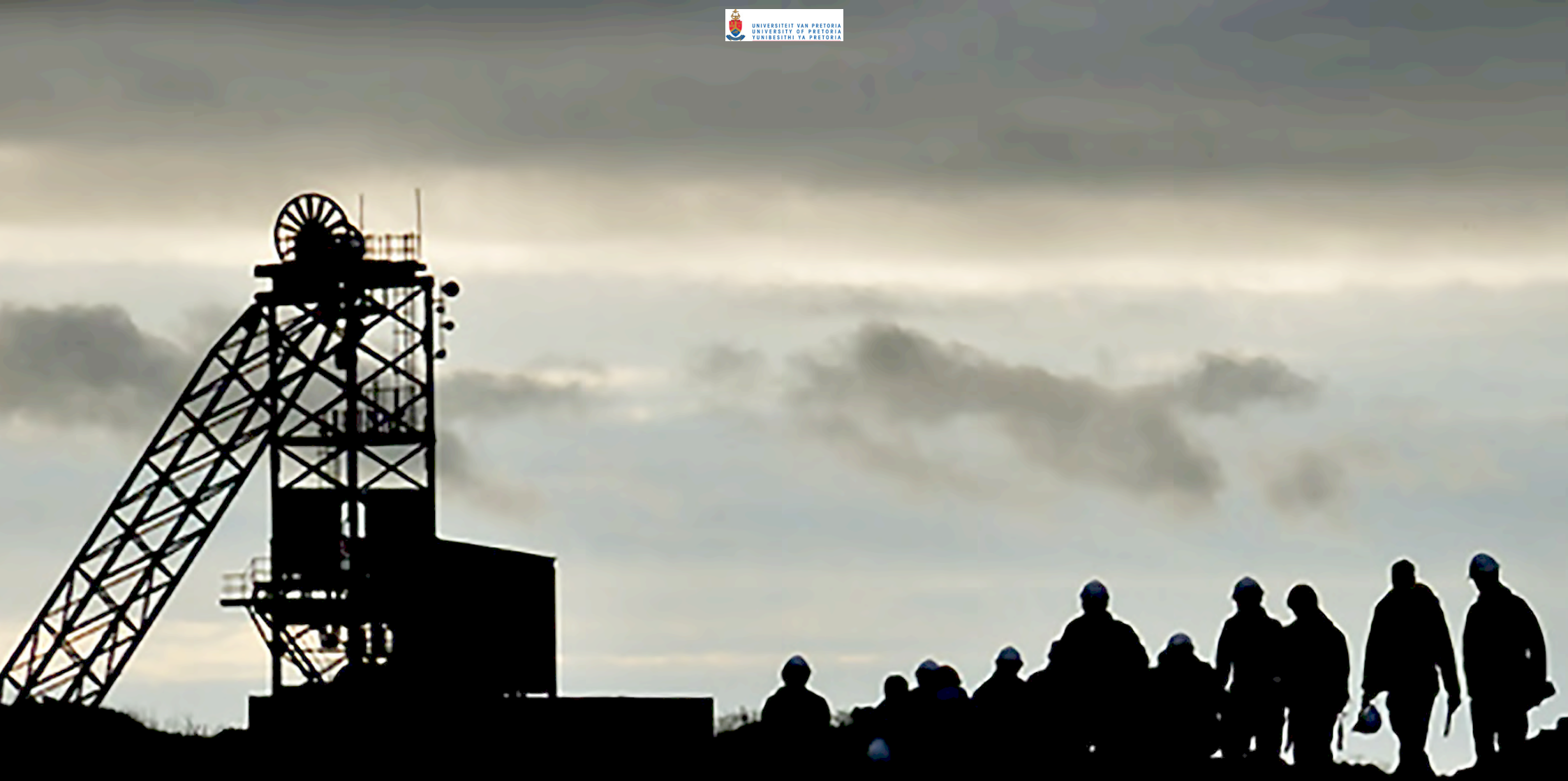
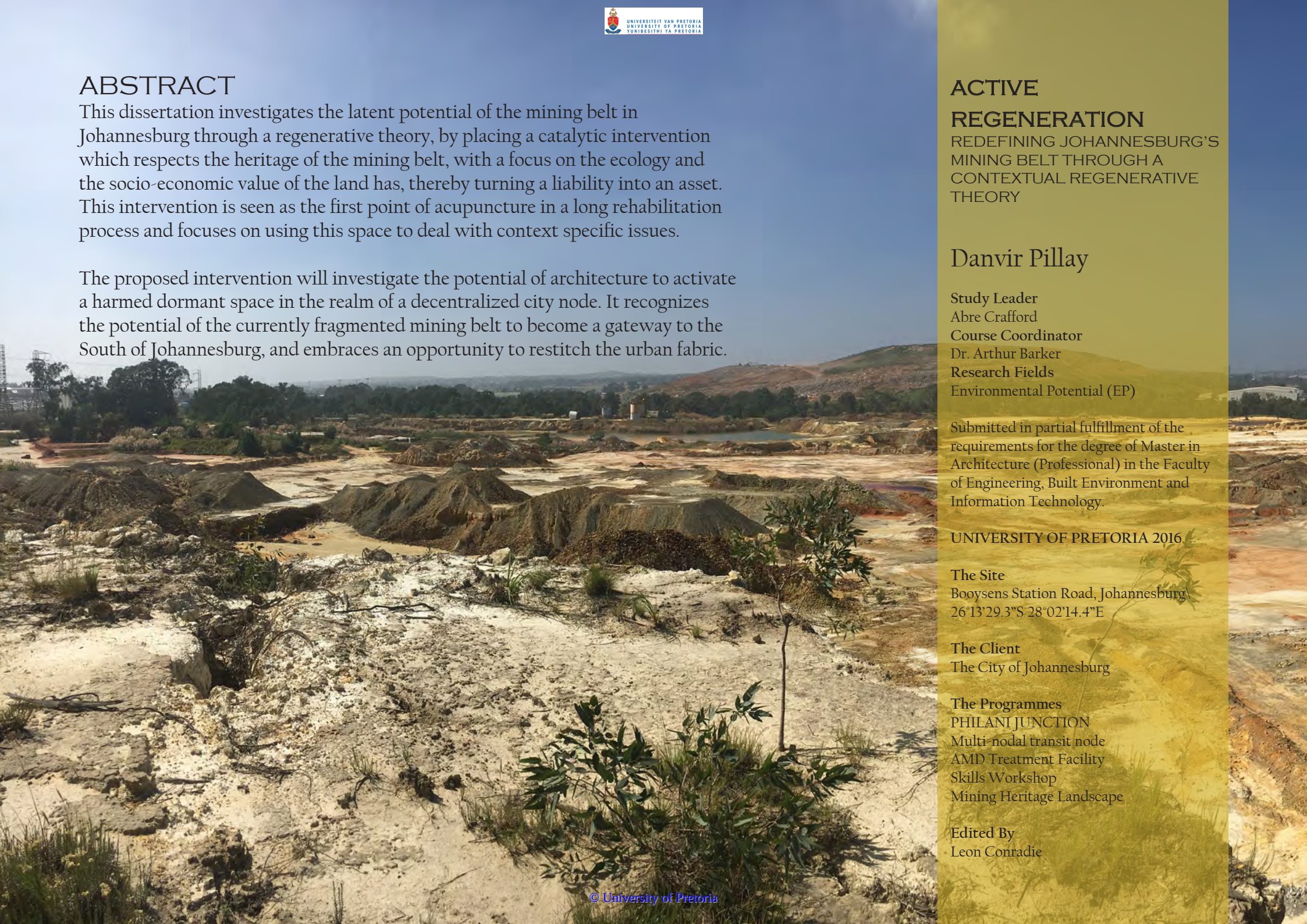


ACTIVE REGENERATION

RE-ACTIVATING JOHANNESBURG'S MINING BELT THROUGH A CONTEXTUAL REGENERATIVE THEORY

DANVIR PILLAY
16342730



ABSTRACT

This dissertation investigates the latent potential of the mining belt in Johannesburg through a regenerative theory, by placing a catalytic intervention which respects the heritage of the mining belt, with a focus on the ecology and the socio-economic value of the land has, thereby turning a liability into an asset. This intervention is seen as the first point of acupuncture in a long rehabilitation process and focuses on using this space to deal with context specific issues.

The proposed intervention will investigate the potential of architecture to activate a harmed dormant space in the realm of a decentralized city node. It recognizes the potential of the currently fragmented mining belt to become a gateway to the South of Johannesburg, and embraces an opportunity to restitch the urban fabric.

ACTIVE REGENERATION

REDEFINING JOHANNESBURG'S MINING BELT THROUGH A CONTEXTUAL REGENERATIVE THEORY

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UNIVERSITY OF PRETORIA 2016

The Site
Booysens Station Road, Johannesburg
26°13'29.3"S 28°02'14.4"E

The Client
The City of Johannesburg

The Programmes
PHILANI JUNCTION
Multi-nodal transit node
AMD Treatment Facility
Skills Workshop
Mining Heritage Landscape

Edited By
Leon Conradie

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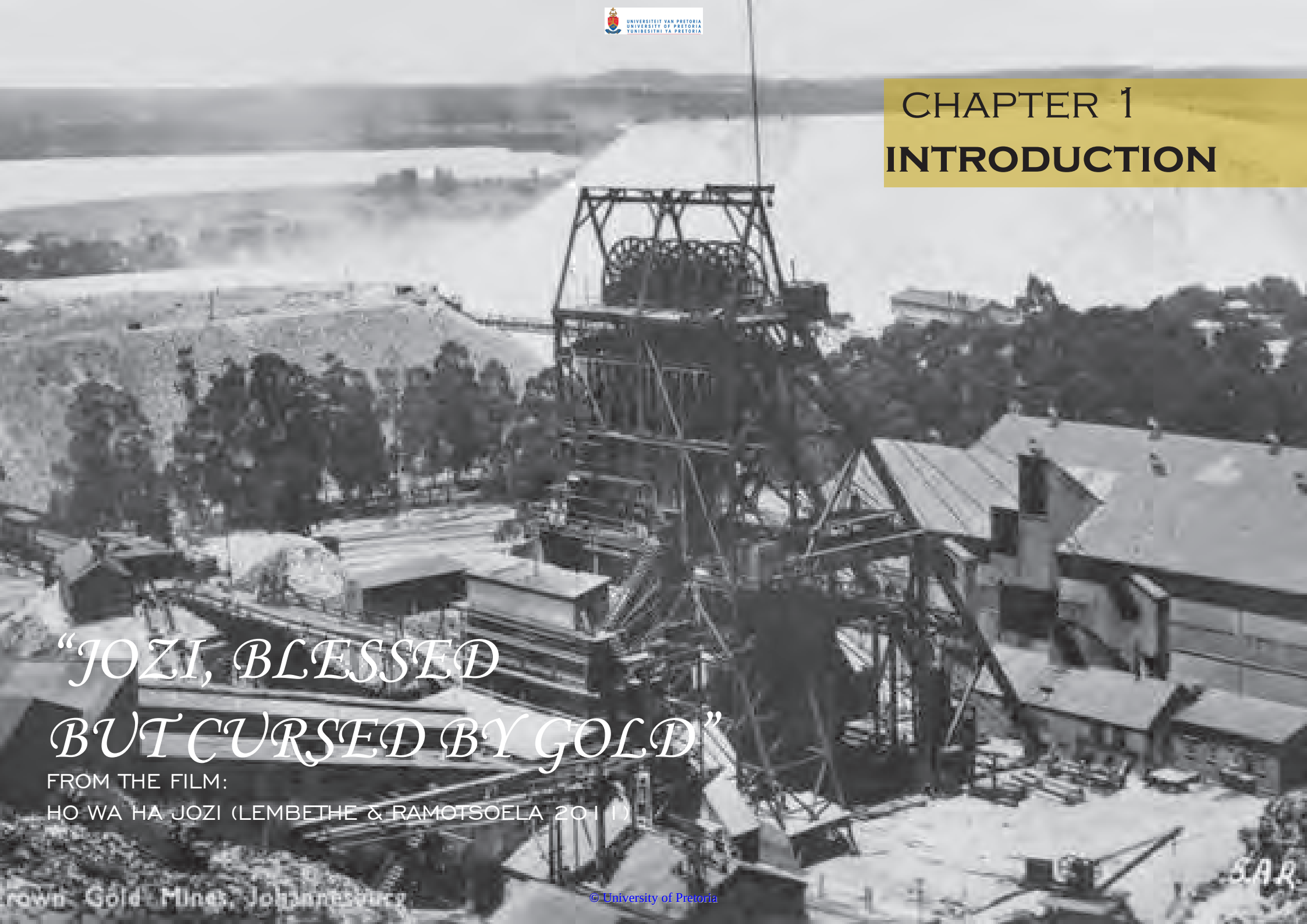
CHAPTER 1
INTRODUCTION



"JOZI, BLESSED BUT CURSED BY GOLD"

FROM THE FILM:
HO WA HA JOZI (LEMBETHE & RAMOTSOELA 2011)

1.1 MINING LEGACY

Mining is the historic and invasive process of acquiring raw materials from the earth often in the cheapest way possible. This process has left toxic socio-ecological scars on landscapes across the world, but has ironically formed the strong foundation of those economies and is a vital part of their resulting heritage.

There is no more emblematic example of this than the city of Johannesburg, which sits atop a labyrinth of tunnels, a subterranean museum which has given way to its successor above. This process has formed the strong foundation of economies and is an important aspect of their resulting heritage. What sets the Witwatersrand apart from other mining regions is that, "most mining belts of this scale are peripheral, whereas this mining belt is located [in] the centre of the city" (Toffa 2015).

Although almost all mining in the Gauteng City-Region has ceased, the region, along a 50km stretch is littered, with mine dumps, tailings and slime dams. These towering mounds welcome occupants to Johannesburg.
"The mine dumps of the Witwatersrand are beautiful. We think of them with nostalgia when we are away, and we return to them with joy." (Schuman 1974: 17-24). Visually they are somewhat like Johannesburg's equivalent to Cape Town's "mountains" and Durban's "beaches" (Toffa 2015). Their presence is thus oxymoronic both as a cultural asset and an ecological problem.

Due to policy or rather lack thereof and stakeholder complexity, the impact of extraction on the post mining landscape of Johannesburg has not been effectively dealt with. This corridor of dead space runs through key socio-economic nodes such as Johannesburg's CBD, and remains as a scar that is not integrated in the 2016 version of the JHB SDF for 2040. Although the mining belt is zoned as a mixed-use area, it have yet to form a significant part of Johannesburg's 2040 SDF[1], only transport nodes around it have been targeted rather than the actual site itself.

"Present day Johannesburg, with the economic structure and growth performance of a successful post-primary post-industrial city, is far removed from its mining origins. However, Johannesburg remains deeply connected to its mining past." (Harrison&Zack, 2012, p564)

FIG 1 : *The mining belt and city condition (Trangos & Bobbins, 2015)*

FIG 2 : *State Mines, in Brakpan (Johnson, 2017)*

FIG 3 : *Children playing in toxic AMD water (Crowley, 2016)*

FIG 4 : *Collage of existing heritage museums gold reef city [left] and the workers museum [right] (Trangos & Bobbins, 2015)*

1.2 THE RESEARCH PROBLEMS

This landscape hosts a complex set of issues with a deep rooted socio-economic heritage. "Mining on the [Witwaters]Rand not only extracted significant wealth from the ground but also instilled deep socio-economic and class divides" (Trangos G & Bobbins K, 2015). Furthermore, the post-mining landscape of Johannesburg divides the city whereby some hazardous zones remain, uninhabitable. These hazardous sites "present challenges for future development and spatial integration of the city-region." (Trangos G & Bobbins K, 2015) This problem is amplified by the existence of informal settlements which are products of the spatially disadvantaged in satellite townships. The mining belt, so close to the urban core, has become, not only a lost space, but a negative one (Trangos G & Bobbins K, 2015). The belt thus lies as a dormant gateway to the spatially disadvantaged Southern region of Johannesburg. In addition it also has the potential to strengthen the metropolitan core of Johannesburg leading to a more resilient city. This could be achieved through high quality linkages and spatially just interventions. This scared landscape, which was the core economic driver of the region through its gold production, has the potential to become an economic and ecological hub.

The most pressing concern resulting from mining activity is the ecological threat of toxic residues, both in the form of airborne dust, and Acid Mine Drainage(AMD[2]). Acid Mine Drainage is when Pyrites and Sulphides infect water on mining dumps and slime dams as well as percolating into the old mines forming an acidic by-product that is hazardous. This harmful product "threatens vegetation, water courses and human health" as well as building foundations.(Kidd 2011) Several authors Naicker, Cukrwosja, McCarthy have argued that this problem needs immediate attention. The city has undertaken certain initiatives with private institutions to decant the AMD from the mines, store and partially treat the water as well as rehabilitating the mining landscape however this has only largely happened in the west rand and mining land.

Another less tangible concern is that is that lost mining heritage which is poorly acknowledged. Stefan Berger noted at the International Mining History Congress that "mining and its heritage have been crucial to forms of identity construction in regions of heavy industry across the world, not just south Africa." Where South Africa differs from other countries is in the lack of celebration, documentation and acknowledgment of its mining heritage, and the potential for this to form part of its national heritage. Johannesburg is the quintessential example of a mining city. Dubbed the City of gold it nevertheless has no official museum dedicated to mining or industrial heritage celebration apart from two sites, one of celebration and one of remembrance (Davenport J, 2012). One is the themed scenography of Gold Reef City and the other a narrative history of migrant labour at the workers museum.

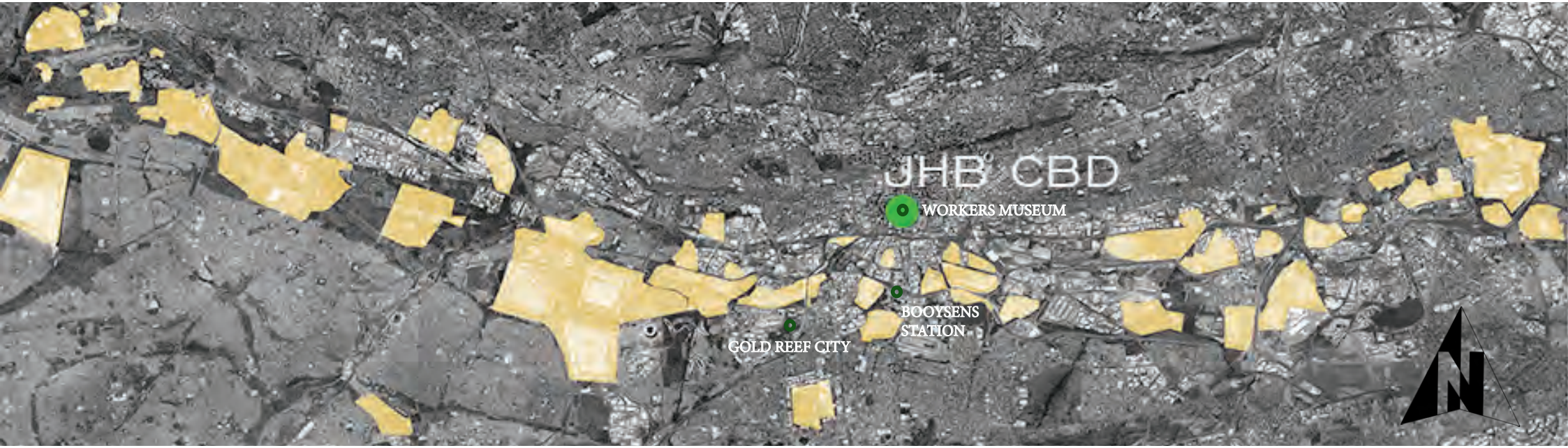


FIG 5 : *Orthophoto showing mining belt and sites of interest (Author, 2017)*

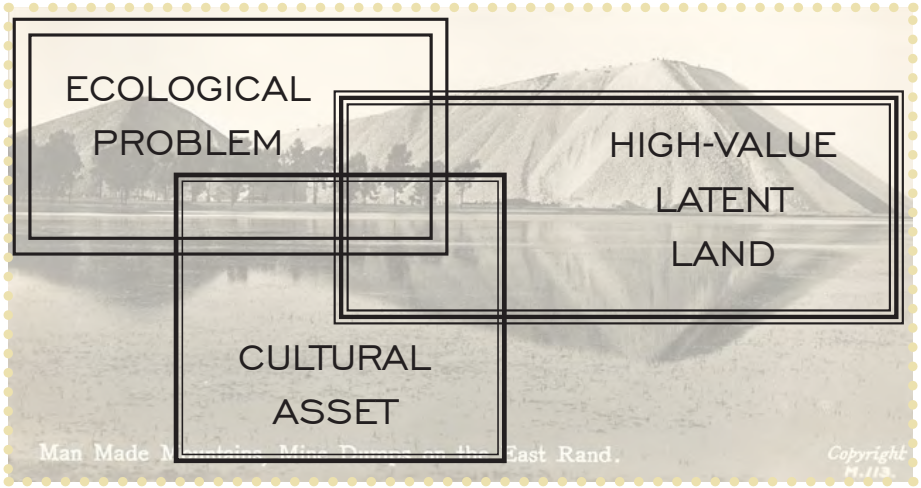


***FIG 6** : Diagram showing the main issues and assets of the mining belt (Author, 2017)*

This belt has the potential to positively impact the spatial and socio-economic strength of the city but If left uninvestigated then not only does it pose a health risk to the city and its inhabitants but it will remain lost space which lies latent as a rich historic landscape.

The Johannesburg SDF for 2040 has been used as a framework to drive this intervention. it is a point of departure for a contextual response and will be explored further in the urban and site analysis components of this document. Specifically, a preliminary urban analysis has highlighted Booysens Station[3] earmarked for a multi-modal upgrade. This provides the perfect driver for this intervention as it provides a loose framework to facilitate a contextual response. Therefore it will become a point of departure for this investigation. This driver will be explored more in the urban and site analysis.

Thus, the question becomes

1.3 THE RESEARCH QUESTION

How can a contextual regenerative theory be utilized to re-imagine Booysens station as a precinct that brings a new legibility to the lost space of Johannesburg's mining belt, addressing socio-economic concerns and ecological damage while acknowledging the mining heritage of the Witwatersrand?

1.4 THE RESEARCH INTENTIONS, ASSUMPTIONS AND DELINEATIONS

In this landscape a web of concerns and informants call for:

1) a socio-economic investigation into the climate of Johannesburg reference to the mining belt, that will lead to a site activation strategy that positively impacts the surrounding communities. Skills development, spatial empowerment and intra-city linkages and connections are focus areas. The intent is to utilize this high value land so close to the CBD through successful activation.
2) An investigation of the infected landscape, specifically AMD to effectively raise awareness of the subterranean problem and begin the process of site rehabilitation. This intervention could be replicated across the 50km stretch of landscape. The intention is to provide a plan to resolve the ecological problem post-mining land has caused
3) Acknowledgment, documentation and exhibition of the history of the mining belt as explored through a heritage landscape. This comprehensive account of the extraction history of the Witwatersrand will include the presentation of documents, photographs, narratives, physical infrastructure and machinery. The intention is to retain the cultural asset of the post-mining landscape.

This investigation sets out to define an initial point of acupuncture within the mining belt that will form part of a greater urban scheme. It deals with the variety of mining belt problems from a holistic perspective, but isolates the three "focus areas" of socio-economic value, ecology and heritage. The intention is for these to generate a complex yet balanced dialogue that responds to and regenerates the site. The study is contextual and targets existing conditions. Thus it does not deal with every issue and is not a generic solution for all post-mining landscapes but rather a very specific response through the aforementioned "focus areas" or lenses.

1.5 RESEARCH METHODOLOGY

In order to address the Research Intentions the following method and format will be utilized in order to generate an architectural solution.

Context
A historical and contextual analysis will be conducted using old book, journals, articles, photograph and web pages to gather information on the mining belt specifically related to the three lenses of ecology, heritage and socio-economic value

Urban Analysis And Site Analysis
An Urban Analysis will be conducted by examining Reports such as The Johannesburg Spatial Development Framework 2040, the Gauteng Mobility Report 2016 and the Corridors of Freedom Proposals. These Frameworks along with urban mapping and contextual analysis will assist in selecting an urban site and developing an Urban Plan to deal with the relevant mining sites rehabilitation

From there a Site will be chosen within the Urban Plan Area and a subsequent Analysis will be carried out through mapping techniques specific to the 3 mentioned lenses. The site will also be documented through photographs after specific site visits. The surrounding community will be engaged to assist in the development of a context-driven response.

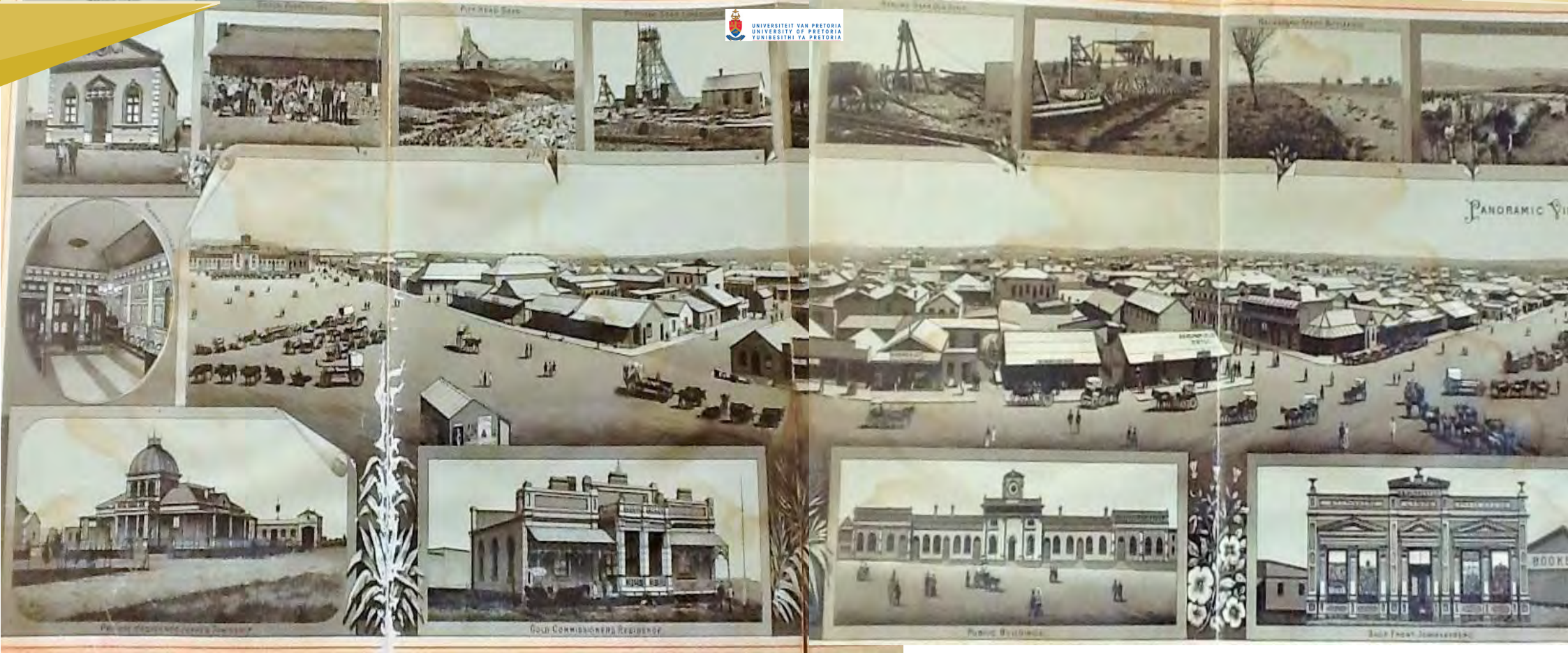
Regenerative Theory
3 Charters will be used to establish a regenerative response, that being "The Burra Charter", Kenneth Frampton's "10 Points on an architecture of regionalism," and Nabeel Hamdi's "The spacemakers guide to big change," These 3 charters will be examined to develop a regenerative theory that will have a focus on ecology, heritage and socio-economic effect. The intention of this theory is to provide a guideline to develop an architecture that will heal and activate this post-mining landscape. This theory will be used to formulate and inform the design conceptually.

Precedents
A series of case studies will be examined to support the formal, contextual and technical responses. Specific Precedents will focus on Multi-modal transit hubs, post-mining landscapes and critically regionalistic design, heritage relevant examples like mining stamps of Johannesburg.

Design Methodology
The Design will spatially be inspired from precedents, specifically Bernard Tschumi's Parc de la Villette as well as the developed regenerative theory. A study into context, site, topography, heritage and historical influences, forms, materials and construction will be conducted to form a complete architectural language.

CHAPTER 2
CONTEXT

understanding the past



George Harrison Discovers main Gold reef
1886

1887
Lack of potable water sources become apparent

52 Mines Established
1889

1899
War between Transvaal and Great Britain

Socio-racial divisions begin
1904

1906
Union of SA (Granted autonomy from Great Britian)

Chinese Indentured Labourers Repatriated
1910

1919
70000 Black Migrant Miners Strike (Rand Revolt)

Cheaper Labour Due To Gold Price Drop
1921

1923
Segregated housing estates

CITY O
JOHANNESBUR
officially establishe
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FIG 7 : *Panorama of Johannesburg 1889 during the mining boom (Latilla, 2013)*

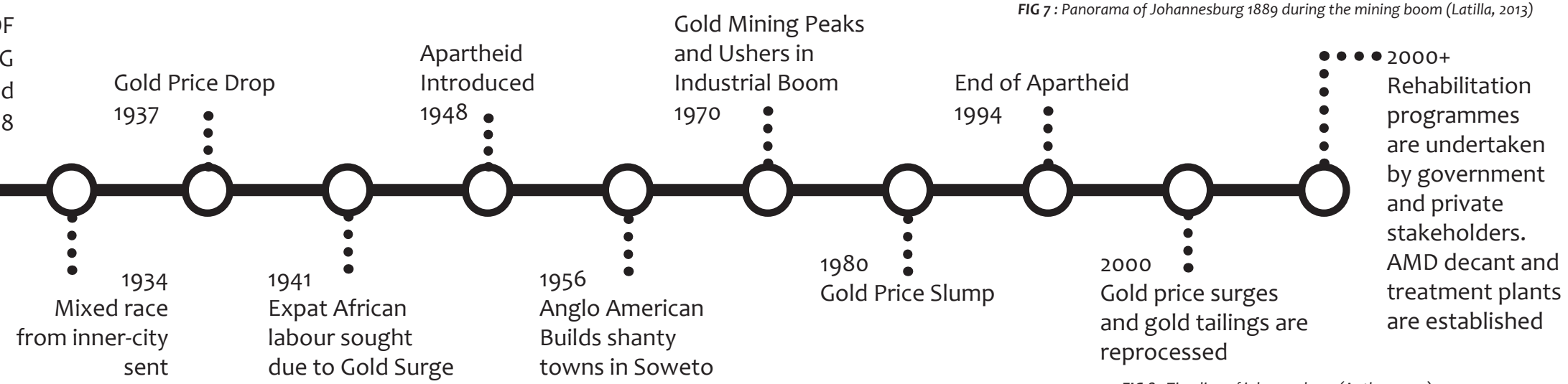


FIG 8 : *Timeline of johannesburg (Author, 2013)*

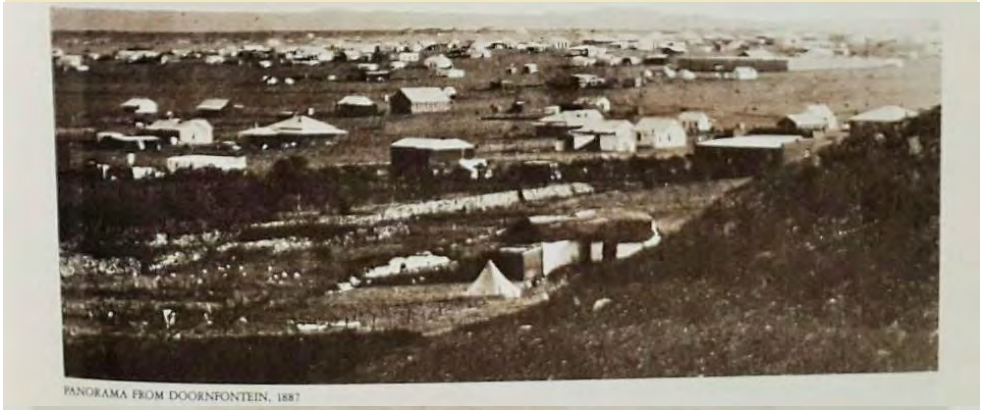
2.1 CONTEXTUAL STUDY

"The extent to which the ills and the virtues of the large and complex urban agglomeration, of which Johannesburg is the core, is owed to mining is poorly understood." (Harrison & Zack . 2012, 568)

To understand this a contextual historical study is needed. This history will focus on the 3 aforementioned lenses.

Johannesburg sits as a decentralized CBD in the ever-growing shadow of Sandton City. South of this lies the mining belt interspersed with industrial activities and huge mounds of mining waste. Robinson Deep landfill towers over the low-rise silhouette of Joburg South, as tall blue gum trees[8] wave in the dusty wind. This post-traumatic landscape is a result of a vibrant city with ever-present socio-ecological scars. The current spatial, socio-economic and ecological state of Johannesburg is a direct result of mining activity and this history must be explored to understand the need and reasoning for the proposed intervention.

FIG 9 : *Oblique View of current city conditions, towering waste mounds [old top star drive-in] in an industrial belt just South of Johannesburg CBD (Tang, Watkins, 2011)*



PANORAMA FROM DOORNFONTEIN, 1887

PANORAMA FROM THE NORTH-EAST, 1888

HARRISON AND MARKET STREETS, 1889. The Building in the foreground was the Standard Bank

FIG 10 : *Progression of Development in Johannesburg 1887, 1888 and 1889 from top to bottom (Latilla, 2013)*

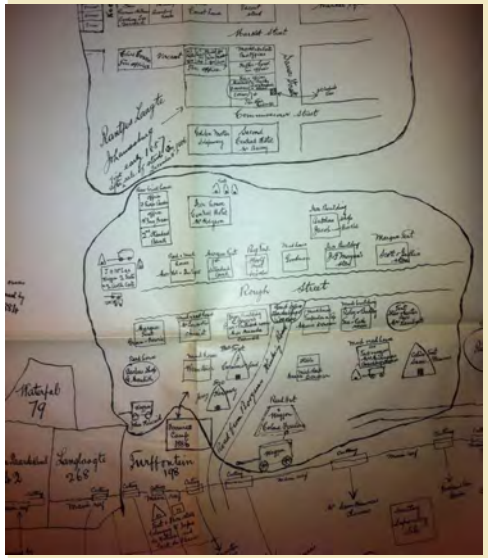


FIG 11 *:Sketch of Johannesburg's spatial layout (Latilla, 2013)*

FIG 12 *: old map of the original farms. "Uitvalgrond" marked out (Doucakis, 1997)*

FIG 13 *: "Uitvalgrond" original triangular piece of Johannesburg city (Jansen van Vuuren, 2012)*

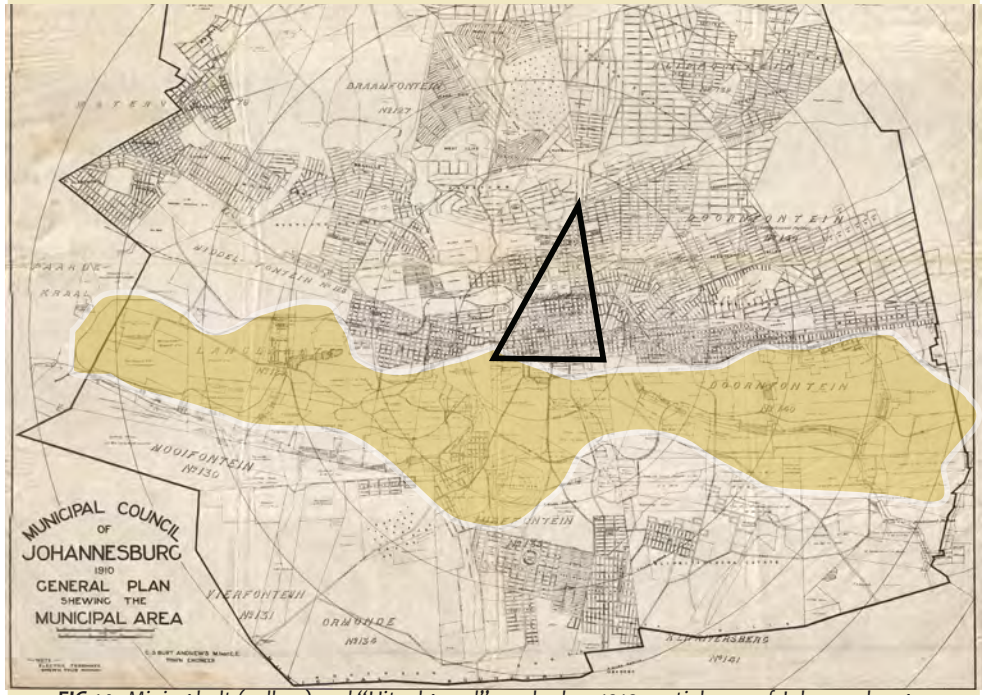


FIG 14 *: Mining belt (yellow) and "Uitvalgrond" marked on 1910 spatial map of Johannesburg (Author, 2017)*

2.2 SOCIO-ECONOMIC HISTORY OF JOHANNESBURG

In 1886 George Harrison discovered the main gold reef in present day Johannesburg, on the farm Langlaag. The original mining camp was established in Ferreira's town by Col Ignatius Ferreira. Due to the short-lived nature of mining settlements of the day, Johannesburg was planned for impermanence, the spatial layout was typical of nineteenth century mining camp planning. Even after it was discovered that the reef was large and deep and the MacArthur-Forrest cyanide process allowed deep excavation the town wasn't seen as a permanent city. The buildings maintained a prefabricated iron and timber composition as the town's lifespan wasn't seen as exceeding 25 years (South African History Online, 2011). Originally a community of 3000 people established the township of Johannesburg on the 3rd of October 1886. The mines grew from 1 mine in 1885 to 52 mines in 1889, most of which were open shaft.

Originally there was political unrest between Great Britain and the Zuid Afrikaansche Republiek (the old transvaal of which Gauteng is a part) due to the fact that the Witwatersrand was the largest gold producing region in the world. War erupted in 1899 and lead to Great Britain establishing political dominance. However, after the 1906 granting of autonomy to the Transvaal, the gold fields of the Witwatersrand became shaped by the Union of South Africa rather than British interests. (Harrison P & Zack T, 2012)
The main drawbacks faced by the inhabitants of the mining belt were their distance from major transport routes and the lack of nearby potable water. This issue has continued to today, with urbanized promise of Gauteng having a population of 8.5 million, water security and public transit are major city issues. (Harrison P & Zack T, 2012)

The mining sector was formative not only in terms of production and subsequent growth but also in the evolution of societal relations in the unique history of the migrant labour system and subsequent labour relations (Innes 1984,69)

Population growth was rapid from the moment the gold reef was discovered, a trend that is still prevalent today. The contextual study of the population growth is specifically focused on Migrant labour. The migrant labour system, which was a result of mining activity, was an economically driven, socially destructive construct. There were major changes in the composition and skills level of mining labour on the reef, often related to demand and fluctuations in the price of gold, but importantly because local labour was inadequate and migrant policies were intended to restrict labourers from establishing roots within the mining town. (Yudelman, 1984)

The South African War of 1899-1901 saw the first slump in economic activity. This eventually lead to the importation of 60000 Chinese indentured labourers who were all repatriated in 1910. This in turn resulted in the importation of black migrant labourers from Mozambique and further north within Southern Africa. This was because the "natives" could not adequately supply the workforce needed. Originally there was a colour bar that restricted the mining jobs to skilled but expensive Australian and British people. It was modified to replace them with cheaper labour when the gold price dropped again suddenly such as in 1921 (Harrison & Zack, 2012, 556).

After 1941 African labour became more militant (Chilvers 1948). Migrant Workers slept on shelves in the deprivation of the camps as depicted in fig 15(right). These labourers signed contracts and were uprooted from their families. They were also kept away from the better skilled jobs through legislation and subsequently kept away from training by laws and mining customs which enforced minimal training that would require supervision (Harrison & Zack, 2012). They were housed in camps and allowed to see their

FIG 15 : *Mining Camp Conditions, sleeping quarters with shelf beds. Poor housing conditions contributed to miners developing TB. (TBFacts.org, 2017)*

FIG 16 : *British officials collecting taxes from Zulu chieftains in the early 1900's* (Potenza, 1996)

FIG 17 : *Migrant Workers (Tang, Watkins, 2011)*

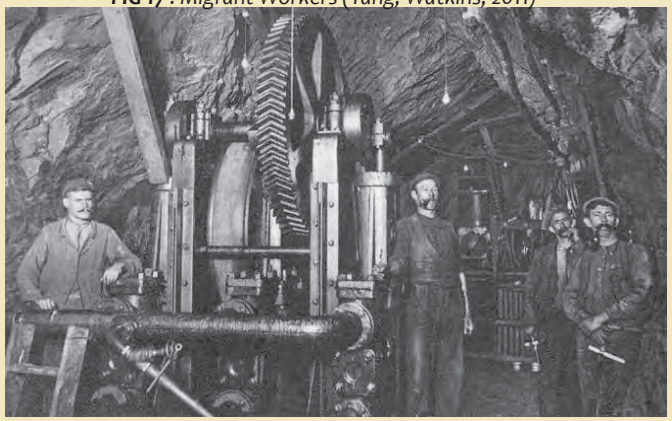


FIG 18 : *White (top) and Black Migrant Workers(bottom)*
(Johnson D. 2017)

families only twice a year. Contracts prohibited black migrant workers from establishing residences along the mining belt. They weren't allowed to settle their families here - this set the "groundwork" of later apartheid policies.

It had become a conglomeration of cyclical recruitment and return of migrant workers. This established a yearly turnover so the black working class couldn't establish roots in the community. Migrant workers came in the hundreds of thousands from all over Southern Africa. Due to these policies, wages and working conditions there were many resistance movements and uprisings throughout Johannesburg's mining history, a trend that carried through to today and is apparent in disputes such as the wages issue which eventually lead to the Marikana massacre. A disruptive and harmful legacy that makes it clear that with these practices mining "played a key role in shaping the racial oligarchy" within south Africa (Harrison P & Zack, 2012).

Johannesburg has evolved far past it's mining heritage and become a financial powerhouse this started at the end of world war 1. Johannesburg had established emergent industries due to the need of a self-sufficient system after imports were interrupted. (Innes 1984). The mining sector catapulted South Africa from a "quasi-state to a surprisingly advanced modern industrial state" in just 80 years (Yudelman 1984,9). Manufacturing eclipsed mining as the core local economy at around 1948 when the National Party came to power and introduced political policies like apartheid (Harrison P & Zack T, 2012, 552). Thus mining heritage formed the basis of Johannesburg's booming economy with it being the precursor, giving rise to the industrial sector and eventually giving rise to the financial sector. This is how Johannesburg survived the boom-bust effect, typical of mining town.

2.3 TECHNICAL AND AESTHETIC HISTORY OF JOHANNESBURG

The quintessential aspect of Johannesburg's heritage is the mining landscape and its resulting morphology. Originally huge steel machinery and frames scattered the landscape, some examples still standing today, such can be found and crown mines. This industrial fabric had a very specific formal and aesthetic quality which is explored through a series of pictures(Refer to Tectonic Precedent) depicting the past tactile experience of the mining landscape. The most prominent feature was the mining head frame structure which sat atop the shaft, a steel tectonic landmark that controlled the descent into the mine shafts below. Ore was collected and taken to industrial mills where it was processed by mine stamps.

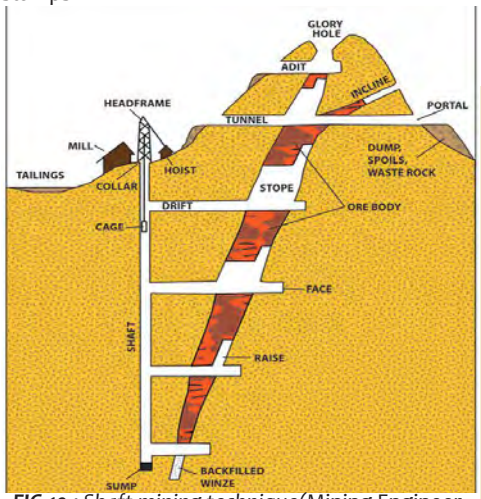


FIG 19 : *Shaft mining technique(*Mining Engineer, 2017)

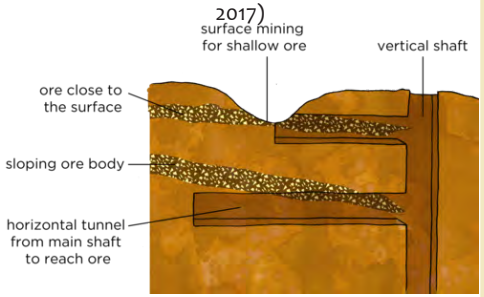


FIG 20 : *Shaft Mining* (Siyavula Education, 2017)

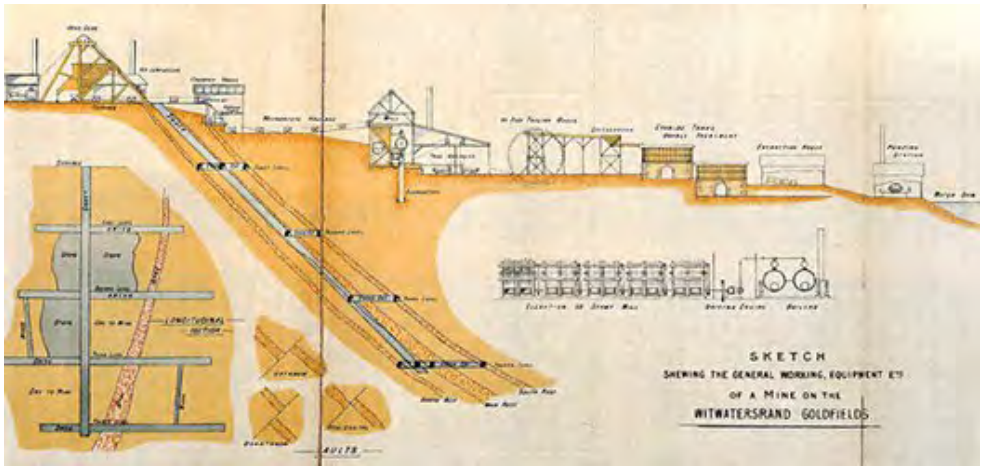


FIG 21 : *(left) " The Witwatersrand gold reserves exist in a one-meter thick "reef" that is remarkably deep, requiring mining shafts that reach up to four kilometers below the surface. Historically, horizontal tunnels were built to connect vertical shafts to the gold bearing reef, as the reef extended further underground at an angle. In deep mines, the main vertical shaft shifted several times to stay close to the reef. Although there is an abundance of gold ore within the region, the low gold content in individual reefs necessitated the removal of a large amount of earth. Over the past century, over 1.7 billion metric tons of material have been removed from the earth and deposited in mine dumps." (Tang, Watkins, 2011) [Image from "Witwatersrand Gold—100 Years," edited by E.S.A. Antrobus, 1986, courtesy of the Geological Society of South Africa.]*

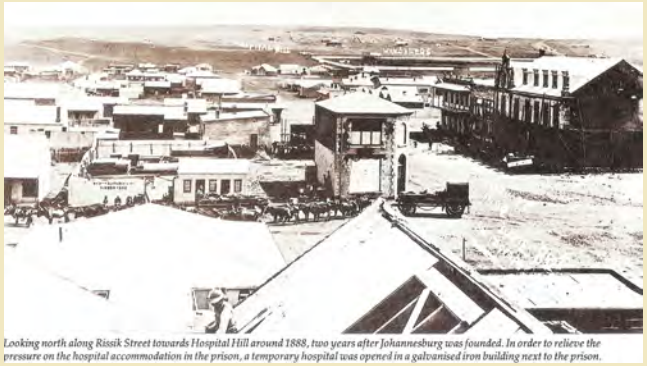
FIG 22 : Mining Landscape (Johnson D. 2017)

FIG 23 : PICTORIAL EXPLORATION OF JOHANNESBURG SPATIAL AND AESTHETIC QUALITIES DURING MINING BOOM *(Latilla, 2013)*

Notable features, the walkable streets, busy market spaces and move from impermanence to more permanent building typologies, left to right

View of Johannesburg 1888. It is interesting to note how Johannesburg has developed from a town on a flat, treeless plain into the attractive City of trees and gardens it is today.

COMMISSIONER STREET, JOHANNESBURG.



Looking north along Rissik Street towards Hospital Hill around 1888, two years after Johannesburg was founded. In order to relieve the pressure on the hospital accommodation in the prison, a temporary hospital was opened in a galvanised iron building next to the prison.

THE MARKET SQUARE, JOHANNESBURG.

2.4 SPATIAL HISTORY OF JOHANNESBURG

" the spatial evolution of early Johannesburg was profoundly shaped by the physical presence of mining and by the hierarchies and intersections of a society that emerged around the mines." (Harrison P & Zack T, 2012, 557)

The Witwatersrand mining belt with its associated infrastructure and tailing residue, is a significant geographic and spatial feature that stretches 50km East to West, splitting North from South. At first development of the city of Johannesburg was northward, with the South reserved for future mining activities. This split became entrenched with the North becoming synonymous with a privileged white elite such as the Randlords and the South, including the mining belt, hosting camps for the black community and migrant workers. (Harrison&Zack, 2012). The state-owned land of Johannesburg was originally marked out on a triangular piece of land just north of the mining belt. Because of its perceived impermanence it was crudely placed on a tight grid with small blocks (Beavon 2004).

The population had a steady growth and eventually in 1928 Johannesburg was proclaimed a city. With a surge in gold price the 1930s brought a massive boom in development and infrastructure and subsequently the repression of black settlements within the city controlled by the "booming white space." An industrial belt developed along the mining belt while high rises dominated the city. (Harrison P & Zack T, 2012, 558).

The theme of socio-racial segregation in the city's development is evident from as early as 1887. These patterns were firmly in place by 1904. (Bevan 2004.) Migrant labourers were housed in camps that originally were made from wood and steel but later, made up of concrete. However, these migrant labourers weren't the only black Africans in Johannesburg. Some found work in other sectors and accommodation in municipal compounds as well as slums in the city. It was

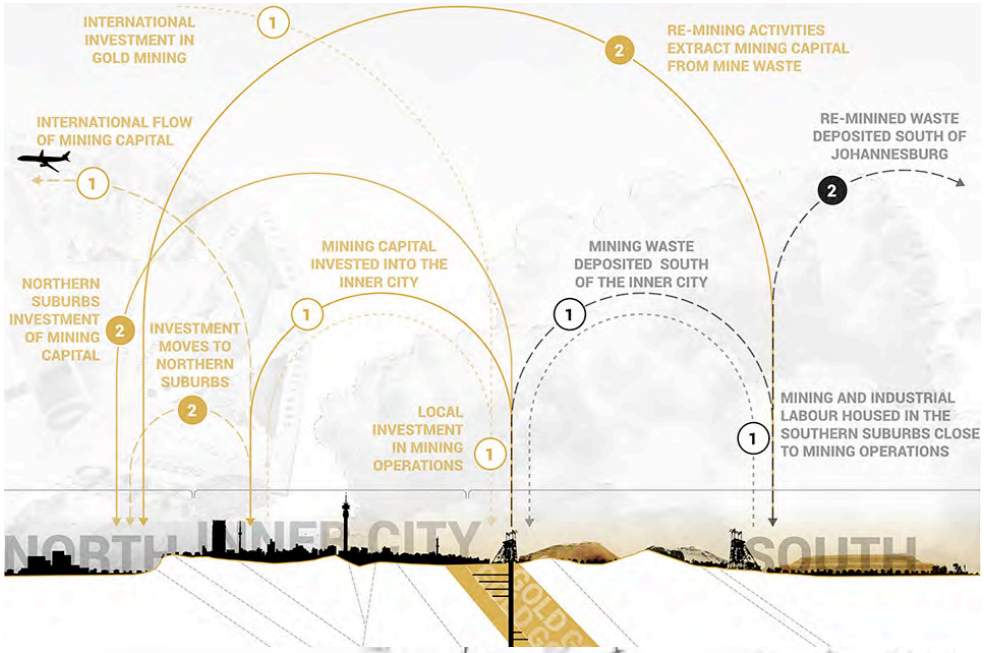


FIG 24 : *(Right) Processes of Extraction: Landscapes of wealth and waste. Diagram depicts historic (1), and modern extraction processes (2) along the Rand* (Trangos & Bobbins, 2015)

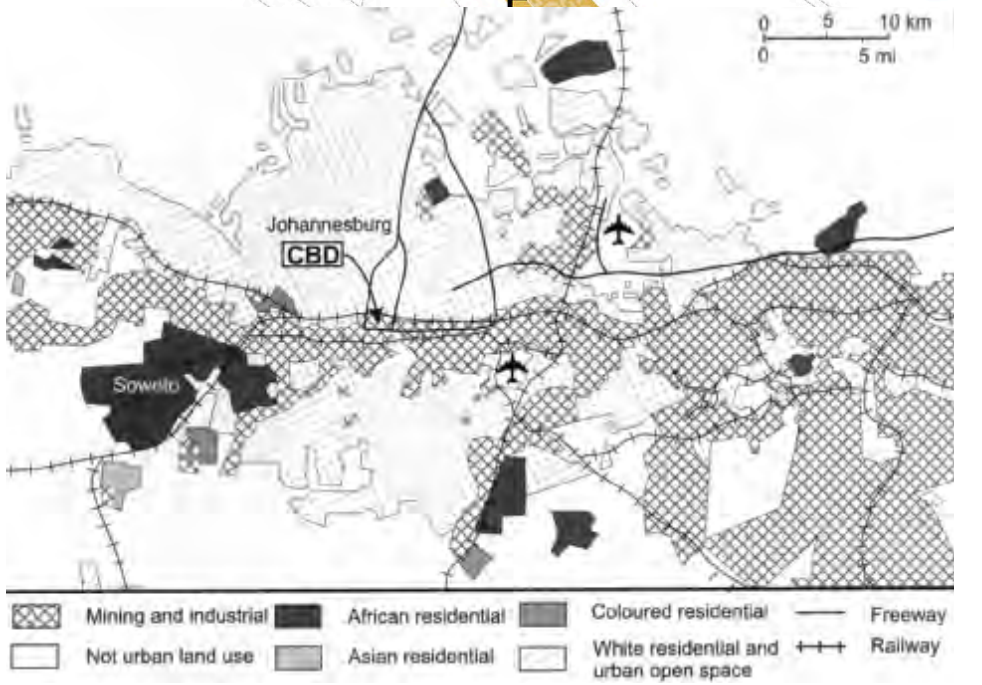


FIG 25 : *(Right) Urban Models of Apartheid Cities in Johannesburg* (Cole & De Blij,2007)

***FIG 26** : (Left) "This image from the 1950s offers a view to the west across the mining belt and illustrates the scale and enormity of the landscape transformation. Deep shaft gold mining and associated mine dumps across the 80-kilometer mining belt altered the topography, hydrology and ecology" (Tang, Watkins, 2011)* [Image courtesy of AOC Geomatics]

***FIG 27** : (Left) The legacy of extraction still impacts those living adjacent to mine waste* (Trangos & Bobbins, 2015)

this cross pollination of blacks and whites living arrangements that provoked the white lead agenda to segregate inter-racial spaces and proximity (Parnell and Mabin 1995).

"The mining industry was the key driver in the increasing levels of urban segregation, and provided the template for the socio-spatial engineering of the National Party government in later years." (Harrison&Zack, 2012)
This can be seen in the example of Soweto, which formed in 1903 after Black Africans living in current day Newtown were moved 16km to the remote settlement of Klipspruit. This was done under the guise of threats from the bubonic plague(Harrison&Zack, 2012). From the onset of the Native Urban Areas Act of 1923 segregated housing estates were developed. By 1933 Johannesburg was a white municipality creating a spatially disadvantaged network that persists today. Thus not only were migrant labourers uprooted from their homes for long work periods but also traveled long distances to work once they were relocated to areas like SOWETO. This oscillating migration is a culture that can still seen today with pendulum migration whereby the economically disadvantaged workforce has to leave their families for a time to travel far distances for jobs. This factor is made worse today by weak public transit connections, a job-housing disparity and a huge spatially disadvantaged city which was originally perpetuated by mining heritage. (guillaume 2001; Beall, Crankshaw and Parnell 2002; Murray 2008).

The fundamental divide of south and north was a structure to separate non-whites and whites, perpetuated by policies such as the slums act in 1934. This act "was applied for demolition of various inner but dilapidated suburbs ... The displaced Black populations were largely rehoused in segregated mono- racial municipal housing estates on the urban periphery" (Christopher 1994: 38) Black neighborhoods were moved to Orlando in Soweto (Tomlinson,

R., A. Beauregard, L. Bremner, and X. Mangcu, 2003) (Beavon 2004). The disparity was made more evident with Randlords living in northern suburbs away from the dust and noise of the mining belt. While apartheid is seen as the cause of racial segregation most of it was achieved before 1948. The mining sector was therefore a primary engineer of the socio-spatial network. This was used as a template for the National Party (Harrison & Zack, 2012).

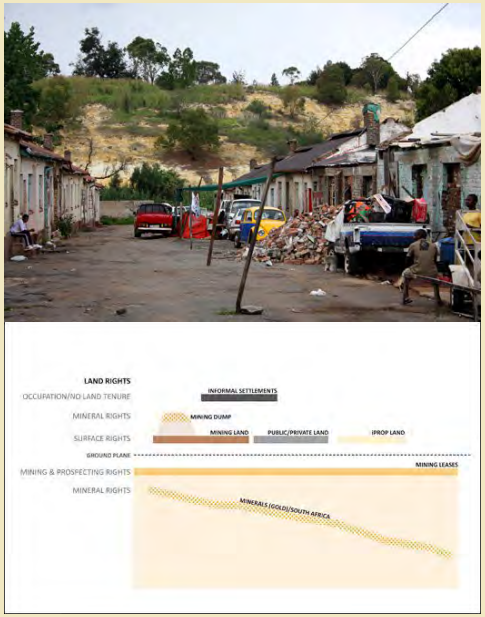
The gold price and production fluctuated, however in 1944 a resurgence for steady gold production began which reached its peaked in 1970. By 1980, mining activity declined (crush, jeeves, and yudelman 1991). Most mining activity in the central Rand district ceased after the 1970's with a resurgence in the clearing of mine tailings due to a sudden market price change in the early 2000's (Viljoen 2009). In the 1980's apartheid was coming to an end and the mining workforce was almost completely South African. Unions were established (NUM) which resulted in increased wages. (Crush, Jeeves, and Yudelman 1991). Finally, after the decline of the industrial boom in the 1970's, financial and service based industries became dominant.

The multi-national mining conglomerate, Anglo American had afforded the government a loan in the 1950s to build housing, shanty towns and emergency camps for families, specifically zoned within SOWETO, thus starting a long legacy of spatial disparities and disadvantaged areas. This translates today with housing and job densities that don't align. That separation results in difficult transport networks, not supported by government, forcing privately owned minibus taxi systems to transport people from the peripheries of the city. This mismatch is also the reason inner-city slums being formed with people wanting to live closer to work opportunities (Harrison P, Zack T, 2012)

While the rise of democracy brought about radical socio-economic change which encouraged expansion to periphery cities in the North. This process of "white flight" resulted in a degradation of Johannesburg's CBD and the financial wakening of the metropolitan core. Financial interests and investments also followed a northward trend and Sandton City took hold and the new financial CBD of the Johannesburg Metropolitan Area. As investments flowed North it only aggravated socio-spatial disparates (Harrison & Zack, 2012).RDP housing on the city edges, although meant to empower the poor, seem to be creating new slums of poverty due to their distant location from job opportunities, some 20km away from Johannesburg CBD.

What remains, after the closure of the mines and the movement of the population to the North and South West, is a belt of fragmented and toxic mine tailings that could be used for commercial, residential and industrial programs which is the city's main objective, A mixed-use east-west corridor to reconnect the poorer south with the richer north (Johannesburg SDF 2040, 2016). This will be examined more in the next chapter.

"Mine waste is such a critical part of our history and



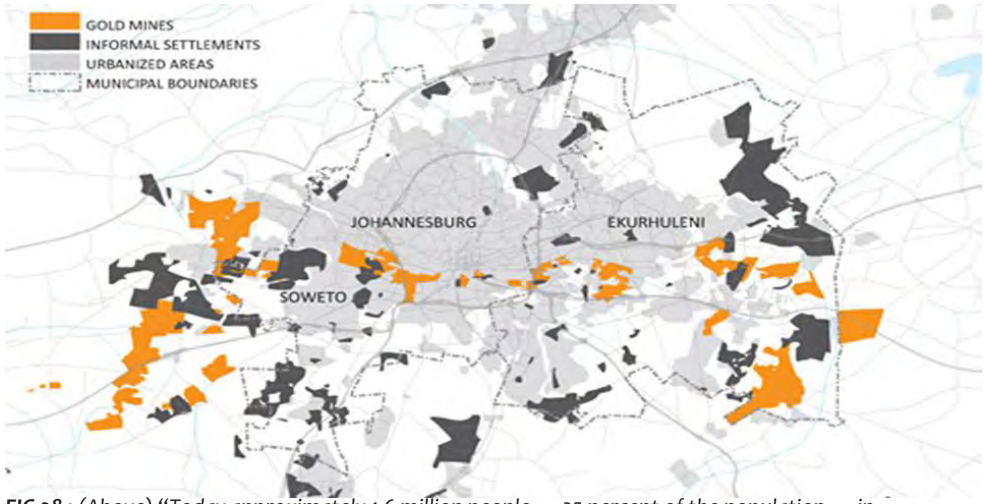


FIG 28 *: (Above) "Today approximately 1.6 million people — 25 percent of the population — in Johannesburg and Ekurhuleni live in informal settlements throughout the metropolitan region. Of this number approximately 400,000 people live in informal settlements in the mining belt that traverses the two municipalities" (Tang, Watkins, 2011)*

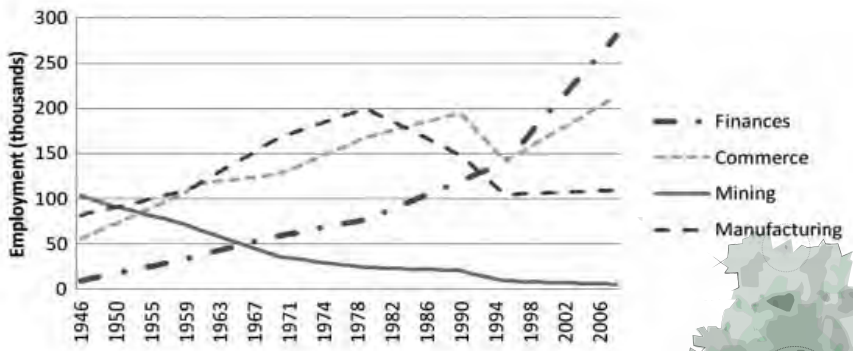


FIG 29 *: (Above) Change in employment by sector 1946-2009, Johannesburg (Beall, Crankshaw, and Parnell, 2002)*

FIG 30 *: (Left) 'Mining operations in South Africa involve a series of complicated land-right relationships. Surface rights allow landowners to build as they please, but the minerals themselves belong to the federal government, and mining companies obtain permission from the government for prospecting and mining. These relationships are further complicated by informal settlements that are home to approximately 400,000 "squatters" who have no legal rights to the land but have occupied it for decades' (Tang, Watkins, 2011)*

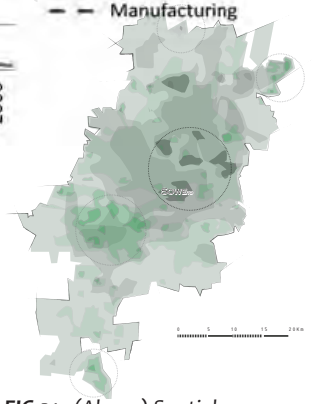


FIG 31 *: (Above) Spatial Inequalities job-housing mismatch (Joahnnesburg SDF 2040, 2016)*

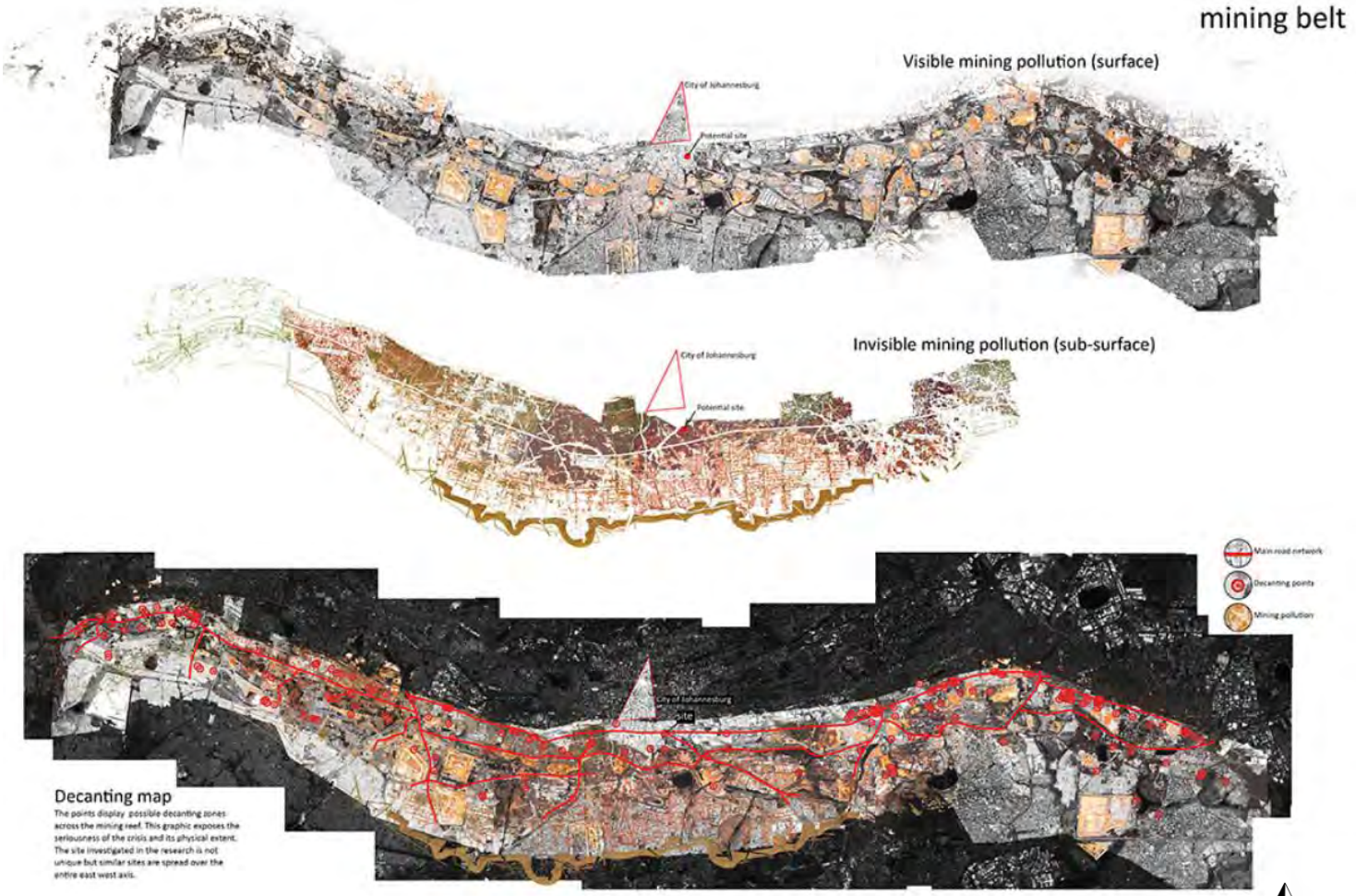


***FIG 32** : Pollution mapping from top to bottom 1)Mining sites, 2)Sub-surface pollution and lastly 3)decanting points and pipe network* (Coetser, 2012)

2.5 CONTEXTUAL ECOLOGICAL IMPACT

the identity of Johannesburg, and people are almost desensitized to both the negative and potential positive impacts." (Toffa t 2015)

The mine dumps legacy today involves illegal miners, called zama zama's trying to get an income finding gold in the mine tailings, many who live close to these tailings in informal settlements are in constant threat of respiratory, and other health related risks not only due to the uranium in the tailings but also the toxic AMD water and airborne dust.

According to the Johannesburg SDF 2040 "The former apartheid government placed many settlements near or even on top of the mining waste dumps."About 11000 people live around these areas today.

"With the closure of the mines, new land was released for development, but the toxicity of the land and the large number of slime dams and mine tailings was a major constraint." (Johannesburg SDF 2040, 2016) Although the mines produced 2.5 million pounds of gold, silver and uranium they are now volatile wastelands. These dumps are responsible for more than just surface value issues but also contribute to a toxic subterranean problem. Acid mine drainage pollutes water supplies with heavy metals creating by-products like sulphuric acid. It also creates sinkholes. Johannesburg's water department estimates about 92 million gallons of water per day of AMD water is produced. The Rehabilitation of AMD is of high importance because of its threat to water security especially for the Wonderfonteinspruit(West Rand)&Vaal water systems south of the city. (Department of Agriculture and rural development, 2009, 7).

The Witwaterstrand mine shafts started closing in the 1950's and thus water stopped being pumped out of these mines. From then water through rainfall and water tables has filled that void. As more shafts closed neighboring shafts had to pick

up the slack in decanting the water mass. East Rand Property Mines ltd was the last company left, keeping the water level at 1200m below surface eventually pumping out 40m liters a day. (McCarthy, 2010) The series of mine shafts were largely interconnected however divisions did exist and it is for this reason thats the West Basin filled at a quicker rate than the eastern basin. In 2008 ERPM stopped pumping and the water level sat at 600m below surface level in 2010. It is regularly monitored at the Crown Mines Shaft 14 (Gold Reef City). It is rising at a rate 15m per month. (McCarthy, 2010) Toxic AMD was set to decant in the central basin in 2014 however a decanting station was built in the East Rand which decants and processes the water with a simple lime wash. This does not make the water safe to discharge into water courses so further processes have to be undertaken to get the water to a naturally safe level. (McCarthy, 2010)

The potential risks of leaving this problem untreated are detrimental. It effects water security, buildings foundation, water courses, ecosystems, animal and plant life and the city as a whole with specific focus on Main Reef Road. This Toxic water could be running through the streets of Johannesburg putting business's and more importantly lives at risk. (McCarthy, 2010)

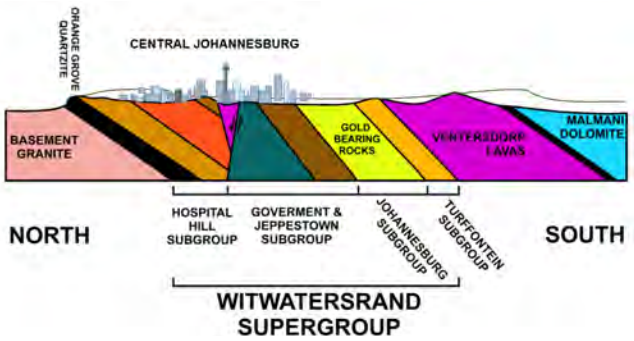


FIG 33 : *(left)* A diagrammatic north-south cross section through the Witwatersrand ridge/ plateau (Oggmus, 2014)

FIG 34 : *(left) Map depicting Witwaterstant* Catchments and basins *(Department of Water and sanitation, 2017)*

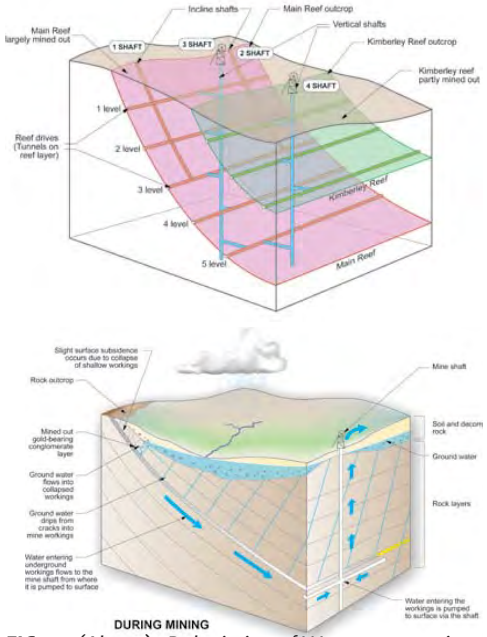


FIG 35 : *(Above) 3D depiction of Water seepage in Johannesburg mine shafts (Mccarthy, 2010)*

FIG 37 : *(Above) AMD formation* (Nayak S, 2017)

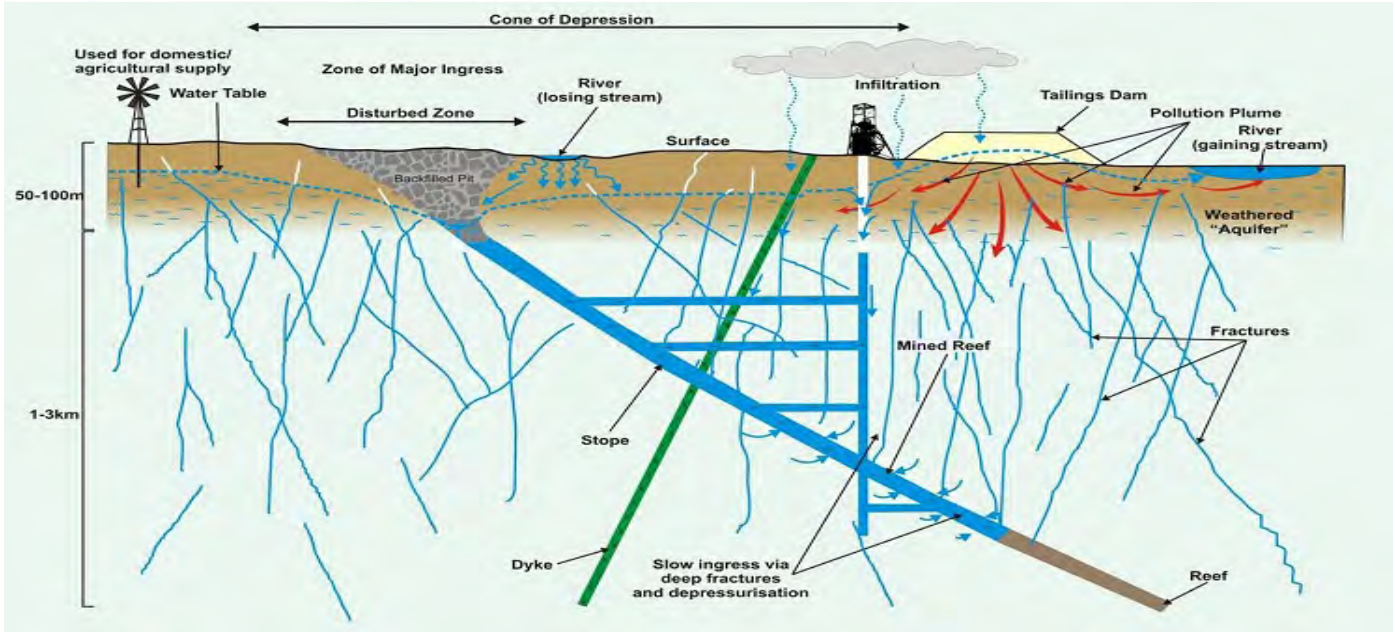
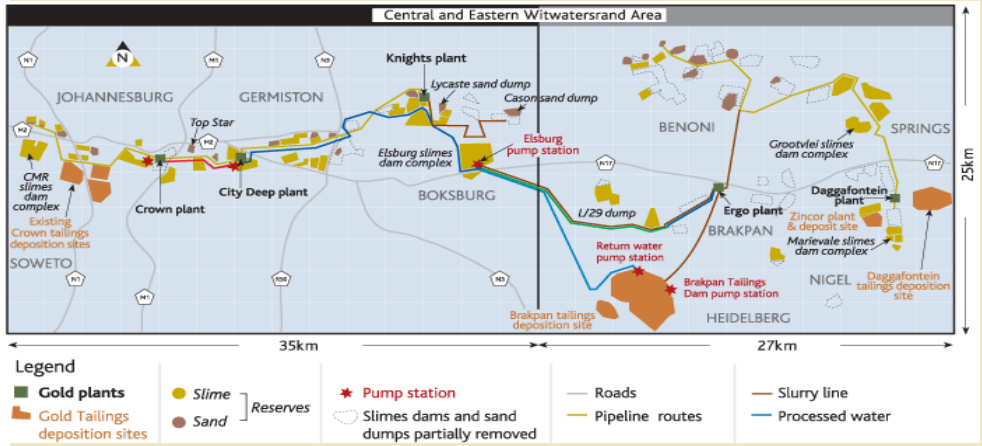
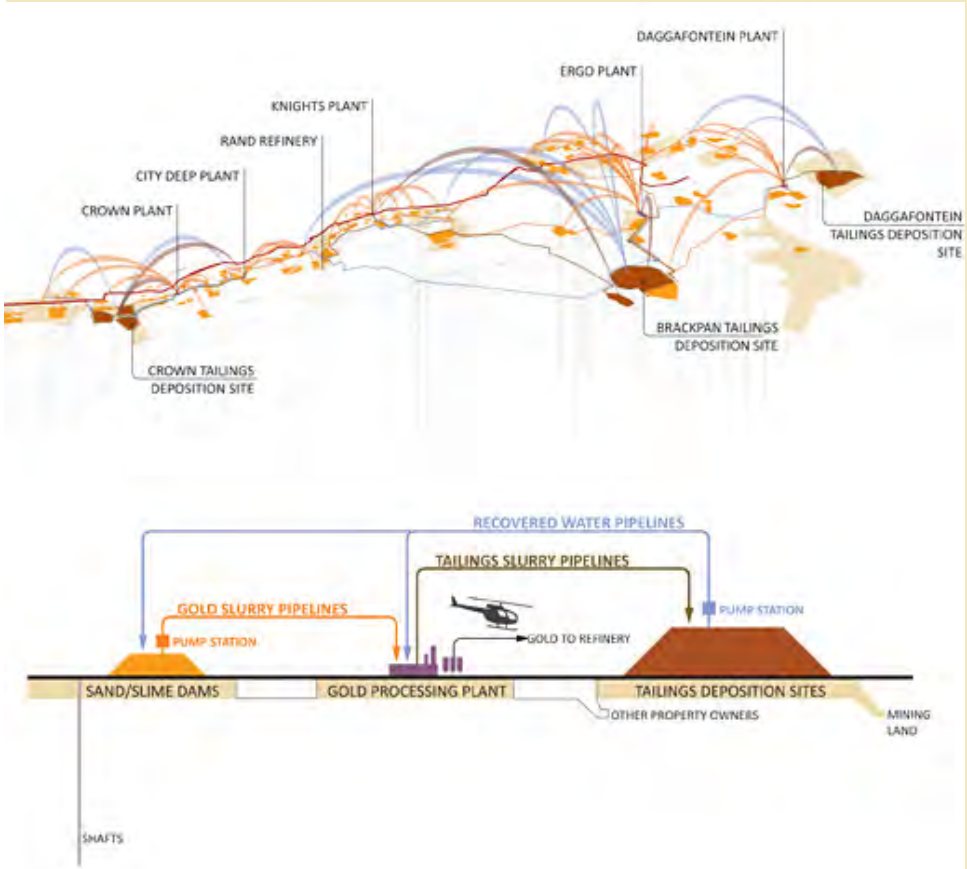


FIG 36 : *(Above) Hydrological model through the Witwaterstrand mine void (Department of Water and sanitation, 2017)*





The solution involves pumping stations that pump the water to the surface for basic treatment. Due to the blockages in connectivity within the central, west and east basins several decanting points need to be established. A minimum depth of 250m is needed to keep the Gold Reef City facility active which hosts mine tours.(McCarthy, 2010)

This would have to be a state funded initiative as the city of Johannesburg is the biggest stakeholder and will be most effected by AMD. As Reported by Fin24 News, government already has a few initiatives running with the relevant stakeholders (mining and water treatment companies) and has pledged to Invest 319 million in the Witwaterstrand AMD treatment initiative as of 2015.

***FIG 38** : (left) "Mining infrastructure in the early 1900s was based on rail connections between mineshafts, processing plants and dumps. Railroads were located along a natural shelf parallel to the mines, forming an east-west corridor that moved tailings, people and goods between mining facilities. Later, technological advancements in gold ore processing resulted in tailings with finer particles. Tailings were hydrated into slurry, and pipes replaced trains as the primary mode of transportation. The new method uses an extraordinary amount of water to move slurry through the pipes. These diagrams show the movement of slurry, waste and water in a massive gold reprocessing chain. Hydrated tailings are moved from older mine dumps — typically closer to existing urban areas — to reprocessing plants. After being reprocessed, the tailings are rehydrated and moved to new super dumps at the fringes of the city." (Tang, Watkins, 2011)*

While AMD lies as a subterranean issue, on the surface North Westerly winds carry debris from mine dumps that are not vegetated, about 42.24 metric tons of tailing-piles dust blowing into the air daily. (Olalde M, 2015) The exposure to this toxic material is through water contact and dust inhalation or consumption and even low levels of radiation. Although not enough investigation has been done there are risks of radioactive exposure. The radioactive threat can only be removed by removing the source material otherwise it can cause forms of cancer and respiratory diseases. (Olalde M, 2015)
"the only potential method is total removal of the mine residues and replace it somewhere else." (Department of Agriculture and rural development, 2009, 6)

***FIG 39** : (Above) "Over one thousand kilometers of pipeline connect the historic mine dumps, gold processing plants and new super dumps in a vast network that covers the region. Under 45 bars of pressure, the pipe network delivers new gold slurry to processing plants and reprocessed waste to super dumps. Roughly 30 percent of the water used in this cycle is lost to evaporation or seepage" (Tang, Watkins, 2011)*

Given this data it is clear that the ecological threat is pressing and immediate especially taking into account the proximity of this belt to the city and its inhabitants. The way in which the general population interacts with the waste tailings and mounds is worrying. It is seen as a recreational park by biking enthusiast or as sand mounds to board down. Children play in them and some people even live on them. As can be seen in the pictures on the right.

This Contextual study has provided insight into the potential lost heritage of mining that could be documented as well as the socio-spatial issues resulting from the mining belt. The spatial disparities need immediate attention while the lack of proper treatment and training of migrant labourers must be addressed. This obviously cannot be done directly but can be done through positive measure that counteract the injustices of the past such as skills development and integrating informal communities into urban schemes and projects. The last concern is that of AMD which has quite a clear solution but a poor urban integration. The reach and density of AMD decanting and treatment must be increased and appropriately dealt with.

Some mining dumps have been re-excavated leaving the land primed for rehabilitation. These plots have the potential to become new economic drivers. Taking Heritage into account, this transformative potential is akin to that of a massive adaptive reuse intervention along the mining belt. According to the Conceptual Study on Reclaimed mine land by the Department of agriculture and Rural Development, there are suggested land-use potentials such as

- Recreational resorts
- Urban Development
- Social activities
- Heritage sites

An Urban Vision is needed to proceed further which will be conducted in the following chapter.

FIG 40 : *(above) Current mining belt condition with pools of toxic water developing on the infected soil.(Tang, Watkins, 2011)*

FIG 41 : *(above) Collage of current uses of mining belt from top to bottom.*
kids playing in infected water
kids playing in toxic mine sand
dirt biking on radioactive mound
Informal Settlers
(Tang, Watkins, 2011)

FIG 42 : *Collection of images depicting remodeled Roman Quarry formal and aesthetic relationship to landscape*
(Archhello, 2017)

2.5 POST-TRAUMATIC LANDSCAPES

CONTEXTUAL PRECEDENT

2.5.1 REDESIGN OF THE ROMAN QUARRY, AUSTRIA

ARCHITECT: ALLESWIRDGUT
BUILT: 2008

This intervention is located within a disused quarry in Austria. Since closure it has been an open air performance venue with little architectural intervention. This intervention was about defining the journey to the performance venue as well as articulating it. The Journey is guided through a 400m series of disabled friendly ramps that are entrenched into yet defined from the landscape the user dives 16m all the way to the building entrance at the end of a cliff.

The materiality of this project is what entrenches it in it's heritage and context. The rock has been used to form a major part of the building and stone walls compliment this feature. Edges and cubes are defined with oxidized steel plates which honour a construction, machinery aesthetic.

This post-industrial, post-mining landscape has been sensitively interacted with even though prominent structures have been placed on it. The resulting place-form has been derived from existing site conditions including the topography and heritage. This conversation between built form and " natural" or existing landscape is one where neither is dominating over the other but is used to compliment the conditions while immediately giving a tactile sensory experience of the site.

2.5.2 LANDSCHAFTSPARK DUISBURG-NORD GERMANY

ARCHITECT: IBA-EMSCHER PARK
BUILT: 2000

This 200ha zone was a steel and iron works which stopped production in the mid 80s. This fostered ecological growth in the area which resulted in a renewal project in 1989. This post-industrial site was intended to become a industrial monument park with a network of green spaces and preservation projects it's aim was to give land back to the city.

Another main aspect of this project was the preservation and renewal of the Emscher watercourse. This river runs through the site and uses the factory's old cooling tanks to help regenerate the watercourse downstream through rainwater harvesting and controlled release.

The landscape has turned into a water and play-scape which is vegetated to offset the existing pollution. The building and interventions themselves are very interactive with cement climbing walls and a scuba diving facility. An educational farm completes this intervention.

The public square is a heritage inspired intervention, with smelted and recycled material forming blocks defining it. This disused mining zone is a sensitive ecologically inspired intervention that considers heritage and ecology as main drivers to foster high quality public space.

***FIG 43** : Collection of images depicting LANDSCHAFTSPARK DUISBURG-NORD re-use of space in a sensitive landscape intervention and celebration of existing industrial heritage* (latz+partner, 2002)

CHAPTER 3
URBAN VISION

bridging the gap to reclaiming lost space

3.1 URBAN FRAMEWORK

Using the Johannesburg SDF for 2040, 2016 as a point of departure the mining belt will be been examined in a contextual sense. Its' opportunities and problems will be identified and synthesized into a final urban plan. The research intention is to directly tie into the existing SDF, building on it and altering it where need be to create a stronger proposal that effectively deals with the mining belt.

When analyzing the City's spatial framework there are 2 apparent issues. The East-West Sprawl of the mine belt(depicted in purple) and its currently fragmenting nature. Located along a main railway line there is an opportunity for substantial, well connected and beneficial development. It is clear that the mining belt can be rehabilitated to not only act as a bridge to the South of the city but also to provide a desperately needed East-West connection, from the spatially disadvantaged areas of SOWETO to that of Germiston and the Further East-Rand.

This connection Would not only provide more job opportunities and a more reliable cheap public transit system however it would serve to activate the areas along the journey, that being the sites primed for rehabilitation along the mining belt. The railway is strategically placed along the mining belt as it was originally used to transport goods and materials. Today this passenger rail system is under utilized due to the dilapidated station's lack of multi-modal connections to other forms of transport, and distance to work opportunities.

Thus on an urban scale the intervention is focused on linkages and connections. These being the reconnection of the fragmented North-South connection, which stops traveling south at Park Station, JHB CBD, and reconnecting East-West and Central Rand to form a strengthened Metropolitan core. The problem if left untreated is a huge inhibitor to socio-economic growth within the city but beyond that it has the latent potential to positively contribute to the standard of urban living by becoming a much needed green lung and providing high density housing especially closer to the metropolitan core and thus jobs.

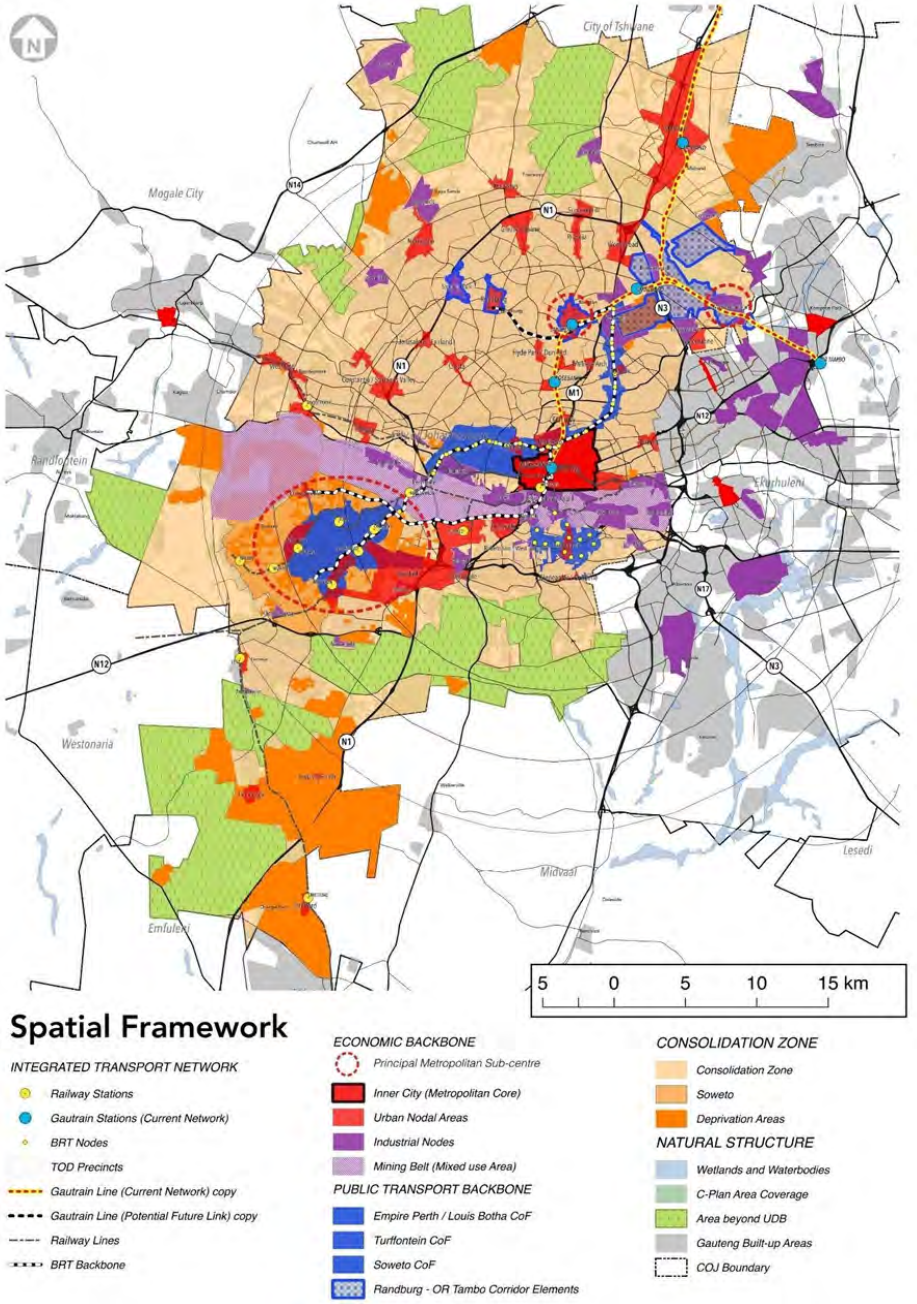


***FIG 44** : Spatial Framework of Johannesburg (JHB SDF 2040, 2016)*

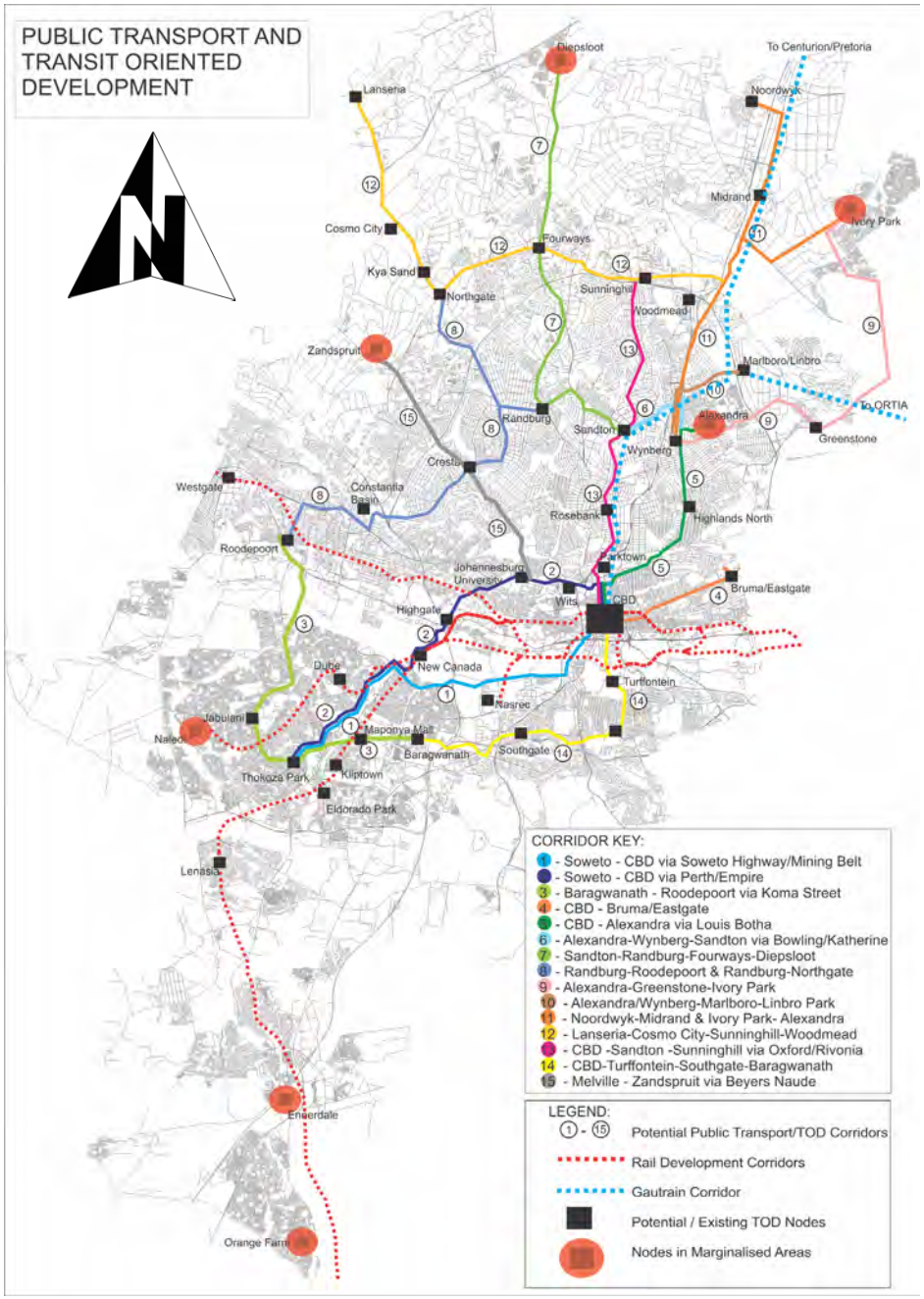


***FIG 45** : Corridors of Freedom, Transit and development Corridors of Johannesburg (JHB SDF 2040, 2016)*

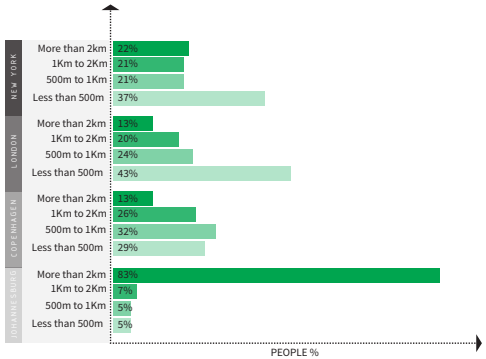


***FIG 46** : Bar graph showing distance traveled from home to work in JHB, Copenhagen, London and New York (JHB SDF 2040, 2016)*

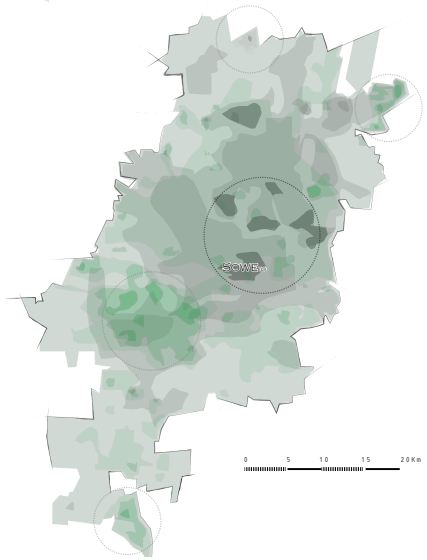


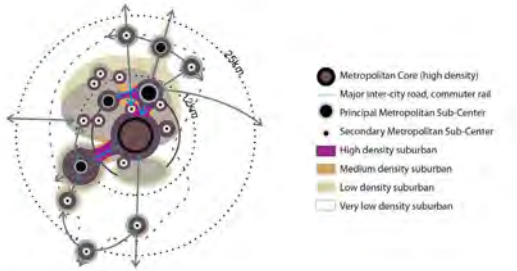
***FIG 31REPEATED** : (Above) Spatial Inequalities job-housing mismatch (Joahnnesburg SDF 2040, 2016)*

3.1.1 POLYCENTRICITY MODEL AND CORRIDORS OF FREEDOM

The goal is that of a compact polycentricity. A polycentricity is an urban structure that is characterized by a dense urban core interlinked by efficient transit networks to dense complementary sub-centres such as the Corridors of freedom. (Johannesburg SDF 2040, 2016) These work off of public transport corridors and transit orientated development nodes. They are placed around strategic movement axes such as the Turffontein and Soweto corridors. The current trend shows Johannesburg as a weak metropolitan core with weak linkages and transit corridors.

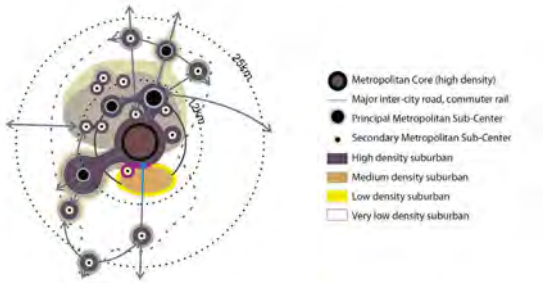
The key to achieving this polycentricity can be found in the mining belt. Which should be part of a densifying process of mixed-use typology established by strong transit networks. Because of the apparent job-housing mismatch(refer to image showing Job-housing density mismatch), whereby the spatial distribution of the city is fragmented in terms of distances people travel to find work, the creation of a polycentricity based on public transit infrastructure is paramount. The mining belt is presented as a spatial discontinuity and a transformation zone that could trigger positive city-wide change that would combat urban sprawl which is holding the city hostage. (Johannesburg SDF 2040, 2016) The effects of urban sprawl are apparent when looking at travel statistics, 83% of the population of Johannesburg live more than 2km away from their work, as opposed to London's 13%. This fact is worsened by weak transit linkages. The Mining belt itself is viewed as a transit corridor initially to spawn development and to connect the spatially disadvantaged areas of Soweto to jobs by connecting east and west (Soweto- Germiston).

This forms part of the larger urban framework of which the proposed intervention will tie into. This is thus a larger urban analysis that was needed to establish transit linkages and connection within the city. This general overview provides a base to select an Urban Site in which to establish an intervention.



CORRIDORS OF FREEDOM

Johannesburg's focus areas for development based on public transport corridors, with the potential to generated substantial economic growth and increase housing densities around strategic points and along the primary movement axes, Areas such as Turffontein, Louis Botha, Empire/ Perth, and Soweto have been identified as corridors of freedom



UNLOCKING THE MINING BELT

Johannesburg SDF 2040 acknowledged the mining belt as a mixed use zone but there is no proposed vision for the belt . This spatial discontinuity presents significant opportunities for: integrating the North with the South, improving cross border linkages between East and West Rand.

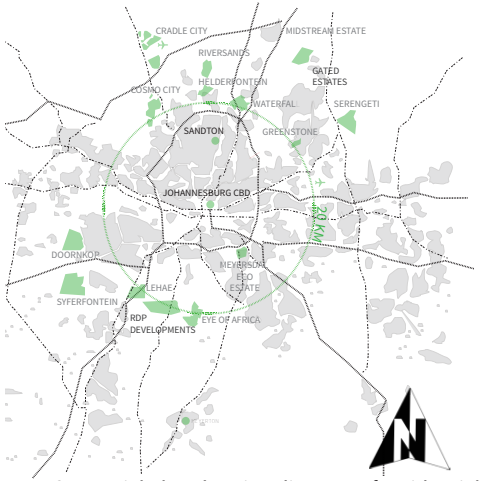
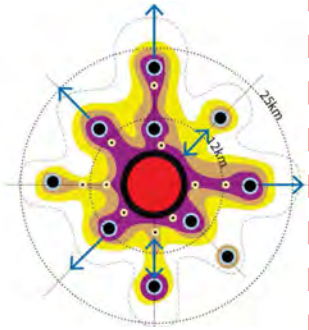


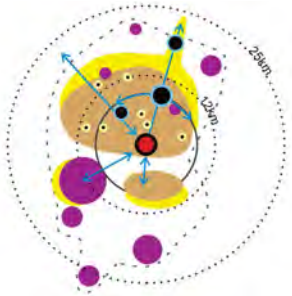
FIG 48 : *Spatial plan showing distance of residential developments and RDP developments in relation to JHB CBD, green line signifies the 20km mark (JHB SDF 2040, 2016)*

COMPACT POLYCENTRICITY MODELS

IDEAL MODEL



JOHANNESBURG MODEL



Inverted polycentric urban model, metropolitan core not strong enough and residential areas separated from economic centres

PROPOSED MODEL

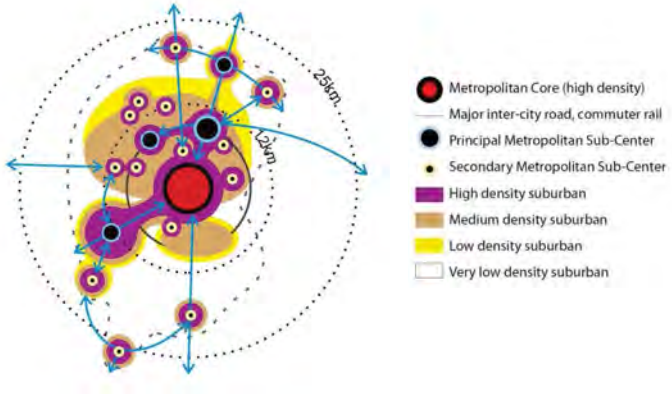


FIG 47: Multiple Spatial models of the city *(JHB SDF 2040, 2016)*

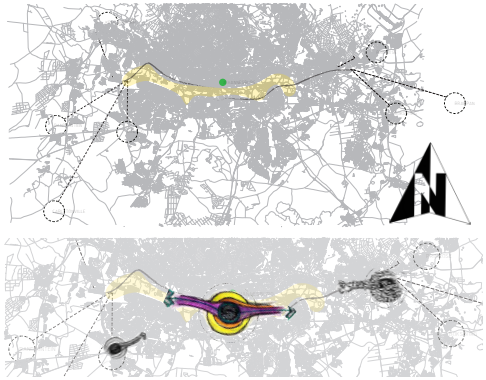


FIG 49 : *Existing condition (top) with conceptual proposed condition (bottom) connecting north and south (Author, 2017)*

EXISTING URBAN CONDITION

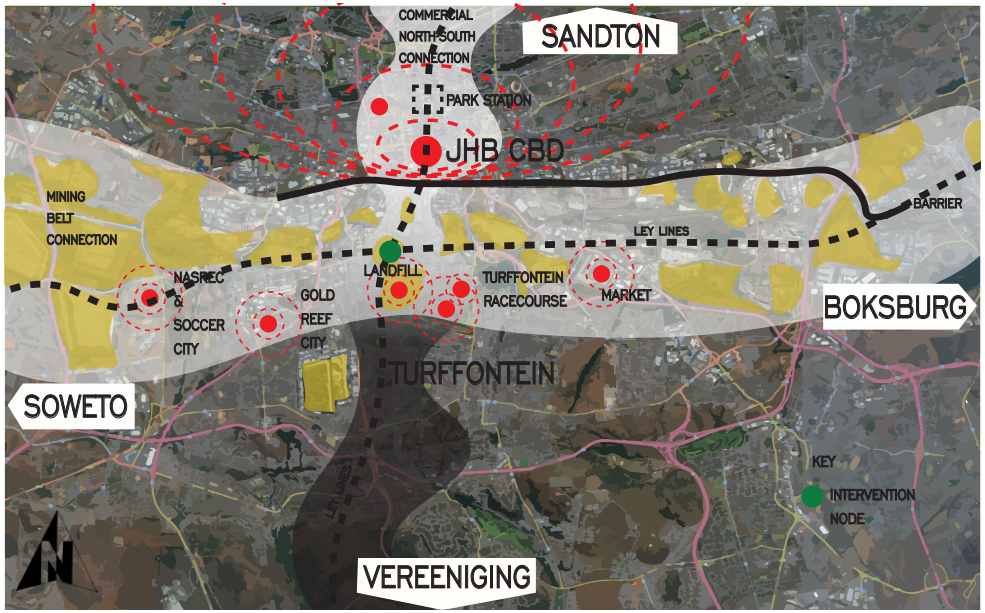


***FIG 50** : Existing urban condition mapping (Author, 2017)*

PROPOSED URBAN CONDITION

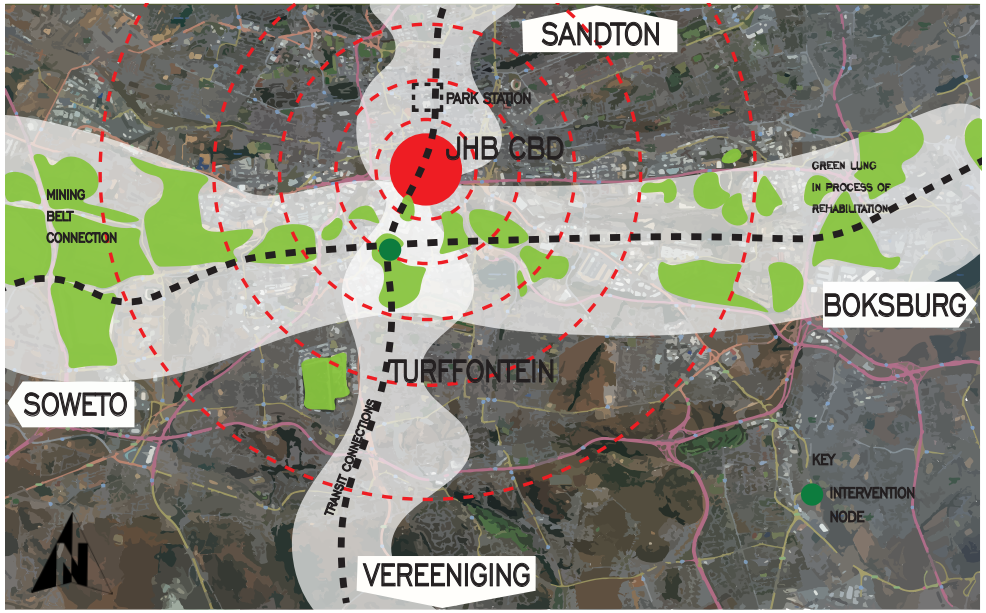


***FIG 51** : Proposed urban condition mapping (Author, 2017)*

3.2 URBAN SITE SELECTION

Choosing a site within the mining belt is thus a product of spatial intentions. This is in relation to proximity to transit connections, planned interventions, frameworks and upgrades as well as linkages. This also includes proximity to mine shafts, pump stations, piping networks, services and the city. To discover the "goldilocks" point Ley lines were drawn along the crucial North-South and East-West connection. These Ley lines or energy lines were centralized around nodes of activity, the mining belt and decanting points which resulted in the selection of the Robinson Deep or Village Deep Area. Consulting the other aforementioned parameters, specifically transit networks and proposed upgrades an excavated mine dump was chosen next to the Robinson Deep Landfill along Booysens Station Road.

With the selection of this Urban site the proposed Urban condition becomes strengthened by the integration of the mining belt. The mining belt which used to be toxic will be transformed incrementally, first into a green lung and then into an economic ecological hub. This site fulfills the urban intention of restitching the Urban Fabric in both the North-South and East-West directions, thus forming strong linkages.

The Urban site sits as a central node that is in-between the Turffontein Corridor of Freedom and the city as well as in between SOWETO and Germiston. It is located near major transport routes and proposals and is primed for rehabilitation due to the fact it has been re-excavated. The site selection is still an Urban site selection informed by the aforementioned Urban Framework and thus an Urban Analysis and Urban Plan must be developed.

The mining belt's vision as a whole works off of the SDF by starting with strong linkages and a catalytic project, with the intention to create development after the land has been rehabilitated. This Mixed-use development corridor is seen as offering high density housing and jobs and thus becoming an ecological, economic node. (50% open ecological space 50% built up mixed-use) This activity will strengthen the Metropolitan core while offering a new subcentre and high-density housing. The fragmenting 1200ha of mining land could become one of inclusive productive land. Providing 40-60U/ha of housing as per the SDF proposal and furthermore recreational parks and green spaces

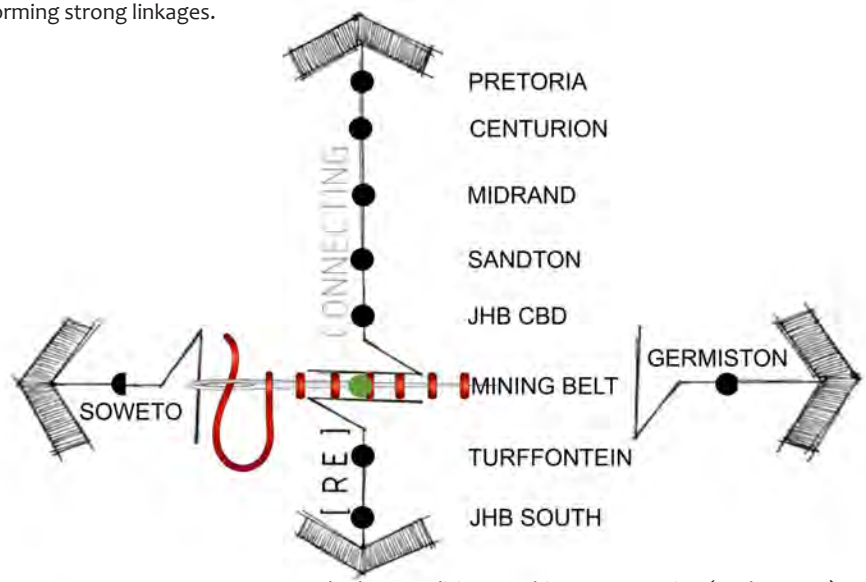


***FIG 51** : Proposed urban condition graphic representation (Author, 2017)*

3.2.1 URBAN SITE

The Urban Focus Area is represented in the aerial photo to the right. This is the Urban Area chosen through the Larger Urban Framework and it is the area in which the Urban plan and intervention will be focused. The Urban Area will be analyzed according to, transit connections and routes, upgrades and future developments, key points of interest in terms of Heritage and Socio- Economic Value as well as ecologically. From there an Urban Plan will be developed and a final site will be selected

SITE POSITION INDICATED BY YELLOW DOT

FIG 52 : *Urban Site Orthophotos (Google maps, 2017)*

LOCALITY

GAUTENG

JOHANNESBURG

WARD 126
ROBINSONS DEEP
81-IR MINE DUMP

FIG 53 : *Site Locality (Author, 2017)*

Figure 28: Residential

The map clearly shows the dominance of residential uses in the southern part of the study area (55% residential). These residential uses are mostly detached single residential in nature with a few higher densities, 3 story walk up type of housing scattered throughout the area.

Figure 29: Business / Commercial

The land uses indicated as business/commercial uses in the northern part of the study area are mostly large industrial uses. In the southern part, small retail facilities are located mostly along important internal roads. There is very little mixing of uses as can clearly be seen.

***FIG 54** : Residential vs business densities (Turffontein Corridor of Freedom final draft, 2016)*

Figure 11: Rea Vaya and Metrobus Routes

Figure 12: Minibus & Metered Taxi Routes and Facilities

***FIG 55** : Residential vs business densities (Turffontein Corridor of Freedom final draft, 2016)*

***FIG 56** : Ecological mapping (Turffontein Corridor of Freedom final draft, 2016)*

***FIG 57** : Nolly map of Urban area (MapAble, 2017)*

3.2.2 URBAN SITE ANALYSIS

The ecological state of the larger area is a mix of built up city and suburban area, recreational landscapes and toxic infected mounds of mining waste. The mining networks also form a network of pumping stations and pipes which pass just north of the Urban Site. These networks can be used to contribute to the central rands AMD decanting efforts. Two mines flank the Urban Site, that being Crown and Village Deep Mine both of which have pump stations that could be tapped into. None of these sites Treat the AMD water to an ecologically safe level. The larger Ecological mapping also shows the alarming proximity of the mining sites to populated areas, an ever present threat that must be incrementally dealt with.

"Transport affordability and access are critical development concerns due to high day-to-day costs of travel, the unavailability of public transport in many peripheral areas is a major issue along with poor home-to-work connections, because of badly defined routes and weak inter-modal integration. These all impact severely on the poor, especially in a sprawling city-region where poverty and spatial dislocation are often synonymous." (Gauteng Mobility Report, 2014) This is the major urban issue which areas along the mining belt face. When analysing the Transit networks existing such as busses and taxi routes it becomes apparent that the mining belt is a disconnected pass-through zone whereby people are either trying to get to Turffontein or the JHB city. The only population currently interacting with the mining belt are those working in the surrounding industrial belt. The mix of zones is strictly business commercial and residential. The Density of the area is mainly made up of low-rise industrial buildings broken up by mining waste sites as can be seen by the Nolly diagram.

It is important to note the position of Booysens station and its lack of connectivity to other forms of transport which ignore the rail system completely. The johannesburg SDF 2040 has extended the BRT Rae Vaya system down and through turffontein which is shown in the transport mapping.

3.2.2.1 BOOYSENS STATION

Booysens station is a key point in this intervention not only because of its position in relation to the site but also because of it's proposed upgrade scheme to a Multi-Nodal Station, including a taxi rank and BRT station. It is the perfect driver for this intervention as it is deals with one of the main urban issues of connectivity. The city has proposed to do this upgrade on land which houses an informal settlement, with no indication of how the informal settlers will be accommodated. Although it would be cheaper to displace informal settlements there is a clear question of social justice and this coupled with the legacy of the mining belt is a unethical response.

An alternate proposal would be to move that station to the nearest mine dump and use it as a driver for this regeneration. By doing this it targets a central site within the mining belt, that being the mine dump adjacent to Robinson Deep Landfill. This site is just off Booysens Road and has an existing Metro Railway line bordering it which connects it to the rest of the mining landscape. This creates a point of acupuncture from which to start a regenerative intervention while activating the site. About 10000 commuters use Booysens station daily however the areas main modes of transport are cars and taxi's while public transit systems like bus and rail systems are not utilized. This is a huge problem as these forms are pubnlic transport are cost effective and critical to a cities connectivity.

By also proposing an N17-M70 linkage through this site, from Soweto to Boksburg (explored in the transport mapping), that artery can support an effective BRT and Taxi system. This can be coupled with an additional North-South Gautrain line, which forms a gateway to the south, thus bridging the gap between North-South and Park Station-The mining belt. This begins the process of re-stitching the urban fabric together and can create a strengthened Multi-nodal station which activates the area effectively. This deals not only with the major issues of Booysens Station, that being a single entry, mono-modal station that is far removed from movement routes, but it also deals with the linkages issues of the mining belt.

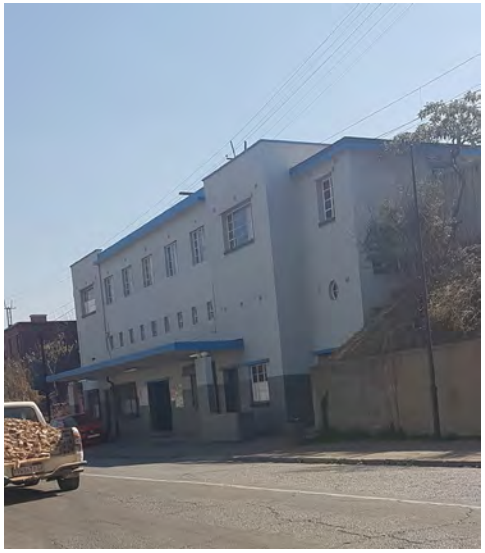


FIG 62 : *Booysens station (Author, 2017)*

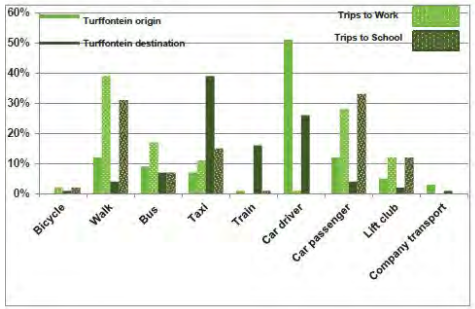


FIG 58 : *Graph showing mode of transport movement in and out of Turffontein (Turffontein Corridor of Freedom final draft, 2016)*

Table 6:2007 Gautrain Passenger Rail Census

Station	Description	> 06:00	06:00 08:30	08:30 16:00	16:00 18:30	18:30 <	Total
Booysens	Board	138	871	490	4156	88	5743
	Alight	873	2615	259	918	15	4680
Village Main	Board	2	214	17	827	19	1079
	Alight	50	717	30	161	0	958
Kaserne West	Board	348	599	606	1835	51	3439
	Alight	1005	1402	199	919	125	3650
Total	Board	488	1684	1113	6818	158	
	Alight	1928	4734	488	1998	140	

FIG 59 : *Graph showing commuters in surrounding Train Stations (Turffontein Corridor of Freedom final draft, 2016)*

FIG 60 : *Booysens station upgrade proposal (Turffontein Corridor of Freedom final draft, 2016)*

Table 4: Main mode of transport for people working or studying within Turffontein (residents and non-residents)

Main mode of transport	Employment	Education
Bicycle	<1%	2%
Bus	7%	7%
Car driver	26%	0%
Car passenger	4%	33%
Company transport	<1%	0%
Lift Club	2%	12%
Motor cycle	0%	0%
Taxi	39%	15%
Train	16%	1%
Walk	4%	31%
Total	100%	100 %
Total trips	36,607	13,522

Important Note...

70% of Turffontein residents do not work within the Turffontein area. This translates to morning and afternoon peak trips from and to the area, and supports the largely "commuter-corridor-nature" of the area.

Table 3: Main mode of transport for Turffontein residents (internal and regional movement), based on 2004 NHTS

Main mode of transport	Employment	Education
Bicycle	0%	2%
Bus	9%	17%
Car driver	54%	1%
Car passenger	12 %	28%
Company transport	3%	0%
Lift Club	5%	12%
Taxi	7%	11%
Train	1%	0%
Walk	12%	39%
Total	100%	100%
Total trips	14,300	10,300

The predominant mode of travel for employment is via private car (63% as driver or passenger), whilst walking (39%) is the mode most likely to be used to go to school based on NHTS 2004These figures show where Turffontein residents travel for work and education based on mode of transport, according to the NHTS 2004.

Important Note...

The majority of Turffontein residents either use private transport (63%) or non-motorised transport (walking 12%) as mode to access employment opportunities.

The majority of education trips within the study area occur on foot as the education facilities are all located within the residential areas.

FIG 61 : *Transport distribution in Turffontein (Turffontein Corridor of Freedom final draft, 2016)*

FIG 63 : *Transport And nodal mapping (Author, 2017)*

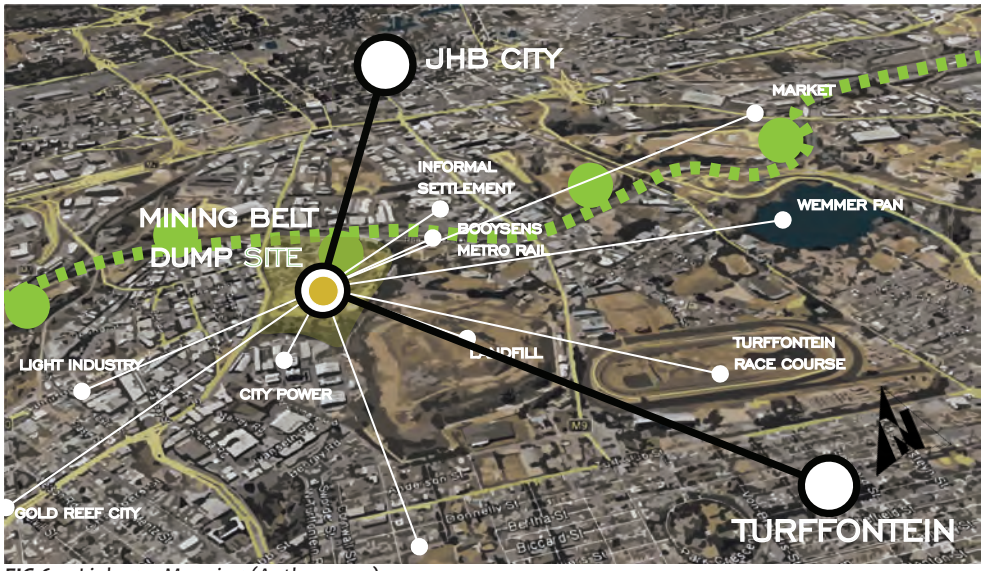


FIG 64 : *Linkages Mapping (Author, 2017)*

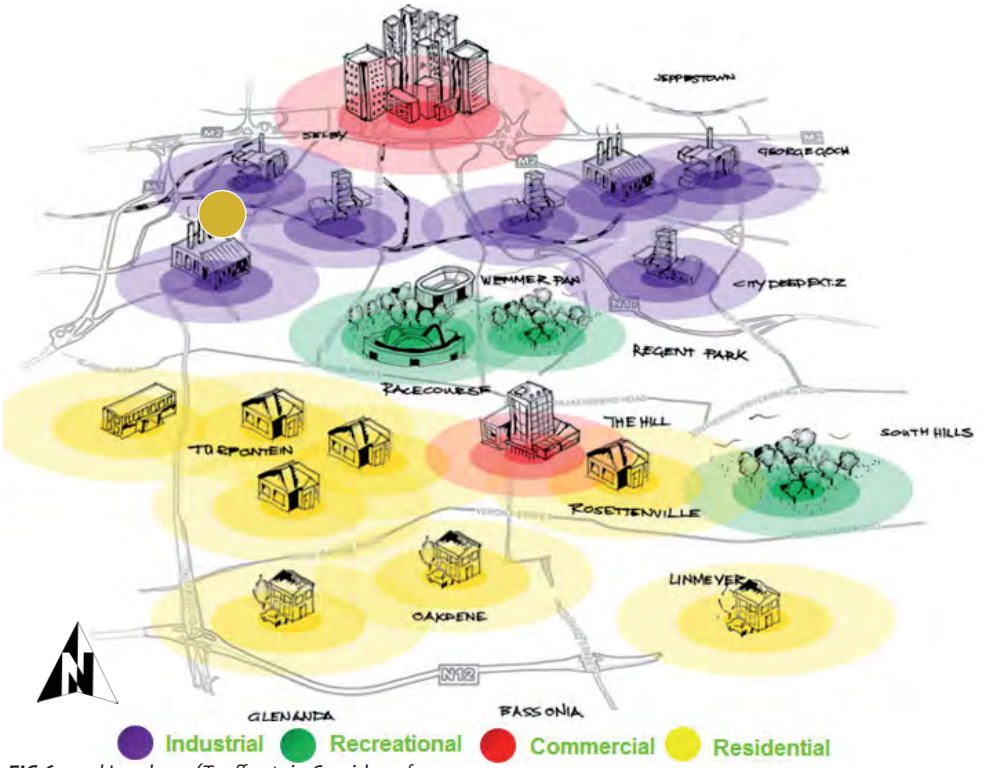


FIG 65 : *3d Land use (Turffontein Corridor of Freedom final draft, 2016)*

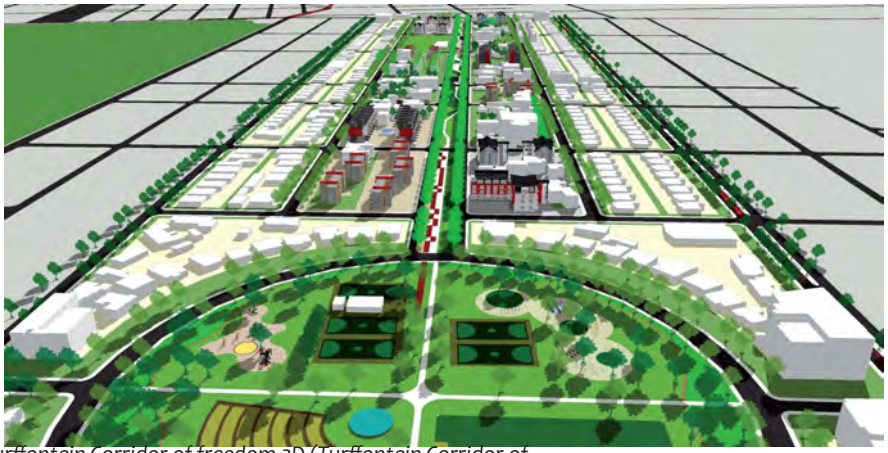


FIG 66 : *Turffontein Corridor of freedom 3D (Turffontein Corridor of Freedom final draft, 2016)*

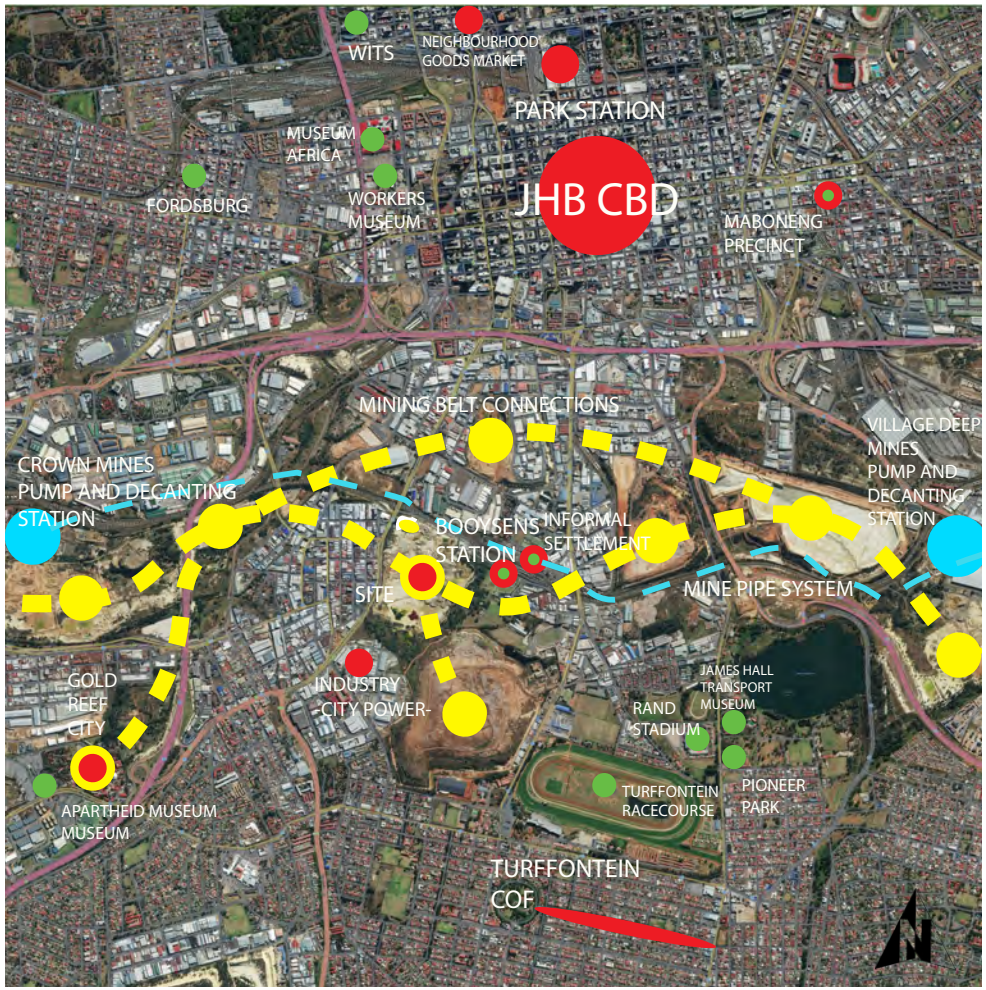
3.2.2.2 MAPPING

There is a varied mix of land-uses within the study area, moving from a residential South (Turffontein); to a low rise industrial belt sprinkled with mine tailings and recreational activities; to the high rise silhouette of Johannesburg CBD. As can be seen in the 3D representation The Turfontein Corridor of Freedom looks at densifying that area into an active city node.

The Urban Area is surrounded by a myriad of informants that being recreational zones like Turffontein Racecourse, Wemmer pan Dam and Rand Stadium as well as Heritage Sites like The James Hall Transport Museum, however only the informants relative to the lenses of Heritage, Ecology and Socio-Economic Value will be considered. Notable influences are aspects such as the Markets surrounding the area including the Fresh produce and night markets, The Network of mining sites and the network of subsequent pipes, The Turffontein Corridor of Freedom, The Braamfontein Arts precinct of which this site will feed off of in terms of its momentum within art facilitation. The South portion of the site houses a Large landfill which was a re-purposed mine dump. This will be converted into a park after the landfill has closed. There are many industrial activities taking place directly around the site such as the Telkom training Centre and City power. Most of the activities are warehouses, wholesalers and car service yards. The North of the site is flanked by a rail network that has an Informal Settlement which has developed around what is now Booysens Station.

The ecological mapping of the site brought attention to some key features, such as the isolation of the site apart from Zama's Zama's and squatters. There Are some clear zones where the vegetation is thriving and encroaching onto the harmed soil. The landscape is an infected yellowish colour, typical of mine tailings. The soil itself covers most of the site however only one significant mound of waste remains, the rest has been re-mined for gold. There are large deposits of natural stone on site as well as formations of stagnant water on site, infected by the soil. These catchments of water fall to the south of the site and form in large pools. The trees on site are indigenous however the reeds will have to be removed as they can cause respiratory problems. Around the stagnant pools of water dead birds can be found, as a direct result of the toxic water. The varied contours are typical of a re-mined site and form an interesting series of levels.

The Urban site is a blank canvas in terms of transit points with roads flanking the edges of the site. There is one clear travel route which is marked by a dirt road and footpaths. This cuts through the site from Booysens Station to the M70. The site is an isolated island of toxic waste at the moment but is surrounded by bustling activities and busy roads such as Booysens road, which the proposed BRT extension passes through. All the elements are there to create a strong transit node. The North East of the site is the main point of entry with a dirt road being located there. The North-East corner also hosts a cement factory. the rest of the site forms barriers in the form of low mound walls.



POINTS OF INTEREST

***FIG 67** : Points of interest in heritage and socio-economic value(Author, 2017)*

ECOLOGY MAPPING

FIG 68 : *Ecological mapping of harmed, industrial, vegetated and stone landscapes with water masses(Author, 2017)*

BARRIERS AND MOVEMENT

FIG 69 : *Transit, Access and movement mapping(Author, 2017)*

3.2.2.3 TROLLEY PUSHERS

The Informal Settlement is a typical result of necessity where the impoverished and under-skilled have situated themselves next to employment opportunities, although this intervention does not specifically deal with informal housing, it rather seeks to empower in the form of skills development and other means to support and enable a contextual response.

One key feature of not only this informal settlement but Johannesburg South are the Trolley Pushers, who collect valuable trash for recycling and processing in exchange for money. They are readily employed by the landfill and pikitup(waste services company) as they do not have many other potential buyers or privatized clients. This is a monopolized situation in which there is no growth opportunities or accountability.

The trolley pushers face harsh conditions from having to sort through large amounts of trash to carting that trash around the city on roads that do not accommodate their movement or business. They are not enabled in any way by government or police often times inhibiting their business. Although they avoid taxes in their informal businesses they also avoid protection and consideration. (Zack, Chalton, Kotzen, 2012)

The trolley pushers offer a sensitive alternative to trash trucks. They provide this recycled waste to the formal economy. It is important to know trolley pushers are also a victim of pendulum migration having to travel far distances.

Paul the trolley pusher, travels almost 120kms every week pushing his trolley through Johannesburg's suburbs to collect enough waste to feed his family. He earns about R1100 on a good work week, but he is a success story (Zack, Chalton, Kotzen, 2012)

FIG 70 : *Trolley pusher city condition*(Author, 2017)

FIG 72 : *Informal settlement condition*(Zack, Chalton, Kotzen, 2012)

Paul the Trolley Pusher

RECYCLABLES

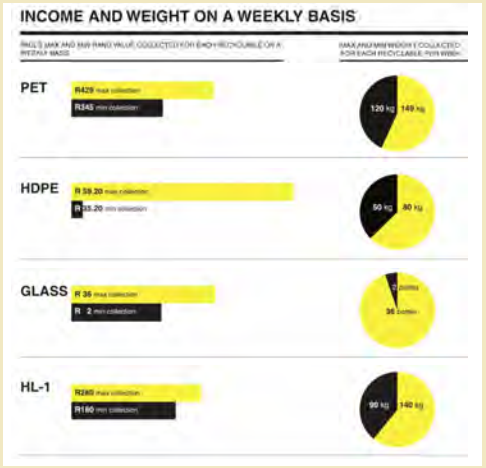


FIG 71 : *Info graphics depicting price of recyclables*(Zack, Chalton, Kotzen, 2012)

3.2.3 PICTORIAL URBAN CONTEXT EXPLORATION
(ALL IMAGES TAKEN BY AUTHOR, 2017)

FIG 73 *:Urban Exploration through pictures depicting industrial condition amongst the toxic waste mounds (Author, 2017)*

3.3 URBAN VISION

An urban strategy was formulated, by our urban group which comprises of 2 landscape students and thus 2 landscape interventionist as well, in which these issues are dealt with. As the site needs rehabilitation, a 35-year plan will be implemented as follows:

- 5years: The toxic land will be re-formed into mounds and processed to remove the uranium and then will be made into bricks by the cement factory on site. This will happen while the remaining land is vegetated to rehabilitate the soil. A wetland system will process the water on site in conjunction with an AMD treatment centre and a transport node will form the first intervention to activate the area.
- 5-35 years: All road facing edges will be developed into mixed-use facilities. By this point the toxic land will have been processed and the brick facility can start processing other sites toxic material.
- 35+ The inner potions of the site will be built up with high density mixed-use buildings and varying typologies, establishing a firm economic presence within the city. This effort can then trickle out from this central site into the remaining mining sites. The processing of the site is a long process but it also gives it time to establish itself in an incremental manner which allows for a sustainable and resilient intervention.

FIG 74 *:Urban Vision large Walkable streets with mixed uses that open to the street (Urban Group, 2017)*

RESILIENT-CITY	INCLUSIVE CITY	CONNECTED-CITY	GENERATIVE CITY	COMPACT-CITY
PROTECTING BIODIVERSITY AND ENERGY AS WELL AS HIGH VALUE AGRICULTURAL LAND	BALANCED SERVICE PROVISION AND DIVERSIFIED LAND USE, BRIDGING SOCIAL, SPACIAL AND ECONOMIC BARRIERS	ENHANCING PUBLIC TRANSPORT ON PROVINCIAL AND URBAN SCALES TO RECONNECT THE CITY STARTING FROM THE CORRIDORS OF FREEDOM	SPURRING ECONOMIC GROWTH AND OPPORTUNITIES.	DENSITY AND DIVERSITY, ACCESSIBILITY AND TRAVEL.

FIG 75 *:Urban Plan depicting regenerated precinct (Urban Group, 2017)*

URBAN PLAN

PHASIN G OF DEVELOPMENT

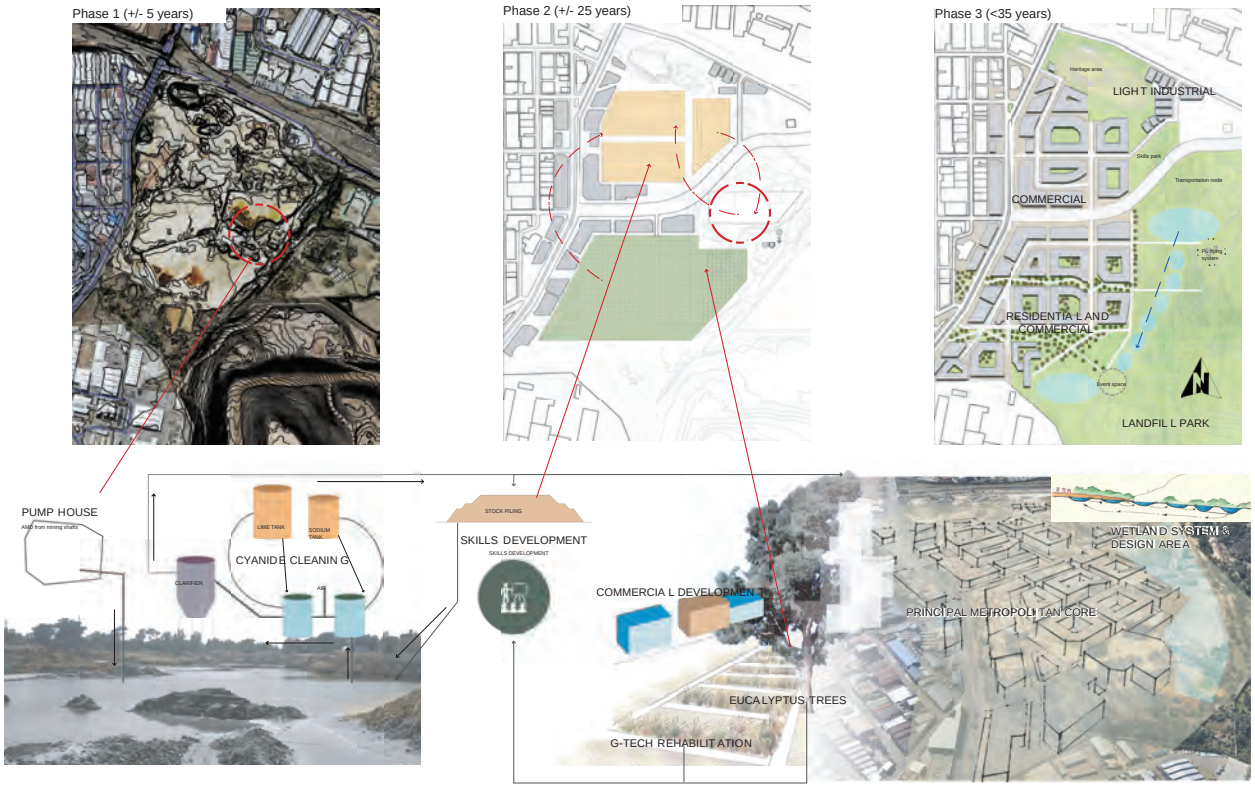


FIG 76 : Incremental process of site rehabilitation(Urban Group, 2017)

The Urban Plan developed is an aim to synthesize the projects intention with existing Johannesburg Frameworks such as the 2040 SDF.

It focuses on creating an incremental development that will eventually bring new economic activity to the area and kickstart development along the mining belt reclaiming the landscape for the city.

The site itself has been imagined as a economic, ecological zone in order to provide a much needed green lung to the precinct and city.

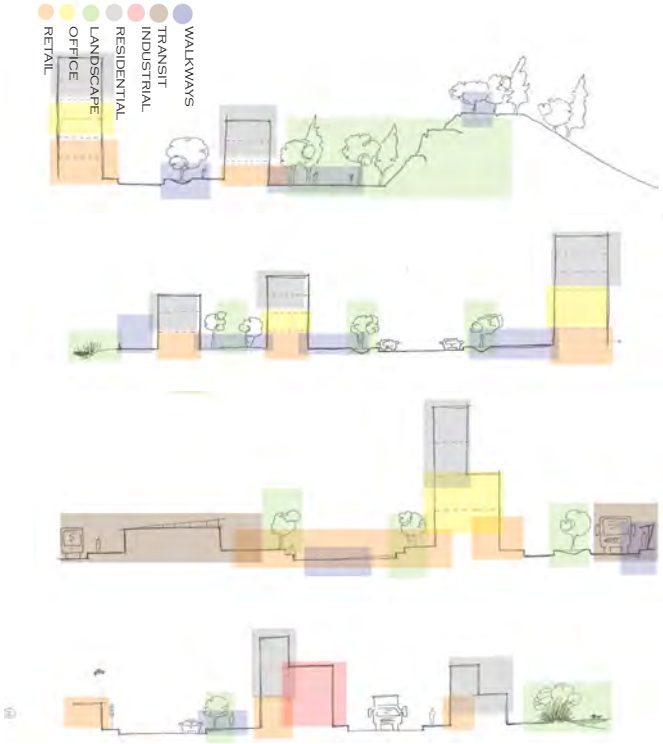


FIG 77 : Sections depicting building typologies (Urban Group, 2017)

CHAPTER 4
SITE ANALYSIS

documenting post-traumatic landscape










4.1 SITE CONTEXT

Within the urban framework This study focuses on the first built intervention on site. Initially a transport node that has used Booysens station a point of departure. This feature has been zoned to the north-east of the site due to its proximity to the proposed road and rail network. This portion has to interface between a green belt to the east, an Acid Mine Water mass to the south, a New Main Road to the north and toxic land to be removed and replaced with a layer of topsoil.

The topography falls about 8m along the north-south axis of the site and has a view of JHB city to the North and the Landfill to the South. Due to the prevailing winds, the smell of the landfill is quite diluted. The site is quite isolated from the surrounding activities, a desolate space of toxic land which in and of itself has an innate beauty. This leads to an architectural issue of developing an architecture of regionalism from the site and poses the question, how does site become architecture, not only through topography but also contextually, bearing in mind the rich mining heritage and typology. To be true to the zeitgeist of the site and in an effort to capture and realize this idea of Active Regeneration this question must be answered.

***FIG 78** : Pictures depicting urban and site conditions, mounds of natural stone, gabion walls, vegetation, infected soil and water, mounds of remaining toxic soil (Author, 2017)*

4.2 PICTURE EXPLORATION THROUGH SITE

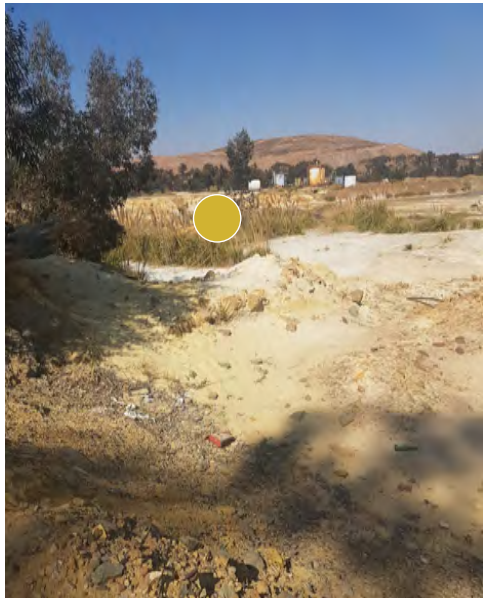


FIG 79 : *Pictures depicting urban and industrial conditions as well as site conditions. The water mass on site and harmful reeds which disperse a fine fluff that can be a respiratory risk (Author, 2017)*

4.3 TOPOGRAPHIC EXPLORATION AND IMPLICATIONS

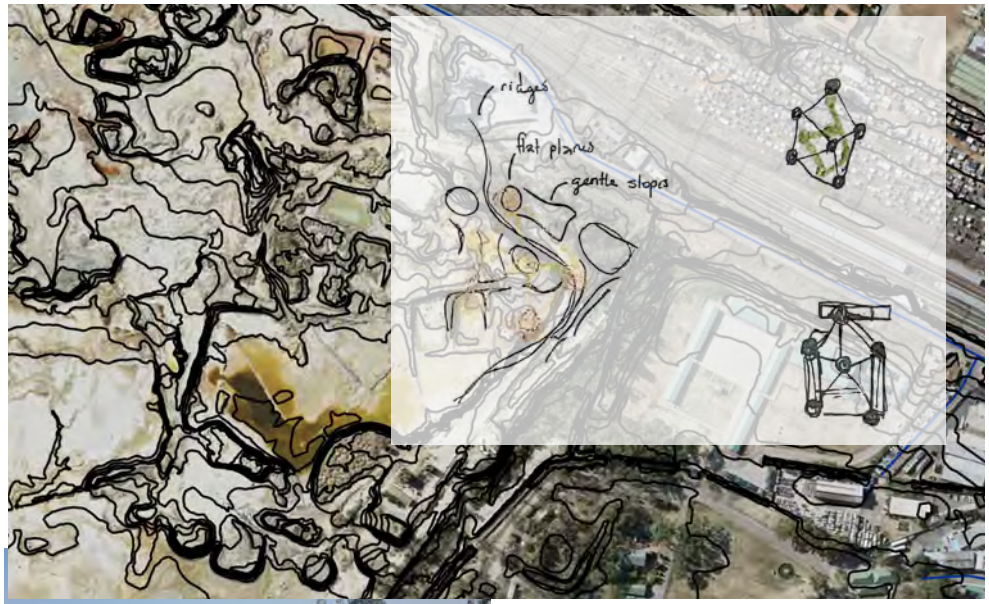
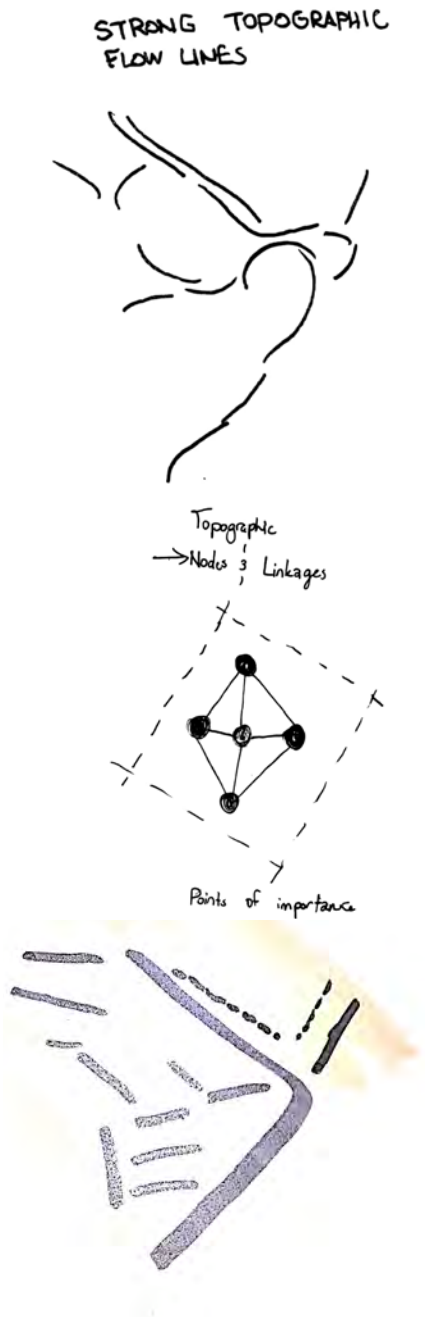


FIG 80 : Topographical exploration with nodes and edges (Author, 2017)

FIG 81 :Ridges and drops on site (Author, 2017)



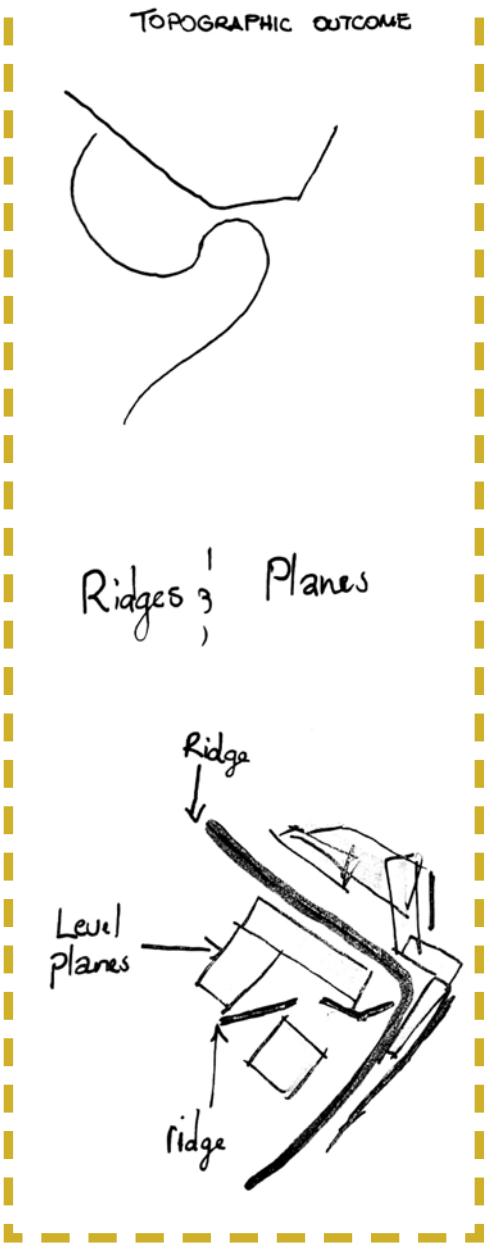


FIG 82 :Topographical solution and spatial outcome(Author, 2017)

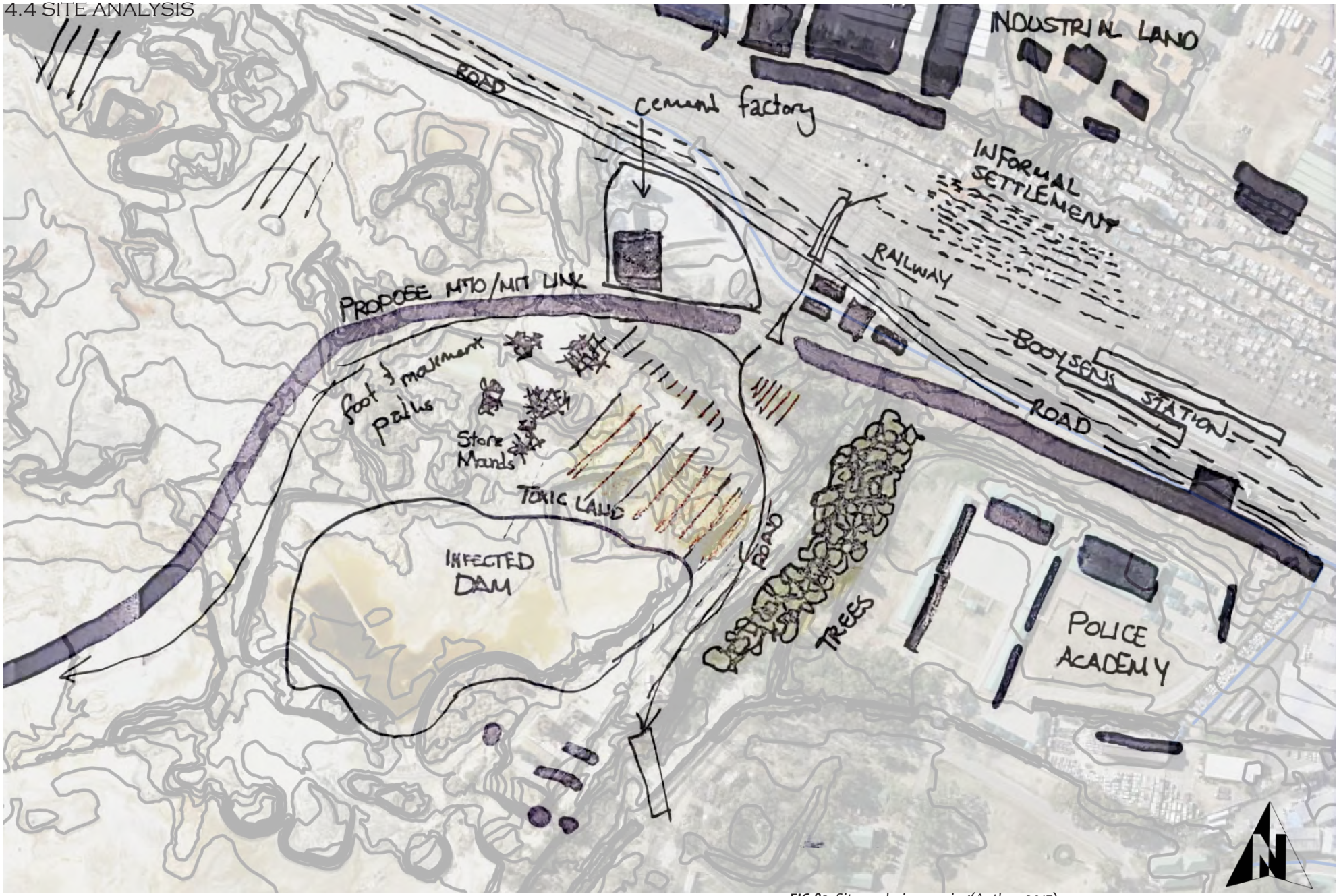


***FIG 83** :Site analysis mapping(Author, 2017)*

***FIG 84** :Climate mapping(Author, 2017)*

CHAPTER 5
THEORETICAL CONSTRUCT

developing a new contextual network of theoretical linkages

5.1 THEORETICAL POSTULATION: REGENERATIVE THEORY

"Regenerative architecture is the practice of engaging the natural world as the medium for, and generator of architecture" (Littman. 2009) It is a system of generating architecture with a focus on natural and living environmental systems, based on conservation and performance. This essentially sees the natural world as an equal partner.

Littman goes on to Re-define this architecture as "the art or practice of designing and constructing place, through the integration of site and building." He argues that Site/place is an integral part of regenerative theory, an obvious yet important connection. His inflection is further explained as site and architecture including systems existing "as one system that co-evolves as one complex entity... producing more than it consumes."

In this Re-definition Littman eludes to an architecture that is alive, in a way interacting with its context and users to become a constantly evolving system. This leads to the theoretical postulation of the concept of Active Regeneration. A regenerative architecture which interacts with site, context, systems and theory to produce an ongoing regeneration through relevant interaction with this architecture. This interaction and regeneration could be through water and systems, land and built form, heritage and space-making or even people and activation. The crux is a tangible regeneration of the site's ecological, commercial and people based systems.

There are nine principles that make up a regenerative theory as displayed in figure 85 to the left. They are ecology, sustainability, community and heritage based which are all pertinent points for this intervention. However, due to the specific contextual site condition, that being a harmed mining landscape, certain principles need to be edited, specifically the principle of integration into landscape and concentration. The reasons being that the harmed landscape must be removed and can only be acknowledged artificially in a very controlled manner and the fact that the site needs very specific programmatic responses to the issues presented.

The theoretical intention of this dissertation is thus to establish a contextual regenerative theory, which targets aspects dealing with landscape, ecology, the rich history of the site and the spatial and socio-economic concerns resulting from that heritage, thus incrementally re-identifying the mining belt through the concept of Active Regeneration.

The concept of Active regeneration will have three main focus groups that will act as conceptual drivers. These are the drivers of Heritage, Ecology and Socio-Economic Value. The interaction between these three lenses and where they overlap will inform this intervention. These three drivers will be iterated to find the most appropriate dialogue and architectural outcome which will not only form the first point of entry onto the new mining belt but also lay the groundwork for the future of this ecological, economic node. The nine principles already established fit into one of the three drivers, they are however mostly ecologically related and pragmatic rather than theoretical. The following theoretical discourse will establish a theoretical realm in which to place these pragmatic solutions by looking at targeted and relevant manifestos.

The Methodology follows a literature review;

- The Burra Charter, from which an appropriate historical and contextual study is explored. A process of documentation and exhibition is established which focuses on displaying the undocumented heritage of mining activities and its larger effect on Johannesburg, including narratives, mining equipment and social as well as ecological impact.
- Kenneth Framptons "10 Points on an architecture of regionalism," which forms a guideline for developing architecture from the site. This will speak to an architecture that is true to the ecology and heritage of the site specifically in regards to topography, water, light and materiality.

FIG 85 : *The Nine Principles of Regenerative Architecture (Littman : 2009)*

- Nabeel Hamdi's "The spacemakers' guide to big change," which explores Socio-Economic systems, from which appropriate activities can be extracted to activate space in a socially just and appropriate manner through targeted built interventions and public spaces.

It is hypothesized that synthesizing these three manifestos will form a regenerative theory and offer a conceptual approach to the formation of architecture which when contextually placed can effectively rehabilitate and reactivate the mining belt.

5.2 THEORETICAL CONTEXT

The Theoretical Context involves a succinct literature review relevant to the research proposal and a discourse which concludes and synthesizes the intentions relevant to the research proposal. This discourse will be in Grey for clarity.

5.2.1 HERITAGE REVIEW AND DISCOURSE

When evaluating the heritage value of the mining belt, documents such as the BURRA charter and the South African National Heritage Resources Act, are useful.

The South African National Heritage Resources Act, 1999 states that:

5(1) (a) Heritage resources have lasting value in their own right and provide evidence of the origins of South African society and as they are valuable, finite, non-renewable and irreplaceable. They must be carefully managed to ensure their survival.
5(1) (c) heritage resources have the capacity to promote reconciliation, understanding and respect and contribute to the development of a unifying South African identity.
5.5 Heritage resources contribute significantly to research, education and tourism and they must be developed and presented for these purposes.

Conclusion: These statements become important for the South African population especially a younger generation to understand the influences that mining had on socio-spatial issues in Johannesburg, this resource should be readily available and accessible to the public as a quintessential part of heritage studies to contribute toward that aforementioned "South African" Identity.

The Burra Charter states that:

The Burra Charter is a ICOMOS developed document adopted by Australia to provide guidance in the conservation and management of places of cultural significance. This charter can be applied to any place of cultural significance including natural, indigenous, historic, spiritual, scientific, social and aesthetic places. This charter specifically references mining landscapes as relevant heritage sites. The significance of a place is in its use, meaning, setting, fabric, impact, nature and associations. This charter States that:

Its Purpose is to: conserve a connection to the community, landscape and to past lives and experiences; form a historical record, Identity and experience; tell us who and why we are and offer an important lens for a stronger, unified future and make sure places of cultural significance are conserved.

This safeguarding should not be at risk in a vulnerable site and there must be respect for the existing fabric, meaning, use and cultural association. Conservation should make use of all the knowledge skills and disciplines which can contribute to the study and care of a place. It should take into consideration all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others. Conservation requires the retention of setting, visual and sensory. The spirit of the place and cultural relationships also contribute to this.

Any adaptation should be appropriate and sensitive. The "contents" should be retained at that place and their removal is only acceptable for treatment, cultural reasons, health and safety, or to protect a place. Where circumstances permit, these contents should be returned or sensitively appropriated.

All cultural lenses should be respected and recognized while allowing for open access especially to those directly associated with the cultural site.

Policy development is the key to successfully preserving cultural significance however this policy must be contextually based to the specific circumstantial needs of the place.

Burra Charter Process
- Understand Significance
- Develop Policy
- Manage in accordance with policy

The conservation process involves the retention, reintroduction, adaptation and interpretation of use, association, meaning, fabric, contents and place. Change may be necessary and permissible when cultural significance is retained through appropriate interpretation. Removed significant fabric should be reinstalled where circumstances permit. Adaptation should have minimal impact on cultural significance. New work is acceptable where it respects the cultural significance without detracting from the interpretation and appreciation of the place and new uses may be reintroduced.

Significant associations between people and place must be respected and retained, with opportunity for interpretation, celebration and commemoration to be investigated and exhibited. Meaning and spirit of place should be respected and celebrated. Interpretation should enhance engagement and understanding.

Conservation practice involves initial oral, documentary, physical and other studies to be carried out in order to understand the heritage value. Supporting written statements and policies should be prepared and incorporated. People associated with the place should be interacting, contributing and participating in the space. Processes and policies should be reviewed and appropriately altered periodically. Existing fabric, meaning, association and use should be documented and recorded. Disturbance of the existing fabric

FIG 86 : *Critical regionalism in action in the Water Temple in Awaki Island, Tadao Ando* (Martin, 2013)

FIG 87 : *Critical regionalism in action in the Benesse House in Naoshima, Japan* (Martin, 2013)

should be suitably justified and contribute positively to the space without affecting the cultural significance. Management and responsibility must be mapped out with a clear direction. Records should be kept and the place should function as a resource on the whole.

Conclusion: This Charter display the importance of documenting and exhibiting heritage as well as the multitude of ways in which it can be celebrated. The historical contextual investigation established what themes need to be celebrated and acknowledged as well as what negative aspects need to be counter-acted.

The mining belt is a string of associated sites which has meaning placed upon it through its deep rooted heritage as the foundation of Johannesburg. There is a iconic affiliation with the toxic waste mounds of Johannesburg which are recognizable landscape features, however for the cultural significance to be preserved and the land made habitable, it cannot merely be reconstructed, due to the land's toxicity but must be adapted with the cultural significance interpreted. It is a unique case where the physical heritage preservation is at odds with environmental standards. As a result, the goal is to develop an architecture that resists a universal lack of place and meaning and rather holds a strong and respectful language in the mining belt. This allows for a reformation of the land into a non-toxic but culturally significant form to isolate an architecture of regionalism, perfectly articulated by Kenneth Frampton.

5.2.2 ECOLOGICAL REVIEW AND DISCOURSE

Ecology is the study of how one living organism interacts with other living organisms. It focuses on connections and interactions between different systems. In architecture this could relate to a number of things such as the Site and building and the occupants and light or water. These interactions are explored pragmatically in Framptons, "10 points on an architecture of regionalism: a provisional polemic" and in Framptons, "Towards a critical regionalism: 6 points for an architecture of resistance." These manifestos will be used as an environmental discourse.

Frampton originally famously postulated "6 points for an architecture of resistance" that would bring architecture toward a critical regionalism. In this manifesto he specifically aims to encourage modern architecture for its progressive attributes but argues it should be a space specific, context inspired response. The emphasis being places of site and resulting conditions. This can be translated to the creation of site specific, responsive, contemporary architecture devoid of ornamentation.

Frampton uses an ironically relevant quote from "history and truth" which states, "In order to get on to the road toward modernization, is it necessary to jettison the old cultural past which has been the raison d'être of a nation? … Whence the paradox: on the other hand, it has a root itself in the soil of its past, forge a national spirit." (Ricoeur, 1965) This is directly related to the issue the mining belt faces in that its cultural value lies within the toxic waste mounds, which in essence are the inhibitors to development.

Framptom refers to examples like Tadao Ando, who's architecture employs strong geometric form in harmony with the landscape, using light and in some cases water to highlight an experiential quality of the building. Frampton then refers to the "serpentine" transit networks that enable modern city high-rises which in turn has enabled globalization, the agglomeration of building form to a universal standard aesthetic. He suggests a mediative in-between whereby globalization is combined with elements that are a product of the peculiarities of a specific place thus being influenced by, heritage, context, topography or light. Although architecture defined by boundaries must not be disconnected, from the extended context, by them. Thus spatial articulation is important in defining the characteristics of place. He outlines the importance of "place-form" being a balanced product of the natural qualities of the landscape and the cultural legacy that is critical to a place's identity. This concept is in opposition of placeless design. In conclusion of his 6 points Frampton talks about the

importance of a haptic experience of the building in both creating and evoking memory. (Frampton, 1983)

Frampton later in his career discusses this view of critical Regionalism in, "10 points on an architecture of regionalism: a provisional polemic. This "Speculative manifesto" suggests that:

1)Critical Regionalism is not a "vernacular fetishism" but rather a "recuperative, self-conscience, critical endeavor." (Frampton k, 1987, 378)
2)It pays attention to how the built form specifically interacts with the ground/site.
3)Regionalism is defined by climate and locality but furthermore a school of thought in educational and cultural value, that which is of meaning. It should also be defined by committed clients and or stakeholder/s.
4)The experiential quality of a building should build a true and unique genius loci that is separated from scenography.
5)Urban realms are becoming universal, a privatized domain with a loss of place and closeness however, as Heidegger suggests it should be a "phenomenologically bounded clearing or domain" (Frampton k, 1987, 382)
6)Topography is quintessentially site-specific, a concrete appearance of the site itself. This is often in opposition to typology which is formalistic. The conversation between these two creates a resultant place-form which is a keen dialogue between ecology, symbolism and the new intervention.
7)Architecture's roots lie in the expressiveness of the true built form, that is the conversation between tectonic and stereotomic elements, the celebration of "frame and joint in the genesis of construction." (Frampton k, 1987, 383)
8)Architecture has a symbiotic relationship with nature and thus should respond appropriately to not only topography but climate and light. Artificially created environments counteract the rootedness of a design and leaves an occupant feeling placeless. Even in sensitive spaces like museums, careful placement can still allow for natural interaction with ventilation and light while still protecting the art.
9)The building is a composition of hierarchical spatial episodes that are experienced first by the sensory bias of sight but complemented by other senses such as the tactile, air movement, temperature, acoustics, materiality and feel.
10)This is quintessentially a manner of experience, for the body, of an environment, framed in place both physical and metaphysical.

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Conclusion: Critical regionalism is explored in a specific way to outline the ecological informants of contextual elements like water and topography, and to a lesser extent light. The site is a harmed landscape with water and topography needing to be treated. The topography of the site will have to be completely removed however it can be echoed by the buildings form. Thus building is inspired by or rather becomes topography creating a connection with the peculiarity of this site. Water treatment is an important contextual informant and can contribute to a haptic or phenomenological experience of the site. The toxic AMD has to be treated and the active regeneration of the water can be a visual process and even become interactive after treatment through systems like evaporative cooling and spray systems. Water can also be displayed in poetic senses using structure to create a relationship with it, without the toxic water actually touching users, such is popular in Tadao Ando's work where concrete structures are submerged in water to allow a user to experience the water in a phenomenological and indirect nature.

The next connection ties into the Heritage lense of which Critical Regionalism is directly connected to. The heritage forms a cultural legacy and identity which is also a haptic and visual journey expressed through a heritage landscape through physical mining tools and systems being exhibited. The heritage factor also ties into the materiality, form and construction of the "place-form" which will directly speak to the tectonic, exposed structural steel nature of mining landscapes.

This process presents a strong theme of tension between heritage and ecology. This is due to the fact that the Heritage response requires an imposing, invasive tectonic place-form and the Ecological response requires a sensitive, stereotomic response. The theme of tension will thus directly influence the overall experiential quality of the design as it

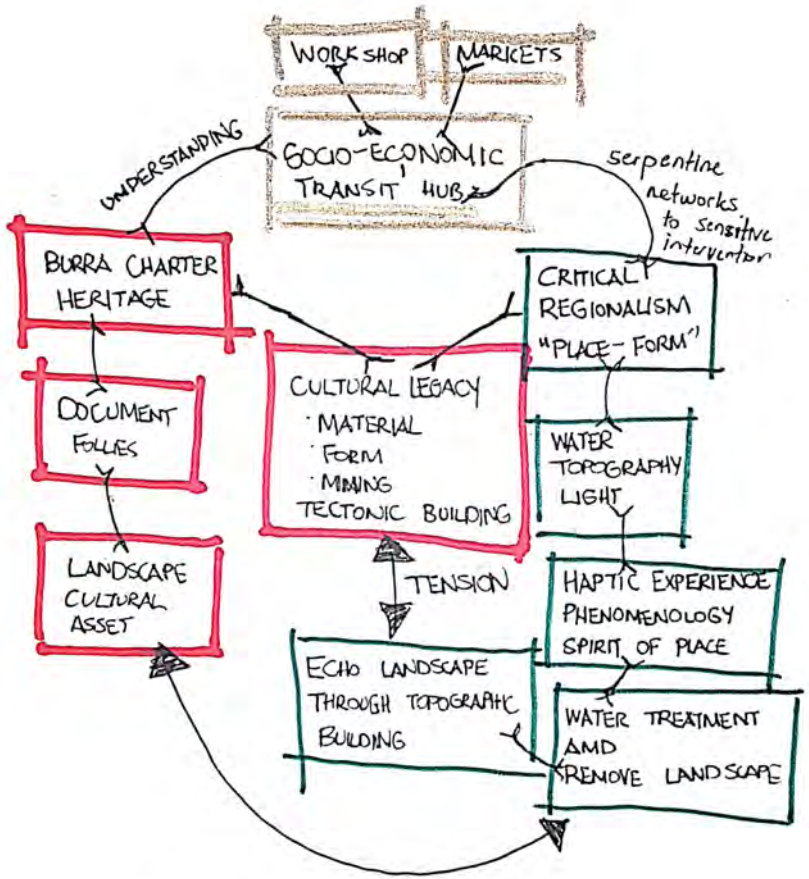


FIG 88 : *Theoretical Networks and linkages, crossovers and tensions* (Author, 2013)

5.2.3 SOCIO-ECONOMIC REVIEW AND DISCOURSE

transitions from tectonic to stereotomic.
" To do something BIG- to think globally and act globally - one starts with something small and one starts where it counts." -Nabeel Hamdi, 2015

The act of community building is paramount in an area undergoing rehabilitation, especially one as fragmented as the mining belt. This focus on the socio-economic value is specifically programmatic, helping the community and rooting itself by recognizing a local or contextual need. This intervention looks at counteracting the negative socio-economic effects of the mining belt has had which was explored in the contextual study. This mainly refers to the fragmentation of the city, spatial disparity and skills issues. The lack of adequate skills amongst an underprivileged black community is prevalent in the unemployment rate of Johannesburg which is currently sitting at 25%(Statistics SA, 2017). This is a long lasting legacy initially started by the mining sector as discussed in chapter 2. In order to address this in a effective manner Nabeel Hamdi's, "Spacemakers" guide to Big change" will be consulted. This is a handbook that deals with Participatory planning and spatial agency.

Hamdi suggests that participatory practice is necessary because of its efficiency and equitability in building the social economy of place which is fundamental for community building. Participatory practice involves active engagement with end-users, identifying their needs &requirements resulting in more efficient and appropriate outcomes. It engages with informality and utilizes acupuncture to unleash more significant results.

This is placing responsibility with both authority and stakeholders. This is beneficial for bringing people together and identifying alternatives and unique contextual ideas. There is also a greater strength in the resulting schemes which develop as more emphasis is placed on what people actually need rather than an imposed top down standardized solution.

Practice, then, is about making the ordinary special and the special more widely accessible, tapping into spatial agency — expanding the boundaries of understanding and possibility with vision and common sense. "It is about building densely interconnected networks, crafting linkages between unlikely partners and organizations, and making plans without the usual preponderance of planning. It is about getting it right for now and at the same time being tactical and strategic about later." (Hamdi N, 2004, xix)

This process is there to empowering people to mobilize interest, resources and partnerships while understanding community, place, interest, practice and culture. Understanding these aspects will help to identify who the role players are and then help identify the practical and strategic objectives. There is a conversation or creative sweet spot between, community action planning (bottom up planning), which involves locally based programmatic interventions with immediate outputs, and strategic action planning (top down) which involves policy orientated interventions on a large scale. this combined with the idea of forward planning with Backward reasoning creates a "one size fits all" approach to community interventions

Hamdi focuses on the key points of PEAS- Provide opportunities, Enable through programme, Adapt solution accordingly and create a Sustainable response. These principles are the crux of any resilient targeted intervention. To establish a targeted intervention or plan a cyclical process is outlined by Hamdi which involves Identifying:
1) Problems or Opportunities
Put into contextual investigation this can be seen as The informal settlement housed at Booysens station which accommodates bot a problem that can be turning into an opportunity in the form of trolley pushers
2) Goal and Priorities
To provide safe trolley routes and a deposit point where the trolley pushers gain useful and fair payment
3) Options and Trade-offs
Payment can be in the form of night classes to develop skills or even transit tickets
4) Resources and Constraints
Developing a strengthened transit network in Johannesburg South provides a strong resource in which to include the Trolley Pushers, however due to the low economic activity this function will have to be governmentally run or funded unless private funding can be found
5)Project Teams and Tasks
Stakeholders include government and the trolley pushers to interact with a skills development team
6) Catalytic Projects/ Programs
The collected trash could be turned into art or functional furniture as part of the skills development workshop
7) Strategic Plans
Due to the informality of the trolley pushers operating as independent informal workers, organization can become an issue which can be solved through the implementation of a mobile phone app that formalizes collection, working areas and drop off points.
8)Evaluation
Although this allows for a more efficient network of informal trolley pushers, most do not have access to smart phones and data. Unless a service provider becomes part of a project team to sponsor this service it is unrealistic.
9)Implementation
The first stage will be implemented through word on mouth by choosing and identifying key role players that want to empower themselves through the Night Classes offered after they are done working in the day.
10)Analysis
This process will be conducted post-implementation in which the process will start its cycle again
11) Policy Planning
This top down process takes a long time to go through and involves things like better protection and allowances for trolley pushers to use the roads in the form of bicycle lanes or something to a similar effect without being harassed by police or being a public nuisance.

"Practice is about opening doors, removing barriers to knowledge and learning, finding partners and new forms of partnership, building networks, negotiating priorities, opening lines of communication and searching for patterns. it means designing structures — both spatial and organizational — and facilitating the emergence of others, balancing dualities that at first seem to cancel each other out — between freedom and order, stability and creativity, practical and strategic work, the needs of large organization and those of small ones, top and bottom, public and private." (Hamdi N, 2004, 116)

5.3 THEORETICAL CONCLUSION

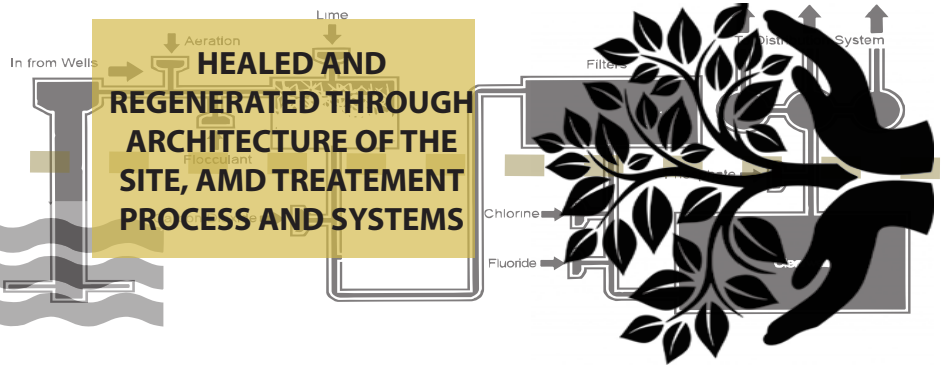
The combination of these three lenses takes the aforementioned nine principles of a Regenerative theory and focuses them into three succinct categories. These categories are supported by targeted literature reviews to inform an architectural product. These three focus areas produce a theoretical discourse for a more contextually driven Regenerative theory than previously developed. This theory deals directly with the main issues outlined in Chapter one that being the Cultural value and contrasting ecological hazard that the mining belt poses as well the latent socio-economic potential the land and it's resulting place-form could offer. Thus it is important to note, that due to the specificity of this regenerative theory, it cannot be duplicated anywhere but in the intended Urban area. What has been produced is a regenerative theory with a conceptual base of Active Regeneration that will have spatial, formal and programmatic implications in the generation of architecture.

SOCIO-ECONOMIC

ACTIVATED AND EMPOWERED BY TRANSIT LINKS, SOCIAL INTERACTION AND SKILLS DEVELOPMENT

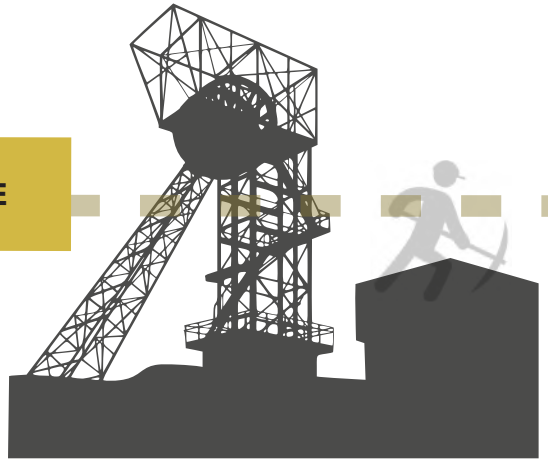
ECOLOGY

HEALED AND REGENERATED THROUGH ARCHITECTURE OF THE SITE, AMD TREATEMENT PROCESS AND SYSTEMS



REGENERATIVE THEORY

HERITAGE



DOCUMENTED AND DISPLAYED USING NARRATIVES, PICTURES, BUILDING COMPONENTS AND FORM IN A HERITAGE LANDSCAPE

FIG 89 : *Info Graphical overview of Regenerative theory* (Author, 2013)

Fig 90 : Collage depicting the chronological series of the 7 areas from top to bottom (1-7 respectively) (ShowMe.tm, 2017)

5.4 CULTURAL/ HERITAGE PRECEDENT

FREEDOM PARK, PRETORIA
ARCHITECT: MASHABANE ROSE ASSOCIATES, GAPP ARCHITECTS AND URBAN DESIGNERS AND MMA ARCHITECTS
BUILT: 2004

Freedom park is a heritage landscape that stands to evoke patriotism and honour South Africa's past in terms of freedom, humanity and purpose.

It is divided into distinct sections over the park's journey. There are 7 different areas with 7 distinct themes each unique to their respective content. This includes the Hapo Museum. The parks landscape and tectonic expression is in the form of acknowledging, respecting and documenting the past as well as celebrating and optimistic future.

The 7 areas are the:

1. Isivane area- which honours the spirits of those who died fighting for freedom and liberation
2. S'khumbuto- Which documents important conflicts in South African history
3. Wall of Names- 75000 Names of Freedom fighters
4. The Eternal Flame- for those who died without recognition for fighting for freedom
5. Reeds- 200 32m poles symbolizing national rebirth
6. Reconciliation Road- the road to reconciliation between the Voortrekker Monument and Freedom Park
7. Hapo Museum- documents physical and national heritage from 3.6 billion years ago until present day.

This display of heritage is calculated along an extended landscape rather than one museum and becomes a haptic experience of story-telling which is what the heritage landscape within the proposed precinct aims to acheive.

5.5 FORMAL PRECEDENTS

5.5.1 TECTONIC PRECEDENT

WITWATERSTRAND MINING BELT, JOHANNESBURG

ARCHITECT: PROSPECTORS

BUILT: 1886+

The Mining belt was a purely economically driven project and as a result the resulting "architectural" language is pragmatic and functional with large steel structures forming landmarks amidst low rise industrial timber, steel, concrete and brick structures. The steel members were purely functional to carry the appropriate loads across and support efficient mining.

This precedent/ tectonic exploration is directly related to the stereotomic precedent. This relation is through contrast and tension. The tension is that represented in the relationship between heritage (honouring the past cultural tectonic value of the mining belt) and ecology (having to create a sensitive intervention which respects the toxic to-be-removed landscape) The theme of tension and resulting mediation will result in the contextual "place-form."

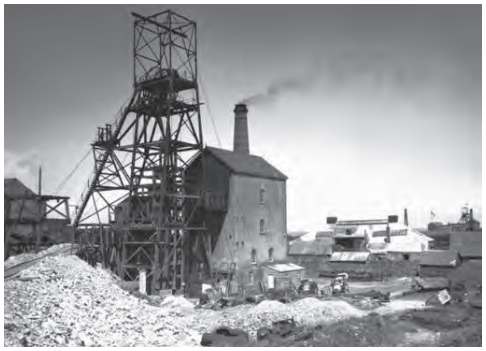


FIG 91 : Collage depicting the Mining Landscapes tectonic aesthetic and formal quality (Johnson D. 2017)

5.5.2 STEREOTOMIC PRECEDENT

IGUALADA CEMETERY, SPAIN

ARCHITECT: ENRIC MIRALLES
BUILT: 1994

Igualada Cemetery is a sensitive project that blends into the landscape and unfolds as the user journeys through the existential space. It was part of a replacement project of an older cemetery.

The play of light brings about a consciousness of the ground and sky. The use of natural material makes the architecture feel site inspired as if it had been an organic extension of the landscape. There are places for reflection and memories with conceptually poetic response that is intended to connect past, present and future. Nicknamed the "city of the dead" it is meant to evoke an experiential and spiritual journey through the site to bring users closer to passed-on loved ones.

The fluid progression of this earthwork combines the mutes tones of stone and cement to form the landscape. This is complemented by cor-ten steel members that guide the entrance of the site through the windy path. There are wooden railroad ties embedded into the stone speaks to the context with addition of the gabion walls and natural aesthetic.

FIG 92 : Collage depicting Igualada cemetery site inspired architecture, topographic and stereotomic formal and aesthetic qualities and a critical *regionalist response* (Kroll. 2011)

CHAPTER 6
PROGRAMME

activating the space for the city

TRANSIT HUB (24 975m²)

FUNCTION	REQUIREMENTS	M²
MAIN STATION	Max capacity 40 000 commuters	**5550m²**
Circulation space	50 staff including services building	600m²
Ticket offices x3	Glass separated purchasing office	100m²
Ablutions	60 WC, 30 urinals, 60HWB	330m²
Food court	60 Seater Movable chairs and tables	420m²
Waiting area	Mechanically Assisted Ventilation	300m²
Courtyard including AMD storage tank and folly 1	Security monitoring system	300m²
Train platforms		2000m²
Bus platforms	Steel waiting chairs	500m²
Taxi platforms	Steel waiting chairs	900m²
Bicycle hire and showers	Steel waiting chairs	100m²
	10 showers, 3 basins, 10 lockers and wooden furniture	
TOTAL DEDICATED TRANSIT SPACE INCLUDING PLATFORMS:	Security monitoring system	**8500m²** 2000m² 1500m²
Taxi Rank	Open-air facility	4800m²
Bus Station	Open-air facility	1000m²
Pedestrian Bridge	Open-air facility	
SERVICE BUILDING	Equipment list to be compiled by rail specialist	**725m²**
Signal control manager room		150m²
Relay room		150m²
Cable terminal room		25m²
Control room		100m²
Battery room		25m²
Electrical power room		62.5m²
Emergency power systems room		62.5m²
Transmissions room		50m²
Staff room		50m²
Storage		50m²
OFFICES	Security monitoring system	**300m²**
Site management offices	15 Staff. Toilets included with 2WC, 2WHB	150m²
Transit Station offices	Mechanically Assisted Ventilation	150m²
START-UP BUSINES SPACES	Security monitoring system	**500m²**
BASEMENT PARKING	Security monitoring system	**9000m²**
MARKETS	Security monitoring system	**3500m²**

6.1 TRANSIT HUB AND MARKET

Using Booysens station as a point of departure It must be upgraded to a multi-nodal transport junction, to create a strong transport node and socially just space. This Junction aims to combine both the Metrorail and Gautrain platforms to encourage an equitable public space, with the addition of a BRT system and taxi rank. The BRT system works straight off of the road for efficiency while the taxi rank is inset off the road to interact with a market.

transport
Department:
Transport
REPUBLIC OF SOUTH AFRICA

Rea Vaya
Joburg

GAUTRAIN
FOR PEOPLE ON THE MOVE

prasa
PASSENGER RAIL AGENCY OF SOUTH AFRICA

MAIN STAKEHOLDERS
City of Johannesburg
Department of Transport
Commuters
Gautrain
PRASA
Rae Vaya

The main issue with Booysens station was its mono-functional nature, as a train station with no linkages to other modes of transport and as a result it has a peak capacity of 10 000 people however the new station will operate on a peak capacity of 40 000 people per day to account for Turffonteins planned growth from 81778 people to 160 000 people with the Corridor of freedom development, initially working off of the needs of Turffontein and the resulting developments while allowing for growth of not only the mining belt but also Johannesburg South. This transport hub will also link into the precincts larger walking paths and bicycle routes, offering bicycles to rent. This socio-economic activity's intention is to ACTIVATE the area effectively and provide foot traffic.

Any informal economy finds it's roots in area with high foot traffic, this makes a transit hub the perfect space to cultivate this important economic activity in the form of an informal market space. The market will feed off the taxi rank within the transit hub and provide opportunities for informal trade managed through an NGO such as exemplified in Warwick Junction, Durban which has a balanced bottom up-top down approach, the NGO being the mediator between government and traders. This empowers places such as the informal settlement across the railway tracks. The market will sell groceries, made goods, food, cosmetic items, recreational goods such as music, art and fresh produce.

The Transit Station will be the first point of entry or ACTIVATION on the site and as a result will be the start of the Junction's journey through the site.

6.2 HERITAGE LANDSCAPE

The heritage landscape is an initiative driven by heritage conservation principles such as those outlined in the Burra Charter. In order to conserve the important heritage value of the mining belt this landscape works as a series of intervention throughout the precinct. The issue of lost heritage, including narratives, time-lines, processes and ecological influences of the mining belt are to be exhibited in different ways through the use of functional follies. The Follies will become an architectonic expression of the Heritage journey. Each folly will have a theme dealing with heritage, some more integrated into the buildings than others. The follies are initiative inspired by both the cultural precedent as well as the spatial precedent of Bernard Tschumi's Parc de la Villette which is explored in the Design development chapter.

The first folly, located within the main Station will be a chronological time-line of the mining belt. Works like David Goldblatt's photos "on the mines" will be displayed here.

The second folly is located at the exit of the station. This Folly will display the two opposing narratives of the site, that being poor migrant workers and the rich Randlords. This folly will display a theme of tension and contrast feeding off of the work of Nadine Gordimer's essay, "mines of the beloved country: through the mind of a photographer and essayist" This folly will also house a smog sucking machine that cleans the air and turns the resultant smog into a compacted cube that can be used for jewelery and sold at the market

This is followed by the 3rd folly which is located at the dam edge within the water. This folly reticulated the water that has run through the artificial wetland created as a landscape intervention. This folly displays the technical mining process and has a clear connection to the ground, sky and water. A metaphysical space that encapsulates the SPIRIT OF PLACE within the nature of the site

tourism
Department:
Tourism
REPUBLIC OF SOUTH AFRICA

SAHRA
NDZALAMA YA RIXAKA
SOUTH AFRICAN HERITAGE RESOURCES AGENCY

MAIN STAKEHOLDERS
SAHRA
Department of Tourism
The city of Johannesburg and transit hub users
Educational programmes and schools

MAIN STAKEHOLDERS
Department of Tourism
The city of Johannesburg and transit hub users
Art enthusiasts and general public

HERITAGE LANDSCAPE

FUNCTION	**REQUIREMENTS**	**M²**
MINING TIMELINE FOLLY	Exhibition mounted to concrete AMD water Storage tank in Transit Hub Courtyard	150m²
NARRATIVES FOLLY	Exhibition mounted to steel frame along Market Space	350m²
TECHNICAL FOLLY	Concrete Exhibition space submerged in Dam water	450m²
ECOLOGICAL FOLLY	In AMD Research and Treatment Facility Courtyard	350m²
EXHIBITION FOLLY	Exhibition Space Shares the Same space as the Exhibition Landscape and forms the last folly	1000m²

EXHIBITION LANDSCAPE (2750m²)

FUNCTION	**REQUIREMENTS**	**M²**
GALLERY	Security monitoring system Max 100 Occupants	**500m²**
RESTAURANT	Security monitoring system	**750m²**
Kitchen		150m²
Restaurant Floor		500m²
Toilets		100m²
PUBLIC SQUARE	Max 200 Occupants	**1500m²**

SKILLS WORKSHOP (1490m²)

FUNCTION	**REQUIREMENTS**	**M²**
WORKSHOP	Security monitoring system, Max 50 Occupants	**695m²**
Production storage	Storage for finished projects	20m²
Assembly area	Open area for project assembly	200m²
Wet zone	Sinks and metal tables	125m²
Machinery area	Saws, Drills and Presses to be specified	100m²
Working zone and class room	1.2m high metal top tables with stools	250m²
STAFF ROOM		**85m²**
Ablution	4WC, 2WHB	20m²
Kitchen		15m²
Lounge		50m²
OFFICE	1x Wooden table and 2xinterview chairs	**50m²**
WASTE COLLECTION POINT	Security monitoring system	**265m²**
Reception		120m²
Sorting Facility	Large Steel Table	45m²
Storage Facility	Steel Shelves and Cupboards	100m²
BOARDING FACILITY	Security monitoring system	**395m²**
Dorm Bedrooms	10 Beds	120m²
Ablutions Facility	5 Showers, 4WC, 4WHB	50m²
Kitchen		65m2
Lounge		160m²

labour
Department:
Labour
REPUBLIC OF SOUTH AFRICA

MAIN STAKEHOLDERS
Department of Labour
The city of Johannesburg
Booysens station informal settlement
Trolley pushers
Professionals and Practicioners
Educational programmes and schools

The 4th folly is located outside of the AMD treatment facility. It is the ecological folly which will document the ecological effect of the mining belt and will be a jagged form depicting harsh harm. This will be placed over the treated water's storage tank. It is a raised steel perforated platform with harmed landscape preserved below in the centre, outlined by a glass circular walkway. This folly is paramount in the representation of the active REGENERATION going on in the site

Finally, this journey will culminate in a circular fashion at a public square exhibition space. This folly in the form of space defining elements will speak of the future vision of the mining belt and will be one of celebration and liberation, strong yet adaptable form. This exhibition space will be supplemented by a restaurant which will use fresh produce from the green roofs on site as well as the potable water processed on site. This Exhibition space completes the sites programmes with an exhibition of the treated water and produced art. This also completes the journey of active regeneration, aptly named due to the site still being regenerated and that change-in-motion being very visible through the skills development and water treatment facility.

The materiality will speak of mining heritage, with steel and blue gum timber being the main elements as well as the bricks made from the site.

6.3 SKILLS WORKSHOP

The Skills workshop is a targeted program that will tap into a proposed recycling center for the trolley pushers. The trolley pushers and neighborhood of Johannesburg can deposit their collected useful waste and either collect a transport ticket, money or food in exchange for their selected trash. This "trash" will be used to create art and it will be exhibited within restaurant exhibition space. The Skills Workshop targets professionals like Mbongeni Buthelezi to teach targeted members of the community, key role players, the skills of the trade (art) and thus furthering their skill set. This artistic premise will be supplemented by practical skills training for the industrial activities in the Booysens area, whenever artisans or professionals need skilled workers this can form a mutually beneficial program in which the best workers are found while passing on valuable skills. The Workshop will also host night classes to educate and provide more opportunities for the trolley pushers and impoverished community. This programme is very dependent on a mediated approach between community effort and policy, a top-down bottom up approach with backward reasoning that has been used to achieve a contextually grounded response.

This precinct is named Philani Junction (approx. 10000m2) which will be the start of the journey through the mining belt. Philani, is used to signify that something is healthy or alive which is in line with the concept of active regeneration which is an essentially "live" process of regeneration. It sets out to actively deal with the 3 issues of; heritage (through the follies), ecology (through water air and site treatment) and finally socio economic-value (through the transit junction, markets and skills development workshop)

AMD WATER TREATMENT AND RESEARCH FACILITY (2895m²)

FUNCTION	**REQUIREMENTS**	**M²**
RESEARCH FACILITY	Security monitoring system, 15 Staff	**555m²**
Reception	6WC, 4WHB	85m²
Toilets		45m²
Offices	Equipment to be specified by Research Specialist	125m²
Labs & Cold Room		300m²
TREATMENT FACILITY	Security monitoring system, 25 Staff	**2340m²**
Control Room		140m²
Treatment Floor		1200m²
Storage Tanks		1000m²

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

MAIN STAKEHOLDERS
Department of water and sanitation
The city of Johannesburg
Anglo American and Rand Mines
Trailblazer Technologies
Segra Water
Water Affairs and Water Research Commission
Educational programmes and schools

AngloAmerican

FIG 94 : formal bubble diagram of precinct spaces (Author, 2017)

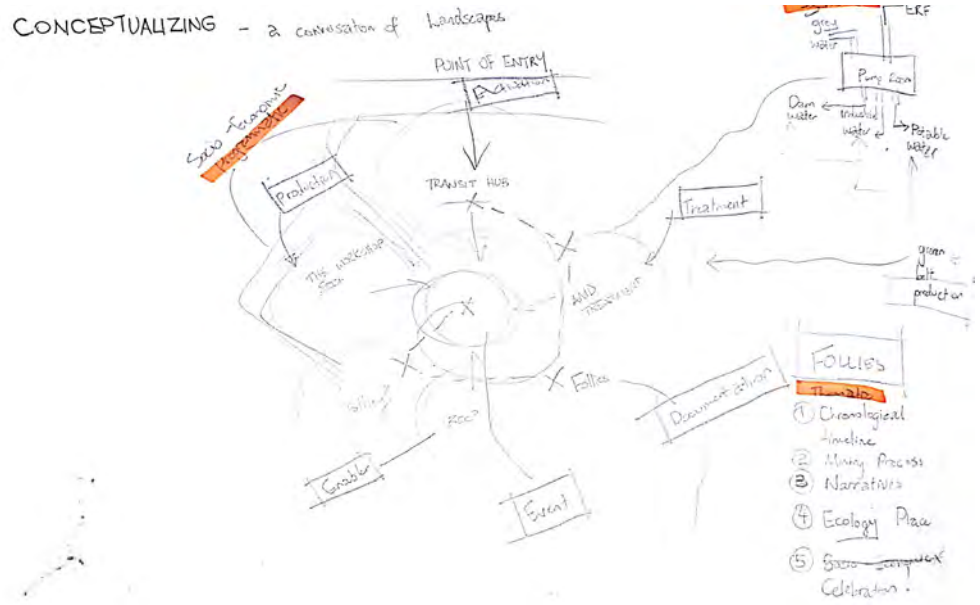


FIG 93 : Rough bubble diagram of precinct spaces (Author, 2017)

6.4 AMD RESEARCH AND TREATMENT FACILITY

This plant will house the KNeW(Potassium Nitrate Ex-Waste) process-TM by trailblazer technologies[9]. This is a scalable and profitable water treatment process that can produce water at different levels. Such as industrial Grade and Potable water. This process will be supported by a research and testing center. The water is sourced by nearby decanting stations such as Village Deep and Crown mine by tapping into the vast existing pipe network which runs just past the site. This process removes all organics, radium and uranium. It features the Additions of Palm Ash, Nitric Acid and an Ammonia Solution to produce output eluates which eventually result in water and with the addition of chlorine Potable water. The profitable outputs are mainly Potassium Nitrate and Ammonium Sulphate however, sodium chloride, dolomite and gypsum are produced on a lesser scale.

This treatment facility will continually test this process to optimize efficiencies and form as a base for research in AMD treatment. The water will be tested on site to ensure requires quality is maintained. Te water produced on site is reticulated into all water systems, such as the evaporative cooling system, toilets, showers, taps and gardening services. Grey water is reticulated back into the treatment facility lowering the Acidity of the AMD in the first storage tank thus forming a closed system. The Industrial grade water will be used within the workshop in the production of art as well as the toilet systems. According to the Gauteng City Region Reports the amount of water available is 70000 cubic meters daily which is more than sufficient to supply water to the site.

The overflow of treated water will be pumped back to rand water with existing pipe networks, And excess industrial water will be pumped to nearby industrial facilities. This intervention Forms part of the REGENERATION LANDSCAPE

6.5 ACTIVATED LANDSCAPES
PROGRAMMATIC PRECEDENTS

6.5.1 PARK-STATION, JOHANNESBURG
ARCHITECT: JACOB KLINKHAMER
BUILT: 1897

Park station is the largest transit hub in Southern Africa and the spatial treatment has lead to a crime ridden precinct that is segregated. This is the closest multi-nodal transit hub and more importantly shows some distinct shortcomings, due to bad planning and lack of space. The site sees 1 million commuters a day however it is not socially just in the way in which public space is treated. The space outside the Gautrain station is policed whereas the space outside the Metro stations are bustling with markets and activity. The Gautrain wall has signs all over it that do not allow any sitting or loitering whereas the Metro stations and taxi ranks aren't landscaped or policed.

There's a clear socio-economic divide just within the station whereby a small collaboration between companies could ensure people were equitably sharing public space of the same high standard.

6.5.2 WARWICK JUNCTION BRIDGE, DURBAN
ARCHITECT: ANDREW MAKIN
BUILT: 1910

Warwick Junction is a vibrant transit hub that sees massive foot traffic that activates a bustling informal market that turns over billions of rands in revenue every year. The markets are a huge rationalistic phenomenon located in the heart of the city and being a key example in pendulum migration some traveling hundreds of kilometers over the week to sell products. It brings a cultural hub of activity and sense of place due to the agglomeration of people. The markets actually drive down crime, with the managing agency, that has formalized the informal trade. There is a progression of market spaces and an organic journey of different experiences, from a music bridge to a bovine market. The progression and variety offers a sensory experience and its strength and unique quality is made possible by the strong linkages the transport node has, as well as the people who contribute their narratives to this highly commercial space. This is a people centric and collaborative effort to empower informal traders and build a community in which the spatially and economically disadvantaged have an equitable public space in which to make a reliable income and build a customer base.

FIG 95 : Spatial condition at Park Station, Contrast between metro and Gautrain public spaces (Tyler, 2015)

FIG 96 : Pictures exploring the aesthetic and spatial features of Warwick Junction in Durban, including people based activity and robust yet attractive design and facilitation (The KwaZulu-Natal Institute for Architecture, 2017)

FIG 97 : Markets of Warwick including baskets, adornment, jewelery, produce and services like sewing (Eason C, 2017)

STEREOTOMIC

TECTONIC

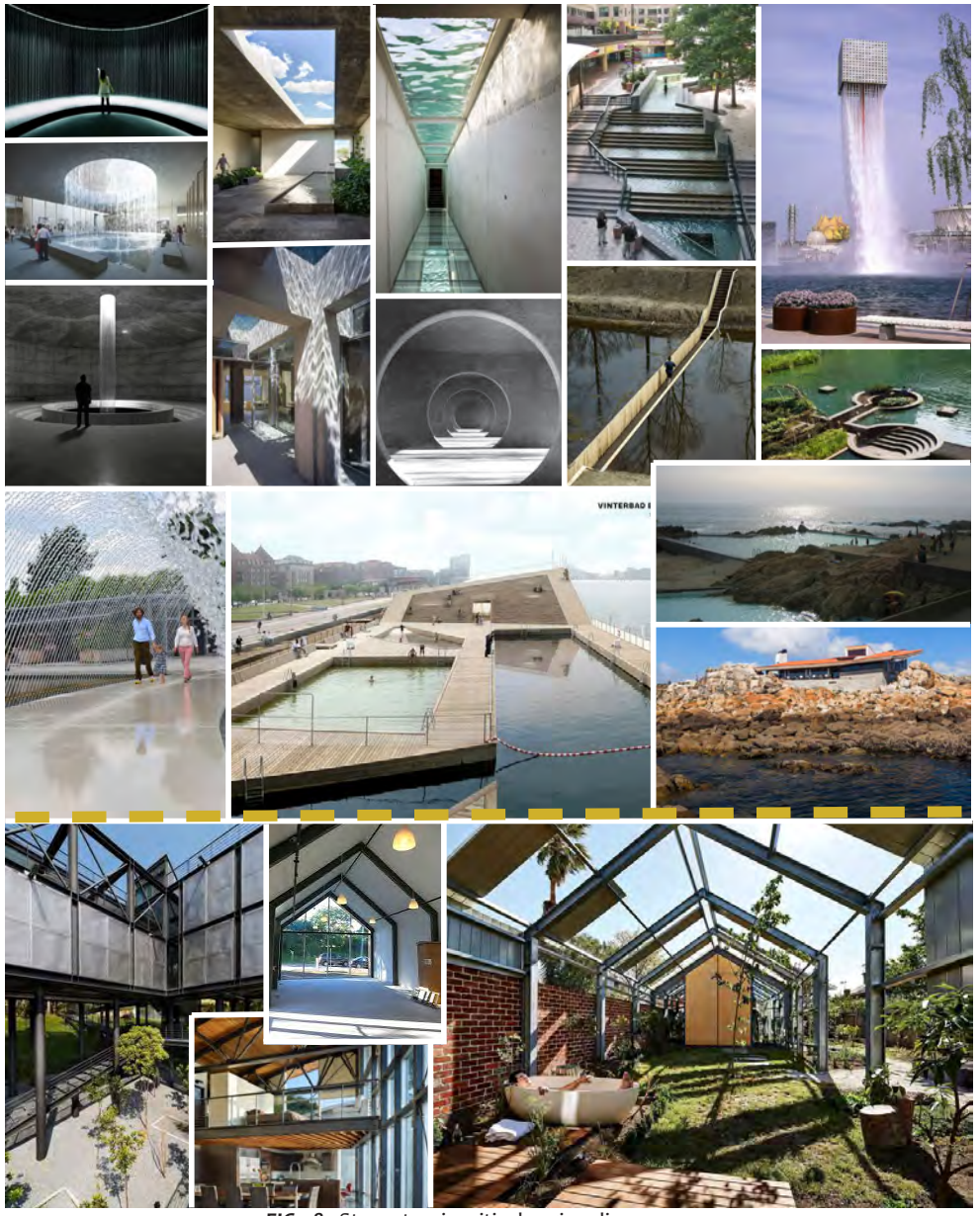
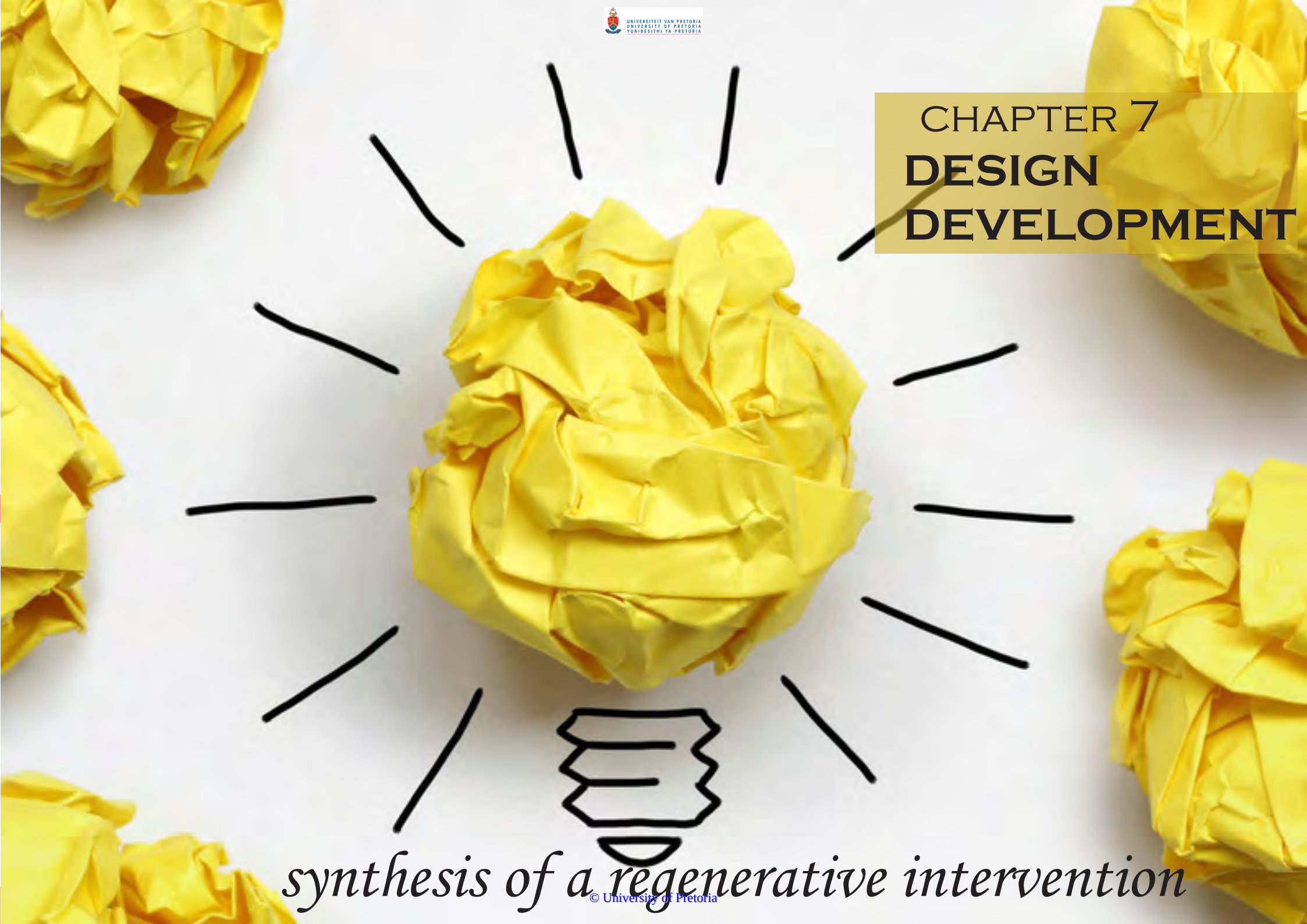


FIG 98 : Stereotomic critical regionalism vs tectonic idea collage (Author, 2017)



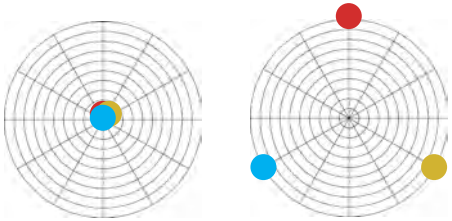
CHAPTER 7
DESIGN DEVELOPMENT

synthesis of a regenerative intervention

7. DESIGN DEVELOPMENT

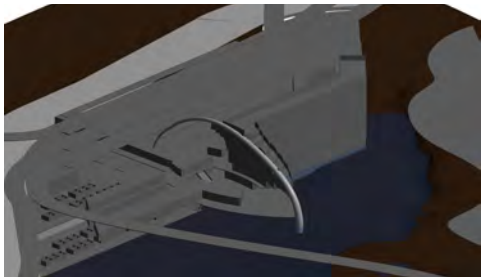
The design process and development was an architectural journey to discover the appropriate mix of heritage, ecological and socio-economic value. Its evolution follows the form of a large monolithic structure that housed a transit station,housing and eventually an AMD treatment centre to a more sensitive heritage informed intervention that is scaled to fit individual urban areas along the mining belt.

Iterations and Design Development is done and assessed through A regenerative matrix in which the 3 lenses of Heritage (mustard), Ecology (blue), and Socio-Economic Value(red) are scored and then iterated on to improve the weak areas. The further away from the circles center the higher the score. Thus the goal is to have all 3 nodes on the outer most circle of the regenerative matrix. The matrix is illustrated below with worst score on the left and best score on the right

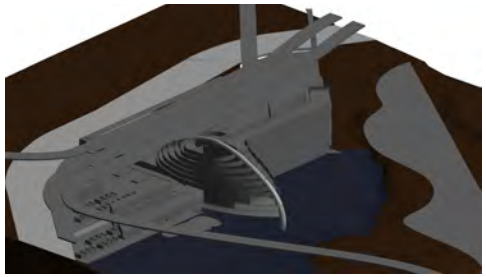


7.1 MONOLITHIC DESIGN

The first part of the design intervention was an unsuccessful product as it did not meet any heritage qualities and rather focused too heavily on socio-economic aspects. This resulted in This monolithic design being iterated in a reformative way to introduce heritage as one of the main threads throughout the design. This is why the main concept only comes into fruition after the monolithic design. The design process unfolded as follows



1



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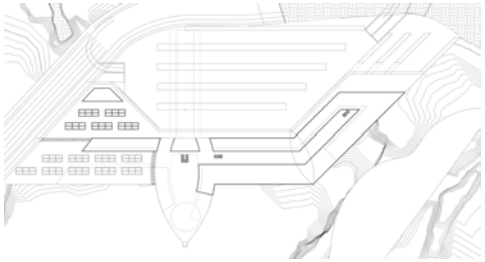

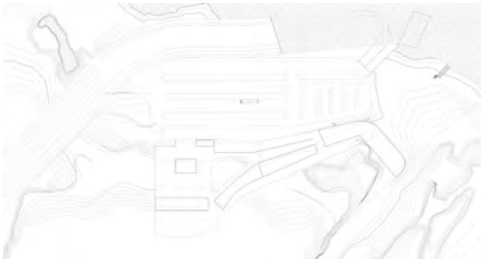

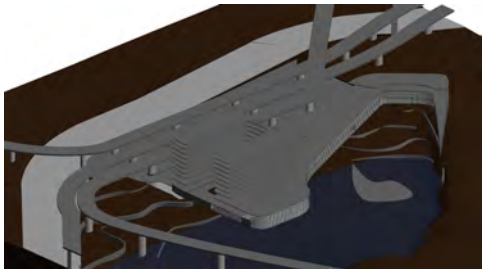

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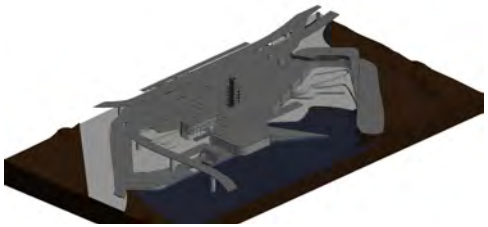
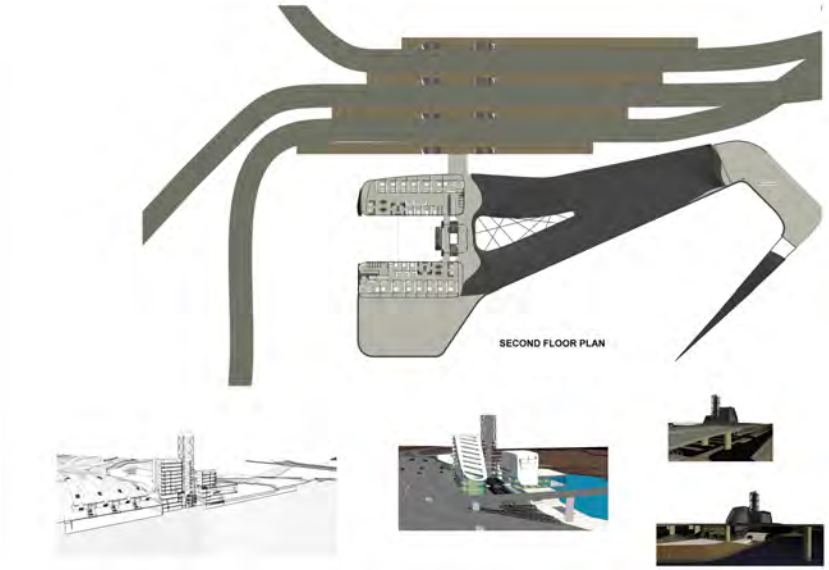
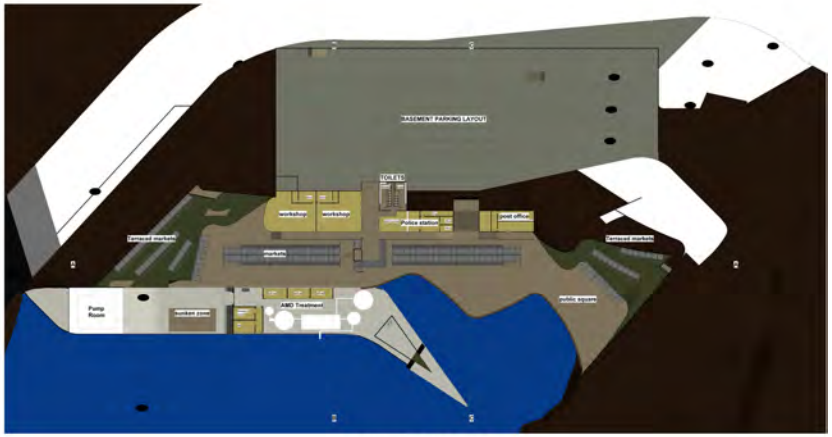


6

FIG 99 : Formal and Spatial Development Of Monolithic Design 1 (Author, 2017)

GROUND FLOOR PLAN





BASEMENT FLOOR PLAN

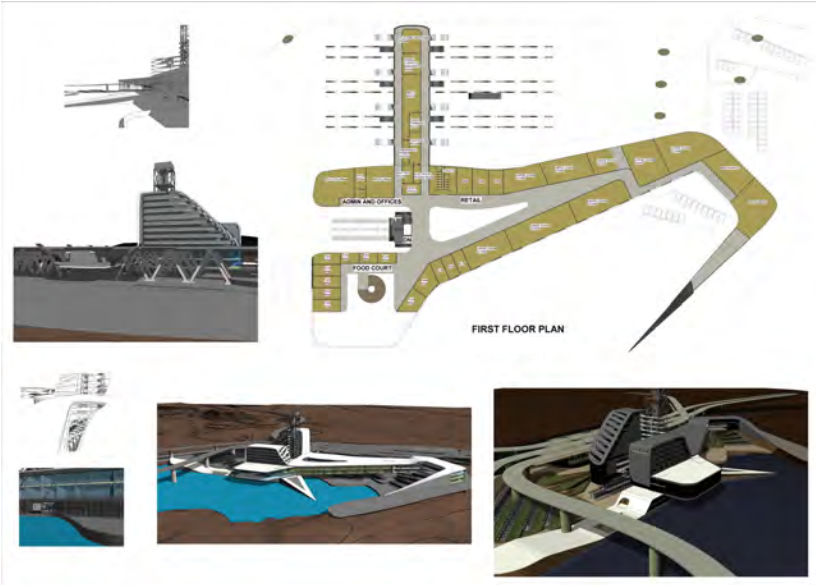
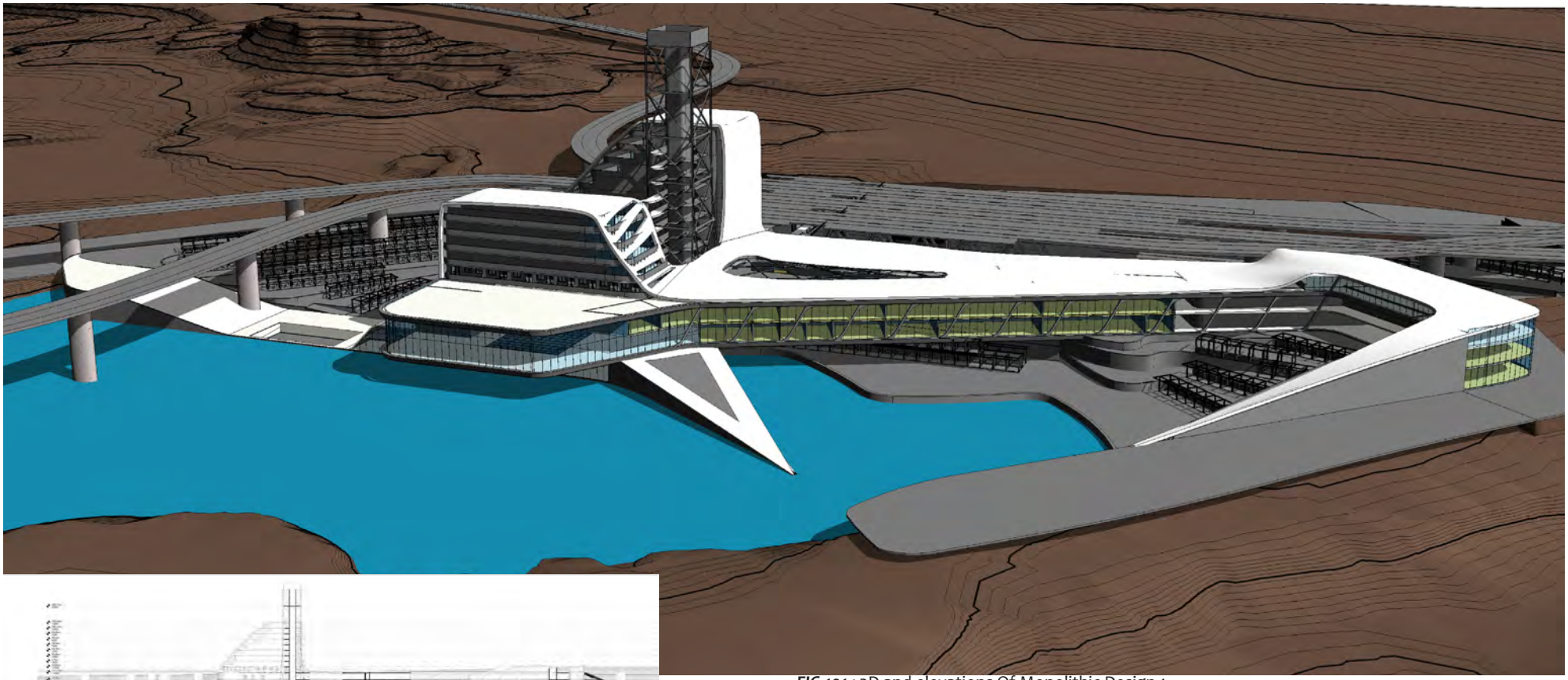


FIG 100 : Floor plans Of Monolithic Design 1
(Author, 2017)



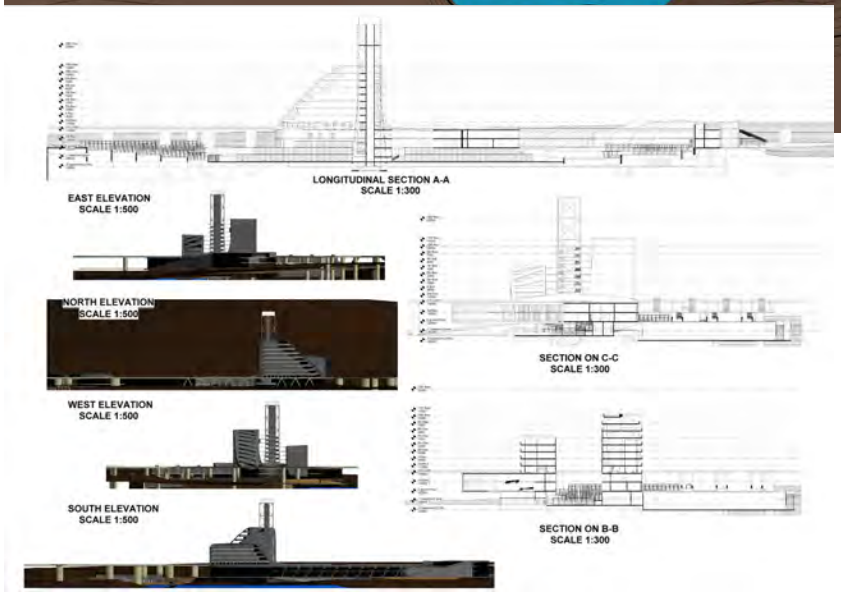
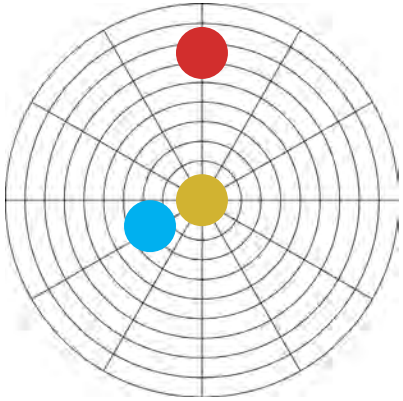


FIG 101 : 3D and elevations Of Monolithic Design 1 (Author, 2017)

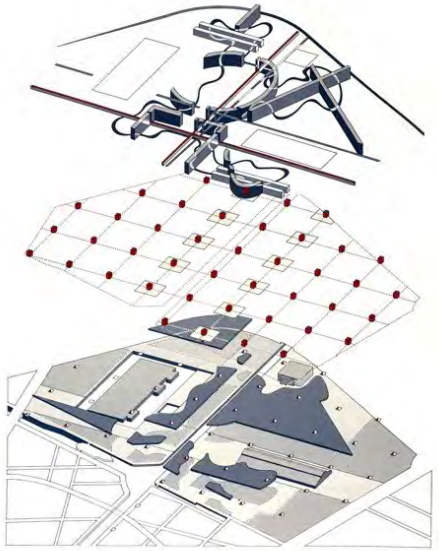


7.1.1 MONOLITHIC DESIGN REFLECTION

This design was out of scale in accordance with its surroundings and was an alien form, sitting in an industrial belt. The main issue was that it met no heritage value and for that reason it was not a regenerative response but rather a globalized iconic form

The good attributes of this design was its formation from and inspired by the topography as well as its programmatic functions

This ides was then iterated with a more formative concept and inclusive regenerative response.



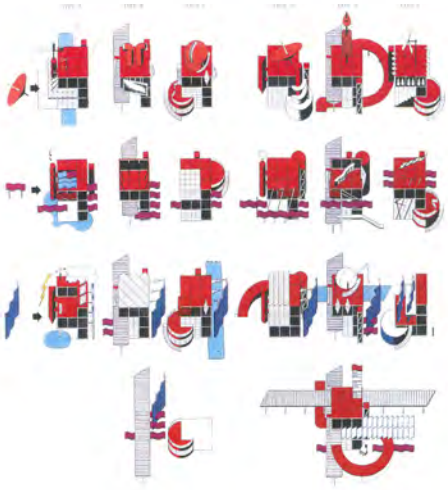


FIG 102 : Spatial organization using simple points lines and planes (Eduardo Souza, 2011)

FIG 103 : Pictures depicting tectonic expression and spatial distribution of follies along the landscape(Eduardo Souza, 2011)

7.2.1 SPATIAL REGENERATION CONCEPTUAL AND SPATIAL PRECEDENT

PARC DE LA VILLETTE, PARIS

ARCHITECT: BERNARD TSCHUMI

BUILT: 1987

In 1983 a competition took place to revitalize abandoned land from a slaughterhouse and market in Paris. The project was won by Bernard Tschumi who envisioned the landscape as more than just a landscape and rather a site of cultural significance where the natural and artificial are in a constant state of flux.

It was meant to be explored and interacted with evoking a sense of freedom within points of reference, the follies (Souza E, 2011).
In this journey Tshumi envisioned these places being used as a play-scape, for meditation and relaxation.

A simple ordering system of points, lines and surfaces were implemented over a 35 point grid. This deconstructivist intervention is meant to provide a sense of place. Some criticism that faces this design is its lack of respect for the heritage of the site. This is an important precedent for using follies as a driver to tell a story of heritage with regards to the mining belt while being multi-functional spaces that evoke a sense of place. This ordering system relates directly to the mining landscape which was comprised of points lines and planes, in the form of markers, shafts and landscape.

7.2.2 SPATIAL CONCEPT

The concept of this design evolved from the Regenerative theory developed in Chapter 5. This theory was translated into programmatic needs and developed into a concept of Active Regeneration. All the activities on site contribute to different lenses of regeneration that is actively happening. This is a regenerative precinct which encapsulates change in motion through not only the substantial movement through the transport hub but also the treatment of AMD and production of art through the skills workshop.

The intention of this study was to regenerate the mining belt. This process addressed three parameters to achieve this regeneration. Conceptually the three lenses of heritage, ecology and socio-economic-value became the drivers for the intervention and it is the dialogue between these aspects that will determined how successful the scheme is going to be. The lenses were used in a dialogue to generate the design through analysis and iteration.

The organizational programme was based around nodal points within the precinct that represent socio-economic and ecological interventions joined together by the thread of heritage as a journey-based-story through the precinct. Much Like Parc de la villette used follies to orient a person in space, This precinct consists of a grid with nodal points representing the lenses of ecology and socio-economic value, connected by the thread of heritage. This heritage thread is expressed in a landscape of follies which are used to orientate a person in space as well as time, taking the user through narratives, time-lines, effects, processes and exhibitions. Originally this concept was quite linear in thought, with an initial socio-economic node followed by an ecological node and ending with another socio-economic node, all joined by a Heritage Thread. However, when overlayed with site conditions and programme this evolved into a more complex matrix

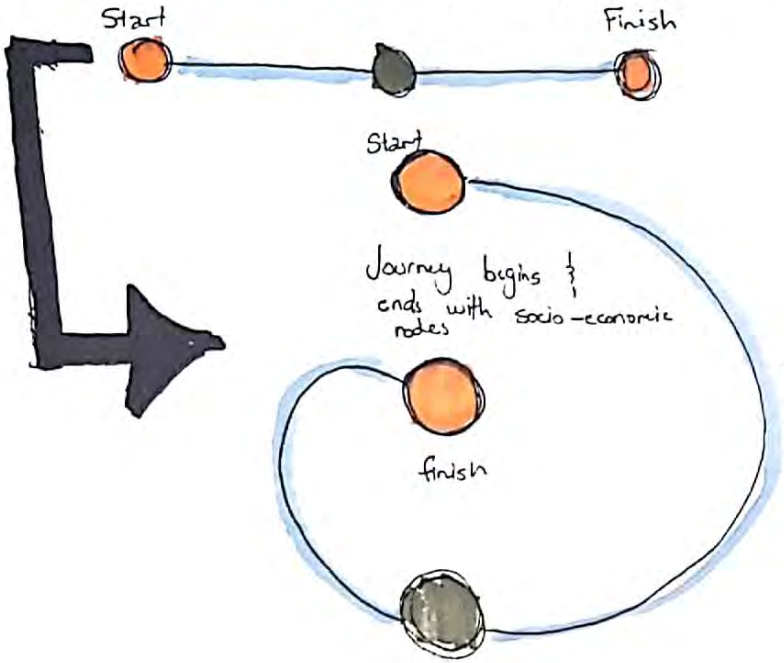
of interdependency with socio economic nodes, ecological nodes and Heritage threads forming a Web-like circular pattern within the site. This spatial concept finally evolved into layers of interdependent and overlapping landscapes with 5 main processes, that being An activation, documentation, production, regeneration and exhibition.

FIG 104 : Bubble diagram of Heritage, ecology and Socio economic intentions(Author, 2017)

CONCEPT.

'ABSTRACT IDEA'

Spatial implications of an idea



The thread of heritage to connect through a journey

ecology is at the core of the journey

IDEA : REGENERATIVE THEORY

ACTIVE REGENERATION

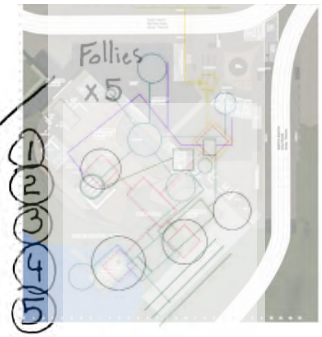
TO FACILITATE CHANGE-IN-MOTION.

Using 3 Drivers

AMD Treatment

" Centre Architecture from site "

Skills Workshop



A process of "celebration"

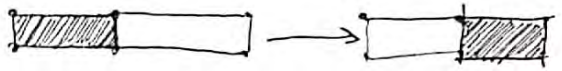
- DOCUMENT
- HEAL
- ACTIVATE

NODES ALONG A JOURNEY

* an active heritage journey through targeted socio-economic programmes in an ecologically ~~conscious~~ rehabilitative landscape

CONTRAST

solid semi-void void



Journey

"A JOURNEY OF CHANGE IN MOTION"

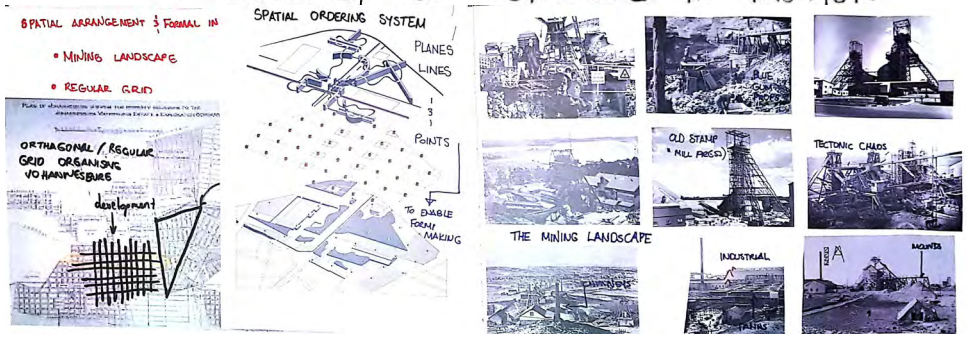


FIG 105 : Concept exploration (Author, 2017)

7.2.3 CONCEPTUAL DEVELOPMENT

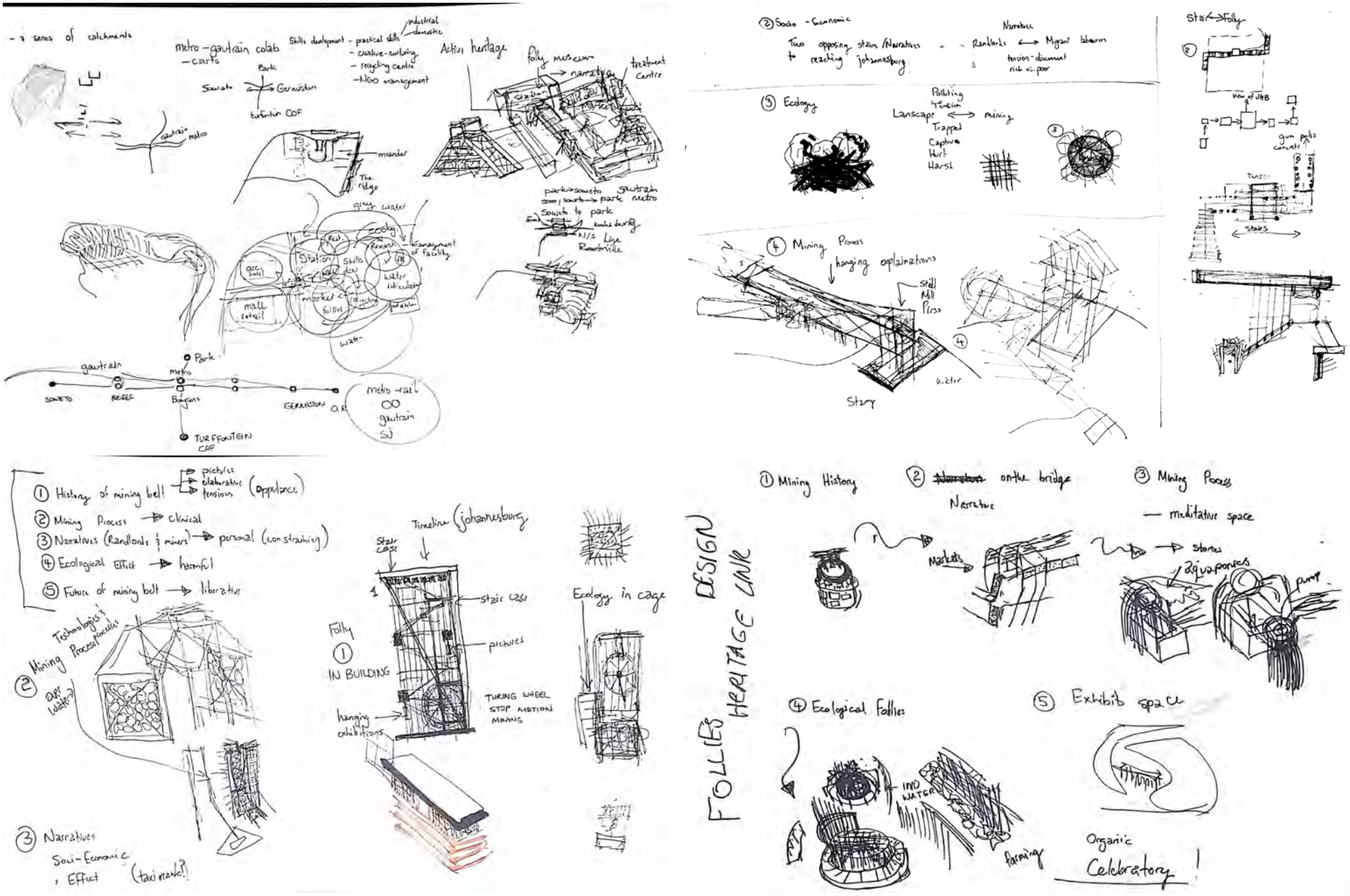
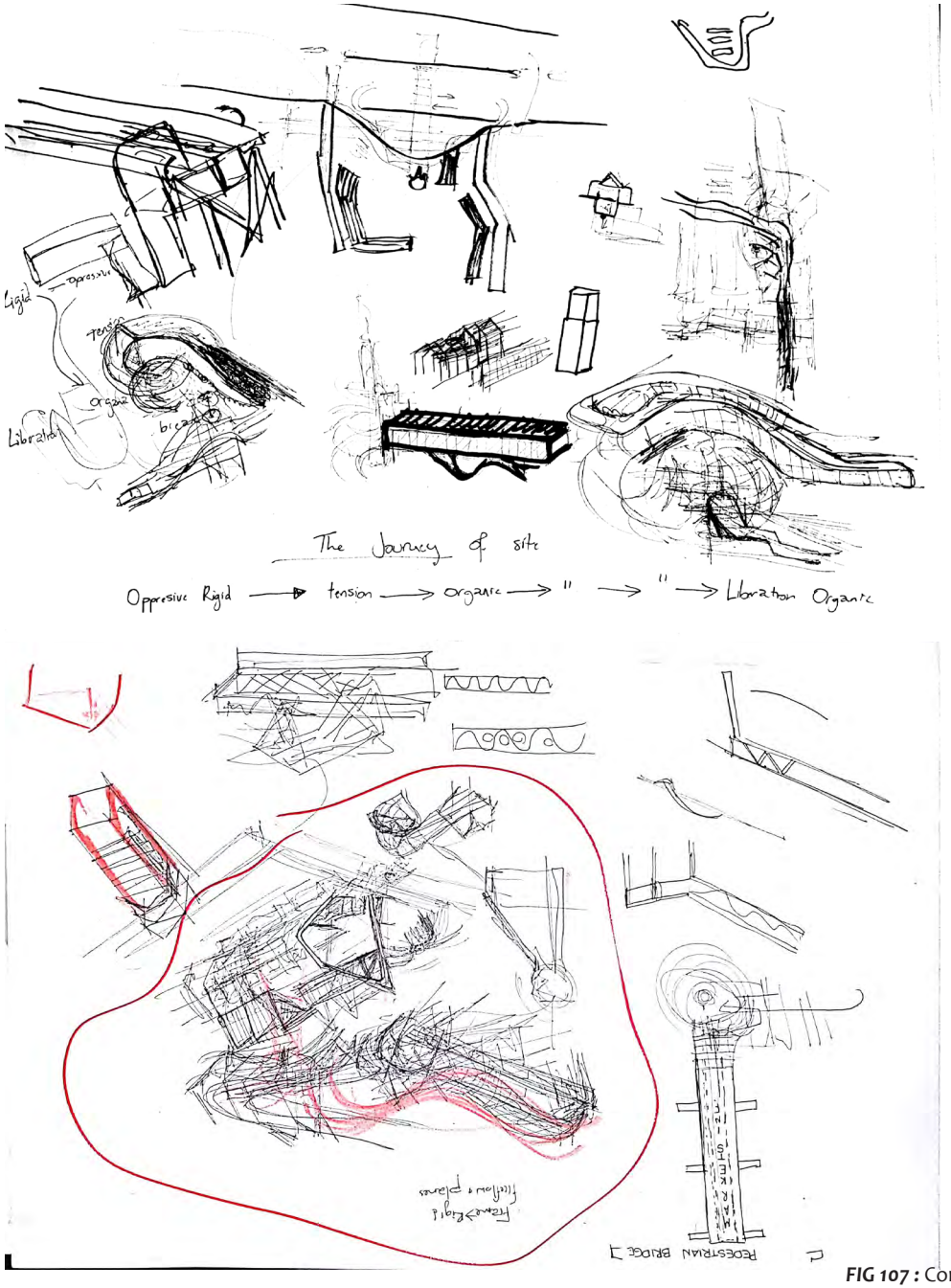
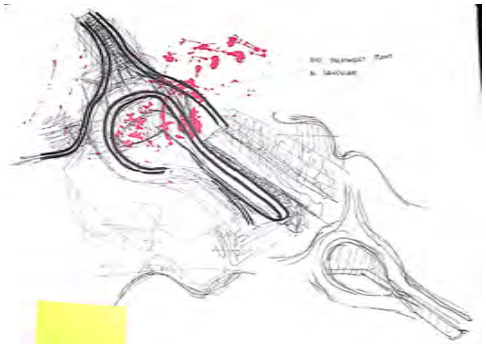


FIG 106 : Conceptual follies exploration (Author, 2017)





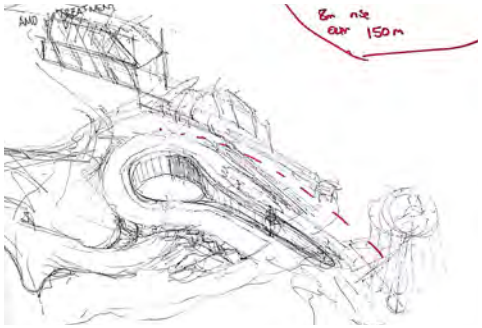


FIG 107 : Conceptual formal exploration (Author, 2017)

7.2.4 DESIGN 2 ITERATIONS

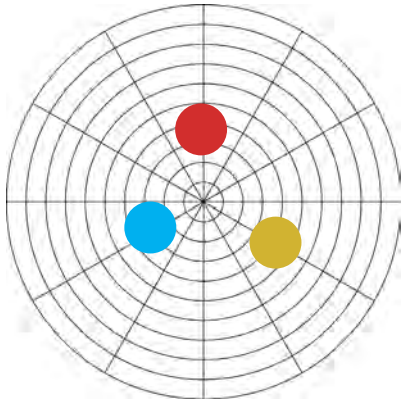
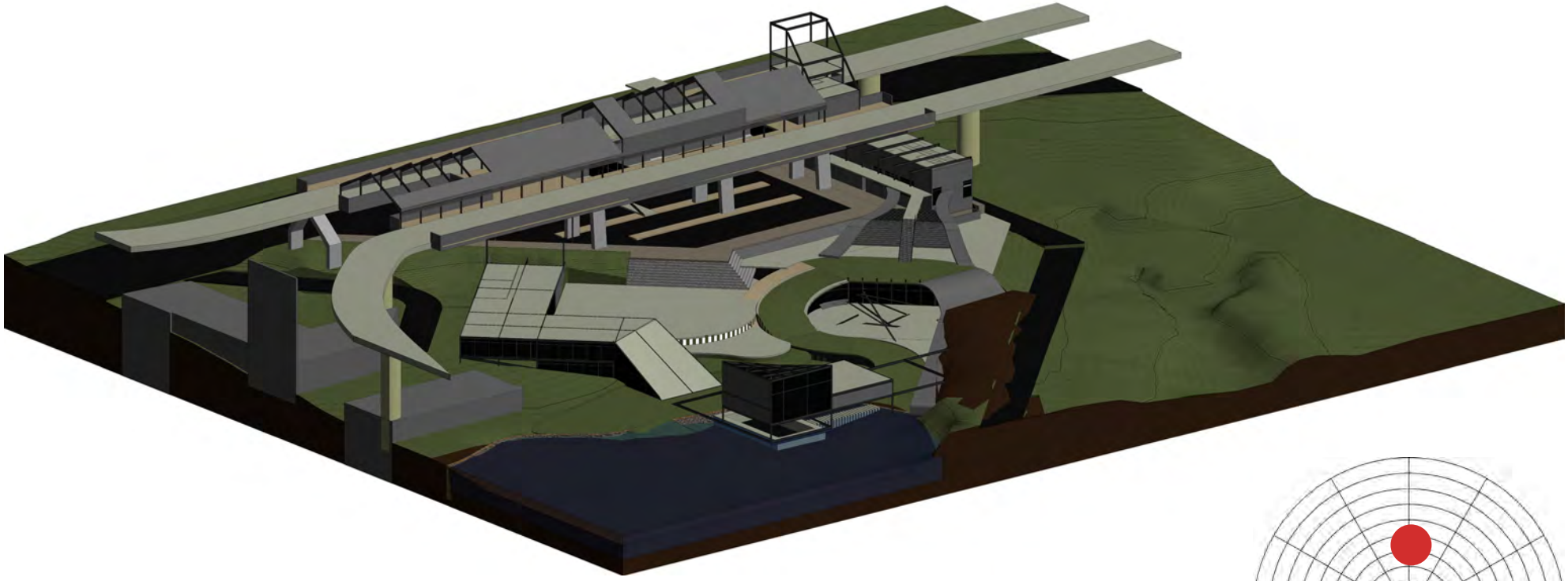


FIG 108 : First Heritage based Design at a much smaller more contextual scale, topography inspired design missing. Iteration 2 (Author, 2017)



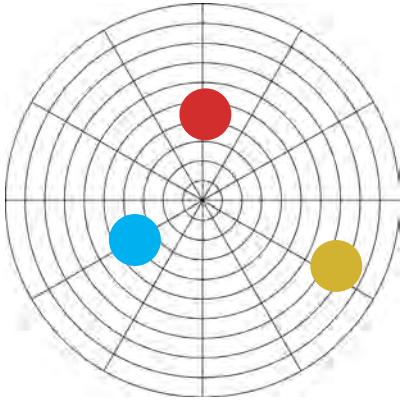
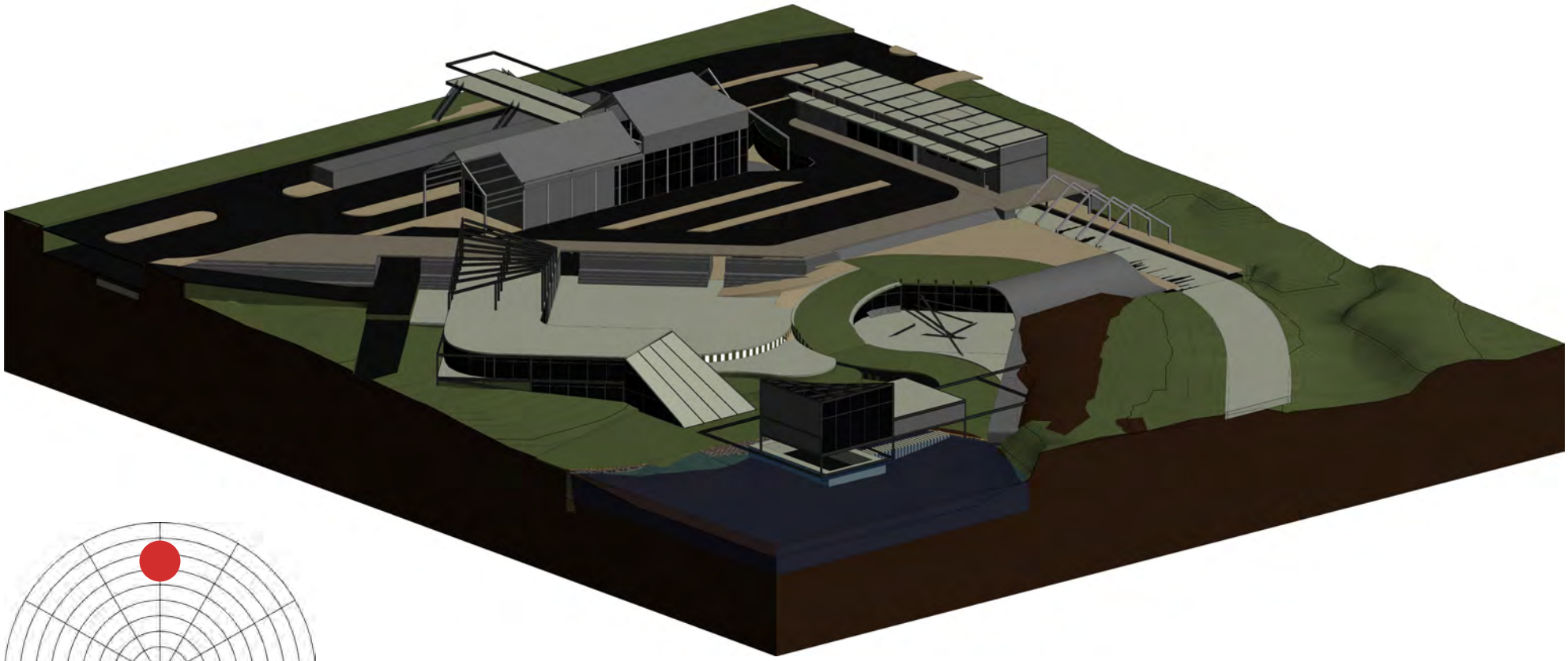


FIG 109 : Iteration 3, Formal qualities are better but the raised railway presents a huge infrastructural problem(Author, 2017)



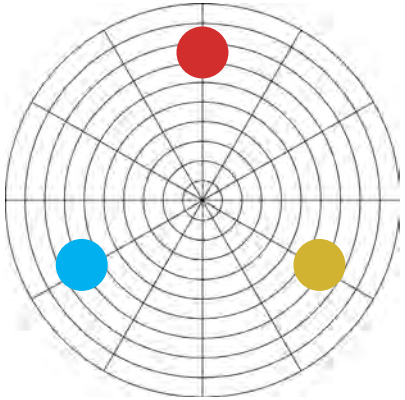
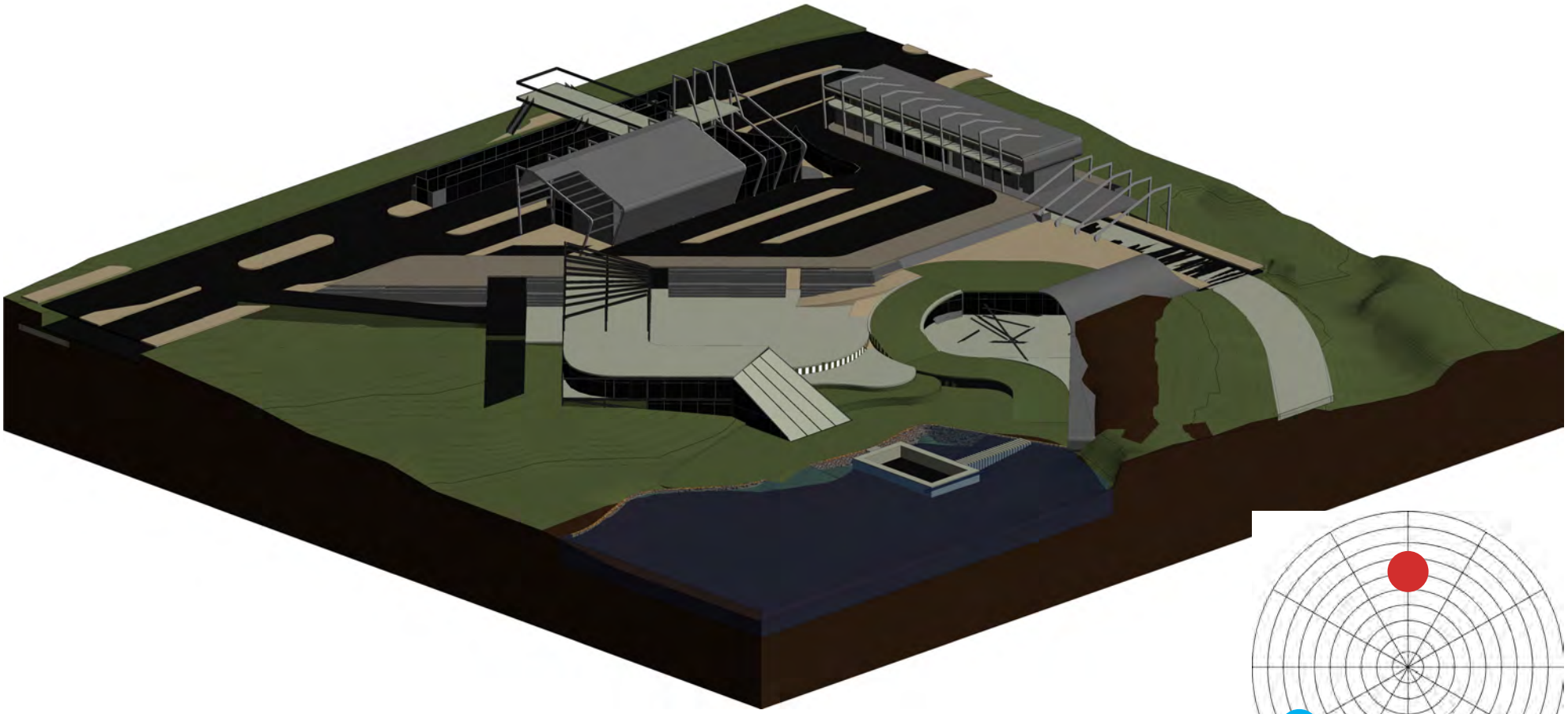


FIG 110 : Iteration 4 Railway sunken below ground, follies developed(Author, 2017)



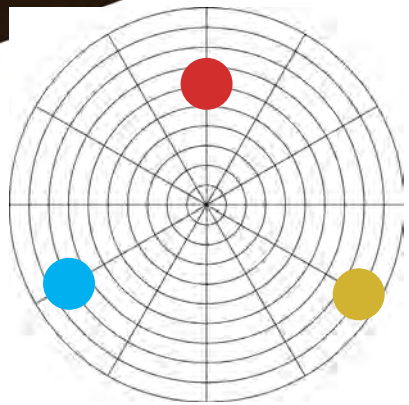


FIG 111 : Iteration 5 Formal concept of tension and portal frames takes shape (Author, 2017)

7.2.5 FINAL ITERATION (6)

Following from the concept, the design process was informed by a network of generators that being the aforementioned established regenerative theory, a keen understanding of the context, an interpretation of the site conditions and programmatic requirements. This approach should ultimately be in line with the main intentions of the project which is ultimately to regenerate the mining belts socio-economic activity, ecology and heritage value.

7.2.5.1 SPATIAL DESIGN

The initial form making resulted from site analysis of major features with a focus on topography. The topography was one of the main site generators, identifying ridges and planes which formed specific zones of activities. Considering the 8m drop on site 4 main levels of activities were identified. Although topography was a major factor in developing space-form there was also the factor of heritage which needed to be apparent. A harsh rigid mining belt contemporized and eventually melting away into the landscape. This tension is a formal and spatial concept which is representative of the sites opposing needs of ecological and heritage value. In essence all the remaining toxic topsoil will have to be removed therefore there only cut and no fill from a sectional standpoint and the building is sunken into the ground, revealing itself where the previous topography lines ran. Thus the buildings and landscape echo the topography of the now to-be-removed toxic soil.

From this point a regular 5x5 grid was placed onto the site to match planes and ridges. This was done in order to easily form the transit hub and resulting services. This spatial approach is similar to Parc De la Villettes Conceptual approach of laying down a grid in which planes and lines can move freely between of on. This method echoes the mining landscape in a sense as a mining landscape is made up of points lines and planes with the mining presses, shafts, camps, warehouses and carousels. From this grid a spatial layout could be formed with the spatial intention in mind.

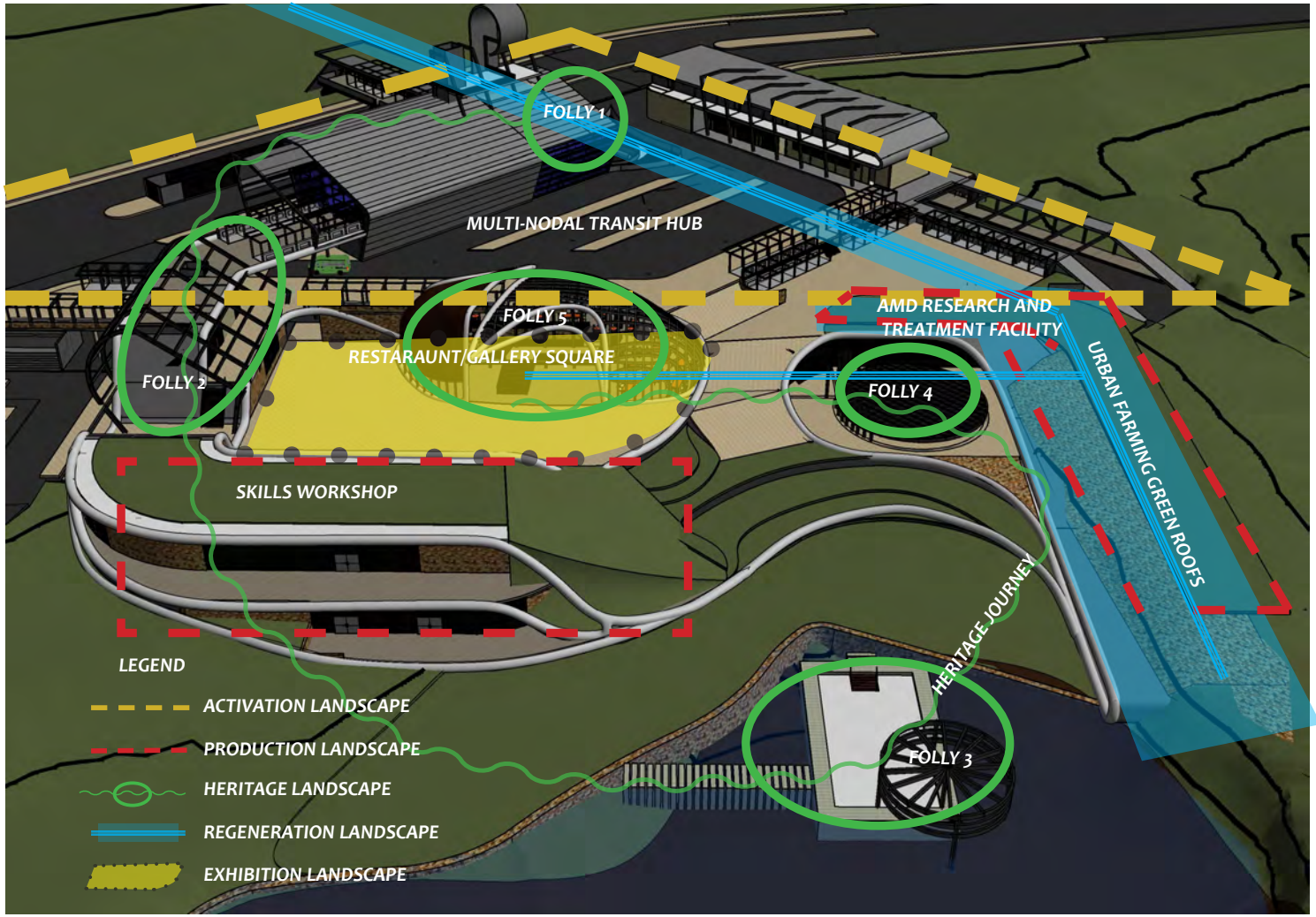


FIG 112 : 3D DEPICTING CONCEPTUAL LANDSCAPES' INTERACTIONS AND LAYOUT (Author, 2017)

7.2.5.2 DESIGN INTENTIONS

The intentions of this project were to establish a regenerative precinct using these lenses and intentions

The Heritage lense- The past is important to understand where we came from and why things exist in their current state. This understanding forms a basis of understanding problems and opportunities within the present day to develop a vision into the future the intention of the heritage journey is to not only document the rich mining heritage of Johannesburg that was explored in chapter 2 but also acknowledge the role it played in negative spatial, ecological and socio-economic issues. It is in documenting the narratives and data from this period that fosters understanding and a path to move progressively into a better narrative for the mining belt. The Heritage journey must incorporate a chronological history of the mining belt, narratives of mine workers and Randlords, the ecological impact of the mining belt, mining procedure and exhibit the vision of the future of the mining belt and this precinct. One of opportunity, equality, sustainability and bustling economic and social activity

The ecological lense- in such a harmed landscape it is hard to justify keeping the toxic soil as a cultural asset while trying to rehabilitate the precinct because it is a hazardous ecological feature . However a token of the past-state of the mining belt is needed, which will be fulfilled in the heritage landscape. The main intention deals with a critically regionalistic precinct which has a focus on its connection to the site (topography and water). This site speaks to the treatment of AMD as well as treatment of land, so it's success will be benchmarked according to
1. Its reticulation and articulation of water, in the form of systems and services.
2. Its treatment of topography and the built forms connection to the ground, focusing on how that is articulated from the heritage based, steel driven response to a recessed non-building that forms part of the landscape.

FIG 113 : 3D of final iteration (Author, 2017)

FIG 114 : 3D of final iteration (Author, 2017)

The Socio-Economic lense- the intention of this lense is to create a socially just and contextually based economic space that reactivates activities in the area as well as engages with community needs thus counteracting the role the mining belt had to play in the injustices of the past, such as the conditions of migrant labour and spatial disparates. This is done through two functions, a Multi-Nodal transit hub and the Skills Workshop. The main goal is to have contextually based responses that contribute to a high quality of public space and services, empowering and activating the area. This intervention will give the land lost to the mining belt back to the city and its users. This public space allows connections both economic and social to be made and fostered. This is expressed in the form of markets and exhibitions. Public transit should be equitable in the sense that it should provide high quality service so that people of all different economic backgrounds, high and low use it. This was the main intention of combining Metro and Gautrain waiting areas. The skills development workshop is a targeted intervention that is meant to empower and create positive effects within the community.

7.2.5.3 Design Consolidation

The journey through the precinct is explained through the 5 landscapes, which are developed form the 3 main drivers. Landscapes refers to areas or spaces within the precinct which share the same or similar functional and conceptual compositions. These landscapes encapsulate the intentions of each programmatic activity.

REFER TO FIG 112 FOR FURTHER CLARITY ON SPATIAL LAYOUT OF LANDSCAPES

The first is an activation landscape which features the main entry and exit into and from the site. That being the Multi-Modal transit station which is supplemented by informal markets, start-up businesses. It has been established this is an upgrade of the non-functional Booysens station, taking it from a

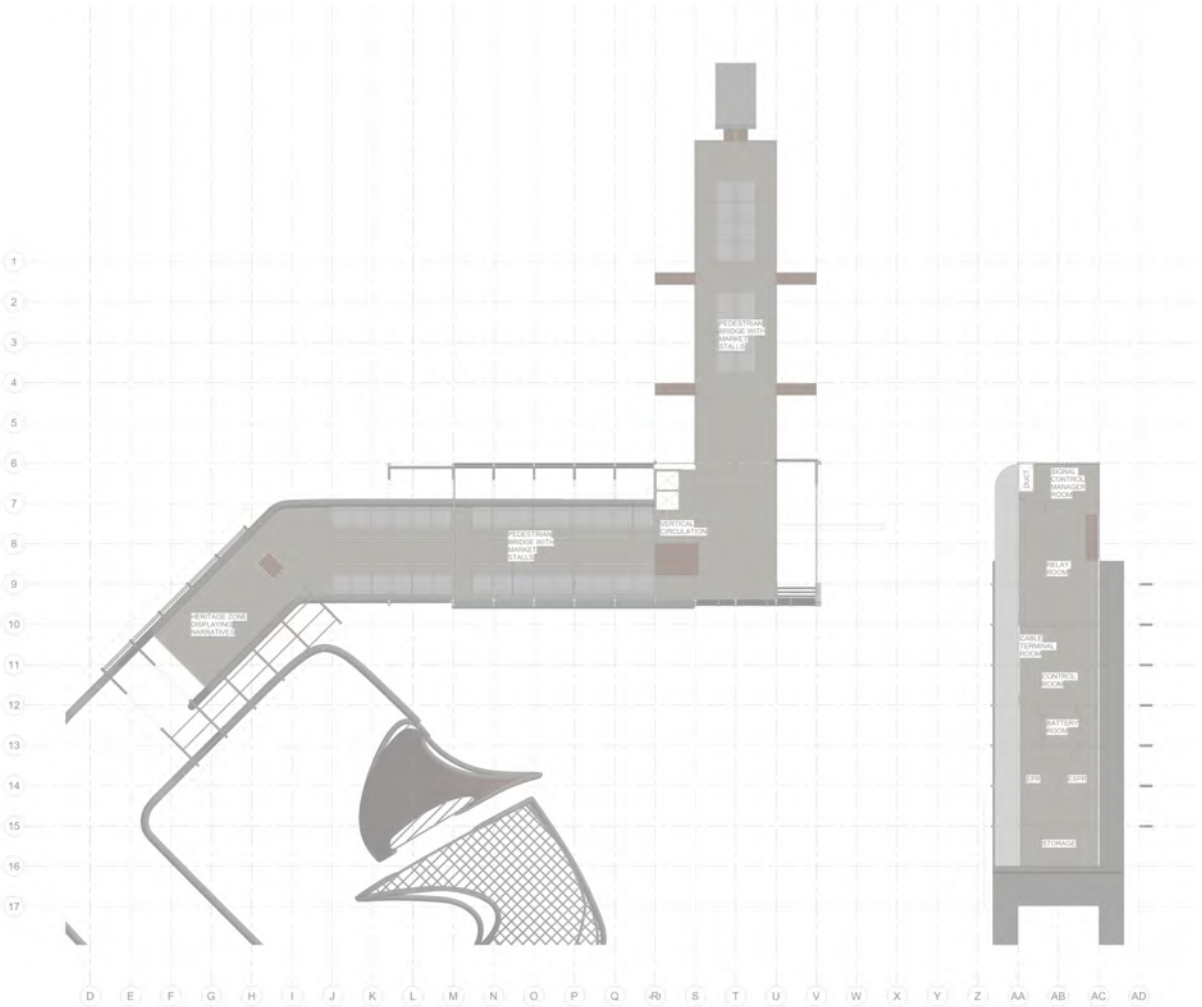


FIG 115 : FIRST FLOOR PLAN (Author, 2017)

mono-functional train station to a multi-modal efficient transit precinct. The intention of this transit node is to build off of the momentum of the Gautrain and make rail a more prominent, safe and equitable feature in Johannesburg, This includes other forms of public transport such as a Rae Vaya BRT connection that feeds off the new proposed road linkage and a metro, Gautrain bus station. There is also large taxi rank that can hold up to 40 taxis and transport 20000 people daily. The transit station also holds 3 levels of basement parking with a total of 320 parkings to allow for precinct activity as well as parking facilities through the day for public commuters such as in a typical Gautrain station model. There is a bike center where you can hire or leave your bicycle if you cycle to the precinct as well as free showers and change-rooms to use for those commuters. The bicycle lanes provided are 2.5meters and also double as trolley pusher lanes in order to facilitate safe and easy navigation through the precinct for trolley pushers. The bus system is designed to carry 20000 people daily and the train system is designed to carry 40000 people daily (Johannesburg SDF 2040, 2016). The site itself is very walkable with a series of ramps leading through it. The Transit hub connects North and South across the road with a large pedestrian bridge that houses market stalls. This bridge can be used to access the Rae Vaya or main transit station directly.

The stations services are located to the east of the site with the train operating rooms, site management services and ablutions all being located there with a few small start-up business shop openings. This is due to the fact that it is the edge of the site and urban precinct because of the large ecological ridge feature that is beyond it, interspersed with vegetation and trees this zone is to be left untouched. The site management offices will manage the market and various transit ticket offices as well as the small start-up business opportunities. The intention of the small start-up business) business openings is for informal traders or locals who have attended

FIG 116 : GROUND FLOOR PLAN (Author, 2017)

the skills workshops can use their skills to form a start-up business with a reduced rental rate thus allowing for a jump from the informal economy to the formal economy.

The train station is sunken below the ground for 2 reasons. The firs major issue is spatial flow on site, and with the intention of making This Urban precinct a walkable city train infrastructure would be a huge hindrance to this. As well as the fact the North-South Gautrain Line falls naturally to a point where it emerges at ground level. There are 2 separate lines, a Metrorail and Gautrain line which share the same waiting areas but different platforms to ensure a fair mix of socio-economic classes while attracting economic movement South of the city. These 2 lines are parallel to each other but fall and rise 3m respectively over a distance of 100m to cross over each other. At the platform they are on the same level.

The transit waiting area which is a level below ground and is supplemented by a food court and courtyard which draws natural light into portions of the platforms and waiting area. This courtyard houses a large reservoir for the AMD water that is pumped onto site, .These pumps are to be suspended above of the reservoir so the courtyard becomes a public pumping station that will contribute a sensory experience through the form of the sound of churning water being pumped. This is the first point of entry for the infected water on site. It is pumped from the Rand Mines connection located across the road and travels above the pedestrian bridge through the stations double volume waiting space and out into the reservoir. This activation landscape is not only where the Socio-Economic lense and Ecological lense is being activated but also the heritage landscape and the reservoir which is raised 4m above the courtyard forms the backdrop for the chronological time-line of the mining belt. This circular concrete mass will be supplemented by a perforated steel catwalk to provide the sufficient space to give a historical overview over the mining belt.

FIG 117 : -1 BASEMENT FLOOR PLAN (Author, 2017)

The main station and service building are both sealed and mechanically ventilated however instead of using a conventional HVAC which inst environmentally conscience the building employs an evaporative cooling system which utilizes the processed water on site. This feature is not only for practical purposes but also displays a connection to the water treatment process and the aforementioned heritage.

The Transit station being the highest building and arguably the most hierarchically important is essentially a heritage inspired building being informed by old mine stamps and steel structures. Thus it has been constructed using a partially exposed steel portal frame that is covered by corrugated metal sheeting. This roofing structure peels away at some points to reveal exposed purlin members as well as curtain walls. This structure's sectional profile is directly inspired from a mining press, however the treatment of both sides of the portal frame is different, having to deal with two different conditions. The one side is closed off to the taxi rank and the other is open toward the bus station. The structure culminates in a viewing deck, sitting atop it is the evaporative cooling system under a circular terminating roof. This first intervention, which sees the most foot traffic incorporates many mining elements such as blue gum wood floors that were used as mine shaft props. It's formal intention is to be a rigid and prominent form within the precinct and evoke the power that mining belt had over the landscape, sitting atop a large plinth of road and pathways, this structure does not touch the ground sensitively, rather it sits atop this imposing plane which sets the scene for a stark contrast between this rigid place-form that is a clearly defined building to create a tension with the landscape inspired place-form that becomes almost a non-building as the user moves further into the precinct.

The second is a production landscape. The intention of this landscape is to harbour productive and targeted contextual growth within a socio-economic lense for the surrounding community. In particular this intervention

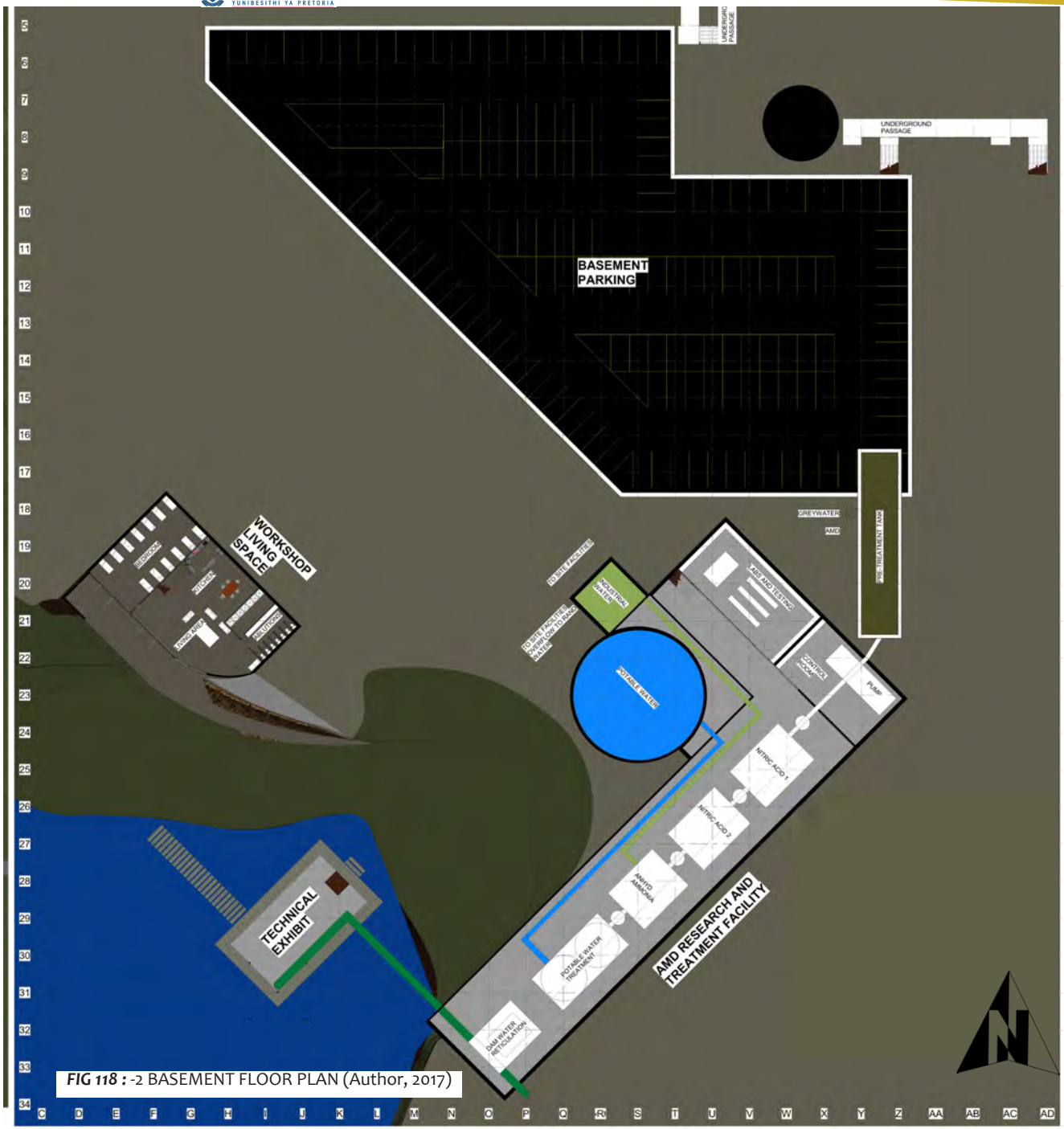


FIG 118 : -2 BASEMENT FLOOR PLAN (Author, 2017)

has targeted the trolley pushers, the informal community, practitioners, artists and the local government.

This initiative looks at paying trolley pushers for their collected trash with a variety of different means. They can be paid in cash, with free transit tickets (rail, taxi or bus) or free food from the site restaurant. The payment option also involves a free training programme for the trolley pushers to attend night time skills development courses in a variety of different options such as business and practical skills such as metal and wood working. These skills will serve them well considering this precinct is located within an area currently zoned as industrial.

This trash is then sorted to established what materials can be used in which programmes. This is managed by the Skills Development workshop. This workshop is a new initiative developed from the theoretical discourse in which targeted role players within a community are picked to participate within this workshop where they live and work for a period of time in line with a practitioner or professional of the arts or relevant skill. This allows for a higher success rate and a real world learning experience where people exiting this programme have really learned and gained the intended skills. Upon leaving they will receive a certificate to certify the fact that they are proficient artisans within their specific course and thus make it easier to find a job. In certain situation job placement opportunities will be available in collaboration with the community. So skilled practitioners can use this platform as an interview process to hire new and upcoming talent.
Once selected they will begin their relative courses within the skills development workshop. living on the lowest level with the workshop a level above that.

The Workshop is a multi-functional space with rows of work benches with a maximum capacity of 50. This feeds off of an open assembly space and lastly a machine zone which houses all the electronic drills, saws presses and machinery.

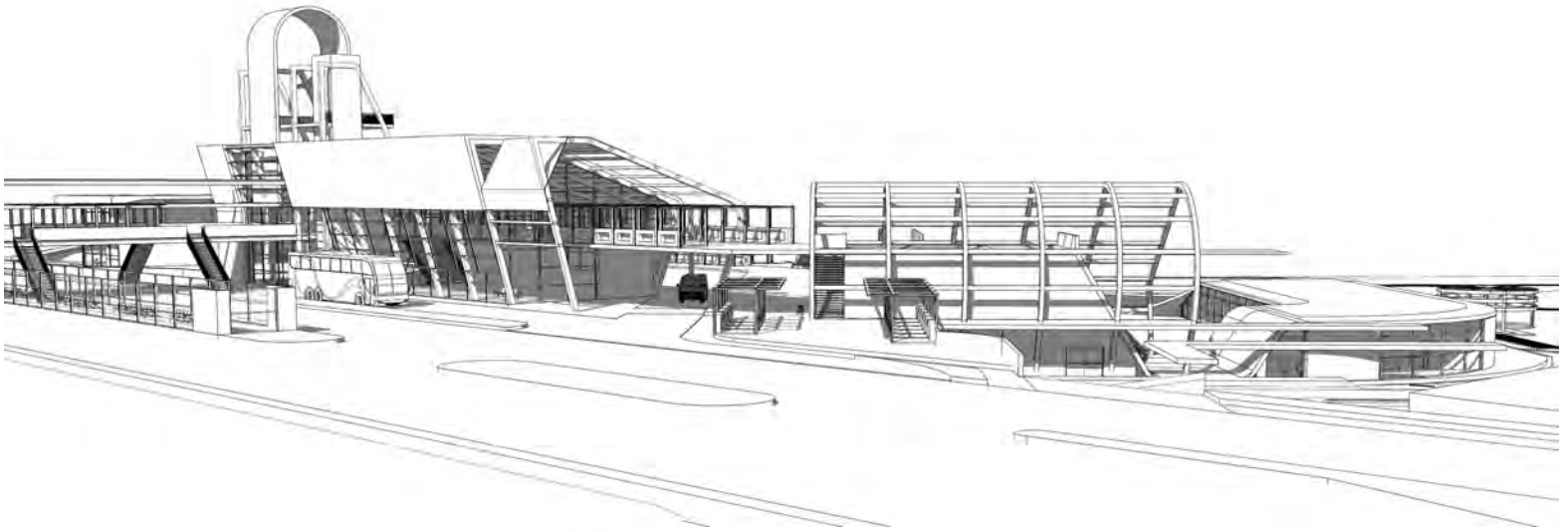


FIG 119 : 3D SKETCH OF FINAL ITERATION (Author, 2017)

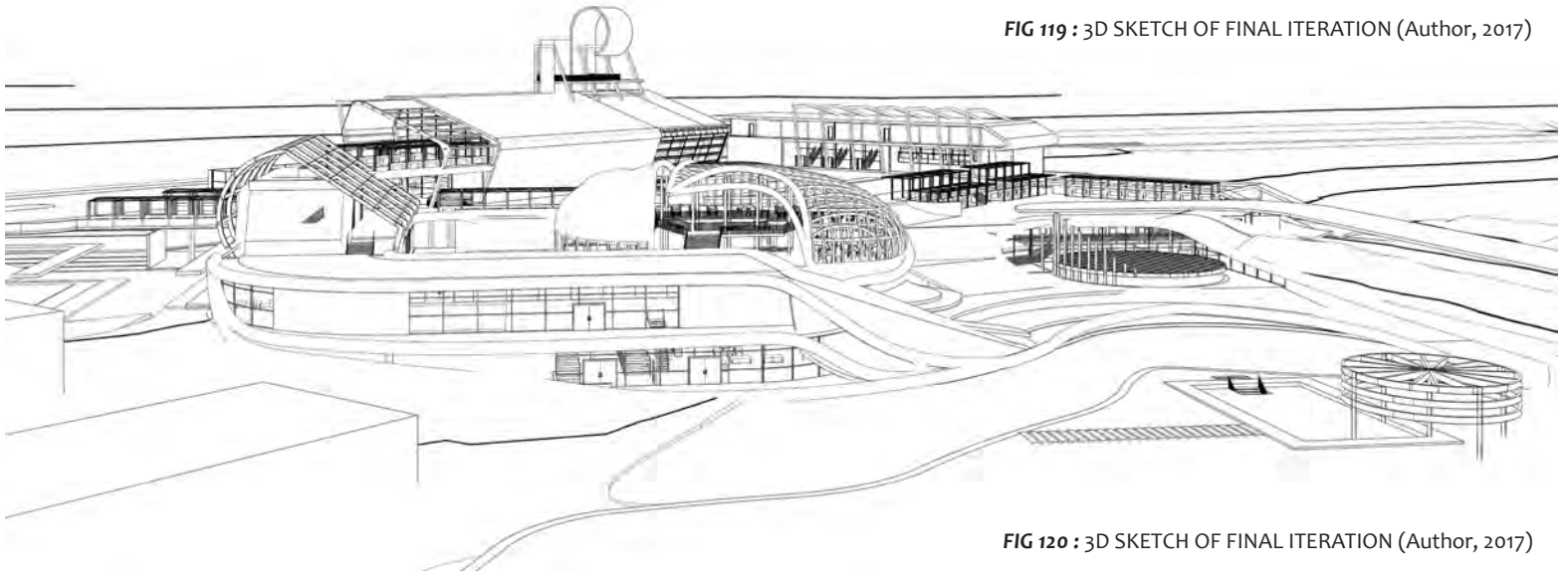


FIG 120 : 3D SKETCH OF FINAL ITERATION (Author, 2017)

These spaces open up to the public square and makes the workshop process very visual. Following this space is a wet zone where cleanup and washing takes place. Then a staff room offices and storage are located west of that. This space is optionally naturally cross ventilated or can also tap into its own mechanical evaporative cooling system

The formal intention of the workshop space was to mediate the point between building and non-building, rigid to a more organic landscape. It in essence represents that tension or transition between the formal concept. This production landscape is actually located a level below ground level but is covered by a flat green roof that is a walkable path. The green roofs form part of the production landscape, producing fruits and vegetables for the restaurant to use. This aesthetic helps create the illusion of landscape as building. This building runs east to west longitudinally and falls 8m to meet the ground to the east. The building completed the transition by literally falling away into the ground through an terraced space. The materials used to construct this space are a mix of concrete steel, natural stone, glass and vegetation. With the natural stone and vegetation being prominent features and the steel and concrete being less pronounced. To the West of this landscape the building transitions from the activation landscape of the transit station to the production landscape through a series of exposed portal frame that house the second heritage folly.

This transitions into the 3rd landscape which has been partially covered already . This is the Heritage Landscape Which runs throughout the site as a linkage thread. This heritage landscape is conceptually based on the idea of functional follies. Masses within the landscape which tell a story. This idea developed into variations of heritage nodes that are integrated into the building and landscaped at different levels. There are 5 different follies with the main intent to document the full heritage of the mining belt with a focus on the lost sectors or ecological impact and narratives of migrant labourers and randlords. The first folly has been explored in the aforementioned Activation paragraph which is the chronological history of the mining belt. The second Folly is on the first floor outside the transit station, just beyond the market space. Located in a series of portal frames which will display alternative narratives and pictures. This is an outdoor space which creates a relationship with the sky by hinting through horizontal slats which filter light into the space. This space looks over the entire site and market spaces brings a perspective of 3 different narratives the, 2 located in the past and one active narrative happening as the site is being regenerated. The materiality of this space is strictly steel and blue-gum wood. The aesthetic falls within the transition zone between building and non-building.

The third folly is a meditative space that has a connection to the ground and water. It is set within the water-scape and speaks to a subterranean journey. This space is a organic concrete bunker that has cut out of the landscape to produce a space that showcases the technical process of mining through exposed machinery equipment joinery and members. A steel structure will host this display and will also house the dam's reticulation outlet, putting water back into the system in a very visual way falling out of the top of the steel structures circular head.

The fourth folly is an ecological folly which displays the ecological effect the mining belt had had. This structure is a steel platform set in the courtyard of the AMD treatment facility. It is a raised circular steel platform set on a grid of steel beams and columns. In the center below the perforated steel walkway is a mound of the old toxic removed soil which has been sprayed with a hardening material to ensure it does not move or spread on site. The outer edges are flanked with a glass walkway that gives the user a glimpse into the Treated potable water storage tank. This is due to the fact the ecological folly is set over this tank. The folly has alternating columns which display pictures, diagrams, graphs and data that show the influence the mining belt. The west facing edge of the AMD treatment plant and east

FIG 121 : URBAN PLAN OF FINAL ITERATION (Author, 2017)

edge of the folly incorporates a layer of flowing water outside and over the curtain wall to form a thermal gap between the harsh west sun and allow for a cooler space within the treatment plant. This folly incorporates evaporative cooling through the use of cooling mist installations. All the outdoor spaces have this system including the 2nd narrative folly and the last folly.

The 5th and last folly is a celebration folly that is made up of space defining elements rather than a actual building. This folly actually forms the last landscape as well which will be discussed separately. This folly is the termination of this Heritage landscape and has no particular documentation of the mining belt but rather speaks to the future vision of the mining belt and precinct as a whole. This structure mediates form between the rigid defined station and the landscape creating a space with the theme of celebration.

The 4th landscape is the Regenerative Landscape of which the main intention is to regenerate AMD. This is done through an AMD treatment and research facility. The facility hosts an upper floor with offices, storage, a lab and conference room as well as reception and toilets. This space feeds off of the facilities courtyard where the ecological folly is housed. Below this submerged further under the ground is a lab, control room and pump room as well as the treatment floor where the KNeW treatment process takes place. The treatment floor is a series of filters and treatment tanks, with the filtration process being quite visible through the west facing curtain wall. The treated water is stored in underground reservoirs next to the facility. The water comes from a Rand Mines connection next to the site and is stored in a reservoir in the transit station. Then it is mixed in a holding tank with grey water on site and then treated. This treated water is then reticulated on site in many different forms. This forms a closed system of reticulation and treatment. Excess waste water will be fed back into the municipal system. This process is a daily operation only being closed on weekdays so the capacity of each reservoir would only have to be a 7 day supply

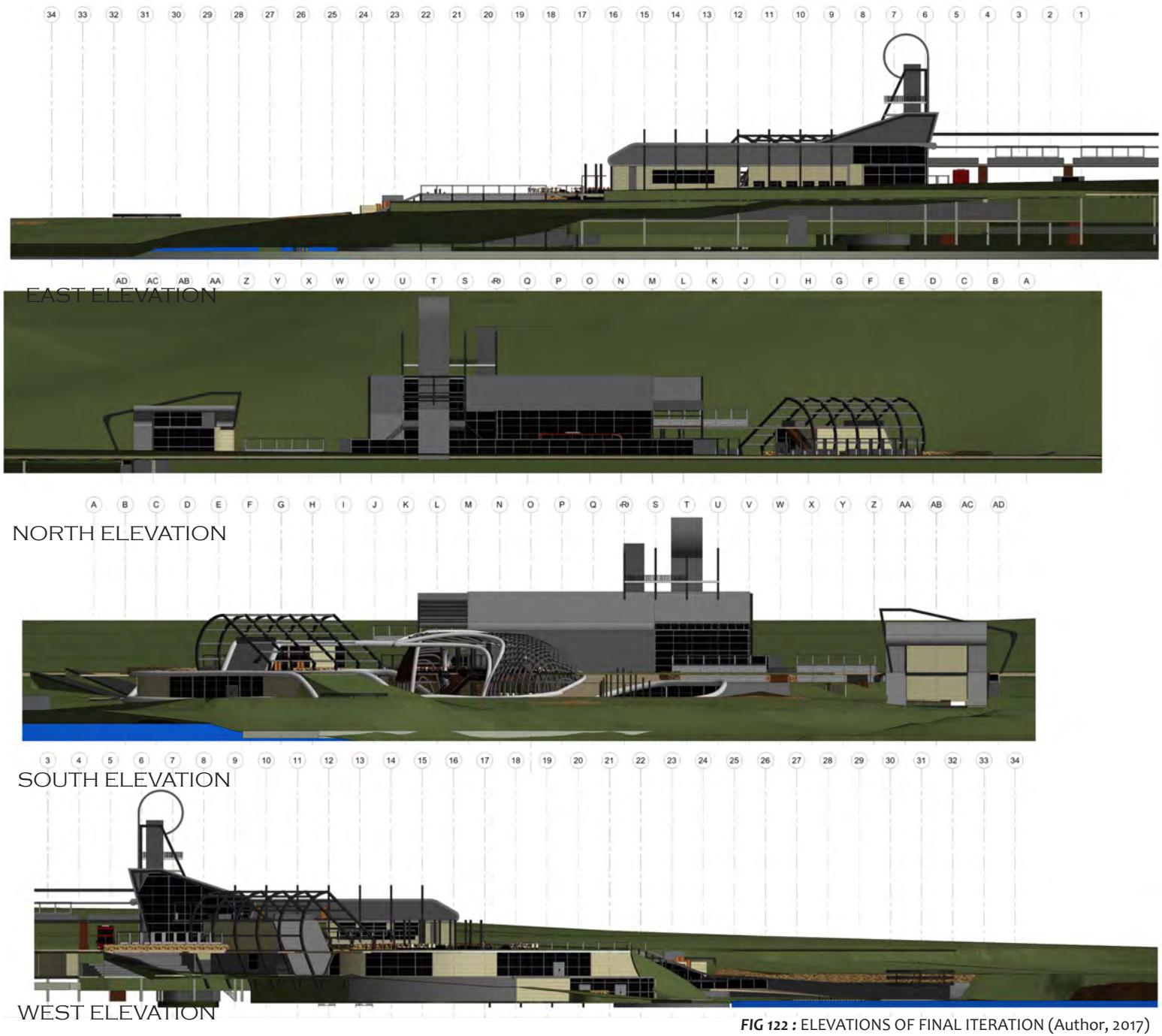
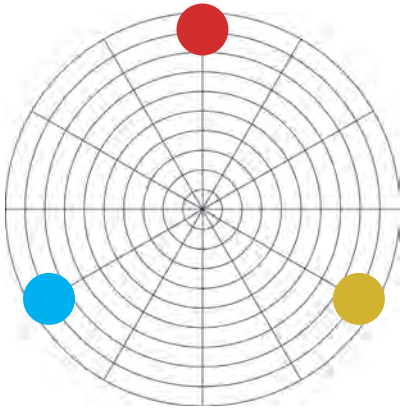


FIG 122 : ELEVATIONS OF FINAL ITERATION (Author, 2017)

FIG 122 : RENDER OF FINAL ITERATION (Author, 2017)



maximum, the scaling has been done according to this estimate,.

The aesthetic of this facility is located on the other end of the conceptual spectrum. It being an organic form set into the landscape almost appearing as a "non-building." This sweeping mass peaks out onto the ecological courtyard and is walkable on all spaces above the facility even hosting a green roof. This represents the ecological vision of the future precinct something very understated, sensitive and contributory. Even though it is constructed using steel and reinforced concrete it hosts greenery and is finished with natural stone to complete the natural appearance, echoing a healed iteration of a to-be-removed toxic landscape that once stood in its place

The Final landscape of this precinct is the Exhibition landscape which has the main intent to exhibit the regeneration or change in motion within a celebratory space. This space is the central nodal point and the conceptual culmination of this journey. This space is supplemented by a restaurant and the intent is to rather have a space defining element than a closed building. This space will be open to the public and large amounts of foot traffic displayed the treated AMD water though glass walkways, pools, fountains and cooling misters. It will display items from the productive landscapes such as food and art that can be purchased on site. This exhibition space is multi-functional and can host community events and private exhibitions as well as day and night time markets, feeding off of the public square it has the potential to become a very activated and bustling space.

The design is spatially resolved however the formal and aesthetic quality needs more resolution which will be done for final presentation.

CHAPTER 8
TECHNE

Constructing a regenerative precinct

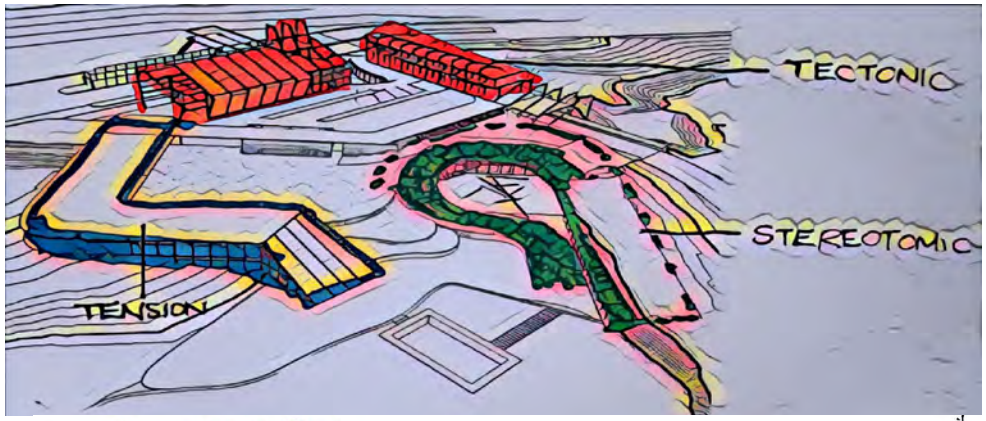


FIG 123 : TECTONIC CONCEPT (Author, 2017)

8.1 TECTONIC CONCEPT

The tectonic or formal concept has been explored in the design development and theory chapter. The mining belt essentially had a juxtaposed or contrasting set of issues and needs. That being the preservation of cultural heritage and the need for ecological reform. This bring a strong theme of tension, contrast and transition into play.

This concept is realized in the form of a transitioning journey from rigid to organic. From heritage to landscape. There are 2 completely different building typologies and aesthetics. The one beings a tectonic steel heavy portal frame construction and the other being a stereotomic reinforced concrete post and lintel type construction. The steel structure is large, imposing and pronounced, whereas the stereotomic structure is set into the landscape sensitively, in this case replacing and echoing the past topography. This concept harbours an experiential quality as the site is being explored by the user from building to landscape.

The technical exploration is done to document and resolve this journey, from exposed joinery and celebrating the genesis of construction and mining heritage to a landscape-aware hidden construction that still has a focus on relationship to site.

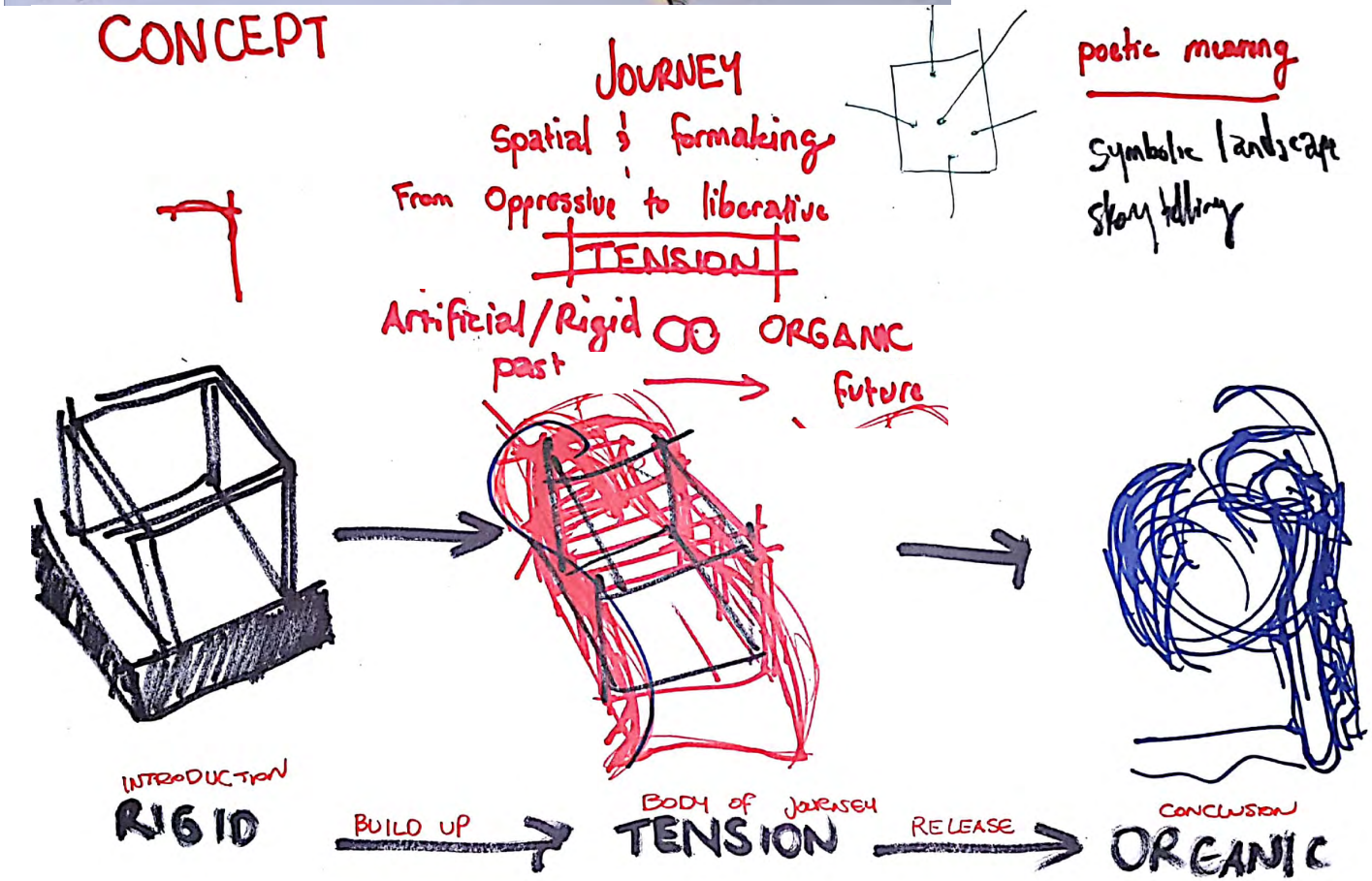


FIG 124 : CONCEPT EXPLORATION (Author, 2017)

8.2 STRUCTURAL SYSTEM AND MATERIALITY

In line with the tectonic concept the theme of tension and contrast is solidified in 2 opposing construction methods. Portal frame steel construction and composite, steel and reinforced concrete construction.

8.2.1 SUBSTRUCTURE

Due to the top layer of infected soil having to be removed the top half of the site sits on an underlying substructure in the form of basement parking and the train station, this structure is made of reinforced concrete columns and a waffle slab marked by the yellow outlined region in the image below. This slab is used for its strength, to carry the heavy automotive loads above. The rest of the buildings on site use and conform to the topography which drops 8m towards the water mass.

8.2.1.1 PRIMARY STRUCTURE

Two basic but opposing concepts form the primary structures, firstly The top half of the site displays a steel heavy design with the extensive use of portal frames welded to base plates and bolted to the concrete substructure or pad footings on the bottom half of the site.

The bottom half of the site which features more organic landscape inspired buildings has a composite structure of steel beams, reinforced concrete retaining walls, with drainage voids and double yellow brick walls (manufactured on site by utilizing processed mine tailing waste) which sit on strip or pad reinforced concrete footings. These colunms and walls support castellated and I-beams which transfer the point loads to the relevent column or wall.

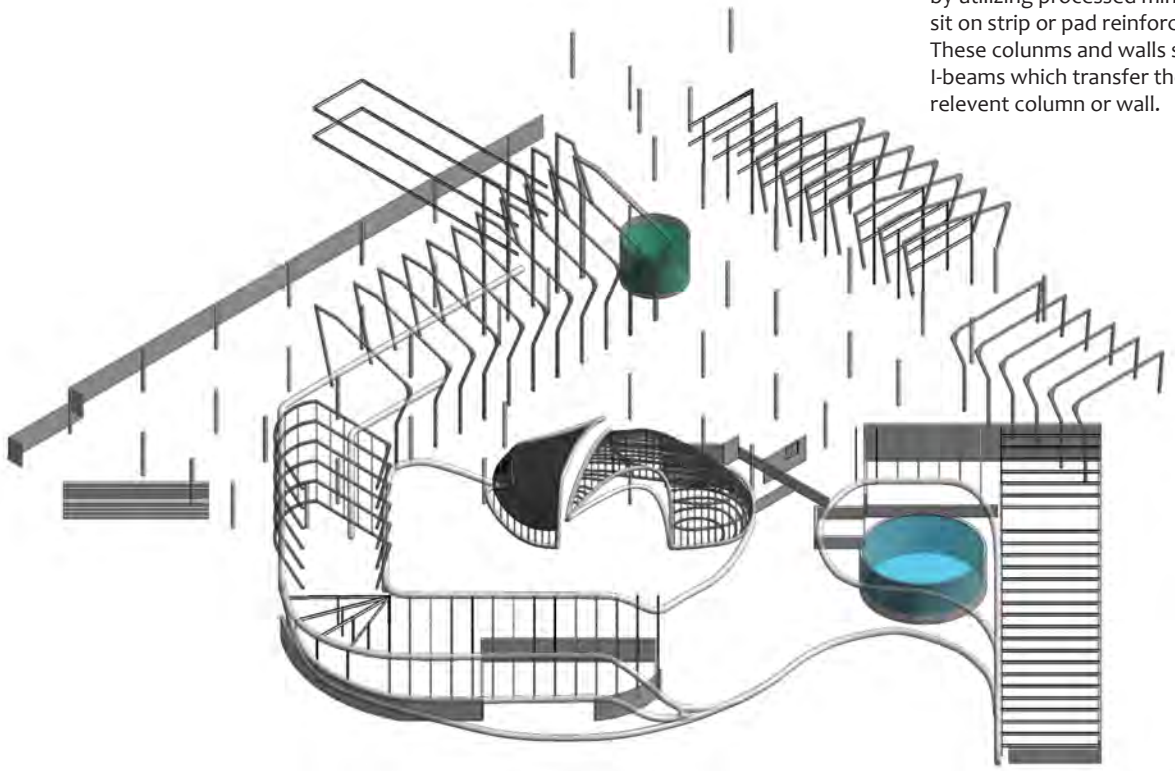


FIG 125 : PRIMARY STRUCTURAL COMPONENTS (Author, 2017)

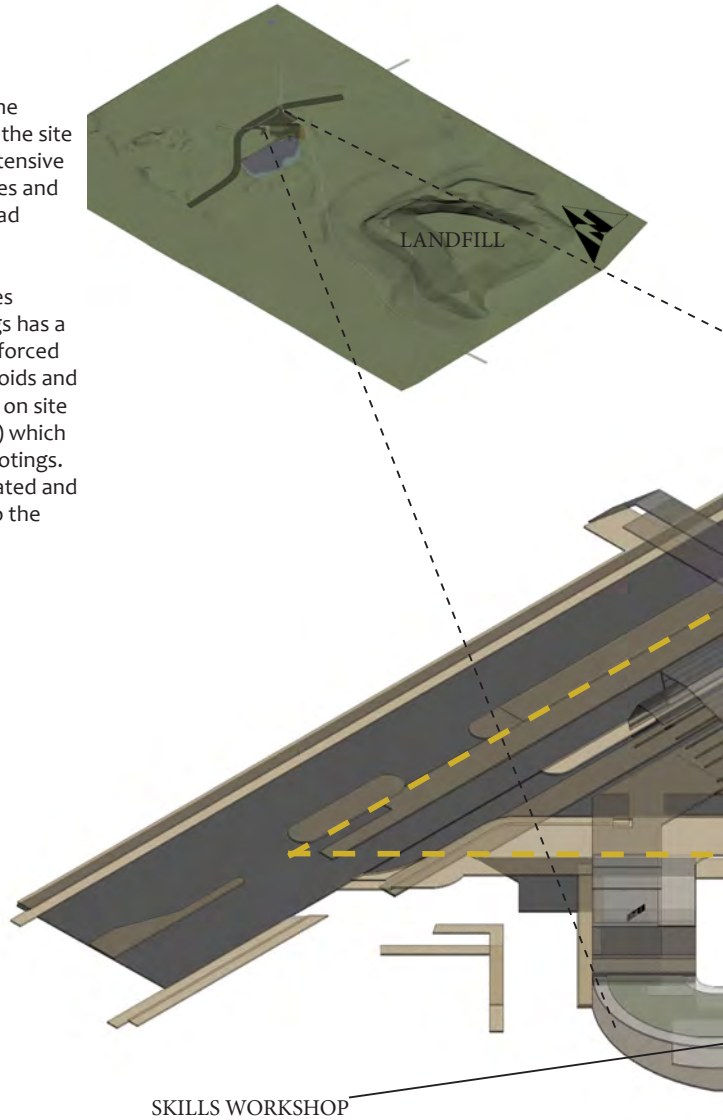


FIG 126 : SECONDARY STRUCTURAL FLOOR PLANES (Author, 2017)

8.2.2 SECONDARY STRUCTURE

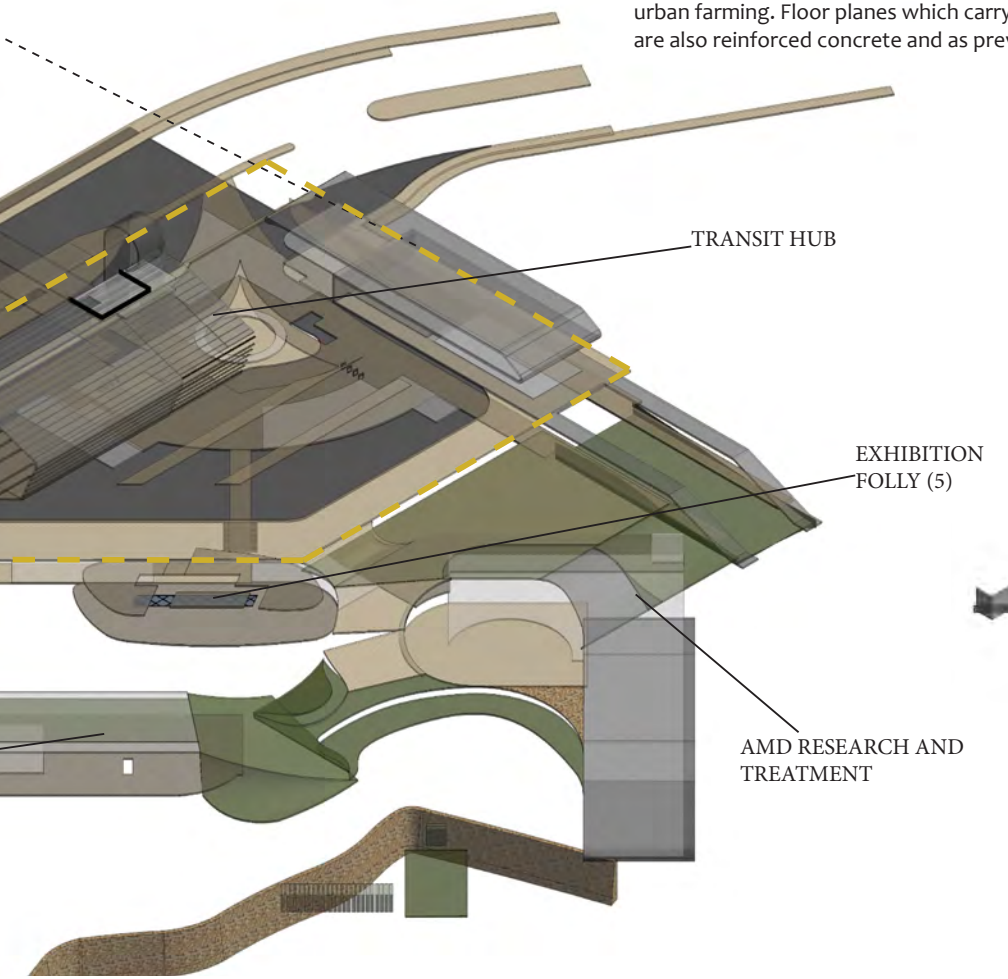
8.2.2.1 LATERAL PLANES

The expression of floor planes is critical to this interventions conceptual articulation. At points the floor melts into the ground forming a stated transition from building to landscape. This is done using reinforced concrete slabs which are finished with natural stone, or green roofs which host urban farming. Floor planes which carry people are also reinforced concrete and as previously stated the roads and transit hub is supported by a heavy duty waffle slab.

The transition space from building to landscape blurs the line between roof and ground. In a less sensitive interaction between site and building the Transit hub hosts an insulated steel sheeting roofing structure which is bolted to purlins which are in turn bolted to the primary structure(portal frame)

8.2.2.2 WALLS, CURTAIN WALLS AND OTHERS

The Walls which do not carry weight in the form of retaining walls form part of the secondary structure. They will use the bricks manufactured on site as mentioned in the Urban plan. Curtain walls have been used to channel light into the sunken and topographically inspired buildings. The internal qualities such as floor finished will compliment the steel structure by using blue-gum wood which has contextual significance as explored in the context chapter.



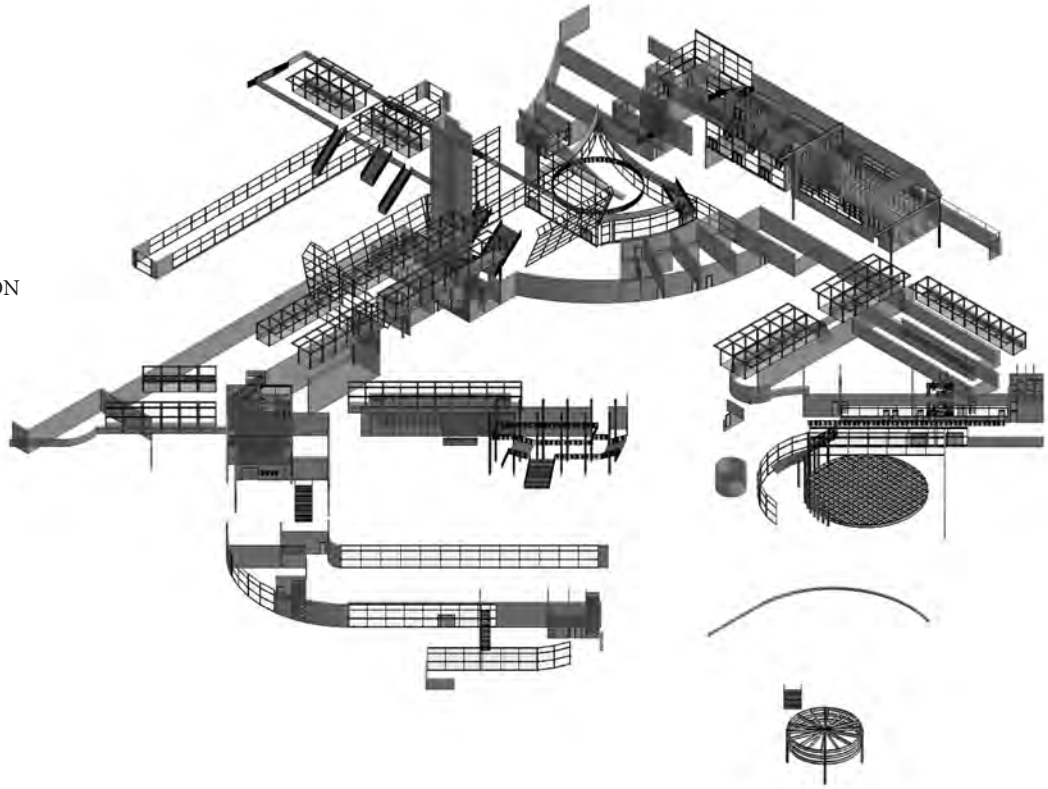


FIG 127 : SECONDARY STRUCTURAL WALLS AND COMPONENTS (Author, 2017)

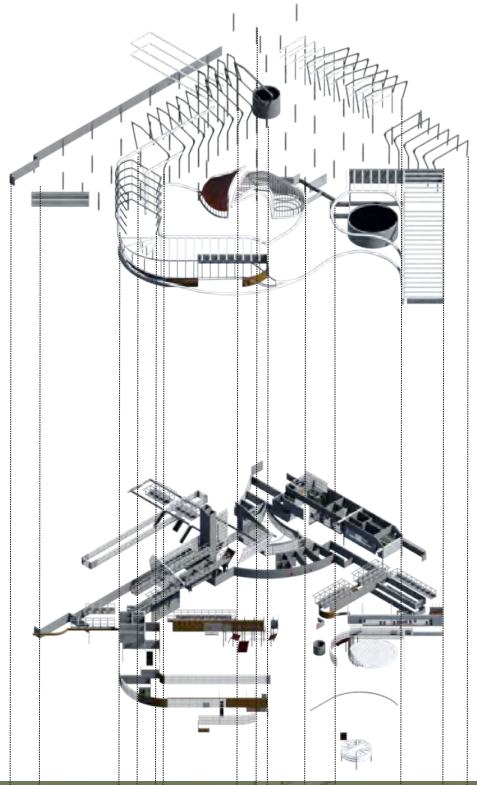
8.2.3 STRUCTURAL COMPOSITION

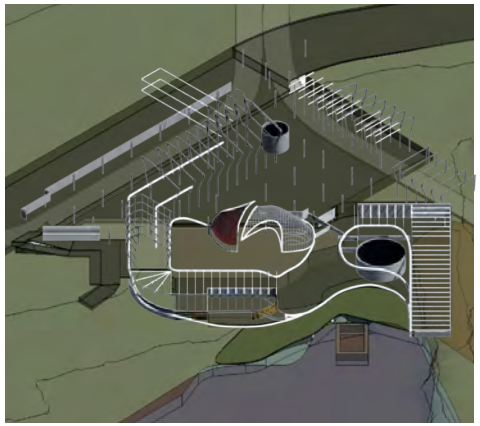
The structures composition displays the structural components relationship with the site as well as with each other.

To achieve the desired aesthetic different areas have been treated differently. In some areas of the design structural framing is exposed and the cladding is pulled back whereas in other areas the opposite is true, The structural framing is hidden and can only be seen from the internal space, giving the appearance of a “non -building” such as in the case of the Acid Mine Drainage treatment facility.

The connections between elements have not been covered up in a scenographic way but rather sensitively placed as to only be exposed where appropriate.

In places like the transit hub the connections between ground and “site” are exposed where the base plate is exposed flush with the blue-gum wood floor finish.





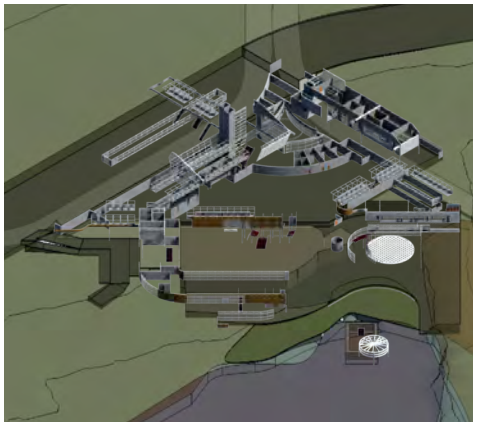


FIG 128 :STRUCTURAL COMPOSITION (Author, 2017)

8.2.4 MATERIAL PALETTE

The material choices were contextually driven with it being in direct relation to the tectonic concept, to display the journey from rigid steel based design to landscape. The materials follow this trend going from processed steel to fully natural elements like natural stone and grass.

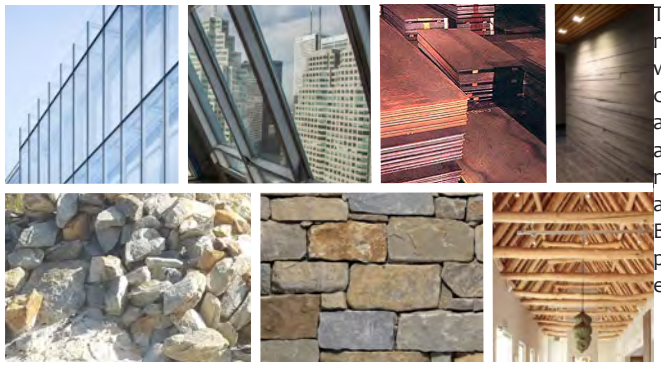
EXISTING

The existing site is a wasteland of toxic yellow soil and water dappled with mounds of natural stone, wood and greenery

STRUCTURE

Steel H and I beams will be used from NJR Steel, a joint venture will be undertaken to acquire composite recycled steel members.
Lower down in the stereotomic landscape buildings oxidized steel members from Gary steel company will be used.
Reinforced PPC concrete will be used for the stereotomic elements.
Yellow Bricks made on site from the reprocessed mine waste will be employed structurally and in infill.

INFILL

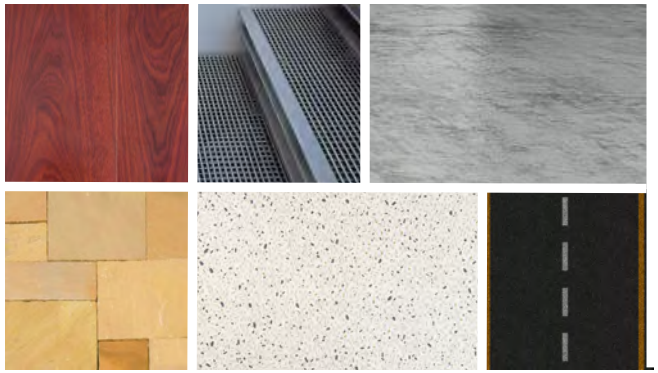


The infill elements will be both manufactured such as curtain walls with aluminum mullions and cor-ten steel being used as an accent material,
and natural with the use of natural stone both processed and left in its rough state. Finally Bluegum wooden poles will form part of sun-shading and accent elements within the design.

ROOF

A waffle slab will form the Roof of the basement parking to carry heavy loads
Green Roofs will top the stereotomic buildings and will grow vegetables
The transit station will employ a mix or new corrugated steel sheeting and copper which will weather with time contributing to the active nature of the site

FLOOR

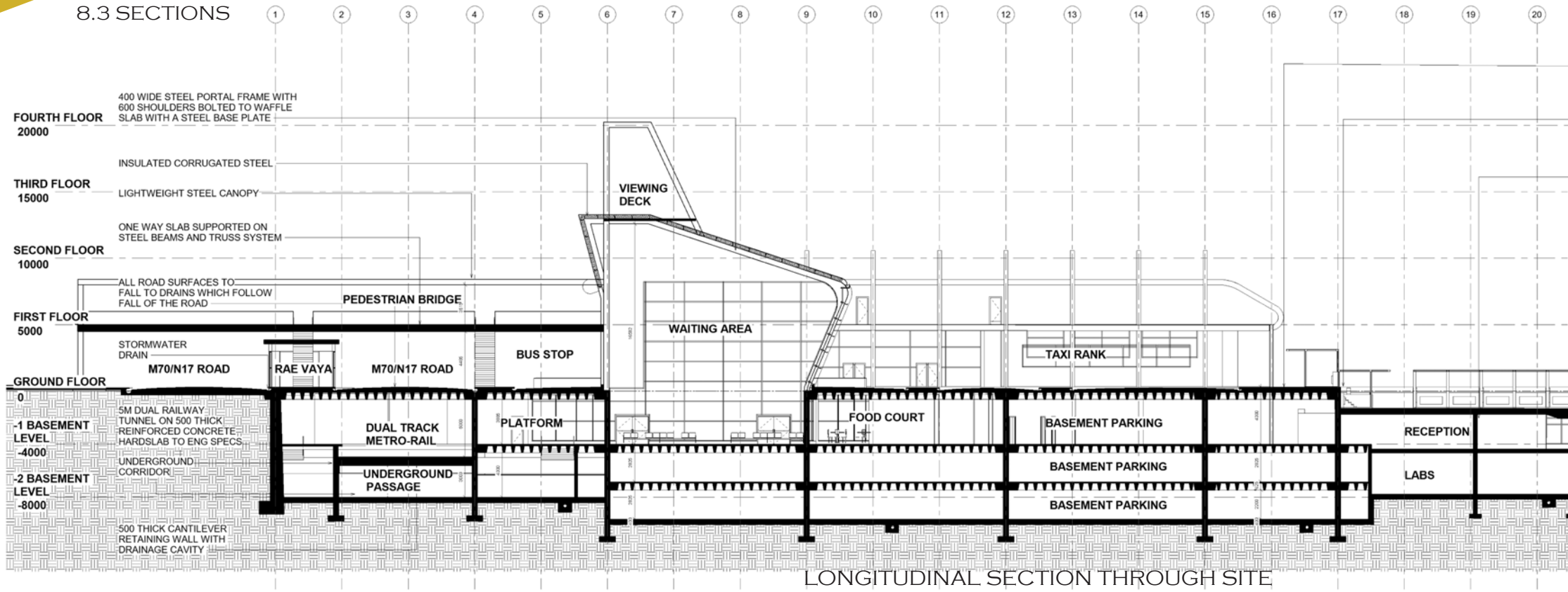


The inside floors will comprise of polished concrete, steel catwalks
and Blue gum floors.

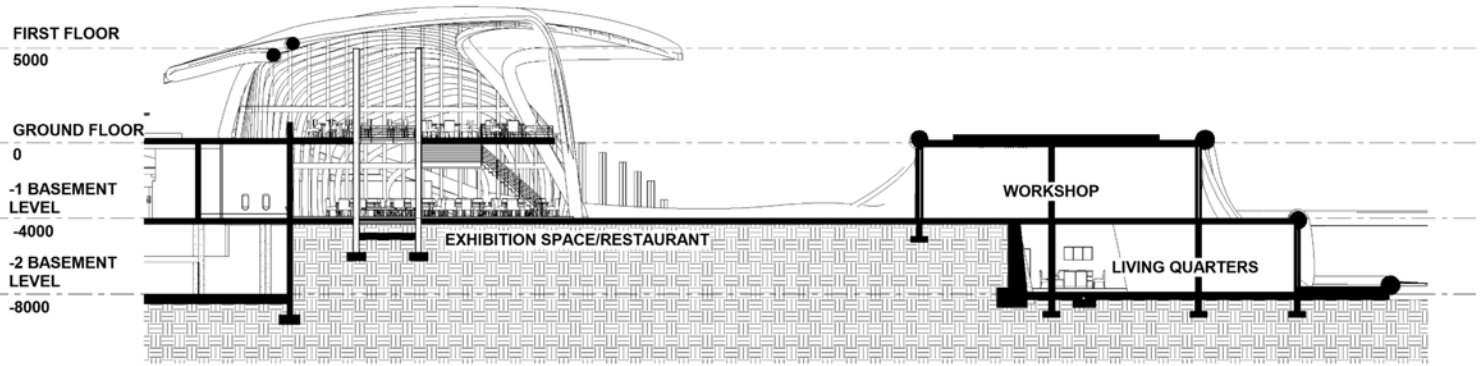
The outside aesthetic will include yellow paves made by the cement factory on site in the same way the bricks are manufactured, terrazzo flooring using processed mine waste as a mix and finally the road with an asphalt finish.

FIG 129 : MATERIAL COMPOSITION (Author, 2017)

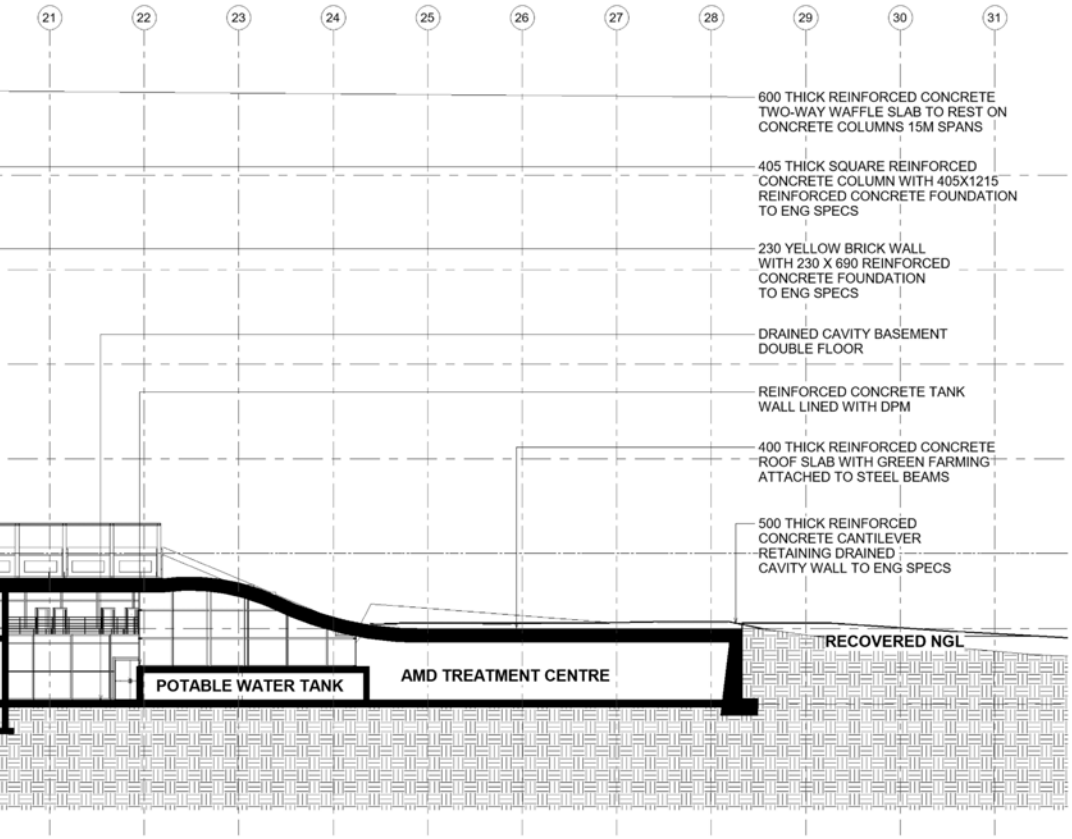
8.3 SECTIONS

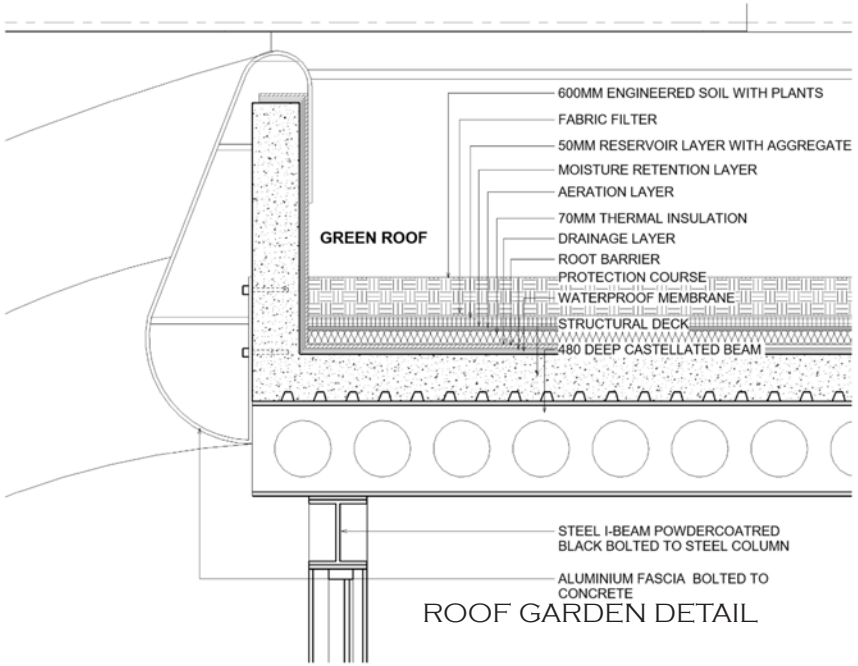


LONGITUDINAL SECTION THROUGH SITE

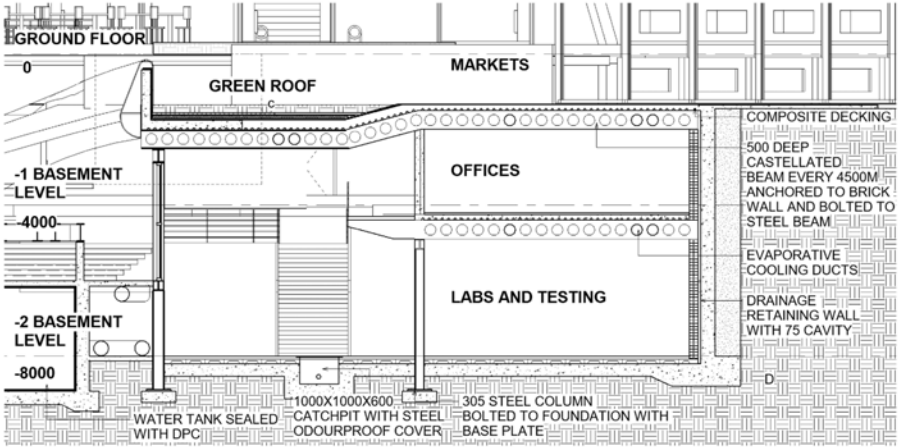


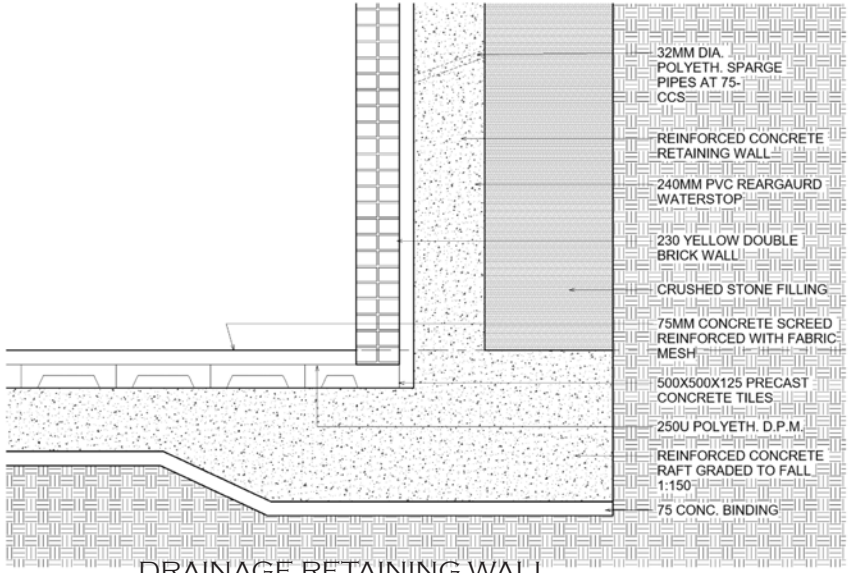
SECTION THROUGH AMD TREATMENT FACILITY



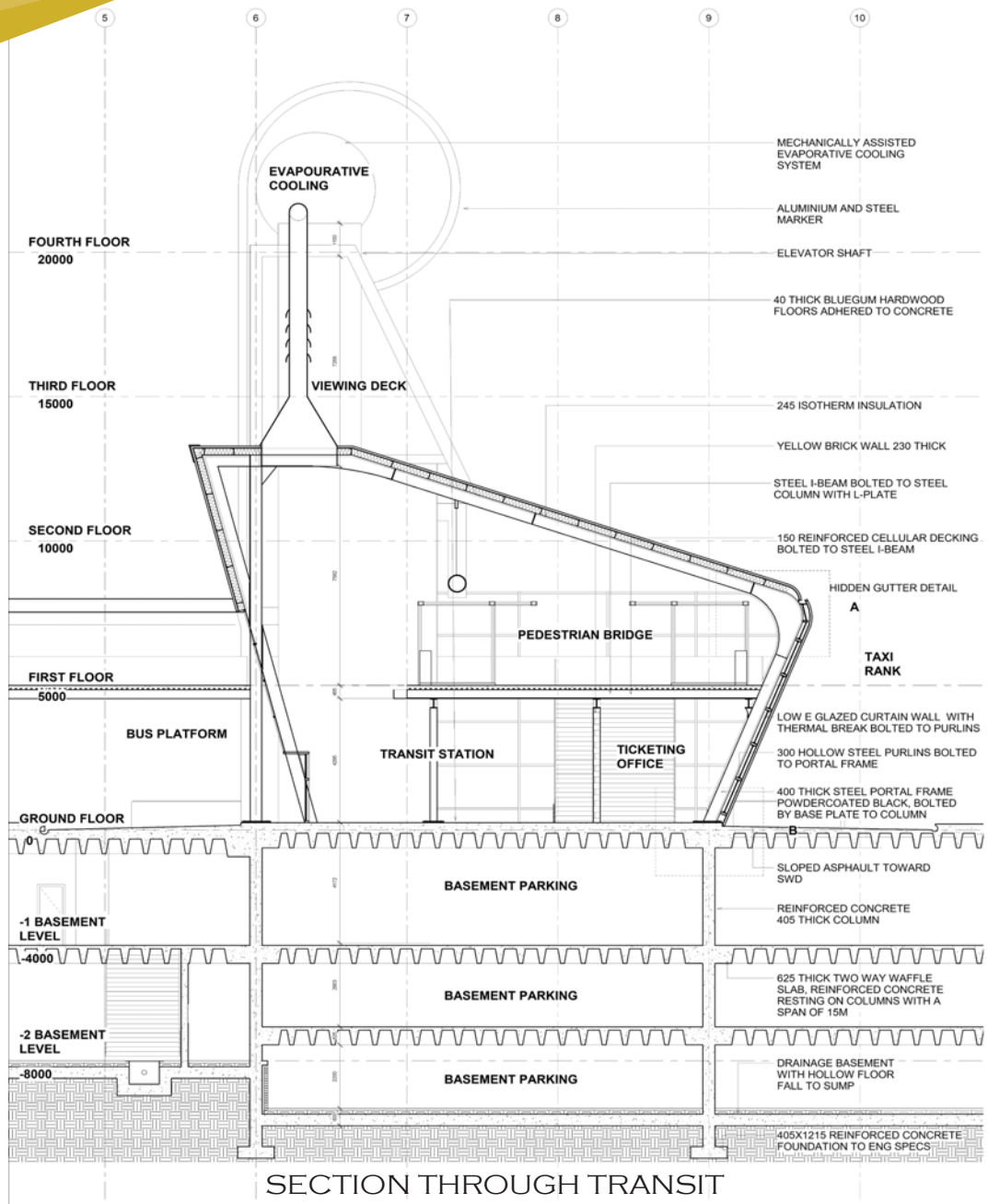


ROOF GARDEN DETAIL

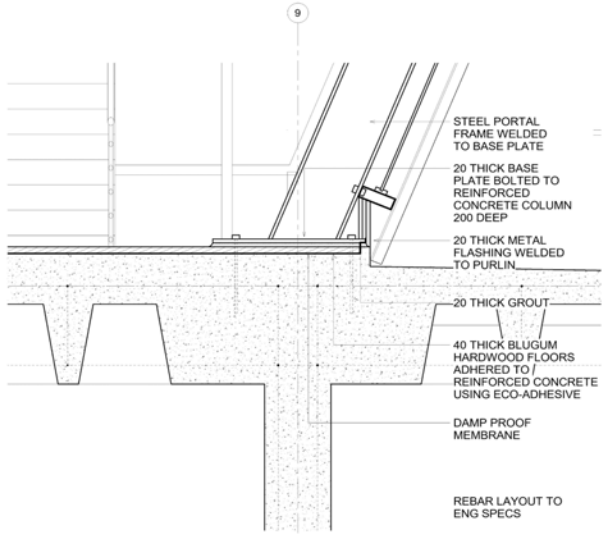




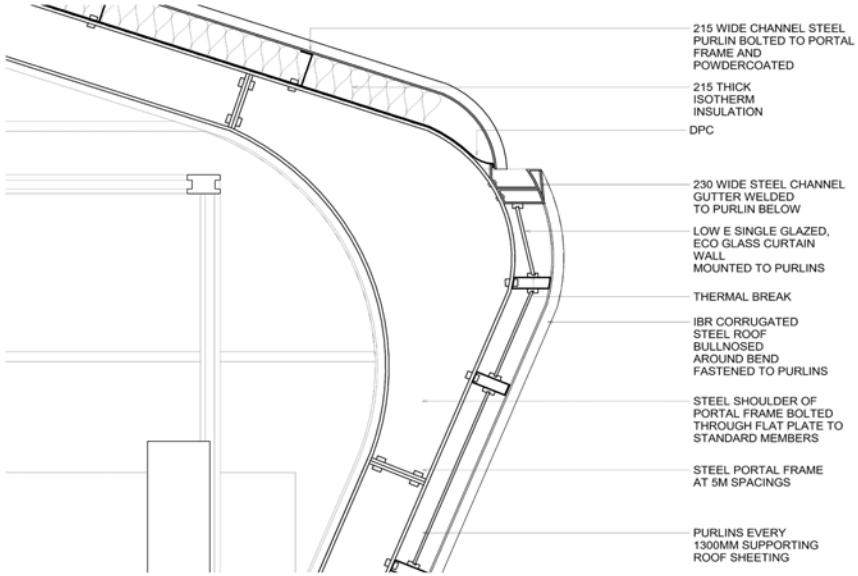
DRAINAGE RETAINING WALL DETAIL



SECTION THROUGH TRANSIT STATION



PORTAL FRAME FOOTING DETAIL



HIDDEN GUTTER DETAIL

FIG 130 : Sectional Exploration (Author, 2017)

8.4 SEFAIRA MODELING AND ITERATIONS

BASELINE SANS 204

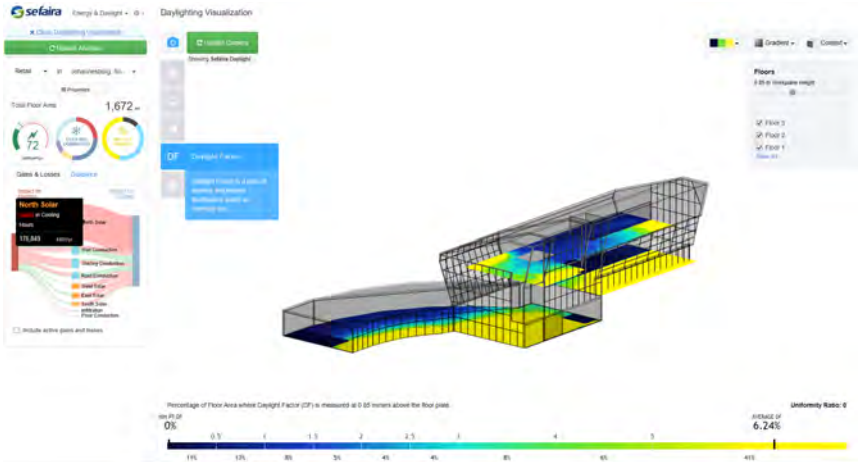


FIG 131 : Sefaira Modeling SANS 204 base (Author, 2017)

The Sans 204 Guideline was far above the performance of my building at the current time due to the face the truss and roofing material was exposed metal and has terrible insulation making it not only an uncomfortable space but also an expensive one. The daylight factor was also above the targeted range.

ITERATION 1

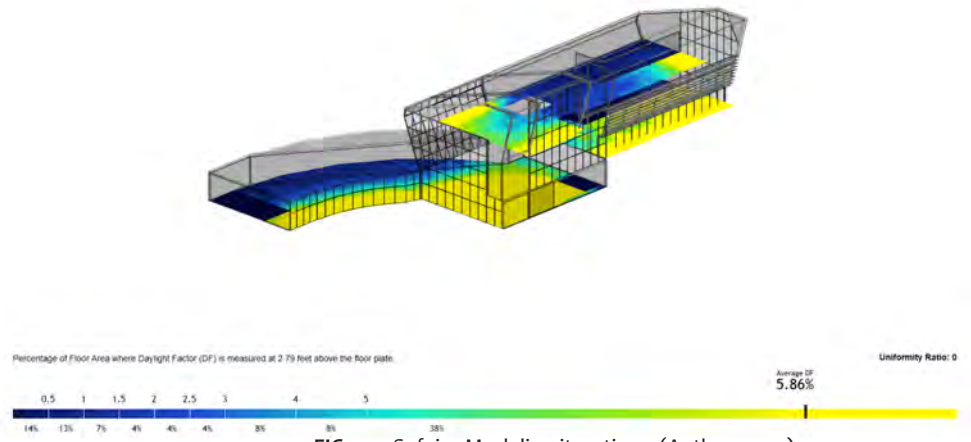


FIG 132 : Sefaira Modeling iteration 1 (Author, 2017)

The first iteration was focused on reducing the daylight factor and some heat gain as can be seen from above the major contributor was the North Facade and as a result a shading device was added to a portion of the northern facade This decreased the daylight factor by 0.4%

ITERATION 2

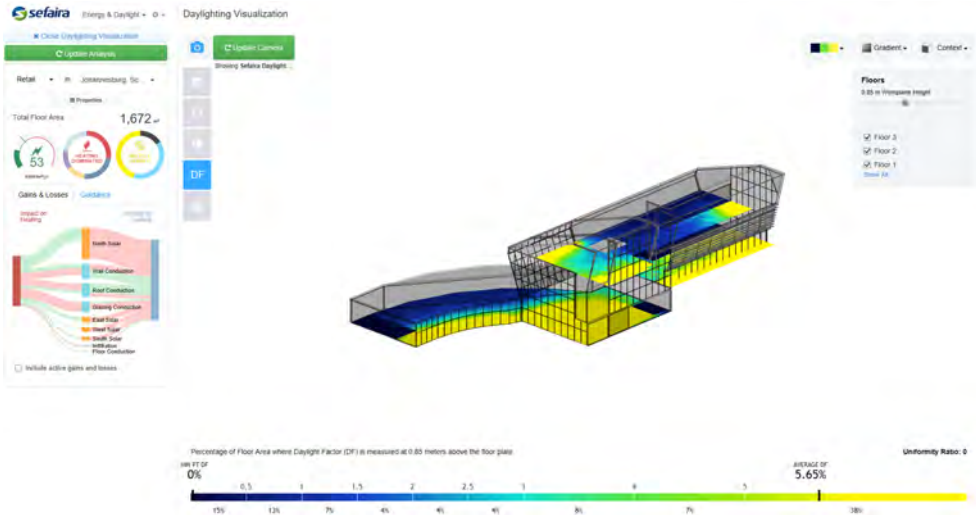


FIG 132 : Sefaira Modeling iteration 2 (Author, 2017)

The Second iteration involved lowering the SHGC and providing a better glazing U-values which would impact on the energy usage. It also effected the DF by 0.1% and the energy usage was significantly impacted by about 20kwH/m2/yr

ITERATION 3

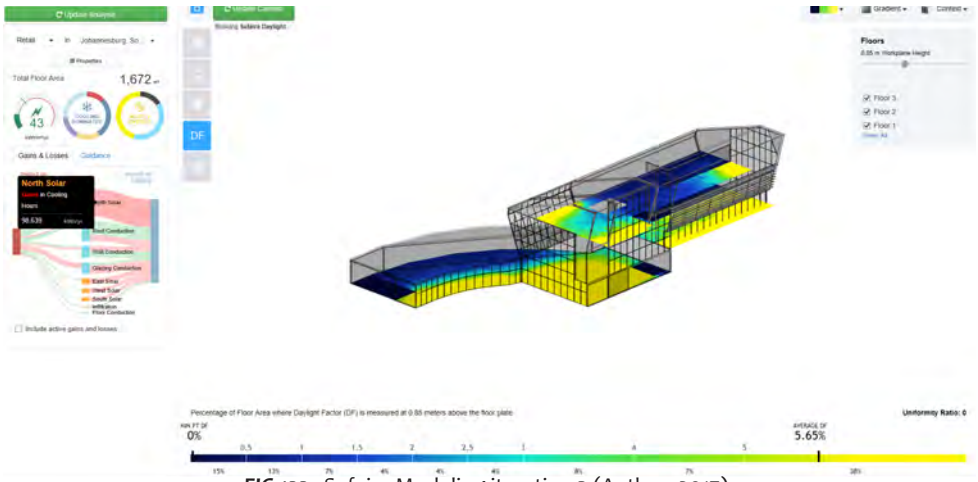


FIG 133 : Sefaira Modeling iteration 3 (Author, 2017)

This iteration was to lower the power usage and thermal comfort further by adding insulation and a ceiling to the roof. This heavily impacted the performance of the building being able to hold heat and became mainly cooling dominated load wise. There was a 10kwH/m2/yr drop in energy usage

ITERATION 4

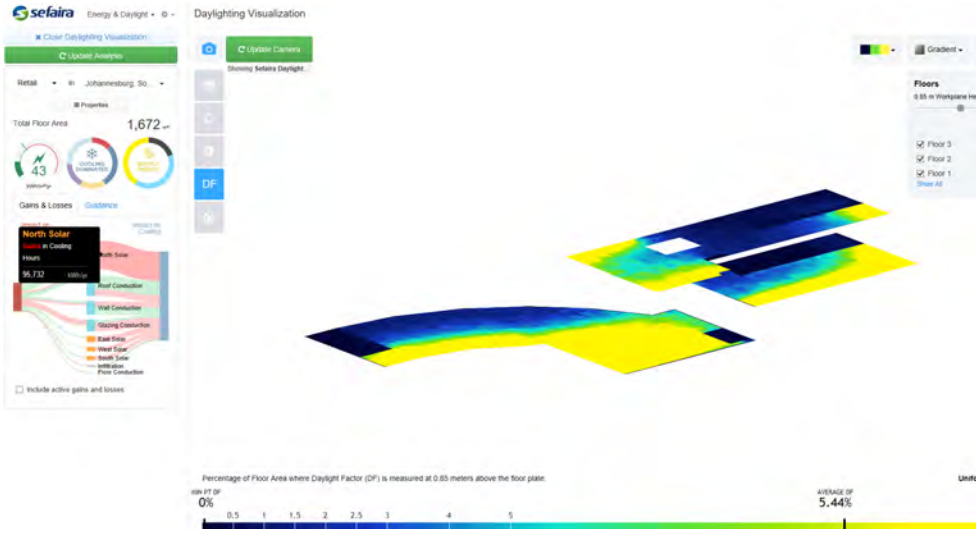


FIG 134 : Sefaira Modeling iteration 4 (Author, 2017)

The final iteration looked at lowering the DF, to add a variable quality the sun shading was made into mechanical louvers assuming a closed position to provide a comfortable level of light within the building minimizing glare. There was a 0.2% drop in DF

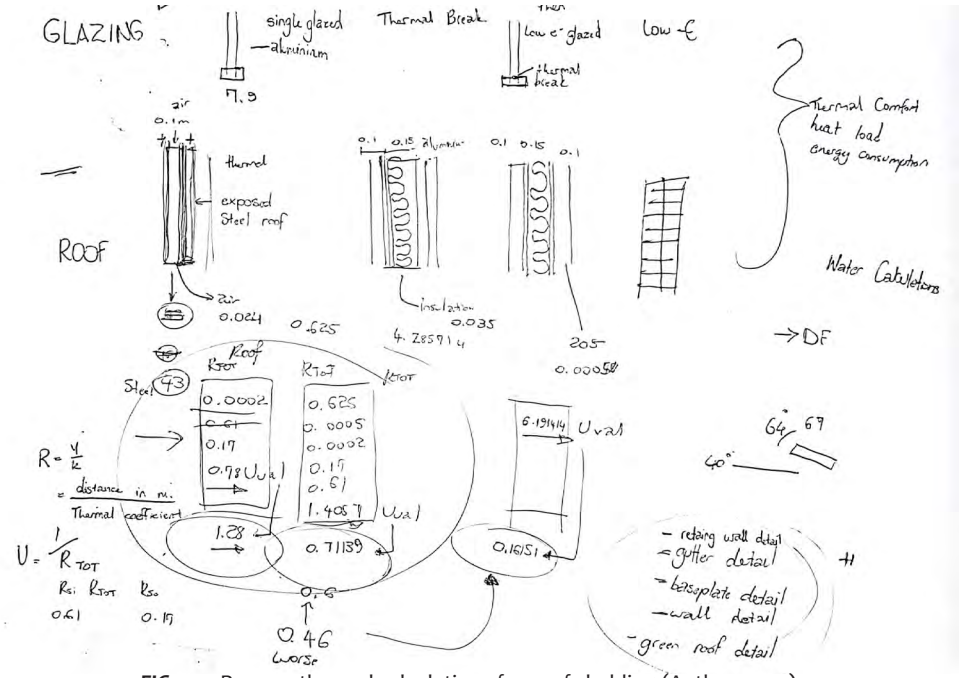


FIG 135 : Process thermal calculations for roof cladding (Author, 2017)

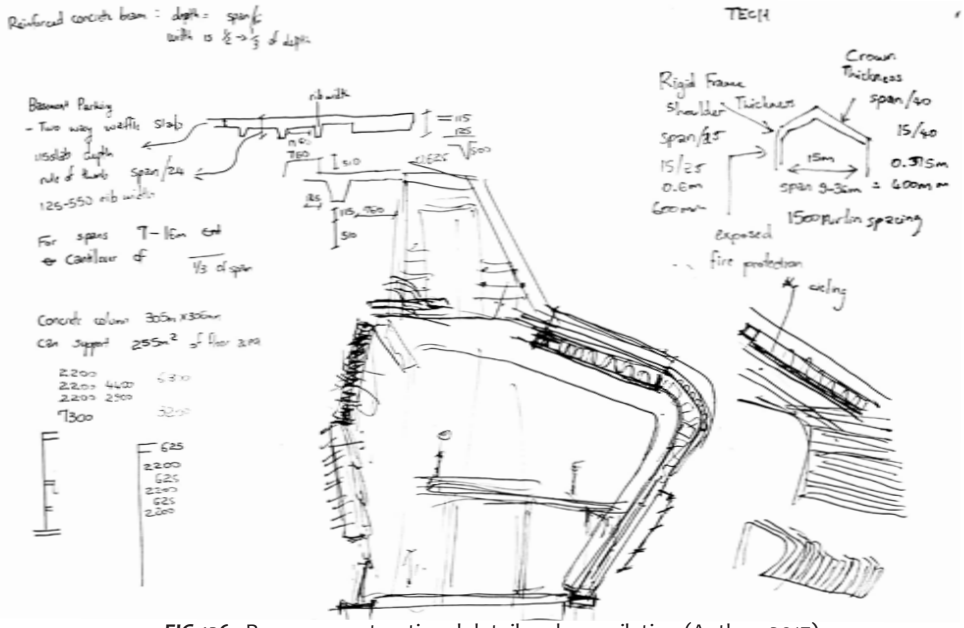


FIG 136 : Process constructional detail and compilation (Author, 2017)

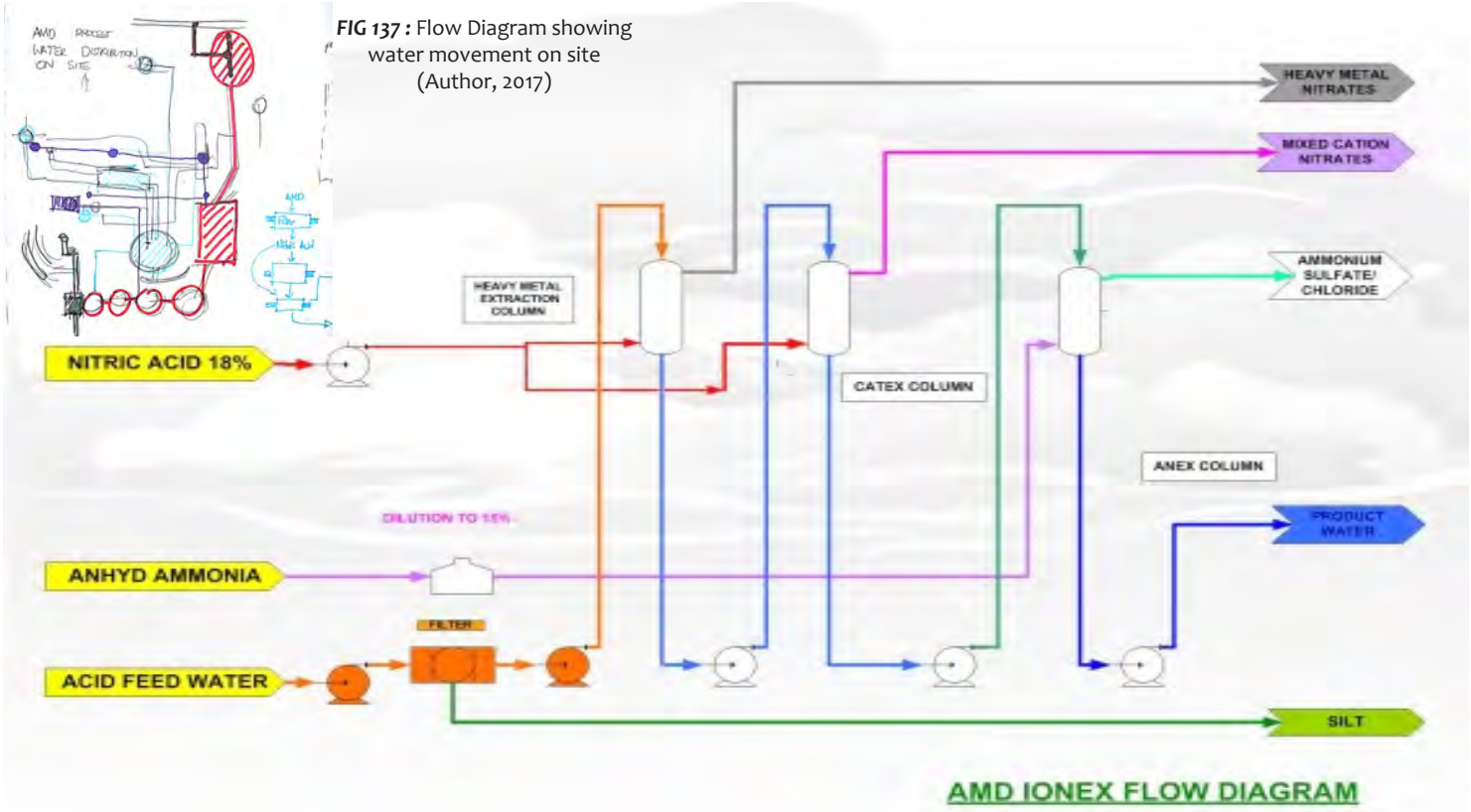


FIG 137 : Flow Diagram showing water movement on site (Author, 2017)

FIG 138 : Flow Diagram showing inputs and outputs of Segra's KnEW Water treatment process (Segra Water, 2014)

FIG 139 : Collage depicting Segra Waters pilot plant (Segra Water, 2014)

8.5 ENVIRONMENTAL SYSTEMS

This intervention has 3 environmental systems to note. The main environmental system is that of AMD water treatment which treats and reticulates water within the site. The second is a subsidiary system using the treated water to achieve thermal comfort in the form of Evaporative cooling. The third includes extensive green roofs which are used for small scale urban farming on site as well as providing a thermal buffer for spaces below it.

8.5.1 AMD TREATMENT

According to SEGRA water, the KNeW process was developed as an economically viable treatment process of AMD water, this process will turn an almost immediate profit. While Reverse osmosis produces a brine substance that cannot be discharged into the natural environment this process produces no waste only usable outputs in various forms of fertilizers and chemicals to be sold to the relevant industries. This process has a low start-up cost and high return and produces zero toxic waste, water can be industrial grade or potable and the radioactivity is completely removed. It is currently being implemented in the East Rand's Decanting Station.

Segra Group is the company looking to develop this mode of treatment into a profitable ecological initiative. In 2014 a pilot plant was constructed in which the scalability and profitability of the system was displayed. This system which was fitted into a shipping container processed around 10000l/h of AMD water
This facility includes a testing centre which is proposed to move to the new junction and site to test and optimize the outputs both water and profitable material. The intention is to supply the precinct with water and become an off the grid system only contributing overflow back into the system. According to CBECS, 2012 the water consumption of large commercial building are 20 gallons per square foot. this converts to about 820l x 150m^2(size of precinct)
=120m^3 of water usage per day.
Accounting for a 5 day capacity takes into accounts weekends and public holidays, when the treatment centre wont be generating water. This figure then comes to a total need of 600m^3 of potable water.

8.5.2 EVAPORATIVE COOLING

The sites thermal comfort and cooling requirements, as established in the sefaira modeling are achieved using evaporative cooling methods. Evaporative cooling is biomimicry in motion, mimicking the body's mechanism of perspiration to cool down a building. In the same way water changes from a liquid to a gas using energy in the form of heat to do so from the surrounding hot air, as do evaporative cooling systems. They provide water to a ventilation system and allow this natural system to cool the air.

The system will focus on cooling internal spaces with a mechanically assisted evaporative cooling system and the external spaces with evaporative cooling sprayers or misters. These systems are effective due to Johannesburg's hot and dry climate.

The system will draw hot air with fans from inside the highest points of the building, with outside air inlets. This air will pass through a pad which is saturated with water, which cools the air through its phase change. The air is then reticulated back into the lower parts of the building through a series of fans and ducts to be articulated in the final design. The basic concept is that of a mechanically assisted cooling tower that works along the length of the building such as in the Transit station.

This system feeds directly off of the AMD treatment centre, using the treated water stored below ground in the tanks to essentially mediate the temperature above ground. This water will be reticulated in a cyclical fashion forming a closed system as well as " displaying" the water throughout the site.

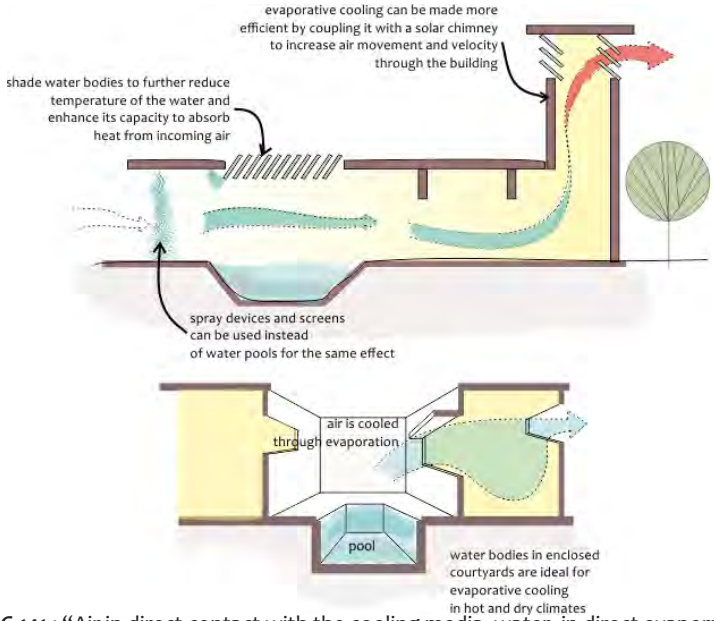


FIG 141 : "Air in direct contact with the cooling media, water, in direct evaporative cooling. The most commonly used methods are water bodies and water sprays." (USAID PACE-D, 2017)

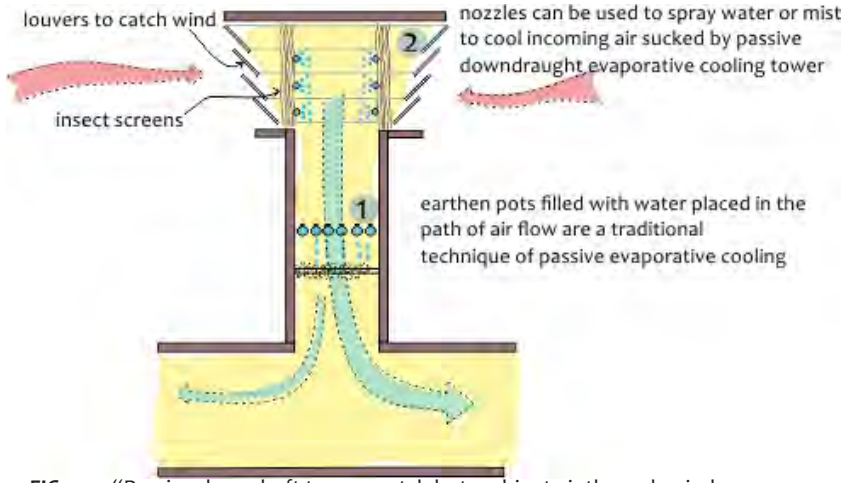


FIG 140 : "Passive downdraft towers catch hot ambient air through wind scoops at the top. The air is cooled either through mechanical systems like nozzle sprays or through passive systems like water filled vessels. The heavy air will sink to the bottom , efficiency is dependent on the difference of air temperature between inside and outside when operating passively" (USAID PACE-D, 2017)

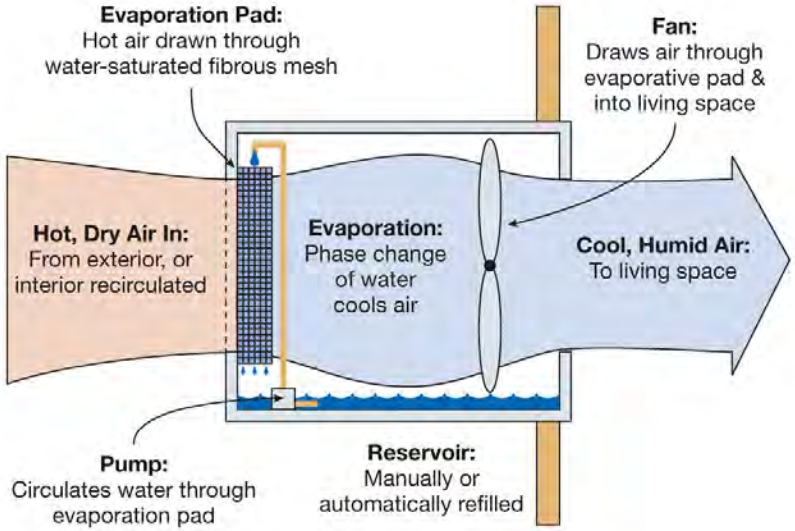


FIG 142 : Evaporative cooling method (Kelley , 2013)

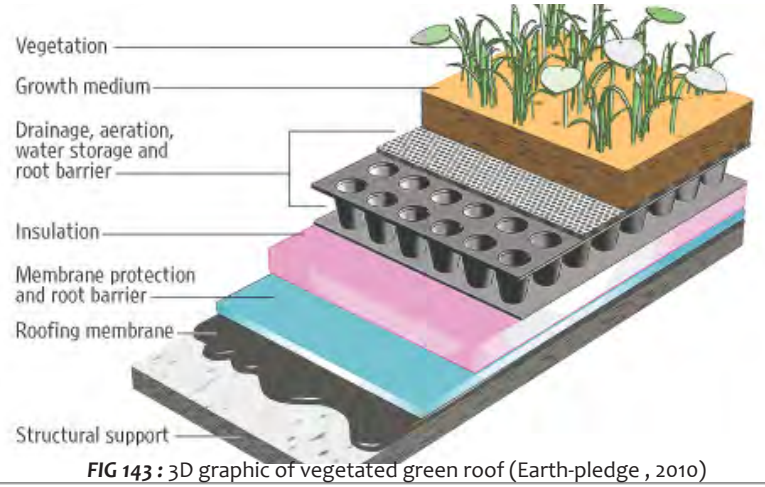


FIG 143 : 3D graphic of vegetated green roof (Earth-pledge , 2010)

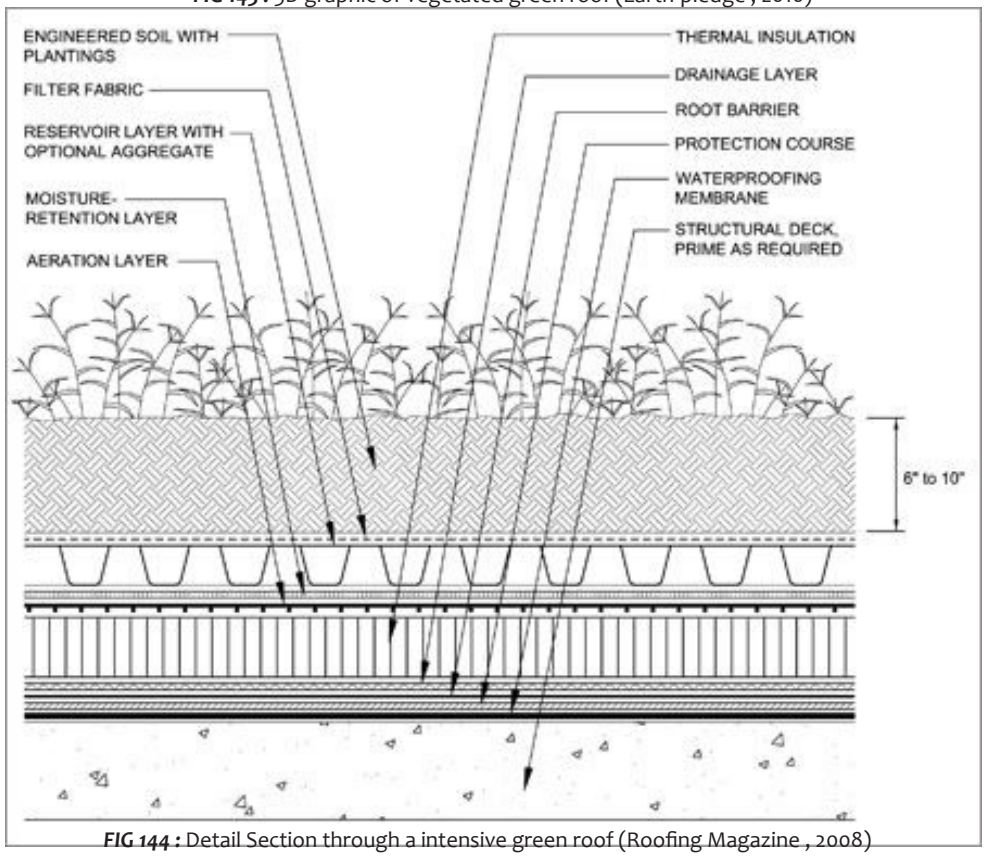


FIG 144 : Detail Section through a intensive green roof (Roofing Magazine , 2008)

8.5.3 SMALL SCALE URBAN FARMING ON GREEN ROOFS

A green roof is a vegetation covered roof Green Roofs form an essential part of achieving the conceptual framework on site, providing the aesthetic of a blurred building and landscape line. These Green roofs will double as a source of production in the production landscape, growing an assortment of vegetables and herbs to be sold at the market and cooked at the restaurant. Thus this green roof will be an intensive system with a large soil and drainage layer which will include an irrigation system. These green roofs will be formed by a system of trays and embedded into the slab

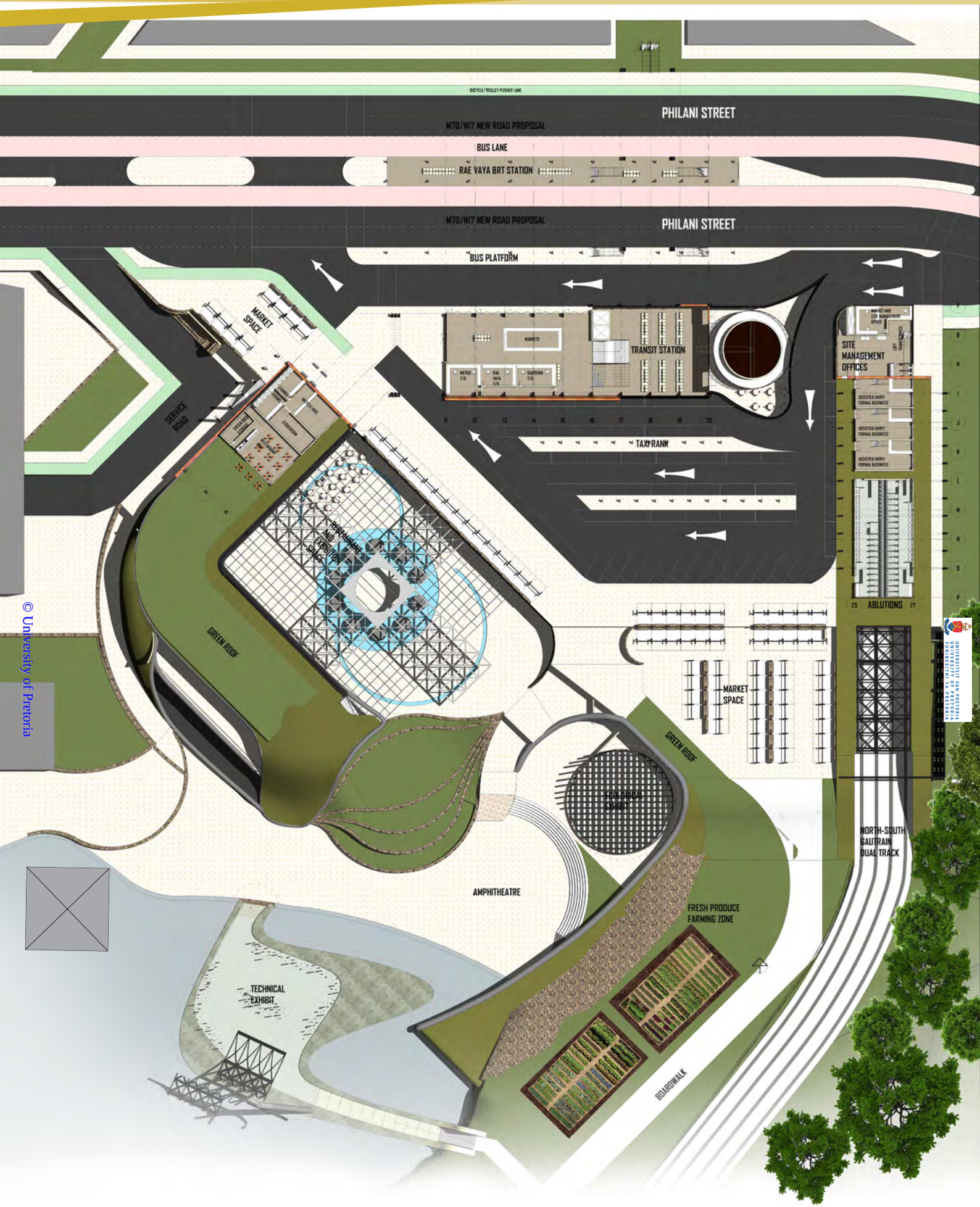
Green roofs also reduce the cooling load within the building by providing a large thermal buffer by which the space below remains cooler than with conventional roofing methods. This is essential for spaces sunken into the ground with little natural ventilation. The roof requires a thick layer of soil around 600mm to allow for the growth of root vegetables like carrots and sweet potatoes. The types of plants that will be grown on this roof are beets, lettuce, onions, spinach, cabbage, broccoli, cherry tomatoes, eggplants, peas and peppers as well as herbs like basil, thyme and mint.

This feature builds upon the much needed green lung of not only the city but the transit precinct providing a fresh supply of oxygen and intake of CO_2 so instead of the mining belt giving off harmful dust it now becomes and oxygen generator that sits sensitively in the landscape, a regenerative powerhouse.

These 3 processes will be consolidated within the final design with final numbers, flow diagrams and sections.

CHAPTER 9
DESIGN RESOLUTION

A regenerative precinct

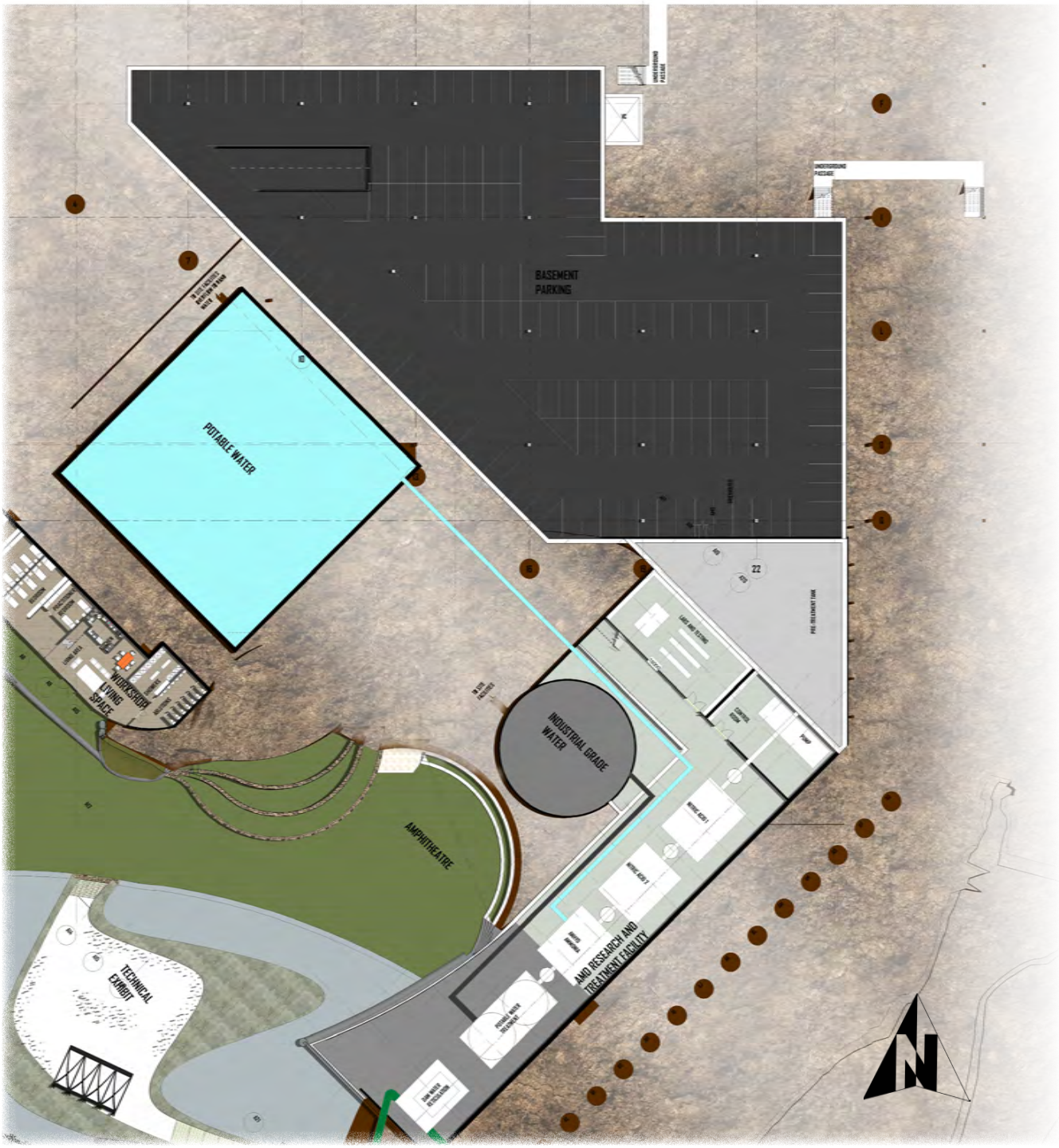


GROUND FLOOR PLAN
1:200

FIG 145 : Ground floor plan (Author, 2017)

BASEMENT FLOOR PLAN
1:200

FIG 146 : Basement floor plan (Author, 2017)



-2 BASEMENT FLOOR PLAN
1:200

FIG 147 : -2 Basement floor plan (Author, 2017)

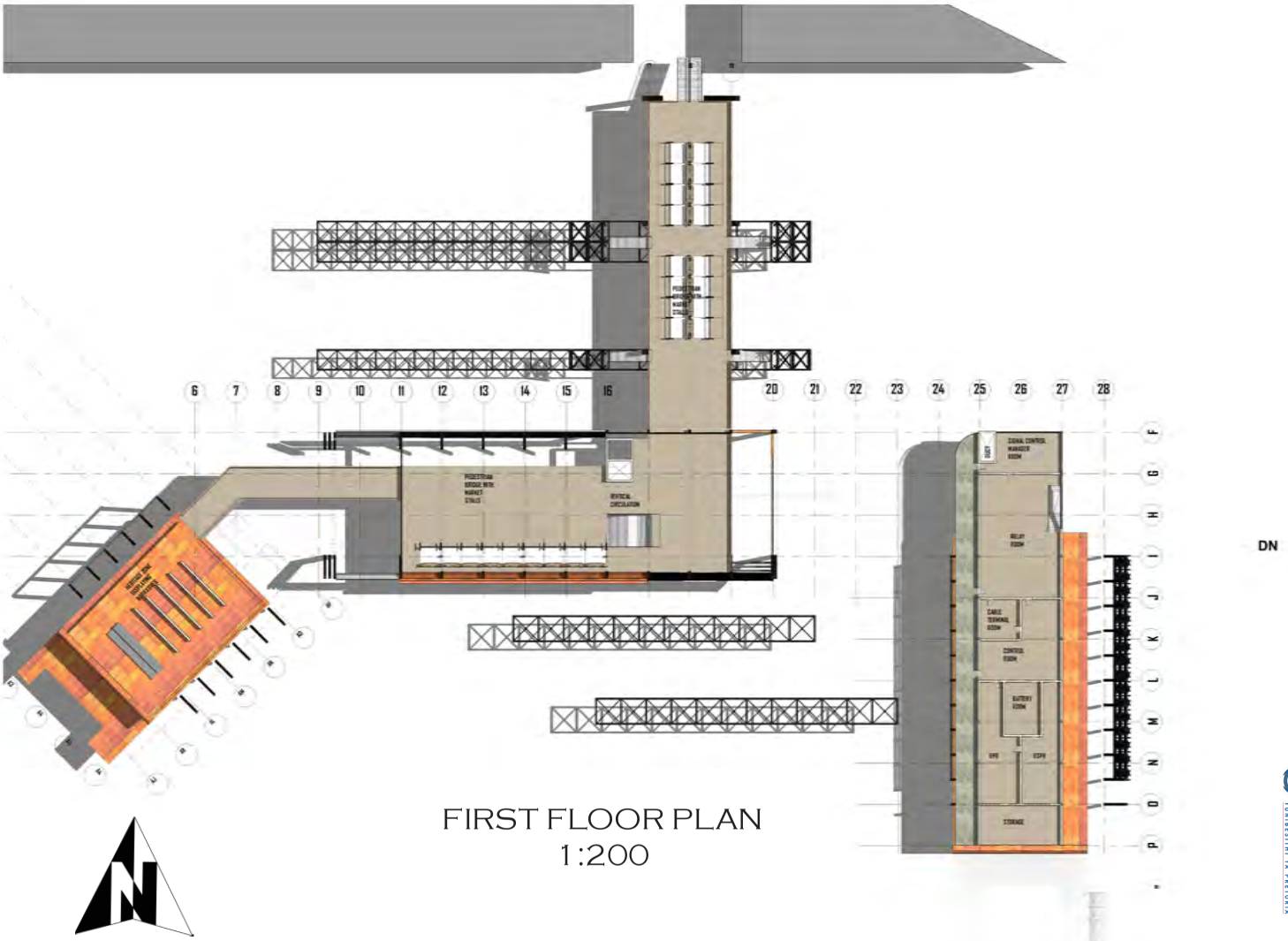


FIG 148 : First floor plan (Author, 2017)

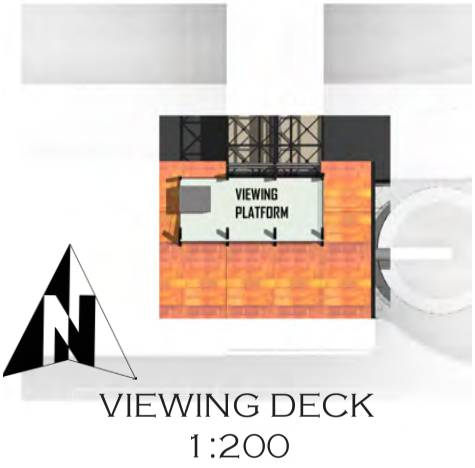


FIG 149 : Viewing Deck floor plan (Author, 2017)

NORTH ELEVATION

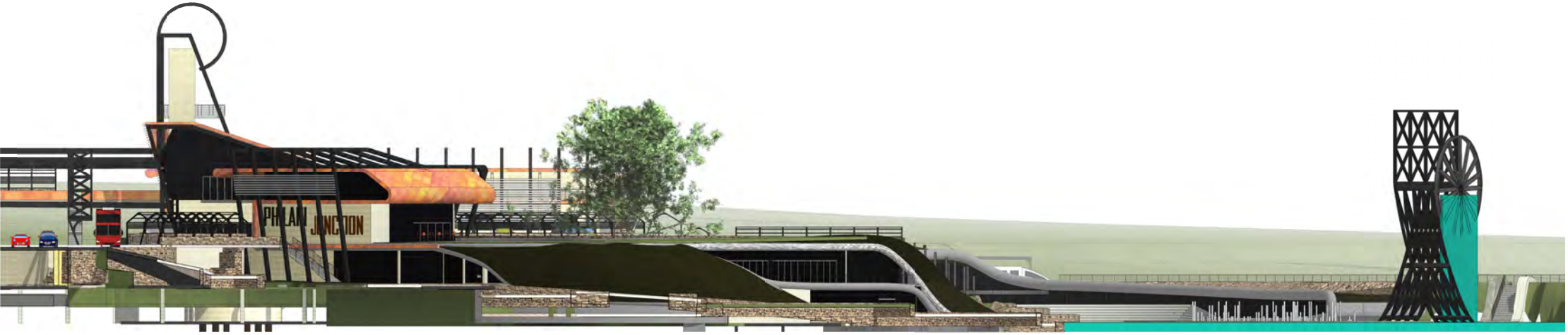
FIG 150 : North Elevation (Author, 2017)

EAST ELEVATION

FIG 151 : East elevation (Author, 2017)

SOUTH ELEVATION

FIG 152 : South elevation (Author, 2017)



WEST ELEVATION

FIG 153 : West elevation (Author, 2017)

FIG 154 : urban plan (Author, 2017)

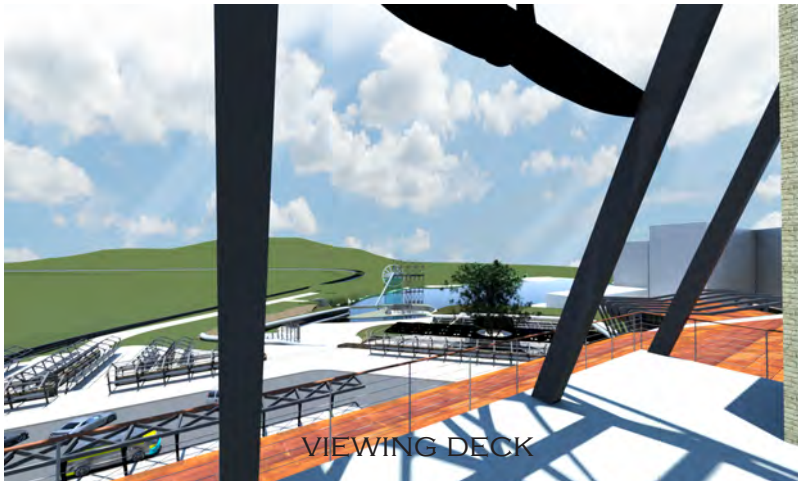


FIG 155 : viewing deck 3D (Author, 2017)

The final iteration of the design resolves a zone for the display of narratives and stories within the space above the bicycle hire, as well as the central exhibition space and the mining heritage folly.

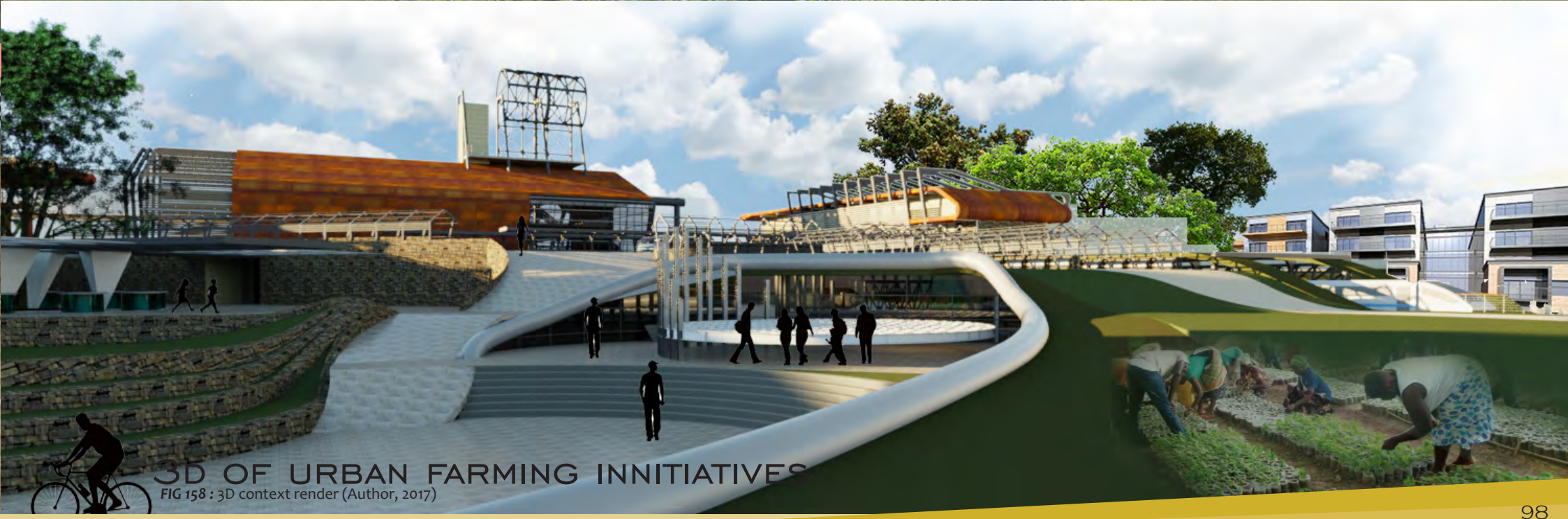
The central exhibition space sits over the potable water storage tank and houses exhibition stands and a green lattice which grows vegetation.

The Mining Heritage folly is an adaptable space going from physical exhibition and meditative space to one of recreation as the precinct moves through its life span. The final iteration sees it as a rock climbing wall and an outdoor theatre.

FIG 156 : 3D context render (Author, 2017)

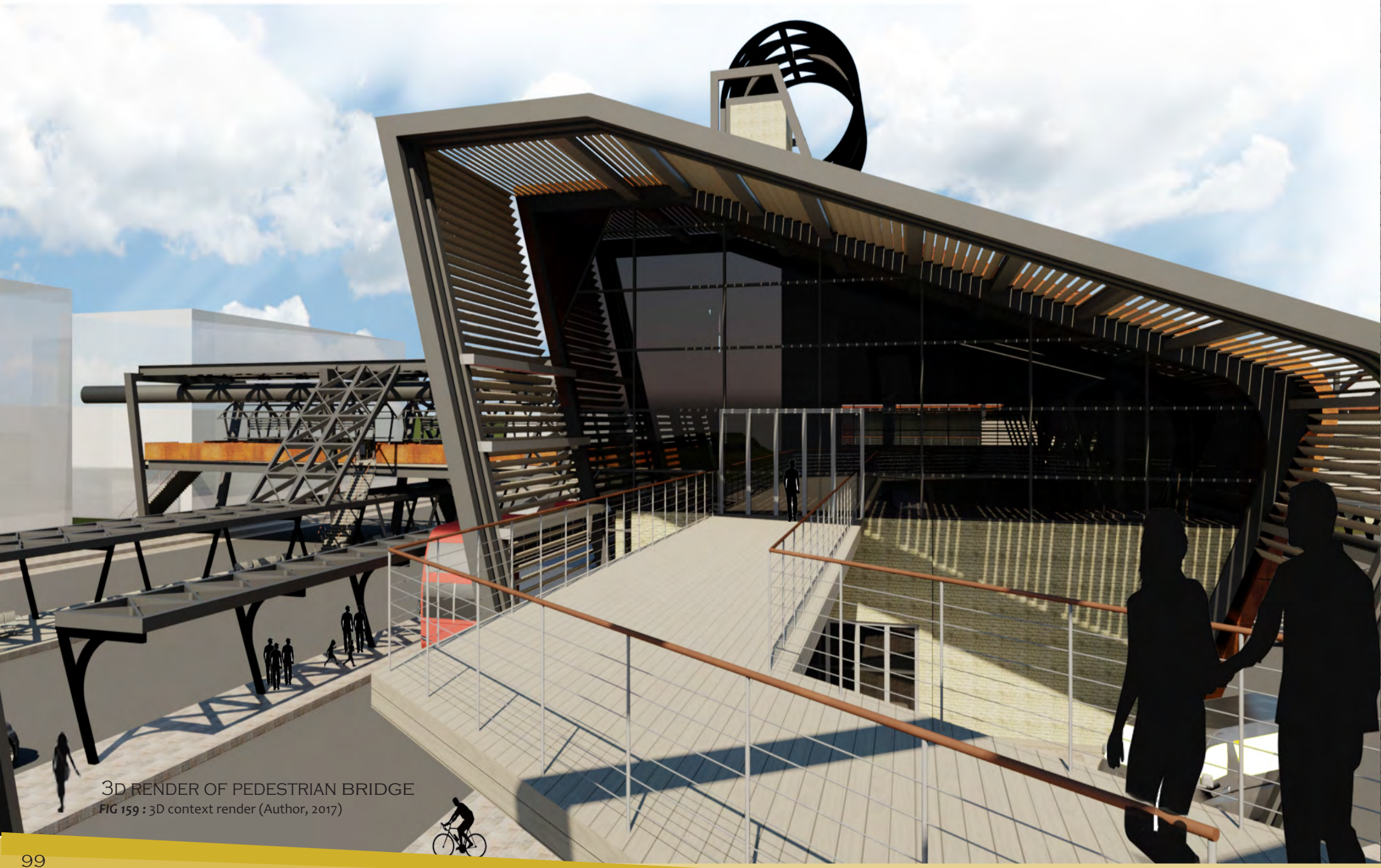
FIG 157 : 3D context render (Author, 2017)

3D OF URBAN FARMING INNITIATIVES



3D OF URBAN FARMING INNITIATIVES

FIG 158 : 3D context render (Author, 2017)



3D RENDER OF PEDESTRIAN BRIDGE

FIG 159 : 3D context render (Author, 2017)

FIG 160 : 3D context render (Author, 2017)

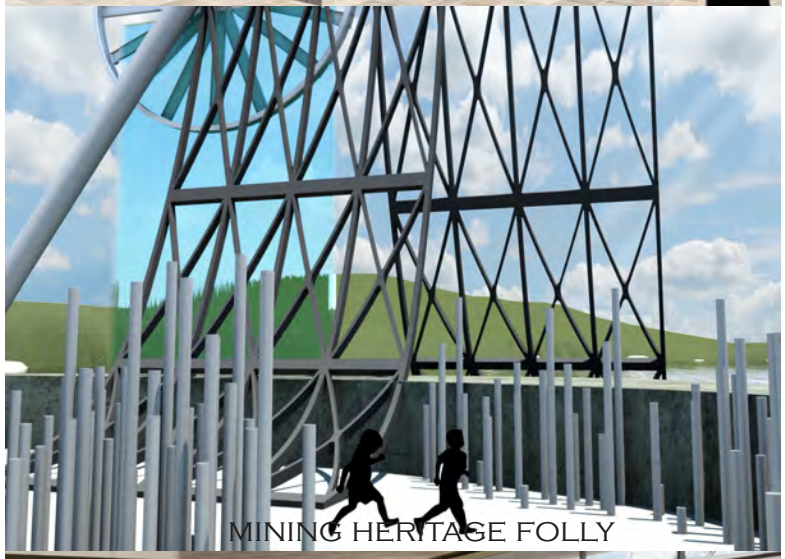


FIG 161 : 3D context renders (Author, 2017)

3D OF PRECINCT EAST

FIG 162 : 3D context render (Author, 2017)

3D OF ENTRY TO SITE: WEST

FIG 163 : 3D context render (Author, 2017)

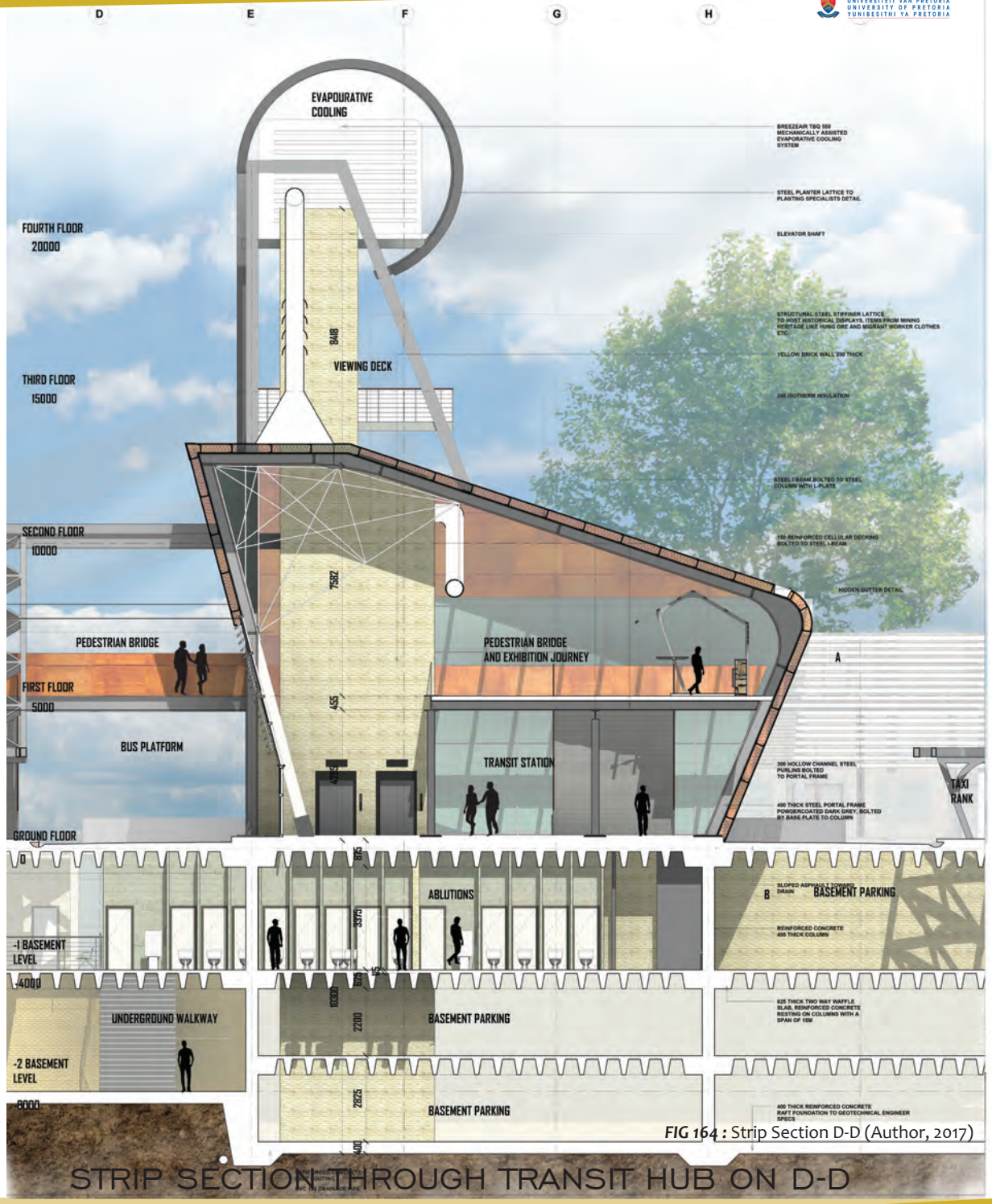


FIG 164 : Strip Section D-D (Author, 2017)

STRIP SECTION THROUGH TRANSIT HUB ON D-D

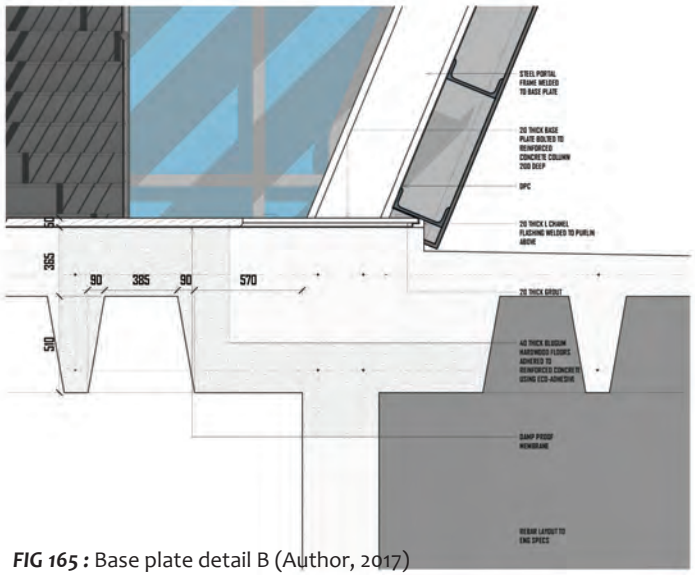


FIG 165 : Base plate detail B (Author, 2017)

BASE PLATE DETAIL B

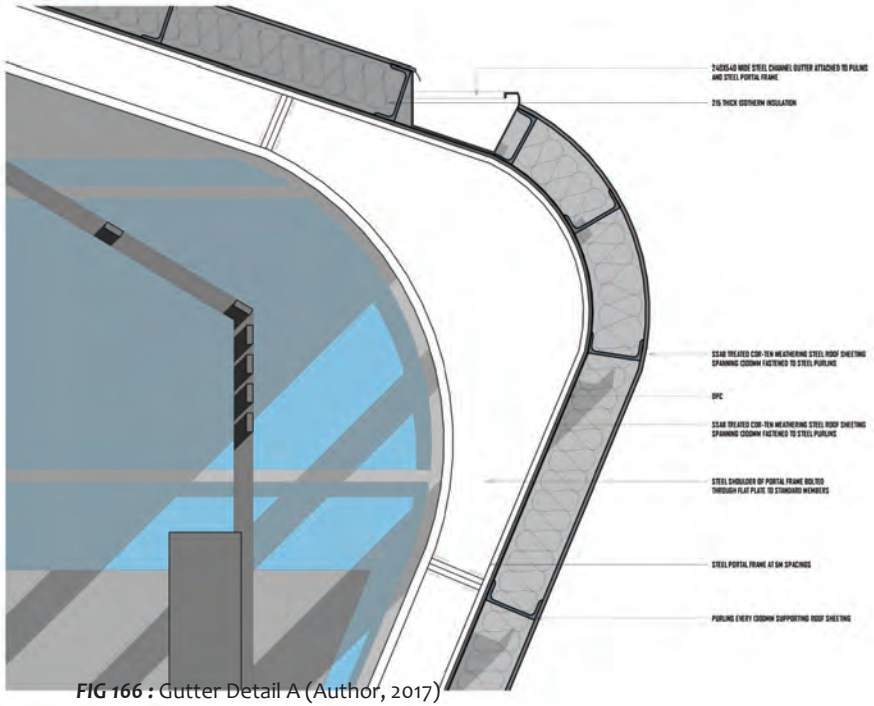
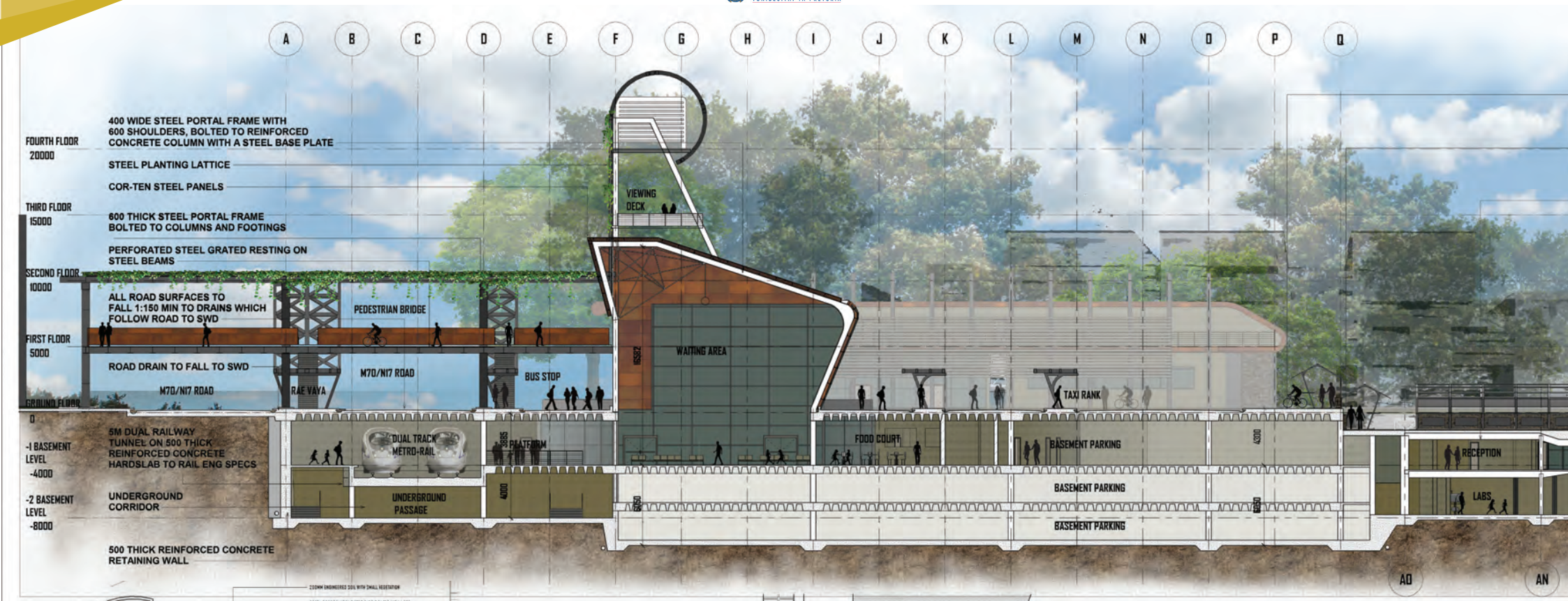


FIG 166 : Gutter Detail A (Author, 2017)

GUTTER DETAIL A



LONGITUDINAL SEC

FIG 167 : Longitudinal Section A-A (Author,

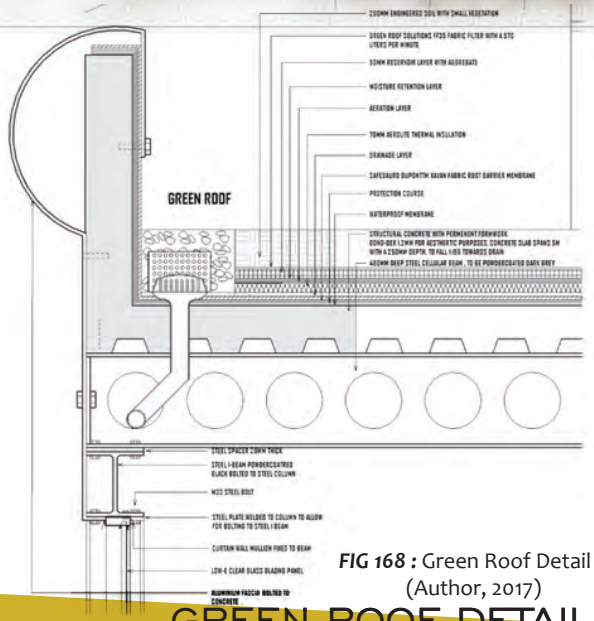


FIG 168 : Green Roof Detail C (Author, 2017)

GREEN ROOF DETAIL C

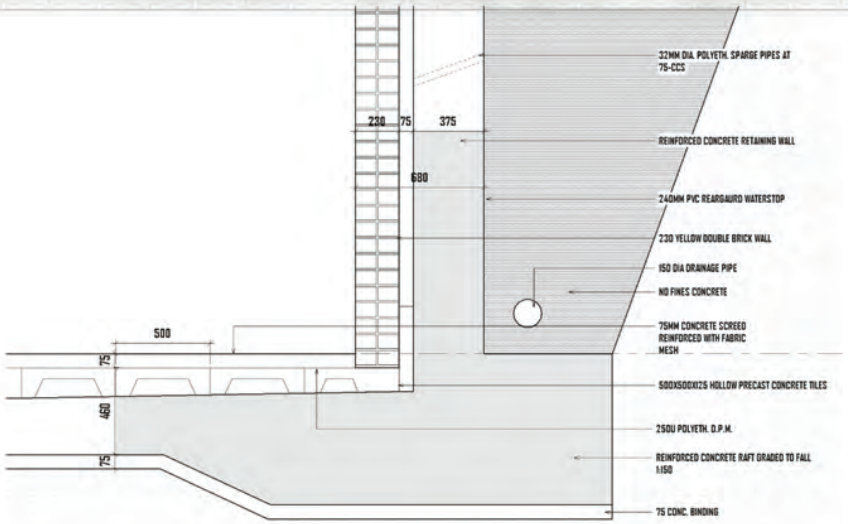
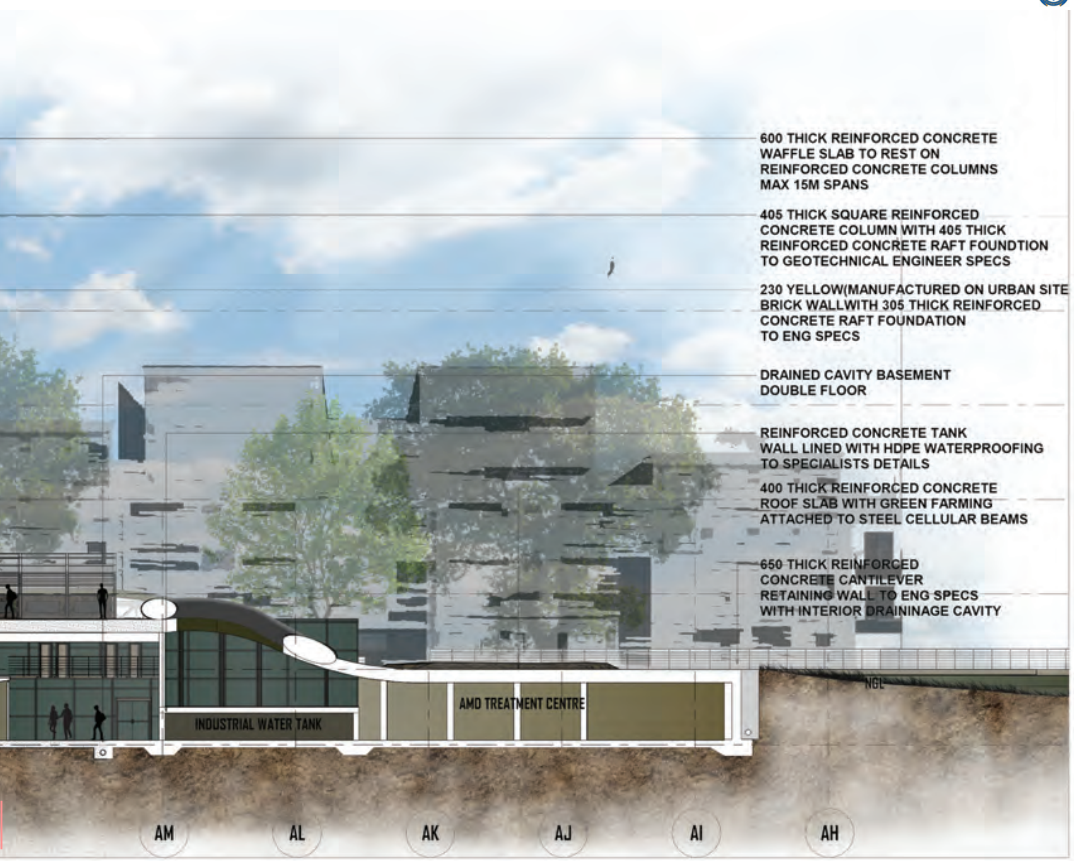


FIG 169 : Drainage Wall Detail D (Author, 2017)

DRAINAGE WALL DETAIL D

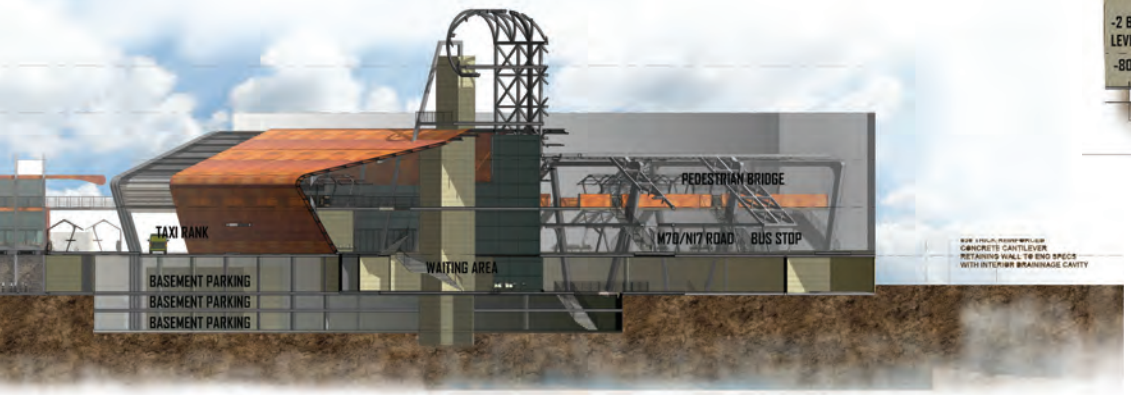
LONGITUDINAL

FIG 170 : Longitu



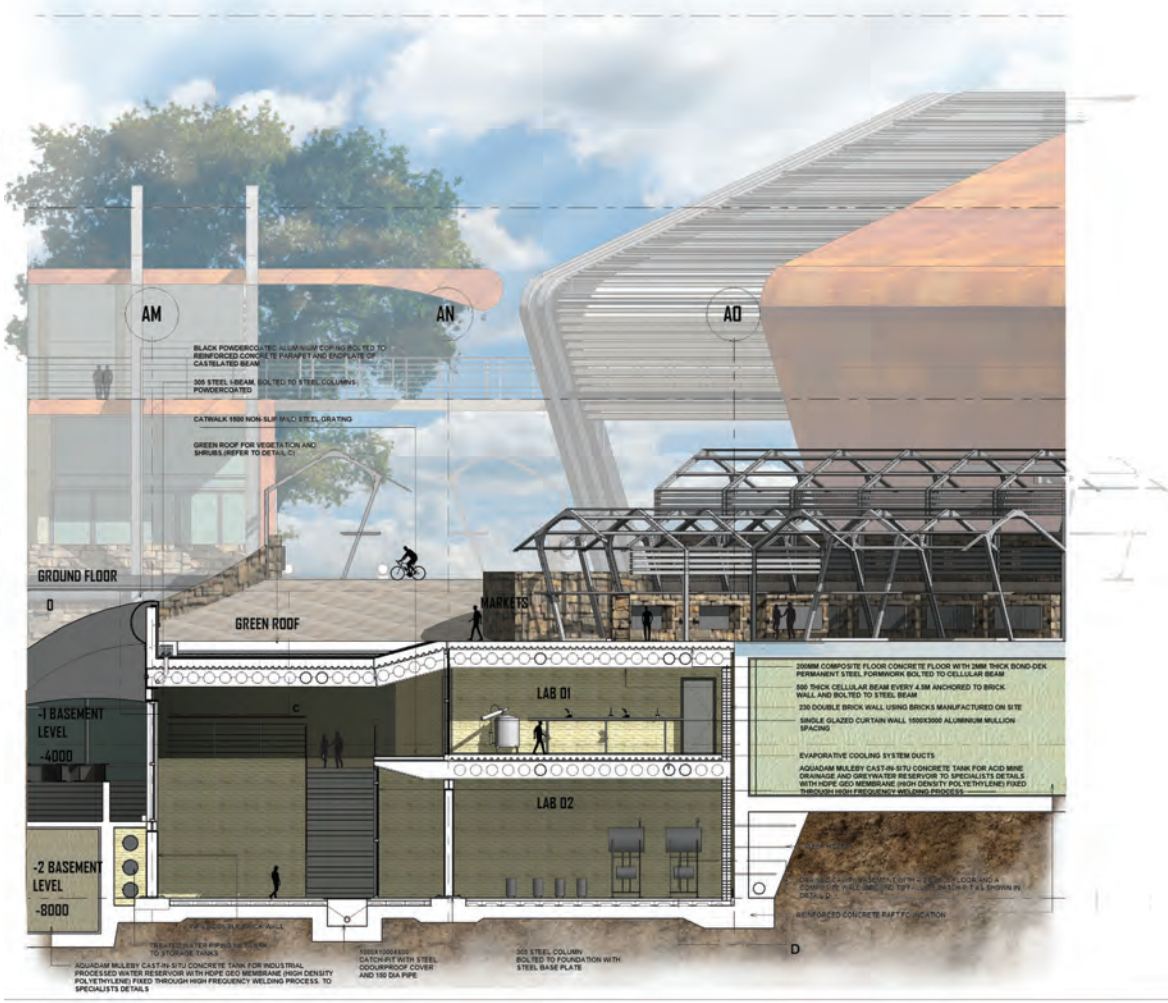
TION THROUGH THE SITE ON A-A

, 2017)



SECTION THROUGH THE SITE ON B-B

udinal Section B-B (Author, 2017)

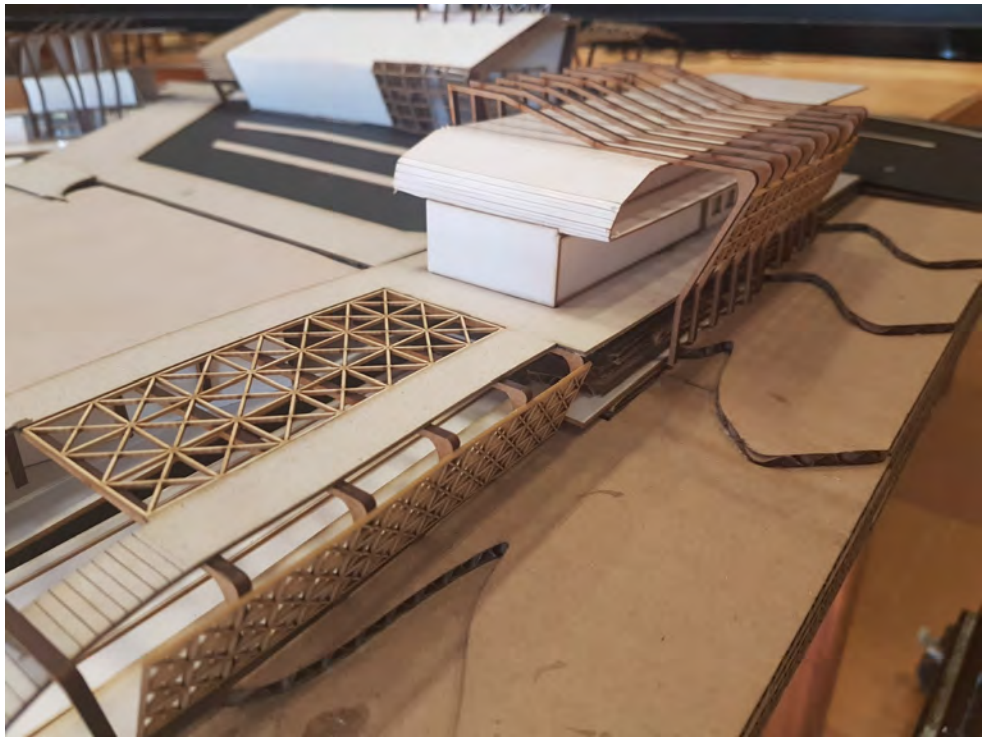


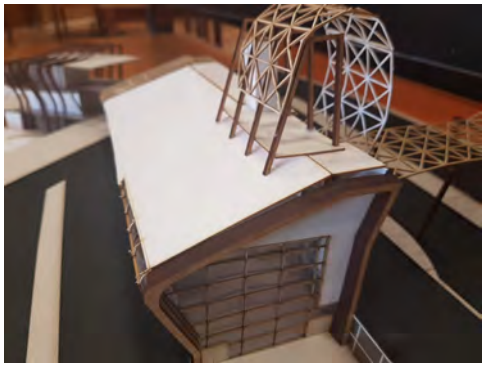
SECTION THROUGH AMD TREATMENT AND RESEARCH FACILITY ON C-C

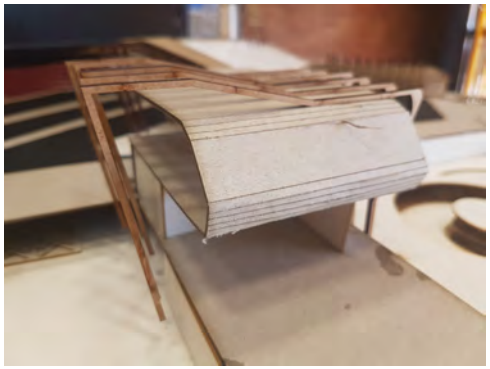
FIG 171 : Section C-C (Author, 2017)

3D OF PRECINCT WEST
FIG 172 : 3D context Render (Author

3D OF PRECINCT NORTH
FIG 173 : 3D context Render (Author, 2017)

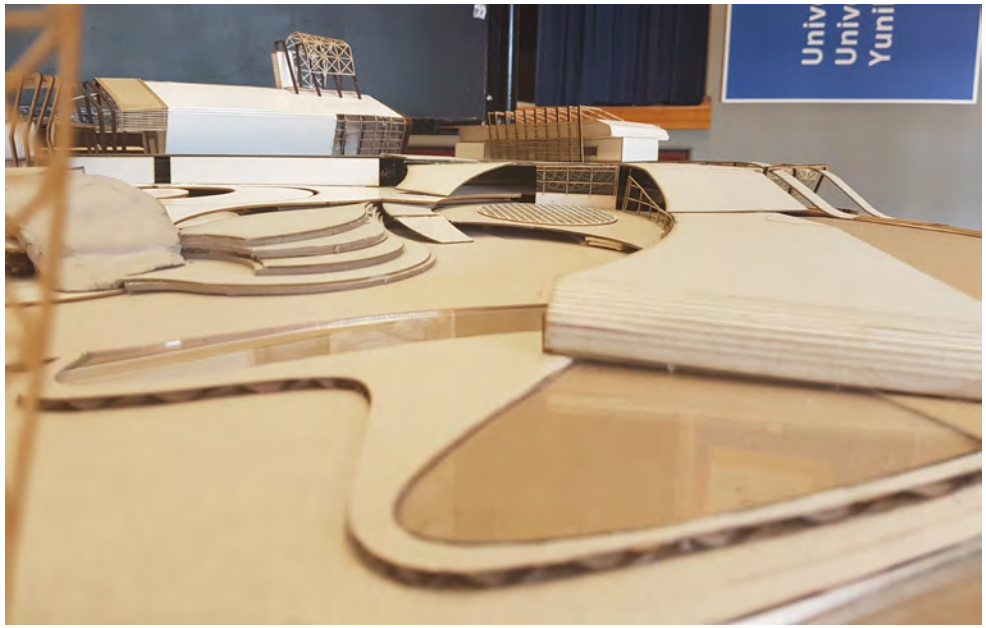


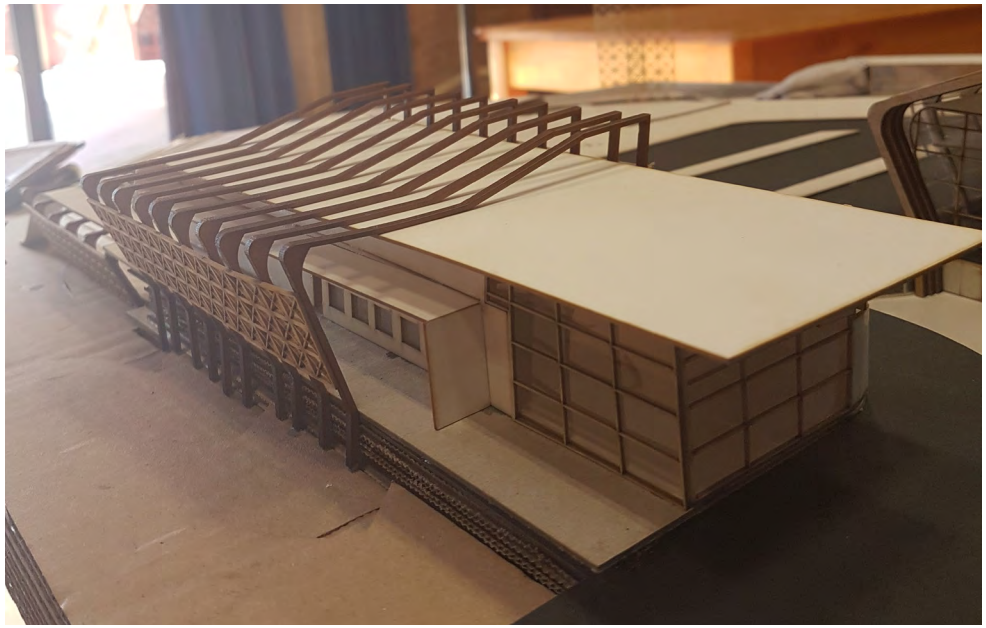




MODEL OF PRECINCT

FIG 174 : Photos of Model and presentation
(Author, 2017)





3D OF PRECINCT SOUTH

FIG 175 : 3D context Render (Author, 2017)

CHAPTER 10
CONCLUSION

reflection on a contextual regenerative intervention

10.1 CONTRIBUTION

This dissertation and its resultant design will contribute a new regenerative potential for the Witwaterstrand mining belt as well as other harmed, heritage sites.

At the Urban scale it strengthens networks, unlocks opportunities re-imagines identity and supports ecological and socio-economic resilience in the city of Johannesburg. Through this the metropolitan core and mining belt region are strengthened.

At site level this research proposal offers a new perspective in cohesively addressing heritage, ecological and socio-economic value, utilizing active regeneration to reactivate this lost space.

The research acts as a driver that counteracts spatial and social disparates and past injustices. Fragmentation of the city, racial segregation and economic stifling are reversed.
Specifically, the intervention generates strange links in the transit network that may empower a spatially disadvantaged southern region, while focusing on public space and functions that encourage interaction across the economic spectrum. Furthermore, targeted skills improvement programmes empower a disadvantaged community and offer opportunities for sustainable growth.

The ecological rehabilitation of water and site provides the setting for reconnection of humans and nature in a healthy dialogue, specifically through the practice of small scale urban farming, and AMD water treatment.

An important contribution is an essentially regionalist intervention, with an architecture inspired by and formed from the site conditions and mining heritage, both physical and social. This creates a new lense through which the city can better utilize existing situations and frameworks to tap into the latent potential of the mining belt. This captures the spirit of the place as well as the actual beauty that can derive from such a harmed setting, turning it into concrete, meaningful form.

Finally, Heritage is celebrated through the use of architectural follies that document the historical relevance of the mining belt that connects present Johannesburg to its past. This is an important perspective that could further an understanding of the evolution of events, spatially and socially. It highlights lost layers of significant history.

10.2 CONCLUSION

There is such beauty within the history of the mining belt which makes the act of regeneration important and beneficial. The progression of events led by this targeted regenerative theory has culminated in the mixed-use Philani junction, which is a multitude of things, a transport node, heritage centre, skills workshop, AMD water processing, market space and restaurant. These all form a cohesive solution under the theme of Active Regeneration and successfully rehabilitates and activates the mining belt.

It is clear from the research that a multi-layered precinct will emerge from the site and allow for a regenerative journey through this introductory intervention. It will lead users through an experiential series of events of that site through regionally suitable practices and engage with the community through a bustling transit node and targeted skills workshop.

At a larger scale this intervention will allow the mining belt to gain traction and momentum for development and potentially translate into significant economic gain not only for the spatially disadvantaged south but also for the city of Johannesburg as a whole. A compact polycentricity which pays respect to its tumultuous past, celebrates its rehabilitation and looks optimistically to its future.

ENDNOTES

1) Johannesburg's Spatial Development Framework for 2040 deals with key weak socio-economic areas of the city. It fails to include an in-depth or conceptual solution for the mining belt however it can be argued that this belt is one of the biggest socio-economic and ecological issues in the city.
2) Acid Mine Drainage occurs when pyrites and sulphides infect water on mine dumps and slime dams, percolating into the old mine shafts forming a hazardous by-product.
3) Booysens station is an existing Metro-rail Train station which links The East and West Rand along the mining belt. It presents several problem areas including accessibility and lack of inter-modality.

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DECLARATION

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

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

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

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