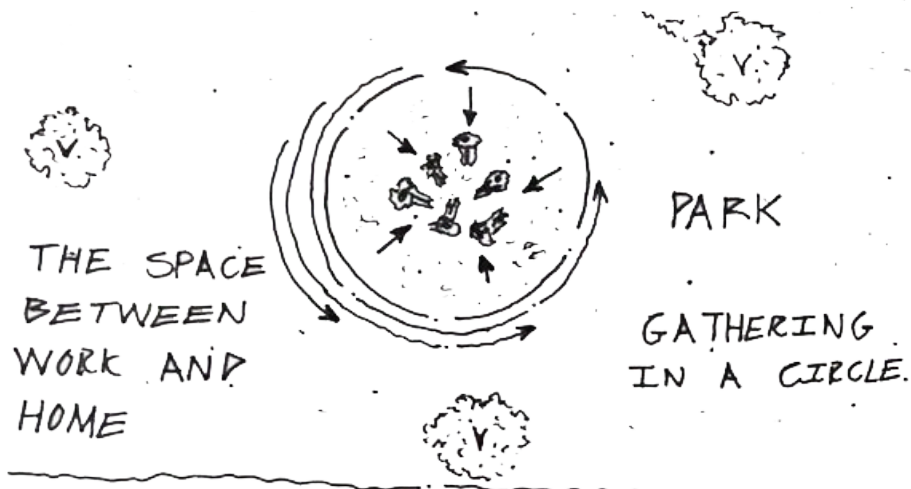
Conceptual Development, Universitas



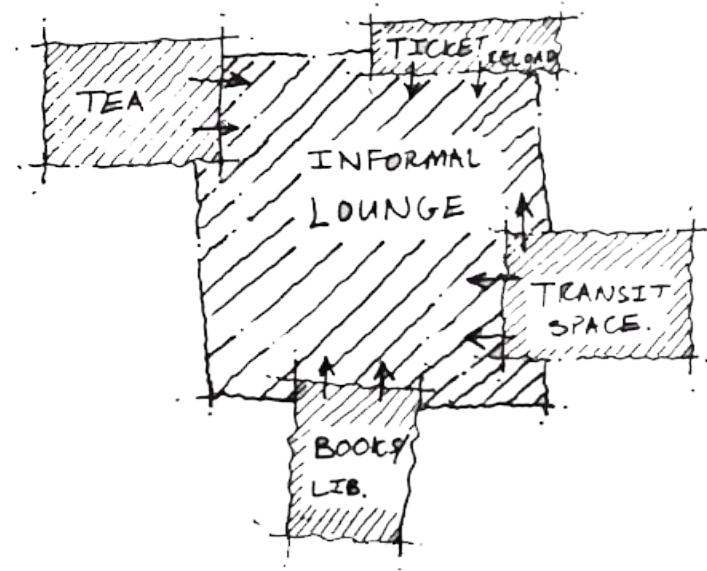
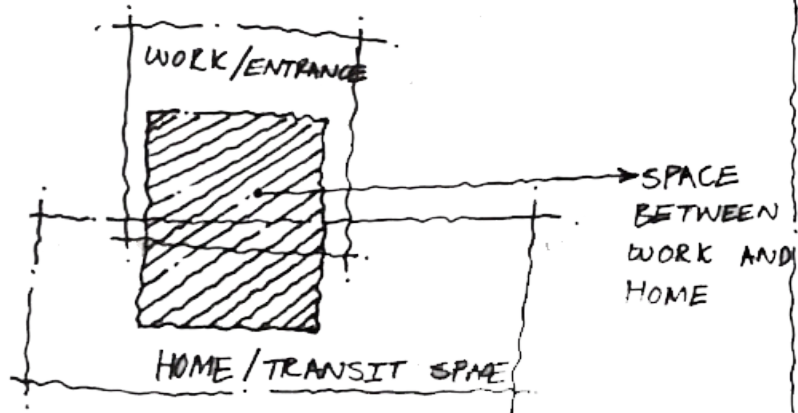
Universitas Transit space, UFS



Conceptual Development, Bayswater transit

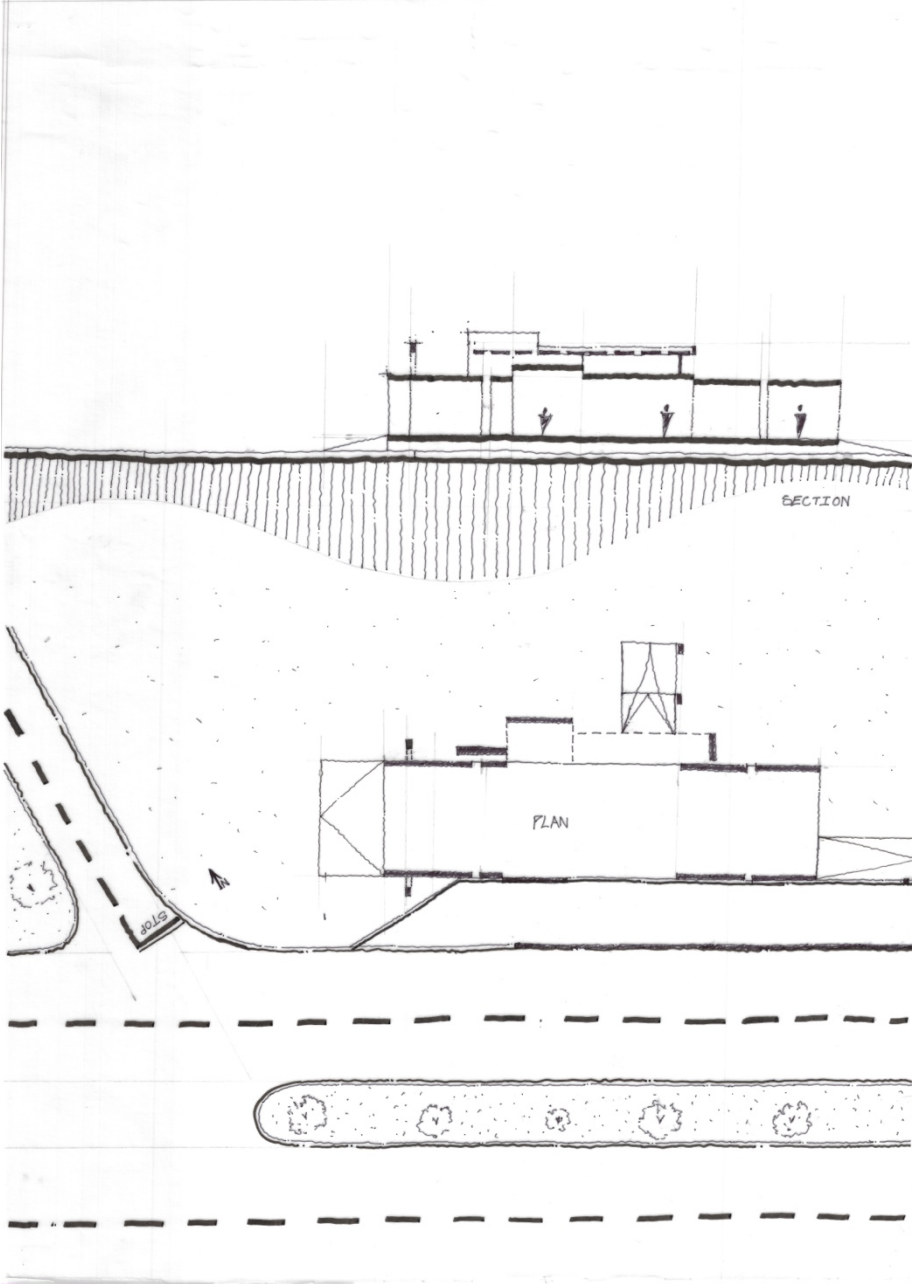


SPACE CONNECTED BY WORK AND HOME



* SPACE IS ONLY ACTIVE DURING TRAVELING

Bayswater Transit space



Bayswater Transit

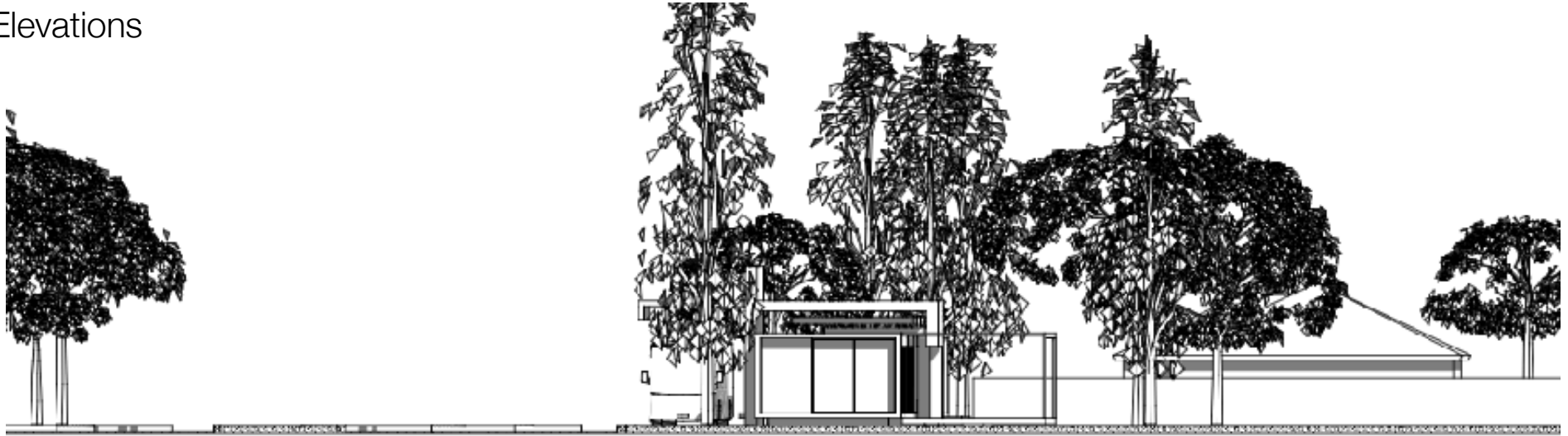


Sections

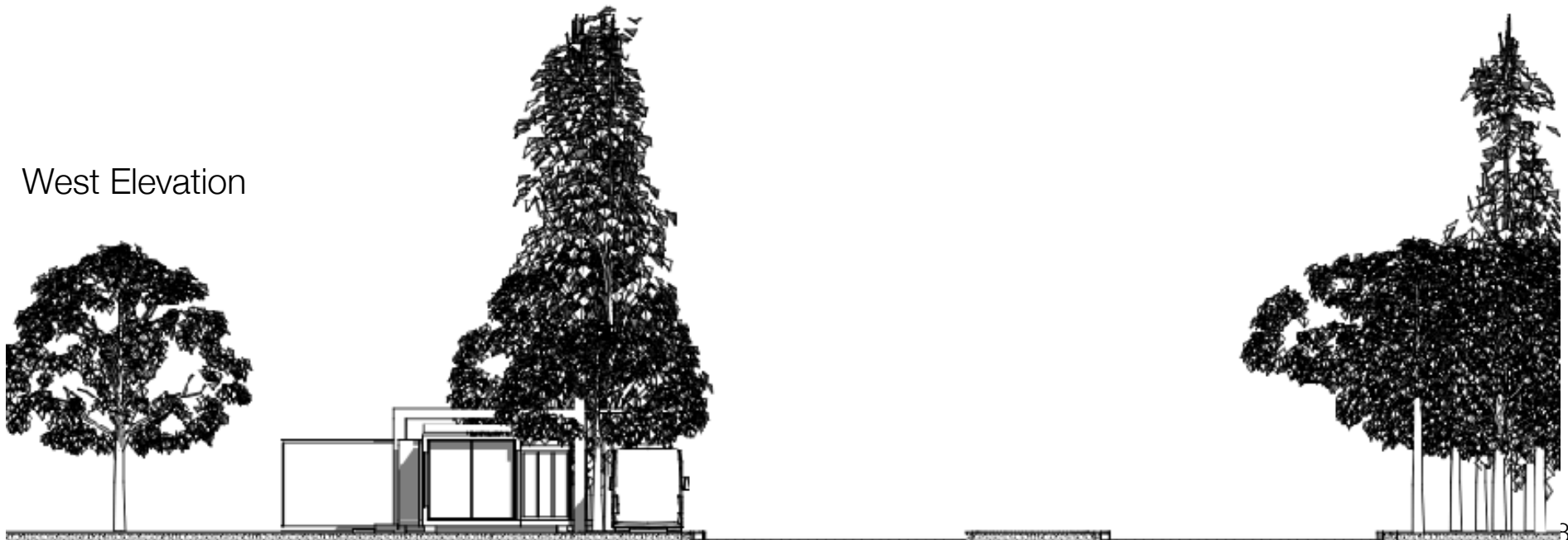




Elevations

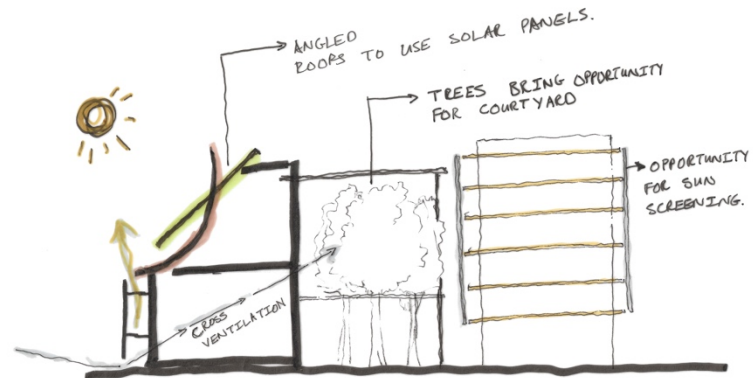
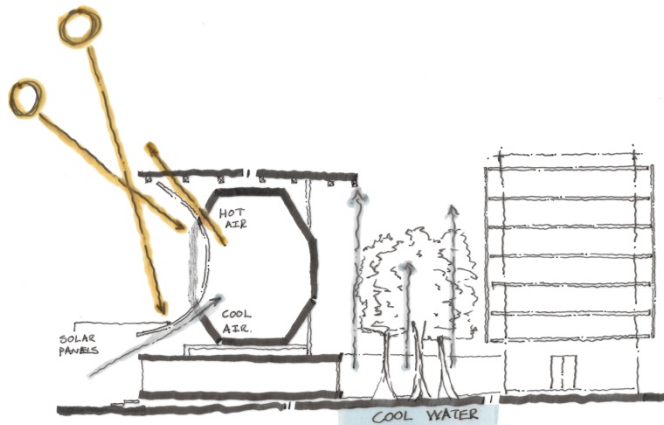
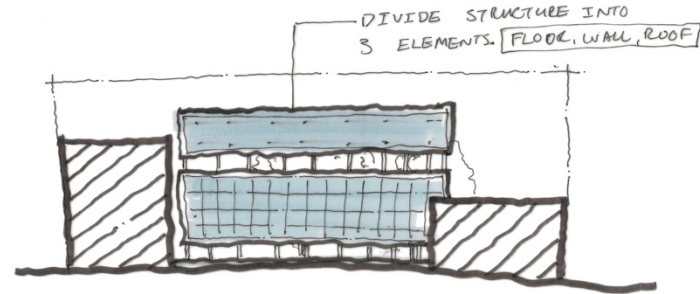
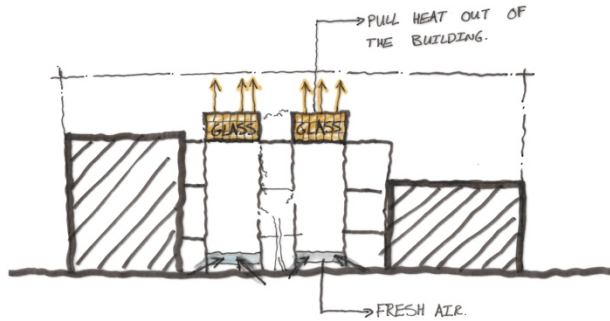


East Elevation

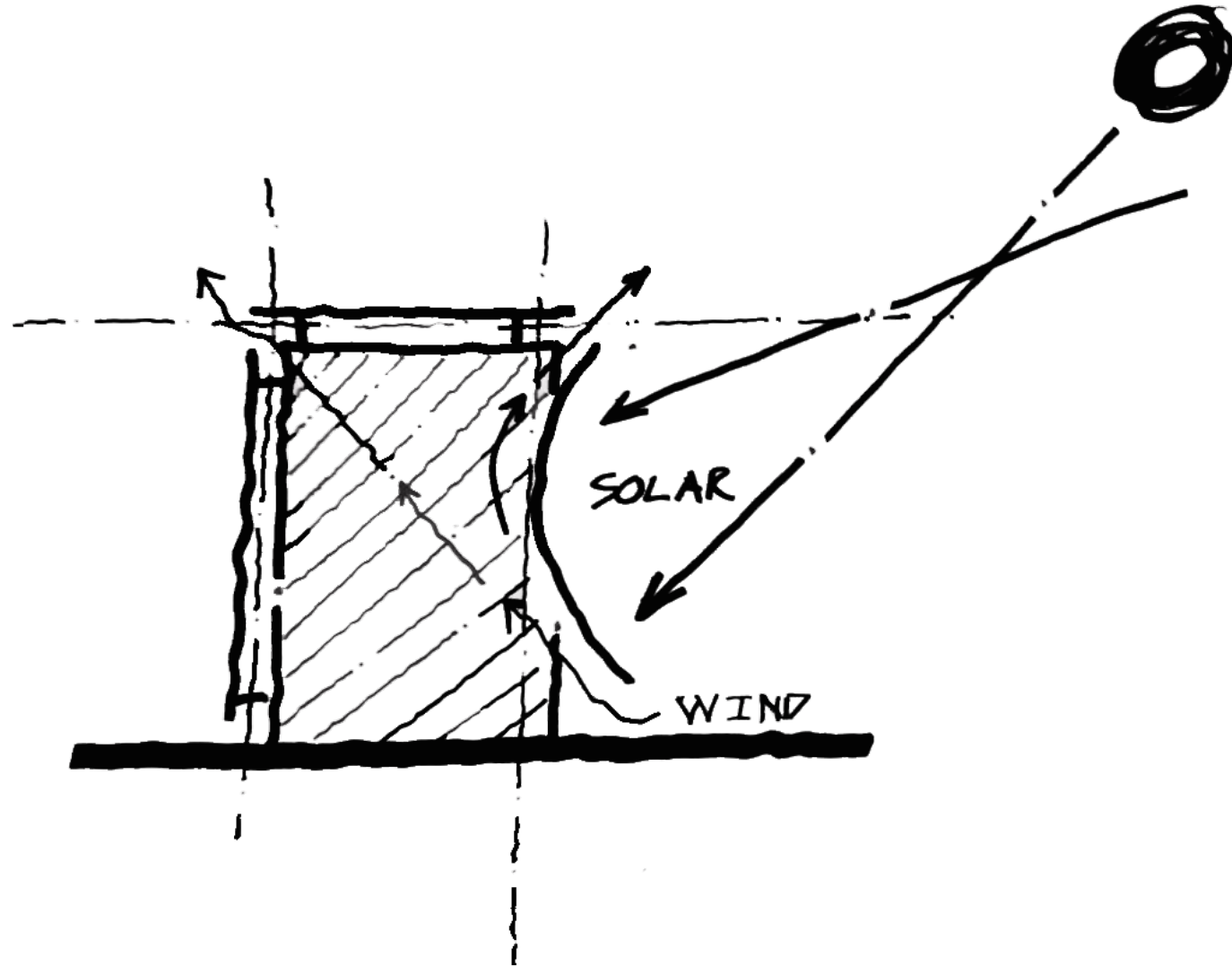


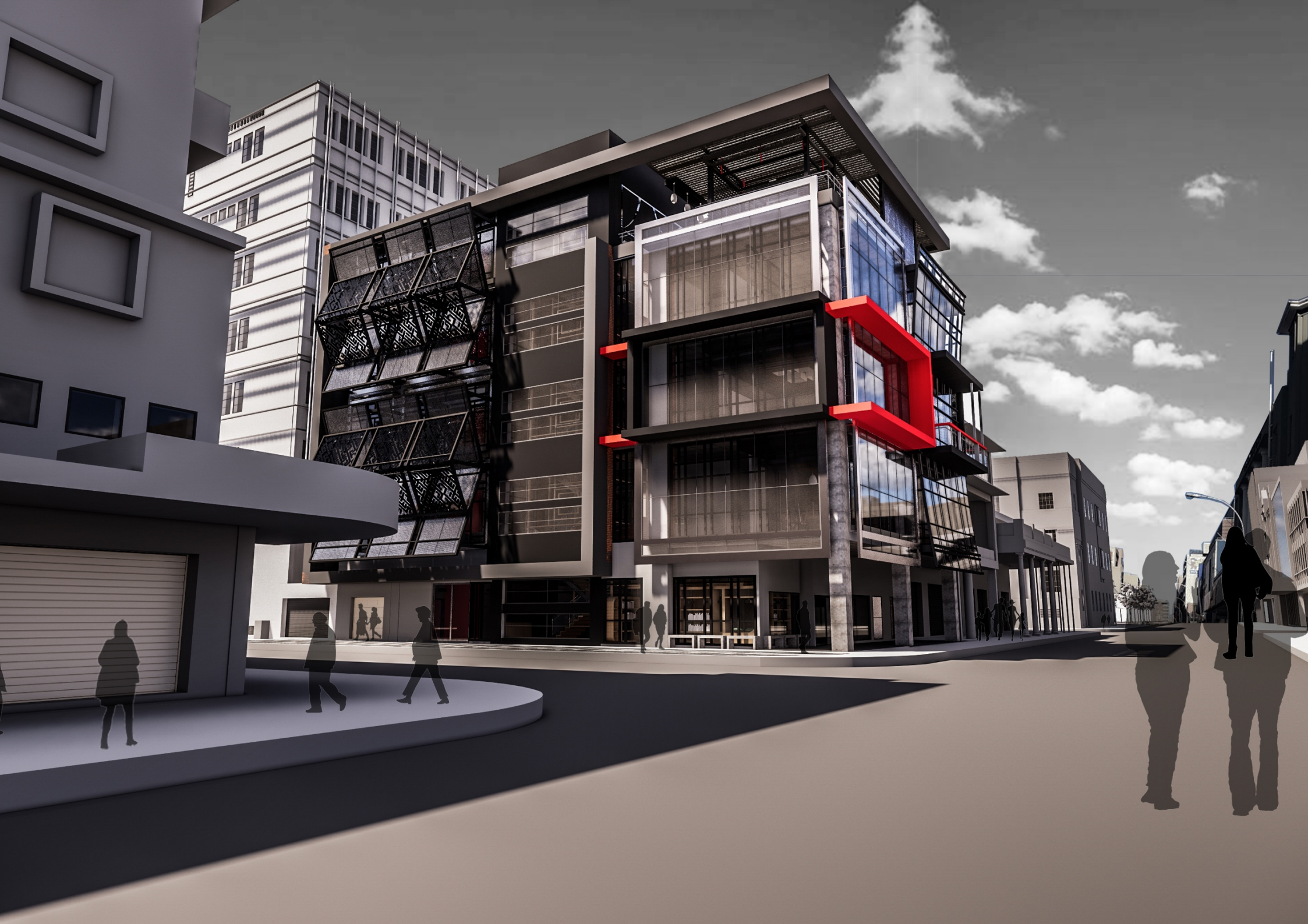
West Elevation

Conceptual Development, Control Office



Conceptual Development, Control Office





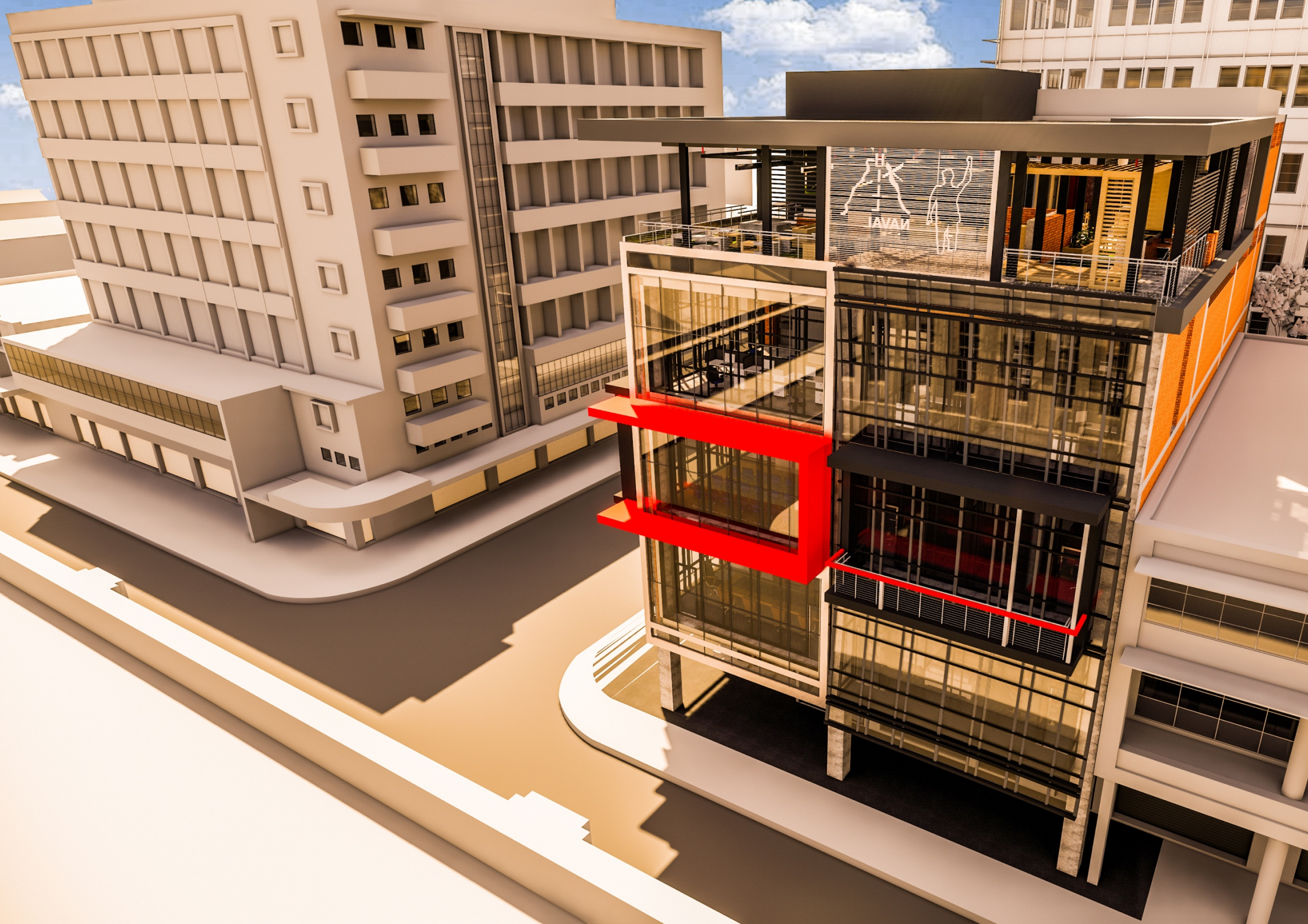


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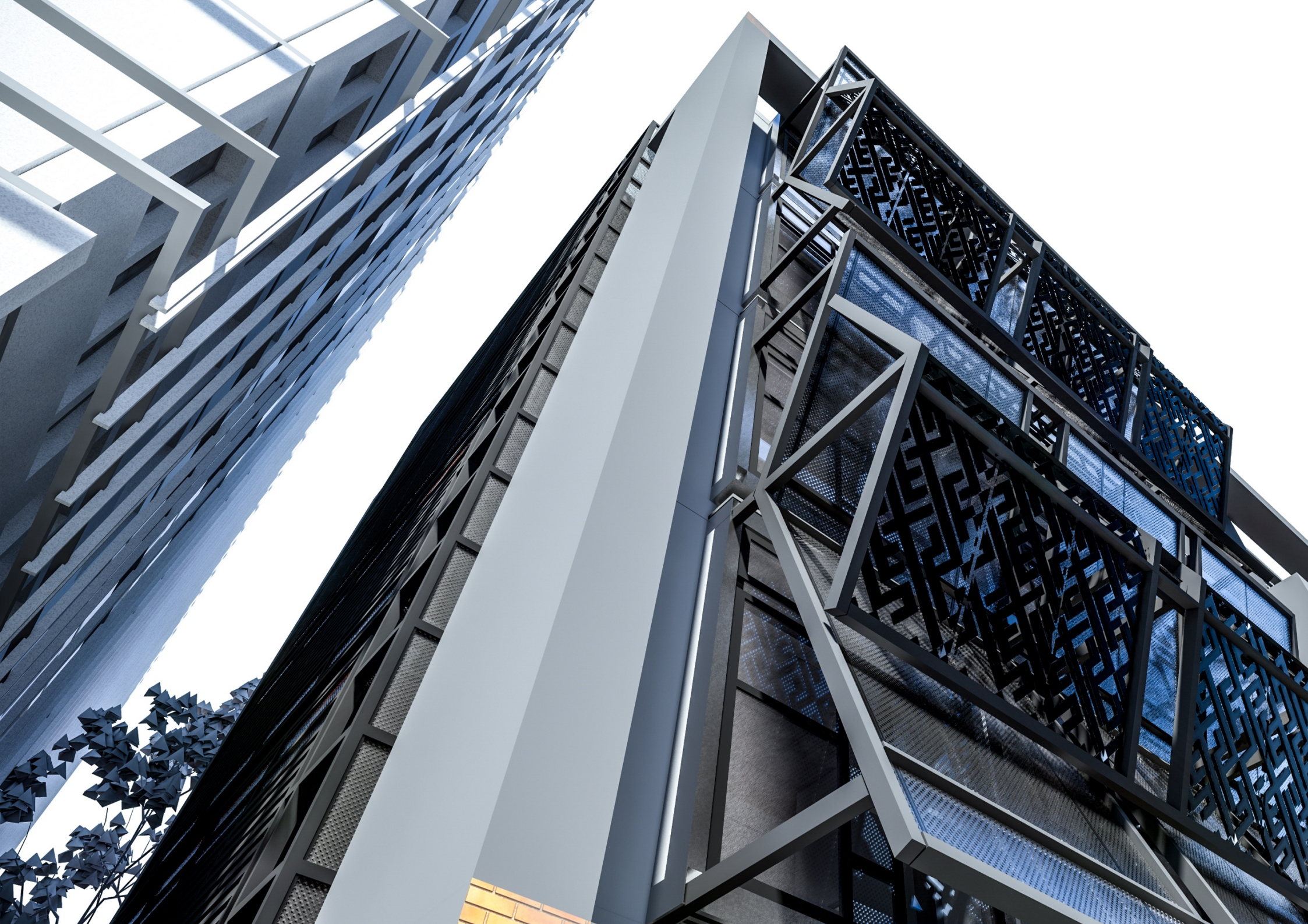
NOTIFICATION

TRIAL **VERSION**

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NOTIFICATION

TRIAL **VERSION**

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EAST ELEVATION



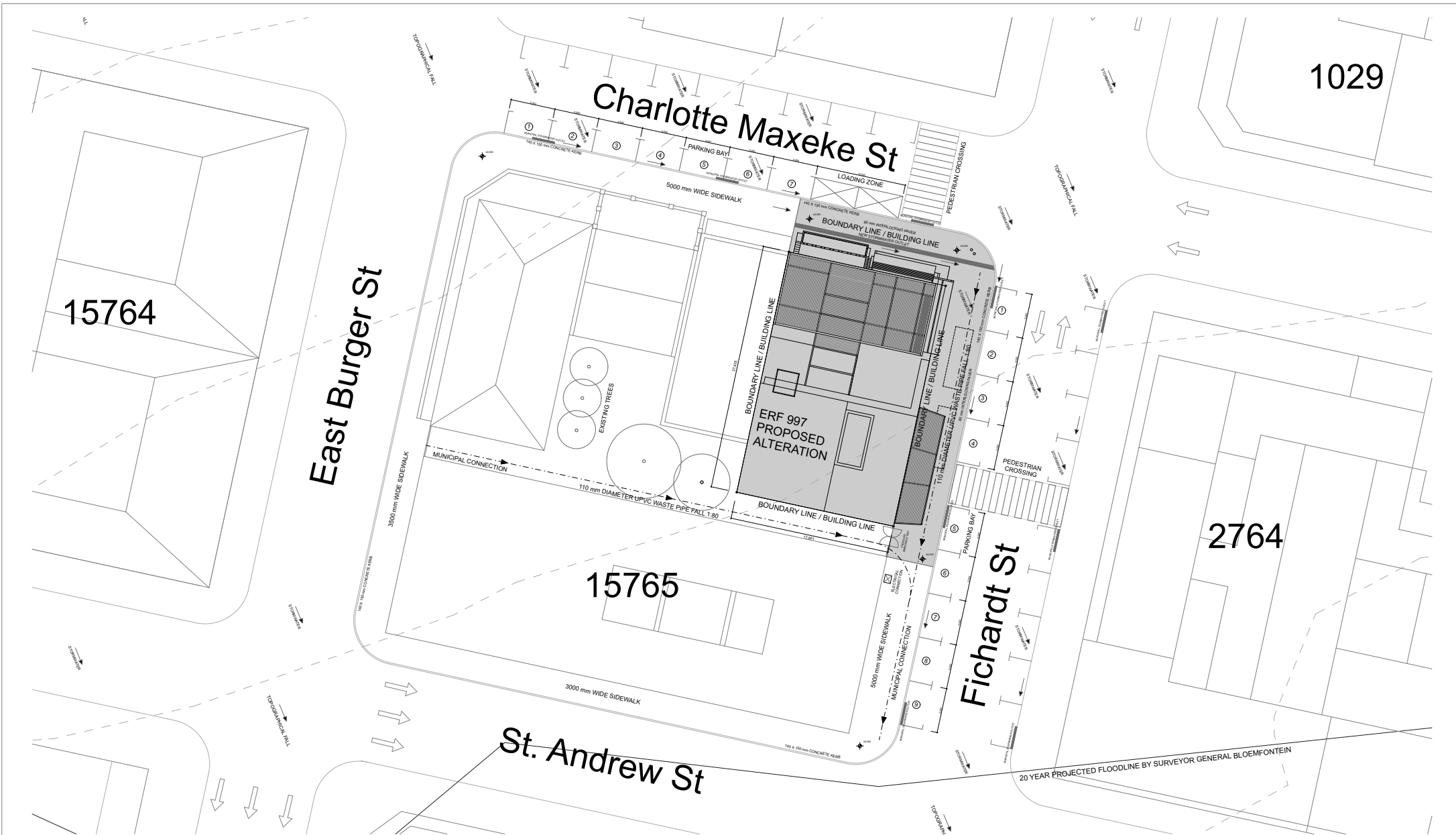
WEST ELEVATION



NORTH ELEVATION



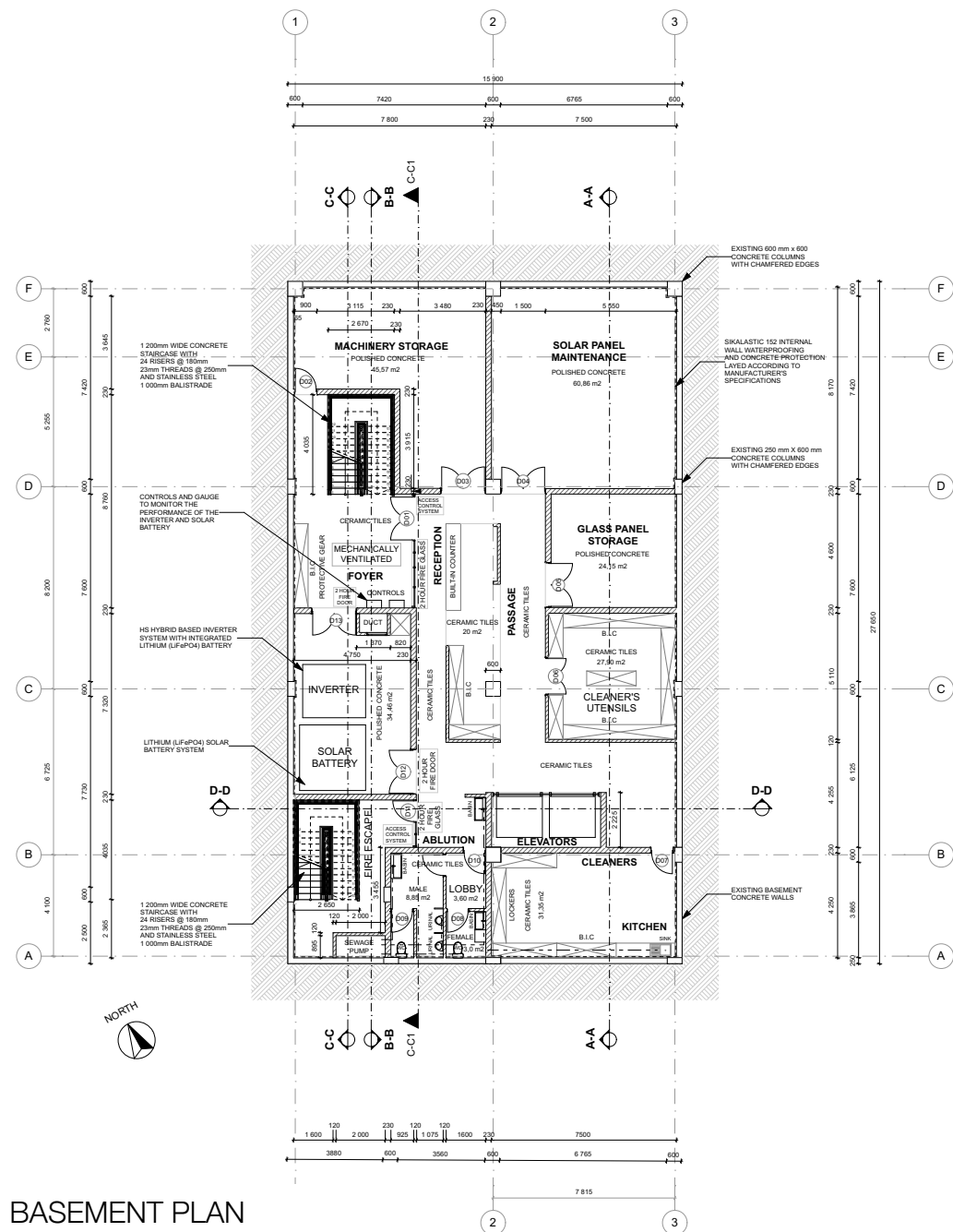
SECTION



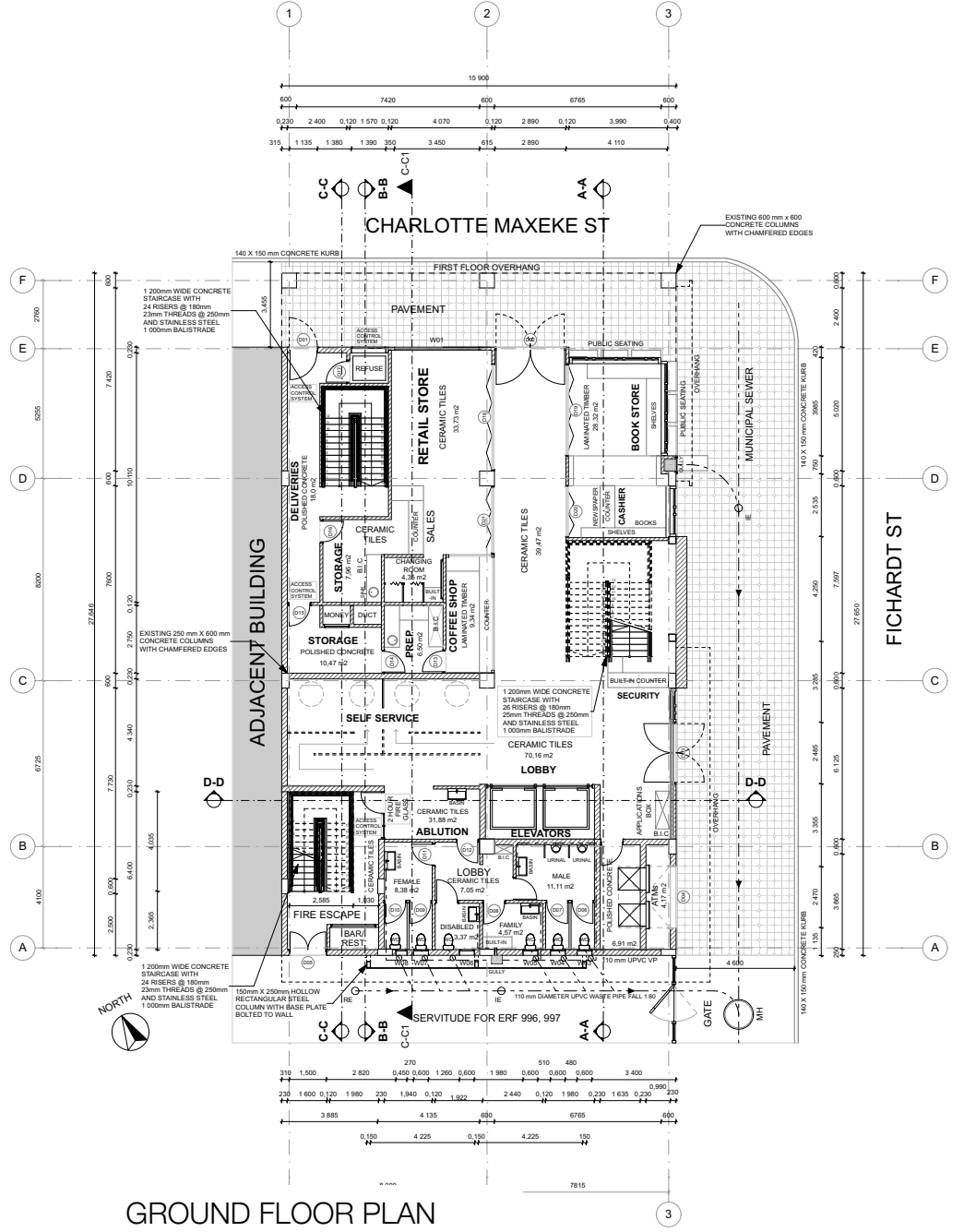
SITE PLAN
SCALE 1:200

PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS	DRAWING DESCRIPTION	DRAWING SCALE	DRAWN BY:	
PROPOSED NEW BRT SYSTEM ERF 997 CORNER OF CHARLOTTE MAXEKE & FICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN		SITE PLAN	SCALE 1:200	NAME	KETU @ B. NJANAGA
								STUDENT NO.	2011013832

FULL DESCRIPTIONS OF
TECHNICAL RESOLUTIONS
CAN BE FOUND IN THE
TECHNICAL REPORT



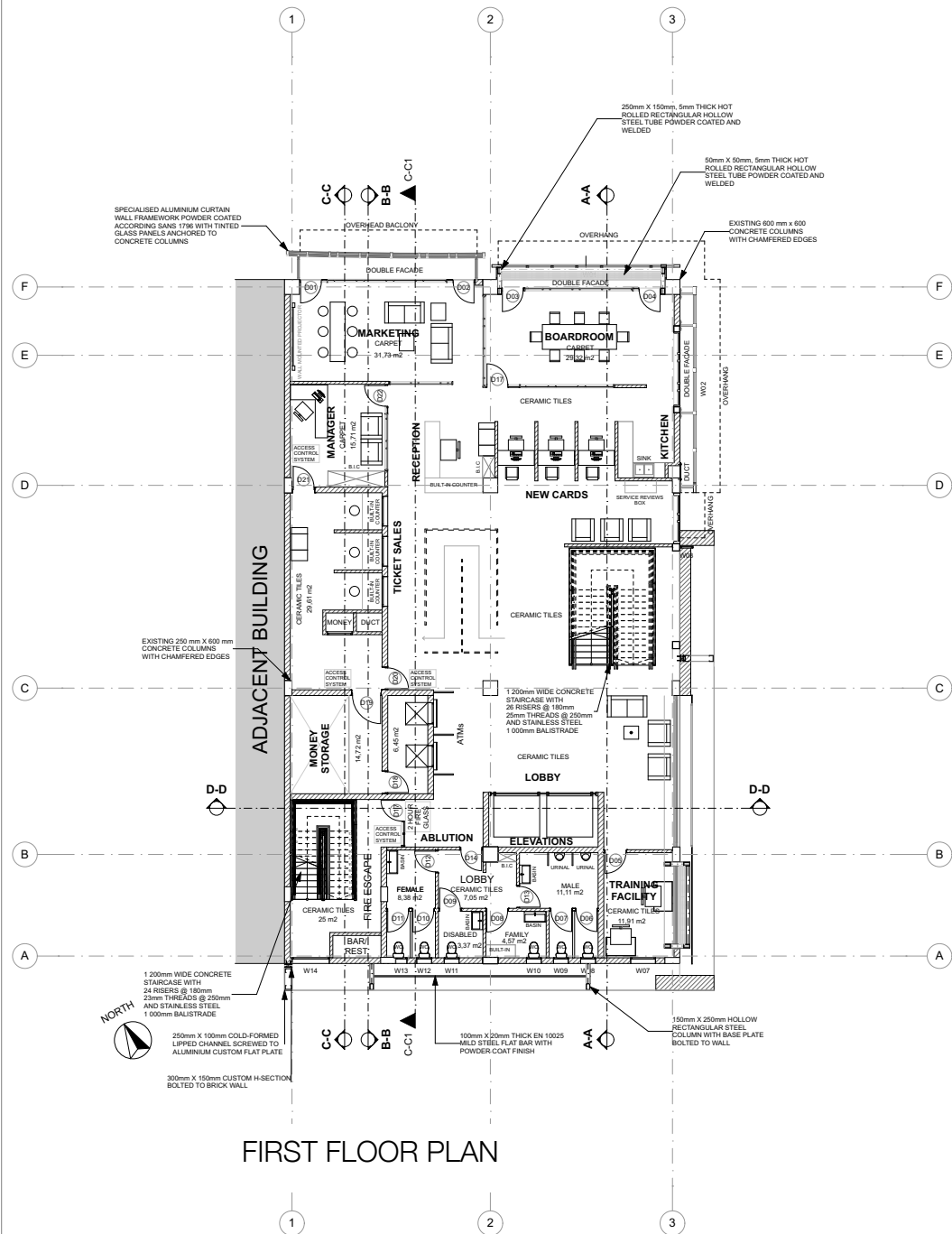
BASEMENT PLAN



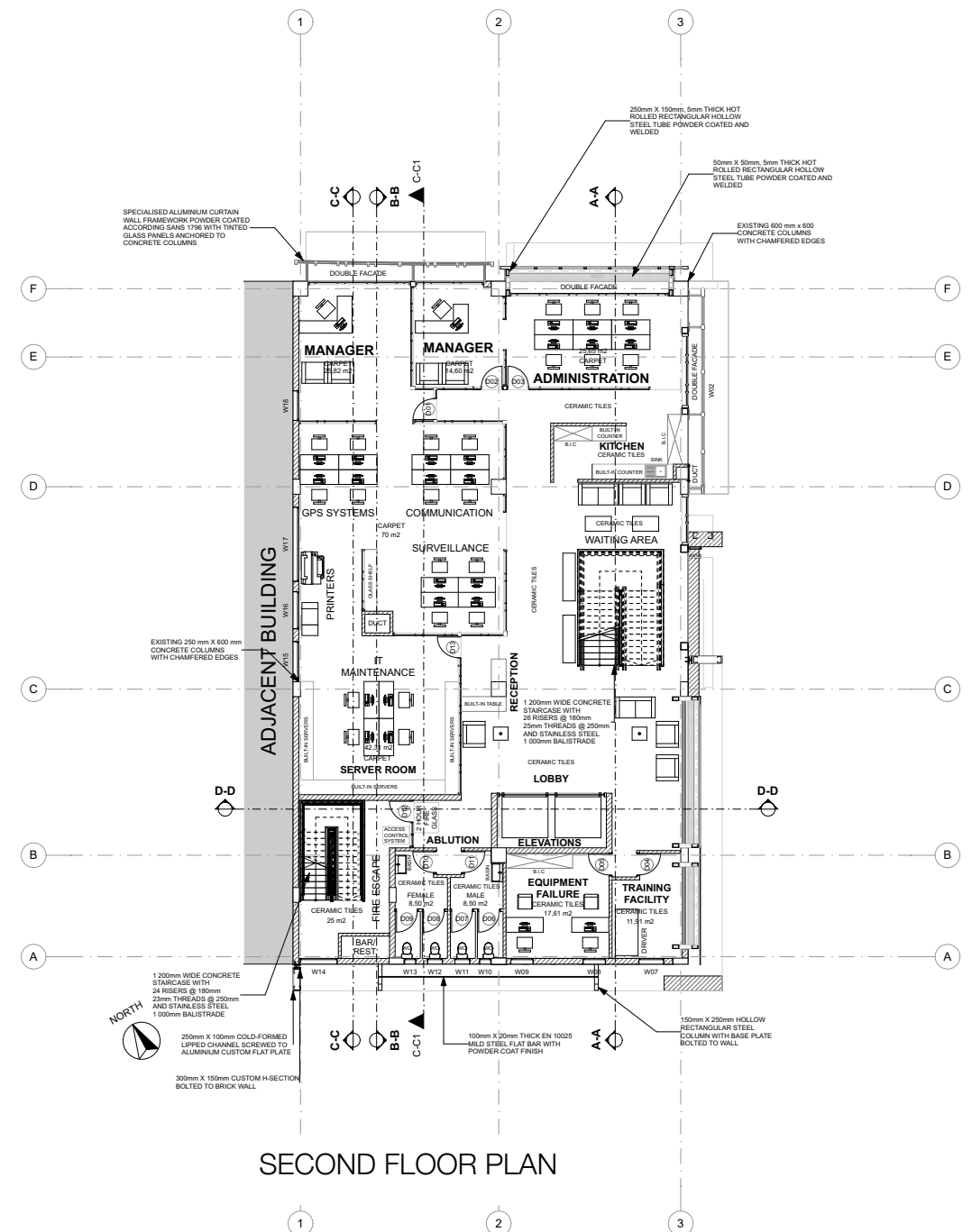
GROUND FLOOR PLAN

PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS	DRAWING DESCRIPTION	DRAWING SCALE	AUTHOR'S DETAILS
PROPOSED NEW BRT SYSTEM ERF 997 CORNER OF CHARLOTTE MAXEKE & FICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN		SECTION C-C	SCALE 1:100	NAME KUTUMI M. MANGA
						SECTION D-D	SCALE 1:100	STUDENT NO. 2011013832

FULL DESCRIPTIONS OF
TECHNICAL RESOLUTIONS
CAN BE FOUND IN THE
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FIRST FLOOR PLAN

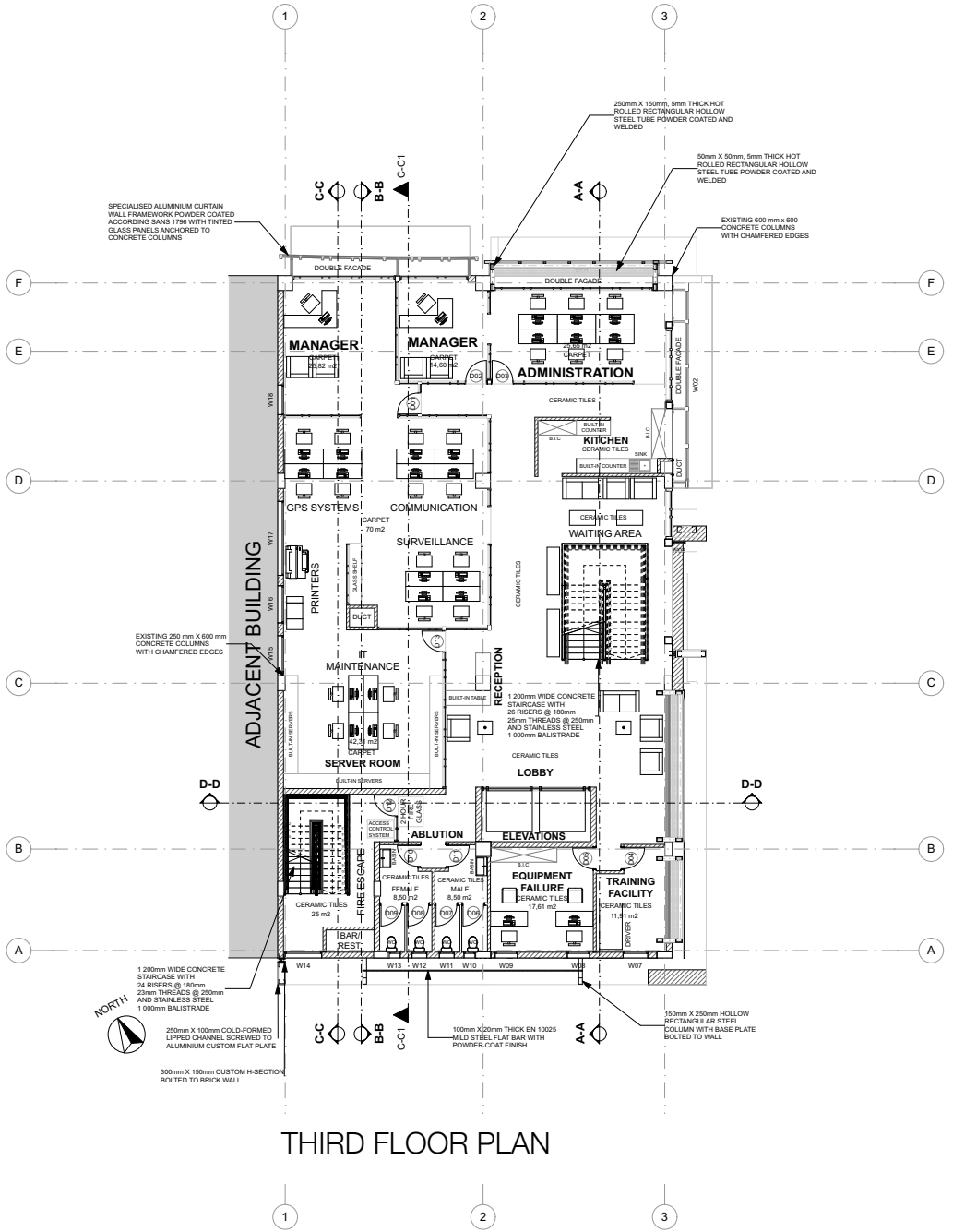


SECOND FLOOR PLAN

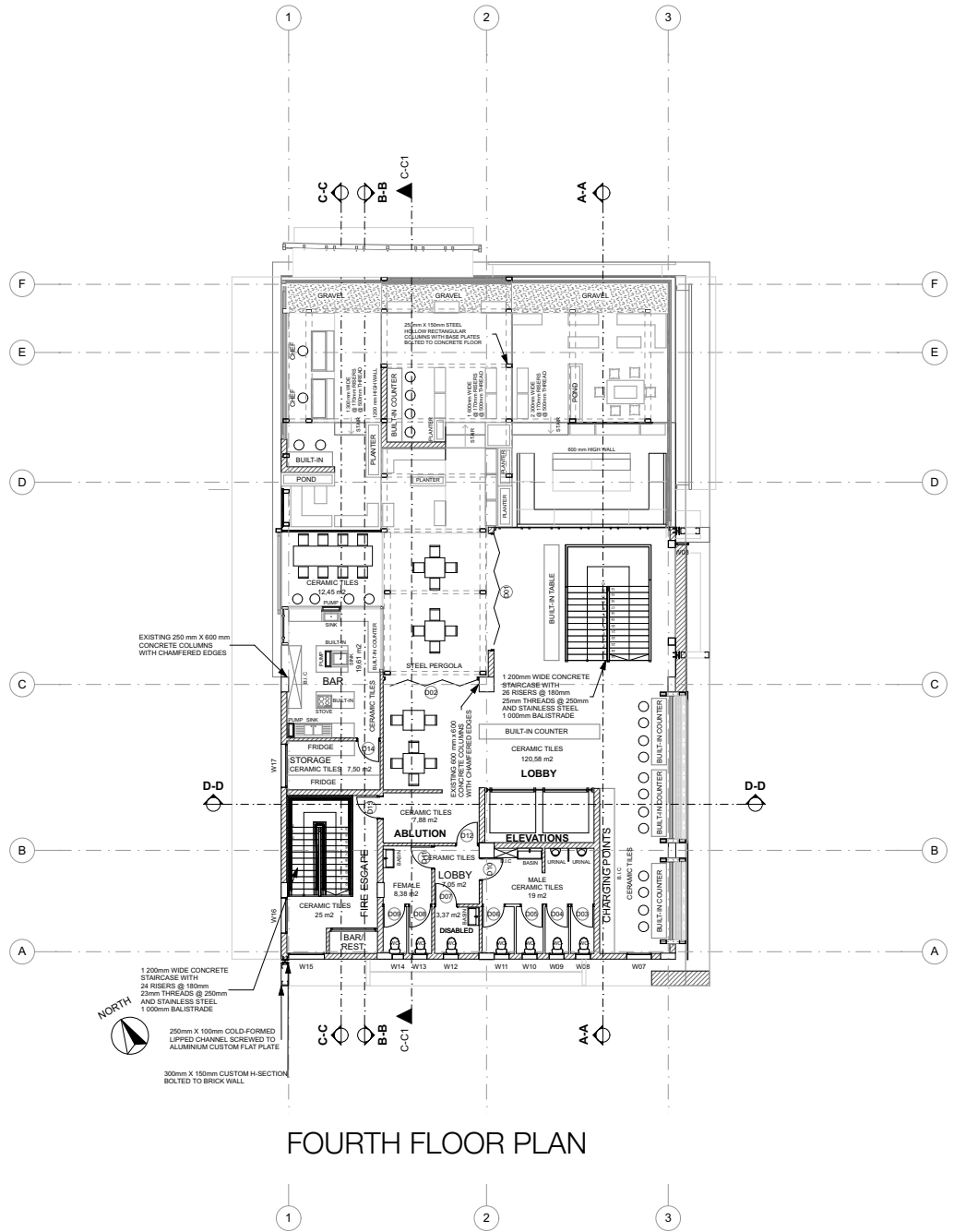
PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS	DRAWING DESCRIPTION	DRAWING SCALE	AUTHOR'S DETAILS
PROPOSED NEW BRT SYSTEM ERF 897 CORNER OF CHARLOTTE MAXEKE & RICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN		SECTION C-C	SCALE 1:100	NAME KEITH S. MOJANAGA
						SECTION D-D	SCALE 1:100	STUDENT NO. 2011013832

FULL DESCRIPTIONS OF TECHNICAL RESOLUTIONS CAN BE FOUND IN THE TECHNICAL REPORT

101



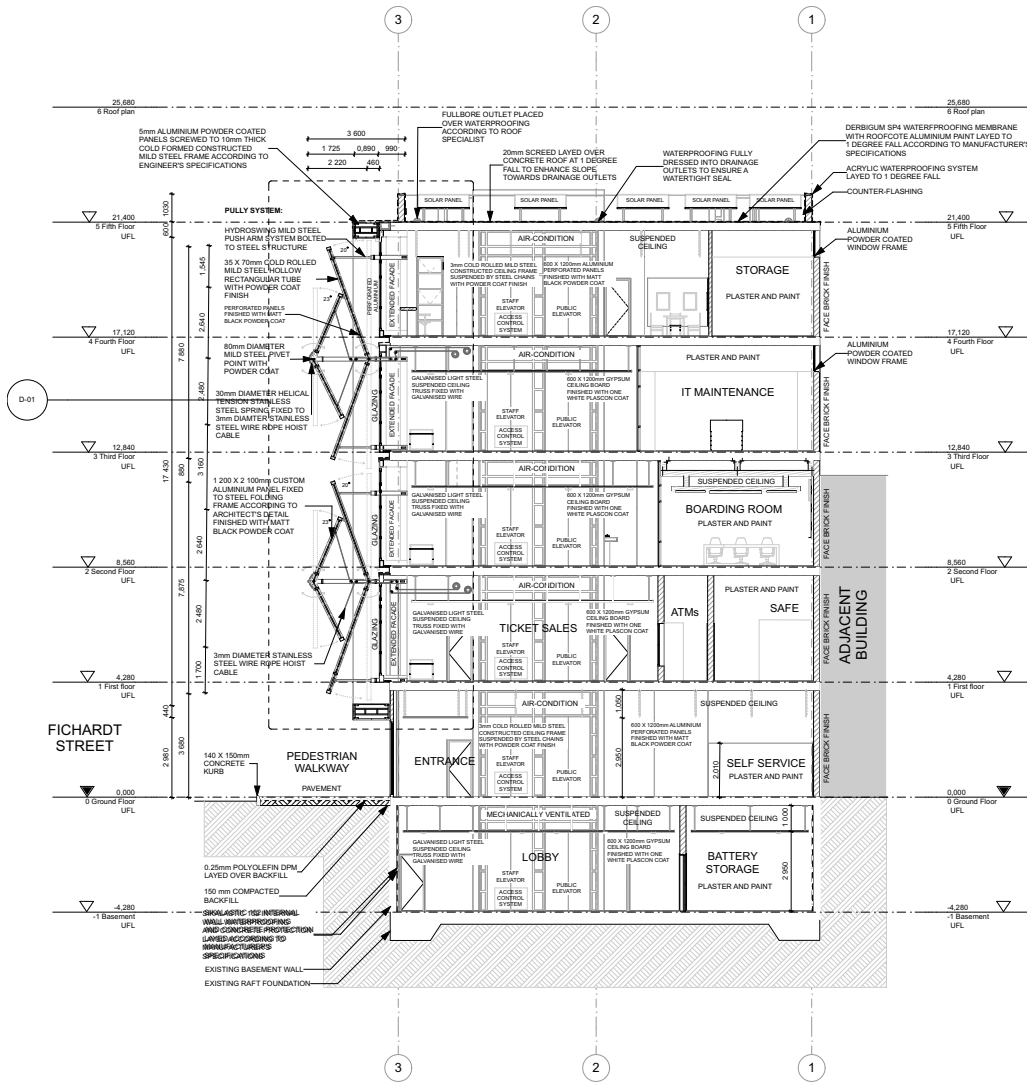
THIRD FLOOR PLAN



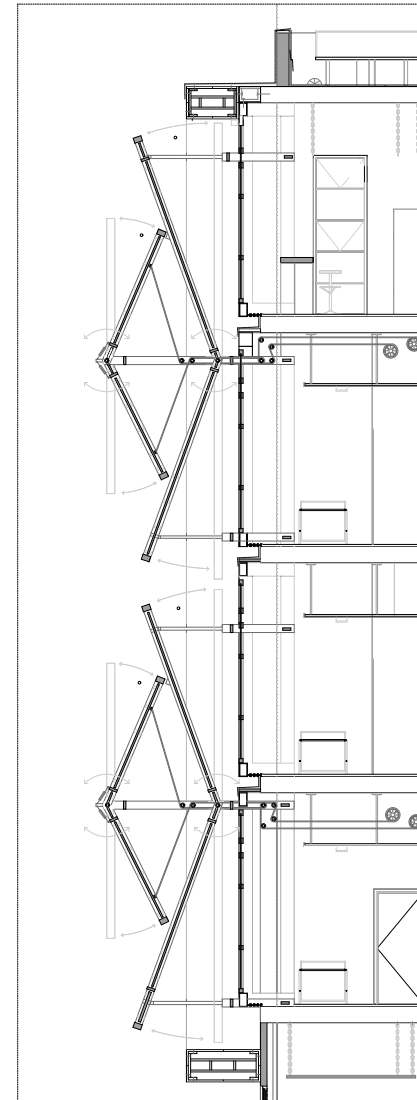
FOURTH FLOOR PLAN

PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS	DRAWING DESCRIPTION	DRAWING SCALE	AUTHOR'S DETAILS	
PROPOSED NEW BRT SYSTEM ERP 997 CORNER OF CHARLOTTE MAXEKE & FICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN		SECTION C-C	SCALE 1:100	NAME	KETU M. MASHAUNA
						SECTION D-D	SCALE 1:100	STUDENT NO.	2011013832

FULL DESCRIPTIONS OF
TECHNICAL RESOLUTIONS
CAN BE FOUND IN THE
TECHNICAL REPORT



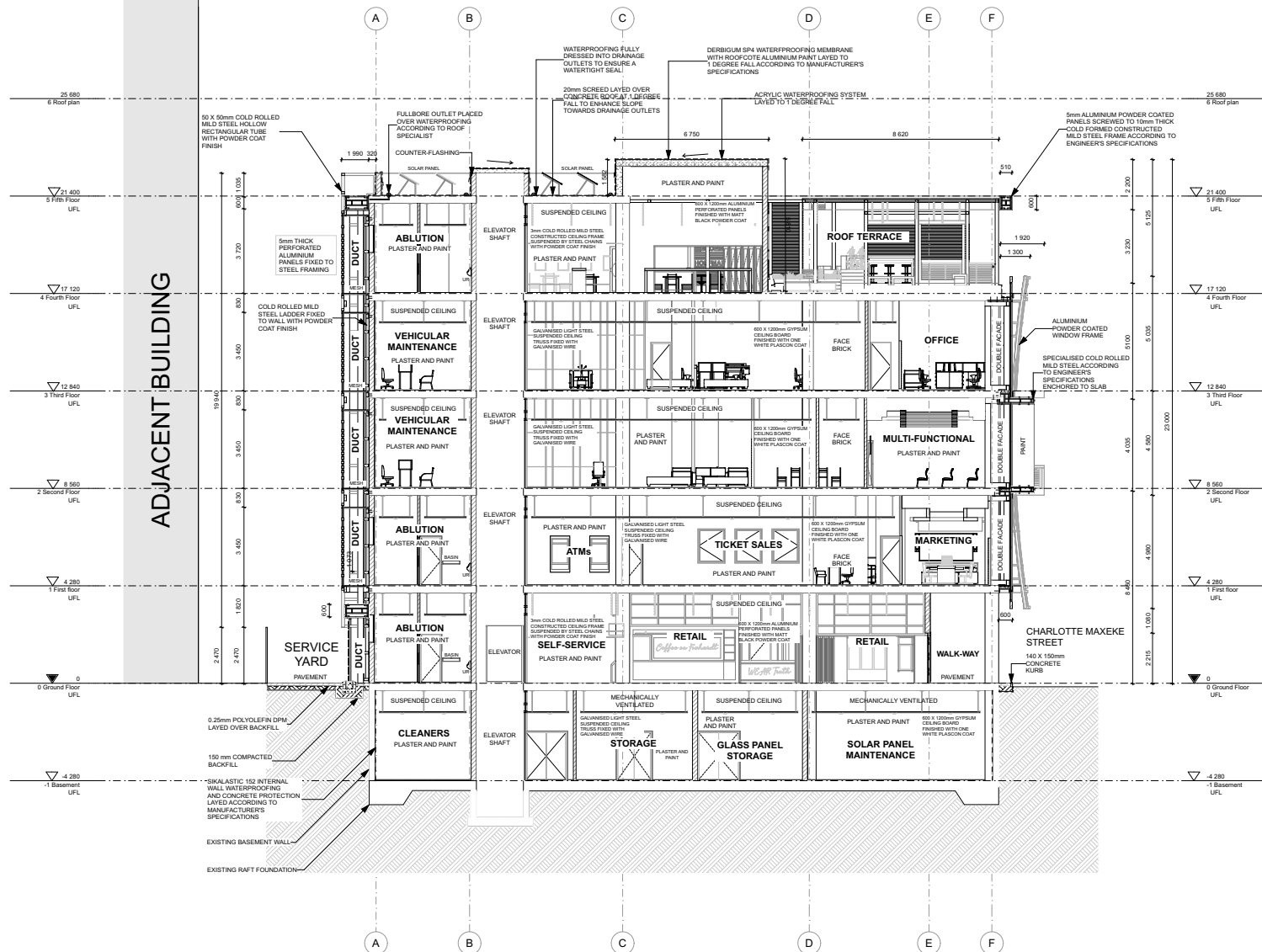
SECTION A-A
SCALE 1:100



SKIN DETAIL
SCALE 1:50

PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS			DRAWING DESCRIPTION	DRAWING SCALE	DRAWN BY:	
PROPOSED NEW BRT SYSTEM ERF 507 CORNER OF CHARLOTTE MAXEKE & FICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN				SECTION A-A	SCALE 1:100	NAME	KETUMILE MOKANAGA
							DETAIL 01	SCALE 1:50	STUDENT NO.	2011013832	

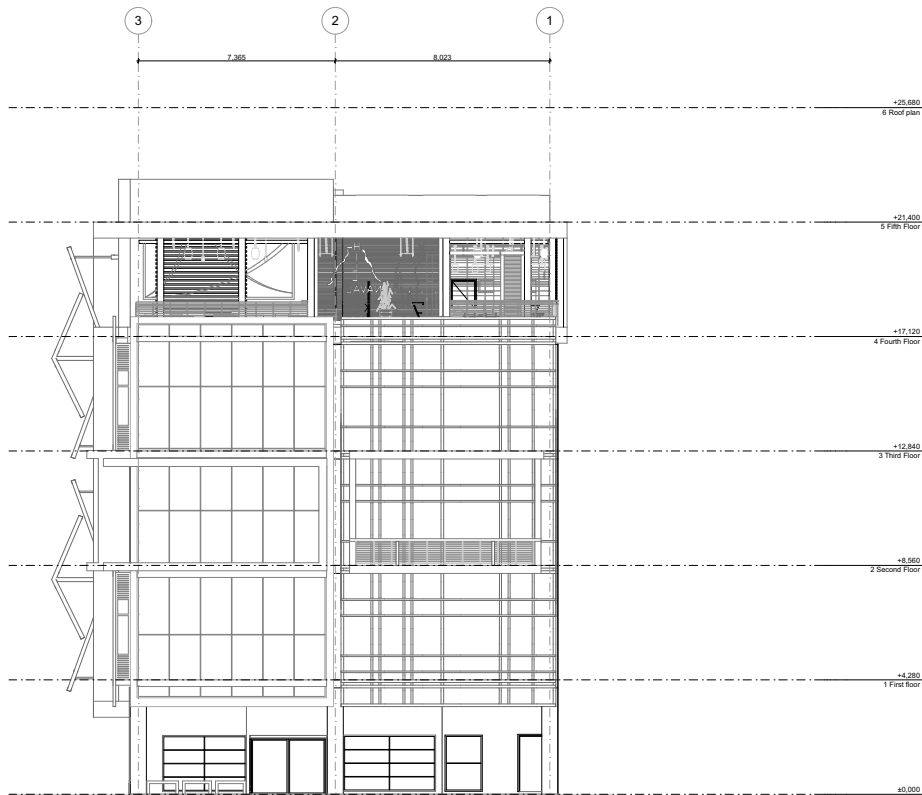
FULL DESCRIPTIONS OF
TECHNICAL RESOLUTIONS
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SECTION B-B
SCALE 1:100

PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS	DRAWING DESCRIPTION	DRAWING SCALE	DRAWN BY:	
PROPOSED NEW BRT SYSTEM ERP 907 CORNER OF CHARLOTTE MAXEKE & FICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN		SECTION B-B	SCALE 1:100	NAME	KETUMILE MOKOENGA
								STUDENT NO.	2011013832

FULL DESCRIPTIONS OF
TECHNICAL RESOLUTIONS
CAN BE FOUND IN THE
TECHNICAL REPORT



North Elevation
SCALE 1:100



East Elevation
SCALE 1:100

PROJECT DESCRIPTION	INSTITUTION	DESIGN LECTURER	CONSTRUCTION LECTURER	CLIENT	DRAWING REVIEWS	DRAWING DESCRIPTION	DRAWING SCALE	DRAWN BY:	
PROPOSED NEW BRT SYSTEM ERF 997 CORNER OF CHARLOTTE MAXEKE & FICHARDT STREET ALTERATION TO AN EXISTING BUILDING	UNIVERSITY OF THE FREE STATE DEPARTMENT OF ARCHITECTURE M. ARCH 2019	JAN SMIT PETRIA SMIT	ANNEMARIE WEGENER	INTERSTATE BUSES BLOEMFONTEIN		NORTH ELEVATION	SCALE 1:100	NAME	KETUHLI M. MANAGA
						EAST ELEVATION	SCALE 1:100	STUDENT NO.	2011013832

FULL DESCRIPTIONS OF
TECHNICAL RESOLUTIONS
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TECHNICAL REPORT

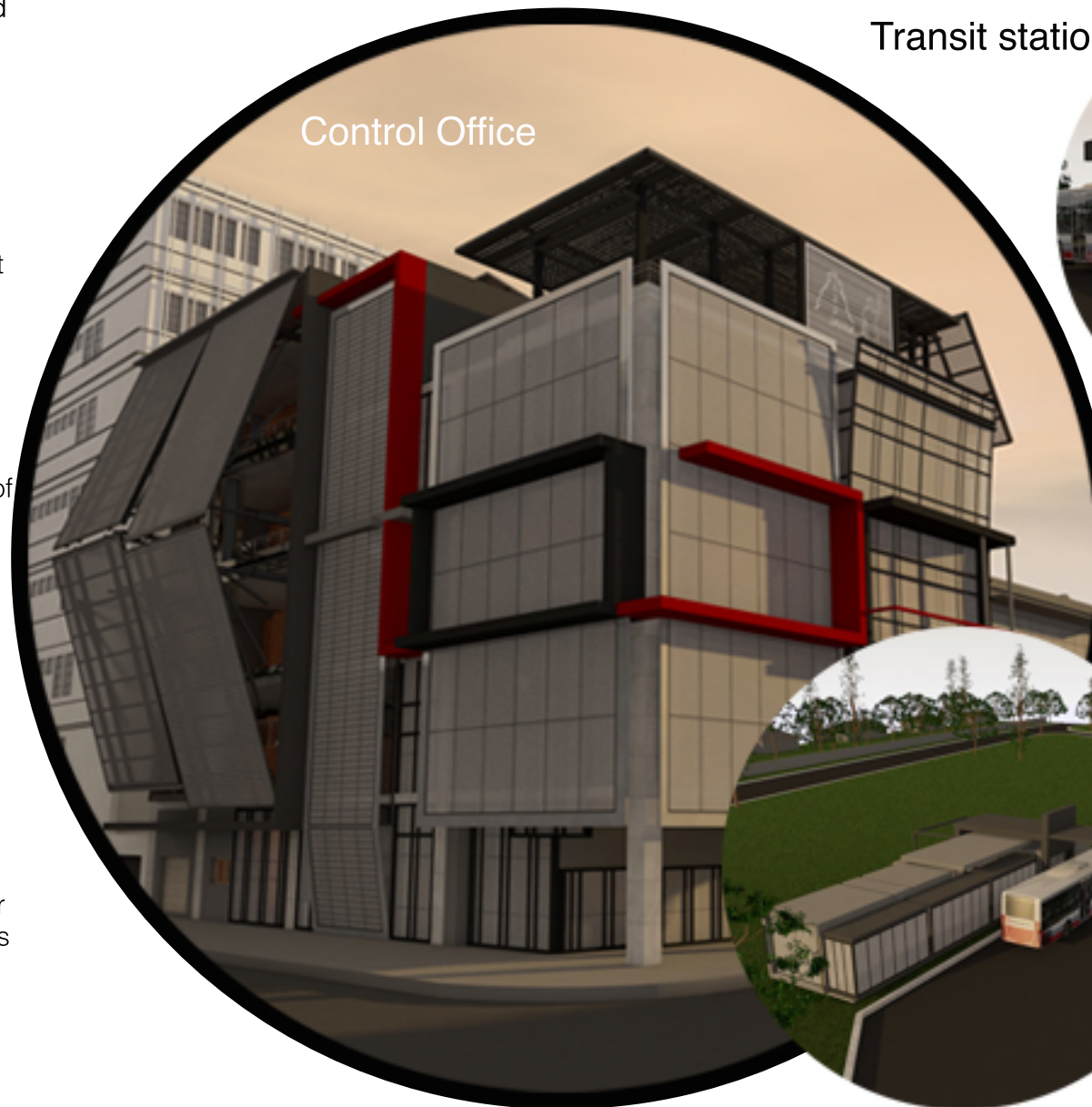
Today, 54 percent of the world's population occupies urban development globally. A proportion expected to increase to 66 percent by 2050 (United Nations, 2014). Concurrently, this particular phenomenon increases the vehicular use in the city context and consequently affects traffic cascade and efficiency.

The effortlessness of daily commute around and within a city has a considerable effect on its participation, tourism enticement, daily enterprise and the quality of life. Bloemfontein has established a commuter bus system that assists the daily transitions of its dwellers. However, the system has not adapted to modern-day transit. With the increased automotive transport in the city, the roads have gained congestion since the inception of the system and have therefore lengthened the process of moving from point A to point B. Secondly, the city appreciation and unique experience have depreciated over the years, primarily due to the constraints of vehicle manoeuvre. This escalating phenomenon eliminates the narrative the city can tell, relinquishing the precious gems of Bloemfontein.

With regard to the above-mentioned scenarios, the dissertation proposes a Bus Rapid Transit system. Utilising this type of system, the citizens can discover other parts of the city other than the ones they are familiar with. They can appreciate the visual treasures Bloemfontein offers, in the comfort of a transit system.

Title: Re-Interpreting the Invisible Boundaries of Bloemfontein

Subtitle: Transforming the unconscious edges of familiarity into liminal spaces through architectural influences.



Transit station



Ketumile Mojanaga
2011013832
M.Arch 2019
UFS



Transit station



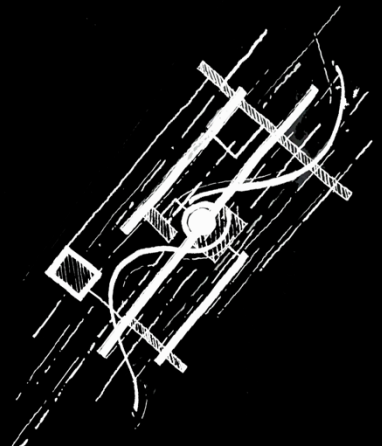
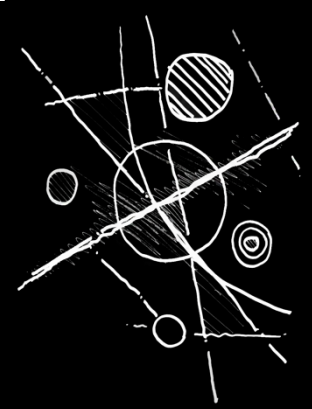


Part 4: Technical resolution

- Technical Resolution Process
- Technical Report
- Final Documentation

Our city is a privilege to me, a sacred
moment
Not a city anymore but a nostalgic
pang of laughter and a dull
awareness of
Seconds.

By Olivia



Existing Interstate Bus System

The ongoing Control Offices for the Bus System is in the CBD. The Control office is on the top floor of the building and the Drop-off and Pick-up zone lies on the roof top.

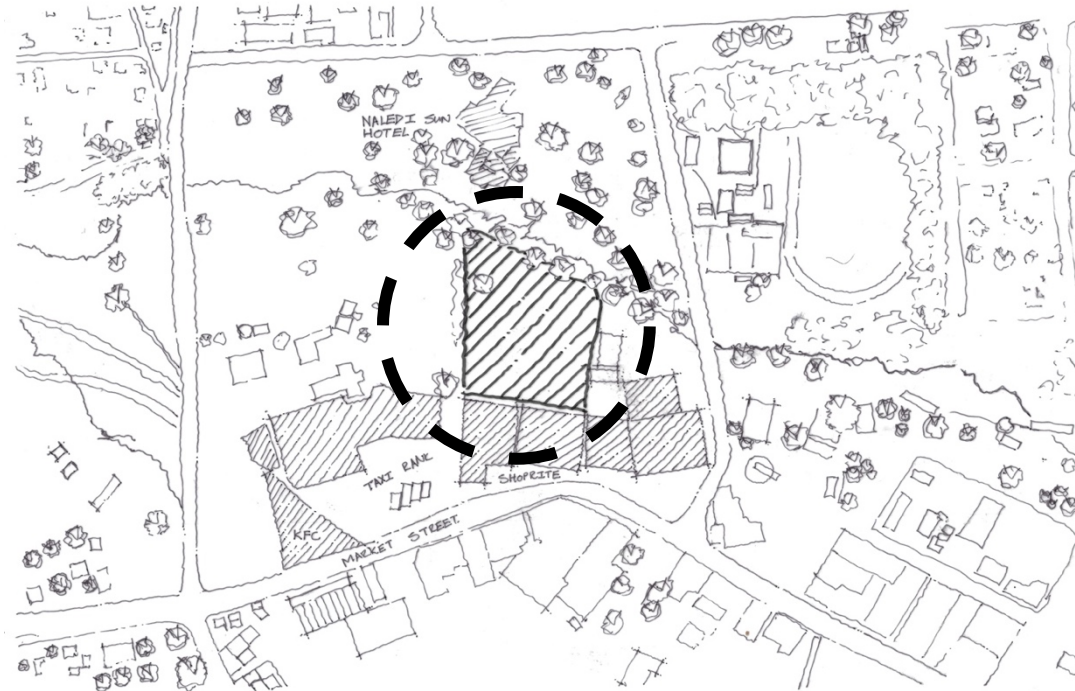
This part of the Interstate scheme will remain as is and will not be changed in any way.



(Figure 2: Map illustrating the existing Interstate Offices, 2019; Google Earth.)

Since the structure of interstate will be re-interpreted, it does not need the fleet of buses it has. The buses which are out of town work on an hourly cycle, this implies that in each route the buses pick up people every hour. With this information we can conclude that less buses will be needed, hence the dissertation suggests that the buses which operate in surrounding towns utilise the existing Interstate bus depot in Thaba Nchu (see image below).

Thaba Nchu Bus Depot



The depot also has offices which is used as a second control office.

The facility is enclosed by Shoprite and Naledi Sun.

(Figure 3: Drawing illustrating the Interstate depot in Thaba Nchu, 2019.)

Proposed Bus Rapid System

Location of Control Office

The proposed Control Office relative to the existing Interstate Control Office.



(Figure 4: Map depicting the two control offices relative to one another, 2019. Google Earth.)

Site Information

1.1 Location

The proposed design is in Bloemfontein, South Africa.

Bloemfontein is part of Mangaung district which also includes:

- Thaba Nchu,
- Botshabelo,
- Peter Swart, etc.

Interstate is a local bus system in Bloemfontein. It owns buses which operate in both Mangaung metro and within the city. The system currently operates in Bloemfontein, Thaba Nchu, Botshabelo and other surrounding towns.

Interstate's intention is to adapt to an evolving society. Therefore, the dissertation proposes that the existing bus system should primarily transit people from surrounding areas into Bloemfontein and vice versa. The reason for this is that a Bus Rapid Transit system can be employed within the inner city. The Bus Rapid System is an enhancement of Interstate Buses, therefore the two systems will function concurrently.

Advantages of the Bus Rapid Transit system:

- Transit spaces cater for various weather conditions,
- Buses routes Interlink and rotate in an orderly fashion,
- Easy orientation if a commuter may fall astray,
- Buses have their own lanes,
- Efficient daily commuting,
- Efficient payment system,
- Caters for disabled people,
- Safe transits spaces.

Site Analysis

1.1 Man-made topography

Street Views

The facades of the proposed building are composed of an amalgamation of facebrick, concrete columns and stripped horizontal windows although the elevations predominantly consist of facebrick. On the north façade, part of the building lies over the pedestrian pavement/walk-way.

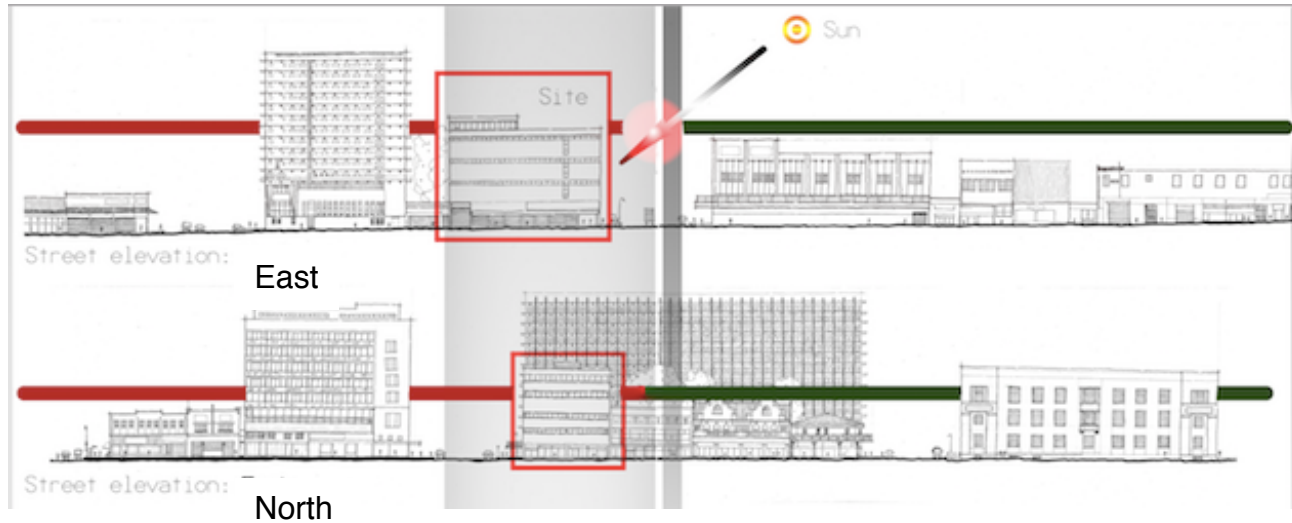


(Figure 10: Images of the proposed building, 2019.)

Street Elevations

The neighbouring buildings have various heights, the highest peak being more or less 30m and lowest being 4m.

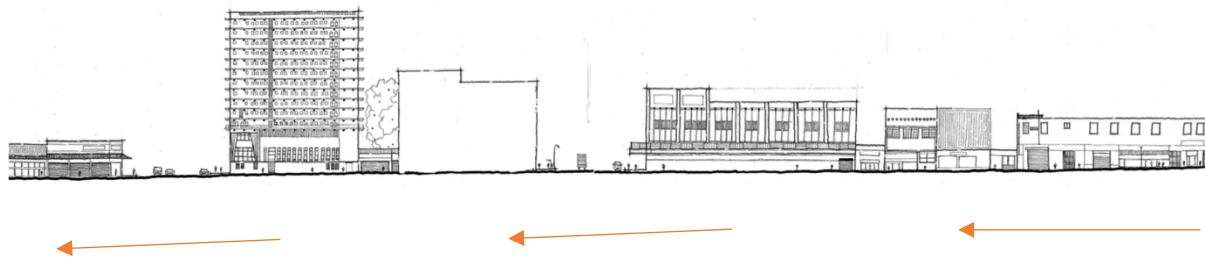
The one storey buildings go up to 4m high, a result of advertising space above the doors and windows. For this part of town, advertising space is very important.



(Figure 11: Drawings of street elevations, 2019.)

Fall of site

There is a slight fall on the site. The fall runs from north-west to south-east as indicated on the East elevation provided below. This will cause a natural stormwater run-off.



(Figure 12: Street elevation of the East façade, 2019.)

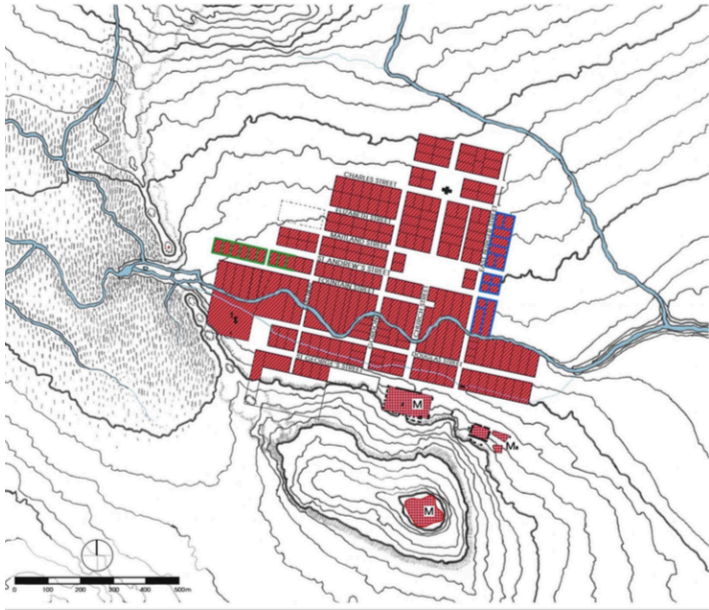
1.2 Geotechnical

There is an existing stream near the site which is locally referred to as the 'Bloem-spruit'. Refer to figure 13 to identify the stream.

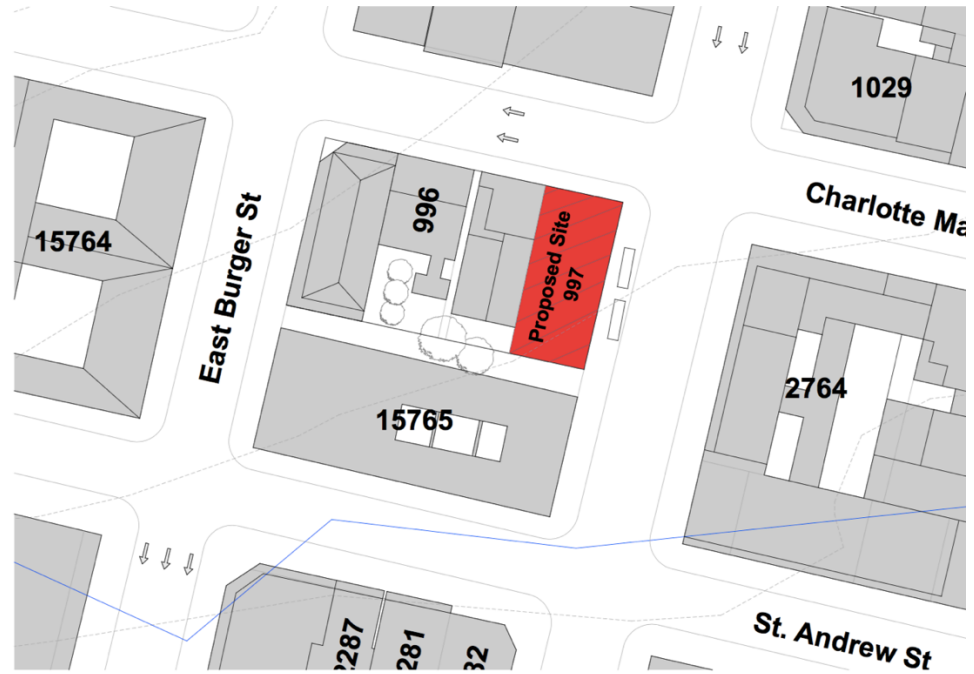
Flood Line

The Surveyor General Office in Bloemfontein has a flood line prediction software which determines any foreseeable floods in the future for worst case scenarios.

The software calculated the food line results for up to 20 years in the future (see figure 15).



(Figure 13: Map which illustrates the development of Bloemfontein, 2015; Auret.)



(Figure 15: Prediction of a possible flood line in the CBD, 2019; Surveyor General Bleomfontein.)



(Figure 14: Image of the Bloem spruit, 2019.)

1.3 Cadastral information

Site:

ERF Number: 997

Site Area: 852,58 m²

ERF 997 is currently subdivided into 3 portions (refer to Annexure A).

Consolidation

All three (3) portions of ERF 997 were scheduled to be consolidated as stated on the original plans. (Refer to Annexure C)

As it stands on the SG Diagram, the three (3) have still not been consolidated. (Refer to Annexure A)

Servitude lines are on CD as seen on cadastral map (Annexure A).

Table 1

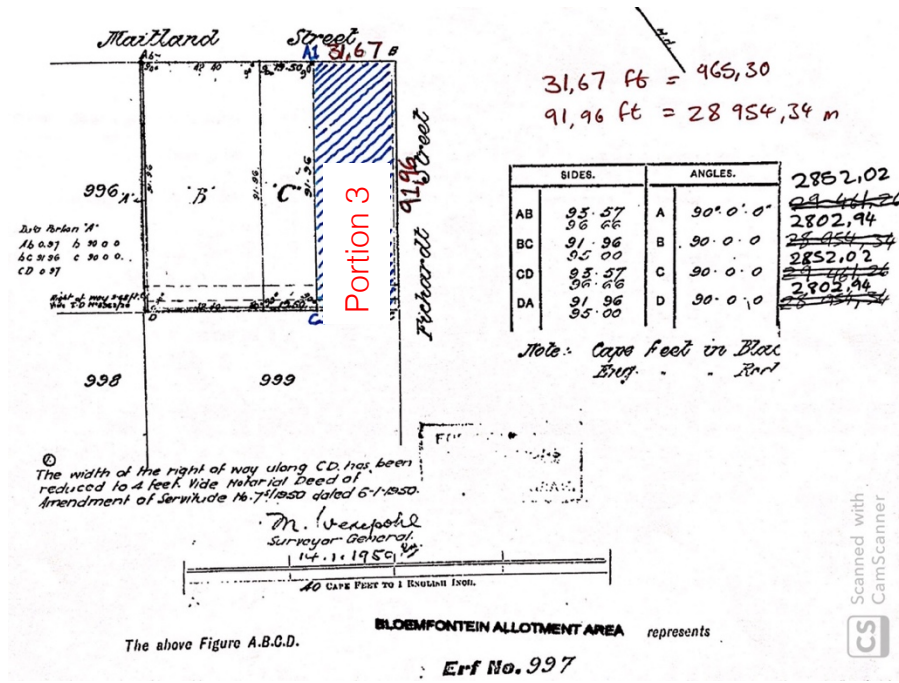
Site Boundaries of ERF 997

Length of Boundaries (m)		Angle of corners (degrees)	
AB	29,45	A	90
BC	28,95	B	90
CD	29,45	C	90
DA	28,95	D	90

(Refer to Annexure A)

Site Boundaries of site for proposed design (portion 3):

Below is the dimensions of portion 3.



(Figure 16: Illustration of the subdivision of the ERF, 1872; Surveyor General Bloemfontein.)

Table 2

Length of Boundaries (m)

Angle of corners (degrees)

A1B	9,97	A	90
BC	28,95	B	90
CC1	9,97	C	90
C1A1	28,95	D	90

(Refer to Annexure A)

Area of portion (3): 288,63 m2

Development Rights

Schedule of Rights	
Property description	
ERF No.: 997	Site Area: 288,63 m2
Portion: Portion C	Township: 372

Zoning Information	
Town Planning Scheme:	Bloemfontein Town Planning Scheme
Use Zone:	H- Business zone
Amended Surveys:	No. 26, 1905
Title No:	6342/70

Development Control Measures

Permissible	Control	Actual
28,0 m	Height	9 storeys
No restrictions	Coverage	100%
6,0	Bulk	-
3,0	Building Line Charlotte Maxeke St	3,0
0,0 m	Building Line Fichardt Street	0,0 m
-	Floor Area	-

Parking

Area	Parking ratio per use	Area per use	Parking Bays Required
Shops	4 Bays per 1000m ²	-	-
Office	2,50 Bays per 100m ²	-	-

Sustainability

According to a video by Andy Cohen, sustainable architecture and design, he explains how buildings have become one of the energy consuming creations in the world. '50% of all resources consumed across the planet are used in construction, making the industry the least sustainable in the world' (Edwards and Hyett 2001: 1.).

The dissertation will focus on the use of hybrid energy and ventilation systems in buildings.

The systems employed will be:

- Collaboration of natural and mechanical ventilation.
- Energy efficiency, solar power and energy storage.
- Rain water procurement and distribution.
- Natural light and solar gain.

1.1 Collaboration of two (2) ventilations systems

Combining two ventilations systems within the building was provoked by the basement of the existing structure, it lies beneath the ground therefore there is limited allowance for natural ventilation. Also, there are a number of climate varieties, not only during the cycle of the day but also during different seasons.

There following will be designed for the building:

A Double Façade for the North Elevation.

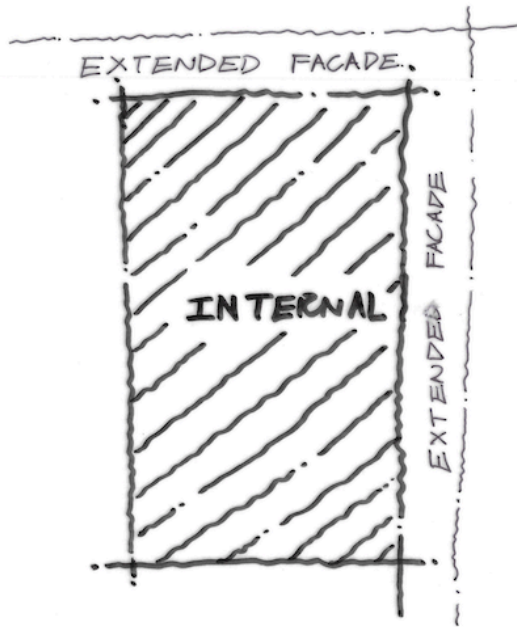


Figure 17: Illustration of the extended façade on plan, 2019.

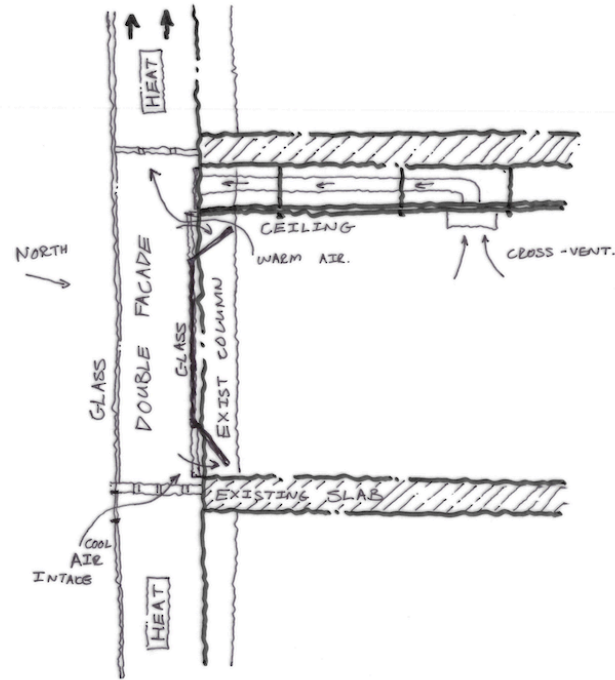


Figure 18: Illustration of the extended façade on section, 2019.

Creating a buffer (sun) space increases the buildings efficiency, this space will also act as a balcony space. It will improve the building's energy performance by widening the range of the outdoor temperature in which thermal comfort can be maintained in the building with low mechanical energy consumption (Architective, 2019; 114).

The main objective of the extended façade was to achieve more light than heat.

In Summer:

A greater portion of the heat is trapped in the buffer space then it rises to the top where it will be released. A modest portion of the heat will be transferred into building. As seen in figure 18, the bottom window will open, allowing cool air to pass through, then, within the room, hot air will move up into the extraction units to further exit into in the double façade then into the atmosphere.

In winter:

The system will function as a closed system. The interior spaces will not be influenced by any external elements, natural cross-ventilation.

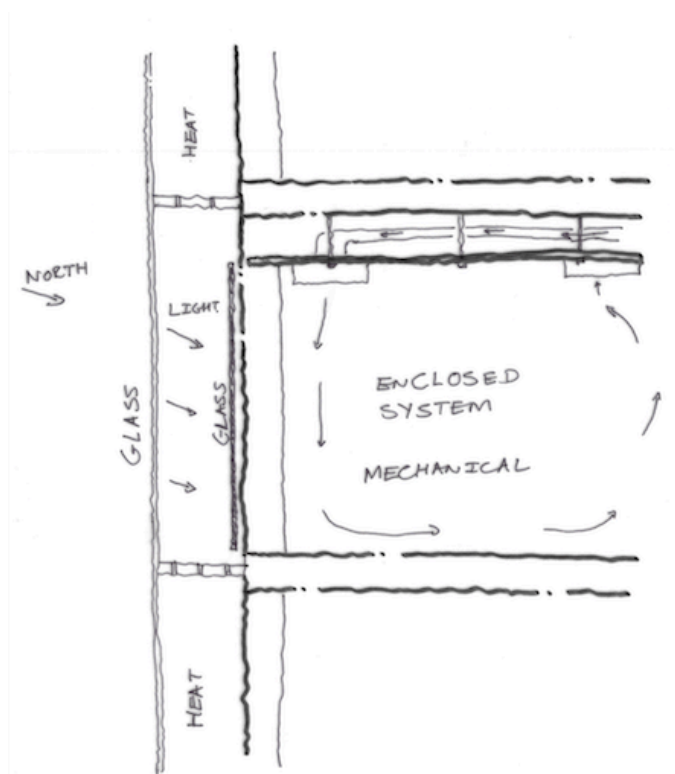


Figure 18: Illustration of the extended façade on section, 2019.

For this particular scenario, if the weather may be uneasy, the windows will be closed. Then, the air circulation will be induced by mechanical ventilation. Also, the double façade will create a high solar gain than a heat gain.

These two (2) system used in this manner will result a Hybrid Ventilation System which reacts to various weather conditions.

1.2 Energy efficiency, solar power and energy storage

Solar power

According to the United Nations Environment Programme as well as the International Energy Agency, the building sector contributes up to 30% of global annual greenhouse gas emissions and consumes up to 40% of all energy (Energy and Environment Partnership Program, 2017. 1)

In South Africa, energy consumption is considerably a very critical concern, especially with

Eskom's electricity load shedding programs which assists in lightening up the country's demand.

Centlec is local electricity distributor, they have a system called off-peak metering. This system allows you to pay less in tariff rates during off-peak and more during peak times.

For proposed building, the thesis is proposing solar panels on the roof which will store the energy intake in batteries. Then, during peak hours the inverter will start up and lighten the load of the electricity supplied by Centlec. This aid the building in paying lower tariffs and assist the building in being less dependent on the electrical grid supply. This energy will also be used in the case of load shedding. The transit stations will also adopt a similar system but on a smaller scale.

The average size for solar panels in commercial buildings:

Firstly, a solar panel is made up of individual solar photovoltaic (PV) cells. PV cells come in a standard size of 156mm by 156mm. The average panel in the commercial industry has seventy-two (72) cells.

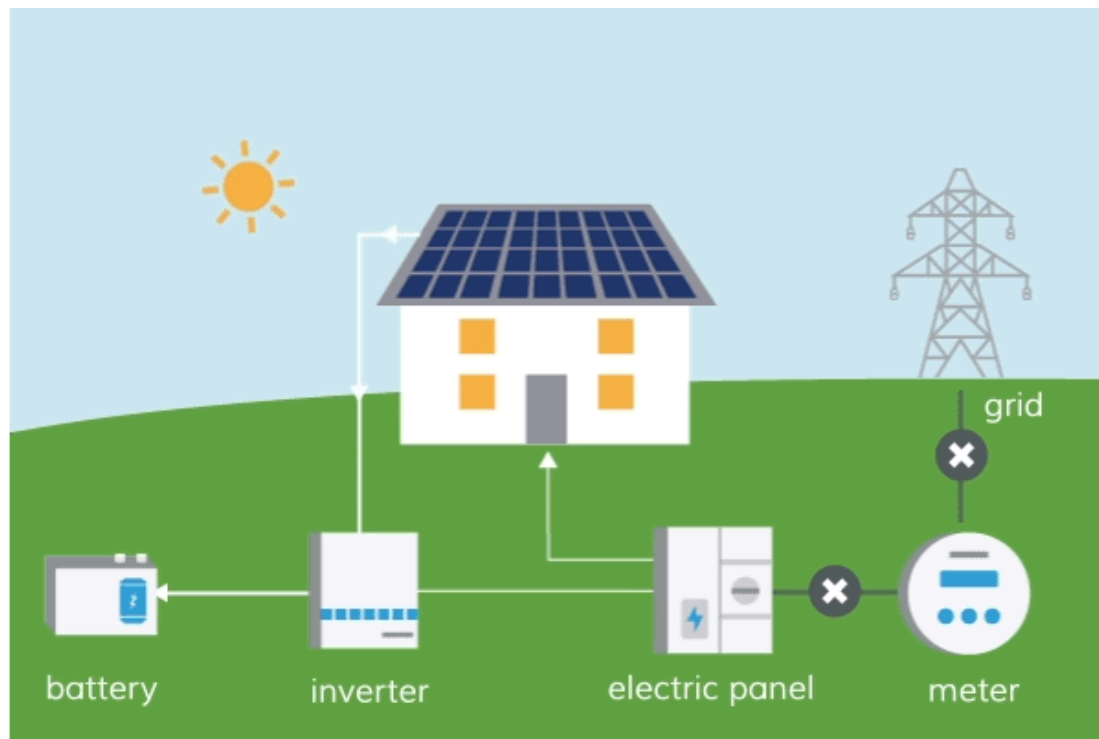
The size of a panel would be 2m x 1m.

This is critical because the sizes of the storage for the solar panels will be determined by the dimensions of the individual panels.

The system proposed in a diagrammatic form:

Date time:

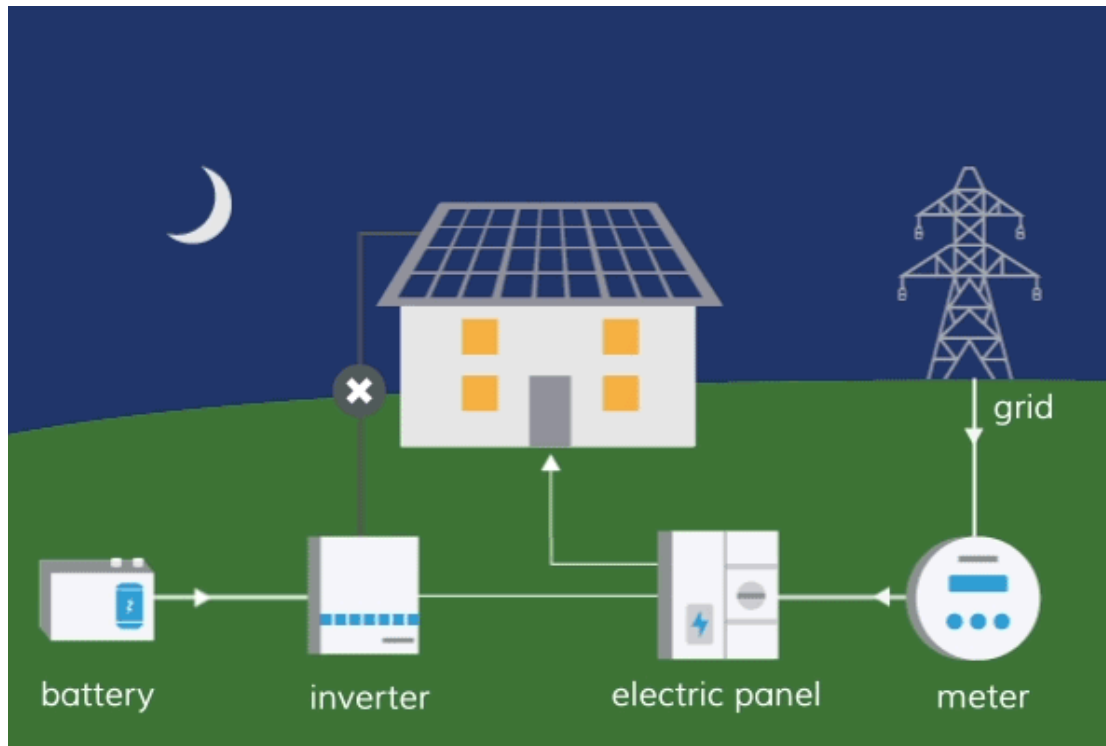
The solar panels store energy and transfer it to the inverter (see figure 28). Then, from the inverter the energy goes to the battery.



(Figure 19: Illustration of a PV system during the day, 2019. Energy Sage.)

Night-time:

The solar panel will stop absorbing energy. The energy stored in the battery is then released to the inverter, then it passes to the building where it will be utilised.



(Figure 20: Illustration of PV system at Night, 2019. Energy Sage.)

Storage of solar power

The building has very advanced IT room and communication room.

In essence, it will need:

- Back-up generators which can supply the building with electricity facility for up to 48hrs,
- Energy storage box,
- And an energy inverter, to convert the stored energy to usable electricity.

Lithium-oxygen batteries



(Figure 21: Image of Solar energy batteries, 2017. IEEE Spectrum)

Battery Capacity: 10 MW

Company: AES

Energy Inverter

TMEIC Corporation introduced the Solar Ware Ninja solar-plus-storage inverter system in 2019 which achieves a new world standard for highest level of conversion efficiency at 99.1% (Solar Power Word, 2019; online). One of the advantages is that it offers Low maintenance without the need for filters or high skill level electrician (Solar Power Word, 2019; online).

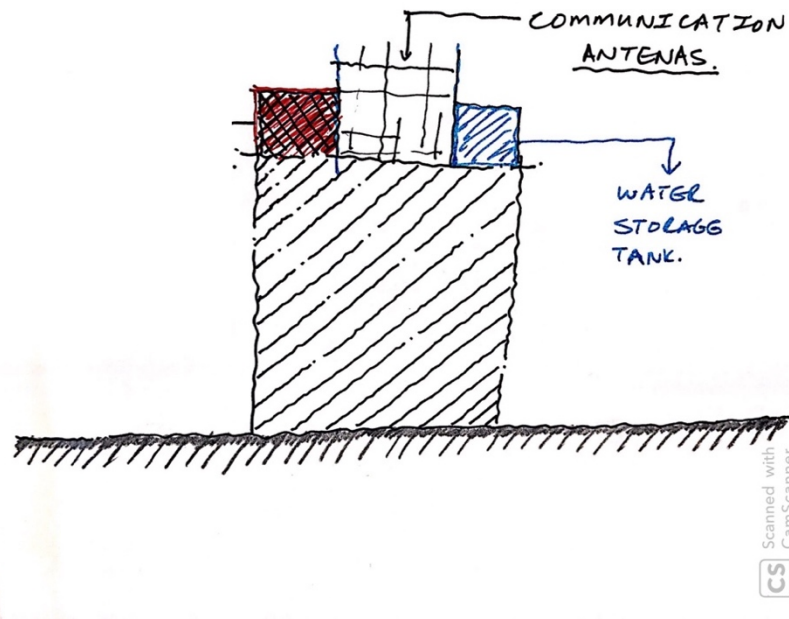


(Figure 22: Image of an Inverter, Solar Power World; Online.)

For safety measures, the lithium battery and inverter will be stored in the basement.

Water storage

The water that collects on the roof will be stored in a storage tank on the roof as seen in figure 23. The tank will be placed on the North West façade so that the solar energy can pre-heat the tank. This implies that the geyser will use less power and time to heat water.



(Figure 23: Illustration of storage tanks, 2019)

PRESTANK

Prestanks are manufactured by STRUCTA TECHNOLOGY.

The Tanks are SANS Approved and meet the South African Hot Dipped Galvanised requirements.

Capacity: range from 1500- 4,2 million litres.

Materiality

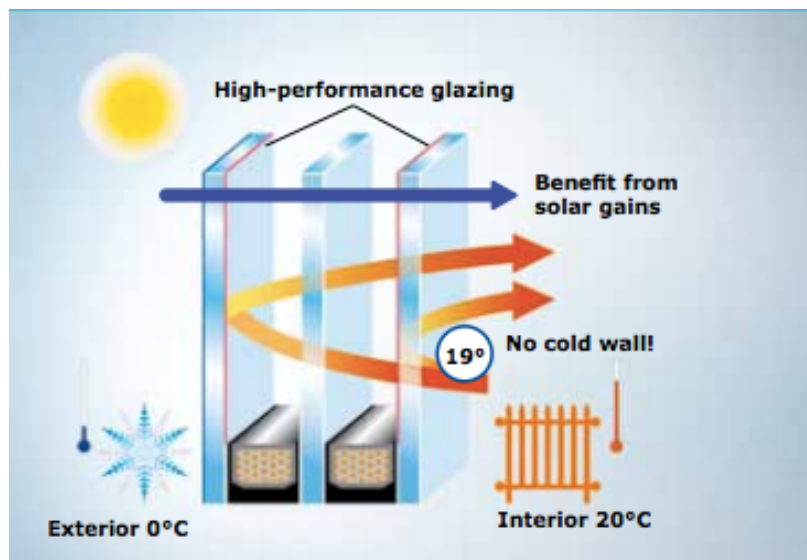
As a result of the proposed structure being attached to another building, the North façade will have a large glass façade in order to allow as much solar gain as possible.

Although there will be a double façade to limit heat gain, high performance glass will also be used in order to limit heat which escape through glazing.

Envelope

High Performance Double Glazing Glass

High-performance glazing has been developed to improve the energy performance of buildings by reducing energy consumption and lowering heat escape (Saint-gobain glass, 2010; online). Double glazing is high-performance when one pane of glass has a low-e coating which reflects heat (Saint-gobain glass, 2010; online). This will minimise the load imposed on the heating system and lower electrical costs.



(Figure 24: Image of high performance glass, 2019; online.)

Three main categories for materiality:

- Structure
- Sub-structure
- Envelope

Structure

Since the North and East peripheries of the structure are extended, the proposed material is steel I-Beams and Rectangular (Hot Rolled) Tubing.

Specifically: Universal Beams SANS 50025/ EN 10025 S355JR

Manufacturer: Macsteel Africa

Advantage: High Strength Capabilities

Surface treatment: black

Sub-structure

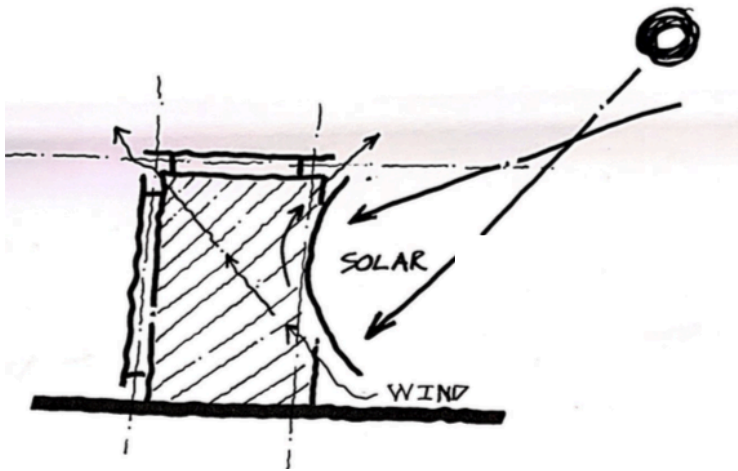
The substructure does not require high strength capabilities. The proposed material for the sub-structure is aluminium. There reason is that it will be exposed to various weather conditions so the corrosive characteristics will suffice. Also because its light weight while having adequate strength capabilities to hold glass infill in place.

Aluminium EN485-1

Use of curved glass on the façade

Curved glass on building facades reduces the emissivity of glazing towards the street. To enhance this advantage, the glass will be applied with a layer of thin tint window film to reduce glare towards the street and create privacy for interior spaces.

The curved glass also restricts the solar gain which falls onto the spaces on the edge of the building.



(Figure 25: Illustration of the curved glass on North Facade, 2019.)

Services

Building systems are inaugurated in buildings to ensure that they are efficient, functional, comfortable and safe for occupational use.

The building will adhere to the following systems:

- Management system (staff)- monitor and control of building services.
- Lifts and stairs.
- Fire safety, detection and protection.
- Access control system.
- Energy supply, storage and distribution, emergency power.
- Mechanical ventilation and heating systems.
- Lighting.
- Security and alarm systems.
- Rooms for data storage, communication and IT facilities.
- Municipal and service yards.
- Storage facilities- maintenance equipment.
- Water supply and drainage system (Design Buildings, 2019; online).
-

Management system (staff)- monitor and control of building services

Some of the equipment in the building cannot monitor itself, hence it will need constant supervision. Also, the proposed is a public building, therefore in most cases, the users will be disorientated. This aspect calls for a need for a reception and information desk. These employed staff members will have to oversee that the following systems are running as they should:

- The temperature of the air-condition.
- Opened and closed windows during and after work hours.
- Light bulbs are all in order.
- Lifts are working accordingly.
- Orientate the public.

Lifts and Stairs

The structure currently has one existing staircase. The staircase will be converted to a fire stair to aid escape routes. The dissertation will then establish an alternative staircase to create an alternative route of circulation. The staircase will also act as a second fire escape. The existing structure possess elevators which were altered considering the size and use of the building. For this instance, there will only be one elevator shaft.

Fire Safety, detection and protection

Fire Escape Plans

Diagrammatic and communicative fire escape plans will be situated in the relevant exists and circulation spaces.

Fire system

According to tecservuk, smoke detectors should be sufficient for an office block. With this regard, the smoke detector should be placed within enclosed rooms, communal spaces and circulation spaces (tecservuk, 2019; online).

After completion of the building, a fire risk assessment will be required to determine the extent of fire equipment needed for the building (tecservuk, 2019; online).

Fire Equipment

For the purpose of the dissertation:

Fire sprinklers in the ceiling space will be installed.

Fire extinguishers at visible points of the building, kitchenets, server room, and close to the battery and inverter room.

Fire Alarms

To warn the general public and employees of any fire.

This system must be installed on a every floor and must have a central control point which must be accessible.

Maintenance

Maintenance for these fire systems and equipment shall be carried out annually.

Access control system

The installation of access should be carried about by a competent engineer and a thorough survey must be done to identify the location, times and level of security required (tecservuk, 2019; online).

Energy supply, storage and distribution, emergency power

For energy supply, storage and distribution refer to sustainability.

Emergency power supply system

Automatic transfer switch (Dieselserviceandsupply, 2019; online).

A UPS for server rooms- no loss of powers for server (Dieselserviceandsupply, 2019; online).

The emergency power will be used to power servers, IT and communication rooms, elevators, access control systems, ATMs and lights.

Mechanical ventilation and heating systems

The mechanical ventilation and heating systems will be placed between the floor and ceiling. The design, load required and placement of air-conditioning systems within rooms will be determined by the mechanical engineer. Although the control unit should be in an accessible place.

Lighting

The illuminated by both natural and artificial means. The building is exposed to natural light of the North and East Façade. In a scenario where the natural light proves to be insufficient, artificial LED lights will be utilised.

Artificial means of lighting are however different for different spaces. Designing Buildings (2019) lists the types of artificial lighting as follows:

General lighting

These types of light sources uniformly service a general space, therefore fluorescent lighting will suffice.

Task lighting

This type of lighting is used to contrast work or task areas - they are used for highlighting reception desks and function as track lighting in the building, LED and Halogen lights will be used in this regard.

Emergency or safety lighting

The main aim of emergency and safety lighting is to provide lighting when there is a power failure, allowing occupants to safely evacuate the building, low intensity bulbs and red warning lights can be used for this purpose (Designing Buildings, 2019: online).

Security and alarm systems

The security of a building not only ensures the safety of the staff and public, it ensures that the money and equipment facilities are not apprehended.

- Security personnel at the main entrances and public spaces.
- Access control at relevant entrances and exits.
- CCTV cameras to monitor all interior and exterior activities.
- Intruder alarm sensors in relevant spaces such as ATM and Money storage spaces.
- Fire detection systems.

Rooms for data storage, communication and IT facilities

These facilities will be used for servers, communication and IT equipment. The specifications of the equipment will done by a competent person.

Municipal and service yards

- Waste Disposal.
- Deliveries.
- Building Maintenance.

Storage facilities- maintenance equipment

The storage facilities in the basement will be used to keep equipment for the Control Office and the transit stations.

The sizes of the equipment stored will determine the dimensions of the rooms.

Water supply and drainage system

Waste removal in the toilets- 110mm soil drainage pipes

40mm PVC pipes

Hot water supply

Copper pipes- limit the loss of heat

Cold water supply

PVC pipes

The System has to be in accordance with SANS ISO22391 for hot and cold water supply systems.

(Marley pipe systems, 2013; online.)

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« Page 1 »



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Check for plagiarism here	Info	Start: 11-Jan-2019 2:29PM Due: 31-Dec-2019 11:59PM Post: 19-Jan-2019 12:00AM	7%	Resubmit View

Annexure A

Existing plans

Mangaung Municipality

Bloemfontein

Architects: M.M.I.A

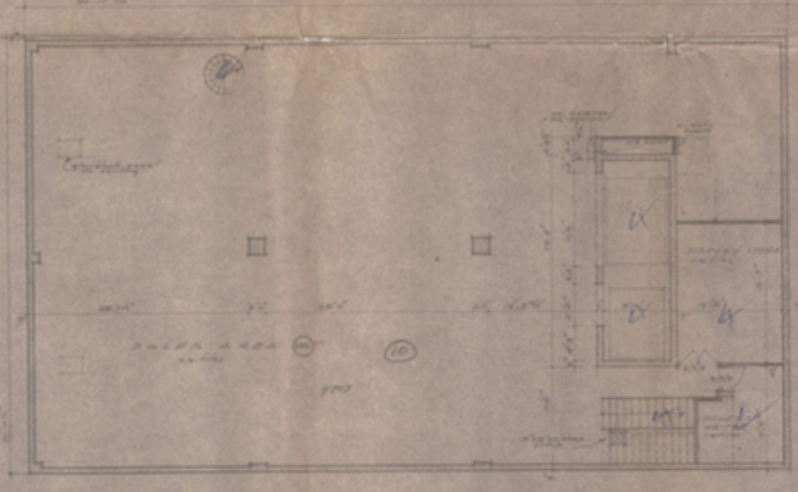
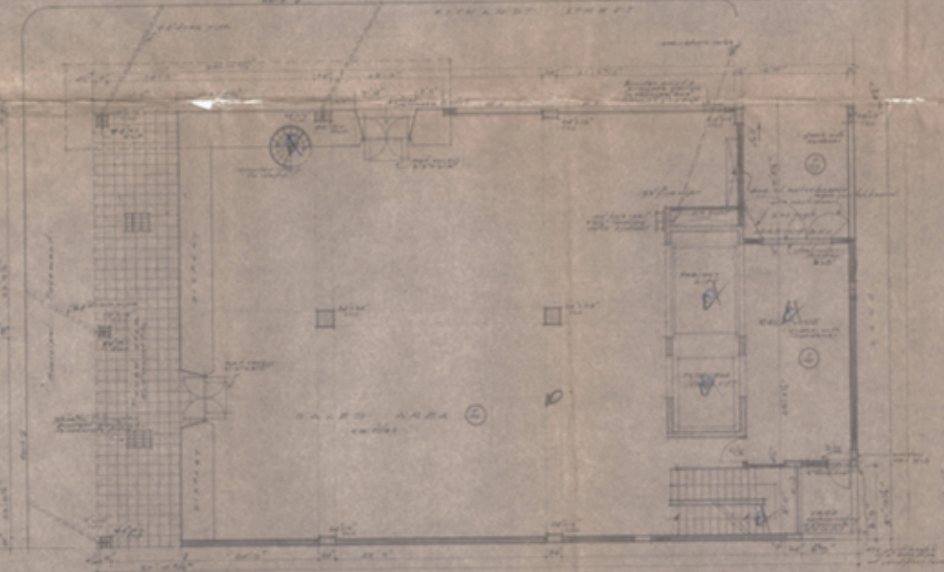
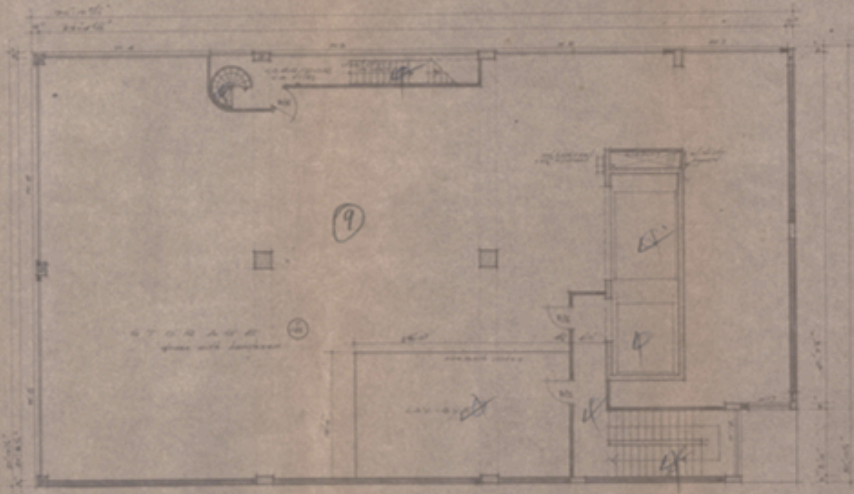
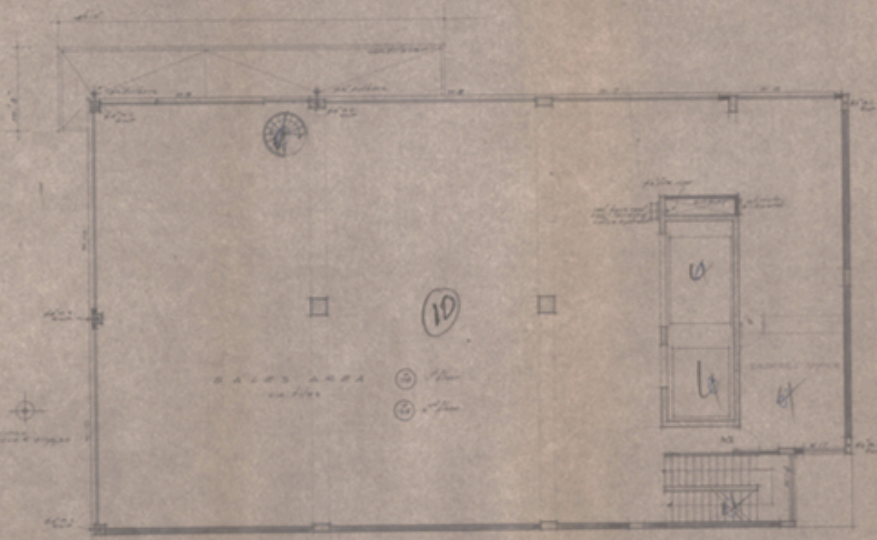
Date printed on 05 April 2019

Date Issued

1970

FIRST & SECOND FLOOR

THIRD FLOOR



GROUND FLOOR

BASÉMENT

[Handwritten signature]
 ARCHITECTE
 63-80

Basement 145 R.100 = R.16-00
 Ground 150 R.100 = R.15-00
 First 150 R.100 = 12.00
 Second 150 R.100 = 9.00
 Third 145 R.100 = 9.00
 Fourth 125 R.100 = 7.00
 Total 63-80
 21-1-1970
 J. van der Z.

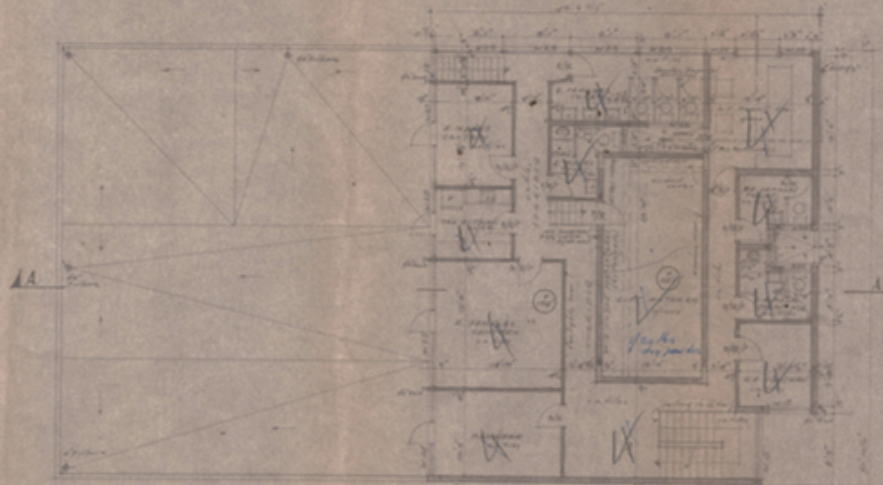
Opp. 1000
 R.100-000

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		NO. 1000	DATE	
		NO. 1000	TEL. NO.	

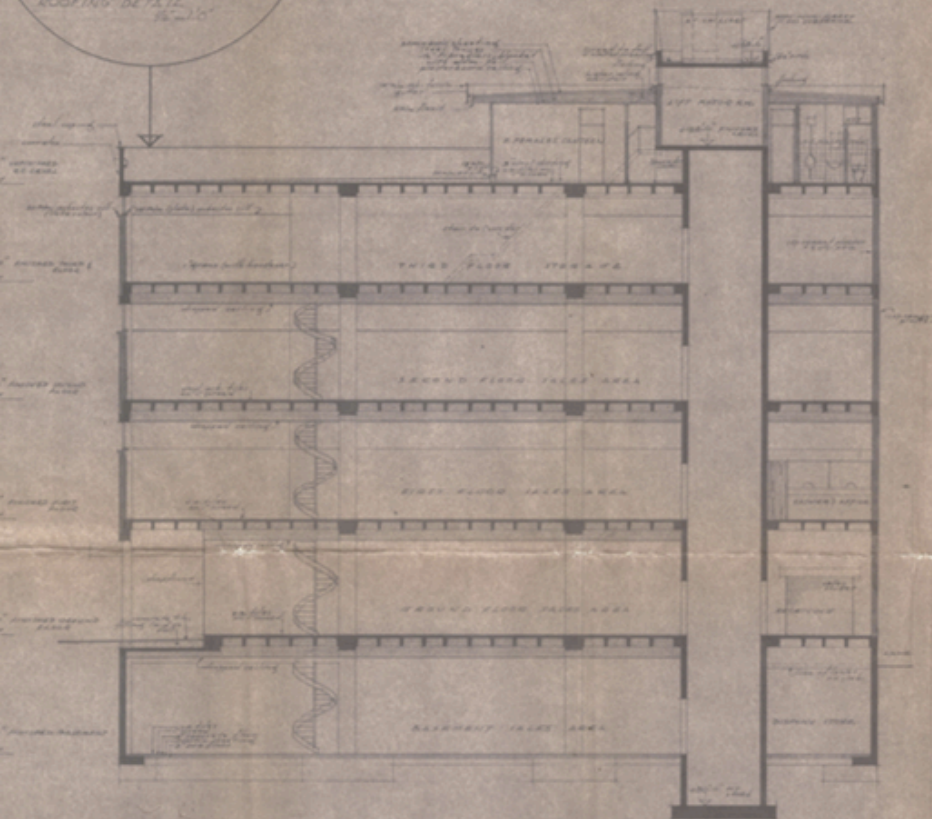
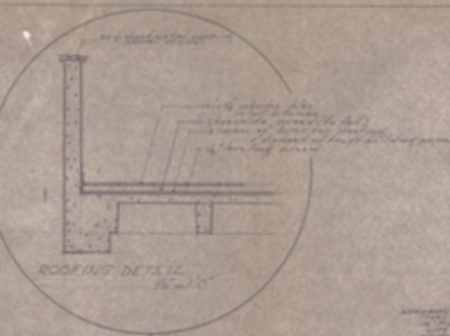
FLOOR PLANS OF EXISTING

SECTIONS OF EXISTING

FOURTH FLOOR



ROOF PLAN



SECTION AA

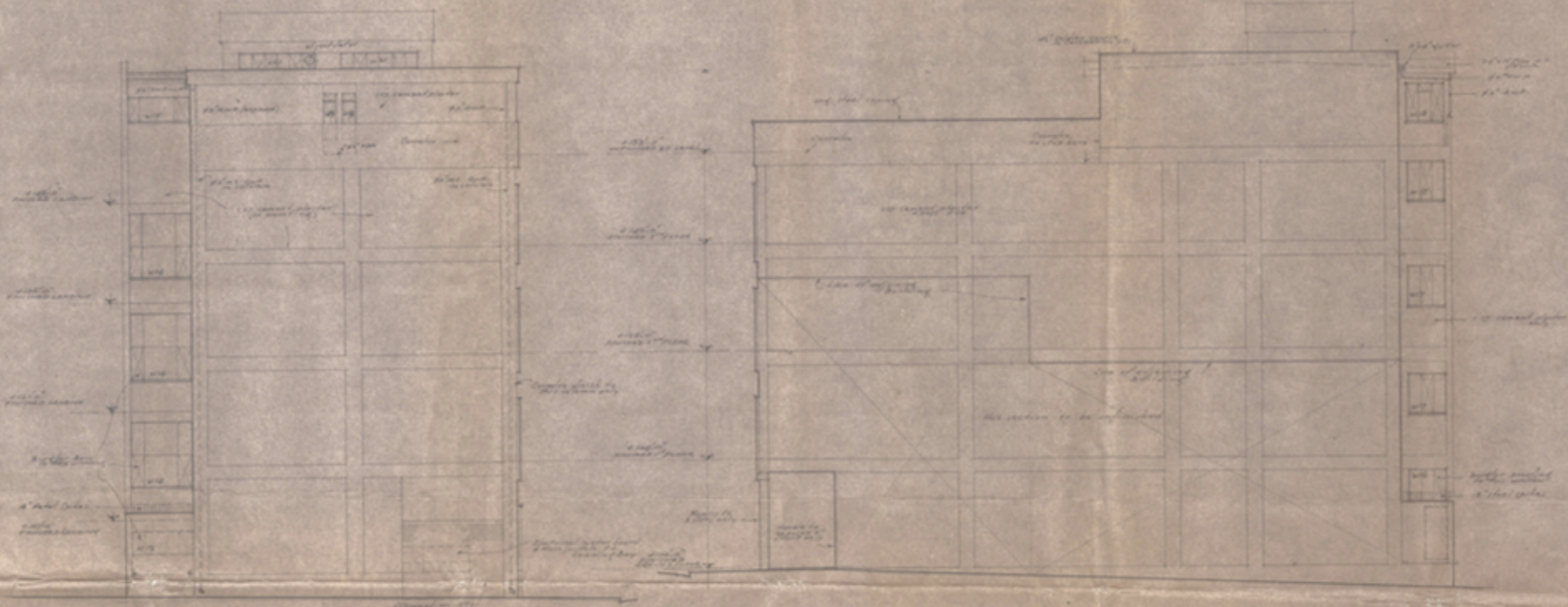
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23-1-1970
Handwritten signature

REVISED	REVISION	DATE	BY	CHKD.

BOEK DE NIE & VAN WYDVAARDER
 ARCHITECTE SWAK
 100 PHOENIX
 100 PHOENIX
 TEL. 406/1111
 406/11

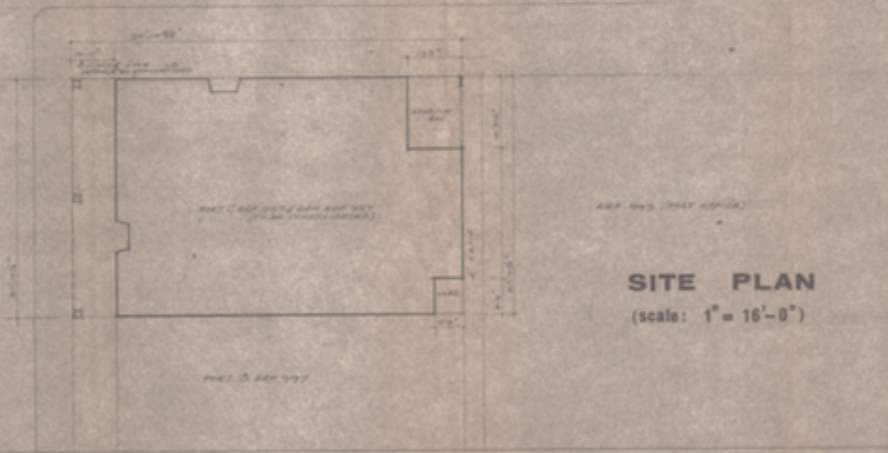
ELEVATIONS OF EXISTING



SOUTH ELEVATION

WEST ELEVATION

RICHARD STREET



SITE PLAN
(scale: 1" = 16'-0")

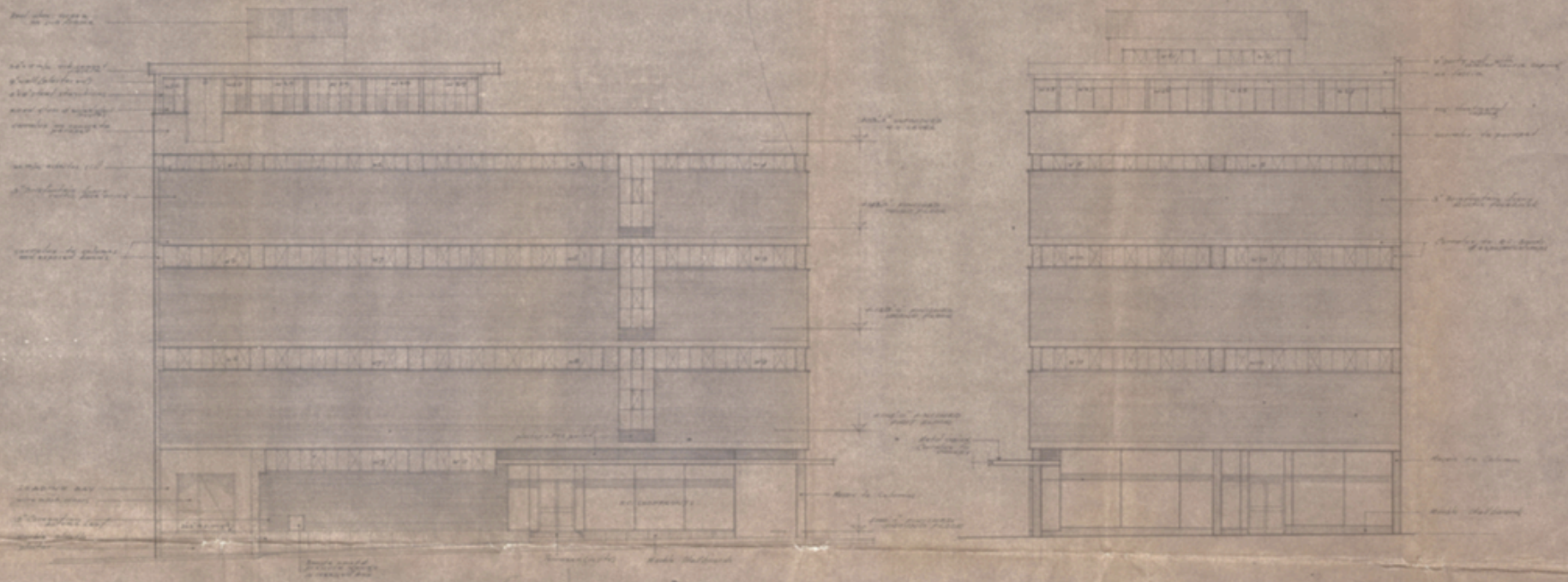
23-2-4920

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V BUILDING MESSRS. TIGER BROS. , BLOEMFONTEIN

REVISED	REVISION	WENK DE RIJ & VAN WYNGAARDEN	SCALE	DATE
		ARCHITECTS W.A.A.	1/4" = 1'-0"	23-2-4920
		MR. PRESIDENT	1/8" = 1'-0"	
		BUILDINGS	1/16" = 1'-0"	
		NO. 104, 107A		
		TEL. 4810-4811		
		BLOEMFONTEIN		
			406/13	

ELEVATIONS OF EXISTING



ELEVATION · FICHARDT STREET

ELEVATION · MAITLAND STREET

21-2-470

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NEW BUILDING · MESSRS. TIGER BROS., BLOEMFONTEIN

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		404 PRINCESTON			
		401 BLOEMFONTEIN			
		P.O. BOX 1074			
		TEL. 4011-4012			
		BLOEMFONTEIN			
			406/12		

Annexure B

Cadastral Information

Surveyor General

Bloemfontein

Date printed on 25 April 2019

Year of issue: SG Diagram

1872



AMENDED DIAGRAM OF ERF.

1700/6606/K/1920

IN ACCORDANCE WITH SECTION 5 OF THE B.G. OFFICE COPY,
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No. 26, 1905.

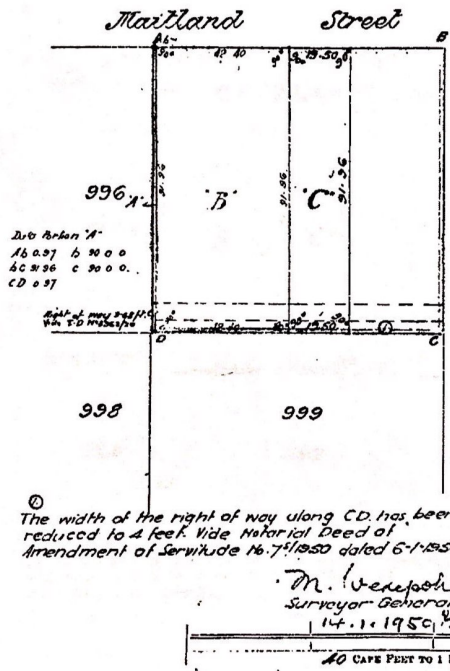
CANCELLED

This *Rem.* now Included In *Sub A. of Erf 997*

Vide diagram S.G. No. *516/170* attached to
Certificate of Conso. Title No. *6342/170*

J.S. Mahaffey 9.10.1970
for SURVEYOR-GENERAL. *14*

Diagrams Referenced
Diagram No.
B.C.



SIDES.		ANGLES.	
AB	95.57	A	90° 0' 0"
BC	91.96	B	90° 0' 0"
CD	93.57	C	90° 0' 0"
DA	91.96	D	90° 0' 10"

Note: Cape Feet in Block
Eng. Feet

The width of the right of way along CD has been reduced to a 4 feet Wide Memorial Deed of Amendment of Servitude 16-7/1950 dated 6-1-1950.

M. Venepohl
Surveyor-General
14.1.1950

The above Figure A.B.C.D. BLOEMFONTEIN ALLOTMENT AREA represents

Erf No. 997

Situate in the Township of *Bloemfontein* Orange Free State
In extent *59* Square Roods *108.70* Square Feet
Framed from General Plan of Township No. *378*

Deed of Transfer
12002 19/8/1972
(part) of 3-th Nam.

W. P. M.
Surveyor-General, O.F.S.
20.5.20

AMENDED DIAGRAM OF ERF.

1700/6606/K/1920

IN ACCORDANCE WITH SECTION 5 OF THE B.G. OFFICE COPY,
AMENDED SURVEYS (TOWNS AND VILLAGES) ORDINANCE,
No. 26, 1905.

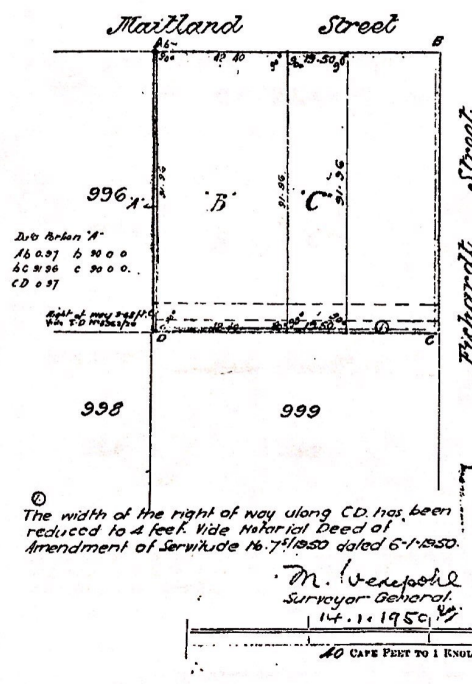
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J.S. Mahaffey 9.10.1970
for SURVEYOR-GENERAL. *14*

Diagrams Referenced
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Deed of Transfer
12002 19/8/1972
(part) of 3-th Nam.

W. P. M.
Surveyor-General, O.F.S.
20.5.20

Annexure C

Zoning Certificate

Mangaung Municipality

Bloemfontein

Date printed on 25 April 2019

Date of Issue

24/04/2019

Attention: Mr K. Mojanaga

Sir

ZONING AND PERMISSIBLE USES: THE REMAINDER OF ERF 996, PORTION 1 OF ERF 996, PORTION 2 OF ERF 997, PORTION 4 OF ERF 997 AND ERF 15765 (CHARLOTTE MAXEKE STREET) CITY, BLOEMFONTEIN.

Your request concerning the above-mentioned matter refers.

In terms of the approved Bloemfontein Town Planning Scheme (B.T.P.S), the above-mentioned erven are zoned "Business" Subzone "H" and may only be used for the following purposes:

Residential Buildings
Places of Assembly
Institutions
Shops
Business Premises
Auctioneers Business
Undertakers Business
Gymnasium
Commercial Workshop
Office
Guest House

With special consent of the Mangaung Metropolitan Municipality, they may also be used for the following purposes:

Special buildings
Block of Flats
Places of Instruction and Adult Instruction
Dwelling Houses
Public Buildings
Light Industry (Dry Cleaning only)
Business premises (Bakery only)
Betting Room
Service Industry

The development restrictions for "Business" Subzone "H" (Business and Restricted Business) are as follow:

COVERAGE:	No restrictions
BULK:	6, 0
SPACES ABOUT MAIN BUILDING:	(a) Subject to the coverage restrictions no further spaces are required to be left about the main building.

(b) Where the ground floor space of a building contains 370,0m² or more to be used for shopping or business purposes, which in the opinion of the council require loading and off-loading facilities, provision shall be made for such facilities, to the satisfaction of the Council.

HEIGHT: Limited to 28,0m

STREET BUILDING LINE: 0m on St Andrews Street, Fichardt Street and Burger Street
3m on Charlotte Maxake

PARKING: Shops:
Shops up to and including 1000m² is 4 parking spaces/100m² GLA with a minimum of 4 parking spaces
Shops > 1 000m² but = or < 15000m² is 6 parking spaces/100m² GLA
Shops > 15000m² is 5 parking spaces/100m² GLA

Offices:
2, 5 parking spaces/100m² GLA with a minimum of 4 parking spaces

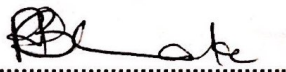
Service Stations and motor workshops:
4 parking spaces/working bay plus 2 parking spaces per 100m² spares and sales area

Industrial and commercial:
Manufacturing is 1 space/100m² GLA
Warehousing is 1 space/100m² GLA
Dairies, bakeries and laundries is 1 space/100m² GLA
Storage yards is 1 space/100m² GLA

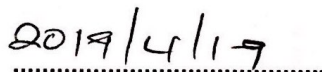
Residential:
Dwelling unit of 1 habitable room is 1, 0 space /unit
Dwelling unit of 2 habitable rooms is 1, 0 space /unit
Dwelling unit of 3 habitable rooms is 1, 25 space /unit
Dwelling unit of 4 or more habitable rooms is 1, 5 space /unit
Visitors is 0, 5 additional space/unit

For any further possible restrictions see the title deeds of the above-mentioned properties.

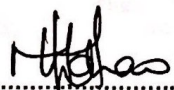
Yours faithfully



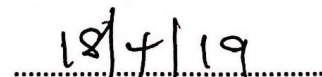
ME B. CHAKE
ACTING MANAGER



DATE



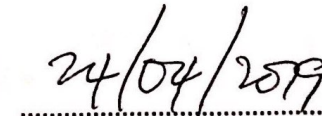
ME M. MAHAO
ACTING GENERAL MANAGER: PLANNING



DATE



MR B. MTHEMBU
HEAD: PLANNING



DATE