

Minimum Built Form for Maximum Urban Impact

Exploring the minimum built form that generates the greatest urban impact through architecture of closed-loop material systems.

Daniel Moreau

Supervisor: Francis Carter, for UCT

Co-supervisor: Tessa Brunette, for ARUP Cape Town

Design Dissertation report presented as part fulfilment of the degree of Master of Architecture (Professional) in the School of Architecture Planning and Geomatics, University of Cape Town.

06 December 2017

University of Cape Town



The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

With reference to issues of urban scale and local context, social identity and community. How do we define **new urban typologies**?



Guga S'Thebe Childrens Theatre recycled timber clad facades. Langa, Cape Town, 2017.

Abstract

Current top-down city planning strategies implement abstract ideas and impose them on a society while neglecting a crucial sense of public voice and inclusion (Krause, 2011). Through exploring ideas of community ownership of space and flexibility of social inhabitation, the design dissertation aims to understand the minimum built form that generates the greatest urban impact through architecture of closed-loop material systems. The inquiry focuses on urban upgrade that is low in embodied energy and holistic in its processes and implementation, where the social side of community participation is overlapped with technical explorations of material re-use and local procurement that promotes inclusive architecture. The use of low-tech materials requires high amounts of labour, which generates a positive state of community buy-in and inclusion both qualitatively (dignity and ownership) and quantitatively (Job creation). The design dissertation demonstrates how a relatively small building can make massive improvements in activation of site and precinct, being catalytic with community participation and urban upgrade of a rich, authentic nature.

The aspiration of this design research is to generate a speculative design framework and set of experimental design details that are useful to local municipalities, planners, urban designers, architects and NGO's that are interested in developing sustainable models for upgrade in under-resourced neighbourhoods of the Cape Town townships. With enough planning and unique tailoring of the building contract, procurement, project management and community involvement, these new typologies can offer more integrity than current and conventional builds. Unique teams require brave and unconventional practices that step out of the rigid comfort zone architects call the industry.



Fields of Play studio fieldwork session Langa, Cape Town, 2017.

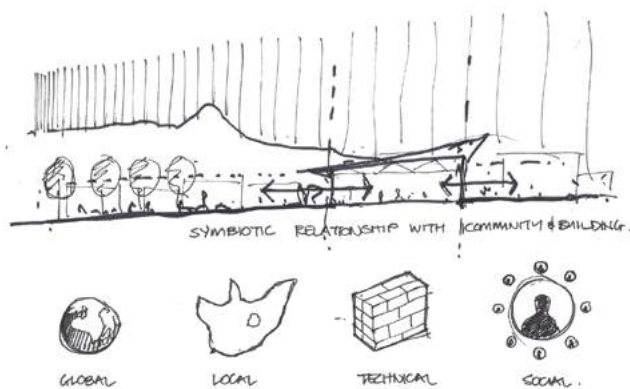
Acknowledgments

This research and design dissertation would not have been possible without the unlimited support of my fellow *Fields of Play* studio colleagues, family and friends.

I would like to extend my utmost gratitude to the ARUP Cape Town team for their consistent support and collaboration throughout all stages of the project process. All the time and energy invested in our studios' programme is much appreciated and I look forward to building further on the relationships made throughout the course.

In the area of fieldwork and site visits, special thanks must go to Tarzan Mbita, who provided invaluable local knowledge and guidance throughout most of the field work undertaken in Gugulethu and surrounds. Thanks must also go to Dumza Vokwana for welcoming us into his home and so enthusiastically sharing knowledge of his industry.

All the interviewees and participants are thanked for their' enthusiasm, time and willingness to engage in conversation. Thanks must go out to VPUU and their team for the time taken to offer critical feedback and critique the studio themes and ideas as they progressed.



symbiotic relationship between community and building
technology | nature

approach



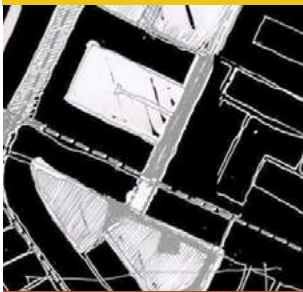
circular economy



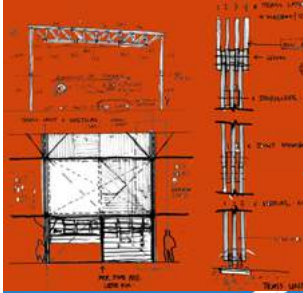
architectural proposition



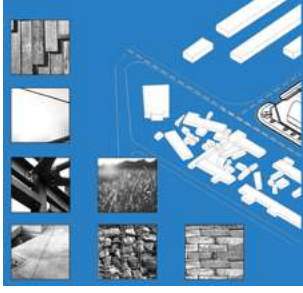
site



building



conclusion



Contents

Abstract
Acknowledgements

PART 1 – THE APPROACH

1.	Introduction to the Design Dissertation	11
2.	Research Question (Sub-Questions)	13
3.	Methods, Limitations and Scope	14

PART 2 – THE CIRCULAR ECONOMY

4.	Defining The Circular Economy	18
5.	Framing the Focus: <i>Reuse, Recycle & Deconstruction</i>	21
6.	The Local Space of Reuse in Public Architecture	25
7.	Life of Materials: Vertical Studio Fieldwork <i>Research Component 1</i>	27
8.	Theory & Technical Study: Key Design Findings <i>Research Component 2</i>	29

PART 3 – ARCHITECTURAL PROPOSITION

9.	The Building Program	37
10.	Skateboarding as a Tool for Social Change	39
11.	Local Fieldwork Studies: Existing Community Research <i>Research Component 3</i>	42

PART 4 – THE SITE

12.	Siting and Context	47
13.	Design Process Development	57
14.	Spatial Framework and Precinct Vision	62

PART 5 – THE BUILDING | 4 LENSES OF FOCUS

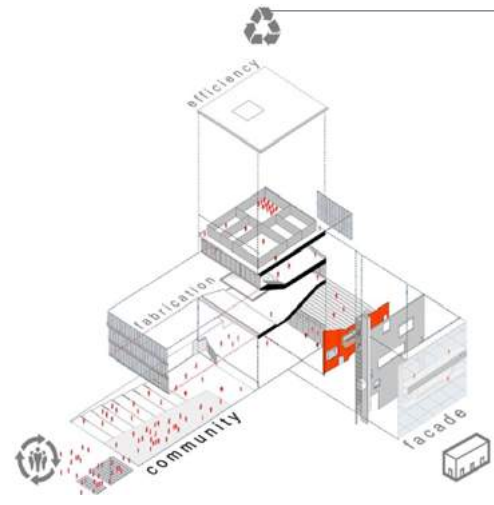
15.	Structure	67
16.	Space & Form	73
17.	Materiality	77
18.	Sustainability: Building Performance	87
19.	The Life of the Building	88

PART 6 – CONCLUSION

20.	Conclusion and Findings	99
21.	References	100
22.	Image Credits	101

ADDENDA

Addendum A: Plagiarism Declaration
Addendum B: Ethics in Research Approval Form
Addendum C: Structured Interview Topics



part 1

the approach



“...timber is always coming in, its a nice second-hand product because its **easy to grade, clean up and sell.**”
Pierre Fourie ,*Doempie Second Hand Building Materials*

Vast second-hand timber stockpile at Ross Demolition Yard in Lansdowne, Cape Town, 2017.

1 Introduction to the Design Dissertation

Current top-down city planning strategies implement abstract ideas and impose them on a society while neglecting a crucial sense of public voice and inclusion (Krause, 2011). Through exploring ideas of community ownership of space and flexibility of social inhabitation, the design research aims to understand the minimum built form that generates the greatest urban impact through architecture of closed-loop material systems. The inquiry focuses on urban upgrade that is low in embodied energy and holistic in its processes and implementation, where the social side of community participation is overlapped with technical explorations of material re-use and local procurement that promotes inclusive architecture.

The Design Dissertation is fed with theory and technical research components with their respective fieldwork, as well as local area fieldwork and rigorous contextual analysis. Through these processes, the architecture emerged in the form of a catalytic active learning centre which develops creative skills through a youth-based educational facility and public skate park, incorporating concepts of the circular economy into the ethos and activity of building program and construction.

In recent years, minimising the energy consumption of buildings has been an important goal in urban planning and architecture (Okeil, 2010). Energy use is a fundamental issue as it is the generally the most important resource expended during a building's life time. Investment and exploration into low-energy buildings has therefore become an essential research field (Thormark, 2001). Creating a green star rated building in the contemporary age takes huge investment and high amounts of embodied energy. These two factors render the field of sustainable design exclusive to a small percentage of the urban realm. How can architecture re-script the way we view material re-use and local resources in a manner that aids sustainability in a buildings life before, during and post occupancy? From a technical level, this concept speaks to 'minimum built form' in a relation to energy (resource) use and economy while maximising social performance.

This idea developed into local research where my fieldwork colleges and I interviewed traders, tracked materials and developed a matrix of possibilities and impracticalities in the local second hand material scene. I also looked at best practice and case studies of community centred, low-energy buildings in Cape Town, and compared findings to global research of circular economy in architecture to develop guidelines as a system of rationale to steer the technical line of inquiry. This soon became a theme of, Low Energy, High Performance, and develops into a set of criteria that plugs into the design process at each stage.

The selected site and proposed intervention receives anchorage from a precinct framework strategy, which prioritises vital existing site features and provides a social and spatial framework for future activities and occupation to evolve and develop over time. At a neighbourhood scale, the site regeneration aims to reinforce existing movement routes between informal settlements and the transport hubs in Northern Gugulethu, providing a multi-use space of safety and security along the busy pedestrian networks. This overall architectural arrangement intends to analyse and understand a type of social architecture that rescripts traditional planning with a particular focus on collaborative community involvement, material reuse and local resource inclusion. The technical side of applying a suitable combination of 'closed-loop', natural and low-energy building materials aims to address the current issue of waste in the building industry and to educate youth and the community on sustainable building technologies.

The aspiration of this design research is to generate a speculative design framework and set of experimental design details that are useful to local municipalities, planners, urban designers, architects and NGO's that are interested in developing sustainable models for upgrade in under-resourced neighbourhoods of the Cape Town townships.

The report begins with Part One, which introduces and describes the design dissertation topic, questions and methods of design research. In Part Two the inquiry into an architecture of circular economies is set up by summarising principles synthesised from emerging global literature reflected back and analysed to the local space of low-energy architecture in the South African context through best-practice case study analysis and fieldwork.

Part Three describes the emerging architectural proposition in terms of social program, community intervention and youth-development. Following the programmatic intent, Part Four unpacks the architecture and urban strategy through site and precinct development followed by a critical breakdown of the architectural proposition through lenses that focus on structure, form, materiality, inhabitation and environmental performance. These lenses of focus make direct links back to circular economic application in our local building industry while describing how the implementation of such design and technological tools have influenced the spatiality, making and social sustainability of the building.

The concluding part ties up the architectural synthesis through extracting key findings and reflecting on the underpinning theme of how material reuse, local procurement and community participation can influence public architecture.

2 Research Question and Sub-Questions

How can flexible architecture of closed- loop material systems influence public space making that demonstrates minimum energy input for maximum social inhabitation?

How can the re-use of materials and local inclusion in procurement/manufacture aid in the holistic and sustainable design of building interventions?

How can the embodied energy of a structure be reduced through future conscious design (e.g. temporary structures, waste reduction in dismantling, incremental phasing etc.)?

What are the opportunities for local inclusion in the building intervention?

How can incremental architecture provide a platform for positive urban growth of under-resourced neighbourhoods?

The research methodology for the design dissertation includes both creative and analytical methods which provide a blend of qualitative and quantitative data to generate a rigorous set of mixed-method based findings. These mixed method forms of research evolved into critical components that feed the theoretical and technical lines of design inquiry. These methods include on-the-ground fieldwork, spatial and social analysis, theoretical and technical review of key literature along with technical workshops and seminars with environmentally driven practitioners and professionals.

The breakdown of the research components in this document are as follows:

- Research Component 1 (Material Driven Fieldwork): *The Life of Materials*, Technical study on local materials in Gugulethu and Surrounds, Cape Town. Vertical Studio Design Research Group.
- Research Component 2 (Study Report): *The Social Agency of Architecture*, Theory and Technology Studies course. Global and local research on inclusive design processes and low energy building materials.
- Research Component 3 (Site-Based Fieldwork): Local fieldwork and Research limited to the selected site and immediate surrounds.



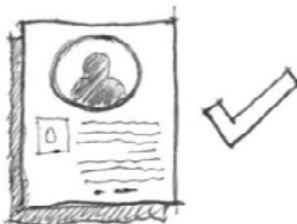
These research components form the basis of the structured gathering of information using tools such as:



Direct observations (spatial): Spatial observation and analysis recorded through on-site documentation and drawing. Physical elements such as built form, open space, pedestrian space, amenities, existing services, infrastructures and pedestrian movement are documented and analysed.

Direct observations (social): Documenting operations and activity of inhabitants in order to explore the relationship between space and event: i.e. the spatial influences of inhabitation have been investigated and critically understood in terms program and event.

Interviews: Interviews conducted with community members and traders/business owners in order to understand the usage dynamic of public space and event over time or material resource streams.



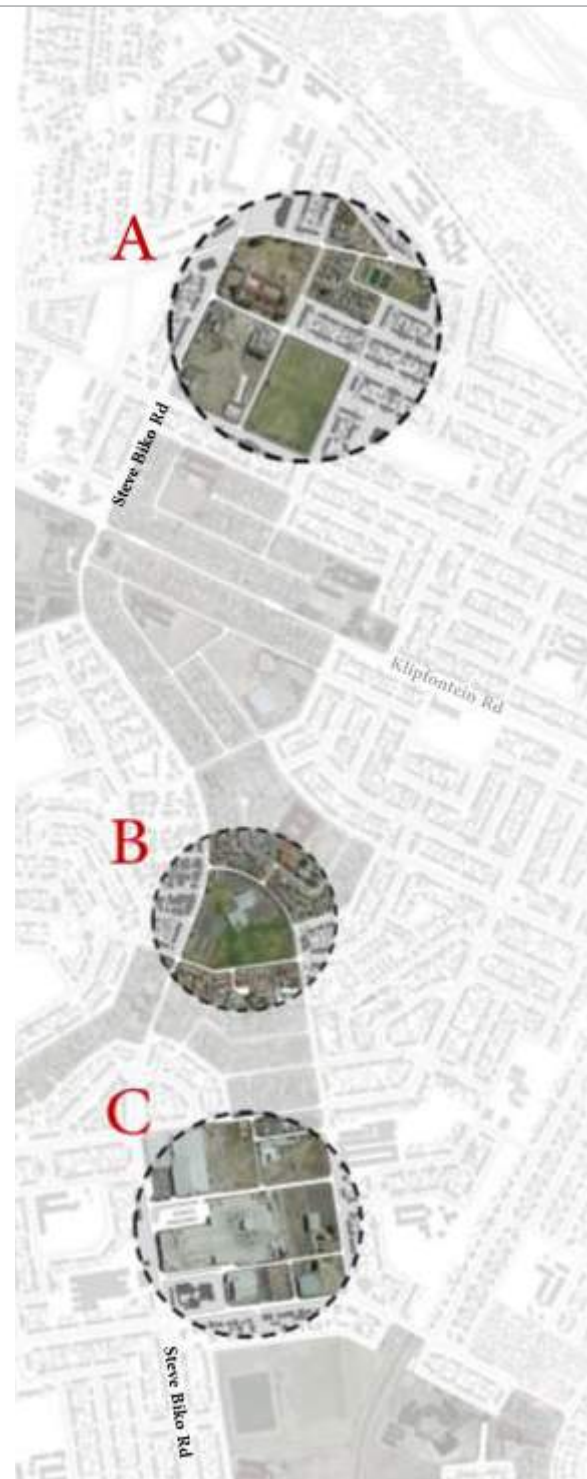
These analytical methods are complemented with creative explorations of flexible inhabitation in fixed space while analogue and digital drawing are used to overlay structural, social and technical informants to generate and develop architectural propositions.

Design development stages have been endorsed with collaborative workshops and design seminars with environmental, structural and technical specialists from the ARUP Cape Town team. These cyclic sessions aided the progressive development of a holistic design process that allowed for the calibration of elements of technical construction in relation to the scale of inhabitation, social context and environmental response.

Limits & Scope of Fieldwork :

The physical limitations of the field work vary as mentioned in the above breakdown of each research component. All fieldwork and interviews were undertaken prior to August 2017. Human subjects over 18 years of age were interviewed, after ethics clearance from the Faculty of EBE in Ethics in Research Committee. The arrangement of the interviews is based on programmatic information gathering for which no ethical conflicts were breached. (Refer to Appendix 1: Interview Consent Form and Appendix 2: Structured Interview Topics.) The space of the local site-based fieldwork was limited to northern Gugulethu and the immediate surrounding neighbourhoods with specific focus given to public open spaces (formal & informal) and community institutions indicated in portion A alongside . Sites of interest that support a range of activities have been selected and analysed.

Care was taken to be transparent and clear in objective by explaining to interviewees that the research had educational and academic purposes, without raising expectations of potential built work or improvements. Photographic documentation is used to capture qualitative social data; however, subjects remain unidentifiable unless full consent has been granted. Institutional permission and local guides were pre-arranged by the research supervisor and department for student access to particular facilities where required.



Contextual map of Gugulethu indicates portions of interest for local fieldwork.



part 2

the circular economy

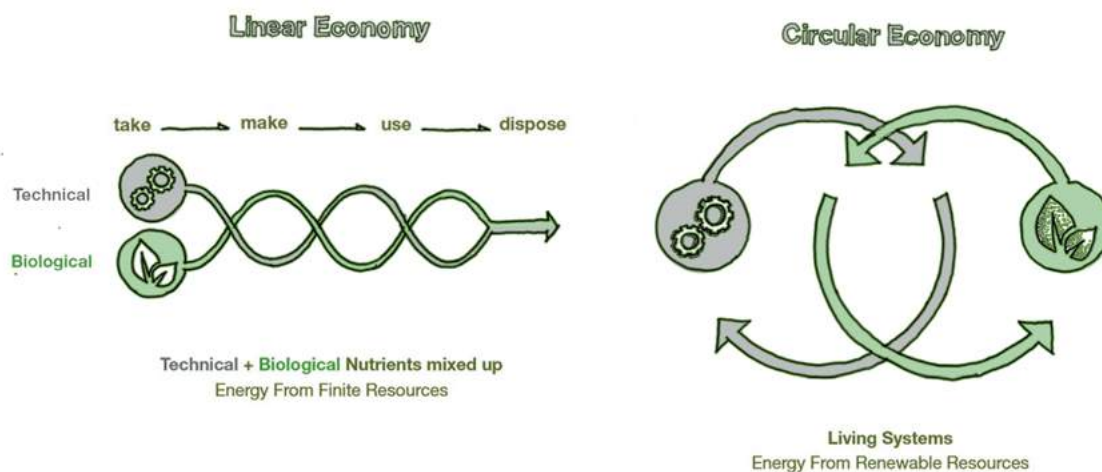
Defining the Circular Economy

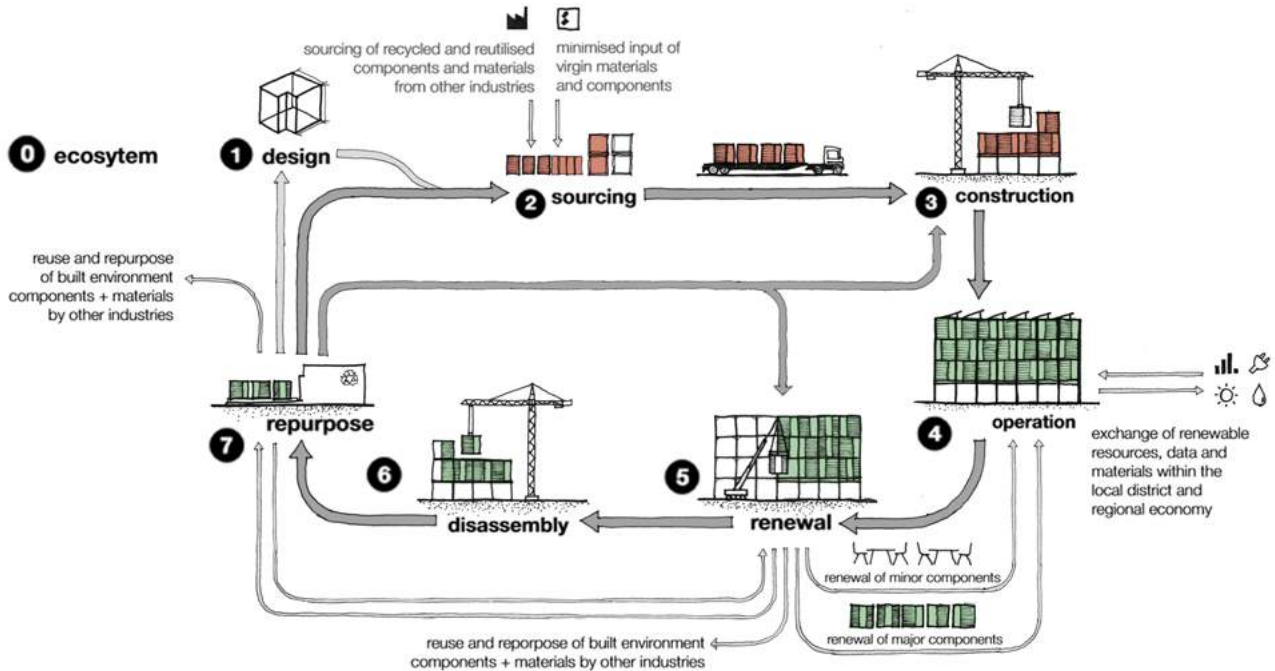
Circular economy by definition refers to the idea of a cyclic system of resource use, production and consumption, rather than the current linear process that is responsible for a large chunk of the world's waste, consumption and emissions. My design inquiry aims to critically investigate central aspects of the circular economy involved specifically in our Built Environment, with a focus on materials that boast low embodied energy and align with the socio-economic opportunities of Gugulethu and surrounding areas.

It is quite clear that the journey towards a truly circular economy will take many years, if not decades or centuries. It is also clear to me that for any tangible widespread success of the movement, this journey requires the unity and cooperation of all of society in order to make vital reductions in resource use, waste and carbon emissions. Currently, any authentic application of circular economic thinking to the built environment sector is not straightforward. Many existing frameworks eloquently express principles and philosophies; yet fail to offer the necessities and specifics on how built environmental assets must be developed, procured, designed, constructed, and operated, maintained and repurposed. (Zimmann, 2016)

Although there does exist a domain of reuse in avenues that rely on temporary structures for mobility or flexibility (i.e. armed forces make use of inflatable pontoons, tents etc.), my intention focuses more on building material reuse in fixed or semi-fixed structures which have a level of permanence with ability to adapt over time to suit user-based growth. This avenue offers multiple opportunities through the structure itself, its components or its materials. These methods always involve the factor 'time' and define a new sustainable quality that adapts in some form as a response. This quality combines technology, risk and sustainability management (Baker-Brown, 2017).

Diagrams of a linear economy vs. a circular economy.





Application of Circular Economy Principles to Commercial Property

Current mainstream building technologies use many composite materials such as welded steel, re-enforced concrete and plastics which cannot be ‘undone’ or separated easily. This physical property of commonly used composite and permanently joined materials significantly eliminates possible reuse potential resulting in today’s building industry facing a trifold challenge as outlined by Baker-Brown:

1. Enabling future reuse of components and materials through development of efficient and waste free construction methods (Baker-Brown, 2017, p xvi).
2. Buildings need to be designed for minimum resource consumption during operation and maintenance through flexibility and adaptability to change in use (Baker-Brown, 2017, p xvi).
3. Developing technical methods of construction that enable deconstruction of buildings and infrastructure while maintaining the highest value, quality and usability of product. (Baker-Brown, 2017, p xvi).



Regenerate

Regenerating and restoring natural capital

Safeguarding, restoring and increasing the resilience of ecosystems

Returning valuable biological nutrients safely to the biosphere



Share

Maximising asset utilisation

Pooling the usage of assets

Reusing assets



Optimise

Optimising system performance

Prolonging an asset's life

Decreasing resource usage

Implementing reverse logistics



Loop

Keeping products and materials in cycles, prioritising inner loops

Remanufacturing and refurbishing products and components

Recycling materials



Virtualise

Displacing resource use with virtual use

Replacing physical products and services with virtual services

Replacing physical with virtual locations

Delivering services remotely



Exchange

Selecting resources and technology wisely

Replacing with renewable energy and material sources

Using alternative material inputs

Replacing traditional solutions with advanced technology

Replacing product-centric delivery models with new service-centric ones

The ReSOLVE framework is a key output of the Ellen MacArthur Foundation's research which outlines six actions to guide the transition towards a circular economy. Their framework indicates six categories of implementation.

1. Regenerate 2. Share 3. Optimise 4. Loop 5. Virtualise 6. Exchange

5 Framing the Focus:

Reuse, Recycle & Deconstruction

Following on from Baker-Brown's three key points on building material reuse, the The ReSOLVE framework is a significant production of the Ellen MacArthur Foundation's research which outlines six actions to steer the built environment towards a circular economy. Their framework indicates six categories of implementation:

1. Regenerate 2. Share 3. Optimise 4. Loop 5. Virtualise 6. Exchange

The six elements can be applied to products, buildings, neighbourhoods, cities, regions, or even to entire economies (ARUP, 2016). In this section of the report, the framework is referenced to illustrate how the circular economy can be applied in the built environment with specific focus on the 'Loop' aspect of circular economic thinking outlined by the ReSOLVE framework, which focus on:

Keeping products and materials in cycles, prioritising inner loops: This focuses on disassembly during the design phase and increases the possibility of reuse pathways for components and materials. It also enables greater integration of recycled materials and components from other industries into the built environment (Zimmann et al., 2016. p.31).

Remanufacturing and refurbishing products and components: In the built environment, maximising the use of repurposed materials, components and structures supports their circulation within the industry and minimises the need for virgin materials. Remanufacturing keeps materials, components and even structures in use for longer, helping to reduce or lower waste" (Zimmann et al., 2016. p.31).

Recycling materials: Recovering and recycling valuable materials reduces resource use and minimises waste, and it can cut costs and earn revenues for stakeholders in the built environment. Buildings and structures can be designed to allow component parts to be easily separated and recycled. (Zimmann et al., 2016. p.31).

To translate the above into defining terms, the technical investigation of 'Looping' focuses on three key physical building aspects of the circular economy:

- building material reuse,
- low energy / natural materials (reduction of embodied energy in production) and
- waste reduction through designing for disassembly

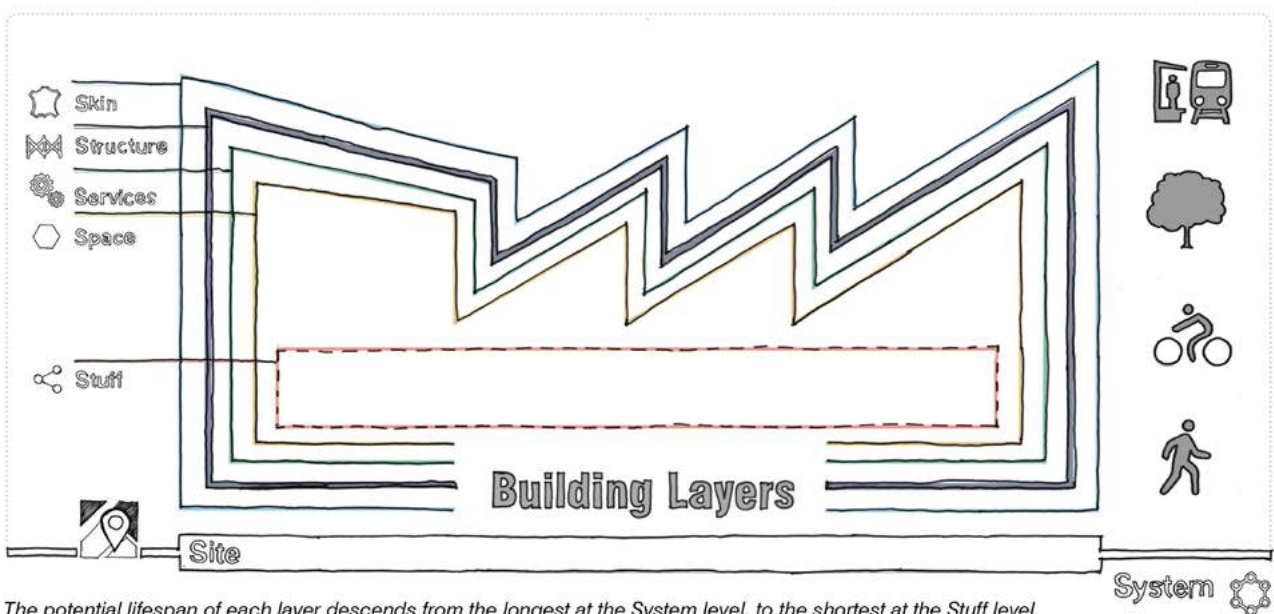
The design takes the abstract concepts of waste, energy, materials, and use and aims to illustrate a realistic way of viewing architecture and the world. (Baker-Brown, 2017).

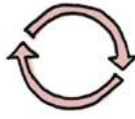
In the 1970's, architect Frank Duffy first developed the concept of building in 'layers', and was developed by Stuart Brand in the 1990's (Zimmann, 2016). This concept suggested that a building is made up of interlinking layers, each with varying lifespans. Brand's notable model includes six layers: Site, Structure, Skin, Services, Space, and Stuff — see figure below (Zimmann, 2016).

The diagram below illustrates how the layers model would operate in the built environment context. An additional layer, System, is added to illustrate how this example could be applicable at larger scales such as district or precinct level. Building in layers essentially means that each element may easily be separated and removed. This model facilitates reuse, remanufacture and recycling which are key aspects of the technical inquiry. For example, façade elements or structural components may be designed and fitted as independent entities, integrated with other building systems but not permanently intertwined with the fabric of the building. Building in separate layers with different lifespans has the added value of permitting elements to be repaired, replaced, moved or adapted at different times without affecting the entity as a whole.







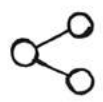
'This reduces unnecessary obsolescence and increases flexibility of use and longevity over time' (Zimmann et al., 2016. p.33).

Building in Layers, enables isolation of elements and systems





Loop

<p>System includes the structures and services that facilitate the overall functioning of the system, e.g. roads, railways, electricity, water and waste water systems, telecommunications, parks, schools, digital infrastructure</p>	<p>System</p> 	<p>Renewables and circular resource flows (energy, water, waste etc). Adapt use over time, e.g. commercial to residential</p>
<p>Site is the fixed location of the building</p>	<p>Site</p> 	<p>Retrofit and reuse existing buildings and assets for different uses</p>
<p>Structure is the building's skeleton including the foundation and load-bearing elements</p>	<p>Structure</p> 	<p>Design for disassembly. Regeneration of buildings for mixed use</p>
<p>Skin is the façade and exterior</p>	<p>Skin</p> 	<p>Modular design and off-site prefabrication</p>
<p>Services are the pipes, wires, energy and heating systems</p>	<p>Services</p> 	<p>Open design and operating standards. Rainwater harvesting, grey water recycling, battery storage on-site</p>
<p>Space is the solid internal fit-out including walls and floors</p>	<p>Space</p> 	<p>Remanufacturing of products and components</p>
<p>Stuff is the rest of the internal fit-out including the furniture, lighting, and ICT.</p>	<p>Stuff</p> 	<p>Remanufacturing of products and components.</p>

The potential lifespan of each layer descends from the longest at the System level, to the shortest at the Stuff level. The table represents the potential for LOOP principles swithin each building layer.



Reclaimed brick traders operating on the road side in Philippi, Cape Town. 2017

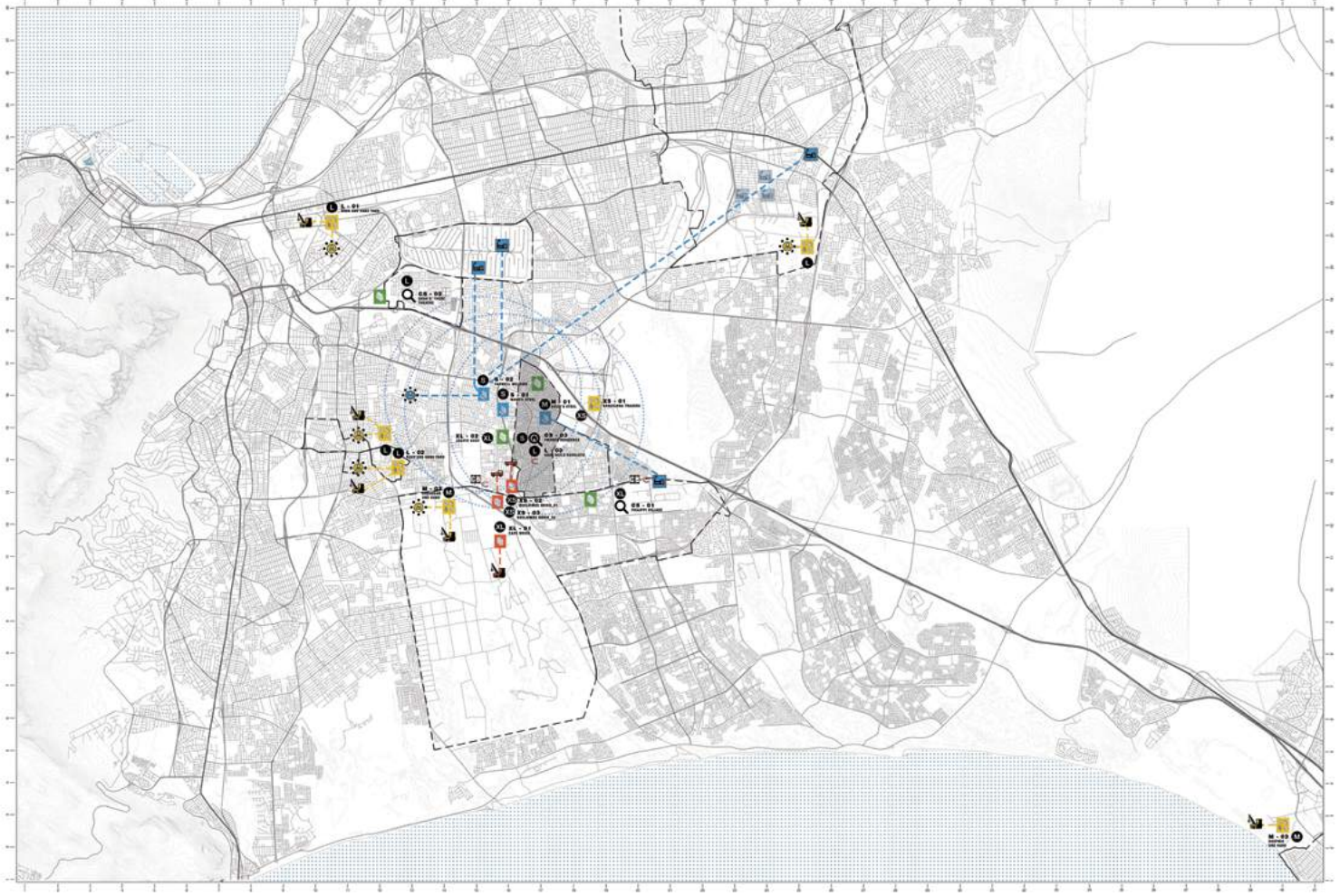
6 The Local Space of Reuse

in Public Architecture

Locally, in South Africa and the Western Cape, poor overall government performance, spatially segregated planning remnants, regulatory issues along with a myriad of other real life obstacles stand in the way of any potential widespread traction of circular-minded thinking. As a broad research topic with the aim of applying local relevance, the task of finding best practice of reuse in a locally built project revealed the scarcity of formal built works of this basis. This shortage of sustainable building examples highlights the importance of the study in unlocking where the potential lies for closed-loop building systems in our South African cities.

Local case studies were selected which represented varied building typologies and programmatic function with differing types of materials used. The analysis of the Guga S'Thebe Children's Theatre in Langa, and the new Delft ECD, both in the greater Cape Town region, entailed a breakdown of material components according to the 'building layers' method mentioned previously. Each building layer and material component is analysed in terms of the LOOP criteria for circular economy in the built environment. The material based findings provided valuable first hand data on three main local materials namely: recycled timber, shipping containers, tyre Earth walls and eco-bricks. This information was synthesised into documentation that selects technical and practical informants for design of the building components.

These case studies underpin the common thread of a materiality and construction systems that specifically make use of reused materials and low-energy construction. They exemplify resource utilisation in a way that 'mines the Anthropocene' and responsively allows these methods to work with the community in ways that encourage a symbiotic relationship between the building and its inhabitants.



1 Quantitative
– Material based

2 Tracking Study
– Material Networks

3 Social Narrative



MAMPUYA O. MULENGE
 Position: Owner
 Age: 55 years
 Language: French, English & isiXhosa
 Trade: Makoti Metal & Steel Works
 Location: Cnr. Steve Biko St. & NY144, Gugulethu

He used to be a handy man before he started this business and strongly believes that **“there is no impossible in metal works by the welding creation, you need to make it possible to get a price for that.”**

Indicative metropolitan map of sites visited in Cape Town, material adapted from the ‘Life of Materials’ vertical studio research document.

01 MAKOTI WELDING WORKS

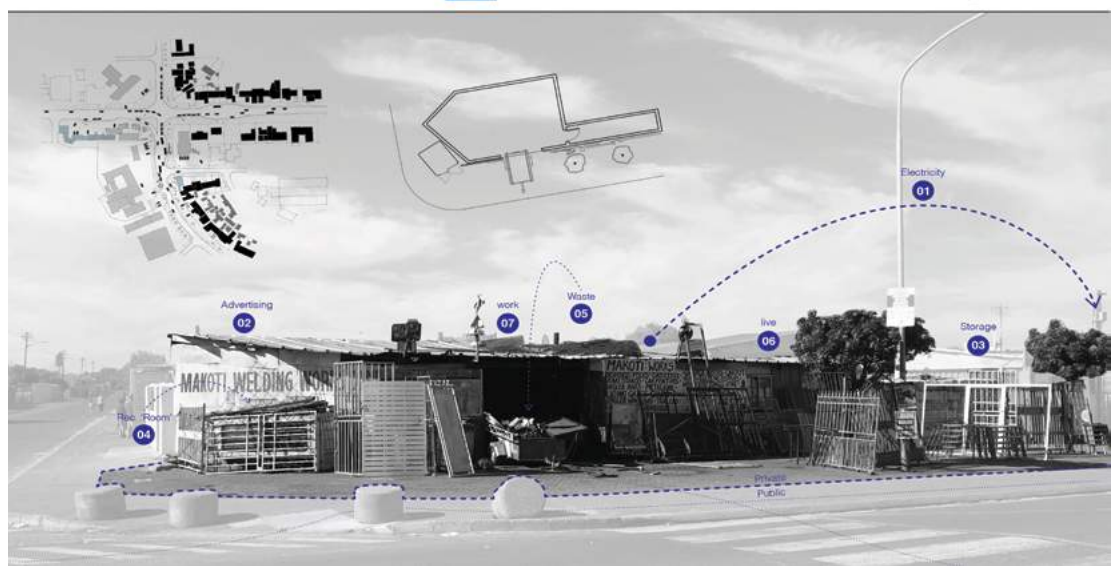
Steve Biko St, Gugulethu



workshop: 70m²
 outdoor : 25m²

S - 01

Makoti Welding Works, Trader profile



Overlaid photograph representing the typical trader survey and service / spatial analysis image adapted from the ‘Life of Materials’ vertical studio research document. Makoti Welding Works, Gugulethu, 2017

7 The Life of Materials:

Vertical Studio Fieldwork Research Component 1

The fieldwork report and research component, titled Life of Materials, provides material grounding to the local space of material re-use in a way that gathers useful qualitative, quantitative and socially related data relevant to the architectural Design Dissertation. The collaborative fieldwork was undertaken as a team of two Masters students and four Honours student from the 'Fields of Play' design research studio and study looks at the life cycles and recycling of building materials in Cape Town and the surrounding regions of Gugulethu: the activities of waste pickers, crafts persons and materials traders in relation to sites of supply, distribution, transit and reassembly. The interview questions were tailored to support analysis through three lenses:

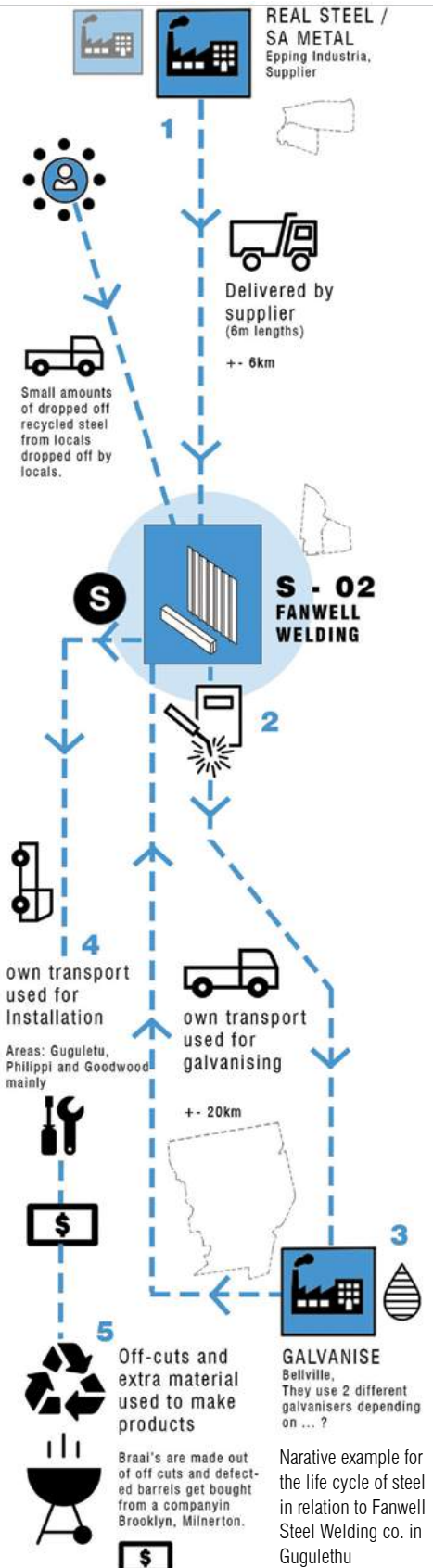
1. Quantitative - Material Based: volumes, pricing and range.
2. Tracking Study – Material Networks: supply, distribution, transit and reassembly.
3. Social Narrative – Narrative of traders and spatial implications.

This fieldwork report yielded rich findings on various levels. The understanding of the certain material networks and 'life-cycles' revealed information on transport, manufacture, processing and waste (discarded material). Social narratives describing the often tough conditions involved in the material restoration industry were complemented by inspirational stories embodied by the entrepreneurial spirit of many interviewees. Throughout the design process, quantitative findings pertaining to specific material pricing, volumes and sourcing became the most valued information from which to base technical and material decisions.

The following table overleaf indicates the local procurement and craft options that drive the material selection and architectural appropriation of the building design from a practical, economic and structural perspective. These traders/sources form a core part of the supplier base and sub-contracting teams involved in the speculative construction of the building.



Categorisation of trade typology based on size



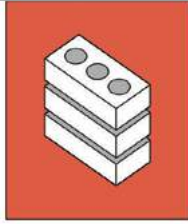
Narrative example for the life cycle of steel in relation to Fanwell Steel Welding co. in Gugulethu



MULTI MATERIALS



PIERRE FOURIE
Position: Owner
Age: 42 Years
Language: Afrikaans & English
Trade: Doempie Second-Hand Yard
Location: Nortje Street, Strand



BRICK



MABHUTI QUKU
Position: Employee - Sales
Age: 28 years
Language: isiXhosa & English
Trade: Recaimed Building Materials
Location: Duinefontein Rd., Philippi



TIMBER



PIERRE FOURIE
Position: Owner
Age: 42 Years
Language: Afrikaans & English
Trade: Doempie Second-Hand Yard
Location: Nortje Street, Strand

LIEZEL TEMBA
Position: Employee - Sales
Age: N/A
Language: Afrikaans & English
Trade: Ross Second-Hand Yard
Location: Maitland
Consent: See Addendum 5



RC/RUBBLE



TYRE



DUMILE VOKWANA
Position: Employee
Age: 57 years
Language: isiXhosa & English
Trade: REDISA
Location: Claremont

Local Sourcing of Second Hand Materials

8 Theory & Technology Studies:

Key Design Findings

Research Component 2

This research study report critically describes my understanding of the ‘agency of a social architecture’ in re-scripting traditional planning with a particular focus on collaborative community involvement, material reuse and local resource inclusion in urban interventions.

The notion of catalytic and self-motivated urban upgrade that has a framework and foundation to adapt over time to suit the authentic needs of neighbourhoods underpins the theoretical narrative to both global and local literature. Working from the ground up and involving local resources where possible, inspires a palette of socially engrained materiality with a sensitive architectural language to emerge.

The local literature provides practical grounding in these theories, backed up by built works that demonstrate the effectiveness of their principles, methods and model. Many of the findings on participatory methods and tools have aided Design Dissertation speculation giving rigor to the architectural inquiry. The findings also contain direct design principles and tools that support the design process in relation to safe public space articulation, siting and spatial arrangement, movement and connectivity. These direct spatial and physical findings are broken down into a set of site-specific design principles that have informed the architectural design strategy as listed below:

- Connectivity on a local context scale;
- Site-asset preservation and appreciating the existing;
- The strategic stepping back of the strong urban wall (continuous built-up street edge with little relief or openings.) Street activation;
- Safe routes and clear multi-directional circulation;
- Building up the street edge;
- Adaptability and incremental growth;
- Support flexible event in public open space with adequate and informed resource provision.

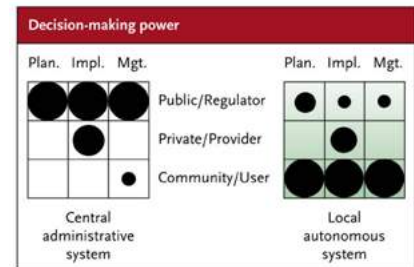


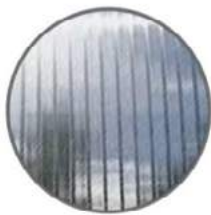
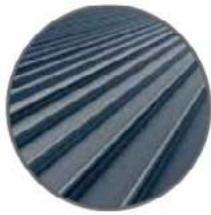
Diagram illustrating the difference between a central administrative system and a local autonomous system such as the VPUU model (source: vpuu manual p.142)



Community involvement in VPUU's innumeration process at Monwabisi Park, 2011 (source: vpuu.org.za)



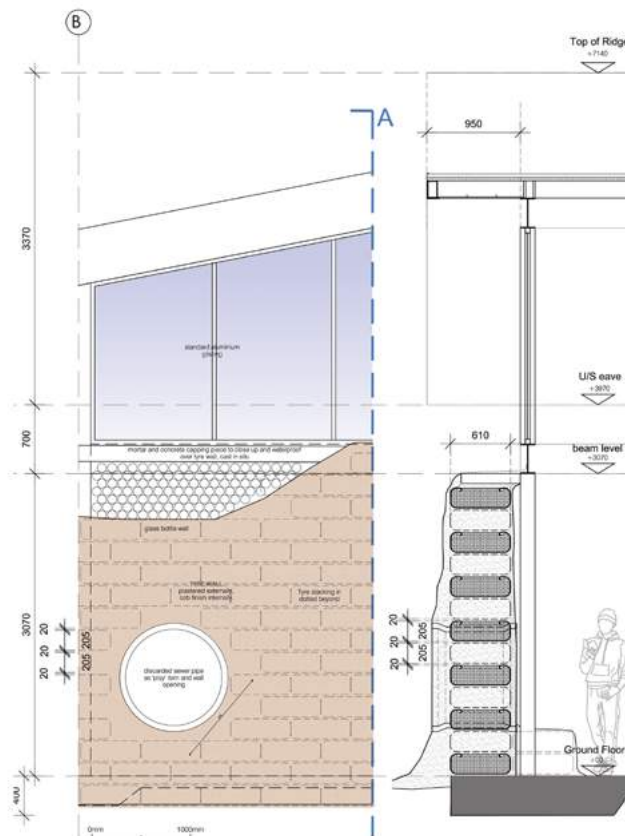
VPUU's concept model based on five core components originally derived from the Brantingham crime pattern theory. (source: vpuu manual p.17)



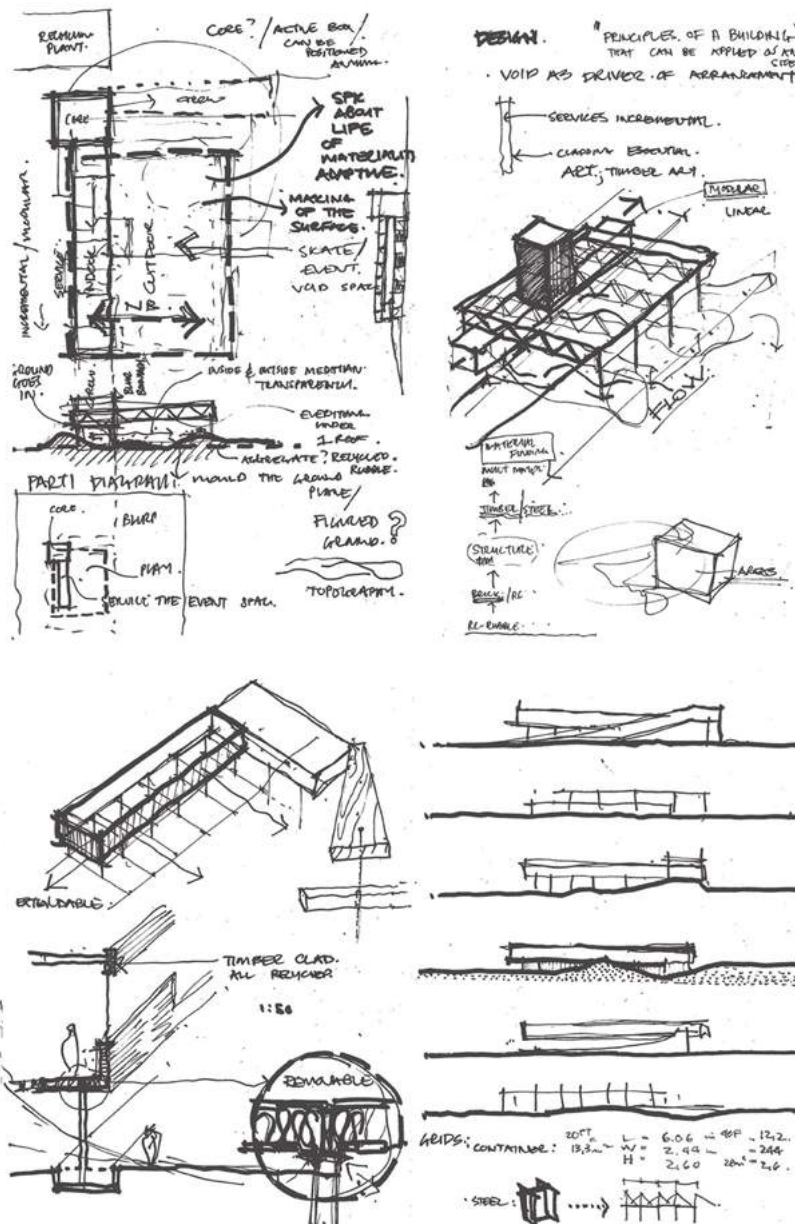
key material & component images from Guga S'Thebe Childrens Theatre.

The technical findings indirectly and directly relate to building material reuse and local resource & skill inclusion. The indirect findings refer to practices or methods that influence circular minded design and community participation, whilst the direct general findings relate to physical discoveries of a technical nature in relation to structure and materiality. The collection of key principles has informed a provisional material selection and a technical set of appropriate details of interest that directly inform the design project.

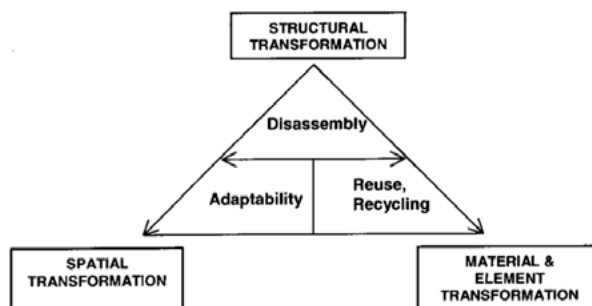
Three core 'circular-minded' principles for building design have emerged out of the technical study - Reuse of material, designing with natural building materials and for low-waste deconstruction. The selective synthesis of all three of these aspects into a composite design framework drives the technical development of the architecture. Building layers all possess unique physical qualities that were explored in relation to the principles of closed-loop sustainable design. This narrative of the circular economy in building construction speaks back to the triple bottom line principles of sustainability in addressing issues of a social, economic and environmental nature.



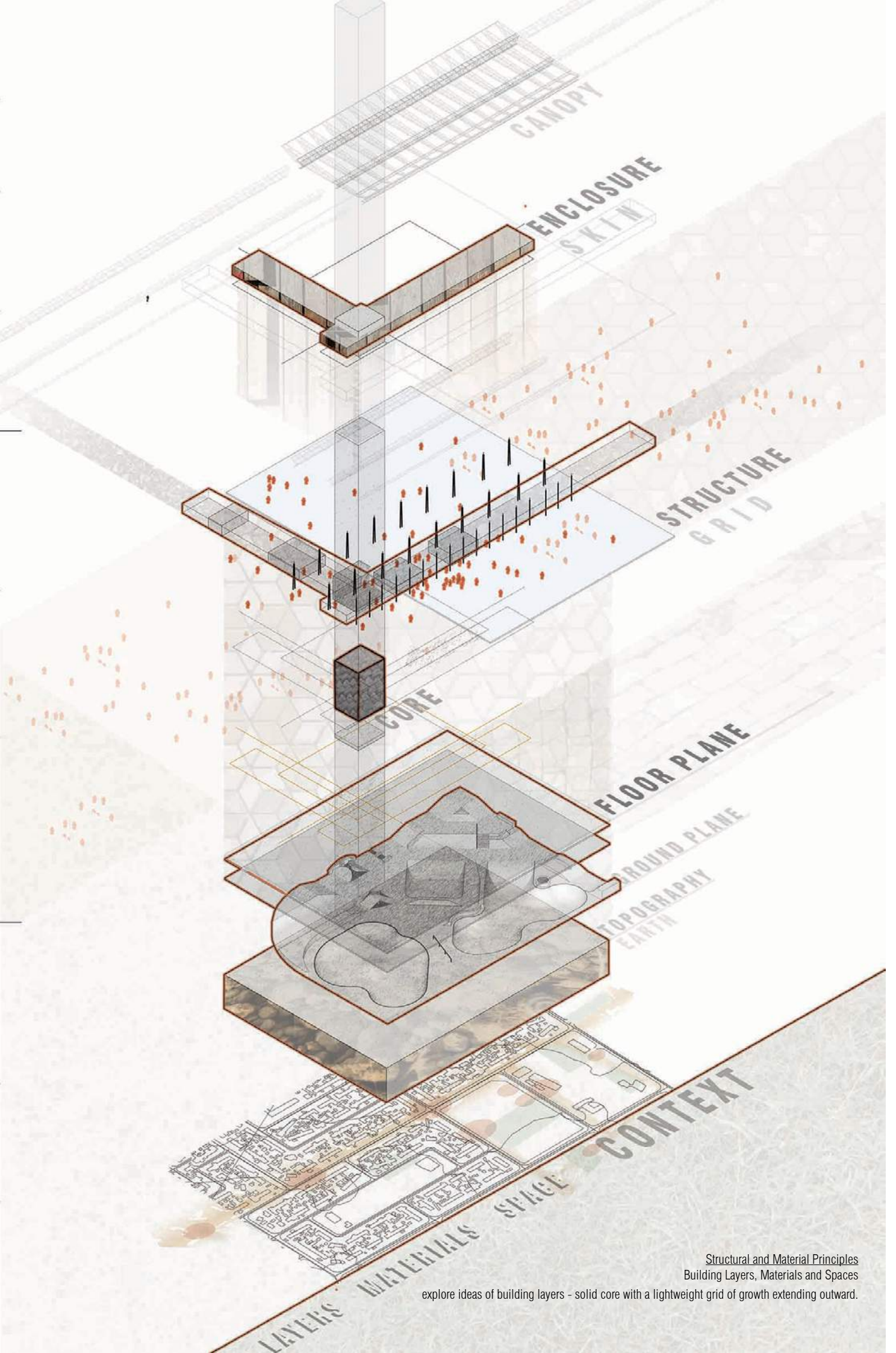
Tyre Wall Part Elevation and Section
nts
Indicating key dimensions and scale of rammed earth tyre wall construction at Delft ECD

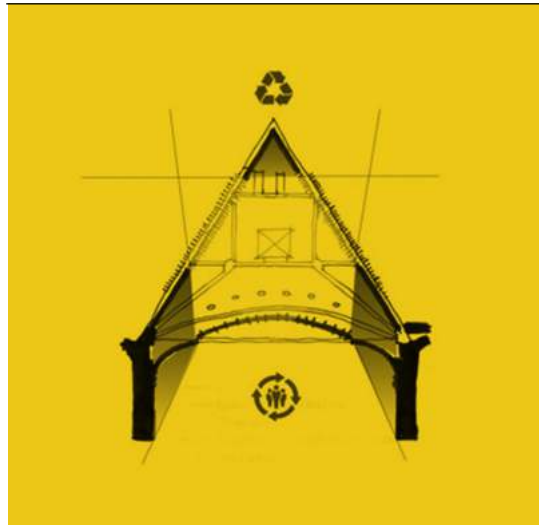


sketches illustrating ideas behind designing for disassembly. Sketches explore ideas of building layers - solid core with a lightweight grid of growth extending outward.



disassembly - the key for building transformation



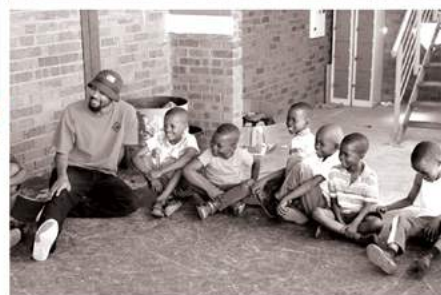


part 3

architectural proposition



Nebula creates and facilitates a nurturing, dynamic environment where young South Africans can explore their potential and grow through experiential learning and entrepreneurial activity. Rooted in passion for skateboarding, art, design, music and dance, Nebula sources strategic partnerships and creates solutions to the social and economic challenges our youth face in their communities. Images show afterschool skate activities currently running at three schools in Gugulethu



9 The Building Program

The programmatic intent of the architectural intervention aims to create a new public space of flexible event, community resource and infrastructure provision whilst enhancing and activating the existing program of the site and immediate precinct.

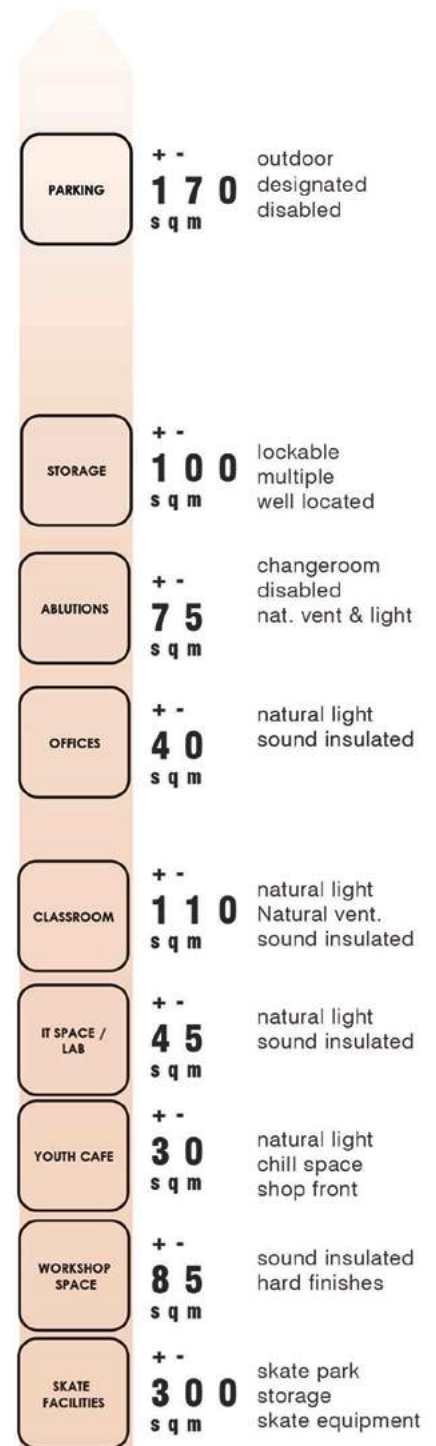
Existing site features provide salient points of departure for the new building proposition to interlink and co-exist with a public skate park facility and experimental learning and skills development school for youth of all ages. The new skills development centre operates as a collection of skateboarding-oriented NGO's and local community members that maintain the program of learning, creating and self-expression through skateboarding and the wide range of opportunities within. The new building aims to provide a healthy, active and educational space that addresses the immense need for youth-centred space that provides a framework for career opportunities and accessible skills development to thrive along with integration of cultural and social activities of the site. The framework for the development of the site and precinct also aims to provide place, provision and opportunity for existing and future business and trade to thrive along the busy Steve Biko Road edge.

Social Program:

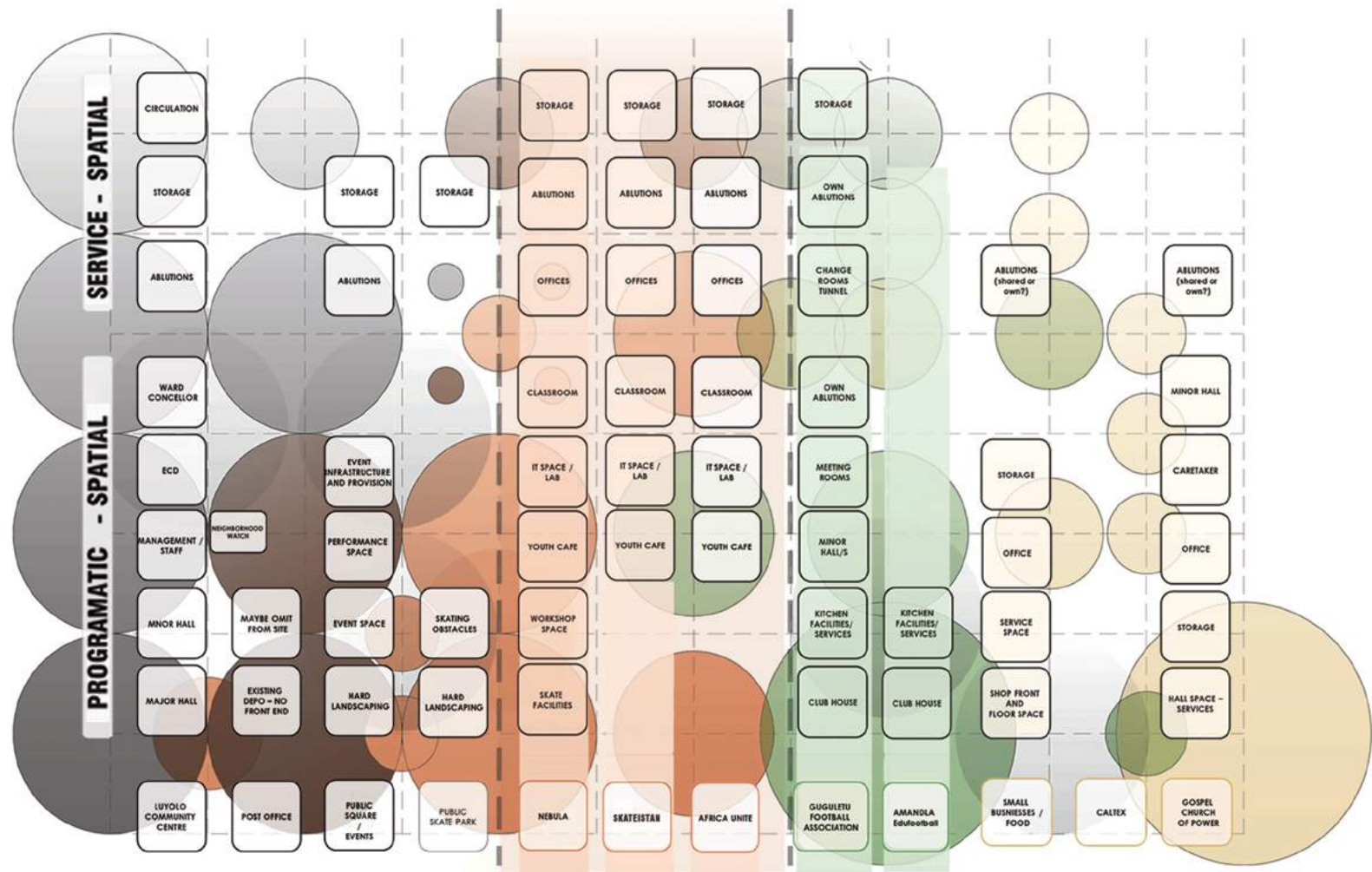
The Skate Lab aims to create and facilitate a dynamic environment where youths can explore their potential and grow through experimental learning and entrepreneurial activity rooted in passion for skateboarding, art, design, music and dance. Institutionally, the building will be run by local community members through a global based organisation, e.g. Skateistan, while acting as a hub for youth based NGO's to operate from. The main programmatic elements of the Skate lab are:

- Outdoor / Indoor Skate park
- Youth Hub and Café
- Versatile classroom and study space.
- Workshop space
- Digital skills lab – IT
- Office Space
- Ablutions and Change Room Facilities
- Versatile 'flat-ground' court space
- Abundant storage for equipment

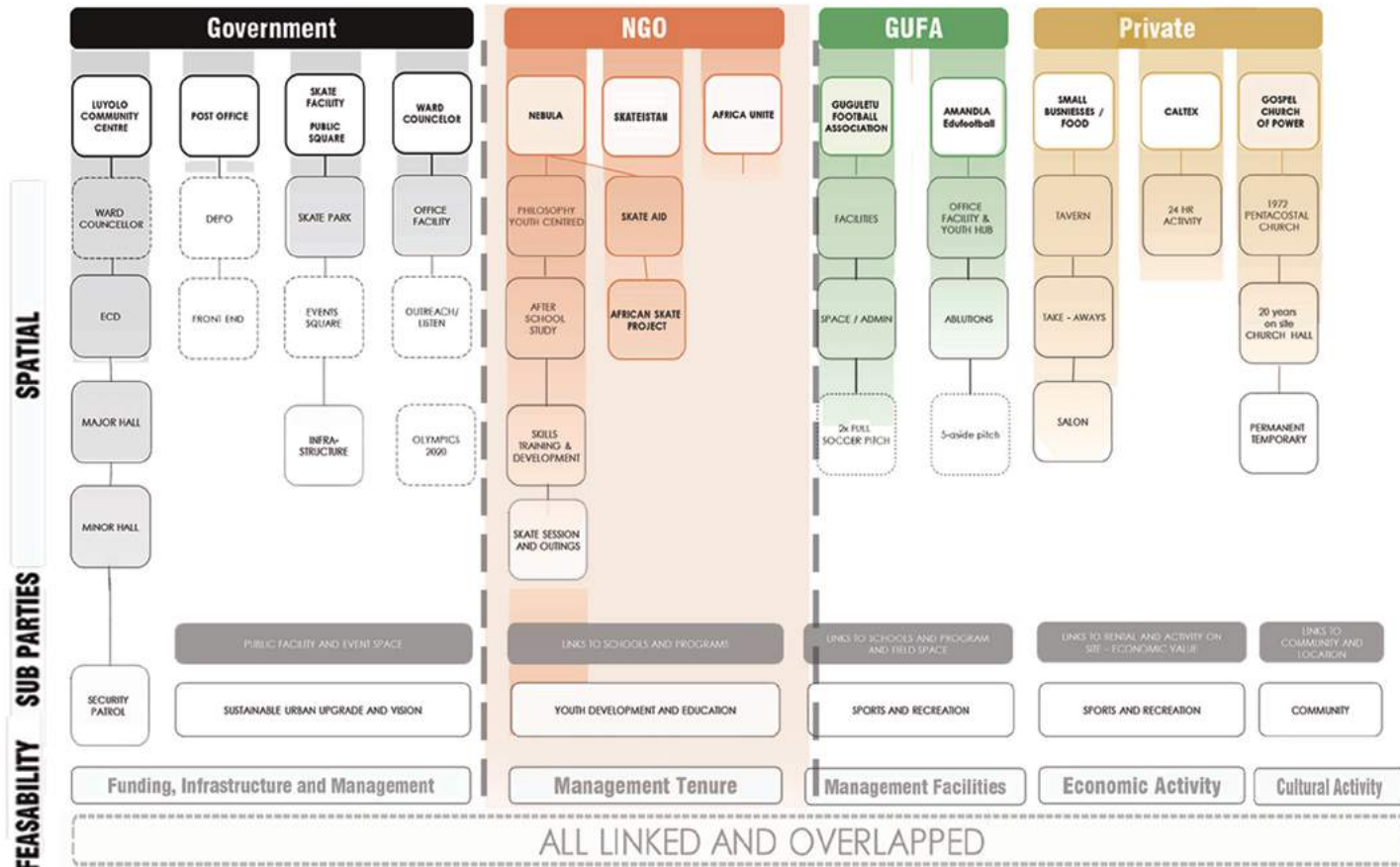
The precinct framework aims to use the new building intervention as a catalyst for user-based growth through incremental design and structural provision across the site, which prioritises the landscape development of open space as an outdoor public events square with adequate infrastructure provision.



Spatial Accommodation Schedule



PRECINCT ACTIVITY OVERLAP INSTITUTIONAL ARRANGEMENT



Program and Institutional arrangement matrix

10 Skateboarding as a Tool for Social Change

Skateboarding as a performance is very fortunate in that it contains multiple disciplines or styles such as vert (vertical ramp skateboarding), park (skate park), street, ramp, cruising, longboard, downhill and various others evolutions and expressions. From a user base perspective, the sport also has the starters, core, recreational and competitive types of skaters (Hardisty, 2015).

This diversity and interpretive room for creative negotiation across fields of artistic expression and athletic conditioning gives skateboarding its appeal and core values. There will always be an area of skating that can appeal to every level and type of skateboarder. Over and above the recreational values, skateboarding is clearly growing as a mode of non-motorised mobility in Cape Town (Hardisty, 2015).

According to an Carin Hardisty of Sports Trader magazine, a local trade magazine for sport and outdoor leisure, Skateboarding in South Africa has been through many decades of ups and downs in popularity and trend, however, still pulses on and manages to thrive in today's age (Hardisty, 2015). Her account of interviews with government officials notes that the City of Cape Town has taken notice of this trend and started a skateboarding task team, which consists of councillors, city officials and the National Skate Collective, representative members of the skate community (Hardisty, 2015). Regardless of the task groups active involvement or degree of impact thus far, this kind of formal acceptance and protagonist behaviour is indicative of a massive mind-set shift in the way skateboarding is viewed and embraced as a sport and tool for positive change.

Two of the biggest problems currently faced by the skateboarding market are funding and illegality of skating on many public roads. The sport lacks formal funding and there is large pressure on the supply and retail chains to provide finance for things like events, which help grow and promote the sport (Hardisty, 2015).

' While skate parks offer skateboarders safe areas in which to practice their chosen sport, they also fence in the freedom associated with skateboarding.' C. Hardisty, 2015. p.33

The National Skate Collective is trying to get a by-law introduced that will allow skateboarders legal access to the roads and generally applying a more collaborative approach to skate park development. This kind of collaboration with youth development programs, funders and key community members not only strengthens feasibility of the project but ensures, crucially, the on-going social sustainability of these facilities.



Certain NGO's have gained positive responses from communities through development programmes aimed at primary and high schools that integrate homework class and tutoring, creative skills development with the active sport of skateboarding.

Amongst the various skate group collectives, NGO's and private businesses, the Cape Town based non-profit organisation Nebula stands out as a prime example of how influential and socially uplifting the integration of skateboarding, education and youth development can be. Nebula is run by founder, Rayne Moses and sets a vision statement which aims to uplift and educate youths from troubled neighbourhoods through skateboarding and the many inherent positive qualities of the sports active and artistic nature. Nebula engages young people in creativity, entrepreneurship and experiential learning and has grown as a project and passion since 2012, with programmes originating in Valhalla Park and Gugulethu.



Nebula: creates and facilitates a nurturing, dynamic environment where young South Africans can explore their potential and grow through experiential learning and entrepreneurial activity. Rooted in passion for skateboarding, art, design, music and dance, Nebula sources strategic partnerships and creates solutions to the social and economic challenges our youth face in their communities. Their ever growing programme covers formalised after-school activities such as:

- Start small businesses
- Engage in experimental learning through games.
- journal and story writing
- Skate workshops and sessions, various creative workshops.
- Outings and exploring.



Skateistan: Through the anchorage of skateboarding as an active expression and sport, Skateistan empowers and educates youths from disadvantaged backgrounds, currently running five community projects of varying scales in three global nations. The quote alongside above, taken from their home webpage, refers to their recently opened project in Johannesburg – their first in Africa.

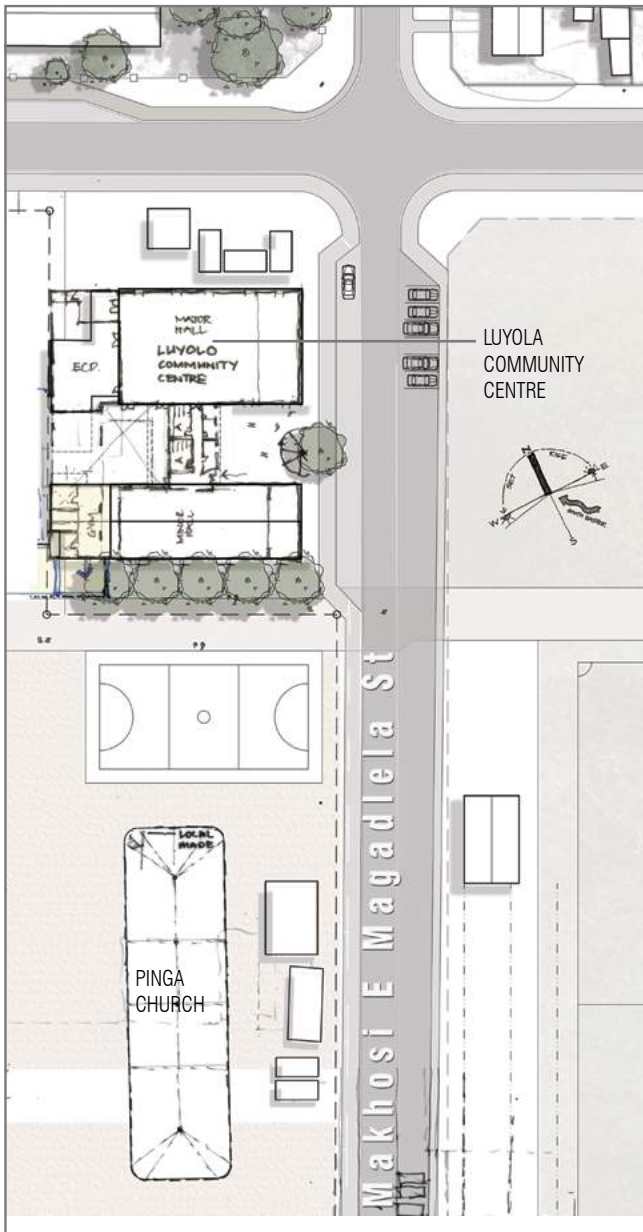
Images of the Johannesburg, Skateistan facility opened in 2016.

'In August 2016, we officially opened our fourth Skate School, located in the Central Business District. The Skate School includes a state-of-the-art concrete skatepark and three-story education centre, with flexible office and classroom space. The programs run five days a week in the afternoon for children to attend after they have been to public school' (Skateistan.org home webpage)

The community's positive reception of this new facility and the significance of the Skateistan program reaching the local context of South Africa, provides much inspiration for the conception of a Cape Town based program which anchors the proposed facility institutionally while providing platforms for other related NGOs to 'plug-in' and make use of the resources.

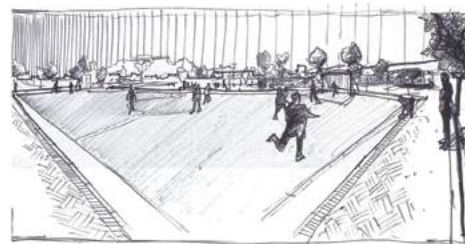
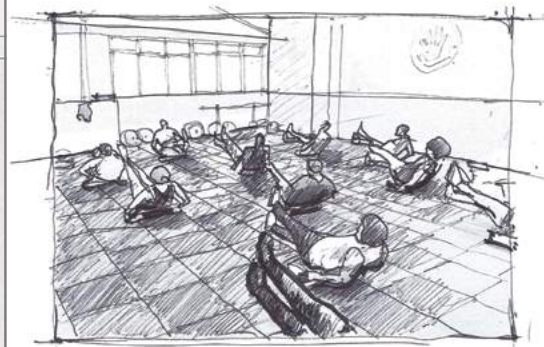
This recent boost in the amount of recognition, traction and real exposure received by skateboarding in South Africa is inspirational. Through interesting socio-political times in the country, skateboarding has managed to bridge all social realms and emerges as a sport growing with potential. I believe that providing a youth-centred facility anchored around skateboarding and public open space can uplift and benefit the neighbourhood and community of Gugulethu through educational outreach, skills development and providing a world class skating facility that attracts youths and skateboarders from all over the nation – giving the neighbourhood positive exposure, providing investment for the youth.

Local Fieldwork Studies:
Existing Facility Fieldwork
Research Component 3



Existing facilities plan of selected site.

The following drawings and photographs address the two key anchoring social institutions of the site. These community-based buildings maintain a rich program and activity with highly active usage, yet suffer from the typical issues of minimal resources and inadequate spatial provision.



Sketches of site based activities

LUYOLA COMMUNITY CENTRE



Original Minor Hall



Damaged and insufficient play space at the ECD



Major Hall

PINGA CHURCH



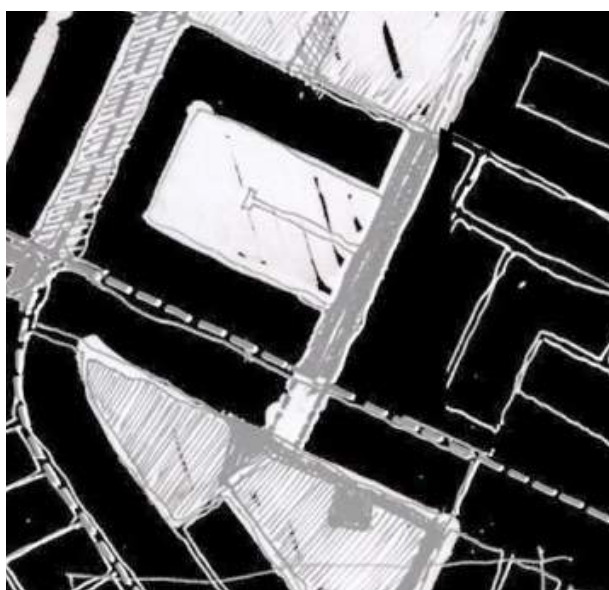
Equipment storage and housing for church caretaker



Image indicating the scale of the tent structure

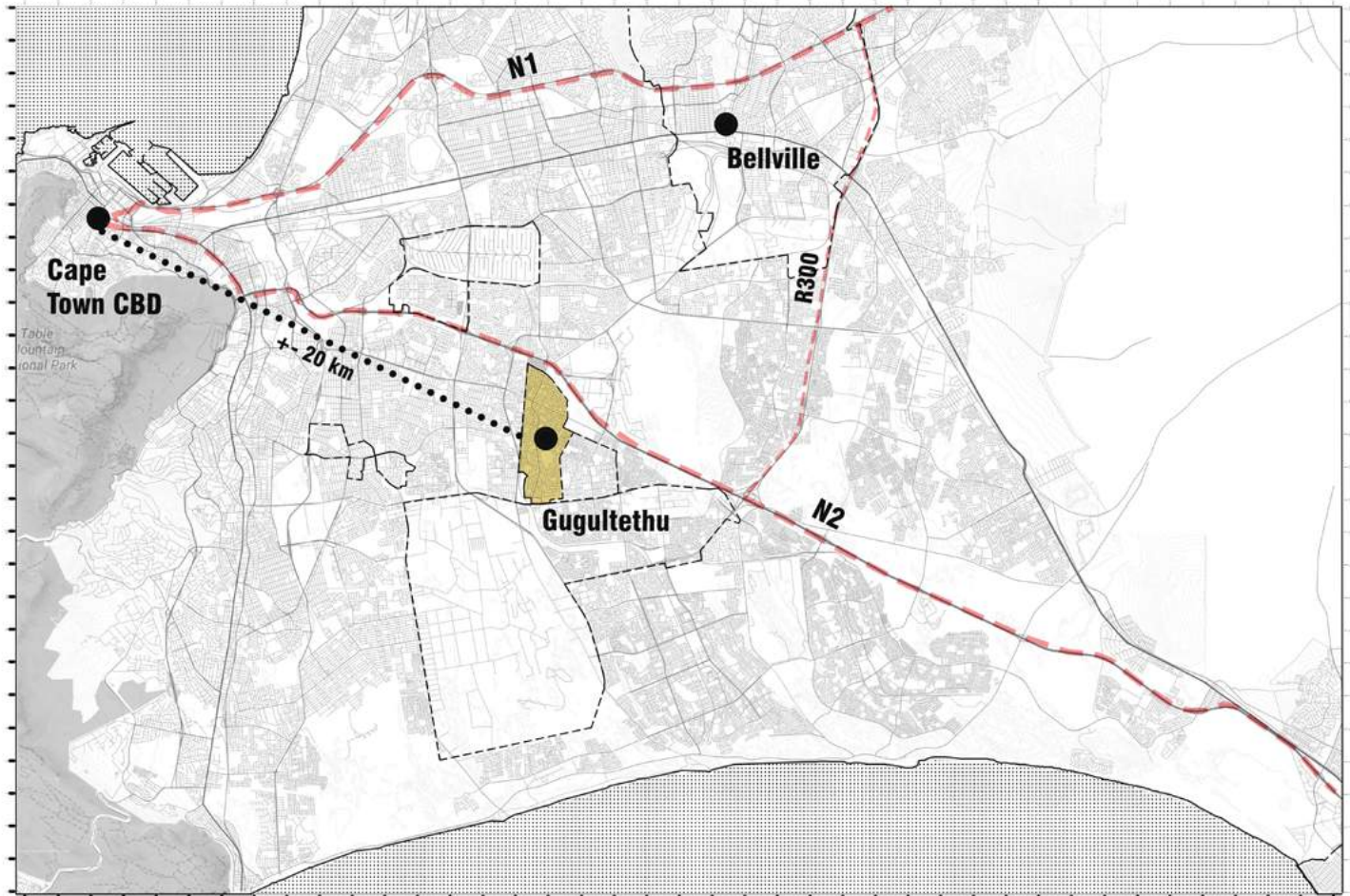


Basic formalising of ground surface and other elements



part 4

the site



Cape Town Metropolitan Map



map of the Republic of South Africa, indicating the Cape Town metropolitan region



Sprawl



Fragmentation

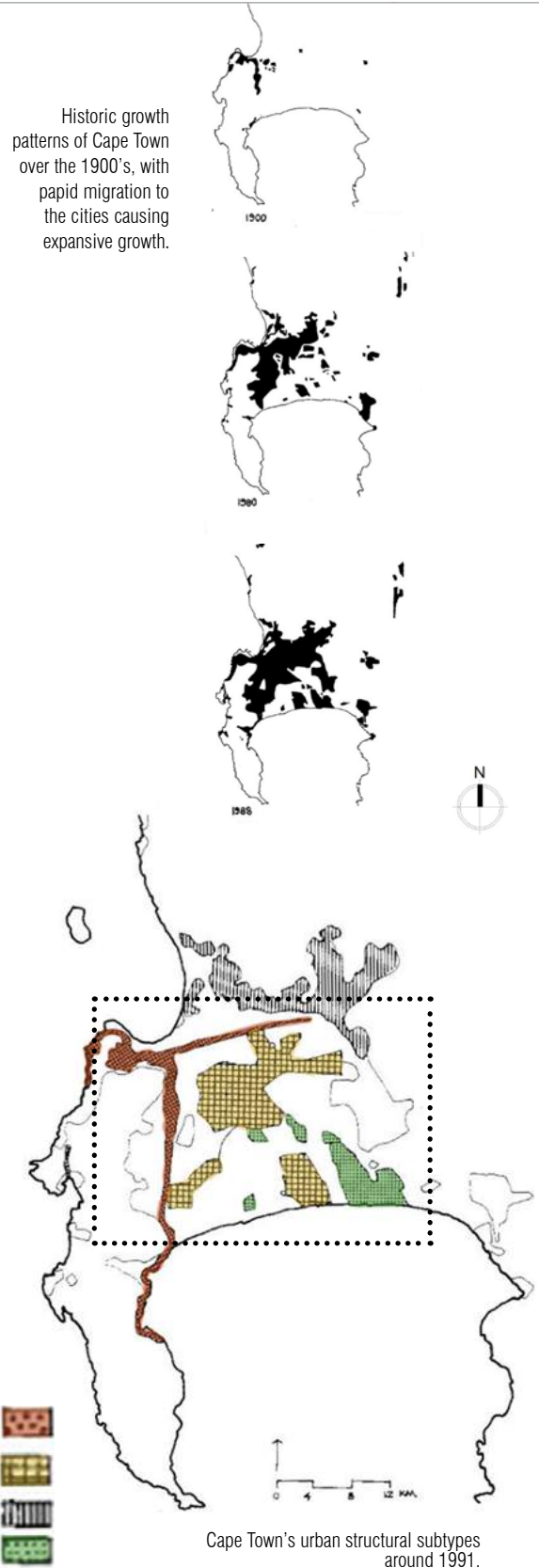
12 Siting and Context

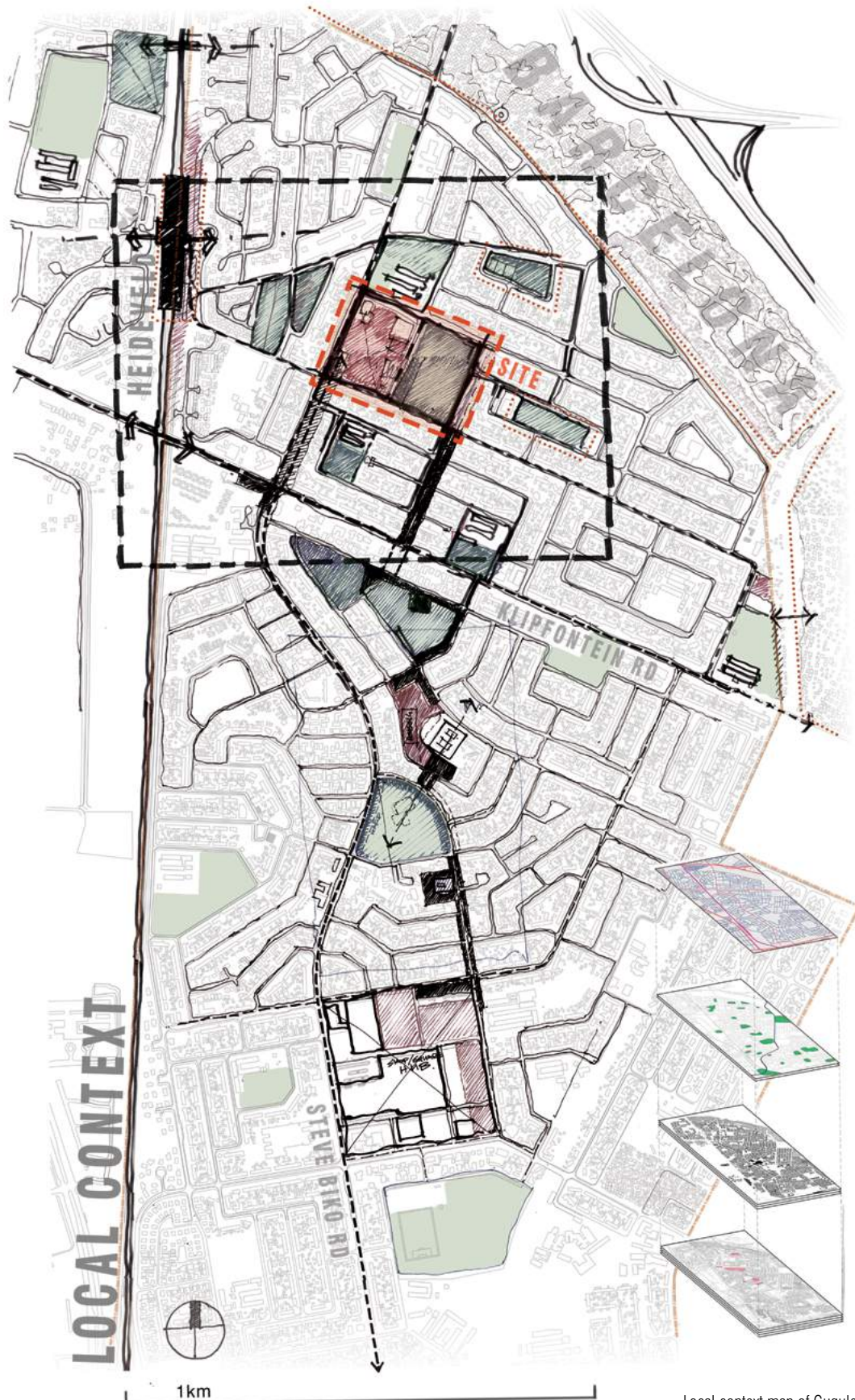
Macro Context:

The Apartheid legacy of South Africa left behind a structurally divided society with displaced opportunity, inherent low employment and extremely harsh living conditions (Green, 2012). These displacements imposed Euro-centric housing models and ideals, neglecting the local terrain, culture, identity and community, resulting in networks of 'dead space' suited to criminal activity.

The proposed site is in the Northern neighbourhood of Gugulethu, one of the original dormitory townships of the cape flats, founded in 1956 and situated approximately 20km from the city centre. Gugulethu's age, history and location have created a local urban fabric that speaks of an energetic community, juxtapositions of formality and informality, strong senses of public space use and intricate blurs between private and public realms. The maps of Cape Town's development alongside depict the patterns of cultural and racial segregation that shaped the macro urban typology of the city, ultimately leading to the disjunction of living resources so prevalent in contemporary South African cities, yet aiding these social qualities of connection and ownership in a rich and vibrant spatial practice (Denaar, Uitenbogaardt, 1991).

In a rapidly expanding city, Gugulethu's centrality and proximity to main movement arteries and public amenities (CT Int. Airport) has allowed authentic sustainability of the township in terms of economic activity, social diversity and cultural heritage. All formalised, governmental resource provision attempts have continually failed to enrich these types of neighbourhoods. I strongly believe that design has the ability to not only enhance the physical elements through effective urban upgrade, but also harnesses the capacity to adapt the ineffective structural systems of current public projects and the agency behind such interventions.





LOCAL CONTEXT

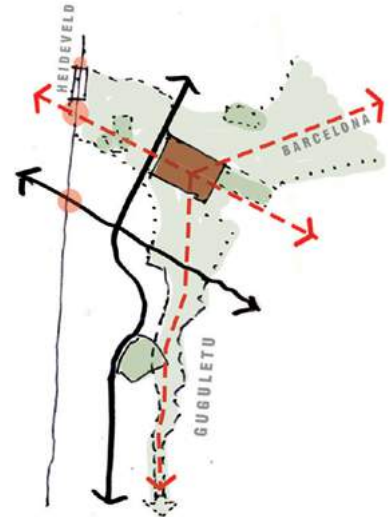
Local Context Map

Local context map of Gugulethu with proposed site highlighted in red.

Local Area Context:

As one moves into a finer grain of contextual analysis of Gugulethu, a movement route running from north to south in the form of Steve Biko Road (Previously 'NY 1') can be distinguished. Steve Biko Road acts as the movement backbone of the local area, connecting with most subsidiary routes of transport at some point along its path.

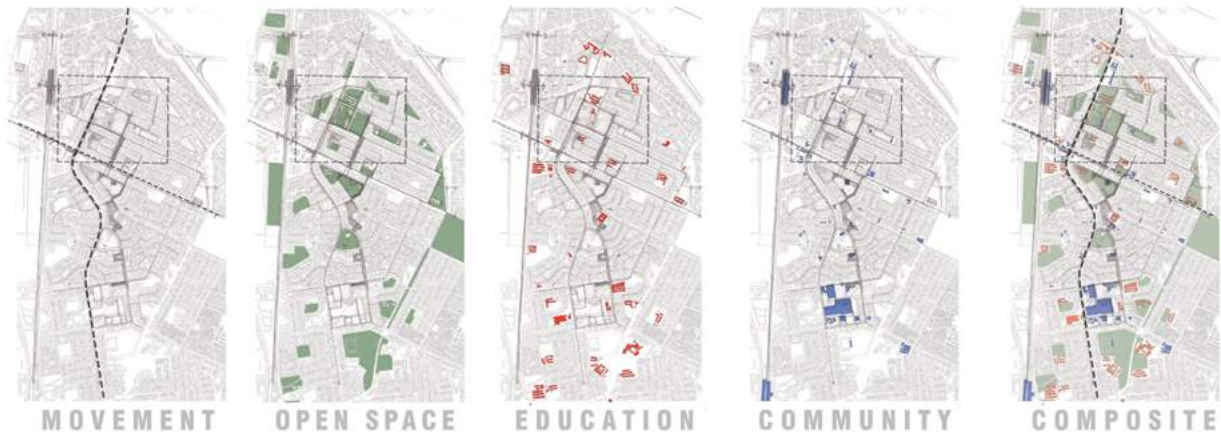
Based on findings from mapping and fieldwork, I noticed a prominent relationship pattern between Steve Biko Road and the immediate residential areas. Due to the high vehicular activity of Steve Biko Rd, a more nurtured and knitted network of community amenities and pedestrian links exists adjacent and offset into the quieter residential areas along Steve Biko Road. This network of social amenities and civic facilities maintains a well-connected series of procession, with certain sites abutting both the main road and this 'back street' community strip, offering opportunity for visual and spatial connection. This well-developed network appears to lose cohesiveness as it moves north of Klipfontein Road (spanning W-E). The range of community facilities of this northern Gugulethu neighbourhood is all actively used and sufficiently connected to this 'back street' system, though could be substantially reinforced as a coherent network allowing richer access to infrastructure and promoting safer lived urban spaces.

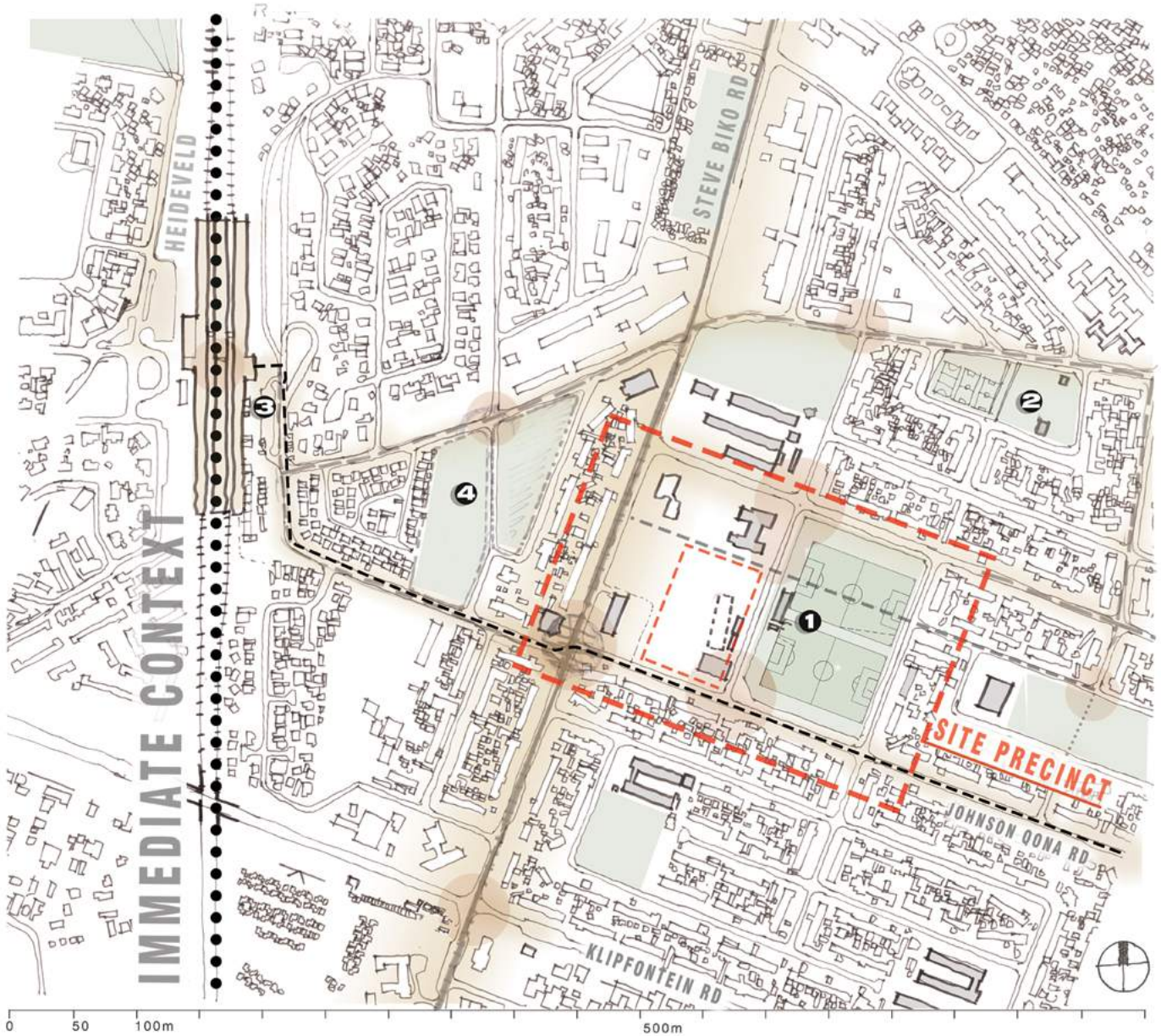


Top: Connectivity diagram representing links between Barcelona informal settlement, Steve Biko Road and

Bottom: Colour coded overlay of basic civic facilities and spatial assets broken down into movement, open space, education, community facilities overlaid into a composite map.

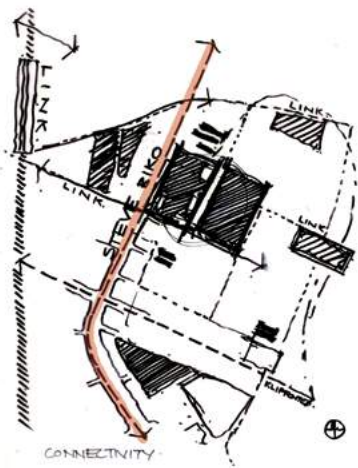
Map indicating the informal settlements along the north-east periphery - with proposed site in red. The dots represent official crossings over the railway





Immediate Context Map

Immediate context map of Northern Gugulethu with important public amenities highlighted.



Diagrams representing a strategic break in the urban wall, celebrating the activity present beyond the realms of the main street.

Immediate Context:

The selected site (highlighted in red) sits in the centre of this northern area of fragmented network, and uniquely straddles both sides of the busy main road and residential fabrics in the form of a large disused piece of land with existing community facilities dotted around the perimeter, all interacting with the street and the public realm in unique ways.

The site sits along an important pedestrian route between the north-eastern fringe informal settlements and the Heideveld Train Station on the east. This unique locational duality of abutting a pedestrian route and Steve Biko Road gave rise to the notion of upgrading the large open space of derelict, unsafe and vacant land into a public space of gathering, activity and learning in the form of an open public space that plugs into programmatic elements of activity and infrastructure provision.



1. GUGA (Gugulethu Football Association) Grounds



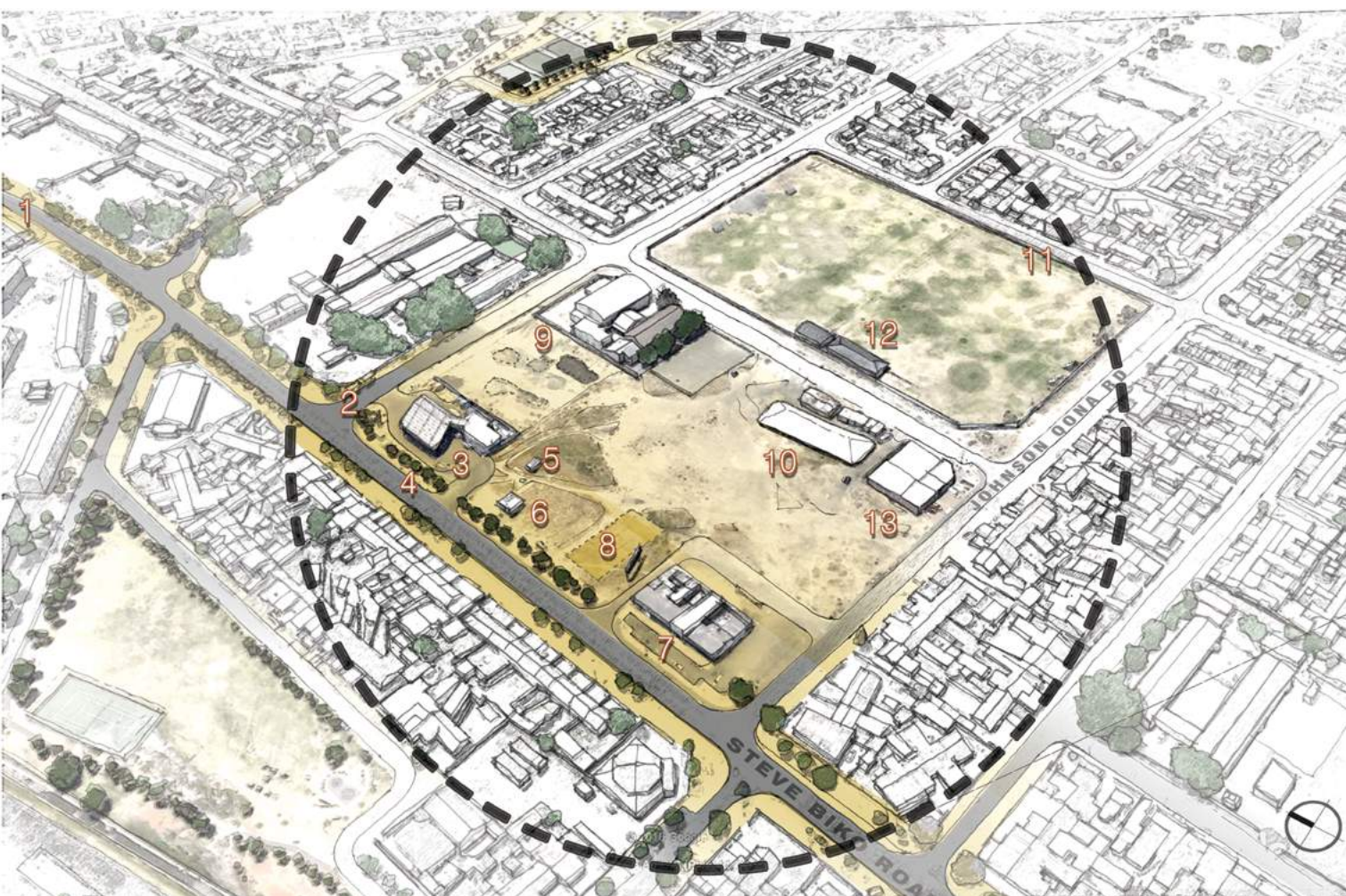
2. Smart Park Facility



3. Heideveld Train Station



4. Community Park with Playground



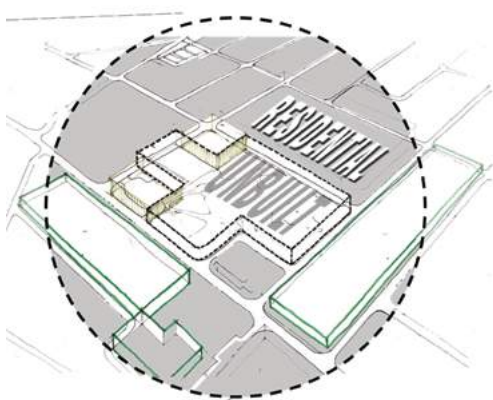
Existing Site Conditions

Aerial sketch showing the existing conditions of the site - mostly occupying the edges of site with resultant disused land in the centre.

1. Gugulethu 7 Memorial Vandalised by public Public want to enclose memorial
2. Informal Chicken Stall Corner location and across from the Caltex garage. Braai chicken and pap on weekends.
3. Caltex Petrol Station 24 Hour service with small shop Privately owned – adjacent ERF 918-RE belong to same owner. Potential future expansion to adjacent site (double story with large fresh stop, offices and forecourt)
4. Amy Biehl Memorial Foundation – school holiday programs Funding Schemes Attracts tourists to the site.
5. Take-Aways Container Open 8-7pm Busiest during morning and afternoon. Electricity fed from Hair Salon through long extension lead.
6. Tire Repair Container
7. Line Shops Chicken Take-Aways – 9-11pm Shoe Repair Tavern Doctor Hair Salon – 9am-6pm Liquor Store
8. Temporary Church Location - tent structure for 3 Months over Easter period. Rented Land. Electricity fed from Hair Salon through long extension lead.
9. Luyolo Community Centre. Councillor Ward 40. 1 Caretaker, also looks after the fields – previously were 6 Gym and Luyolo boxing club, busy in afternoon 4-8pm. Open to the General Public, have to pay joining fee. Open from 8am-8pm. They are very busy and heavily require more space. Kitchen being used as storage – not functional. Original hall used for public meetings. In past stage had been used for plays etc., not anymore. Public Phone; to use if there are issues with plumbing, drainage and electricity. Toilets are locked and are only open for events. ECD - Crèche ; 3-6 year old. 2x class rooms, office, kitchen, playground outside and + toilets. Open 7am-6pm. Main Hall; new hall. Hired out for funerals, weddings, public meetings. Used for indoor sports and aerobics in the evening. Share info about service delivery. Kitchen located in top right corner. Netball courts hardly used - damaged. On notice board; NY 116, road widening, ablution facilities, cctv
10. Pinga Church. Pentacostal Gospel Church of Power Tent Structure Permanently. Rented Land. Biggest church in the area and accommodates roughly 1000 people. Informal structures next door for caretakers (x3), store + meeting room Waiting for negotiations + funds to build a new permanent structure. Takes roughly an hour to set up whole tent. (+- 6 people to set up the tent, +- 6 for chair arrangement?) Every Sunday, 11am-5pm
11. GQUU Tavern On east side of NY 116 Sports Ground. Open to Public.
12. G.U.F.A. (Gugulethu Football Association) GUFA Practice on weekends + matches in the afternoons. Field only used on weekends (Interesting) 2x change rooms and ablution facilities; poor quality and vandalized. Flood lights but no night games. Field used from 8am onwards. Concerts, events, government Imbizo Site owned by City of Cape Town Works in conjunction with the centre. Dangerous for cars to be left outside; theft or vandalism; high perimeter fence creates zero visibility inside field complex.
13. Post-Office Depot Previously a bottle store. Other post office in Gugulethu Square Mall.

Existing Site Conditions:

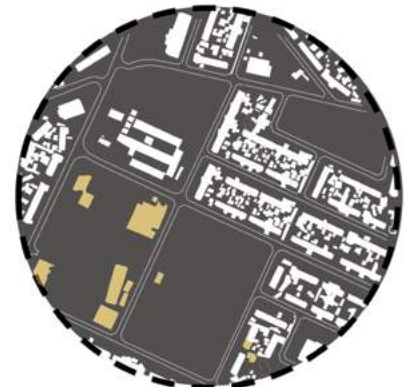
The aerial perspective identifies and locates the numerous existing site features and social programs that give anchorage to the site. This largely vacant site is rich in activity along its edges, with street boundary conditions on all four sides, resulting in a large vacant space of derelict land in the centre. This general arrangement of activities that face outward to the street, coupled with the vast scale of the site, abandons the central space to a kind of ‘no-man’s-land’ type of territory socially, institutionally and spatially. Therefore, this large vacant space becomes highly unsafe at night, which poses many issues of safety given the high amount of cross site pedestrian movement indicated by the many desire line pathways visible in the aerial illustration alongside.



Spatial Qualities



Ammenities and Facilities



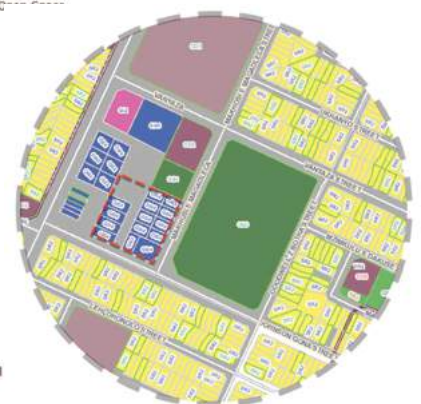
Ammenities and Facilities

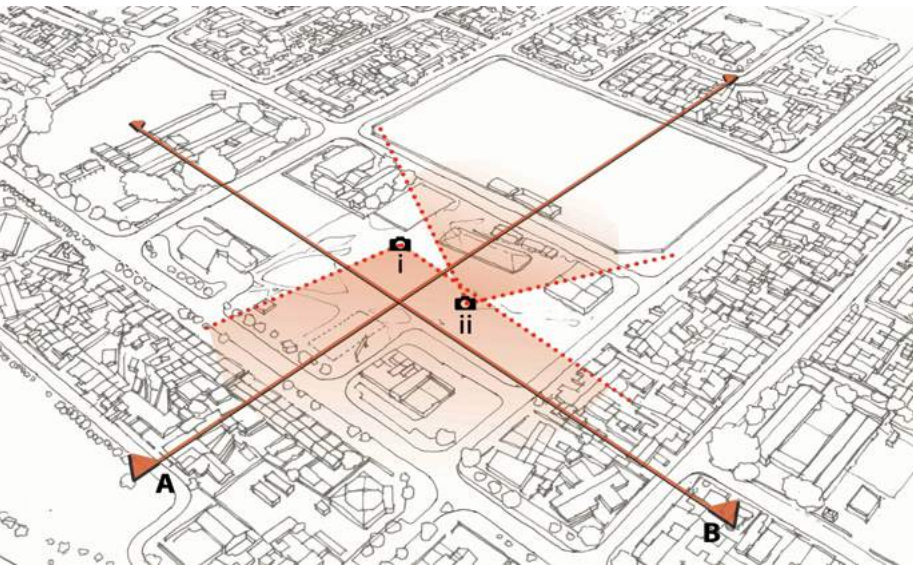
Zoning, Erven and Site Appraisal

With reference to the zoning diagram alongside, highlighting allocations of individual ERF occupancy categories based on the City of Cape Town Government’s interactive e-map as of June 2017, it’s clear to see that any future development for a community based project on this site will require some form of consolidation process done through Local Authority and Town Planning departments. Such a consolidation application will have to be motivated by the client/project team following acquisition of the land by the relevant parties (Skateistan; Western Cape Government potentially). Due to the current disused state of the land along with the opportunity and potential of the site in uplifting the community, a speculative assumption is made: The General Business 4 (GB 4 in blue) zoned sites are to be acquired through the relevant processes. In principle, all servitudes, infrastructural connections and sewer lines have been mapped, checked and noted to comply with the overall development of the site.

- Single Residential 2 : Incremental Housing
- Open Space 2 : Public Open Space
- Community 1 Local

- Community 2 Regional
- General Business 4
- General Industrial 2
- Open Space 3 : Special Open Space
- Transport 2 : Public Road and Public Parking

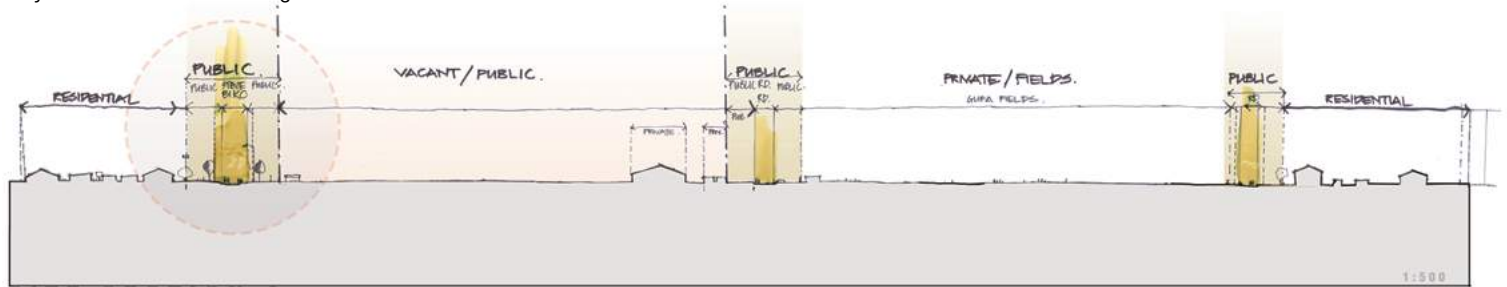




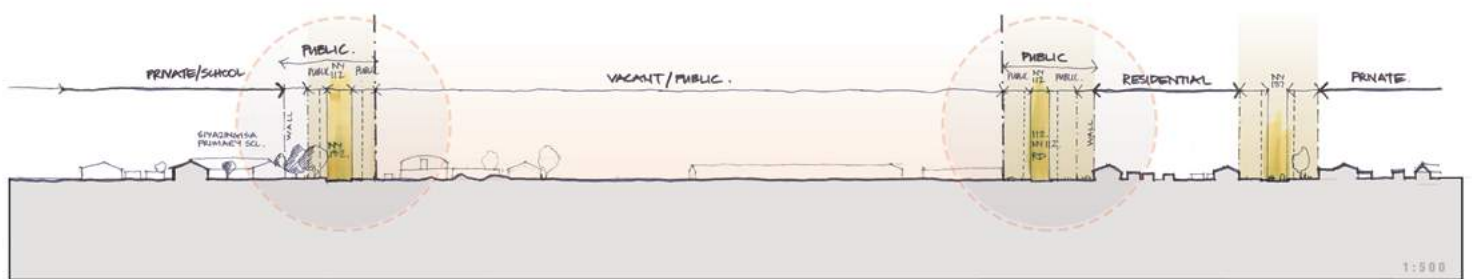
Site Terrain:

The site is reasonably flat with an overall rise of +- 1, 5 metres across the precinct site from SW to NE corners (+- 150m). The ground plane is mostly covered in sand, gravel, overgrown weeds and litter. Piles of debris and rubble have undulated the surface over-time, resulting in uneven ground. The site sections below indicate the scale of open spaces compared to the sizes of streets and built forms.

Key and Reference Drawing



SITE SECTION A



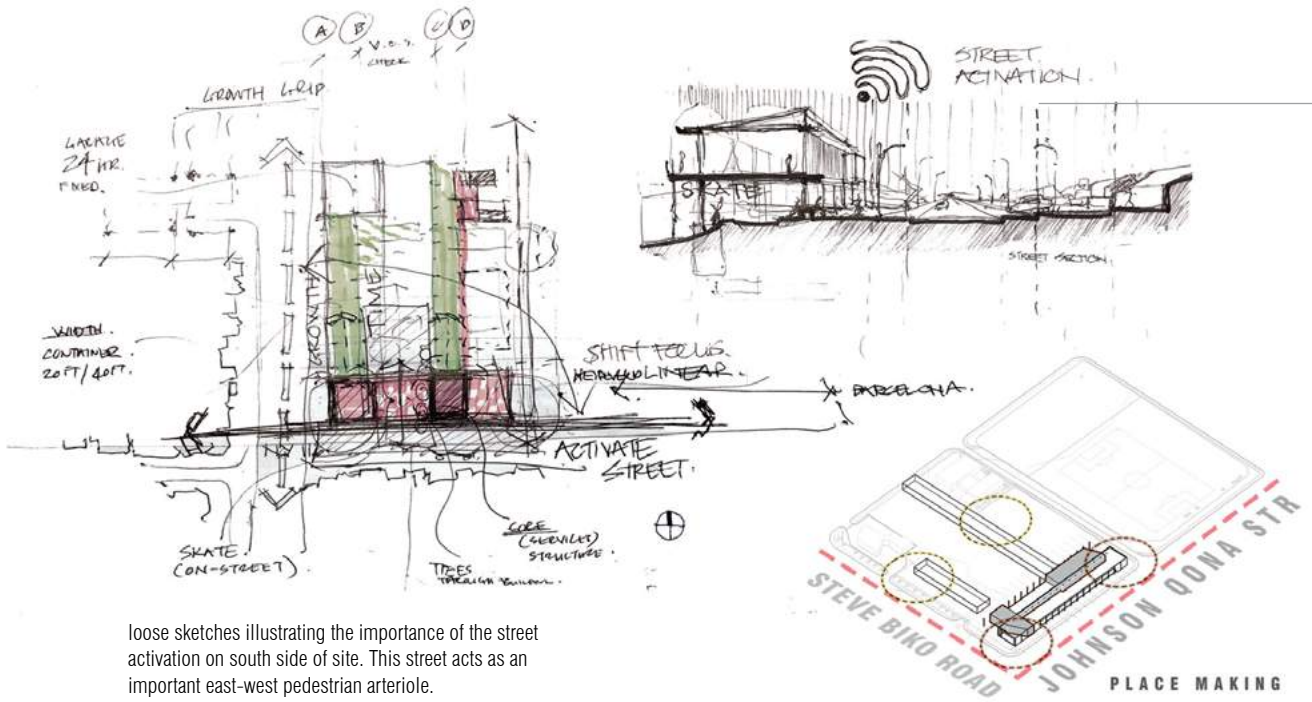
SITE SECTION B



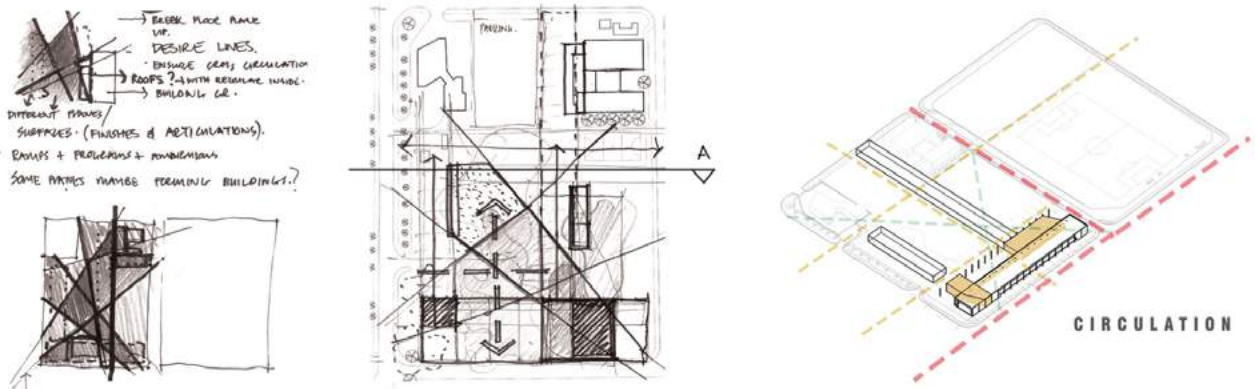
Site Photograph (i) looking south-west with the back side of table mountain visible in the background



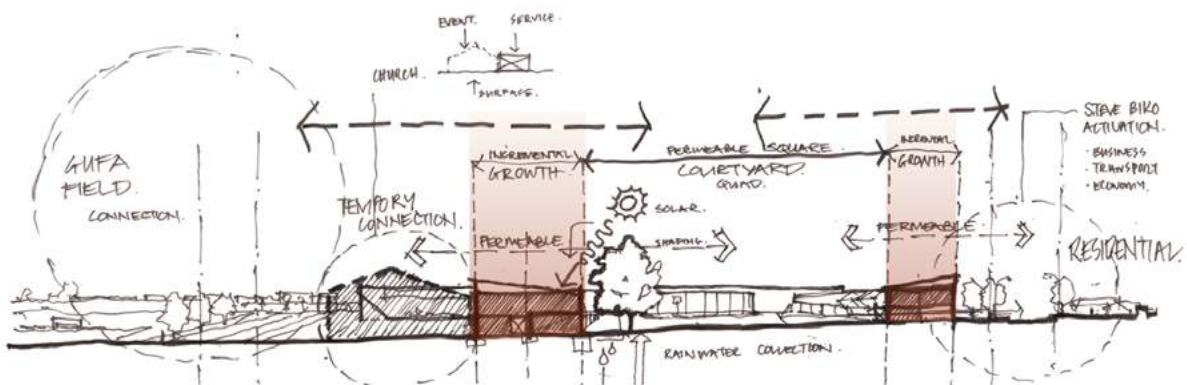
Site Photograph (ii) looking east showing the scale and presence of Pinga Church structure alongside the post office depot.



loose sketches illustrating the importance of the street activation on south side of site. This street acts as an important east-west pedestrian arteriole.



Sketches and diagrams of safe route activation with multi-directional movement.



Diagrammatic section exploring the development of a large public square 'courtyard' space following envisioned user-based growth of the site precinct

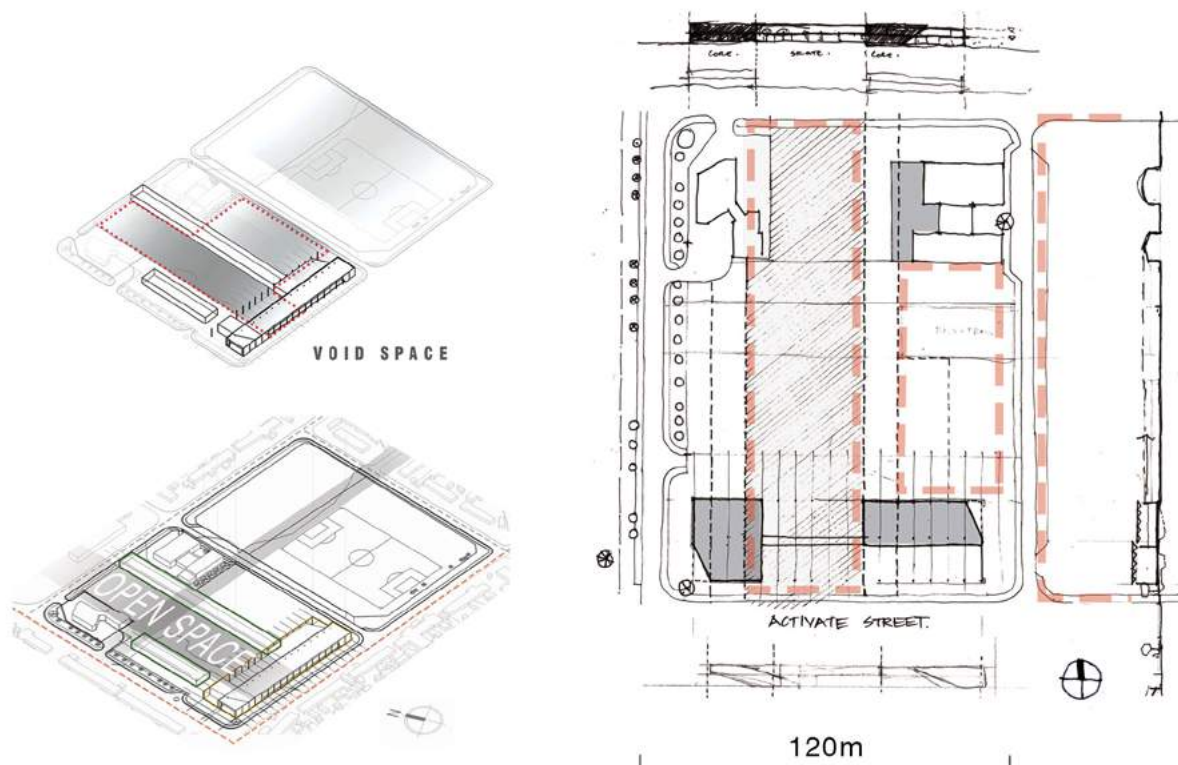
13 Design Process

Development of Site Strategies

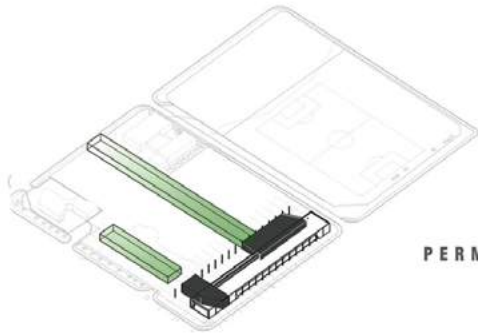
The social and spatial analysis developed the key underpinning idea of linkage and movement between existing facilities through urban upgrade that enhances and enriches the existing anchor points of community activity, whilst designing a framework with an adaptive nature to suite incremental growth. The approach to the site included a set of principles in which ideas on spatial arrangement were addressed, tested and explored. The notion of unlocking vacant urban space to a platform that promotes growth, progression and development through social activity and infrastructure provision drives the precinct vision.

Through the analysis of the site across its various scales, referencing of theoretical and technical design findings and early fieldwork data emerged a set of guidelines providing points of departure. These spatial principles are illustrated below, along with key sketches of importance that emerged out of the process.

Site strategies focused on ideas of circulation, void space, place making and permanence/growth.

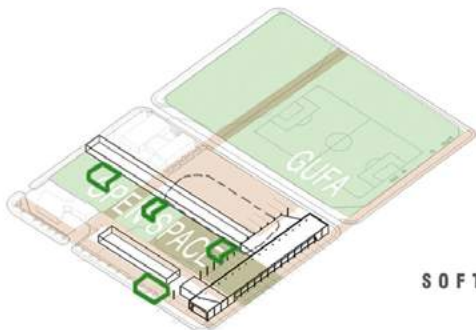
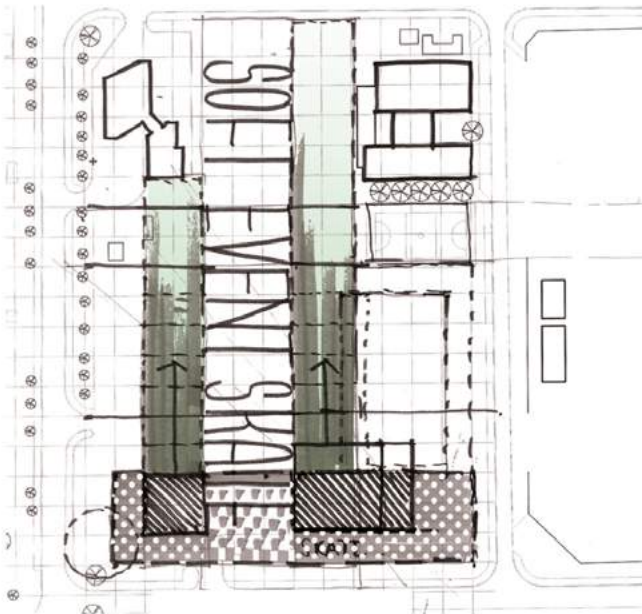


Plan and axonometric sketches of prioritised void space on the site.

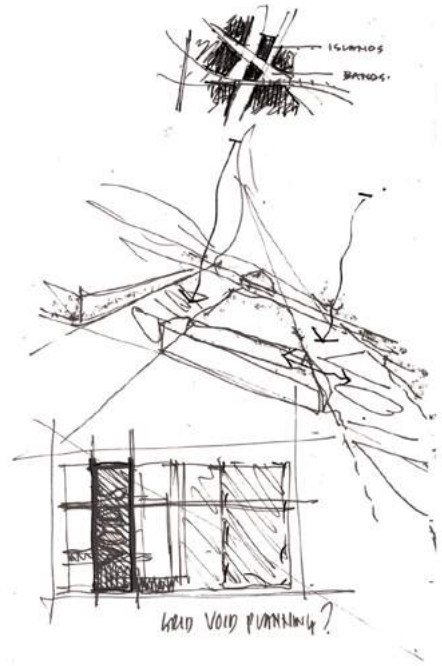


PERMANANCE

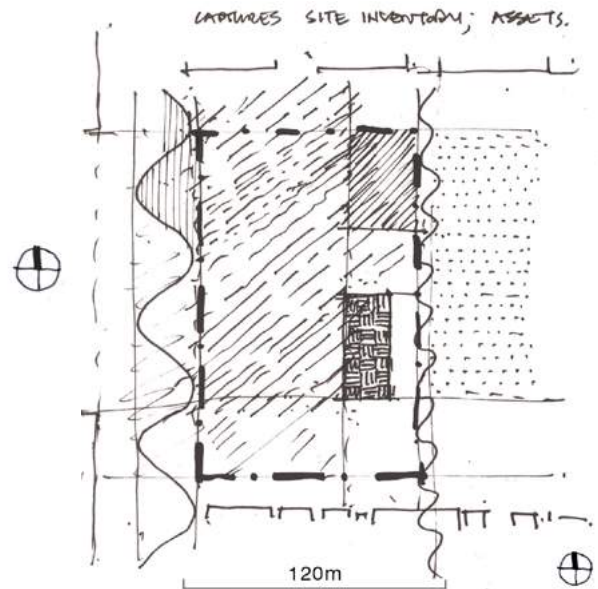
120m



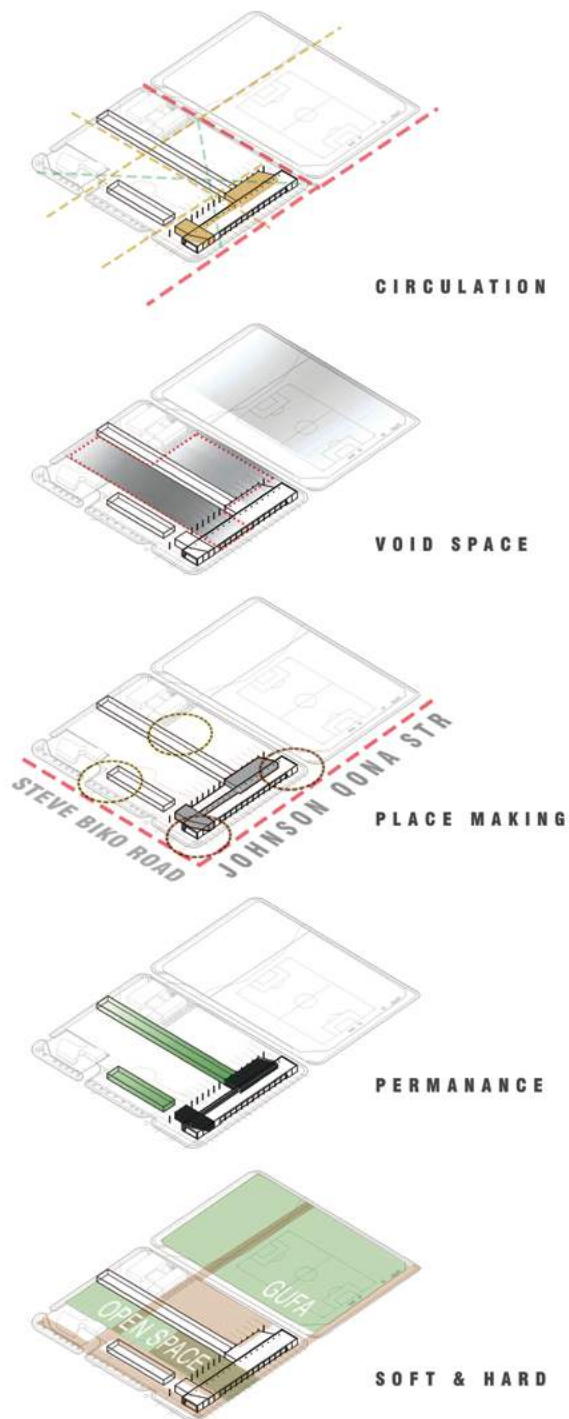
SOFT & HARD



Sketches exploring solid and void space within a sytematic whole



exploratory sketch applying focus over important site inventory being retained and enriched.

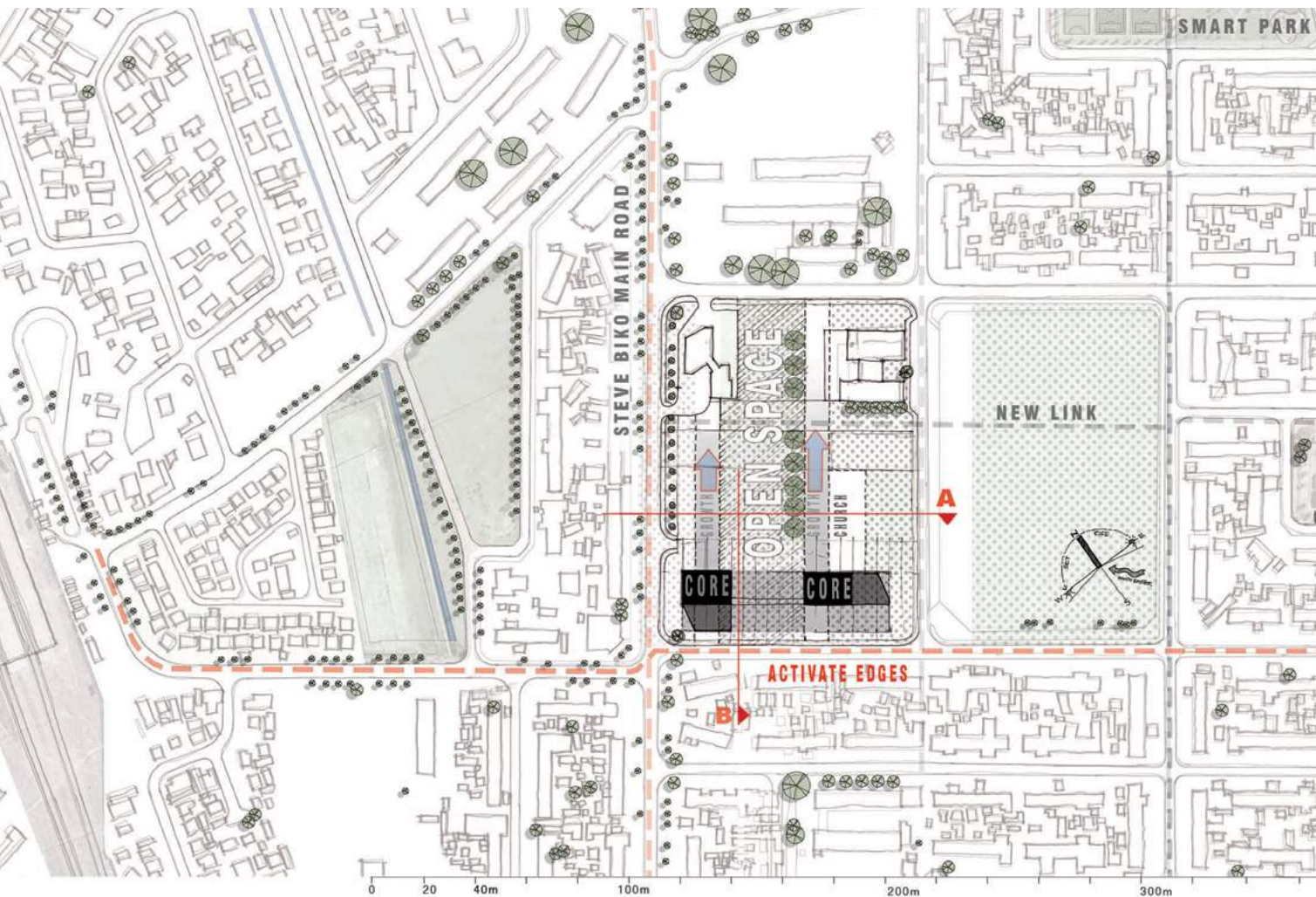


Design principles for precinct framework

The void space acts as a designated space of openness within the framework, which connects and links Siyazingisa Primary School and the new skate park, with emphasis being placed on the street activation of the building placement along the active movement route of Johnson Qona Str. These responsive principles were then accompanied by the material based technical research and synthesised into an architectural proposal that responds to the context socially, spatially and technically.

Circulation principles make use of the existing cross-site pedestrian movement by allowing areas of the street placed building mass to be punctured and opened to suite diagonal paths of movement. These permeable points occur at the junction of void space and building overlap, main entrance and building edges. Circulation of the site precinct introduces a new pedestrian route through the GUFA soccer fields, aligning with adjacent street (NY 113) as the axis, allowing movement through from the local community clinic along the football grounds and past Luyolo Community Centre, the site and eventually to Steve Biko Main Rd. The rationale behind this circulatory addition deals with urban design principles of connectivity and safe, human scaled spaces of rest and reflection.

Part of this design move includes a proposed reconfiguration of the Gugulethu Football Club's pitch to a north-south playing pitch orientation with an addition of an astroturf and a complete removal of the solid perimeter walls. The intention aims to completely open up the previously blockaded space bringing the sport and activity back to the residents, streets and the public eye. Zones of security and protection will be dealt with using as many visually permeable materials as possible, with edge articulation achieved through hard and soft landscaping elements rather than fences where possible. The activation of Johnson Qona Street also sets up a dynamic relationship between active community life and pedestrian movement systems.



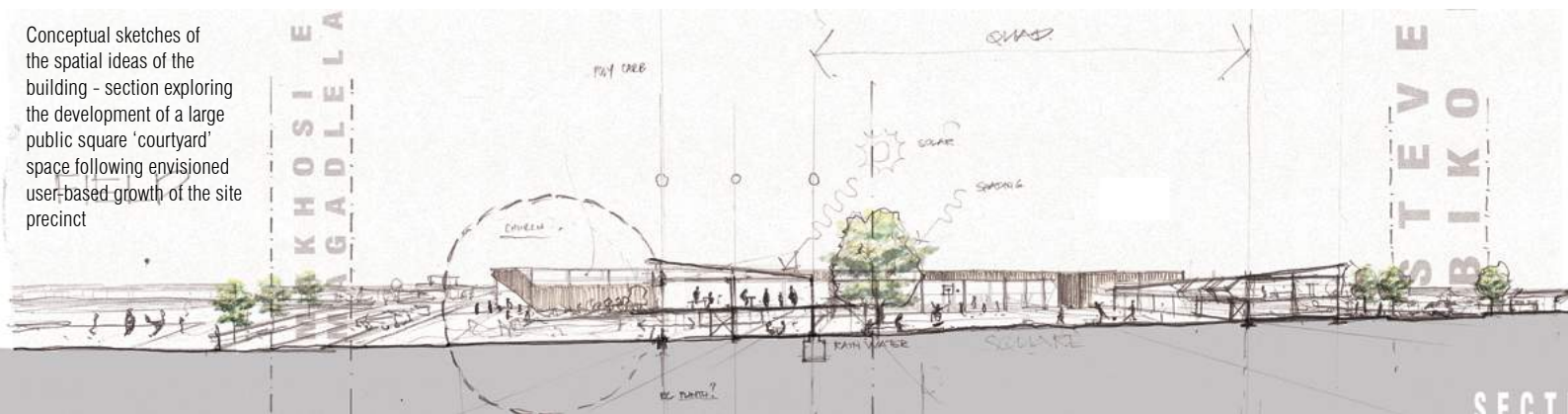
Stie Precinct Framework Plan: *Conceptual*

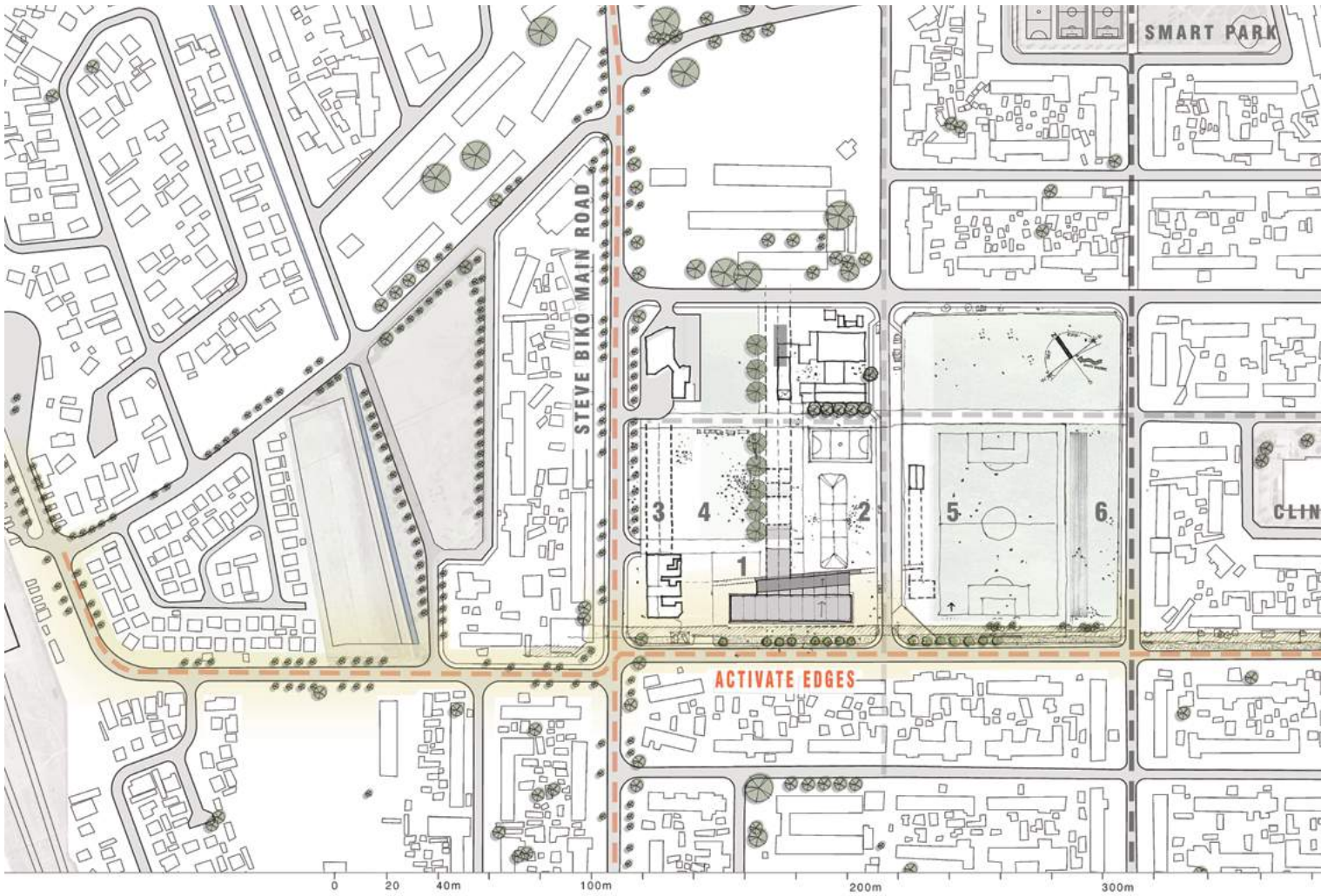
Spatial Framework

Precinct Vision

This early conceptual site plan depicts an envisioned framework that incorporates ideas of spatial arrangement for the two community and publicly used recreational sites, rather than prescriptively 'master planning' the site in one static movement. The light grids of speculative growth are represented by the arrows, reaching up the site allowing potential for connections and interaction with the Community Centre, Church, and active street edge of Steve Biko Road. These abstract wings of growth allocate ideas of opportunity which can plug into the existing social infrastructure of the site, whilst also setting up a rational grid for the new proposed development that works in harmony with the existing precinct fabric. The dark highlighted areas represent the more solid, core elements of the new building proposition, which receives location off the south street edge to activate the architectural program through movement routes.

Conceptual sketches of the spatial ideas of the building - section exploring the development of a large public square 'courtyard' space following envisioned user-based growth of the site precinct

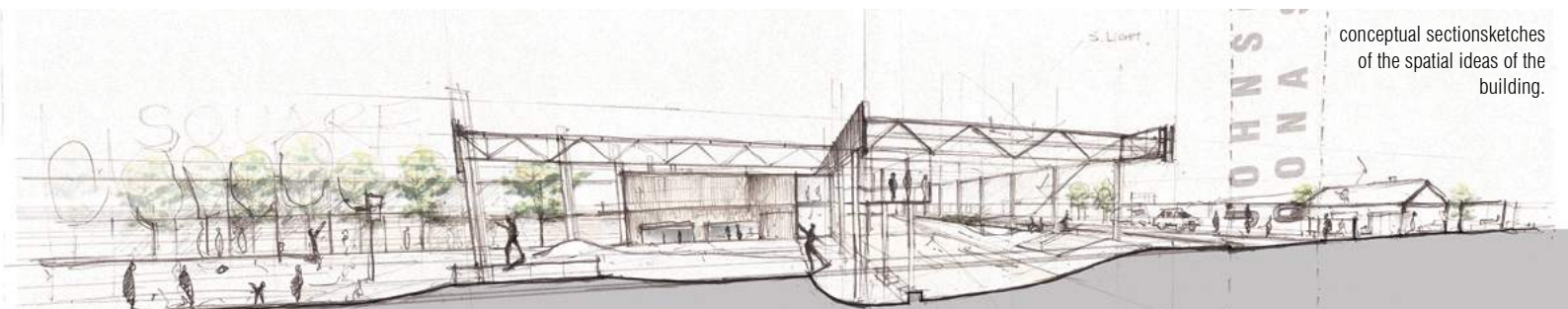




Stie Precinct Framework Plan: *Revised and Updated*

The early concept plan drawing is contrasted with the revised site framework plan (on the right) which went through a process of refinement in terms of scale and architectural scope. The intervention of the previous versions 'black core' areas has scaled down to a more modest building that focuses on developing the architecture of an experimental skate school further. The existing strip of trade stores along Steve Biko Road remains an economic anchor of the site, from which positive entrepreneurial growth can occur.

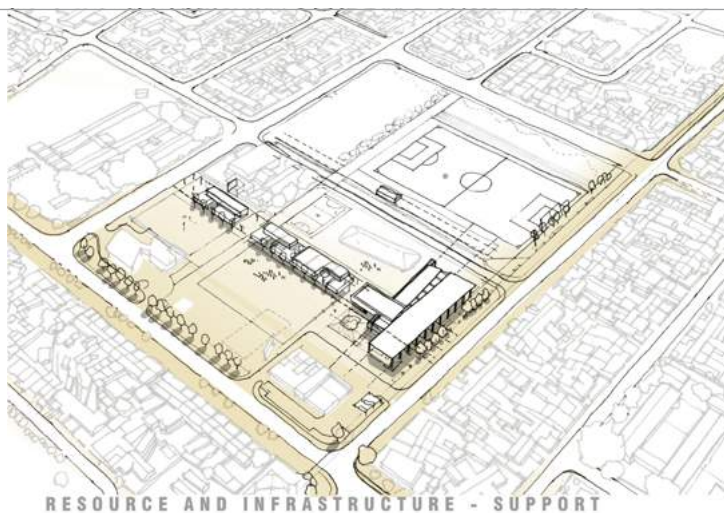
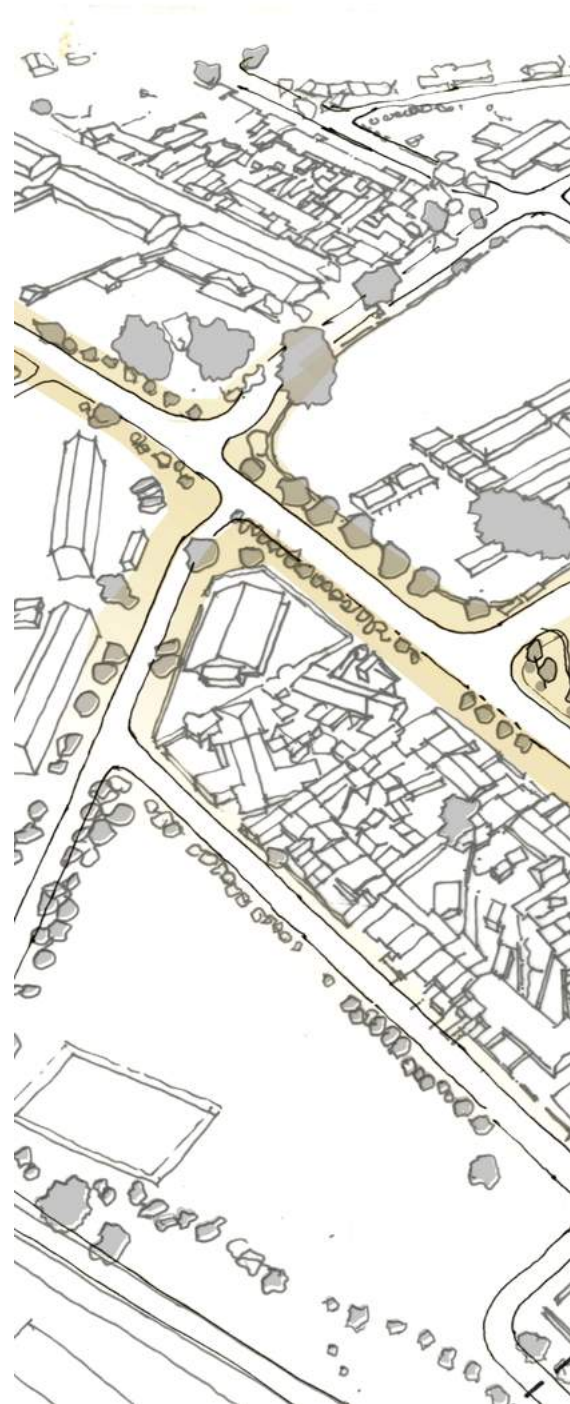
A noticeable feature of revision in the current site plan is the splayed angular line which sets up a unique grid line that anchors the smaller wing of the building. This shift of axis on the smaller more compact wing picks up on a diagonal site line extended from the new building grid out towards the GQUU Tavern on the opposite east side of the sports ground. This tavern is an important landmark in the precinct with iconic presence in the street scape. Motivations for this design decisions (see overleaf) are:



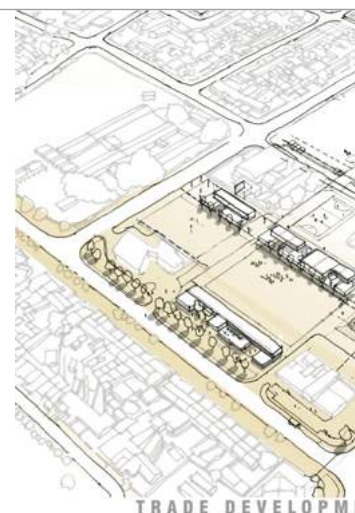
1. Linkage - through a visible site line from building to GQUU Tavern on the opposite east side of the sports ground. This opens up the orthogonal plan of the building and suggests a focus towards the sports ground, as a layer that sits far back off the street edge anchored under the large main space that responds directly to the street axis.
2. Adjusting the orthogonal grid in areas allows for a shift in perceptive experience in areas, more precisely focussing views from the first floor back towards Table Mountain captivating the rare opportunity for incredible vistas in such a context, adding a feeling of ascension and respite.
3. Programmatically, the two horizontal main elements of the building (elaborated on further in Part Five) required a neutral space of buffer in-between. This slight parting of the two structural systems resulted in an open arcade threshold space that presented an interesting opportunity to play with the relationships of each form's grid orientation and the spatial qualities of the programmatic buffer space between.

The thumbnail sketches below represent an envisioned version of how the framework can suite patterns of growth to provide resource and infrastructural support for user-based incremental development.

With strong basis and argument provided for the development of the precinct, the next chapter analyses the architectural design in finer detail with key lenses of focus placed on critical aspects of the design development process. These aspects are: Structure, Space/Form, Materiality and Building Performance.

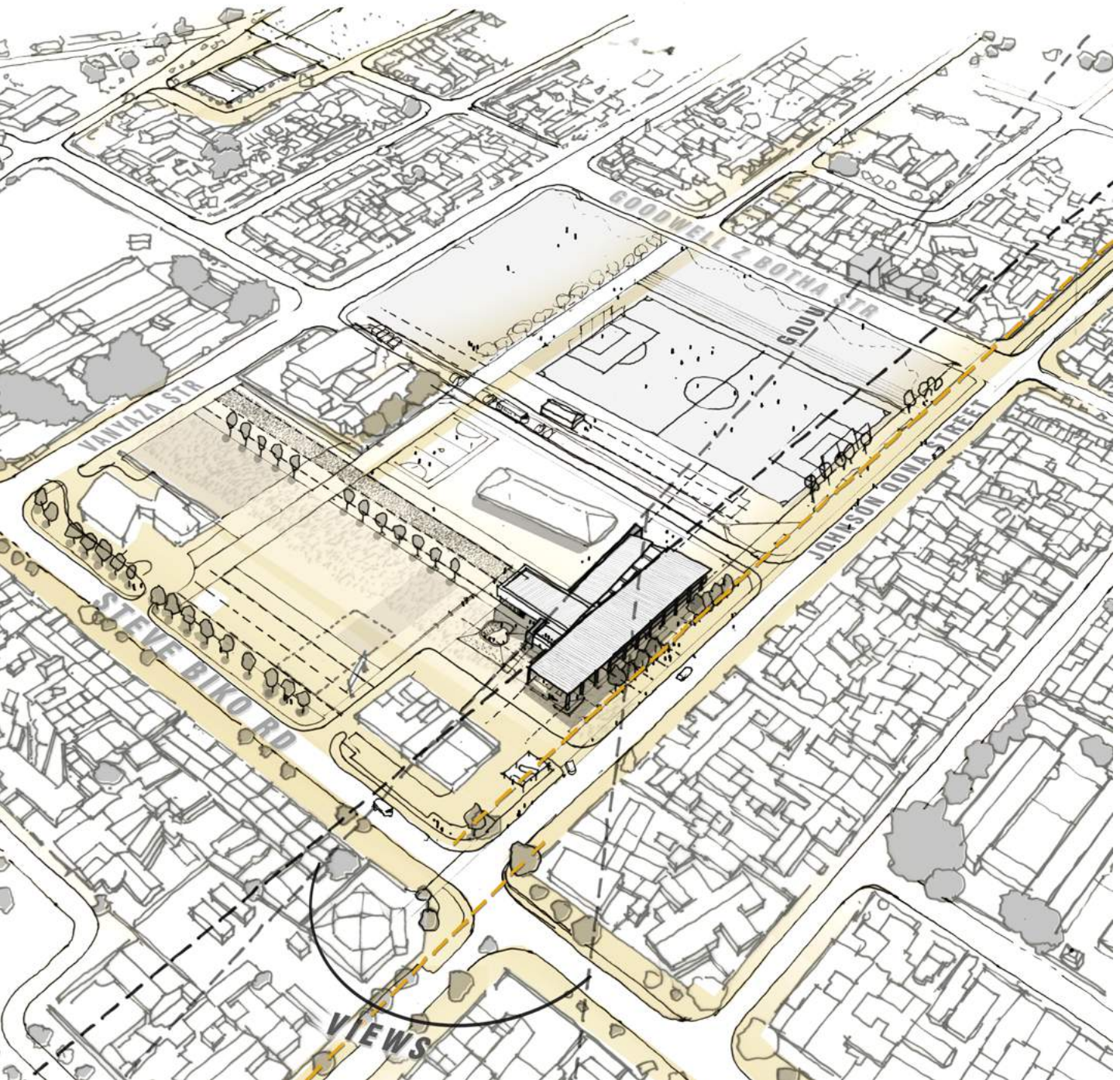


RESOURCE AND INFRASTRUCTURE - SUPPORT



TRADE DEVELOPMENT

Diagrams representing a precinct vision for the future growth of the site and surrounds



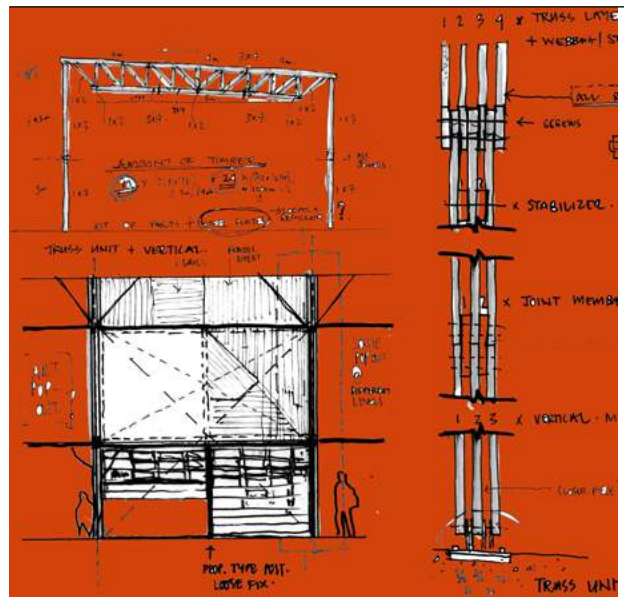
Site Precinct Framework Aerial 3D



DEVELOPMENT POTENTIAL OF STEVE BIKO

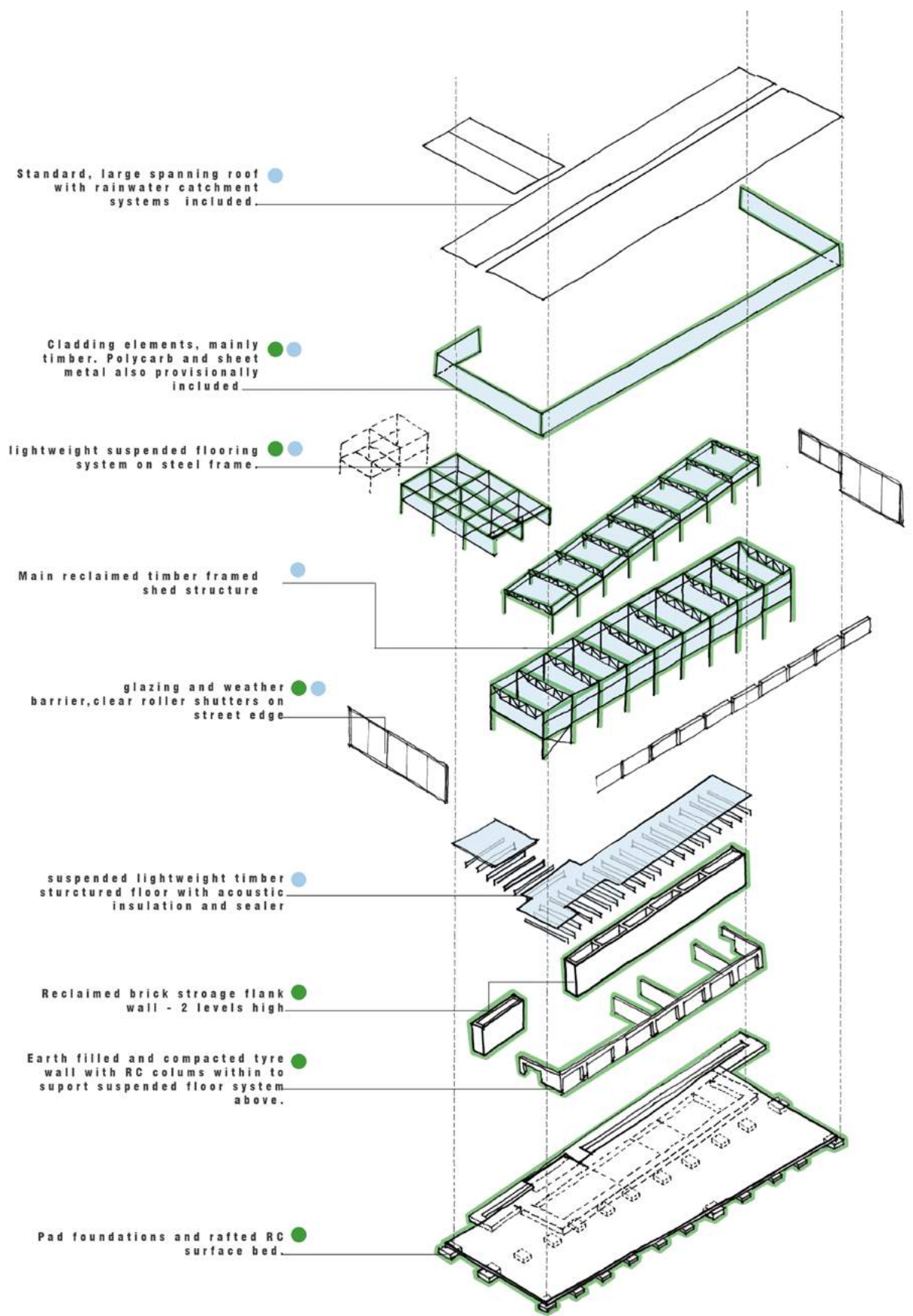


URBAN SQUARE PRECINCT AND GUFU CLUB HOUSE



part 5

the building

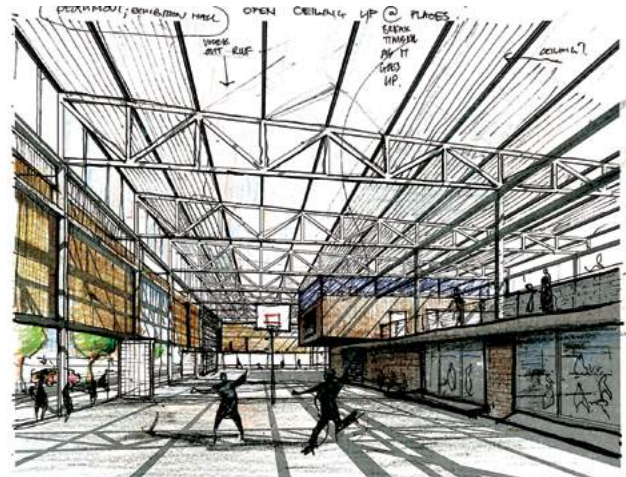


STRUCTURAL SYSTEMS | REUSE AND DISSASSEMBLY

15 Structure

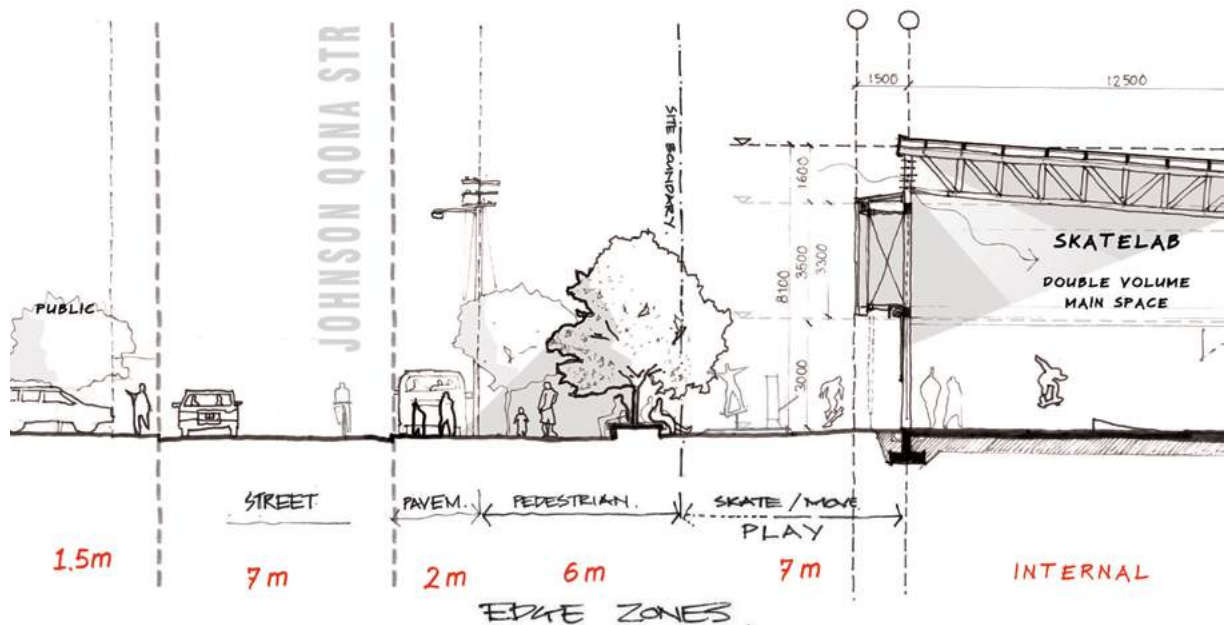
Due to the nature of this project, structure and materials are strongly linked. Recycled elements pose many challenges structurally, which became a big design hurdle to overcome when designing the spatial arrangements of the building. The challenge became an exercise of distributing the material property ideas learned in the research back into the creation of space.

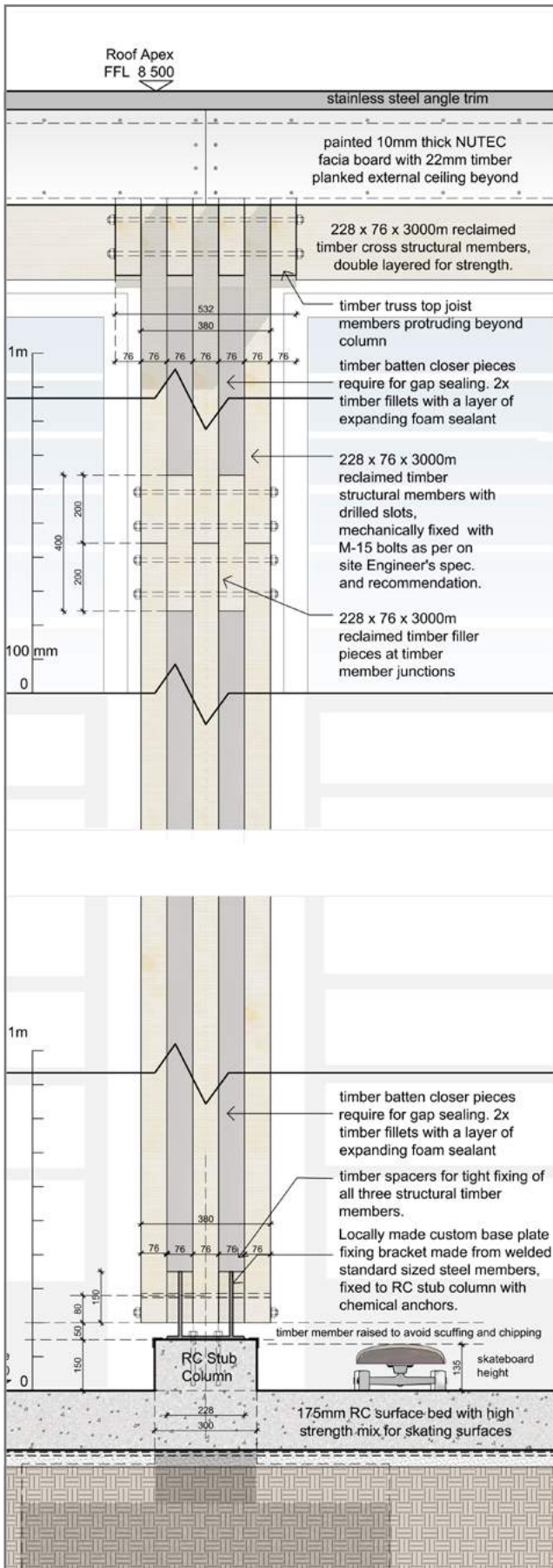
From early on in the process, structure and spatial ideas overlapped as design informants. The conceptual idea of setting the building off the street is represented more realistically alongside in the section, indicating various thresholds of activity and interaction with the building, made possible through the regeneration of this pedestrian route. These thresholds begin in the street and range through different levels of public space use as you move closer to the building's threshold. Thresholds: Vehicular, commuter, pedestrian & rest, skate and move, then indoors. Essentially, this indoor space is an extension of the street where indoor and outdoor can blur, or internal space can be used simultaneously, with volumous indoor space for activity. This translated



Internal sketch of large open space

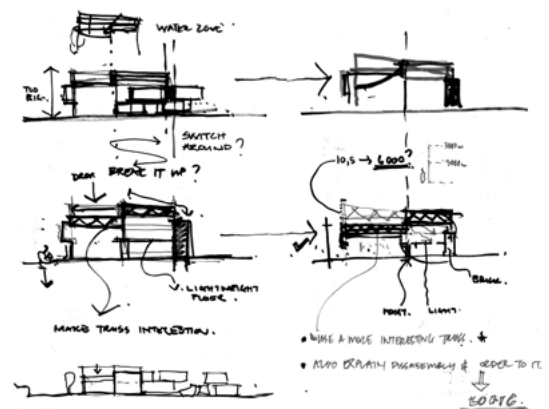
into a big open space dealt with by a framed, mechanically fixed structure that then scales down into a smaller more robust and solid structures, where the more contained and specialised activities occur. The structural language that emerged spoke of a procession of lightweight, solid and then growth from the street inwards to the site interior. In section, these arrangements were making sense, and based on findings on economic dimensions and material spans, the plan applied a logic of economy and conventional grids which also tied in with shipping container dimensions and set the envisioned grid for the possible future growth.



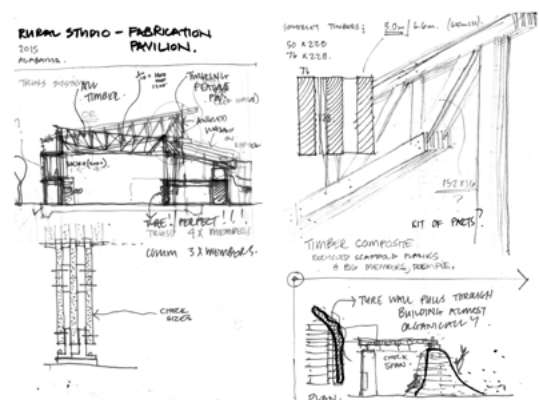


Truss Unit | Base and Head Detail

The main 'shed' structural element of the building is made from composite use of recycled structural timber. Initially starting out as a conventional steel portal frame for reasons of structural economy and restrictions in quality assurance of recycled materials - the idea for the main composite timber structure evolved out of technical research. A feasible method of employing second hand materials for the structural frame came through inspiration from Rural Studio's (a design-build based studio program of the University of Alabama's Architecture Department) ideas of layering, sandwiching and triangulating conventional pieces of structural timber to form large trusses. The detail drawings alongside and overleaf represent the typical joining details at the head and base connections. Procurement, making and assembly of the trusses will be elaborated on further along in the report.



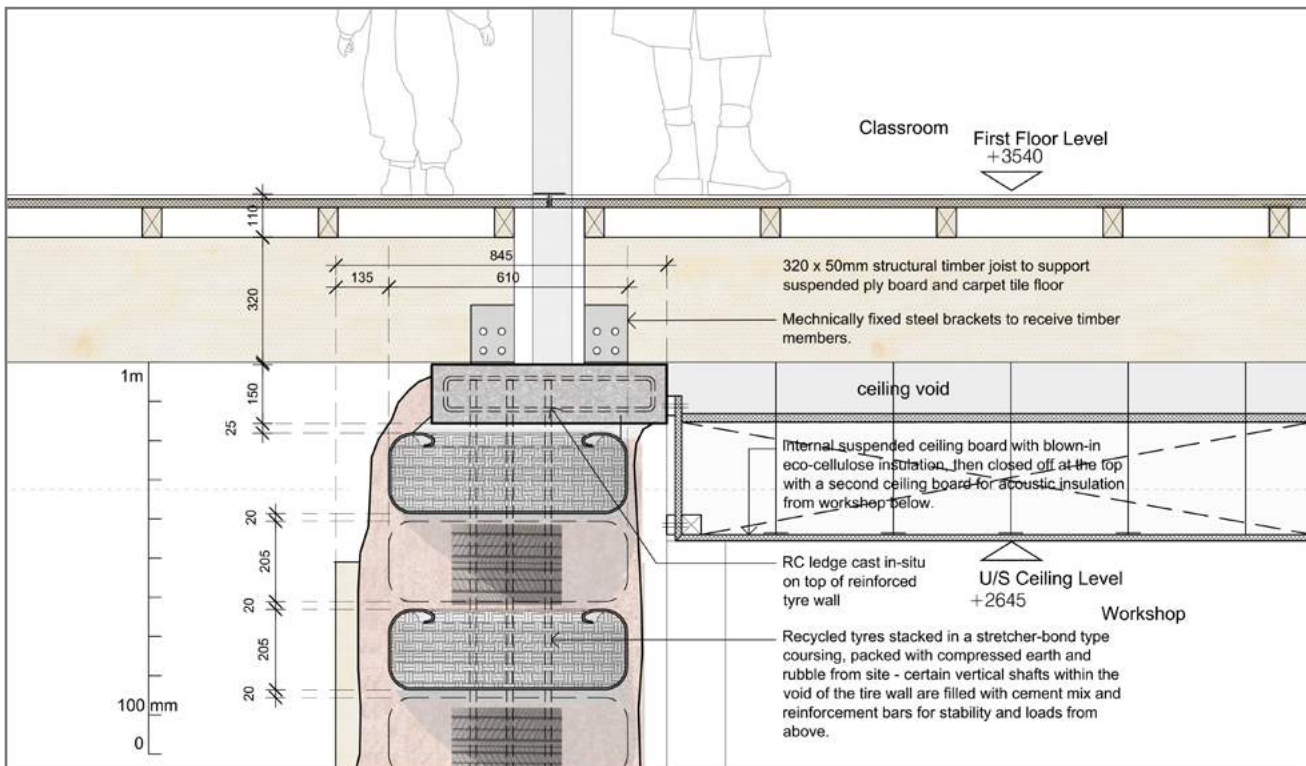
Sketches exploring truss orientation and scale



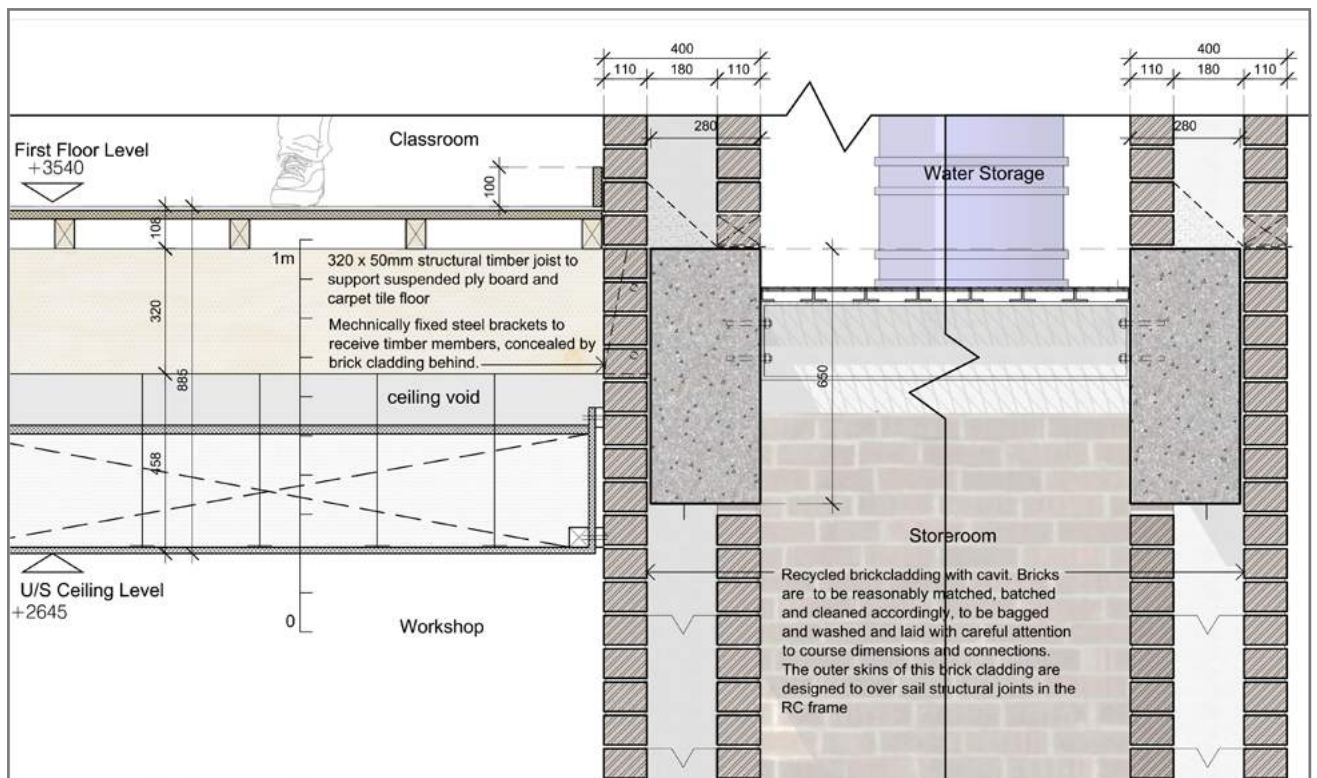
Sketches exploring truss detailing and articulation



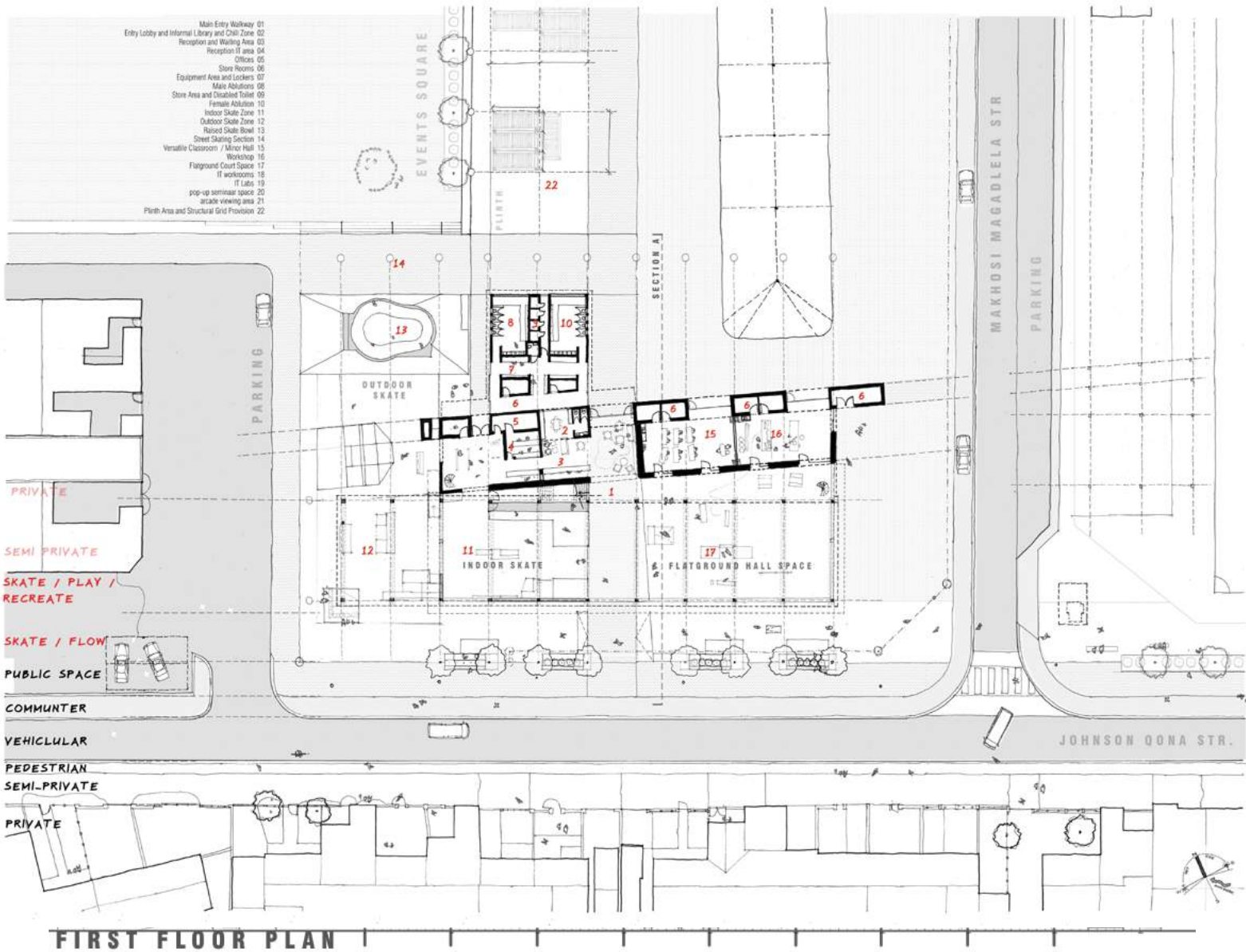
Short Side Sectional Perspective



Tyre Wall and Suspended Floor Junction



RC and Brick Storage Wall and Suspended Floor Junction

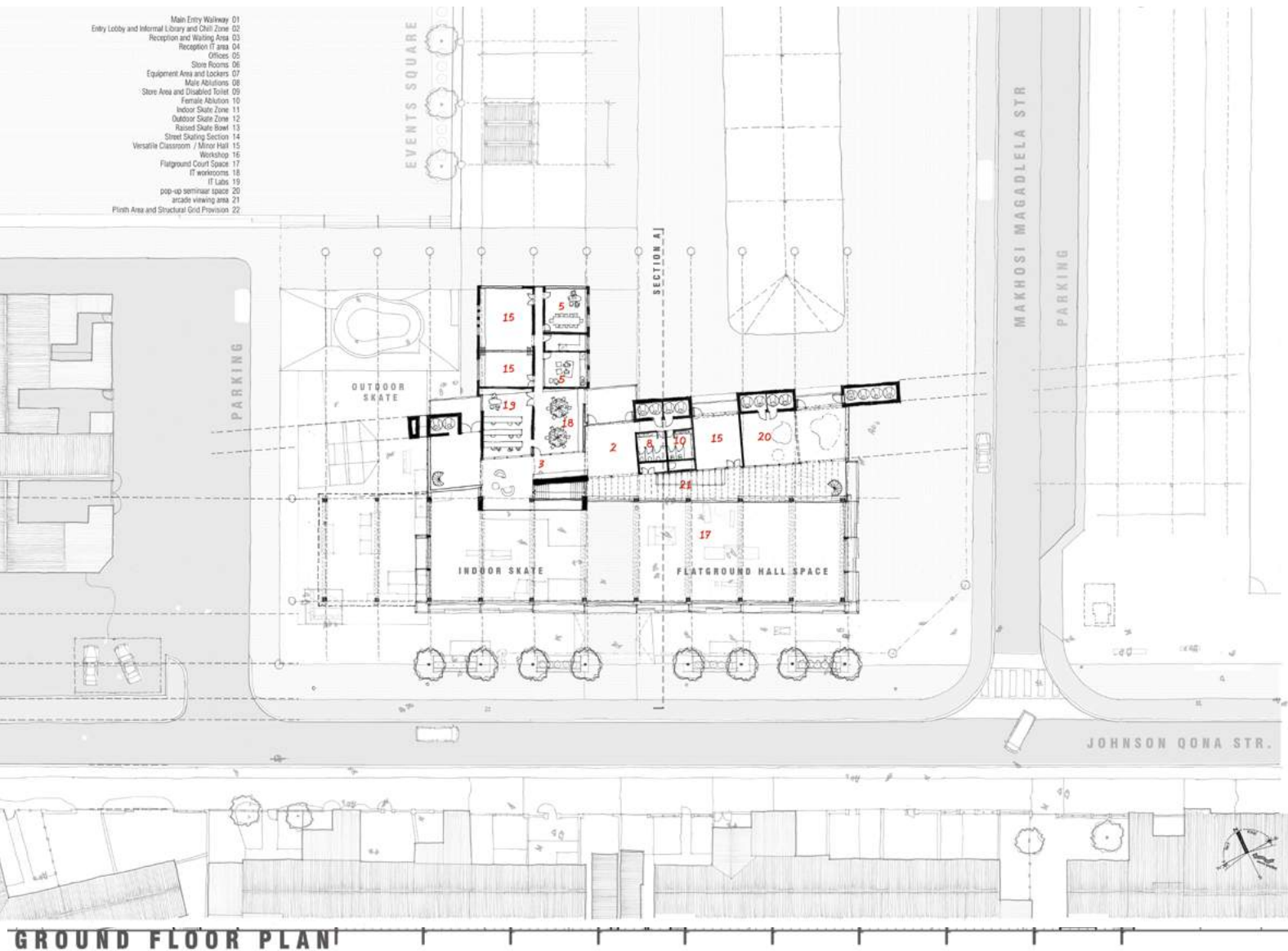


- 01 Main Entry Walkway
- 02 Entry Lobby and Informal Library and Chill Zone
- 03 Reception and Waiting Area
- 04 Reception IT area
- 05 Offices
- 06 Store Rooms
- 07 Equipment Area and Lockers
- 08 Male Ablutions
- 09 Store Area and Disabled Toilet
- 10 Female Ablution
- 11 Indoor Skate Zone
- 12 Outdoor Skate Zone
- 13 Raised Skate Bowl
- 14 Street Skating Section
- 15 Versatile Classroom / Minor Hall
- 16 Workshop
- 17 Flatground Court Space
- 18 IT workrooms
- 19 IT Labs
- 20 pop-up seminaar space
- 21 arcade viewing area
- 22 Plinth Area and Structural Grid Provision

With reference to the ground floor plan above, the big open covered zones allow for a versatile open space that buffers the internal spaces and the street edge. Solidity is achieved through the densely-walled spaces of the angular wing mass of the classrooms and workshops. The skate zone manifests out of the big open area and wraps around into the 'open void space', setting up an indoor / outdoor dynamic. Upon wrapping the building corner, the skate park blurs off into the open events square, losing specificity of skate related space articulation moving north.

The overall forms of the building are dictated by the structure and systems and emerge out of this overlap of programmatic requirements. The main timber structure becomes the dominant element with more nestled and solid elements sitting below, anchored by the large brick and RC service wall. These basic

16 Space and Form

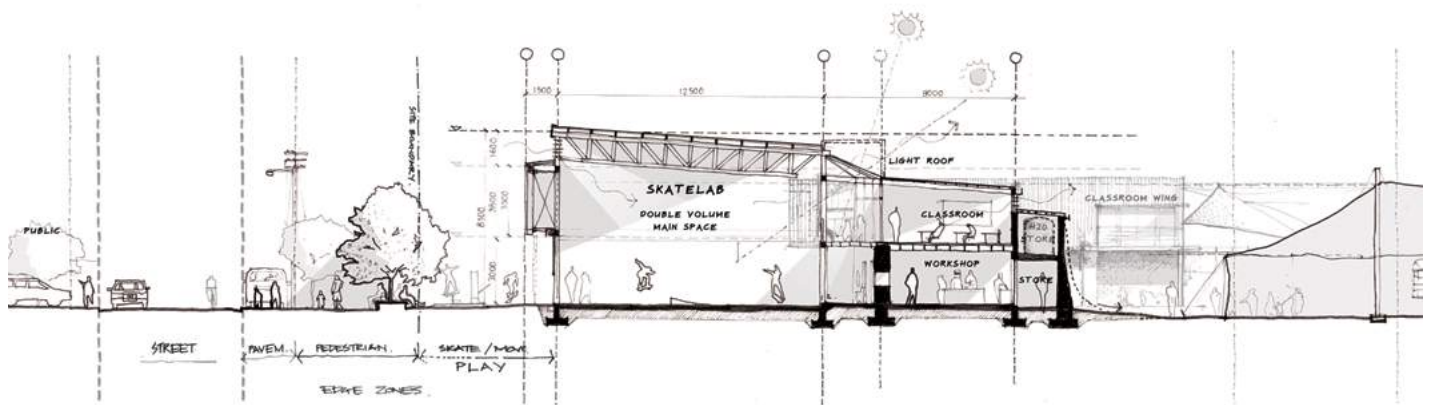
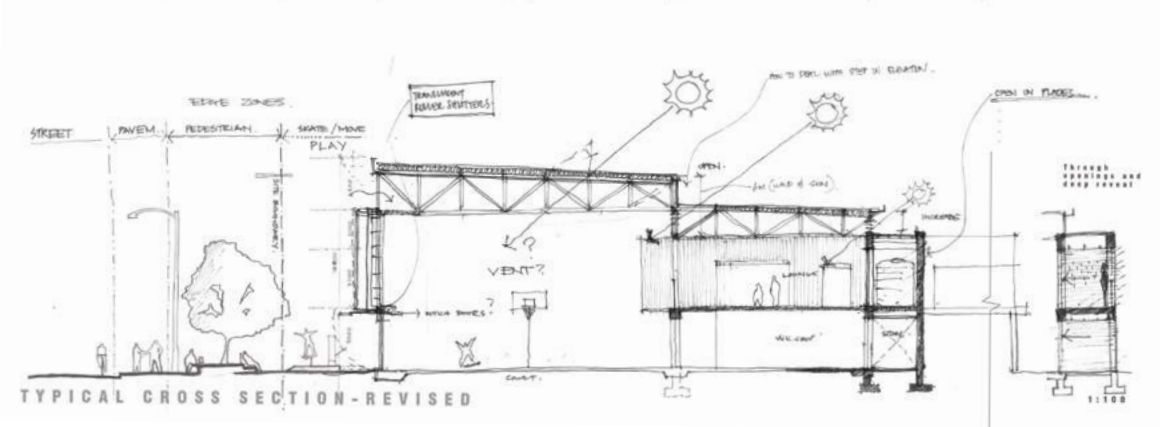
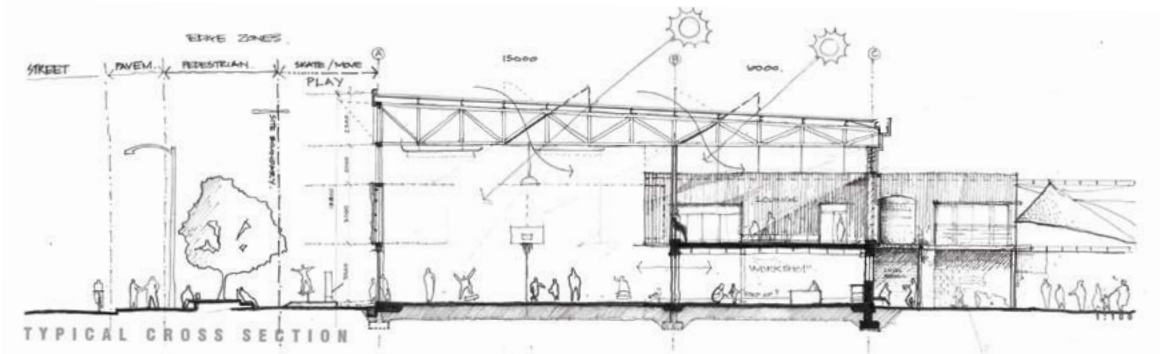


formal elements represent the whole, defining clear programmatic division of intent legible in the buildings massing, form and orientation.

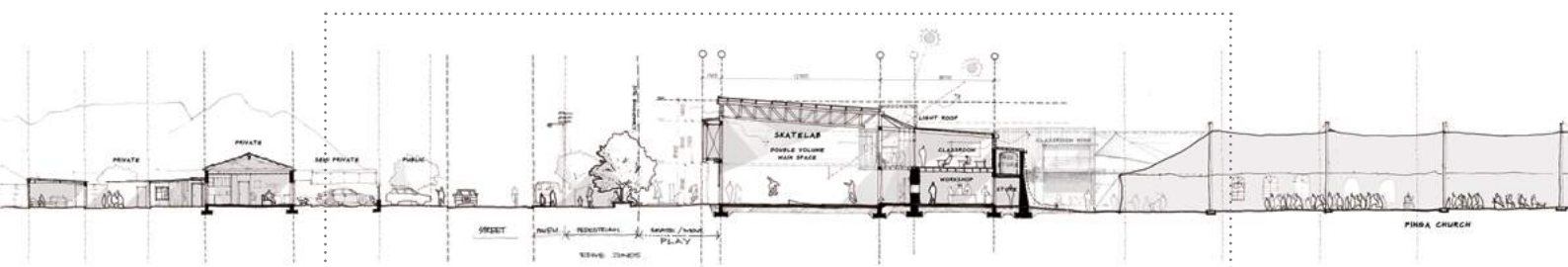
On the first floor plan in the smaller, more compact and vertically orientated wing are the study areas, IT rooms and PC facilities as an isolated and lockable spatial element, with the bottom spaces hardy and solid, to suite the activities of workshop and skating areas.

As mentioned previously, the scale of the building became too large. Imageability and a sense of human scale had been neglected. I then began a process of scaling down the building to address the street in a softer manner. The scaled reiterations of cross sections (see overleaf) briefly explain this process, where spans reduced materials changed; spaces became more compact without losing functionality or practicality.

- 01 Main Entry Walkway
- 02 Entry Lobby and Informal Library and Chill Zone
- 03 Reception and Waiting Area
- 04 Reception IT area
- 05 Offices
- 06 Store Rooms
- 07 Equipment Area and Lockers
- 08 Male Ablutions
- 09 Store Area and Disabled Toilet
- 10 Female Ablution
- 11 Indoor Skate Zone
- 12 Outdoor Skate Zone
- 13 Raised Skate Bowl
- 14 Street Skating Section
- 15 Versatile Classroom / Minor Hall
- 16 Workshop
- 17 Flatground Court Space
- 18 IT workrooms
- 19 IT Labs
- 20 Pop-up seminar space
- 21 Arcade viewing area
- 22 Plinth Area and Structural Grid Provision



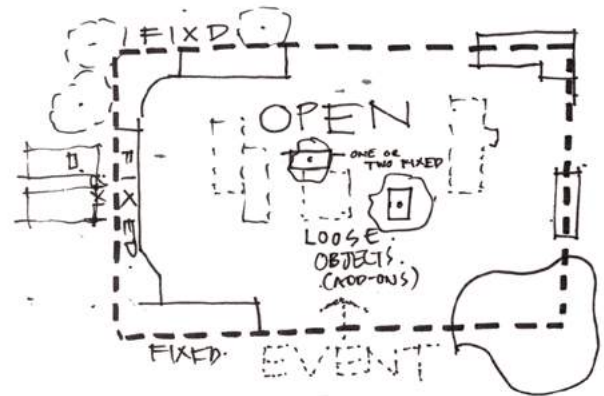
TYPICAL CROSS SECTION - FINAL



PRECINCT SECTION INDICATING RELATIVE SCALE OF ARCHITECTURE

Naturally, the dynamism and fluidity of skateboarding requires spatial configuration that pays respect to its qualities. The design and integration of the skate park concept into the building and public square take a subtle yet practical and versatile approach. This synthesis of a ground plane manipulated into objects of 'skateability' can take many forms. The overarching design dissertation driver of local closed-loop material construction strongly suggests that the skate park design and construction would need to make use of similar principles for similar reasons – this limited the use of expensive high-class concrete to the external areas of the park only. Ramps will be locally made out of suitable timber (new) products designed and built by specialists and youths.

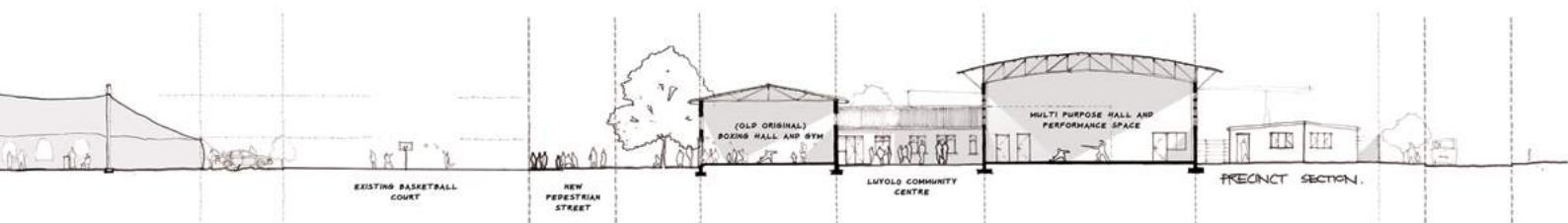
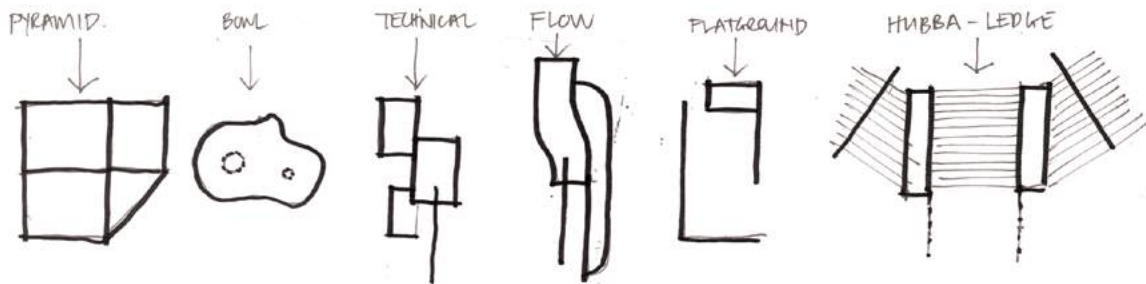
The following diagrams and illustrations give a breakdown of the obstacle categories in skateboarding and how they have been integrated into the skating layout relative to the adjacent social spaces.



SKATE & EVENT; DUALITY.

- FIXED OBJECTS/HARD LANDSCAPING KEPT TOWARDS EDGE. (BLEND IN LANDSCAPING). PYRAMID BECOMES STAKE ETC.
- LOOSE OBJECTS - IN CENTRE. - CAN BE PACKED AWAY FOR EVENTS.
- ONE OR TWO FIXED OBJECTS IN CENTRE FOR ANCHORAGE & SERVICES.

OBSTACLE CATEGORY — HYBRID LANDSCAPING. — PARK SKATE ↔ STREET SKATE BLEND.



PRECINCT SECTION INDICATING RELATIVE SCALE OF ARCHITECTURE

CONVENTIONAL ZINCALUME ROOF SHEETING ON SUBSTRUCTURE ON STEEL TRUSS PRIMARY STRUCTURE .

TOP OF ROOF PITCH +10 4000

ZINCALUME ROOF TRIM FASCIA SYSTEM

CLERESTORY POLYCARB / LOUVRE SYSTEM TO LET IN LIGHT AND AIR

1/2 TRUSS +8 000

PARAPET +6 250

REUSED TIMBER CLADDING SYSTEM ON SUBSTRUCTURE FIXED BACK TO PRIMARY STRUCTURE.

FIRST FLOOR +3000

KRAZI-DOOR ALUMINIUM AND POLYCARB PANNELED ROLLER SHUTTER DOOR, HIGH STRENGTH FOR SECURITY AND HIGH TRANSPARENCY .

GROUND FLOOR +0

5

3

OPEN TRUSS

ALUMINIUM LONGSPAN GUTTER WITH RWPD CONNECTED TO WATER REUSE SYSTEM

CLERESTORY POLYCARB / LOUVRE SYSTEM TO LET IN LIGHT AND AIR

ACOUSTICS

REUSED/ RECLAIMED AND SECOND HAND BRICKS FROM MULTIPLE SOURCES USED FOR FLANKING WALL. RC FRAME STRUCTURE WITH BRICK INFILL AND OVERSAIL.

TRIPLE VOLUME

2200L 7000 WATER TANK (X 10) WITH INTEGRATED RAINWATER HARVESTING AND REUSE SYSTEM

VERSATILE OPEN COURT SPACE

CONVENTIONAL RC FRAMED STRUCTURE WITH REUSED BRICK INFILL

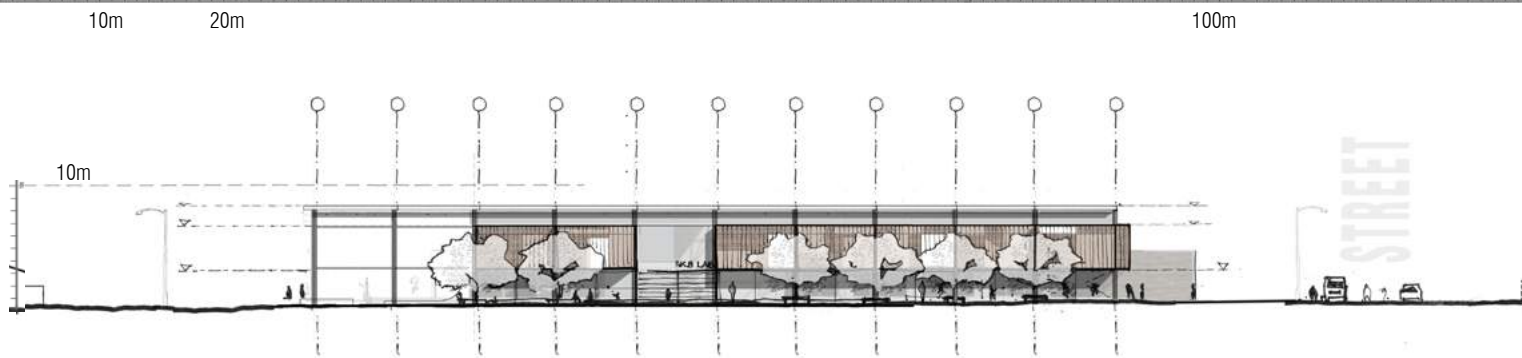
WORK-SHOP

WORKSHOP STORE ROOM

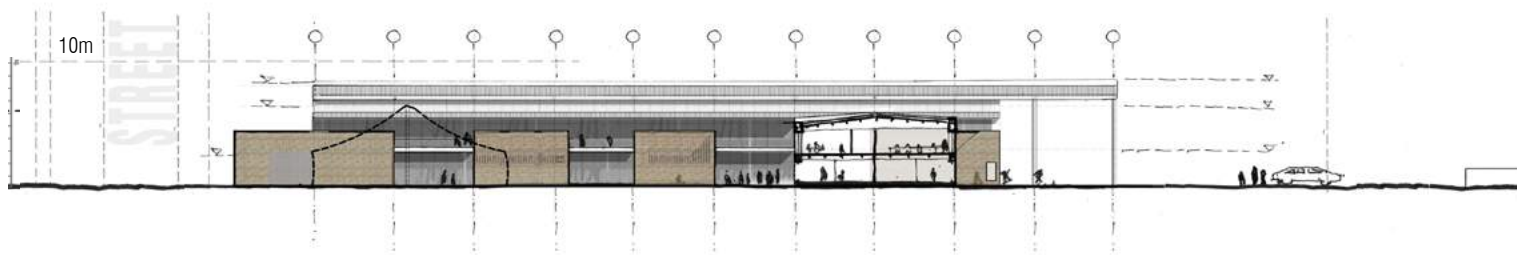
STRIP SECTION

1:50

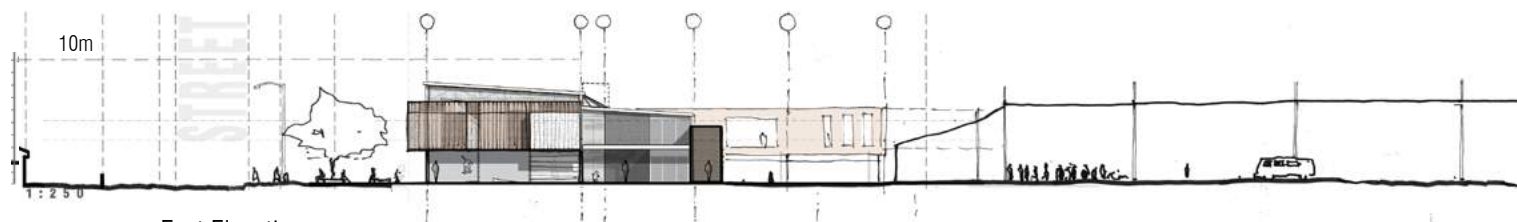
17 Materiality



Street Elevation (South)



North Elevation

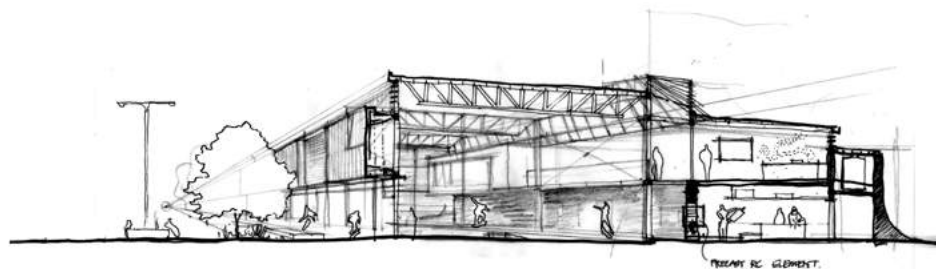


East Elevation

In terms of material reuse and utilising local resource streams, this project will entail unique procurement teams and management structure. The role of the engineer would be significantly different to conventional site roles and procedures, requiring more time on site and more attention to material quality (Baker-Brown, 2017). All second-hand structural timber members will be meticulously checked and approved according to quality, age and grade. These aspects are expected in an unconventional build that aims to rescript outdated planning procedures are necessary and must be stated and anticipated up front and in the project contract, budget and timeline.



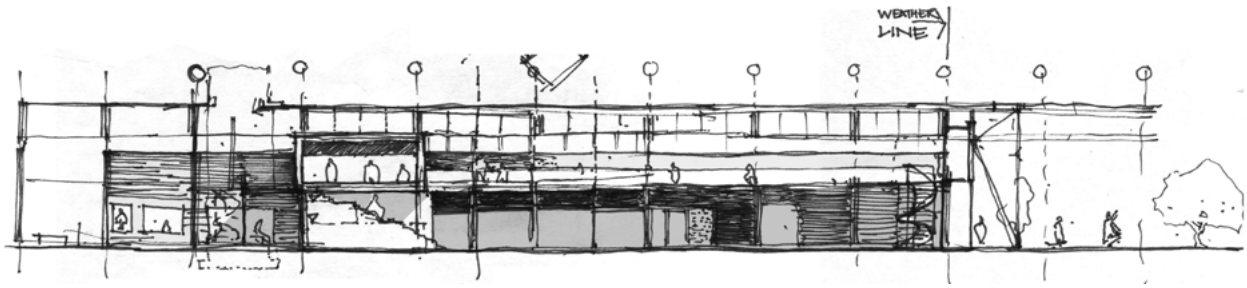
Eye Level Street Perspective Sketch



Eye Level Street Sectional Perspective Sketch



Street Elevation - Part Elevation of Facade Panels



Internal Sectional Elevation

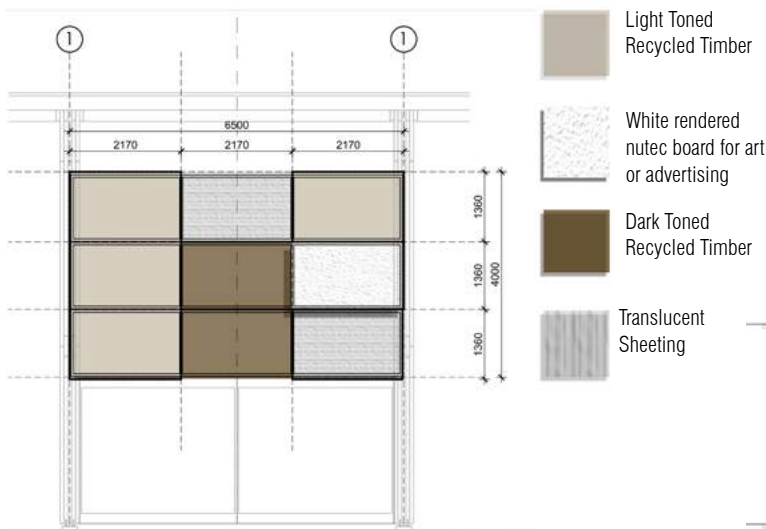
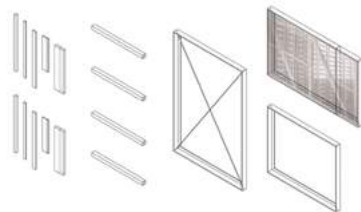
The timber truss system is designed to be recycled timber from second hand yards and demolitions projects. These composite trusses are made up of many different members and may require much time for procurement. This job should start far earlier in the process than is usual – ideally before the design development stages.

A production line can happen on site or at a satellite workshop with varying skill ranges. Feasible transport for the trusses would require them to be delivered to site as half-trusses and assembled together on site. A local team of worker refurbish the timber by cleaning and neatening, then drilling, fixing, and then installing each unit. This timber system is sufficiently protected in crucial areas, and raised off the ground by fixing brackets. These

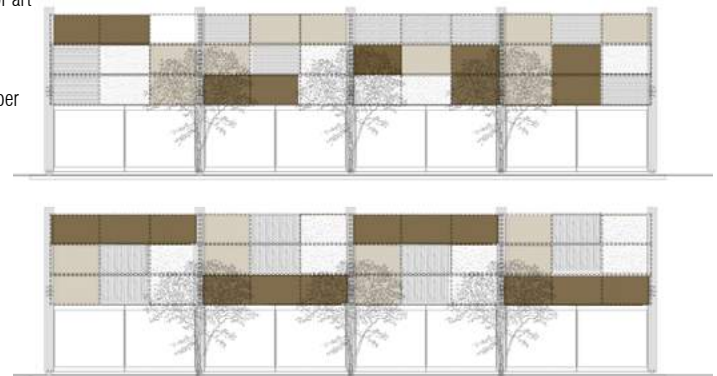
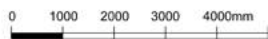
steel fixing brackets will be made locally and are designed to comply with levels of scale and complexity offered by such craftsmen. The truss units and frame structure will have a chunky robust look, made up of smaller elements with a stacked, layered nature – this layering has uniformity in size, yet material variance due to the varying timber pieces.

The same concept applies to the timber clad screening elements –modular yet variable in finish. Timber, translucent sheeting and artwork panels rest in locally made steel frames with fittings, and fixings made for Panels make for ease of replacement, maintenance and material availability. These large steel frames are made up of smaller panels that suite the range and scope for small steel businesses.

Locally made steel frame modular panels



Indicative Facade Screen Unit with Variable Screen panels



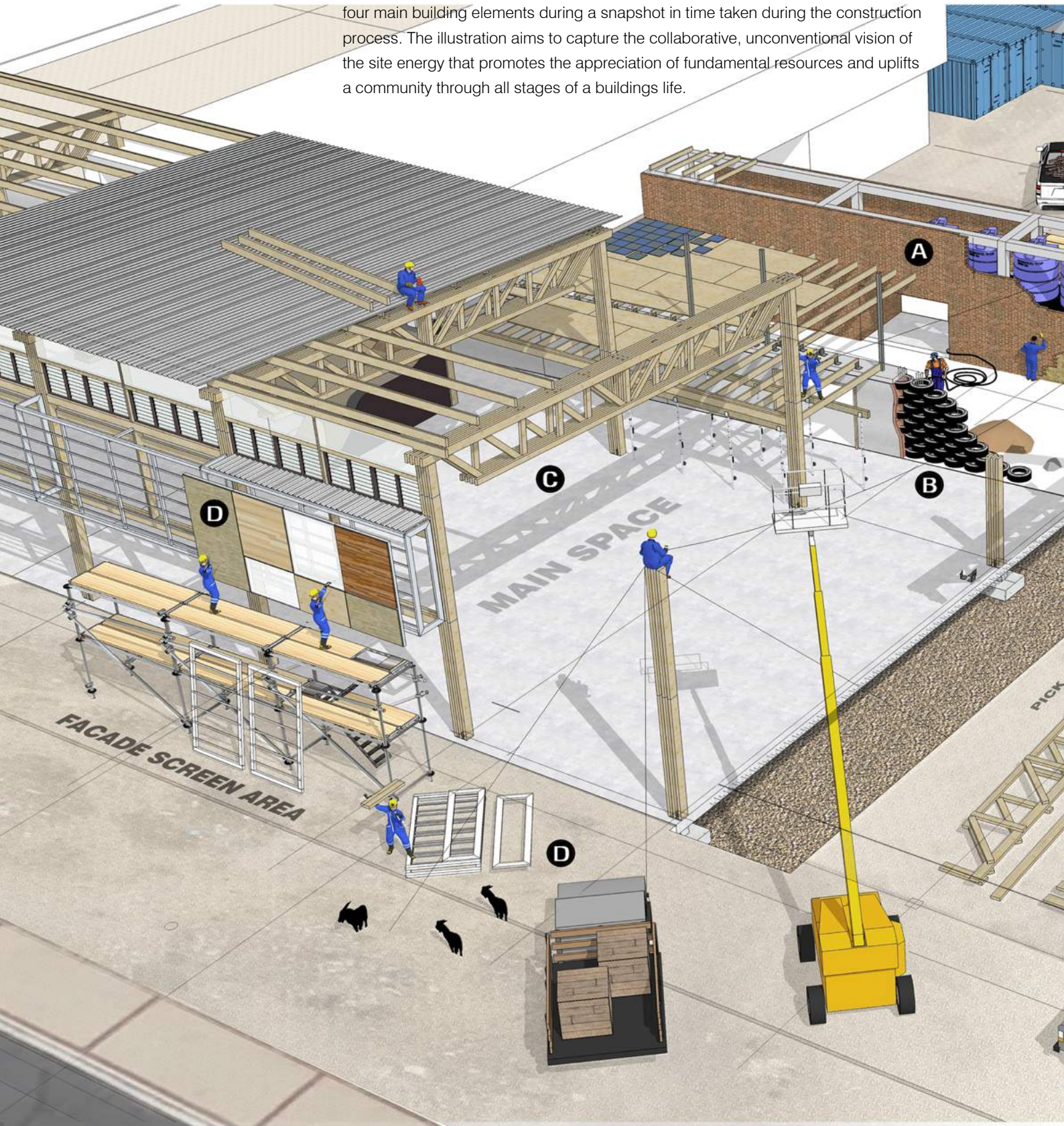
Indicative elevations representing modular panels with versatile and variable screen pattern design.

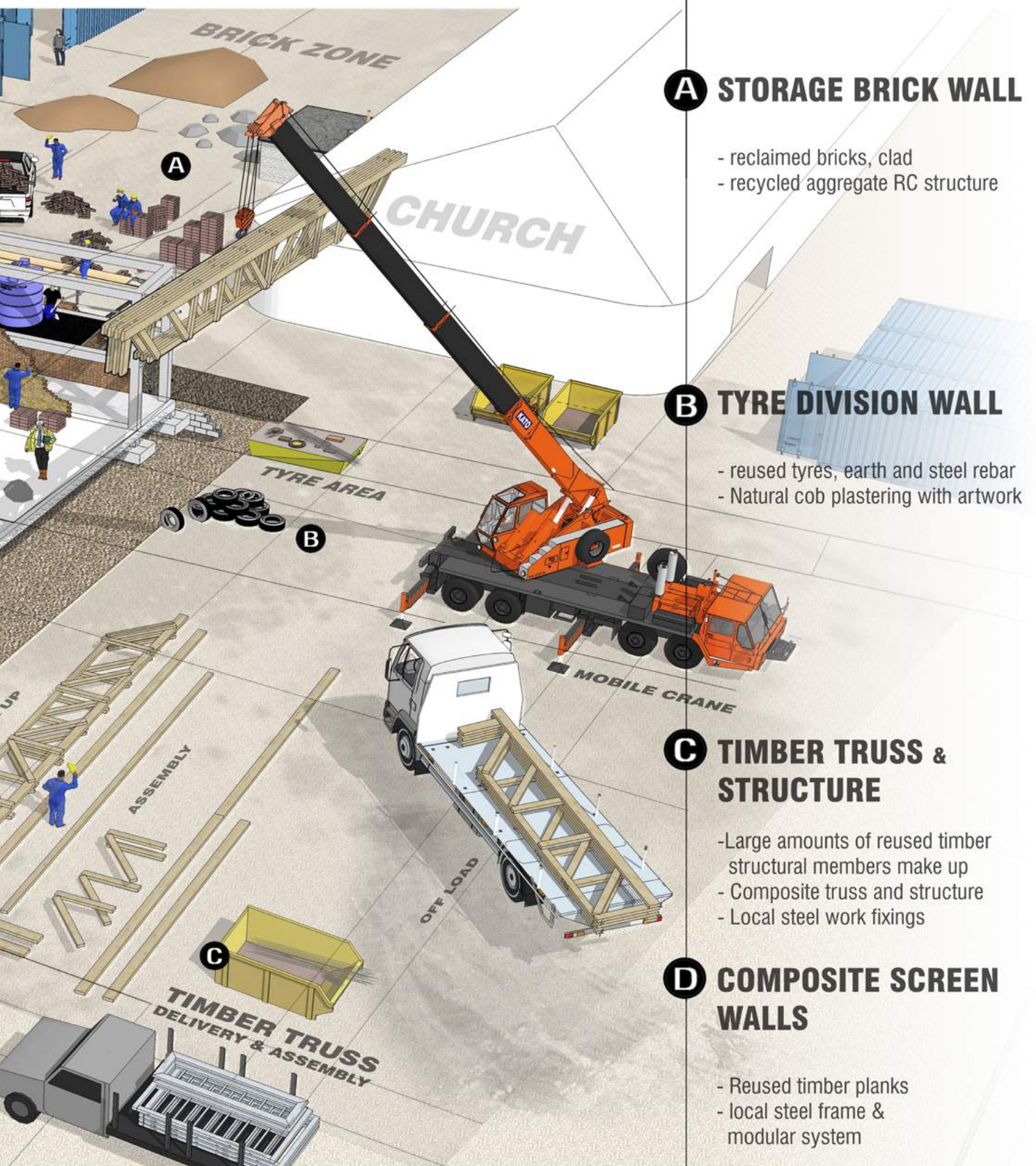


Street Elevation with Rendered aterials (South)



The following assembly drawing illustrates the stories, process and application of four main building elements during a snapshot in time taken during the construction process. The illustration aims to capture the collaborative, unconventional vision of the site energy that promotes the appreciation of fundamental resources and uplifts a community through all stages of a buildings life.





A STORAGE BRICK WALL

- reclaimed bricks, clad
- recycled aggregate RC structure

B TYRE DIVISION WALL

- reused tyres, earth and steel rebar
- Natural cob plastering with artwork

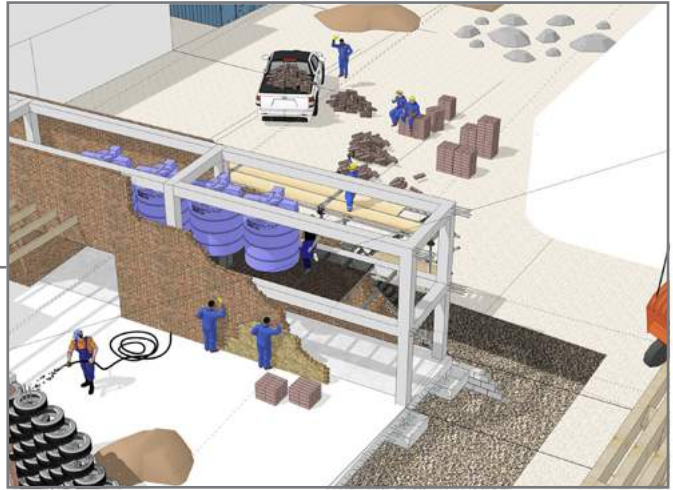
C TIMBER TRUSS & STRUCTURE

- Large amounts of reused timber structural members make up
- Composite truss and structure
- Local steel work fixings

D COMPOSITE SCREEN WALLS

- Reused timber planks
- local steel frame & modular system

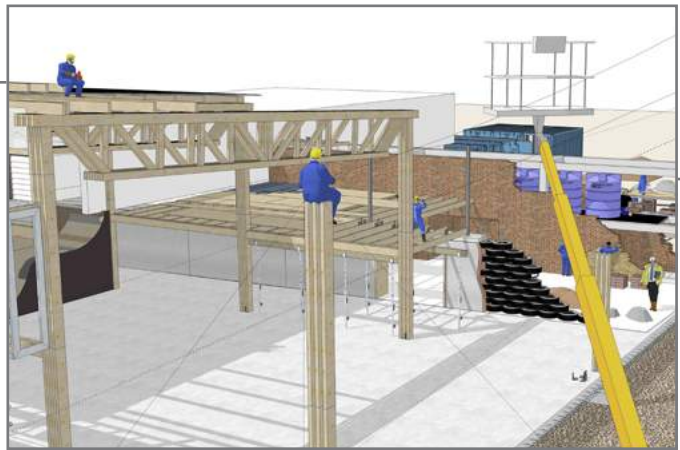
A STORAGE BRICK WALL



B TYRE DIVISION WALL



C TIMBER TRUSS & STRUCTURE



D COMPOSITE SCREEN WALLS



Brick Storage Wall:

This anchoring element consists of a re-enforced concrete frame made from recycled rubble crushed on site with mobile crushers. The rubble is collected from various illegal dumping sites in the immediate context and stored on site. This crushed rubble product forms the aggregate that constitutes the concrete mix. Steel re-enforcement is 50% recycled with all RC cast sizes keeping to convention, allowing standard 280mm wide beams and square columns. The non-loadbearing brick facade consists of a double skin cladding (230mm) made up of recycled bricks from various sources. Bricks are to be slightly matched, batched and cleaned accordingly. The assortment of second hand bricks will be bagged, washed and laid with careful attention to course dimensions and connections. The outer skins of this brick cladding are designed to over sail structural joints in the RC frame below, accentuating its monolithic quality.

Sources: 3 x local brick reclaimed in Philippi, Site demolition of Post Office depot, large volume of bricks available.

- Bricks are collected from local reclaimed brick traders in Philippi. Bricks from site demolition are sorted, selected and cleaned on site. All rubble from demolition to be crushed and sorted on site.
- After simple RC frame is cast, batches of bricks are delivered to the brick layers. This process requires masonry craft and precision, as the bricks finish and joints, will remain visible after the bagged lime wash.
- Bricks are laid according to pattern and design supplied by designer. Pattern and brick staggering techniques provisional.
- Standard sized doors, windows and vents are installed and waterproofed where necessary (also recycled).
- Water tanks dropped in and reticulated, and standard timber rafter lean-to roof installed overhead.

Internal Tyre Wall:

Source: Disused, redundant and discarded tires are collected by the Recycling and Economic Development Initiative of South Africa (REDISA) through a local connection. The Western Cape branch donates the tires for multiple uses across public community building projects. REDISA-organised transport drops the tires off at site and the specific team manager outlines the procedure.

- Tires are rolled to the wall area, stacked in a stretcher-bond type coursing, packed with compressed earth and rubble from site – certain vertical shafts within the void of the tire wall are filled with cement mix and reinforcement bars for stability and loads from above.
- Once the wall is built up to height and openings have been created, a series of precast RC ledges are dropped in place, to receive the first floor joist members. These walls have immense thermal, acoustic, and vibrational insulating properties, perfect for the option of dividing learning space and recreational areas.

Timber Trusses & Structure:

These elements are the most complicated, time consuming and critical elements due to the composite nature of the truss making, which directly affects procurement, quality control and craftsmanship. The timber trusses are composed of all recycled members at approximately 225x76mm/ 154x76mm by 3m/6m or in between in length.

Source: Demolition yards in Cape Town and surrounds. Procurement team on this project will work on sourcing of materials months in advance to any site work. This procurement will be lengthy and requires time, and connections and networking between traders, builders and demolition contractors will be made. Anticipated Sources: Doempie Second Hand Materials (Strand), 3 x Ross Demolition yards in Cape Town (Maitland, Lansdowne, Stikland), Suburban Second Hand Materials (Philippi)

- Timber is sourced according to visual quality and grading specification checked by Structural Engineer, cleaned and neatened in the workshop off-site.
- ½ truss components made in the workshop and transported with regular flat-bed truck to site / alternatively truss units can be fully assembled on-site.
- A rented, small scale mobile crane will lift and position the complete truss units to be received by the top column junctions.
- Suitable bracing and tensioning of structures as per permanent on-site engineers specification and recommendation.

Façade Screens:

The screening system is composed of multiple materials that sit in modular panels, possessing the ability to be arranged and ordered in different ways. The panels are made of recycled timber from various sources, translucent roof sheet cladding and painted timber panelled boxes that allow manipulation or artistic expression on the surface. The steel frames will be sourced and made locally, with installation and fitting being sub-contracted out to such trader.

Sources: Steel: Makoti Steel Works & REAL STEEL. Timber: KROMCO Apple Farm, Elgin: Discarded apple crates (potential source)

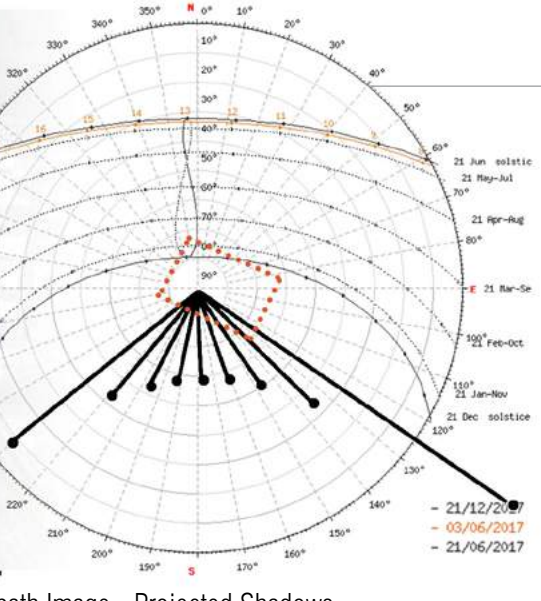
Translucent Sheeting: Cashbuild, Gugulethu: Free delivery and cutting service within radius.

- Recycled Timber is sourced and procured according to specifications and quality. Quantity of translucent sheeting is ordered and delivered to site, to be cut down to the various sizes.
- Steel workers at Makoti Steel Works manufacture the frames according to specification, and install the panels one by one, taking responsibility for all the steel work items covered in his appointment and contract.
- With the frames in place, separate teams assigned to each of the three panel materials install according the design.
- This façade is versatile, changes with age (weathering) and is relatively easy to repair and maintain. The façade can adapt as the building ages, reflecting honesty in the materials that constitute it - with a welcoming tolerance for change, growth and adaptation.
-

The four anchoring elements of the building fully demonstrate how the process of technical design research in the local material field can aid the holistic sustainability of a project throughout all stages and into its lifetime. Elements such as the main timber structure (also all rafters, panels and boards), façade screens and even the brick storage wall have been designed to reduce waste in demolition or deconstruction. This dual purpose notion of circular minded design and construction exemplifies the points set out in the ReSOLVE Framework's 'Loop' category, analysed in Part Two (Zimmman, 2016).



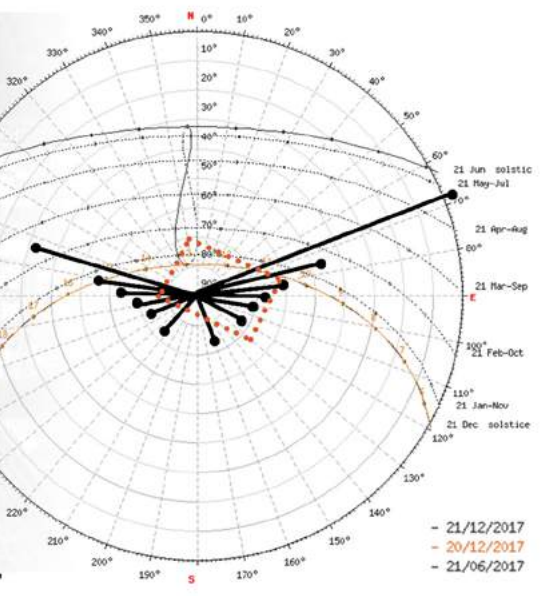
Sunpath Image - Winter Arc



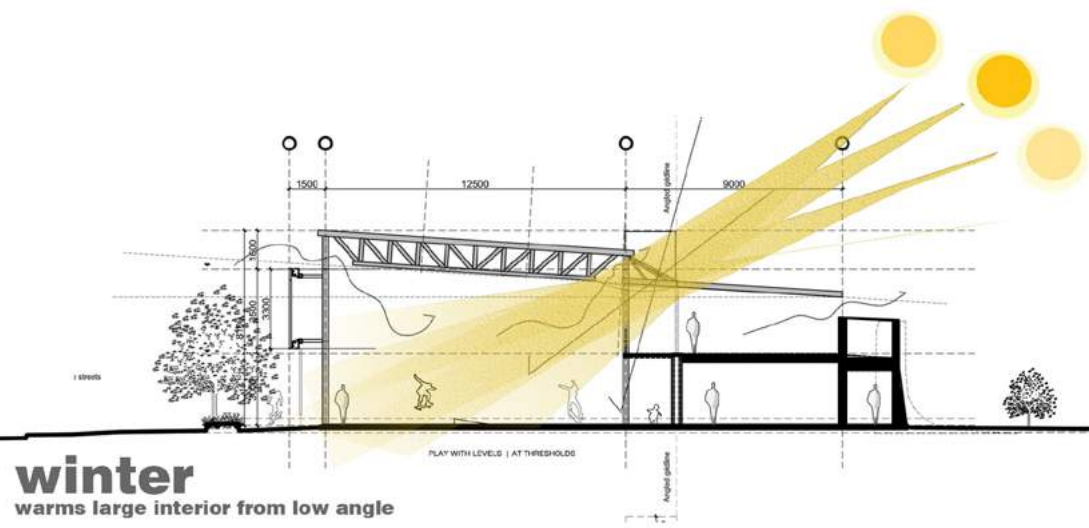
Sunpath Image - Projected Shadows



Sunpath Image - Summer Arc



Sunpath Image - Projected Shadows



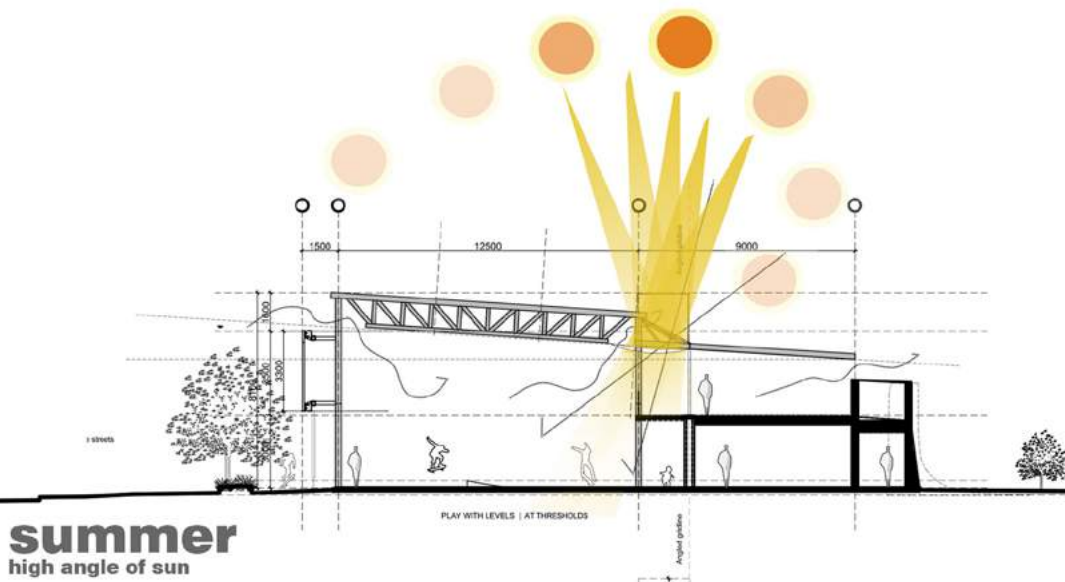
winter
warms large interior from low angle

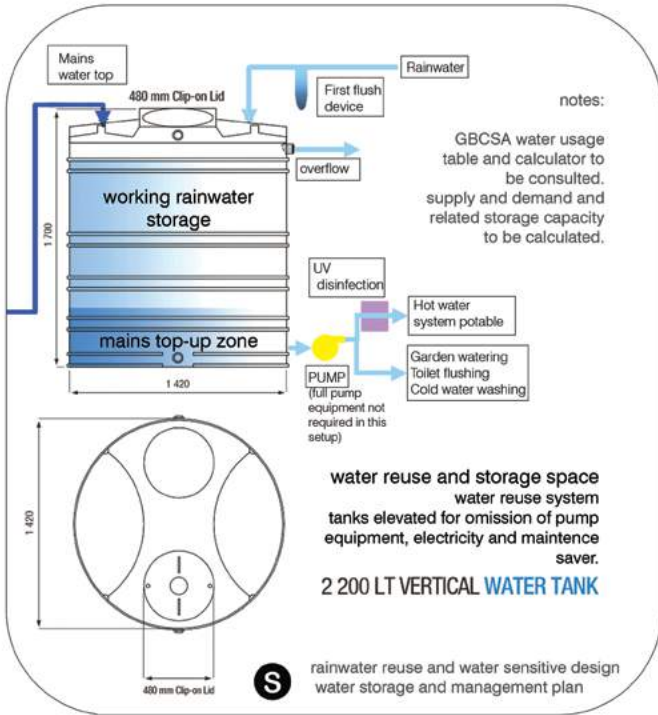
18 Building Performance

Water, Energy and Sustainability

The design of the building aims to make use of low-cost effective means of building performance and sustainability. With reference to the accounting framework for sustainable business models, the Triple-Bottom-Line plan can also be interpreted at an architectural level by applying the same sustainability principles. These three core values focus on social sustainability, environmental sustainability and economic sustainability – values directly addressed by the design dissertation with authentic interrogation and rigorous detail quality (Chamberlain, 2013).

Over and above sustainability inherently playing a huge role in the design dissertation topic itself, the building utilises many low-cost features that focus directly on building performance. Building orientation and size maximises passive ventilation and lighting, eliminating almost all the mechanical HVAC systems. The large skylight is design and tested to let light wash into the building in winter and block out direct sunrays in summer. The limited width of building masses and the orientation to the prevailing winds ensure the occurrence of natural ventilation - ideal in these contexts where funding is minimal.





Basic diagram of water reuse system

employing 14 x 2200 litre JOJO Tanks
 14 x 2200 litres = 30 800 litre capacity

The monolithic service wall at the back of the building is a strong formal element born out of ideas on environmental performance in tackling the extreme issue of water scarcity in the province of late – an issue I believe every member of the local built environment has a duty to address. The flanking face brick wall is designed to house 14 x 2200 litre water storage tanks, suspended above ground to utilise gravity pressure, and capture rain in the wet season, - especially rain in the months of season change where water is scarce and storage capacity and volume becomes important. The entire roof is designed to catch and capture water with all falls leading back to the storage wall. This wall has developed into a strong design feature in that a simple concrete framed structure is clad in reclaimed bricks from various sources nearby, including the demolition material from the post office depot on site. The non-structural brick cladding presents opportunity for patterning and permeability, playing with visibility of the water tanks. The 2,8m width provides deep reveals for north facing openings and allows low sunlight through in the winter. On the ground floor level, these closed off spaces become generous storage spaces – a vital requirement of the program.

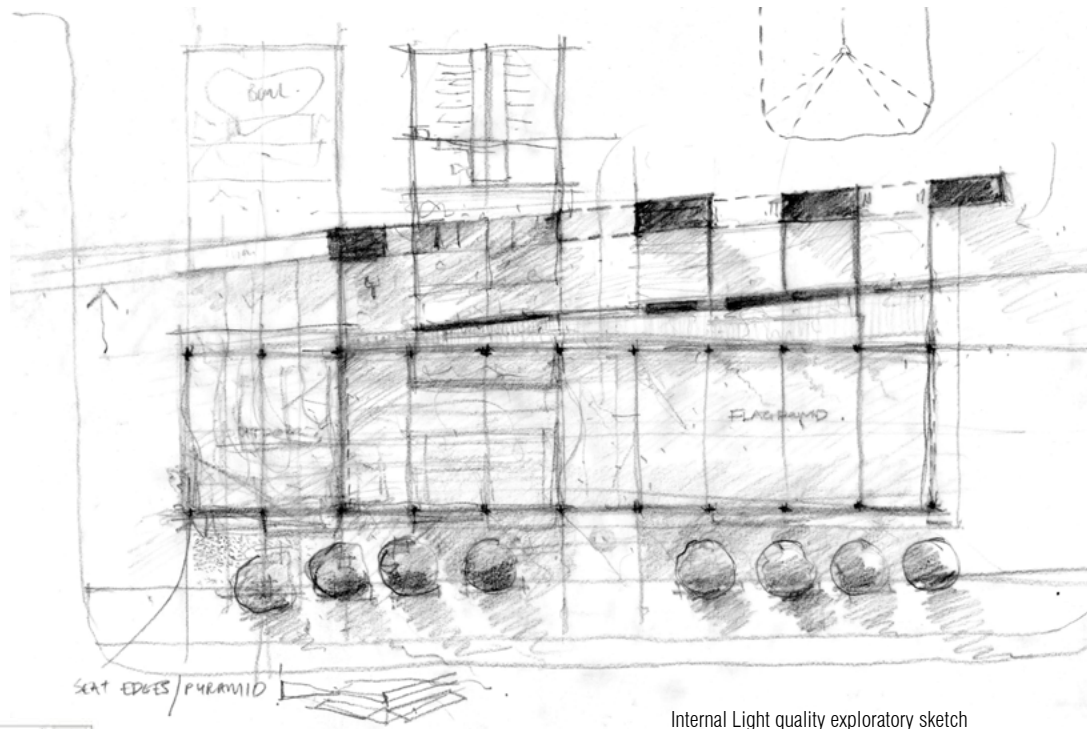
The Life of the Building

19

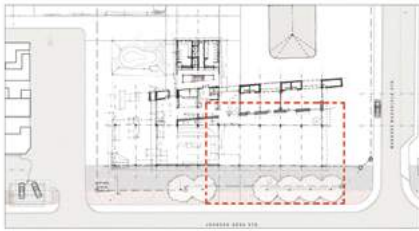
Inhabitational studies

The illustrations below demonstrate the envisioned multiple uses of activity and such usage dynamic between the inner rooms and the flat ground space shown. Skateboarding as program includes versatile capabilities such as professional competitions, normal day-to-day usage as well as program unrelated to skating. The skate park possesses an Indoor and outdoor duality and the ability to opening up completely on the side panels - public yet able to close off for required specificity. The placement of the skate park ensure maximum shelter from the prevalent strong southeast winds in summer. Wind is one of the most hindering weather conditions to the practice of skateboarding.

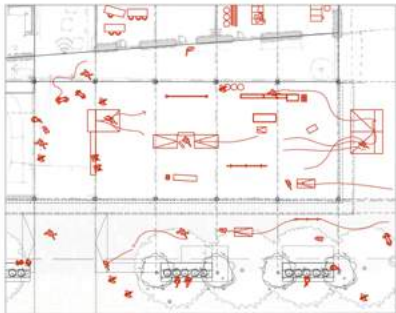
The building and precinct intention maintains an active public life, which increases sustainable safety and security. The spaces and program possess a blend of specificity and ambiguity that caters for all types of users/pedestrians. The aging of the specific materials and the systems in place to allow low-cost solutions for repairs, adaptations and incremental evolutions to take place.



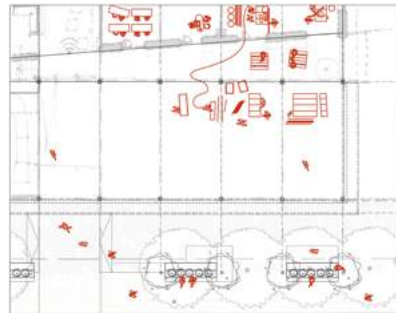
Internal Light quality exploratory sketch



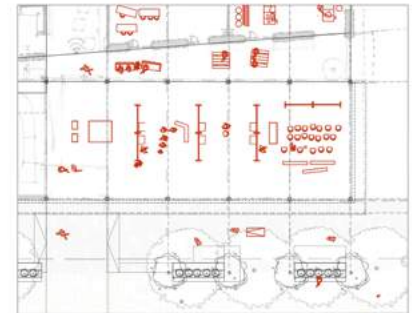
Floor plan reference indicator



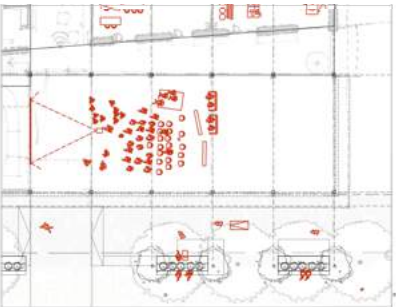
Flatground skate - loose objects, regular program



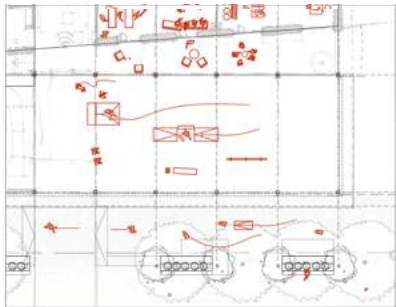
Workshop Spill Out



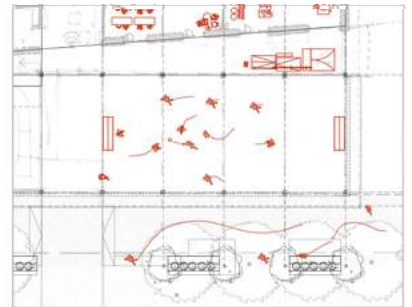
Exhibition | Showcase Day



Flatground skate - loose objects, regular program



Minor Hall Usage by Church (Income Generation)

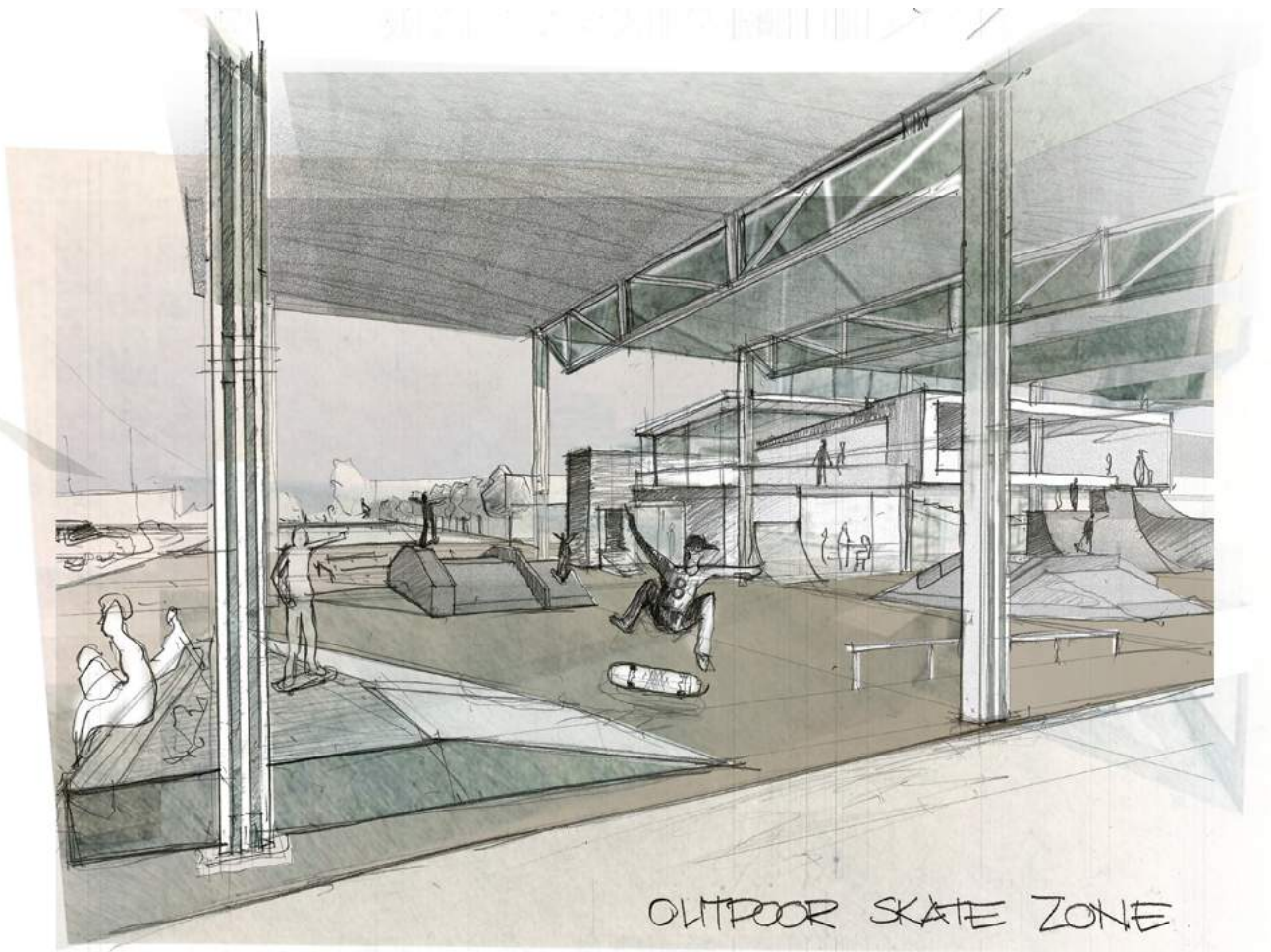


5-a-side Indoor Soccer



INTERNAL PERSPECTIVE

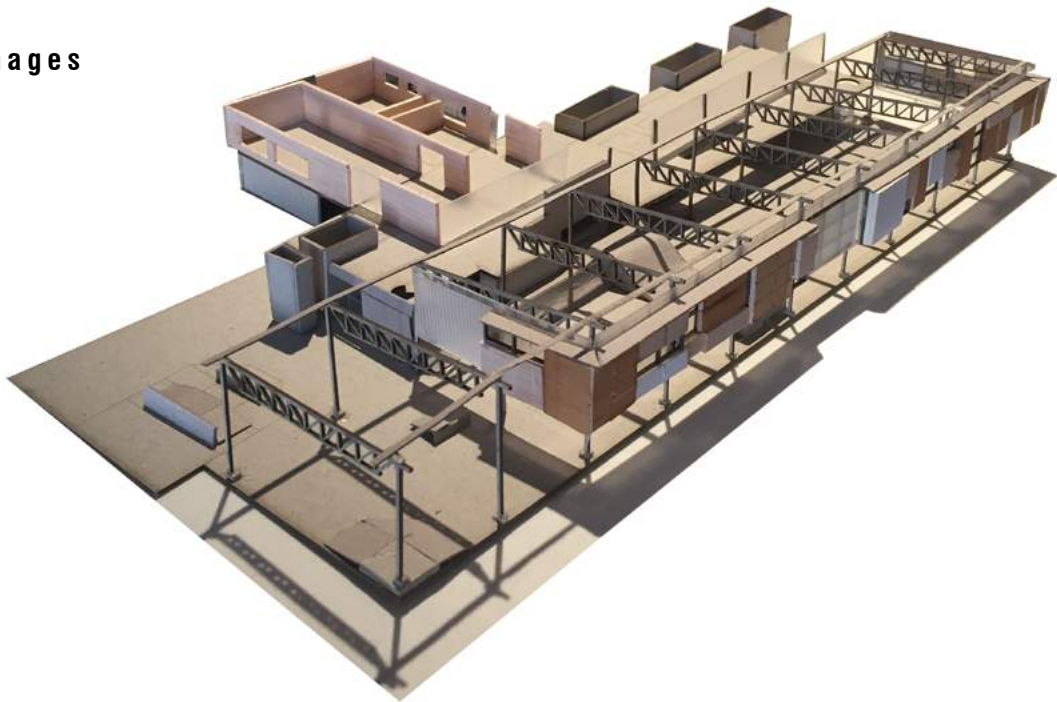
Inhabitation Study



OUTDOOR SKATE ZONE

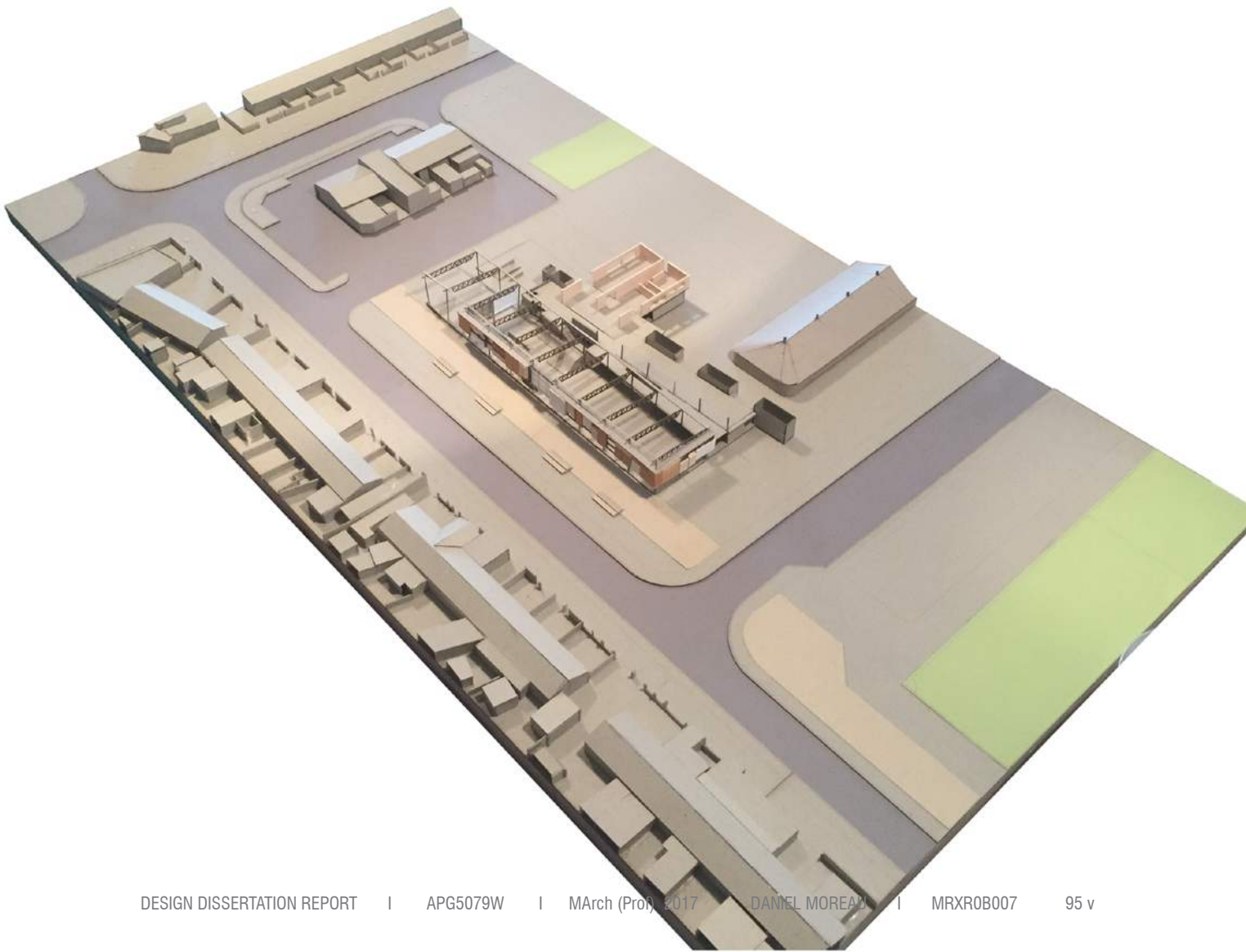
Inhabitation Study

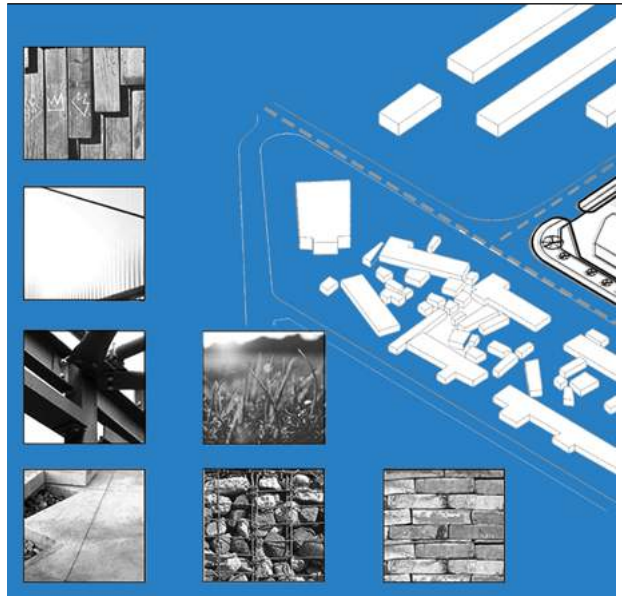
Model Images











part 6

design conclusion



Diagram of the Triple Bottom Line sustainability Model

20 Conclusion and Findings

It is clear that in local contexts such as Gugulethu, on-the-ground community driven architecture can break down the barriers of uninhabitable land and free the landscape to the community. This can be achieved through subtle and effective place making strategies that create contextual solutions to contextual problems with an accuracy that can only result from transparent processes that involve the community throughout. By allowing the dead spaces to be interactive and evoke a sense of activity would not only provide a safer community but also injected a strong sense of public ownership and dignity to the spaces. This sets the motion of catalytic and self-motivated urban upgrade that has a framework and foundation to adapt over time to suit the authentic needs of neighbourhoods. A palette of socially engrained materiality with a sensitive architectural language has emerged through working from the ground up and involving local resources where possible. Safe node networks provide a catalyst for the reaction of social and spatial regeneration to occur.

Public space making through flexible architecture of closed- loop material systems positively influences the community. With closed-loop, building technology and community involvement one can achieve similar, even better, spaces and ideas as existing conventional building, yet still achieve so much more through the process and the collaborative nature throughout the process. The use of low-tech materials requires high amounts of labour, which generates a positive state of community buy-in and inclusion both qualitatively (dignity and ownership) and quantitatively (job creation). The design dissertation demonstrates how a relatively small building can make massive improvements in activation of site and precinct, being catalytic with community participation and urban upgrade of a rich, authentic nature.

The materials have all informed the structure and enclosure ,and the spatial composition. Limits, spans, sizes etc. combined with the social program all shaped the articulation of space. Spaces and size were not limited or compromised because of the material choice – the design demonstrates that reasonably large scale and buildings can be achieved with recycled materials.

With enough planning and unique tailoring of the building contract, procurement, project management and involvement, these projects can offer more integrity than conventional builds of the same type (apart from only environmental). Unique teams require brave and unconventional practices that step out of the rigid comfort zone.

'Unconventional systems require a different set of ideas'

(Duncan Baker-Brown, 2017, pvii)

References

- Baker-Brown, D. 2017. The Re-Use Atlas. A Designers Guide towards the Circular Economy. RIBA Publishing, London. (p.89-99)
- Böck, I., 2015. Six Canonical Projects by Rem Koolhaas, Essays on the History of ideas (p. 89-93). Jovis,Verlag.
- Carter, F. 2017. MArch Prof Research Studies: Requirements and Schedule of Supervision. APG5088Z, Fields of Play Design Studio. UCT School of Architecture and Planning, Cape Town. (pp1)
- Chapman, J, 2017. The Re-Use Atlas. A Designers Guide Towards The Circular Economy. RIBA Publishing, London. (p.161-166)
- Cooke, J et al. 2014. Violence Prevention through Urban Upgrading – A Manual for Safety as Public Good. Section IV: Community Participation (p.141-144) Outlook Filmsales GmbH
- Dewaar,S. Uitenbogaardt, R.S. 1991, South African Cities: A Manifesto for Change. Mills Litho (Pty) Ltd, Cape Town.
- Dissel, A. 2016. "Youth, Street Gangs and Violence In South Africa". Csvr. Org.Za. <http://www.csvr.org.za/index.php/publications/1540-youth-street-gangs-and-violence-in-south-africa.html>.
- Green, J. 2012. "A New Town for Khayelitsha". The Dirt. <https://dirt.asla.org/2012/04/16/a-new-town-for-khayelitsha/>. Accessed 10 June. 2017.
- Hardisty, C. 2015. Skateboarding as a Tool for Social Change, Sports Trader Magazine. Issue 20, July 2015. Rocklands Publications, Cape Town
- Krause, M. 2014. Violence Prevention through Urban Upgrading – A Manual for Safety as Public Good. Section I: Situational Crime Prevention – Urban Design (p.37-50)
- Moreau, D. 2017.The Social Agency of Architecture. MArch (Prof) Theory and Technology Studies. Course Code: APG5088Z APG University of Cape Town (p 35-36)
- Okeil, Ahmad. 2010. A Holistic approach to energy efficient building forms. Energy and Buildings. 42. 1437–1444.
- Skateistan. 2016.Skateistan home webpage. Available at: <https://skateistan.org/projects/johannesburg>. Accessed: 5th November 2017
- Thormark, C. 2001. Motives for design for disassembly in building construction, Construction Management, Lund Institute of Technology, Lund University, Sweden.
- Zimmann, R et.al. 2016. The Circular Economy in the Built Environment. ARUP publication. ARUP. London W1T 4BQ

22 Image References

- All illustrations and photographs are credited to the author unless otherwise stated (below).
- Pg 4: Fieldwork Photograph. Photographer: Alecia Mostert. Life of Materials. Vertical Studio Research Report, 'Fields of Play' Studio. 2017. [Accessed 25 August 2017].
- Pg. 15: Context Map: Google Maps 2017 with author overlay.
- Pg. 16: (Top) the 'waste hierarchy' table – The Reuse Atlas, 17. [Accessed 15 August 2017].
- Pg 18-20: Zimmann, R et.al. 2016. The Circular Economy in the Built Environment. ARUP publication. London W1T 4BQ. Pages in respective order: 10, 19, 44. [Accessed `3 Nov 2017].
- Pg 18-20: Zimmann, R et.al. 2016. The Circular Economy in the Built Environment. ARUP publication. ARUP London W1T 4BQ. Pages in respective order: 64, 66. [Accessed `4 Nov 2017].
- Pg 26-28: Fieldwork Illustrations and Images. Authors own illustrations. Photographer: Alecia Mostert. Life of Materials. Vertical Studio Research Report, 'Fields of Play' Studio. 2017. [Accessed 15 August 2017].
- Pg. 24: Cape Town's patterns of structural urban growth. South African Cities: A Manifesto for Change. Dwaar, Uytendogaardt, 1991. [Accessed 25 July 2017].
- Pg. 29: (Top) VPUU's decision-making power 'matrix. Violence Prevention through Urban Upgrading – A Manual for Safety as Public Good. 142. [Accessed 22 July 2017].
- Pg. 29(Middle) Community involvement – VPUU Homepage. [online] Available at: <http://vpuu.org.za/>. [Accessed 6 August 2017].
- Pg. 29: (Bottom) VPUU's concept model. Violence Prevention through Urban Upgrading – A Manual for Safety as Public Good.17. [Accessed 22 July 2017].
- Pg.31. Building Systems - Design for Deconstruction and Materials Reuse, CIB Publication 272, 2002. p272. [Accessed 4 July 2017].
- Pg. 36: Nebula Skate Program – Mahala.co.za, 2016. [online] Available at: <http://www.mahala.co.za/sport/skate-for-life/> [Accessed 5 April 2017].
- Pg. 8: NGO logos are directly used through each organisations home web page. [Accessed 15 August 2017].
- Pg. 36: Johannesburg Skateistan Facility Photographs. Available at <https://skateistan.org/projects/johannesburg> [Accessed 15 August 2017].
- Pg. 46: Cape Town Metro Map: University of Cape Town, Geographical Information Systems AutoCAD Export with author additions.
- Pg. 46 (bottom dark images):Sprawl and Fragmentation: A Manifesto for Change. Dwaar, Uytendogaardt, 1991. [Accessed 25 July 2017].
- Pg. 47 Cape Town's patterns of structural urban growth. South African Cities: A Manifesto for Change. Dwaar, Uytendogaardt, 1991. [Accessed 25 July 2017].
- Pg. 51: Local Area Amenities: Google 3D Maps 2017 with author overlay.
- Pg.31. Building Systems - Design for Deconstruction and Materials Reuse, CIB Publication 272, 2002. p272. [Accessed 4 July 2017].
- Pg.68. The Fabrication Pavilion, 2015 – Rural Studios. Available at: <http://www.ruralstudio.org/projects/rural-studio-woodshop> [Accessed 8 Sept 2017].
- Pg.84.Sunpath Diagrams. Generated with SunEarthTools and author overlay Available at: <https://www.sunearthtools.com/> [Accessed 3 Nov 2017].
- Pg.86.Water Reuse Diagram. Taking Water Reuse to the Next Level , PM Production Machining with author overlay Available at: <https://www.productionmachining.com/articles/taking-water-reuse-to-the-next-level> [Accessed 3 Nov 2017].
- Pg.92.Trippl Bottom Line. Sustainability management system: The Triple Bottom Line, ERA Environmental Management Solutions. Available at <https://info.era-environmental.com/blog/bid/40788/sustainability-management-system-the-triple-bottom-line>. [Accessed 3 Nov 2017].

Minimum Built Form for Maximum Urban Impact

Exploring the minimum built form that generates the greatest urban impact through architecture of closed-loop material systems.

Daniel Moreau

Supervisor: Francis Carter, for UCT

Co-supervisor: Tessa Brunette, for ARUP Cape Town

Design Dissertation report presented as part fulfilment of the degree of Master of Architecture (Professional) in the School of Architecture Planning and Geomatics, University of Cape Town.

06 November 2017

I hereby grant the University free license to produce the above design dissertation in whole or part for the purpose of research.

I declare that:

(i) The above design dissertation is my own unaided work, both in conception and execution, and that apart from the normal guidance of my supervisors I have received no assistance apart from that stated below:

.....

(ii) Except as stated below, neither the substance or any part of the design dissertation has been submitted for a degree in this university or any other university:

.....

(iii) I am now presenting the design dissertation for examination for the degree of Master of Architecture (Professional).

Plagiarism declaration:

1. I know that plagiarism - to use another's work and pretend that it is one's own - is wrong.
2. I have used the Harvard convention for citation and referencing. Each contribution to, and quotation in, this report from the work(s) of other people has been attributed, and has been cited and referenced.
3. This report is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

Signature.....**signature removed**.....

Application for Approval of Ethics in Research (EiR) Projects
Faculty of Engineering and the Built Environment, University of Cape Town

APPLICATION FORM

Please Note:

Any person planning to undertake research in the Faculty of Engineering and the Built Environment (EBE) at the University of Cape Town is required to complete this form **before** collecting or analysing data. The objective of submitting this application *prior* to embarking on research is to ensure that the highest ethical standards in research, conducted under the auspices of the EBE Faculty, are met. Please ensure that you have read, and understood the **EBE Ethics in Research Handbook** (available from the UCT EBE, Research Ethics website) prior to completing this application form: <http://www.ebe.uct.ac.za/usr/ebe/research/ethics.pdf>

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant	Daniel Moreau	
Department	Architecture Planning & Geomatics	
Preferred email address of applicant:	danmoreaucput@gmail.com	
If a Student	Your Degree: e.g., MSc, PhD, etc.,	MArch (Prof)
	Name of Supervisor (if supervised):	Supervisor: F. Carter, for UCT. Co-supervisor: T. Brunette for ARUP Cape Town.
If this is a research contract, indicate the source of funding/sponsorship	Click here to enter text.	
Project Title	Minimum Built Form – Maximum Proficiency	

I hereby undertake to carry out my research in such a way that:

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

SIGNED BY	Full name	Signature	Date
Principal Researcher/ Student/External applicant	Daniel Moreau	signature removed	Click here to enter a date.

APPLICATION APPROVED BY	Full name	Signature	Date
Supervisor (where applicable)	F. Carter	signature removed	10 April Click here to enter a date. 2017
HOD (or delegated nominee) Final authority for all applicants who have answered NO to all questions in Section 1; and for all Undergraduate research (Including Honours).	Prof. T. Berlanda	signature removed	10 April Click here to enter a date. 2017
Chair : Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the above questions.	Click here to enter text.		Click here to enter a date.

Exploring the minimum built form that generates the greatest urban impact through architecture of closed-loop material systems.

Daniel Moreau

Supervisor: Francis Carter, for UCT

Co-supervisor: Tessa Brunette, for ARUP Cape Town

Design Dissertation report presented as part fulfilment of the degree of Master of Architecture (Professional) in the School of Architecture Planning and Geomatics, University of Cape Town.

06 November 2017

I declare that:

(i) The above design dissertation is my own unaided work, both in conception and execution, and that apart from the normal guidance of my supervisors I have received no assistance apart from that stated below:

.....

(ii) Except as stated below, neither the substance or any part of the design dissertation has been submitted for a degree in this university or any other university:

.....

(iii) I am now presenting the design dissertation for examination for the degree of Master of Architecture (Professional).

Plagiarism declaration:

1. I know that plagiarism - to use another's work and pretend that it is one's own - is wrong.
2. I have used the Harvard convention for citation and referencing. Each contribution to , and quotation in, this report from the work(s) of other people has been attributed, and has been cited and referenced.
3. This report is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

signature removed

Signature.....

Date...06 December 2017.....

RESPONDENT: BUILDING MATERIALS RECYCLER + PROCESSES

Introductions / personal data

Introduction / informed consent

Name / age

Home language, English fluency, interview to be conducted in English or Xhosa

Activity:

Recycled materials trader / craftsperson / waste picker?

What types of recycled materials / crafts do you sell?

How long have you been selling recycled materials / crafts?

Where do your materials come from / what materials are recycled from waste bins?

Do people bring recycled materials to your company or do you collect from houses / other businesses?

Which recycled materials are the most commonly used in your area of trade?

What recycled materials do other companies commonly source from you / what volumes?

Facilities used:

How do you store materials / crafts when you are off site?

Where do you access electricity / ablutions?

What ict / wi-fi / smartphone use?

Cost:

Purchase price / sales price?

How do you compare recycled material prices to new ones?

Do you receive any funding from government / donors / other companies?

Frequency:

How much material is collected daily / weekly?

How often do you sort the materials which you collect?

Networks:

Who supplies your materials / who do you sell materials to?

How do you travel between material source and site of sale / depot, transport of materials?

Do you work together with other pickers / craftsmen, on what basis do you form this community?

Is it a temporary / permanent job? What did you do before / will you do next?

Organisation:

Do you belong to a trade association / how does it represent the needs of recyclers?

What role does government play in the recycling process in your company /should government play a more active role in repurposing recyclable materials?

Built environment performance:

Quality and availability of recycled materials?

What percentage of materials is discarded with no recycled use / what can your company do to reduce the amount of materials being discarded?

Have your recycled materials / products been used in building construction?

Where?

Is it safe work / why not / what would improve safety here?

Who looks onto this space / provides surveillance?

Seasonality:

Where do you work / collect / sell if it is very hot / windy / raining?

Change of recycling pattern in summer / winter?

Perceptions:

Growth potential for recycled materials industry in Cape Town?

Can recycled materials play a larger role in building in future?

What is needed for recycled materials to be used on a larger scale?

General: Any other comments? Thanks.

Walkthrough: Can you show me (these facilities / this source of materials...)?

Notes: