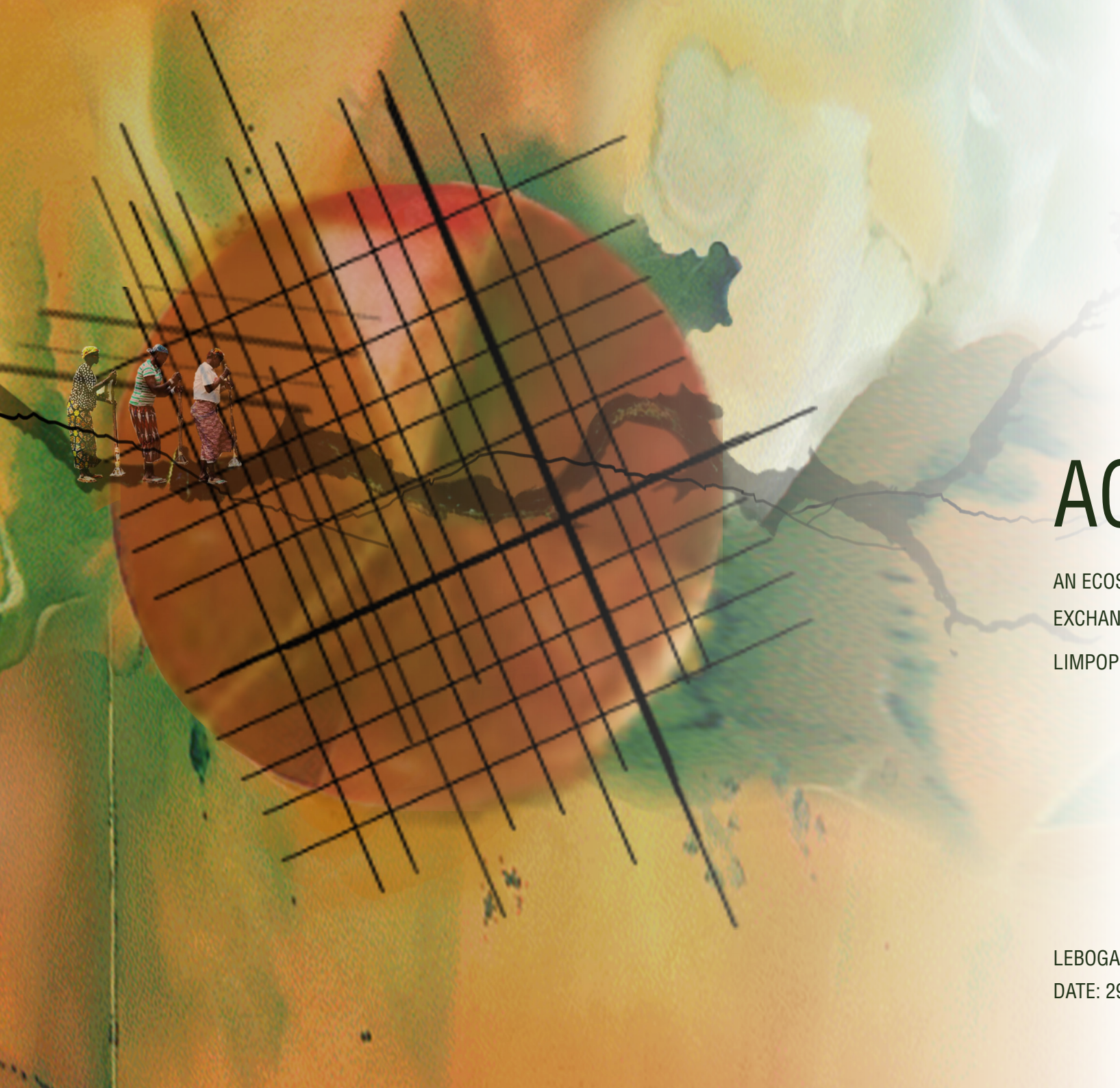


AGRO - POD

AN ECOSYSTEM OF AGRICULTURAL KNOWLEDGE EXCHANGE IN THE GROBLERSDAL AREA, LIMPOPO.

LEBOGANG SINAH SITHOLE

DATE: 29 MARCH 2018

ABSTRACT

"*Architecture is essentially Human; it is the human spirit manifesting itself. For when a man builds, there, you've got him; you know exactly what, who and how that man is.*" Frank Lloyd Wright

AGRO - POD

An Ecosystem of Agricultural knowledge exchange.

There are many threats facing the world's population. Population growth, global warming and especially food security are challenging the conventional methods of food production that have used for centuries. These methods continue to impact the earth negatively and its ecosystems, hence the prevalence of the devastating effects of climate change on the earth. The resulting effects, coupled with our continued use of fossil fuels to keep up with a growing population can only harm the earth even further and therefore harm our very existence.

My chosen site is an abandoned location along a T-junction just outside the town of Groblersdal in Limpopo. The site is already populated with street vendors who originate from the rural area surrounding the towns in the district. These vendors sell fresh produce sourced from the surrounding commercial farms. I find myself confounded by these vendors and their lack of produce variety and always wonder how they sustain their businesses with this typology. What especially bothers me about this dynamic is that these rural communities have been farming traditional crops historically and these highly nutritious crops have managed sustained to sustain them and their ancestors for centuries. These rural communities are native to the places where the crops are grown (or have become part of the culinary culture over time) and these crops are particularly well adapted to the prevailing conditions.

With all this considered my intention is to design a self-sustaining hybrid agricultural support center and training facility. This facility will utilise community participation in the building process to promote economic empowerment and the preservation of local vernacular architectural methods and techniques. The programme aims to be inclusive in order to allow for all stakeholders to gain and impart knowledge, promoting a cycle of knowledge exchange

By employing sustainable architectural interventions such as rainwater and energy harvesting, passive cooling systems and the preservation and re-use of resources, the architecture can become a transformative mechanism for change in the rural context and restore the pride of the Pedi people.

AGRO - POD

AN ECOSYSTEM OF AGRICULTURAL KNOWLEDGE EXCHANGE IN THE GROBLERSDAL AREA, LIMPOPO.

LEBOGANG SINAH SITHOLE

DATE: 29 MARCH 2018

DECLARATION

I, Lebogang Sinah Sithole 0703430Y, am a student registered for the course Master of Architecture [Professional] in the year 2017. I hereby declare the following:

I am aware that plagiarism [the use of someone else's work without permission and/or without acknowledging the original sources] is wrong. I confirm that the work submitted for assessment for the above course is my own unaided work except where I have stated explicitly otherwise. I have followed the required conventions in referencing thoughts, ideas, and visual materials of others. For this purpose, I have referred to the Graduate School of Engineering and the Built Environment style guide. I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my unaided work or that I have failed to acknowledge the source of the ideas or words in my own work.

Signed Author:

Lebogang Sinah Sithole 0703430Y

Supervisor: Ariane Janse Van Rensburg
Date:29/03/2018

This document is submitted in partial fulfilment for the
Degree: Master of Architecture [Professional] at the
University of the Witwatersrand, Johannesburg, South Africa, in the year 2018

ACKNOWLEDGEMENTS

“uMuntu Ngumuntu Ngabantu”

Firstly to God, then to my family, my friends and my mentors, words can not describe the gratitude that fills my heart as I think of all the support, guidance and constant love I have recieved from each one of you. As the famous Isizulu quote says: ‘a person is who he/she is through other people’, I could not have travelled this journey without each and every individual whom helped pave the way.

Ke a Leboga

CONTENTS

Note

All figures, unless otherwise stated are photographs take by the author, in Limpopo, South African between January-September 2017.
All hand- sketches, diagrams and renders, unless otherwise stated are the work of the author.

All text and image references and appendices are available at the end of the document.

INTRODUCTION

The agro-pastoral rural communities in the low rainfall regions of South Africa, whose historical sustenance relied heavily on subsistence farming and their ability to barter both locally and long- distance, are faced with dire phenomenon. Drought has affected these communities extensively in recent years due to the global warming crisis. In precolonial South Africa these communities would uproot and relocate to more fertile water rich areas. However, in the post-apartheid political and spatial trajectory this is no longer a simple option *(Delius, Maggs, Shoeman, 2014: 144)*. Communal subsistence farming has been most negatively impacted in rural contexts, and therefore become obsolete. The lack of fruitful and constant rain is causing the farming land to become arid. Access to resources and supporting infrastructure is challenging, and innovative intervention that could possibly aid these communities is not readily available.

A community affected in this way can be found in the Groblersdal area, in the south-east of the Limpopo Province. Groblersdal, is a progressive farming town set along the Olifants River and one of two major connecting arteries. This automatically creates a crucial node for social and economic viability as well as diversified development in the area. The site is two kilometers outside Groblersdal at an intersection populated by existing traders. Some of the traders have been there for over thirty years, trading for twenty four hours in fresh produce, sourced from the local commercial farms within a twenty- five kilometer radius. The traders themselves originate from rural communities as far flung as two hundred kilometers away. This already raises a fundamental challenge within the spatial and socio-economic construct of Groblersdal as South Africa's second largest irrigation settlement.

Limpopo Province is recognized as "the agricultural production hub for most high-value agricultural commodities. It offers diverse agro-ecological regions, which is characterised by significant variation in natural legacies such as richness of the soil, rainfall, and access to water" *(Limpopo Department of Agriculture, 2015)*. A large percentage of the Johannesburg Fresh Produce Market's turnover is of produce coming from Limpopo *(Limpopo Department of Agriculture, 2015)*. The agricultural sector contributed seven point five percent of the GDP (Gross Domestic Product) of Limpopo province in 2007. The agriculture, forestry and fishing sectors contributed three point one percent to the provincial GDP in 2007. However, in subsequent years, the largest threat has been the universal crisis of water scarcity, which has also threatened food security in the rural villages.

Driving home to Mohlalatwane, a village twenty kilometers outside of Groblersdal, I pass a series of vegetable vendors along the roadside at an intersection, about two kilometers outside of town. These particular street vendors sell fresh produce which is sourced from farms within the Limpopo area. They reside in single roomed shack dwellings attached to the back of their stalls. Most, if not all of these vendors, came to this particular intersection from rural villages near and far to seek economic empowerment.

What is fascinating about this community of vendors is the fact that they all sell the same produce. Taking into account that fresh produce is seasonal and certain fruits and vegetables are popular in the area, it always eludes me why these historically agricultural people would be so lacking in the diversity of the crops they sell (traditional crops in particular). How they can earn their income with such a limited street market model? This research questions how architecture can create a space which supports expanding the boundaries of this limited model. This will be done by exploring various spatial configurations, economic environments and agricultural innovation that will allow broader economic participation, thereby creating a new and more sustainable 'Agro – Culture'.

In the Integrated Development Plan of the Elias Motswaledi Municipality, it is highlighted that agriculture is the relevant sector to stimulate the growth of rural economies and implement community development projects. The projects are aimed at improving the lives of rural communities and simultaneously improve the country's food security *(Elias Motswaledi Municipality IDP, 2015)*. However, rural agricultural practices and methods remain at the periphery of the mainstream agricultural industry. These practices have also recently become scarce due to the lack of access to resources in the rural areas. The latter is alienating rural communities from participating in these economic activities that this region holds so proud. The need to integrate and create a dialogue between mainstream and rural agriculture is imperative to the growth and sustainability of this industry.

This research aims to propose a re-mastered self-sustaining hybrid agricultural support center and training facility. This facility will bridge the gap that exists in the post-apartheid spatial and socio-economic sphere. The center will offer training in viable subsistence farming. It will offer, support by integrating a principal program of growing, processing, and trading raw indigenous and seasonal crops and finished goods to an existing trade community market. Accommodation will be provided in the complex for both research trainers and female - headed trainee families from rural. The architectural approach is informed by vernacular Bapedi architectural traditions and materials, as well as post- modern sustainable architectural interventions. It also resuscitates the sophisticated, highly innovative and agrarian approach to terraced farming of the early Pedi society. By using participatory design strategies, the architecture itself will similarly draw on cultural traditions of community participation and empower self-sufficiency through sustainable methods. The design of the center will evoke skills, knowledge and economic exchange, in an ever changing and challenging global ecosystem.

METHODOLOGY

Through this research report, data has been gathered, by means of professional consultations with agricultural research experts and the Department of Agriculture Sekhukhune District, Cultural History Departments; an interview was conducted with Professor Alex Schoeman, an Archeologist Professor at the Department of Archeology at the University of Witwatersrand were the document was published. Primary data was also gathered by photographing the site, informal group discussions with locals to better understand their needs and circumstances, and therefore produce more informed building precinct that will cater to those needs. This process will not require ethics clearance as I will not publish names of take any statements. I will also acquire site data in form of maps from the city council and information form the agricultural irrigation department in the area.

The data was then analysed and applied through processes of concept sketch design, drawings and model making will follow. This research report aims to unpack the design process and develop a new building typology that will address the research question posed. This interactive design process led to a consolidated design product. This will be accomplished through means of complete design drawings and renders, process models.

Figure 2.1 – African women coming back from harvesting of crops.

03 BACKGROUND

3.1. Agriculture from Traditional to Innovative

"Today hunger and poverty may be only African matter, but the world's population will likely reach nine billion by 2050, scientists warn that this would result in global food shortage. Africa's fertile farmland could not only feed its own growing population, it could also feed the whole world."
Natasha Kwok (Kwok, 2017: n.d)

3.1.1. Introduction

There are 6.8 billion people (the equivalent agriculture land the size of South America) at present (*Despommier and Carter, 2011: 78*) (See Figure 3.1). The World Health Organization and Population Council estimates that by 2050 the human population will grow to 9.5 billion and to 11.2 billion in 2100 *(WHO, Section, 2017)*. As Dr Dickson Despommier, a professor of microbiology and Public Health at Columbia University, so ingenuously puts it:

"Our planet is developing a 'fever', an obvious indication that something is wrong with the entire system. Global warming is an unanticipated consequence of the unprecedented growth in our population." (Despommier and Carter, 2011: 37)

This together with the increases use of fossil fuel to keep up with the demand of cultivating food and manufacturing goods for this growing population has added dire strain to our earth's ecosystem (See Figure 3.2). Agriculture takes seventy percent the available fresh water supplies for irrigation purposes. The runoff of the irrigation ends in our oceans, creating damage there as well *(Despommier and Carter, 2011: 8)*.

Africa is also undergoing many changes, all of which depend on some degree of social and environmental adaptation *(Hunter and Ntiri, 1978: 2)*. The most significant force for change is rapid population growth in conjunction with climate change. The continent is struggling to adapt and pre-empt these situations, whether it is floods burying hundreds of homes in a mudslide caused by heavy rains in Sierra Leone *("Sierra Leone mudslides kill hundreds," 2017)* (See Figure 3.3); or drought and conflict displacing 3.7 million people in Ethiopia, Somalia and Kenya *(Rensburg et al., 2007: 3)* (See Figure 3.4); or plant pests and diseases such as Cassava virus diseases in eastern and Southern Africa, leaving farmers devastated by the loss of crops and disruption in food production *("Plant pests and diseases : FAO in Emergencies," n.d.)*. Africa today is characterized by only limited industrial development (See Figure 3.5) and essentially remains an agricultural continent. Africa's immediate and long-term future therefore depends upon agriculture, both as a source of nutrition and as a means of generating income, capital, and employment *(Hunter and Ntiri, 1978: 3)*.

When similar plant species are cultivated in the same geographic area, they attract animals of different species to co-inhabit that space. This results in a thriving and sustainable ecosystem *(Despommier and Carter, 2011: 10)*. A thriving ecosystem naturally provides systems such as flood control; purification of the air; regeneration of freshwater as well as also stabilised the earth's temperature. Therefore the importance of a balanced ecosystem in the agricultural process is imperative for the sustainability of the industry.

Mixed cropping (is also described as inter-cropping, relay cropping, and serial harvesting-for example, sowing early millet, late millet, sorghum, and other crops at the same time in the same field). This traditional system spreads the farmer's risk of various hazards of climate and disease *(Hunter and Ntiri, 1978: 6)*. Mixed cropping also provides a balanced use of soil nutrients and a balanced diet for the farmer's family, as the variety of plants is diversified *(Hunter and Ntiri, 1978: 6)* (See Figure 3.6).

Agricultural innovation systems such as aquaponics are on the rise. Aquaponics is a system whereby the waste produced from the aquaculture, supply nutrients to the plants that are grown hydroponically and the plants filter the water and transfer recycled water back to the fish *(The Aquaponic Source, 2018)*. These innovation systems have begun to address some of the

issues raised by world agriculture by challenging the agricultural norms of mono-cropping and introducing integrated systems which will benefit human nutrition, improve economic growth and balance the agriculture ecosystem (See Figure 3.7). (Refer to Appendix 1)

This research report aims to spatially translate the integration of successful traditional farming methods with innovative systems. The architectural intervention will encourage a sustainable use of resources and reduce water wastage by introducing water recycling systems and conservation.

3.1.2. Traditional African Agriculture

In Africa certain spontaneous agricultural adaptations to pressure have successfully occurred, such as mounding to collect soil nutrients and facilitate drainage, orchard-type fallows (*Ibo*, Nigeria), terrace construction to reduce hillslope erosion (*Frafra*, Ghana), animal manuring, and irrigated gardens (Mossi, Upper Volta) and the *Dogon* of Mali whom developed systems of pennant cultivation under seemingly impossible ecological conditions (Hunter and Ntiri, 1978: 8). A few similarities that are shared by traditional farming are: having smaller fields or clearings, reduced periods of cultivation, longer fallows, the burning of felt to clear and produce ash dressings, mixed cropping, terraced farming as well as staggered harvesting *(Hunter and Ntiri, 1978:12)* (See Figure 3.8).

In South Africa south of Limpopo province, archaeologists discovered the oldest farming settlement, dated to almost two thousand years ago. Patterns of ruined stone-walled homesteads linked cattle roads and displayed a unique system of agricultural terracing *(Delius et al., 2014: xiii)*. Terraced agriculture is a distinctive feature of the Pedi people's homestead (See Figure 3.9). The terraces were constructed over time to reduce water

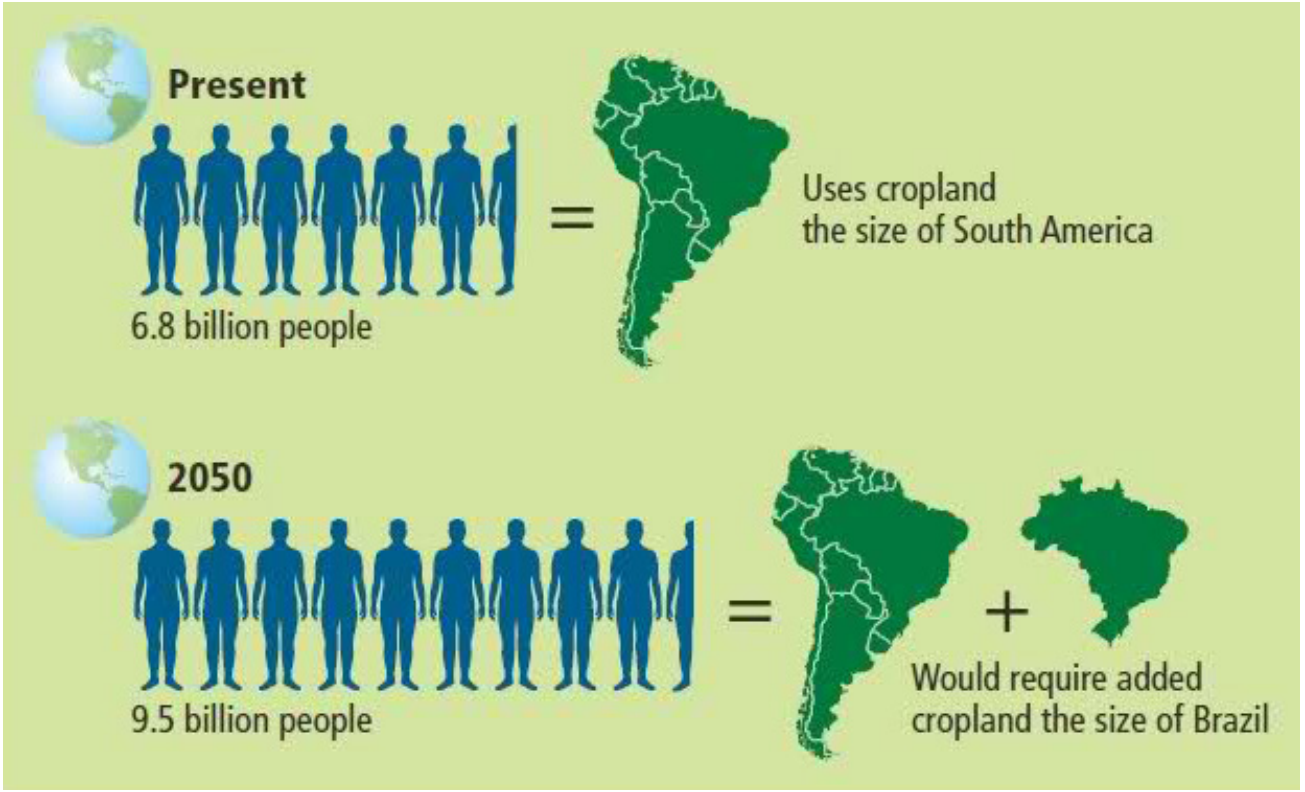


Figure 3.1 – Population growth statistics presented by the WHO and Population Growth.

Figure 3.2 – Drought due to lack of rainfall caused by climate change.

Figure 3.3 – The mudslide that occurred in Seirre Leone due to heavy rainfalls which destroyed homes and killed hundreds.

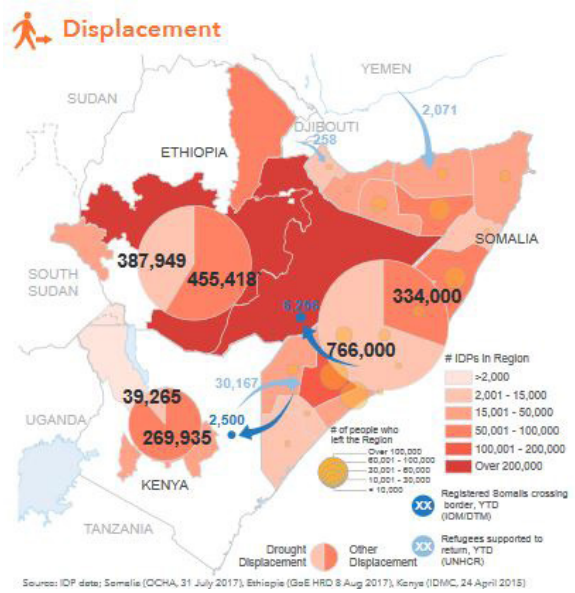


Figure 3.4 – The displacement of people in East Africa due to resent years of drought and conflict.

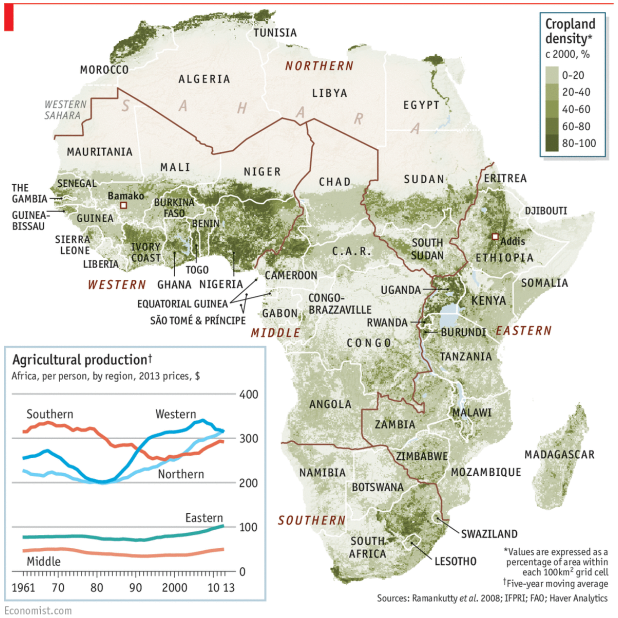


Figure 3.5 – Agricultural crop production in Africa.

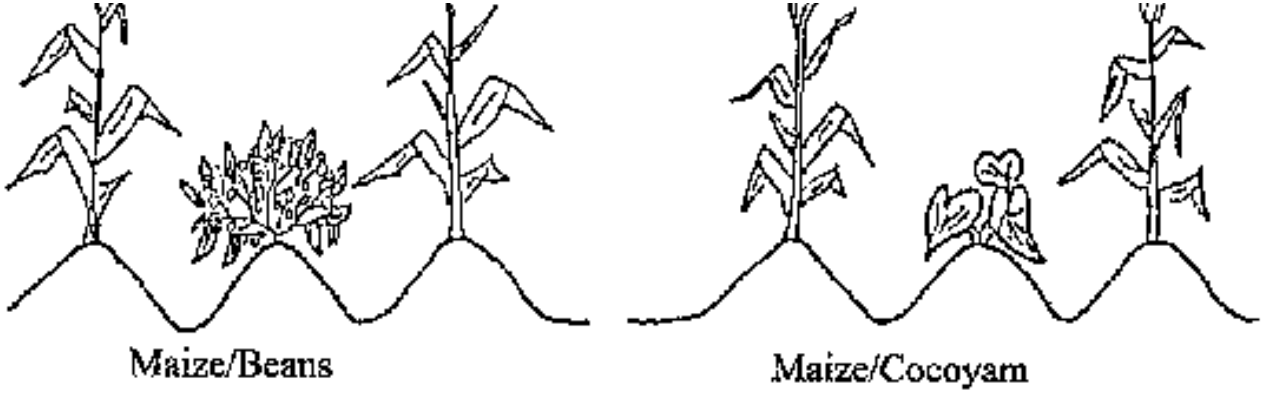


Figure 3.6 – Intercropping as a way to preserve the nutrients in the soil.

runoff and allow more water to penetrate the ground. They also reduced soil erosion. The Pedi people were therefore able to expand sustainable agriculture to much larger areas *(Delius et al., 2014:10)*.

Historically the activity of crop cultivation has been closely acquainted to women and their traditional living patterns *(Rensburg et al., 2007: 1)*. The women of the homestead would were largely responsible for the planting", hoeing, welding and harvesting of crops such as sorghum, millet, beans, gourds and melons. They also collected leafy vegetables from the wild *(Rensburg et al., 2007:2)*. "They made pottery; built and ornamented their huts with patterns; wove sleeping mats and baskets; ground grain; cooked; brewed traditional beer and collected water and wood" *(Delius et al., 2014:14)*. In South Africa, there are more than one hundred different species of leafy plants identified as leafy vegetables which have been used in rural household for decades. These types of leafy vegetables have been ignored by researchers and policy makers, however in recent times this has changed (*Rensburg et al., 2007:5)*. Indigenous and indigenised African leafy vegetables have increasingly become popular and their value has been recognised *(Department of Agriculture, 2004)*. These *morogo* plants such as *tepe, lerotho* and *mphodi,* as well as cowpeas known as *dinawa*, are not only highly nutritious, drought tolerant and require little water *(Rensburg et al., 2007: 7)*. They are also able to grow and reproduce using only the energy obtained from sunlight, water and some minerals from the soil" *(Despommier and Carter, 2011: 17)*. (Refer to Appendix 2)

3.1.3. Agricultural Innovation

"In nature there is no waste"
(Despommier and Carter, 2011: 9).

Discarding anything without reusing it would be unthinkable in today's society. The United States Department of Agriculture (USDA) estimates that over 50 percent of its food production does not reach its consumers due to factors such as drought, floods, plant diseases, spoilage and plant diseases (*Despommier, 2010:17).*

Nature has never intended monoculture, the farming method by which most of the world's fresh produce is grown. As *(Despommier and Carter, 2011: 64)* put it "biodiversity was and still is the rule that enables the establishment of a functional ecosystem." Conventional agriculture systems continue to degrade the land and reduce ecological resilience and diversity, and requires an enormous amount of fossil fuels to sustain them *(Beach, 2006: 53)*. All of which threaten the future of our food production if innovative solution are not incorporated at all agricultural levels.

The efficiency of growing crops in one square meter of an indoor environment could be equivalent to ten to twenty square meters of a traditional outdoor soil-based farm (*Despommier, 2010: 5)*. Indoor farming also offers an advantage as the need to use fossil fuels for ploughing, applying fertilizers, seeding, weeding and harvesting are not necessary. The benefit of planting in a temperature controlled environment also eliminates the damaging of crops due to adverse weather conditions

As stated in *(The Aquaponics Source, n.d.),* "Aquaponics is the combination of aquaculture and hydroponics in one integrated system" *(What is Aquaponics, n.d.).* The fish waste becomes food for the plants, and they naturally filter the water for the

Figure 3.7 – A simple backyard Aquaponic system.

Figure 3.8 – A diagram showing a compound farming system.

Figure 3.9 – Sections of terraced farming walls built at Verlorenkloof,1995.

Figure 3.11– Raft-based Aquaponic farming of leafy green vegetables.

Figure 3.10 – The types of *morogo* that grows wildly in the northern parts of South African.

fish (See Figure 3.11). Aquaponics is a more highly effective way of producing high quality, wholesome crops as a business model, more so the in hydroponics, and it also has many distinct advantages over utilising aquaculture and hydroponics in isolation*("Aquaponics in Africa - Aquaponics," n.d.)*.
Fresh water species such as: tilapia; trout; striped bass; catfish and carp are the preferred fish used in aquaponics systems (See Figure 3.12). Tilapia is however an immense source of protein and important natural vitamins as well as minerals. They also grow at a tremendous speed, producing harvests faster than any other type of fish (*Aquaponics Plan, n.d.*).

3.1.4. Conclusion

Culture, broadly defined, "is the medium between mankind and the environment. In this sense, agriculture is a cultural artifact of man; it mediates with the environment for man's sustenance" *(Hunter and Ntiri, 1978: 22)*. A "feed me and I'll feed you" approach to agriculture must be adopted to ensure a sustainable culture for the production of food. Population growth and social change are overtaking the rate of agricultural adaptation. It is therefore imperative to introduce agricultural innovation at all levels of cultivation, both at a commercial and domestic scale.

The intention is to explore how architecture together with the process of producing food can become a unifying language that brings together diverse people of different age, income groups and cultural backgrounds to exchange knowledge and learn new techniques. This would create a new resilient community, harnessing great opportunities to start a new type of farming market which that strengthens food security is important in this study.

Figure 3.12 – The different types of fish used in an Aquaponic system.

3.2. Vernacular Architecture - The Bapedi Homestead

"To move forward, people need to be inspired; they need buildings that enhance their creativity and push them to take their future into their own hands." (Kere, n.d)

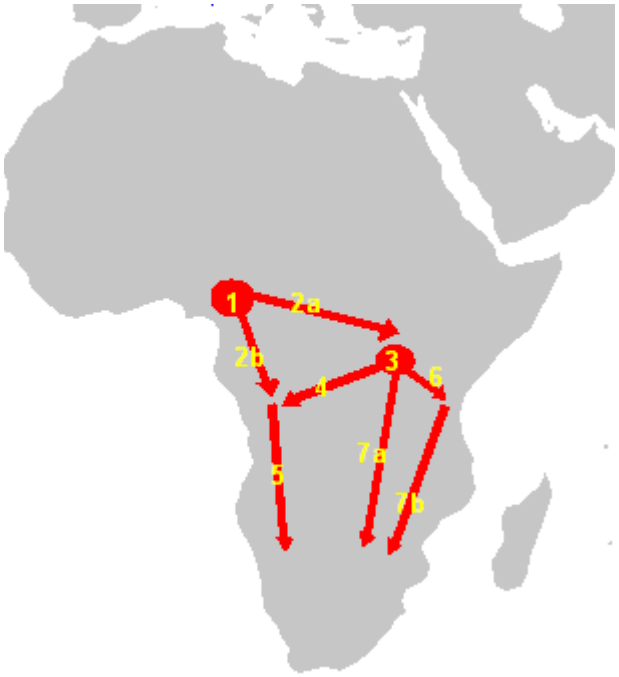


Figure 3.13 – The Map of the Bantu Expansion beginning from 500CE -1500CE.

3.2.1. Introduction

In this section, this research report aims to investigate the phenomenon of community participation within the South African Pedi speaking ethnic group. This chapter is intended for further investigation on the phenomenon of participation within a society, especially in the Pedi speaking ethic group. Their origins will be highlighted and indicating historical lineage; cultural organisation; social and spatial hierarchy; as well as the advancements of their architectural practices. This research report will also investigate the history and advancements of their architectural practices. The aim to analyse these architectural practices will be analysed (building techniques, methods, spatial orientation, use of natural/local materials, decorative patterns etc.). As a precedent study, the report will analyse the adaption of the Pedi traditional homestead – to the modern day village especially my family homestead, Mohlalaotwane Village. The aim to unearth & respond to the important social and architectural language that has remained with the Pedi people over the centuries. The study will also highlight the high degree of sophistication found in Pedi architecture with their meticulous use of building techniques, methods and local materials.

3.2.2. Historical background

Around 1500 BCE, Africa consisted of: (1) the Egyptian world along the Nile; (2) a society of village-based agriculturists and herders that stretched below the Sahara almost across the entire continent; (3) cattle herders in the area of Sudan and Ethiopia; and (4) camel traders and herders in the desserts of Tunisia and Algeria. Everyone else, whether in the forests of the Congo or the savannas of South Africa, were referred to as "First Society people" the oldest civilizations in the world *(Jarzombek, 2013: 549)*.

The geographic landscape of Africa began to drastically change when the agro-pastoralists known as the Bantu (**See Figure 3.13)**, began to expand southwards in the 1000 BCE around the rain forests to the open pasture lands of the south. They were, in search of fertile land, more specifically the prime agricultural Alfisol soil, which is high in nutrients. The origins of the Bantu speaking people can be traced back to the West of Africa, close to the border of Nigeria and Cameroon 4,000 years ago (2000 BC). The term 'Bantu', meaning "people" or "human" is a label given to "300 – 600 ethnic groups in Africa, who speak the Bantu languages" *(Butt, 2006: 73)*. It is said that these languages are a branch of the Niger–Congo language family *(Butt, 2006: 39)*. As expected of any expanding migrant group, the Bantu splintered into numerous adaptations, spreading themselves across the lower sub-Saharan Africa **(See Figure 3.14)**.

The people travelled in two separate waves, the first group crossed the Congo forest region, with the second group heading into East Africa, and other group heading south along the African coast of Gabon, todays, Democratic Republic of the Congo, and Angola. Some people the latter stream also went inland through the many south-to-north flowing rivers of the Congo River system *(Vansina, 1995: 178)*. This expansion gained momentum around 500 CE, and reached the southern tip of Africa around 1000 CE. Smaller groups, thereafter migrated to the southeast from the Great Lakes region were more rapid, with early settlements spreading themselves near the coast and near rivers, due to relatively harsh farming conditions in areas further from water sources. Between the 13th and 15th centuries, the more powerful Bantu-speaking states started to emerge, and were comparatively larger than local chiefdoms began to emerge. An example is the *Mutapa* Empire, near Lake Mutirikwe, who built great a landmark, namely the Great Zimbabwe complex **(See Figures 3.15a & 3.15b).** This was

led by the *Monomatapa* kings, and the complex is believed to have served as a royal palace for the local monarch. It was also, the center of the capital of this large trading empire, and the political center of the region. In 1531, Vicente Pegado, Captain of the Portuguese Garrison of Sofala, vividly described Zimbabwe as follows *(Garlake, 1973: 115):*

"Among the gold mines of the inland plains between the Limpopo and Zambezi rivers there is a fortress built of stones of marvellous size, and there appears to be no mortar joining them.... This edifice is almost surrounded by hills, upon which are others resembling it in the fashioning of stone and the absence of mortar, and one of them is a tower more than 12 fathoms [22 m] high. The natives of the country call these edifices Symbaoe, which according to their language signifies court." (*Garlake, 1973: 115*)

The Zulu society in South Africa, settled in 300 CE in a particularly excellent area for agriculture and herding. This was the lowland region of South African, along the Indian oceans coast with its subtropical climate and the central region of undulating, alfisol-rich hills rising towards the west. These areas are perfect for grazing, both with excellent soils *(Jarzombek, 2013: 549)* (See Figure 3.16). Historical records, along with archaeological studies all account that most tribal grouping in Southern Africa built their settlements in circular plan. Their wealth, the cattle, was enclosed in the centre, and surrounded by dwellings and. At times, the external perimeter was fortified by brush wood, stone walling or timber posts *(Frescura, 1981: 143)*. The basic function of the circular form was attributed to the defence of the community and their commonwealth in particular, as the defence perimeter is equally strong at any point of its circumference (See Figure 3.17).

Archaeologists discovered the oldest farming settlement south

Figure 3.14 – Map of the tribal expansion of the Bantu speaking people.

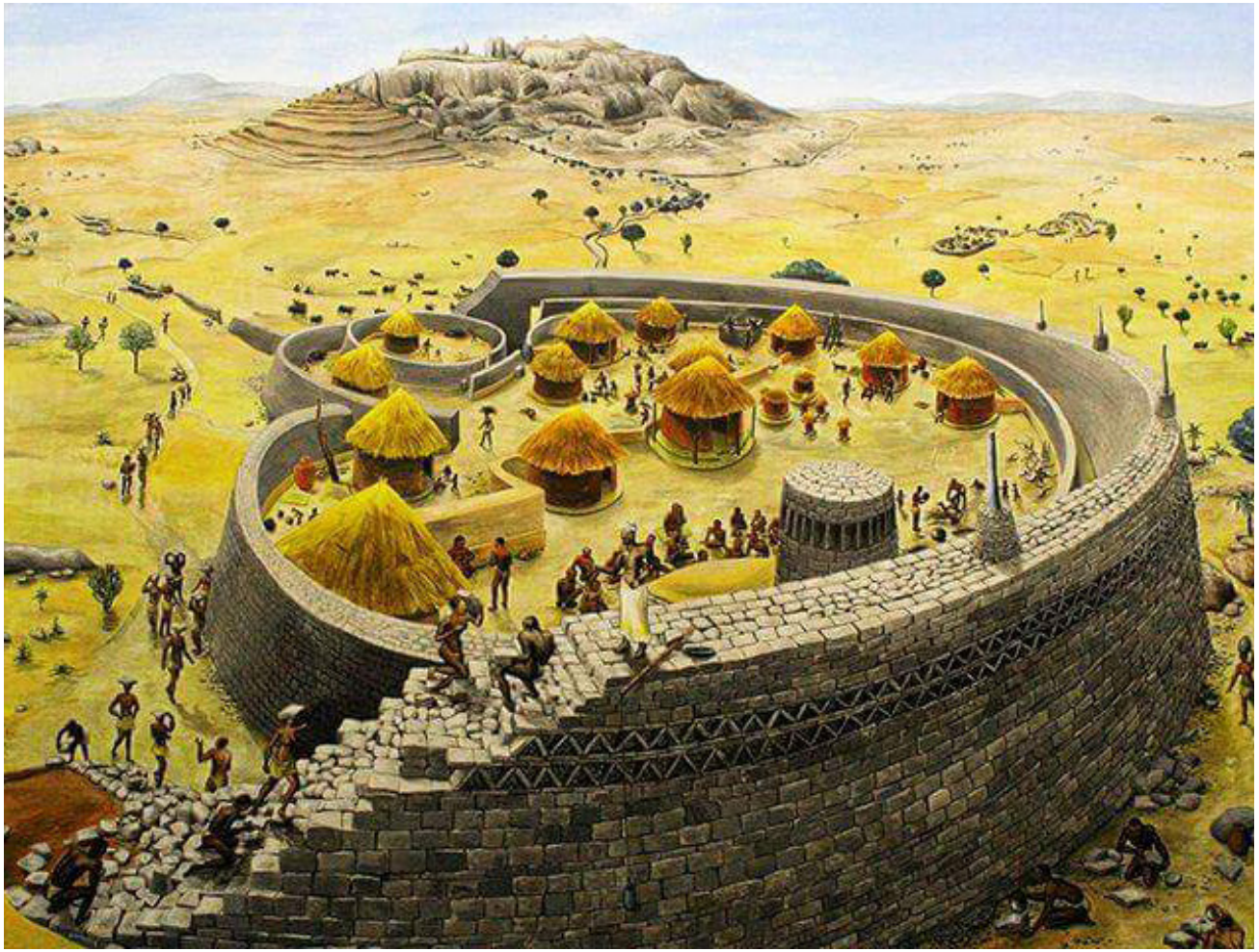


Figure 3.15a – The Stonewall Kingdom of Great Zimbabwe.

Figure 3.15b – The ruins of Great Zimbabwe.

of Limpopo, dated to almost two thousand years ago. Patterns of the ruined stone-walled homesteads were linked with cattle roads, with a unique system of agricultural terracing (*Delius et al., 2014: xiii)*. According to Alex Schoeman, a renowned archaeologist at the University of Witwatersrand, the archaeology of this area strongly resembled Bapedi sites as previously identified by archaeologists (See Figure 3.18).

The main elements that are visible in these intricate stonewall mazes are (See Figure 3.19):

- Firstly, the circular form of the homesteads, depicted as several concentric circle, with different activities taking place within the different layers. They were bordered by slightly higher stonewalling;
- Secondly, the stone walled terraced fields which seem to organically follow the natural slope of the site all with different widths and the low stonewalled demarked road networks (See Figure 3.20). These roads were presumably to lead the cattle from the center of the homestead away from the farming land to nearby grazing land and water bodies *(Delius et al., 2014: 10).*

Some homesteads where clustered closely together. Others where spaced quite widely apart. It can be assumed that these were the homesteads of a clan group under the same chieftaincy as highlighted in spatial configuration of precolonial- and Pedi settlements.

3.2.3. *Kgoro*

Early Pedi settlements were made up of certain clusters, namely *kgoro* (pl. dikgoro). These were groups centered on the male line of the family cluster. Historians of that period suggest they were territorial units similar to the Tswana people. According to

research by Peter Delius, members of a *kgoro* did not necessarily have to be related, but other unrelated groups and individuals could also be attached, partly by the chief". Each *kgoro* retained considerable autonomy of control over the social, economic and judicial affairs of its own members *(Deluis, 1983: 65)*. A *kgoro* consisted of a group huts built around a central cattle kraal. The latter served as a place where the males of the community would meet, a cattle shed, graveyard and ancestral shrine **(See Figure 3.21)** (*Delius et al., 2014: 67)*.

Homesteads where built within, or besides terraced landscapes, usually interconnected by walled roads **(See Figure 3.22)** *(Delius et al., 2014: 68)*. Some homesteads were occupied for a long time. Others were preoccupied by different people. This process of expropriation led to changes in plan configuration. Loose stones were removed from some places and new walls were being built. This emphases the adaptability and fluidity of the homestead to change and be reconfigured to suit the needs of the different people occupying it. Usually, with one entrance and exit point, the cattle were led to their various enclosures. Bulls were situated in the central kraal with the cows and in the outer enclosures. The huts/ living quarters were located on the outer part of the circle and divided by a stonewalled passage. It is often said that the men's area was in the center of the homestead with the 'wealth' of the family – the cattle. The women's and children were found on the outer boundary of the homestead with the domestic activities and granary storage. The women were largely responsible for preparing the fields, planting, harvesting (the annual cycle of crop cultivation) and often trading the crops for the day to day sustenance of the homesteads **(See Figure 3.23)**. Women often undertook extremely arduous labour in societies and this was often trivialised.

Figure 3.16 – King Chetshwayo's Kraal, Kwazulu Natal Zulu Kingdom.

Figure 3.17 – Zulu Kraal under Zwaart Kop near Pietermaritzburg.

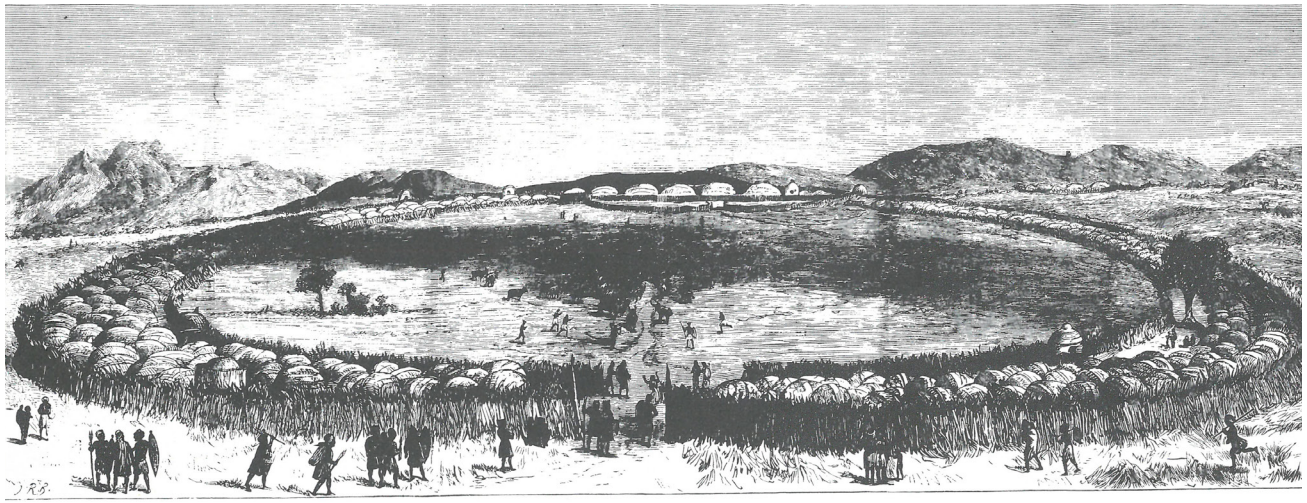


Figure 3.18 – Bapedi Stonewalled homesteads.

3.2.4. Case study - Buffelhoek 471 IQ

Historical evidence, such as the Buffelshoek 471 IQ excavation site was discovered by Michael Taylor of the University of the Witwatersrand Archaeological Department *(Frescura, 1981: 146)*. The site portrays the remains of an Iron Age village, which was suspected to have been erected by a Southern Tswana tribe in the 1750's. Aerial photographs indicate that the area consisted of a central complex of cattle enclosures with the residential areas spiraling out from the middle point **(See Figure 3.24)**. The 'spiral' form showed the different *kgoro* settlement. Through a slow process of growth and amalgamation, people and resources merged to form a single *kgoro* under one chieftaincy *(Frescura, 1981: 147)*.

3.2.5. Lapa and the role of women

"Whether it is the San in South African, or the Sioux on the American Plains, women build and often in a sense 'own' the hut." (Jarzombek, 2013: 114)

The *kgoro* was organised in order of seniority. Like the Ndebele homestead **(See Figure 3.25)**, "the head-wife's hut was situated in the front, by the main entrance and joined to the other wife's huts at the back through semi-closed lap areas. The *lapa* areas where enclosed to the outside using balustrade walls constructed out of mud, inter-leading to the next *lapa* area. This hut was joined to other huts by a series of open-air enclosures called *lapa* encircled by mud walls" *(Delius et al., 2014: 70)*. The Pedi social hierarchy held the notion of privacy in high regard, as the *lapa* played an important role in creating privacy between the different households within the *kgoro*. It was a gathering place for the family, as well as a space to receive and host guests. The spaces beyond the *lapa* enhance the sense of privacy, as they were further divided into a hut for the parents, a

hut for cooking, a hut for storing grain as well as separate huts for the older boys and girls. The latter referred to as 'age sets', and were an important part of the Pedi social cultural principals. The building of these homesteads took place as a group activity. Women however played, and to present day still are an important part of the building process of the home. Be it making the hut, the gathering and preparation of materials, frame construction and latching, the women undertook these responsibilities and often 'owned' the home. The Pedi originally lived in round in shape huts, which were known as *Rondawels* (See Figure 3.26). They were constructed of timber structural frame and cladded with clay mixed with *boloko* (cow dung). The roofing of the *rondawels* was made of grass called *loala* (a type of grass) which was strong and long. They would pack the grass in bundles then roof the houses *(South African History, 2011).* Later the form developed into rectangular units, still enclosed by a central courtyard (See Figures 3.27). It was built in such a way, that the main unit had timber columns that carry the roof load set at 1500mm2 intervals along the perimeter. The columns were free from the walls, which were built of non-load bearing packed earth plastered with *daga*. However in other units, the columns were built within the walls, with the walls acting as infill panels (See Figures 3.28). Roof beams were tied from the eaves to the central crown. The thatch cover was then laid seed- end up, to gather at the top. The floors were made of *daga*, which the women applied using their hands, until the floors were level and smooth.

3.2.6. Conclusion

"*Mosadi o tswara tipa ka bo gale "(translated:* women is the strong hold of the family). *An ancient Sepedi proverb.*

Women play an important role within the Pedi society, be it building the homestead, cultivating the land, or taking care of the household in the absence of the men, whom had gone to become labours on farms or migrant workers in mining areas, within the more resent apartheid period. Therefore, it is evident that the concentration of rich cultural knowledge of the Pedi homestead lies with its women and this research has helped. Pedi women do not only have the architectural knowledge, but the experience of this architecture on daily life as they spend the most time in the spaces they have designed and built. Through methods of interviews, photographic documentation and sourcing of maps, this ancient practice will be unpacked to understand the processes Pedi women undertook.

Figure 3.19 – Stonewalled Homestead ruins near Lydenburg, Mpumalanga.

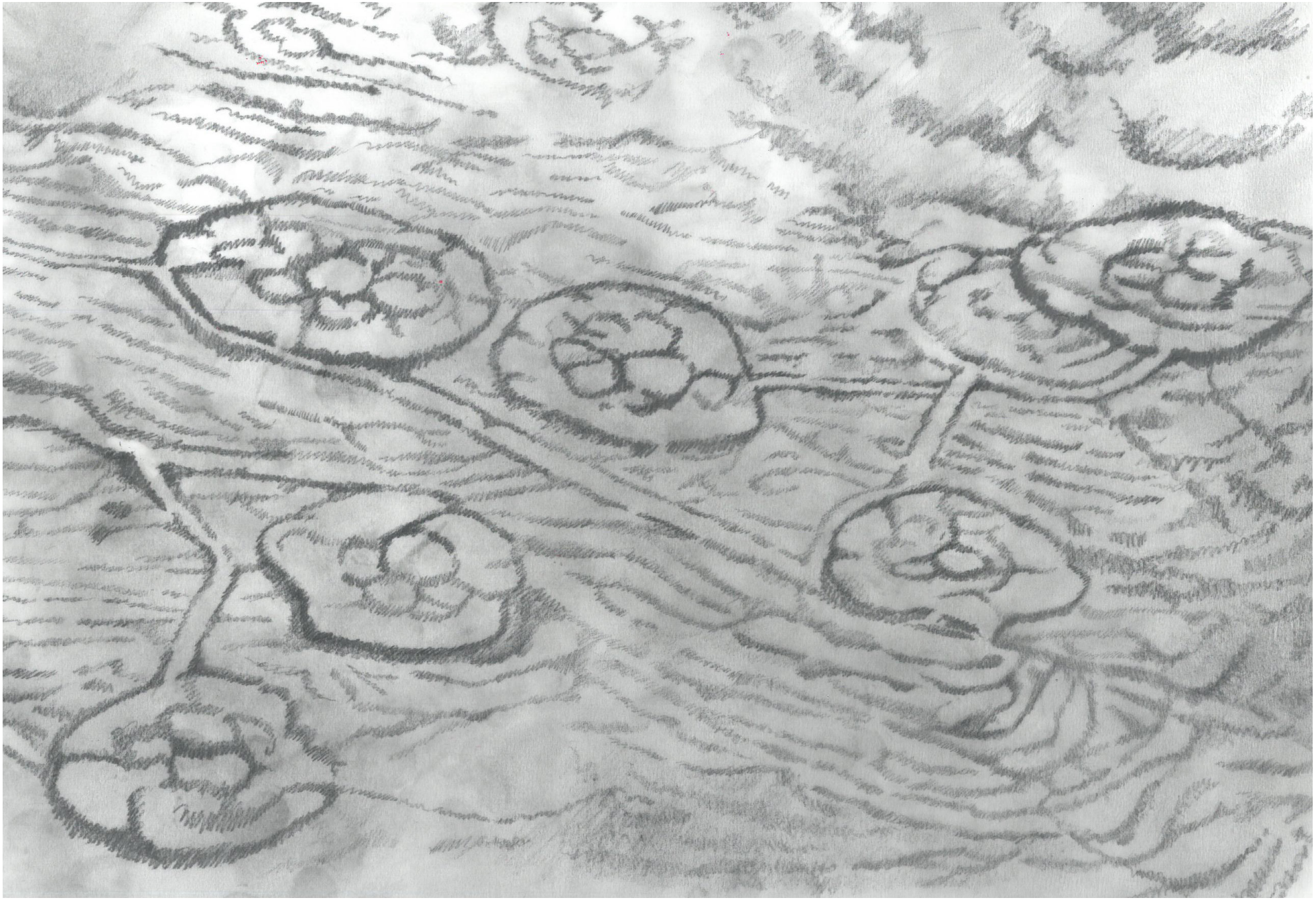


Figure 3.20 – The homestead network systems.

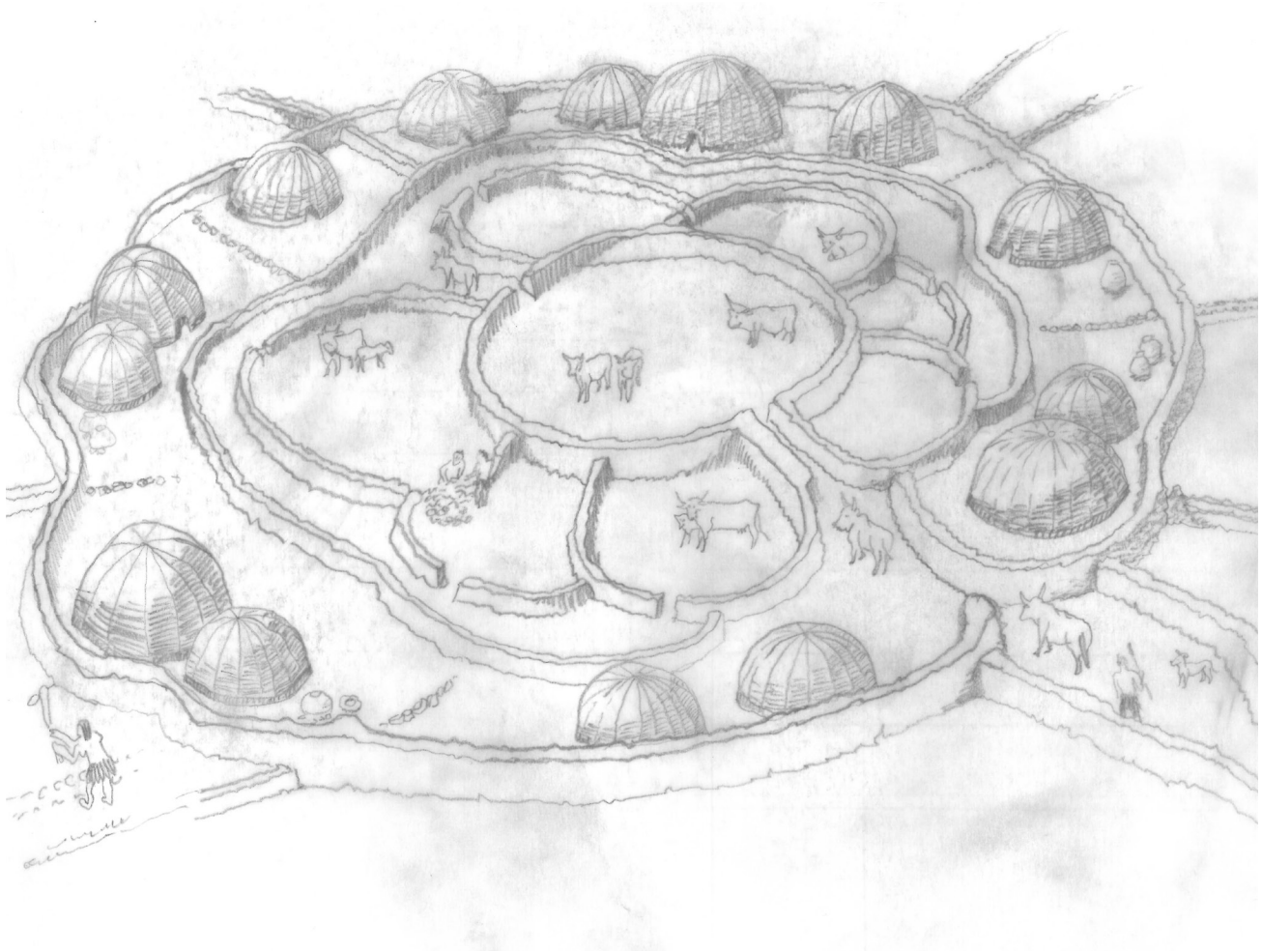


Figure 3.21 – The homestead network systems.

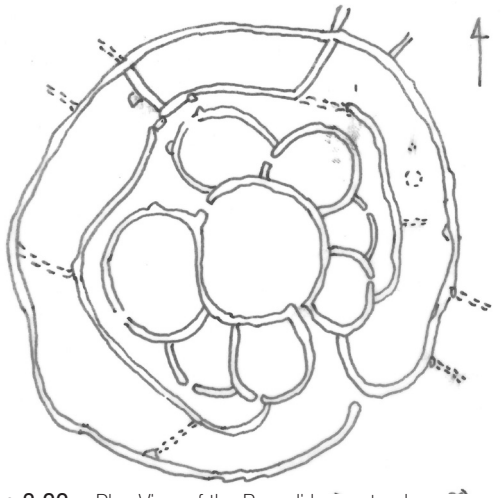
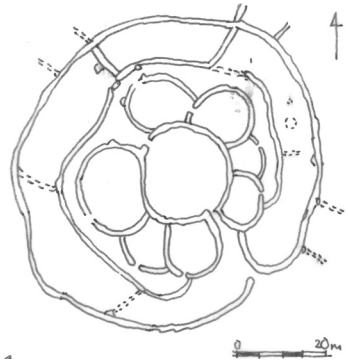
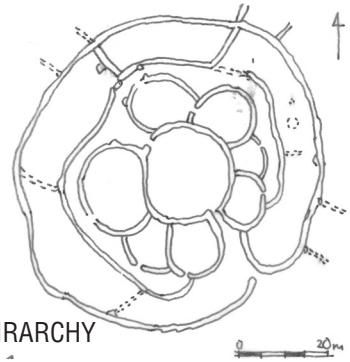


Figure 3.22 – Plan View of the Bapedi homestead.

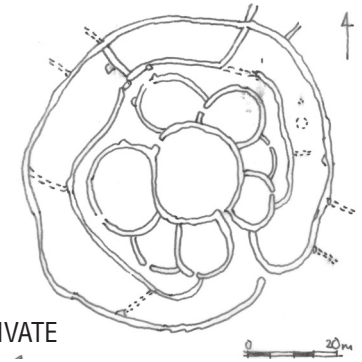
Figure 3.23 – The Pedi women tending the farming activities.



ACCESS

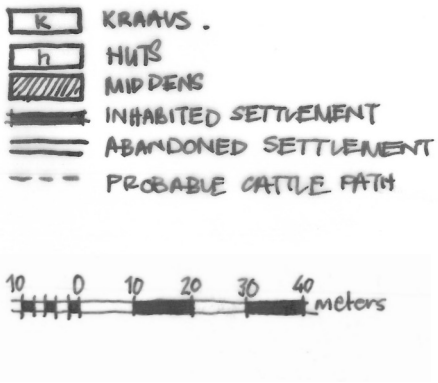


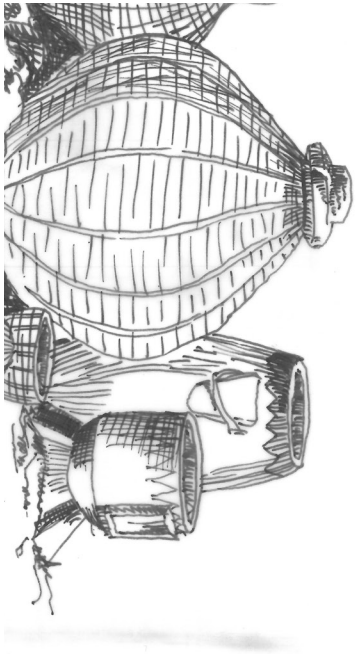
SPATIAL HEIRARCHY

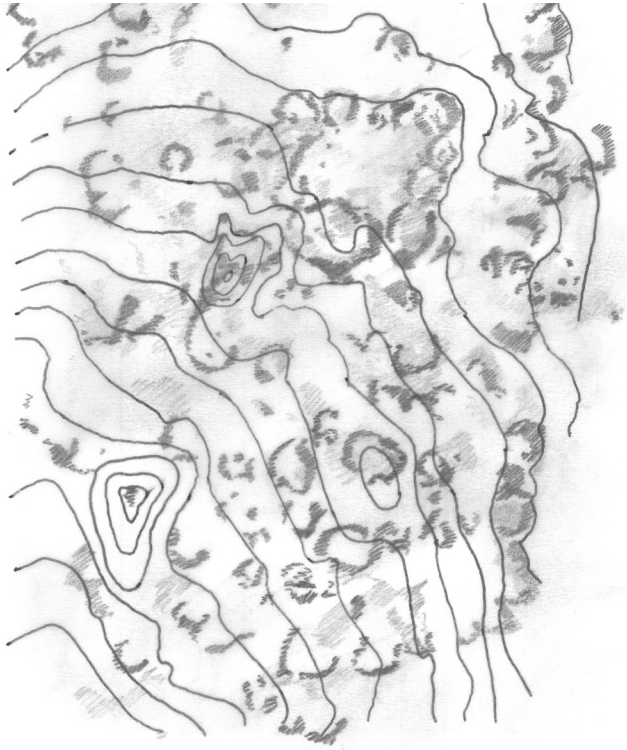


PUBLIC/PRIVATE

Figure 3.24.1 – Buffelshoek 471 IQ excavation, near Parys discovered by archaelogist Michael Taylor of the University of Witwatersrand Archaeological Department.







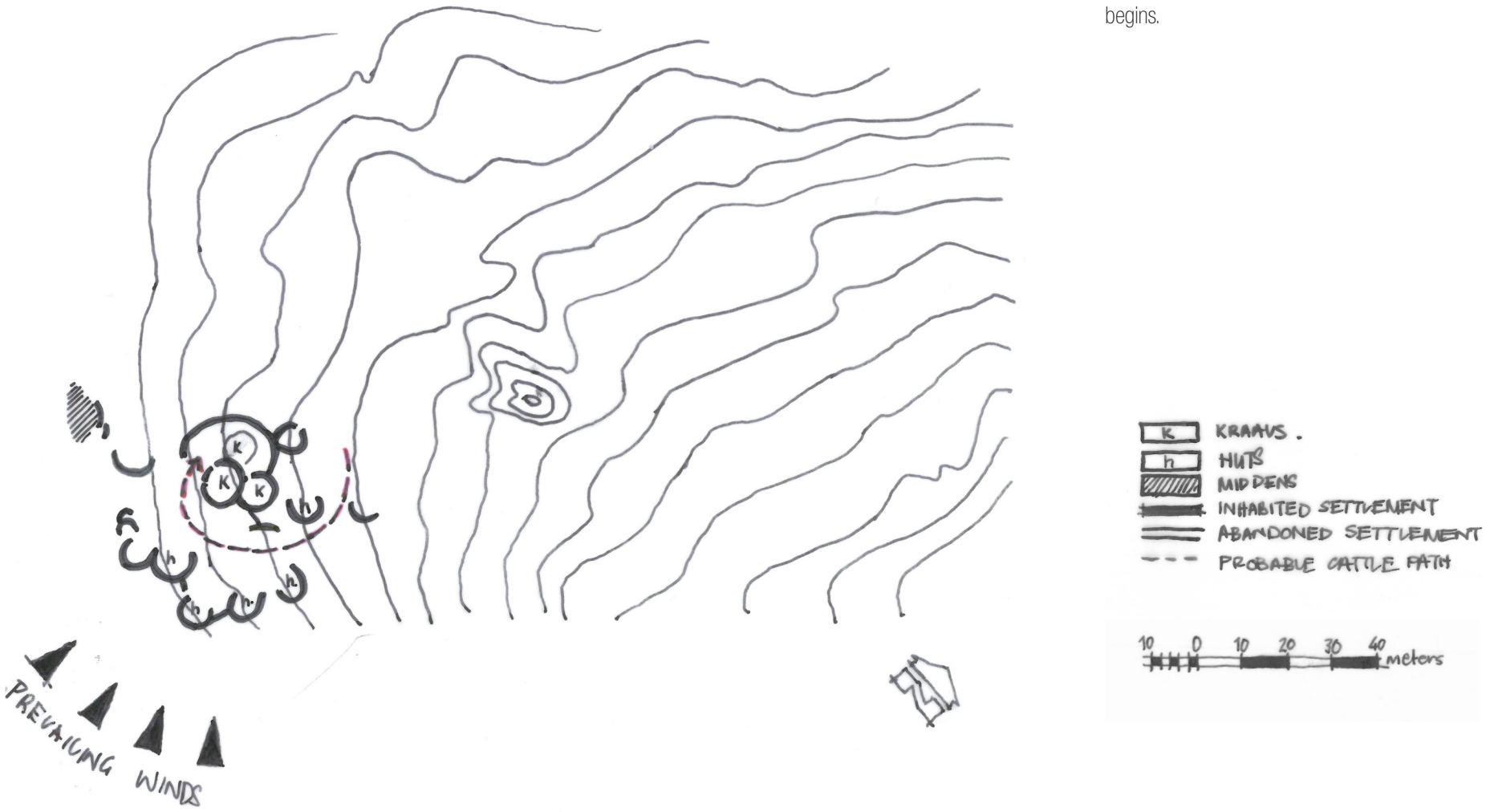


Figure 3.24.3 – The organic growth of the homestead as it begins.

Figure 3.24.5 – The homestead gradually grows and older sites are left barron, with only the traces of the stoned walls remaining.

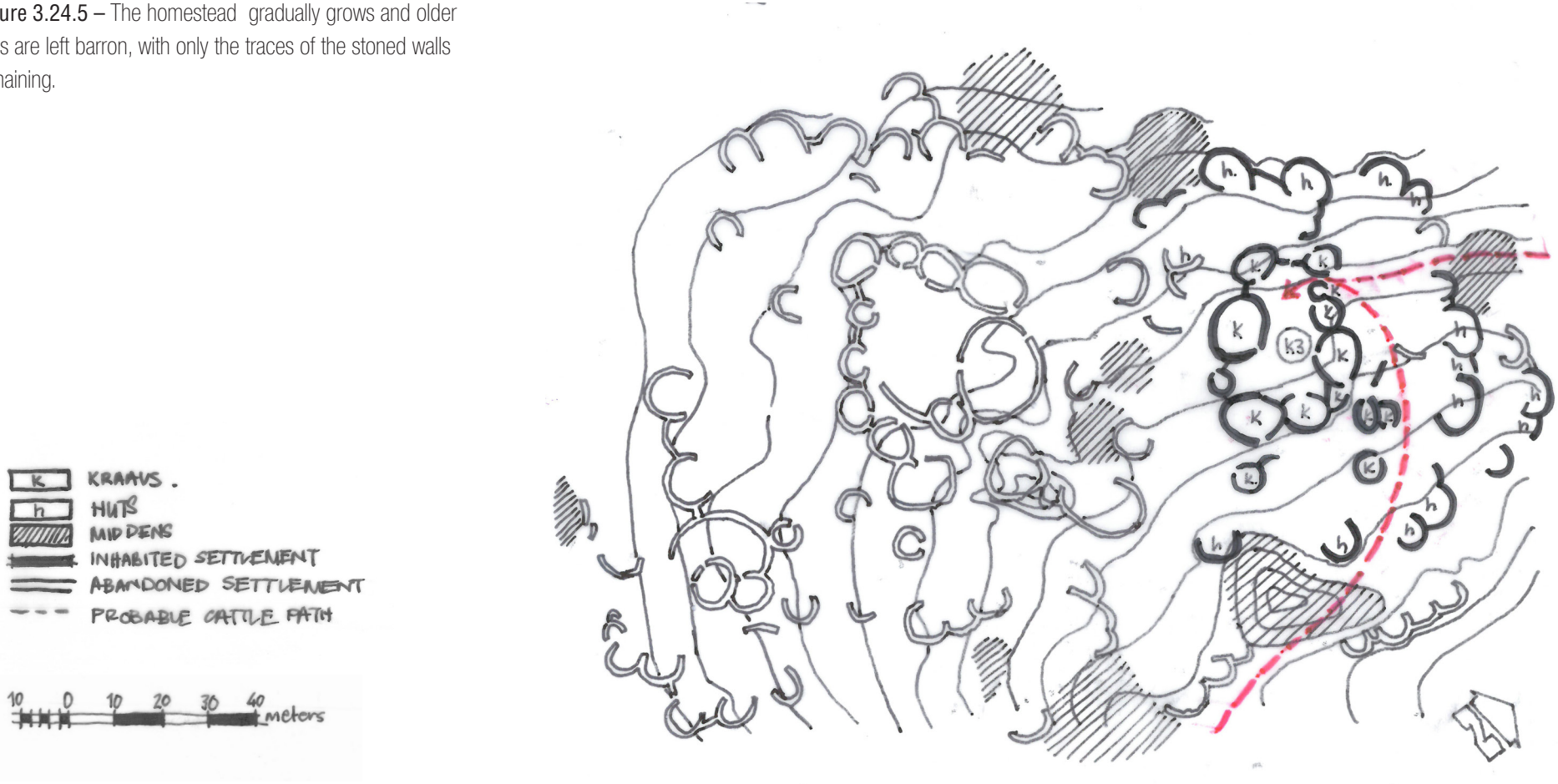


Figure 3.24.6 – Aerial views from west.

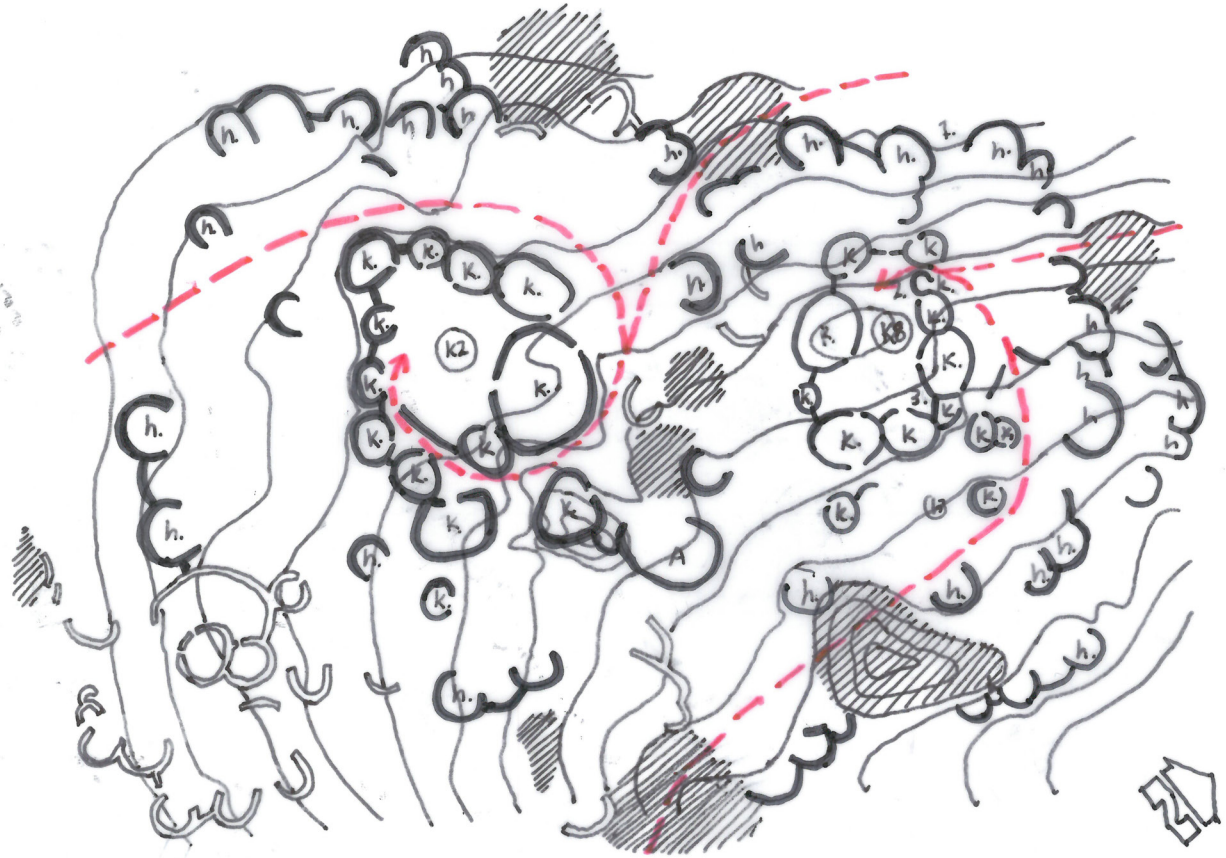


Figure 3.24.7 – The homestead following the terraced pattern sites are left baron.

Figure 3.24.8 – Views from of north of the site.

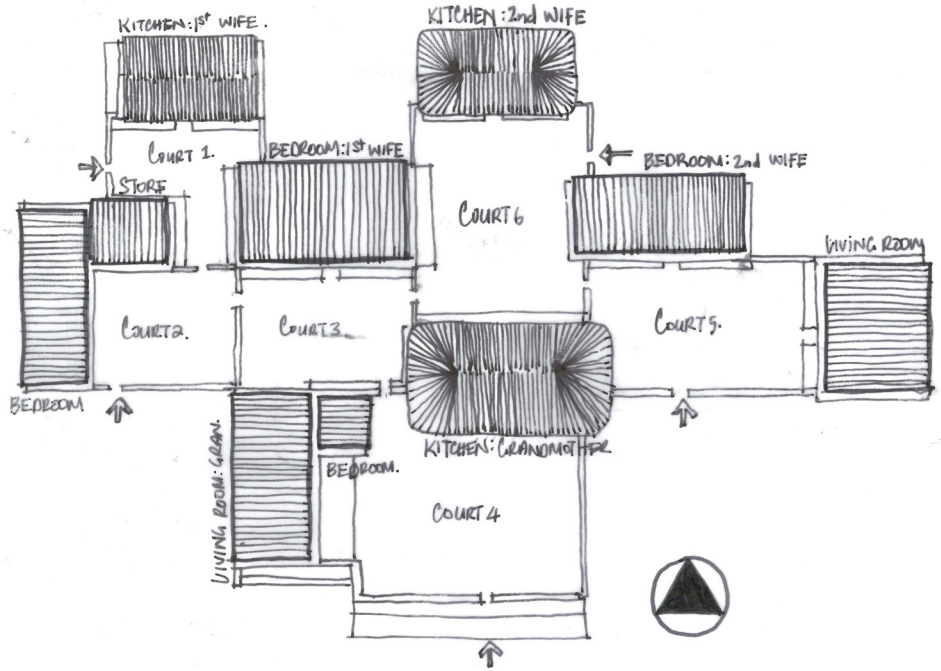


Figure 3.25 – The modern Ndebele homestead.

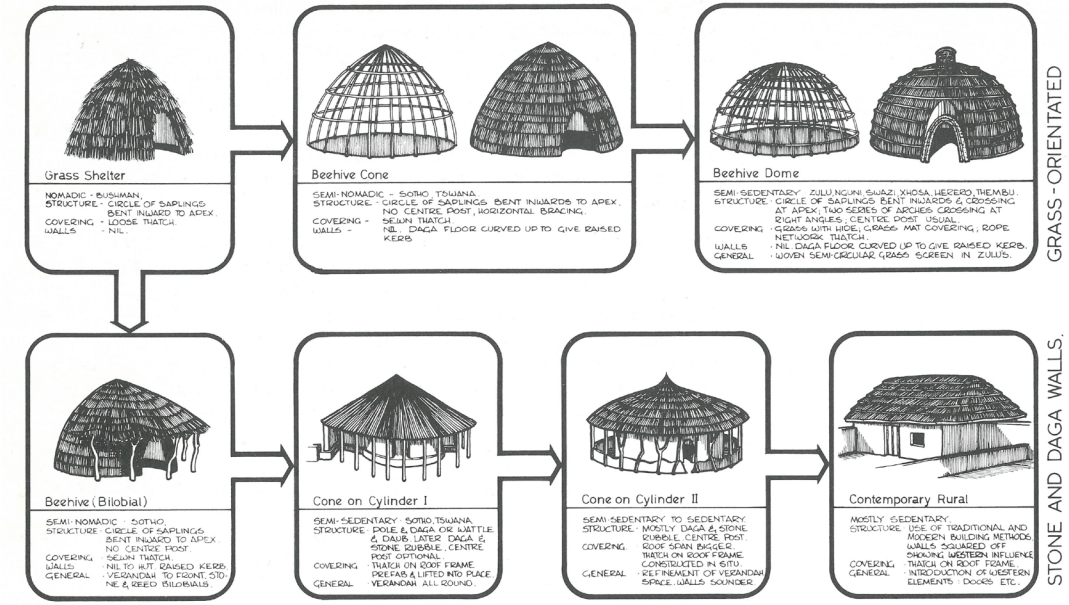


Figure 3.26 – The developement of the Bapedi homestead.

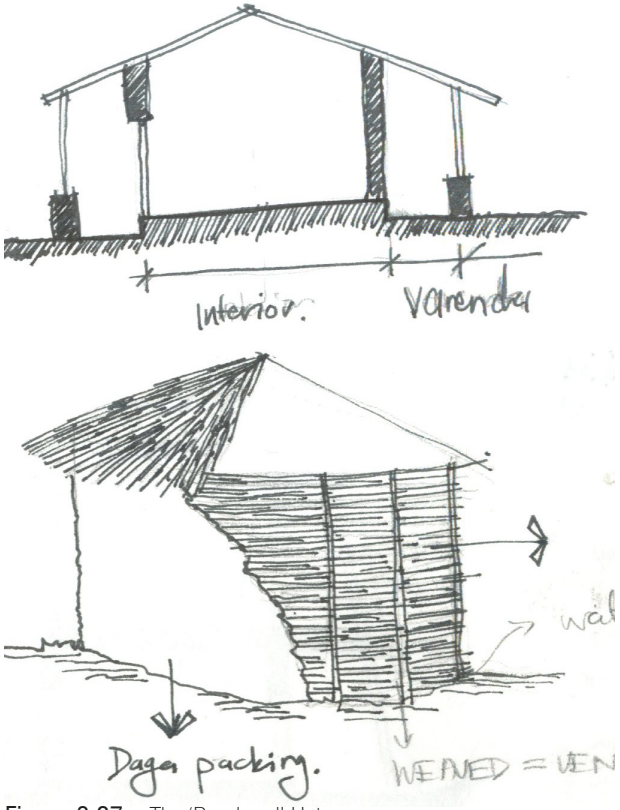


Figure 3.27 – The 'Rondawel' Hut.

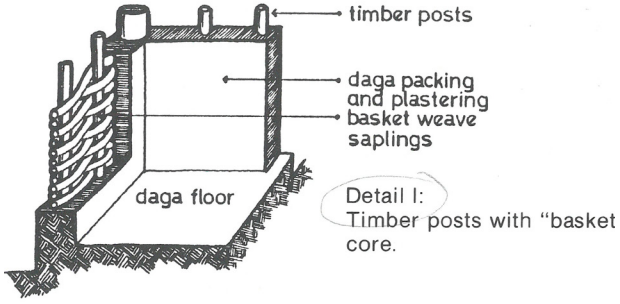


Figure 3.28 – The construction of the wall.

The following series of images and sketches are of the author's great-grandmothers abandoned homestead, in the village of Mothlalaotwane, north east of Groblersdal town, Limpopo. The homestead was built in the early 19th century by the author's great-grandmother, using traditional building materials and techniques. It was later developed and renovated using store bought materials as the homestead typology modernised through time.

Taking this example into account, perhaps the answer of sustainable design does not lie in low technology construction alone but in merging these traditional methods with an adaptation of modern building materials and techniques.

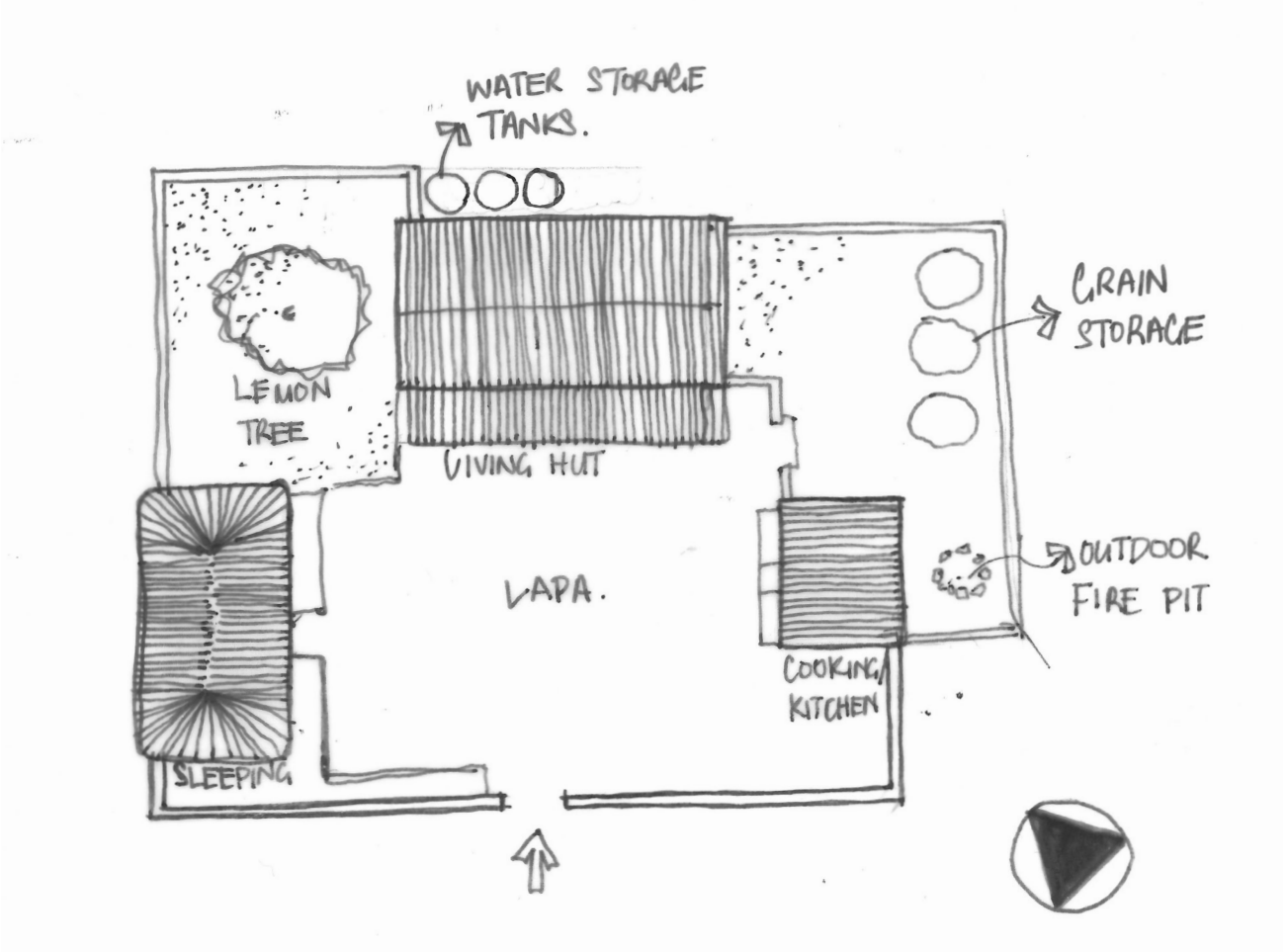


Figure 3.29 – A sketch of my great- grand mothers home, in the village of Mohlalaotwane, Limpopo.

Figure 3.30 – The following pages shows a series of images by the author aim to show the adaptation of the Pedi vernacular architecture to modern materials and building techniques.

View from outer yard, used for grazing.

The combination of thatched and corrugated roof sheeting was used, projecting the building of the different huts at different times.

A veranda was built for the main living space.

The walls enclosing the *lapa* were built of daub and covered with store bought copings to prevent rain from ruining them prematurely, with the ruins of the old kitchen hut joined to th entrance wall.

Fruit trees outside the *lapa*, at the top of the farming land.

The old kitchen tired to the perimeter wall position.

The old *daga* walls were plastered in cement plaster to try protect them from rain, now metal sheeting has been loosely placed for the same reason.

The damaged old *daga* at the back of the *lapa*.

A view of the house from the graved road.

The reconstructed kitchen space.

The entrance gate from the outer yard into the *lapa* with low perimeter walls.

A fruit tree at the back end of the *lapa*.

3.3. Participatory Design

"*Participatory design is an attitude about a force for change in the creation and management of environments for people.*"
(Sanoff, 2008: 57)

3.3.1. Introduction

In the chapter, the aim is to demonstrate participatory design as a growing phenomenon in the history of community design and place making. Participatory design particularly in the architectural design process will be investigated, by highlighting the principals involved. The practice of participatory design has been supported by various professionals and institutions of higher learning, and how the funding and fee models work for such processes will be discussed. By analysing various participatory models, the understanding of how participatory architecture can be obtained in this design process, as an enriching framework to better resolve the research questions. The work of participatory design architects, such as Lucien Kroll and Francis Kéré, will be analysed to understand their design philosophies, documenting their methodologies and analysing the success or failures of these processes. This will better inform the design process and architectural design intended in this research report.

3.3.2. A Brief History

The involvement of communities taking part in the making of their spaces can be traced back to Plato's Republic *(Plato & Grube, 1992: 563)*. Equal representation and freedom of speech, were at the forefront of Plato's concept and this formed the foundation that helped shape what is today, the United States of America *(Sanoff, 2008: 236)*. The beginnings of participatory design (also referred to as community/ co-design) can too be attributed to the 1960' and 1970's political and civil rights movements, which exercised their rights by insisting on more say in the decision-making processes that affected their lives, and taking part in those processes through participatory design (*Simonsen, Robertson, 2013: 340).* Design participation conferences such as Design Research Society, held in Manchester, (*Cross, 1972: 45)*. Around the same time, some architects and town planners began to seek ways to involve people in the design of various aspects of their everyday built environments *(Sanoff, 1978: 240)*. Participatory Design constitutes the involvement of people in the design process of the technologies they use namely: "software design, urban design, architecture, landscape architecture, product design, sustainability, graphic design, planning, and even medicine, this is a way of creating environments that are more responsive and appropriate to their inhabitants' and users' cultural, emotional, spiritual and practical needs" *(Simonsen, Robertson, 2013: 380)*. The main concept of participatory design was for the end user to partake in the collaborative process, in which to better address their human needs *(Simonsen, Robertson, 2013: 381)*.

3.3.3. Principals of Participatory Design

Participatory Design can be described as the end user/ community taking part in several stages of the design and construction process, to attain a more viable solution that will address their needs *(Simonsen, Robertson, 2013: 2)*. During the design development, the input of the end user is crucial in identifying.

From the 1960's onwards, participatory design gained momentum and eventually became common practice among authorities and civilians. In the case of the indigenous Australian groups, many felt at bay when major planning decisions were not inclusive of their primary living needs *(Nichols, 2009: 35)*. This changed with the 1995 project at Mapoon Aboriginal Settlement. "Mapoon is located on the west coast of Cape York Peninsula" *(Moran, 2004: 342)*. It was the cape's largest missions at one stage. In the early 1960s, a decision was taken by both the Presbyterian Church and the Queensland Government to demolish the settlement, against the community's will and make way for a new mining development (*Moran, 2004: 342)*.

The mining was closed a few years later due to poor production, and the people originating from the old settlement began to gradually return to the site. They began rebuilding their homes with no government assistance, using bush timber and whatever building materials they could find, often salvaging materials from the dump site of the bauxite mine. Until 1995, this was the norm for people living in this area to build their own '*humpies*', an informal term given to the informal housing typology **(See Figure 3.31)**.

Participatory planning processes were adopted here, in hope to build better housing for the residents of the settlement. The project was funded by the local commission and the plan was successful, building better houses and neighbourhood infrastructure but was not as successful in implementing development strategies such as, community control, ownership and autonomy. Meeting would be held frequently between the planner, authorities and community leaders to discuss the issues of the community and report back on the progress of the project.

The Mapoon resident's received title deeds for their land and a community council was appointed. The community, together with the Queensland government and various professional bodies undertook the 1995 Plan over a period of 18 months. Through the process of participatory design, most community members were able to collaborate and demonstrate a sense of cohesion, therefore most community members felt that their needs were addressed and that they had a say in the process *(Moran, 2004: 351)*. After the design brief was completed and the development stage begun ,and community participation started to stager. One of the flaws of this plan was that it did not address community management systems beyond the completion of the project.
Policy and building legislation was not carried out by the local authority, as is the norm in mainstream local government authorities; hence it became difficult for the community to control the development. However, in this project it was concluded that the 1995 Plan was successful in introducing housing and infrastructure to the indigenous community **(See Figure 3.32)**. The design outcomes represented the spatial needs of the residents positively and informed the decision-making processes of the stakeholders *(Moran, 2004: 352)*. Despite this success, critics argued that the project neglected to address more intricate social issues of health, education, legislation and governing structures. This questions the scope of participatory design. Does it end at the construction completion phase? Or does it seek to address larger societal issue, which would be a much more sustainable solution.

3.3.4. Co- Design: Aspirations verses Reality

"It is a process – not a procedure – [which] receives and transmits, not wanting to master everything, but to allow some things to remain obscure, apparently irrational… it is not rational, but it is reasonable." (Ellins, 2000: 178)

Lucien Kroll, a Belgian architect, was one of the most outspoken and active advocates of participatory design (or as Kroll's refers to "ethnological architecture") *(Ellins, 2000:178)*. Kroll passionately objected to the traditional sense of architectural practice, whereby the designer imposes their design onto the end-user, rather than understanding the plight and thoughts of the end-user *(Ellins, 2000: 179)*. He sternly questioned the conventional methods of design and challenged the norms by including inhabitants in the design process, which he clearly describes "a brutal choice" *(Ellins, 2000: 180)* which designs have to encumber "between cosmetics and ethnology." Kroll's ethnological attitude is non-rational, non-authoritarian, non-interventionist and non-elitist. He is merely devoted to becoming

Figure 3.31. – A resident built 'Humpyin' house, the form of informal housing, 1995.

Figure 3.32. – The Housing typology produced from Participatory Design Processes.

Figure 3.33 – Gated community showing the relationship between public space and private space images extracted from the catalogue of the exhibition: Simone and Lucien Kroll, an inhabited architecture, under the direction of Patrick Bouchain, Éditions Actes Sud, 2013.

a mediator between inhabitant and desired architecture, facilitating the process in search of a successful co-design system. However the inevitable questions such as, "does the community want what the design professional wants?" Begin to challenge the authority and analysed the architectural stance of the designer. When participates in the design process, are the designer's and the inhabitants' needs able to be met comprehensively?

In the case of the Vignes Blanches **(See Figure 3.33)** such challenges were encountered and will be too analysed to understand the effectiveness of community participation through design [or lack thereof]. The Vignes Blanches (translated: White Vineyard) was a subsidized moderate income cooperative, named after the old cadastral designation of the site, which was previously a large vineyard established during the twelfth century by monks from Parisian St. Martin of the Fields parish, *(Ellin, 1999: 208)*. Located in the new city of Cergy-Pontoise, France, the project entailed an urban development scheme, comprising of forty-three townhouses to be designed and built through a participatory design process.

Commissioned by the Public Development Corporation in 1976, the construction only began in 1978, due to a number of factors. Numerous community design techniques where implemented. Kroll and his team began by seeking prospective inhabitants through advertising campaigns, which in turn prolonged the design process since there was no existing community. The team first sold the forty-three households, by selling the idea of participatory design. At first the idea or designing your own home and in turn your new neighbourhood. A lengthy series of meetings followed with the potential clients in a process to obtain design input and to take their needs into account, during the design process then followed. Most participants were French speaking origin and others from other European countries or former French colonies/ territories *(Census Data,*

1983: 263). This presented cultural diversity and dynamics. Kroll would have to take their needs into account, as it presented its own complexities, such as different preferences in spacial organisation, i.e. some clients preferred an individual house in the center with an open front lawn and a gable roof and others preferred picket fences with flat roofed houses. All had their different preferences, which posed a problem in harmonizing the gated community. This prolonged the process even further while Kroll and his team attempted to research an architectural cohesion together with the community members through more community meetings.

Due to the slow, tedious and costly consultative process, most of the initial potential clients lost interest in the project and went on to buy ready built houses. Disappointingly only three of the initial 'community members' moved into their townhouses and of these three, only one member was involved in the design process from the beginning. He too showed discontentment with the outcome of his home. He had shown Kroll some drawings that he had done of his childhood home, but Kroll inevitably had to take a professional stance, in order to reach an architectural conclusion **(See Figure 3.34)**. He justified the not taking all their considerations into account due to in terms of market demand, the attributes of the construction permit, and the need to have a sense of cohesion aesthetically within the neighbourhood *(Ellins, 2000: 180).*

This is a clear indication that Kroll's participatory design aspirations to help nurture and sustain an ideal neighbourhood. The inhabitants could appreciate, and gradually and spontaneously develop the social qualities of an old village. This was theoretically defined but not practically resolved. He neglected to take into account the fact that the inhabitants may or may not share his values, which led to the failure of the Vignes Blanches which in appearance, was not distinguishable from its surrounding neighbourhood, and was designed using traditional architectural methods. It can therefore be noted, that when participation is reflected upon only in rhetorical, it can serve to pacify and appease the participants, rather the address the society's needs as was initially intended.

3.3.5. Sense of community & Place Attachment

"Architecture is much more than art. And it is by far more than just building buildings, the aim is to provide sustainable models of development that engage with communities and harness local skills". (Slessor, 2009)

Participatory Design offers an alternative method of design, whereby the needs of inhabitants of the space take precedent rather than the aesthetic desires of the professional. Participation has much wider impact on people and environment than just creating a prominent architectural space. Participation can aid in the development of skills, which the inhabitants can use to improve other aspects of their lives. Environmental competence and human development are important by-products of community design, which have a more lasting impact on social development.

What about neighbourliness? When people feel attached to a place and part of a larger community, they will be more willing to lend their time and resources to address problems faced by the community *(Morris, 1996: 78)*. Differences in ideas and opinions ought to be put forward and discussed from the onset, before engaging in the design process, so that the end product is one that's more favourable amongst most of the participants *(Sanoff, 2008: 57)*. It can be noted that outside participation the design process presents many obstacles and as like in the case of Kroll's attempt in Vignes Blanches, this can fail to create a sustainable 'sense of community' among its inhabitants, because

Figure 3.34. – Images of Vignes Blanches, France after it had been constructed (1976 – 1983).

Figure 3.35. – Community members take part in the building process of the Primary School in Gando village, Burkina Faso.

other challenges are; participatory design brings together people from different areas and backgrounds with no similar interests. Different ideological preferences between the designer and the inhabitants, a lack of tolerance among the neighbours, there was a lack of prior place attachment, which was key to Kroll's design philosophy about endowing a neighbourhood with the "diversity and complexity of older villages that grew more gradually and spontaneously" *(Ellin, 2000:178)*.

The opening quote to this chapter is the words of renowned African social architect, Diébédo Francis Kéré, whom was born in a rural village in Burkina Faso called Gando. Kéré was the first person from his village of to go to university and studied architecture at the Technical University of Berlin *(Kere Architecture, 2015)*. Due to the many challenged faced by Kéré, as a child growing up in an extremely underdeveloped villages, where he attended school 40 kilometres from his village. The school facilities, too, where problematic for productive teaching and learning as they had poor lighting and ventilation *(ArchDaily, 2012)*. These experiences incited him to come back to his village and together with the community, use his skills and knowledge to build a school using techniques and methods of participatory design. *(McKnight, 2014: n.d.)* narrates:

*'It was late morning in Gando, a rural community in the West African country of Burkina Faso, and the fierce sun was beating down on the arid, ochre-coloured landscape. Despite the heat, a throng of villagers was busily constructing a new building. Women in colourful skirts and sandals—some with babies strapped to their backs—walked to and from the site, steadily carrying clay bricks on their heads. Men shovelled dirt and mixed mortar. One labourer stood on scaffolding held up by thin tree trunks, laying bricks as they were passed up to him (**See Figure 3.35**). The goal of the project is to provide a place where local residents and international visitors can work together to develop imaginative building methods using indigenous materials." (McKnight, 2014: n.d)*

Unlike Kroll, Kéré solely undertook the design process of the school using a mix of modern and vernacular architecture. Only in the constructing of the school did the community participate, as traditionally practiced, in rural Burkina Faso, where the entire village work together to build and repair each other's homes **(See Figure 3.36)**. A sense of community and place attachment is more evident in this case as active community participation was the key to the success of this project. Kéré uses indigenous knowledge he learnt from practices that are used in the village and built the school using local materials and local skills, which inevitably empowers the community and instils pride within its members **(See Figure 3.37a & 3.37b)**. Through the architectural process, Kéré was able to providing employment to the locals, skill development opportunities and an ideal precedent for future projects in an area that they are much needed *(McKnight, 2014)*.

3.3.6. Place – Making through Participatory Design

In a larger scale public project and participation dynamics are largely shifted. In *A Retrospective Look at Participatory Design Projects*, authors Andrew Clement & Peter van den Besselaar find that, with few expectations, participatory design projects were largely small scale, and predominately pursued by researchers and design pioneers (*Clement, A. v.d. Besselaar, 1993: 33)*. In the case of Union Point Park, a waterfront park in the Fruitvale district of Oakland, California, community organisations in the form of Community Development Corporations (CDCs) have been an important grassroots force in revitalising local communities against conditions of economic and social decline *(Hou and Rios, 2003: 19)*. Armed with grassroots networks for these disadvantaged communities, political capital (local

Figure 3.36. - The traditional taking part in the practice of community members repairing the homes.

Figure 3.37a. – The community come to donate clay pots made by them at home to stogare water and grain, to be used in the construction of the new Community Library to be added to the school.

Figure 3.37b. – The pot were used as moulds on the roof, for natural light to enter roof the roof into the library.

Figure 3.38. – Francis Kere standing in th finished structure of the community library.

and national governance), as well as the financial and technical means, through public and private partnerships within these CDC's, these groups no longer work on the mode of public protest and resistance.

Formed in 1964, the Unity Council (formerly Spanish Speaking Unity Council) is a community development corporation (CDC) that was working throughout the southwestern United States and California to help create minority institutions and to develop greater degrees of political and economic power for low-income people *(Hou and Rios, 2003: 21)*. The main aim of the Union Point Park initiative was to improve the quality of life for Fruitvale's families and children. The district has some of the highest concentration of youth living in the city and therefore the erecting of the park was not only for the improvement of quality of life, but a social responsibility for the CDC. The district has roughly, 0.68 acres of open space per one thousand residents and by revitalizing existing parks and increasing the amount of recreational resources in Fruitvale, this would begin to address the problem *(Hou and Rios, 2003: 21)*.

Public participation has been an important mechanism for local communities to influence the making of public space and the Unity Council went about this by means of community campaigns, such as collection more than three thousand signatures for a petition and a thousand letters of support from community- based and non-profit organisations, to the Port of Oakland to dedicate a nine-acre site along the Fruitvale waterfront for the Union Point Park *(Hou and Rios, 2003: 21)* (See Figure 3.39).

Due to the growing support of the project, the City and Port of Oakland, together with the California Coastal Conservancy and the University of California–Berkeley men's crew team decided to form a project partnership with Union Council. Together this Public Private Partnership, formed networks with other non-profit organisations to gain resources and expertise in order to implement this project. Outreach efforts to organise and educate the community about the park begun and the key organisation met to brainstorm the processes ahead while, smaller community participants assisted to collect petitions, cosponsor events and organise people to attend public meetings.

To manage the design of the park, Unity Council collaborated with University of California- Berkeley faculty staff and students and also involved the local youth in the design process, by means of a design charrette that included the participation of more than sixty teens (See Figure 3.40). The workshops produced several vision for the park which some were used in the final design. The discourse building process was a successful contribution to the project which garnered them even support as well as financial backing from both government, private and public entities and all concluded that the park was needed by the community. The interdisciplinary collaboration among landscape architects, planners and artists, along with local residents and the community development corporation, Unity Council, saw to a successful program development and master plan by recognizing the knowledge of the community (See Figures 3.41), and translating this knowledge into physical form *(Hou and Rios, 2003: 24)*.

Unity Council, a community based organisation whose capacity and credibility were built over years of working at the neighbourhood level, achieved to bring together and manage a complex project by means of participatory design at various levels. By processes of mobilisation (through support from smaller groups), discourse building (collaborating University faculty, students and local youth), political crafting (through addressing issues lack of open spaces in low income communities) and using that information the garner political support and funding, this new model of participatory design question the historical rigid processes that limited the participation and growth of the practice. The processes followed in Union Point Park, allowed the place-making processes to engage a broader network of

Figure 3.39. – The Oakland waterfront prior to the Union Point Park project.

Figure 3.40 – Students of the University of California and community youth undergo a 'Design Charrette' process.

stakeholders and constituents and used a wider set of resources and skills to achieve and sustain their goals (See Figure 3.42).

3.3.7. Conclusion

People planning and building their own spaces, as alluded by many historians of architecture, are some of the oldest and perhaps most forgotten ideals in place making, with aspirations of design such as early African and Mediterranean villages, as well as European markets which had very little to no involvement of professional designers. In recent times we have witnessed designers and their community clients quietly making decisions and producing plans using participatory techniques resulting in positive change in their communities *(Francis, 1983: 189)*. As Kroll described – "Architecture that allows some things to remain obscure, apparently irrational; to allow things to happen themselves, is much more efficacious than to prescribe everything." *(Ellin, 2000: 179)*

Although the process of community - design can promote social interactions and develop a sense of community as the community members and designer meet face to face, lengthy processes of monotonous design meetings can create a lack of tolerance among members as in the design process of Vignes Blanches. Participatory Design in the building phase on the other had can empower a community, enhance social development and instil in them a sense of.

By carefully listening to the needs of the community, through methods of a series of interviews, dialogue and feedback, within my decision making process, this research report aims through this research report, to produce a more socially engaging architecture, responsive to the community's needs, to create an environment conducive for knowledge exchange and one that promotes innovation and enhances community development.

This research report aims to understand the traditional building techniques and methods of the Sepedi speaking people, and their ideological place-making philosophies; this design will incorporated the local materials and integrate these with sustainable architectural design. As a means to enhance rural development this research report aims to use local labour in the hope of developing skills and economic empowerment.

Figure 3.41. – Community members enjoying the outcomes of the community – driven participatort designed Park.

Figure 3.42. & 3.43. – Union Point Park after completion, views from the waterfront, and landscape features.

Figure 4.1 – North- east view of the chosen site (Authors photo).

04 SITE

SITE

4.1. Introduction

Limpopo Province is known to be "the agricultural production center for most high valued agricultural commodities with diverse agro-ecological regions characterised by significant variation in natural endowments such as soil, rainfall, and access to water" (Limpopo Department of Agriculture, 2015: 9). Limpopo accounts for a large amount of the Johannesburg Fresh Market (Limpopo Department of Agriculture, 2015: 13). Agriculture in the Sekhukhune District Municipality is made up of both commercial and subsistence farming. The Southern part of the District (Ephraim Mogale and Elias Motsoaledi Local Municipalities) specifically, contains one of the largest groups of commercial agricultural production in South Africa (2011/12-2015/16 IDP/BUDGET DOCUMENT). Groblersdal is situated in the Loskop Dam Irrigation Scheme is the second largest irrigation settlement in South Africa. In spite of being an important contributor to employment within the District, agriculture remains a relatively marginal contributor (approximately 9, 7%) to the aggregate GGP of the District. Farmers are currently facing numerous challenges such as, water scarcity, droughts, and pest invasions, which has harmed both commercial and subsistence farmer alike, however subsistence farming mainly in rural communities of the Sekhukhune district whom are dependent on dryland farming and practice less-intensive farming activities, and whom are largely focused on subsistence farming have suffered the more due to their lack of access to resources such as water irrigation systems and skills development programmes, which primarily exist for larger scale farmers.

4.2. Macro Analysis

4.2.1. Community

The chosen site will play an integral part in informing the architecture and program that will come of it. The R25 intersection is two kilometers outside Groblersdal, a progressive farming town set along the Olifants River in the Elias Motsoaledi Local Municipality, and east of Limpopo. The R-25 is one of two major connecting arteries that automatically create a crucial node for social and economic viability and diversified development in the area. The existing traders who have been bordering the edges of this interaction, some for over thirty years with 24 hour trade of fresh produce source from the local commercial farms within an average of twenty- five kilometre radius, whereas the traders themselves originated from rural subsistence farming communities (whom farmed predominantly indigenous grains and crops, such as *tepe, leshwabe, leroto, dinawa* and many other crops indigenous to the region) as far as two hundred kilometers outside of the town, this already raises a fundamental impediment in the spatial and socio-economic construct of the region.

This thesis aims place at the forefront the nutritional and sustainable value of indigenous crops and they are more advantageous to the region as they adapt naturally to its conditions such as soil, temperature and precipitation. By growing, processing as well as selling these good to an untapped market, these substance farmers will have an opportunity to take part in mainstream economy and adapt skills which had seen there agricultural traditions becoming obsolete.

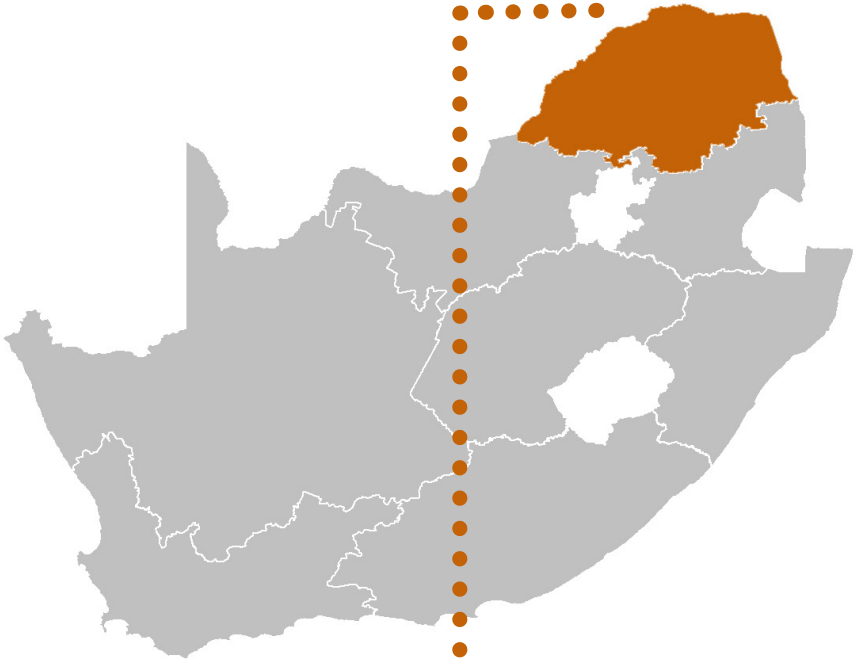


Figure 4.2.1 - South Africa

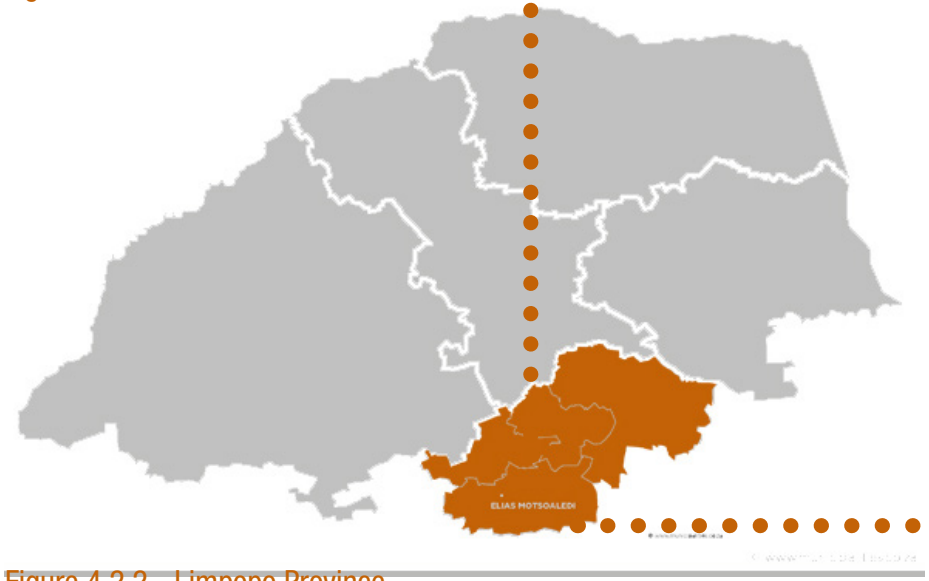


Figure 4.2.2 - Limpopo Province

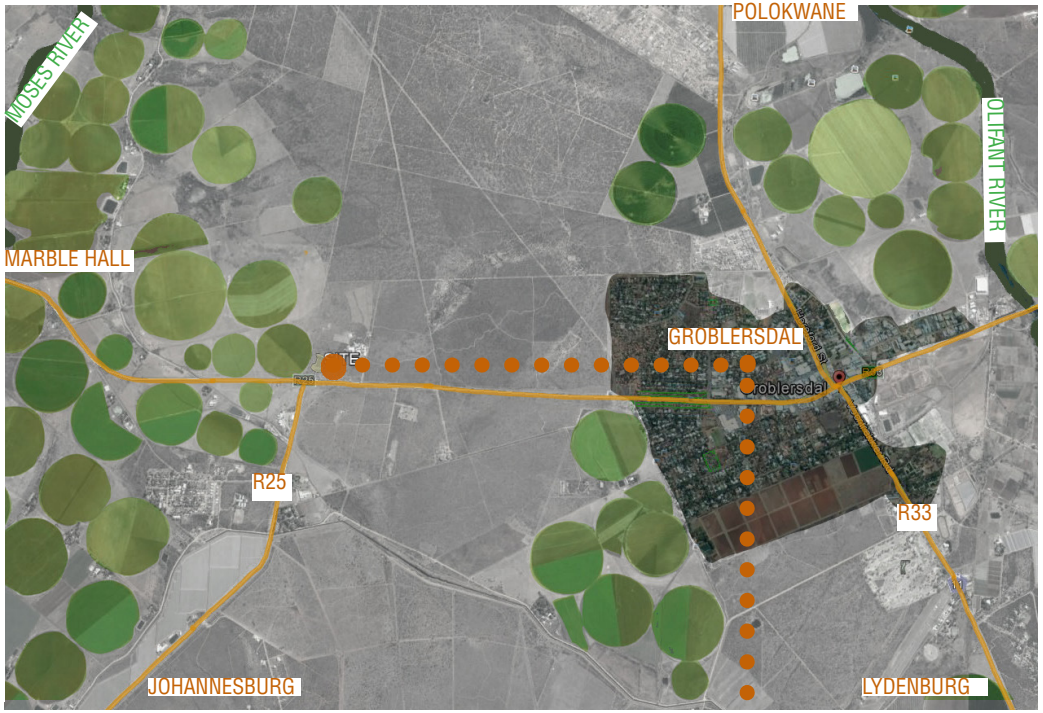
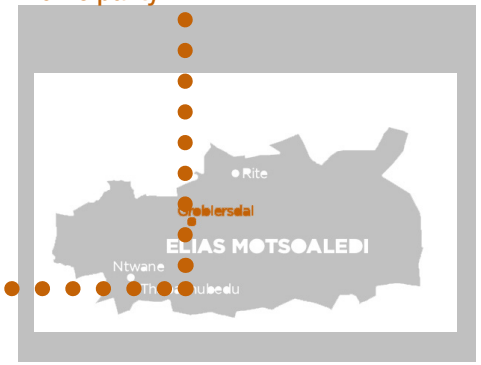


Figure 4.2.5 - Groblersdal town

Figure 4.2.3 - Sekhukhune District Municipality.

Figure 4.2. 4 - Elias Motsaledi Local Municipality.



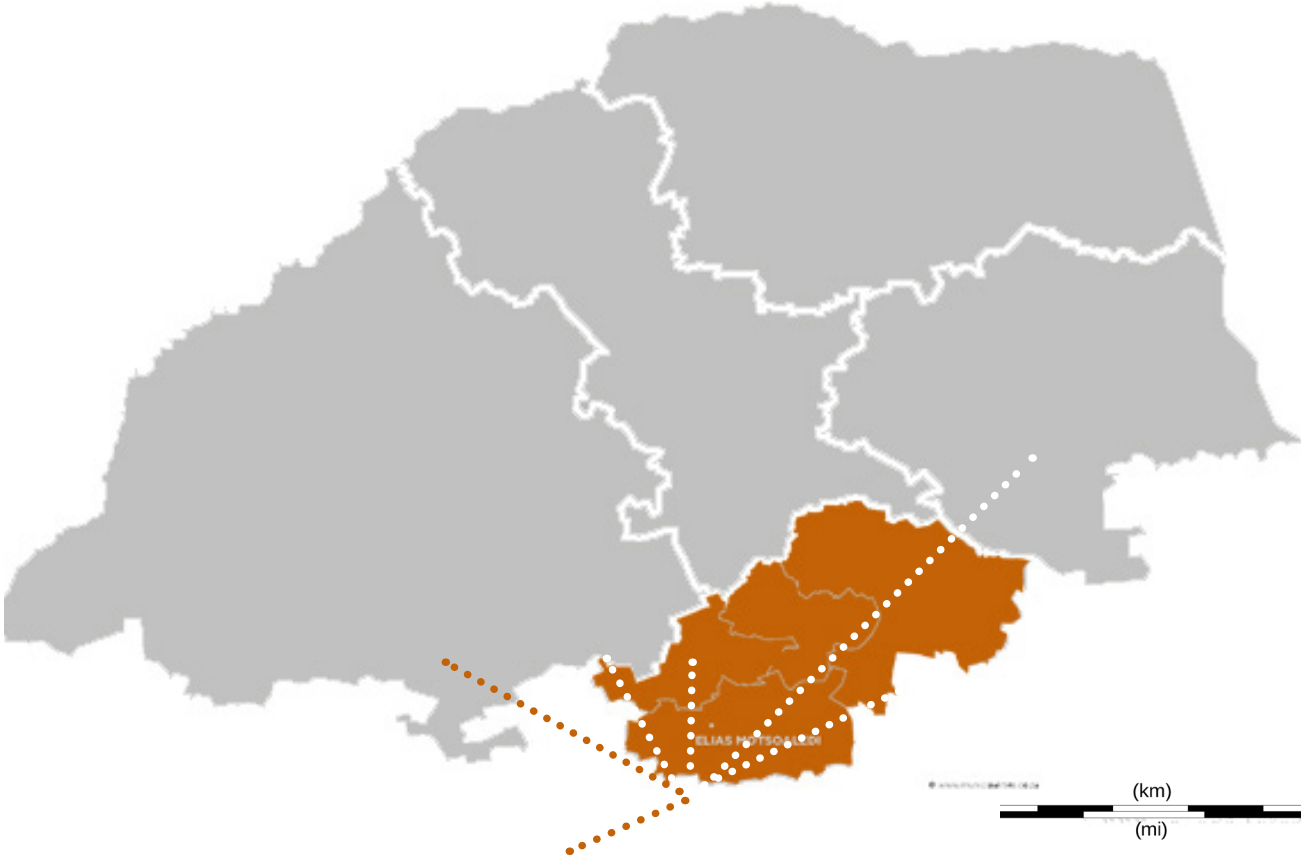


Figure 4.3 – Distance of SITE in relation to origins of VENDORS.

Figures 4.4 -4.6 – Images of the chose SITE.

Figures 4.7 -4.9 – Images of the chose SITE.

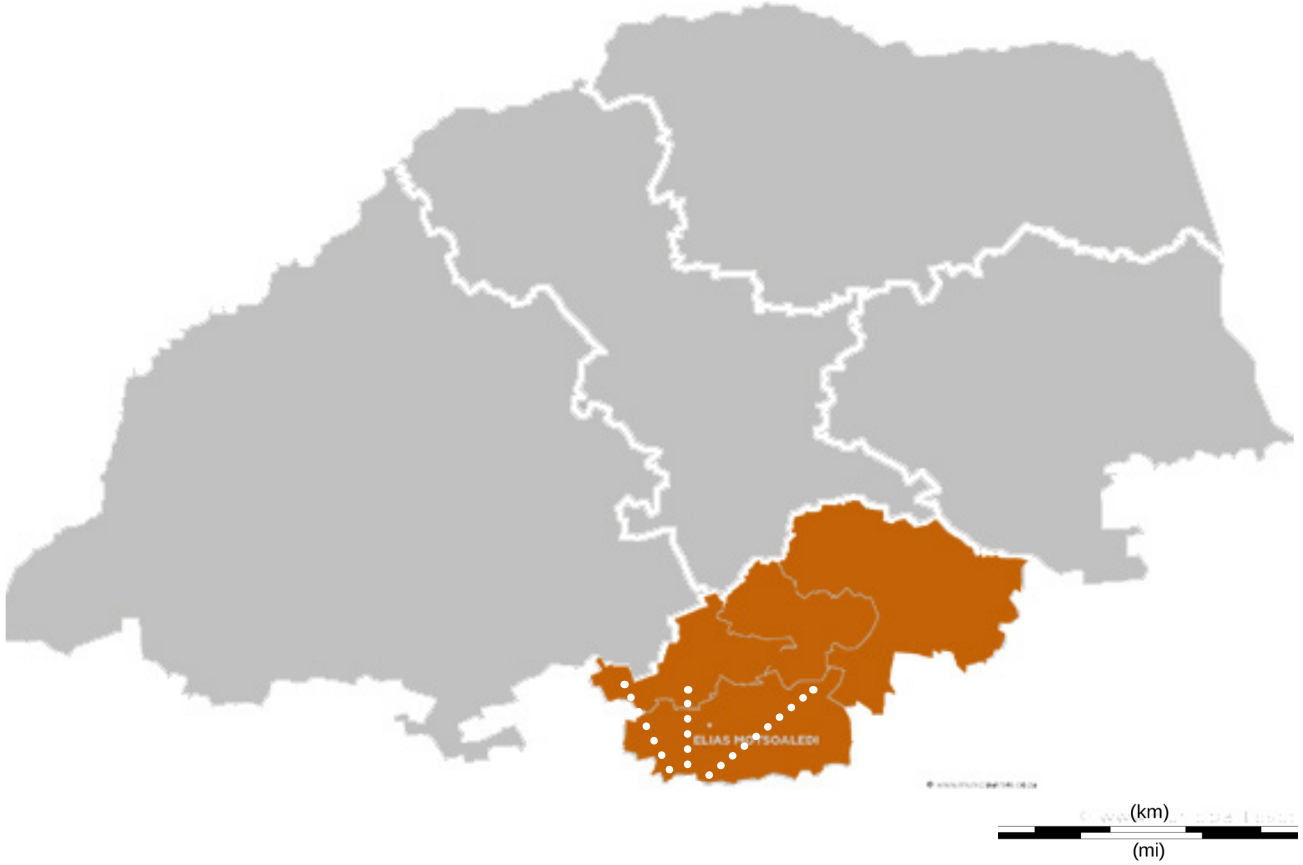


Figure 4.10 – Distance of SITE in relation to FARMS produce was stocked at.

Figures 4.11 -4.13 – Images surrounding the chose SITE.

4.2.2. Connectivity

The site is situated at a T-junction of the R25, connecting Marble Hall and Groblersdal on the east – west axis and Mpumalanga province to Gauteng on the north-south axis and the N11 Freeway connects Marble Hall and Groblersdal with Mookgopong and the N2 Freeway in the North-West direction, connects to the Waterberg and Polokwane districts (Limpopo Department of Agriculture, 2015). Towards the south, the N11 connects Marble Hall and Groblersdal with Middleburg, which is situated along the major N4 Maputo Corridor, hence these roads constitute as part of the main freight and logistics corridors connecting the District's economic activity areas to prominent national & provincial nodes and economic activity areas falling outside of the District *(Limpopo Department of Agriculture, 2015)*.

The research report proposes to provide a platform for all stakeholders to be able to engage in the exchange of knowledge, and support the surrounding rural communities, whom depend on natural resources to sustain themselves and experience any negative consequences more such as drought and water scarcity. Although the site is not located in close proximity to these rural communities, it is well connected to transportation nodes and economic activity which if adequate facilities are provided, community members travel to the facility and reside for set periods of time to utilise, learn & impart knowledge, in order to take part and assist them to empower their communities and the economic and environmental upliftment of the region.

4.2.3 Sustainability

Within the Sekhukhune Spatial Development Framework (SDF) there is a Local Economic Development (LED) Strategy 2011-2016 in which projects are proposed for development along main routes. The vision of this framework includes (*Sekhukhune District Municipality, 2012: 56)*:

- "To utilized the natural environmental and cultural historic features in the District as anchors from which to promote ecotourism and conservation.
- To promote commercial farming and food production along the Olifants River and Steelpoort River drainage systems in the District.
- To facilitate small scale and subsistence farming activities throughout the remainder part of the municipal area.
- To promote industrial/commercial development in the District with specific emphasis on Agri-processing in the agricultural belt (Groblersdal), and mining/ore-processing in the mining belt and agricultural belt to one another, and to the other markets of Gauteng Province along the Moloto Corridor." *(Sekhukhune District Municipality, 2012: 56)*

This research report aims to arrive at a re-mastered self-sustaining hybrid precinct that will become the catalyst in the process of linking underutilized rural conventions with thriving commercial industry and therefore, the site is located strategically within an agriculture development centr that would support and sustain the vision that the facility proposes.

4.2.4. Accessibility

Because the chosen site is an already established node on a high trafficked main route, to maximise the use of the facility and ensure that there is a wide range of in crop diversity knowledge, reaching a larger number of people, the site must be permeable and visually connected to the main route as possible. Furthermore to ensure that the facility becomes the interface between the various user groups, it is necessary for it to be easily accessible by foot and vehicle for all the identified

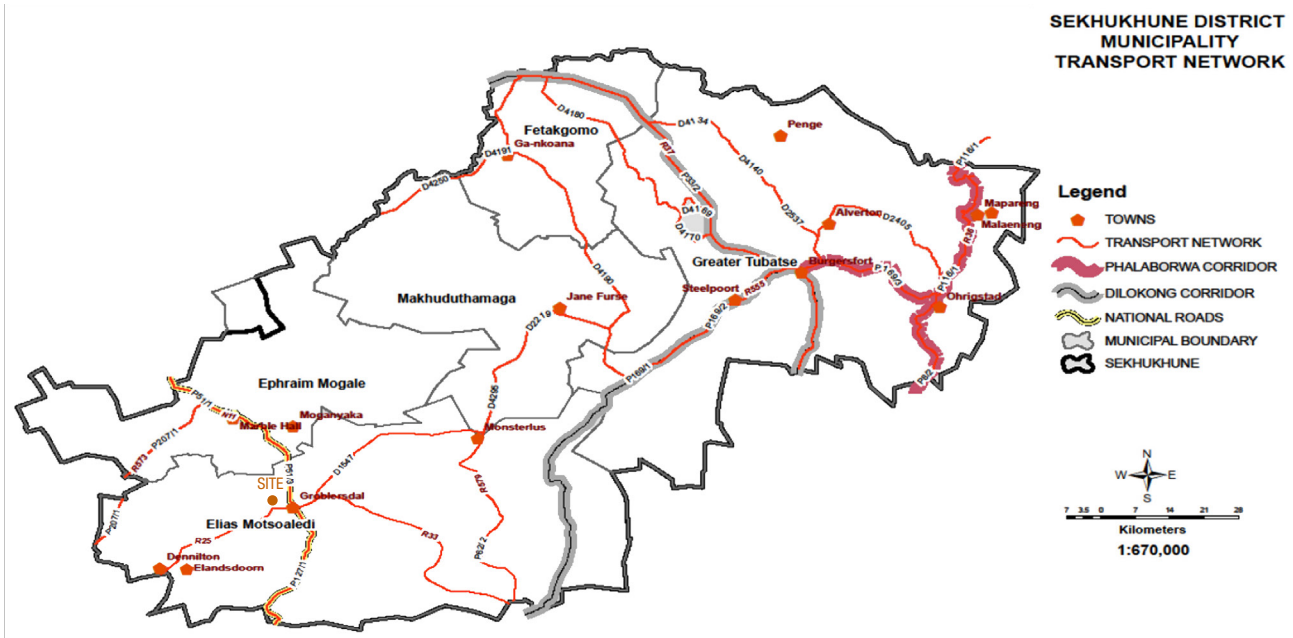


Figure 4.14. Connectivity - District Transport Network (*Sekhukhune SDF 2011-2016*).

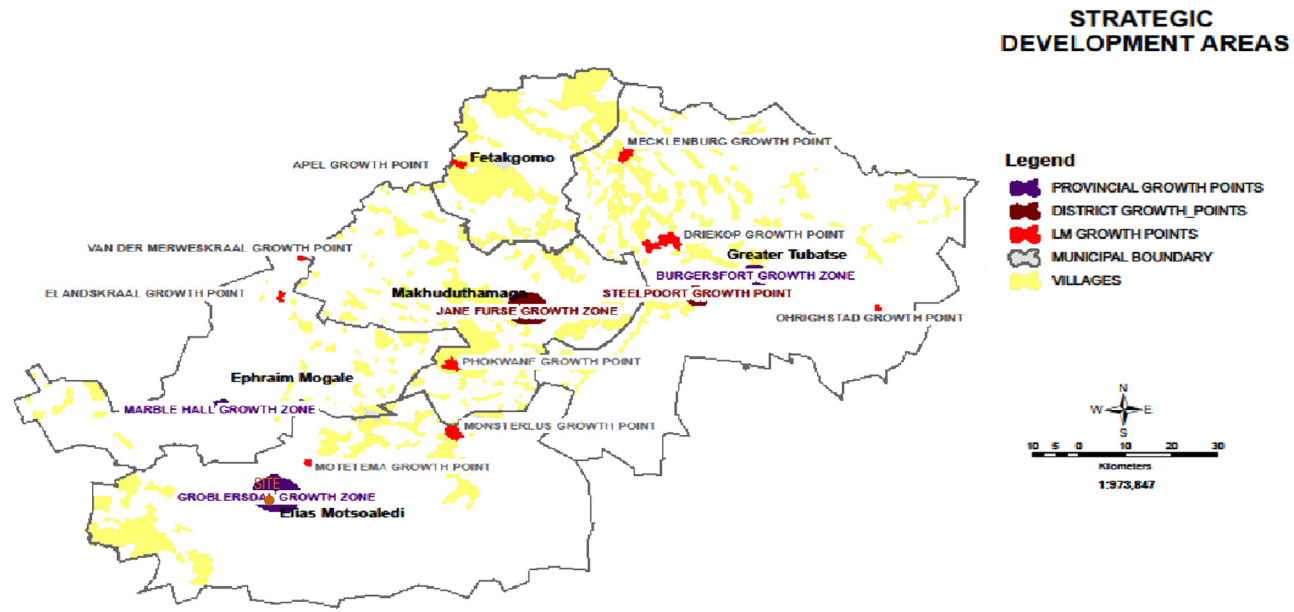


Figure 4.15. Sustainability - District Rural Area Diagram (*Sekhukhune SDF 2011-2016*).

Figures 4.16 -4.18 – Images surrounding the chose SITE.

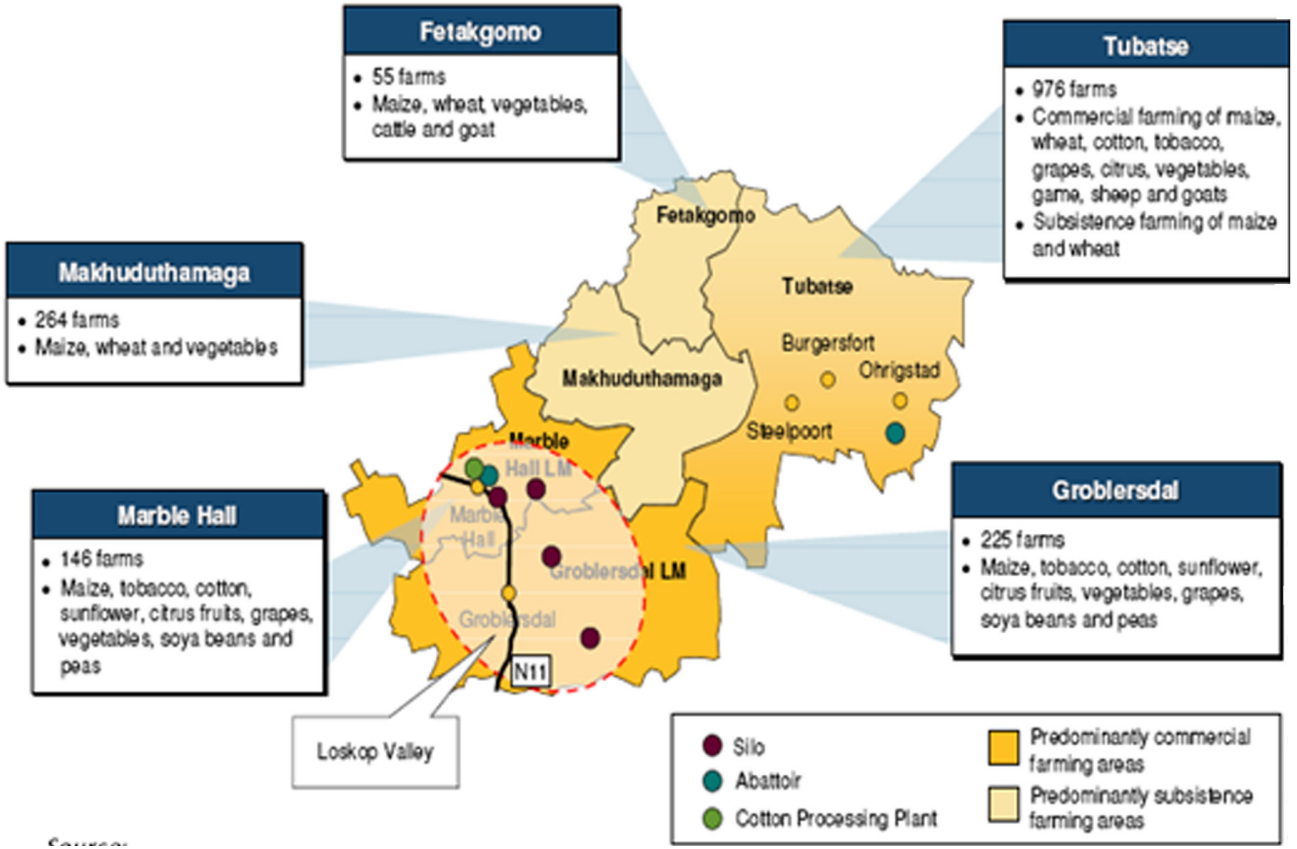


Figure 4.22. Landuse - Agricultural land Diagram (*Sekhukhune SDF 2011-2016*).

Figures 4.19 -4.21 – Images surrounding the chose SITE.

potential users from as nearby urban area.

4.3 Micro Analysis

4.3.1. Typology & Hydrology

Groblersdal is located within the Loskop Valley. Loskop dam, which is located south of the town, serves the commercial agriculture irrigation schemes along the valley. In addition of the Loskop scheme, there are 5 smaller irrigation schemes, which the closest to the proposed site is the Moosrivier scheme and is mostly utilised by the neighbouring commercial farms adjacent to the site.

Groblersdal is found within the Loskop Valley. The commercial agricultural irrigation schemes in this valley are serviced by the Loskop Dam. In addition of the Loskop scheme, there are 5 smaller schemes within the Loskop agricultural area, which closest to the chosen site is the Moosrivier scheme and is mostly utilised by the neighbouring commercial farms adjacent to the site. The closest feeding point is the higher than the site.

4.3.2. Land use

The site neatly situated between two opposing geometries, one being the orthogonal urban fabric of the town of Groblersdal and the other being the rural circular patterning of the commercial farming belt along the irrigation schemes. The site becomes the meditator of the two contexts and overlays these contrasting geometries ton the more organic traditional network of footpaths, water courses and terraced countours.

4.3.3. Movement

The site acts as a pathway for pedestrians connecting to the adjacent private school on the north east edge of the site as well as neighbouring farms on the north end of the site. The R25 route is the main access and connecting road to the site on the south periphery.

Figures 4.23 -4.25 – Images surrounding the chose SITE.

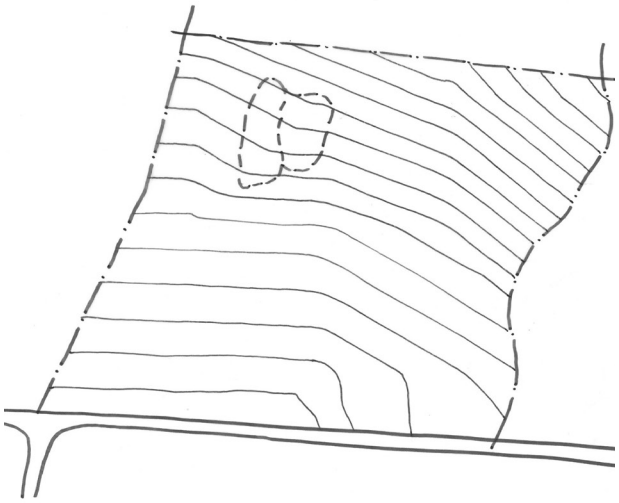


Figure 4.26. Existing site CONTOURS.

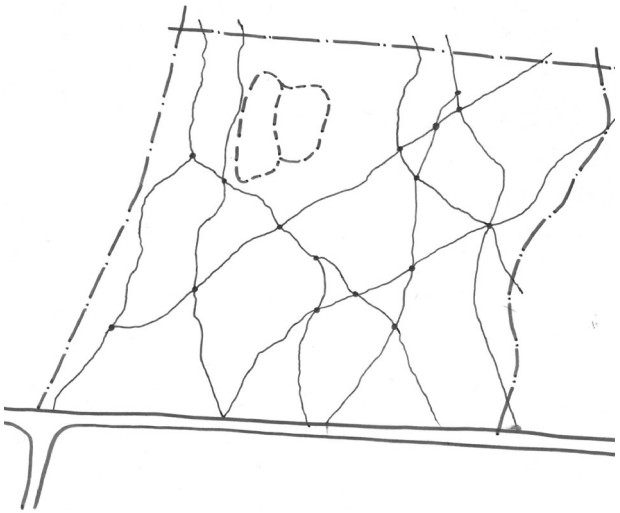


Figure 4.27. Mapping the FOOTPATHS.

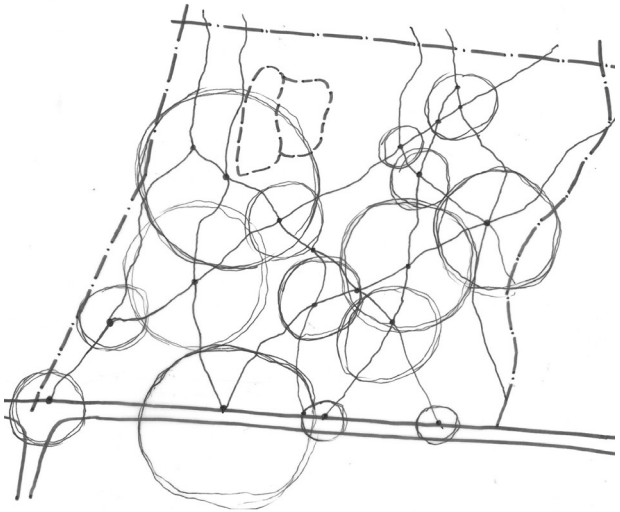


Figure 4.28. NODES created by the crossing of paths.

Figure 4.29 - 4.32. Conditions of Site.

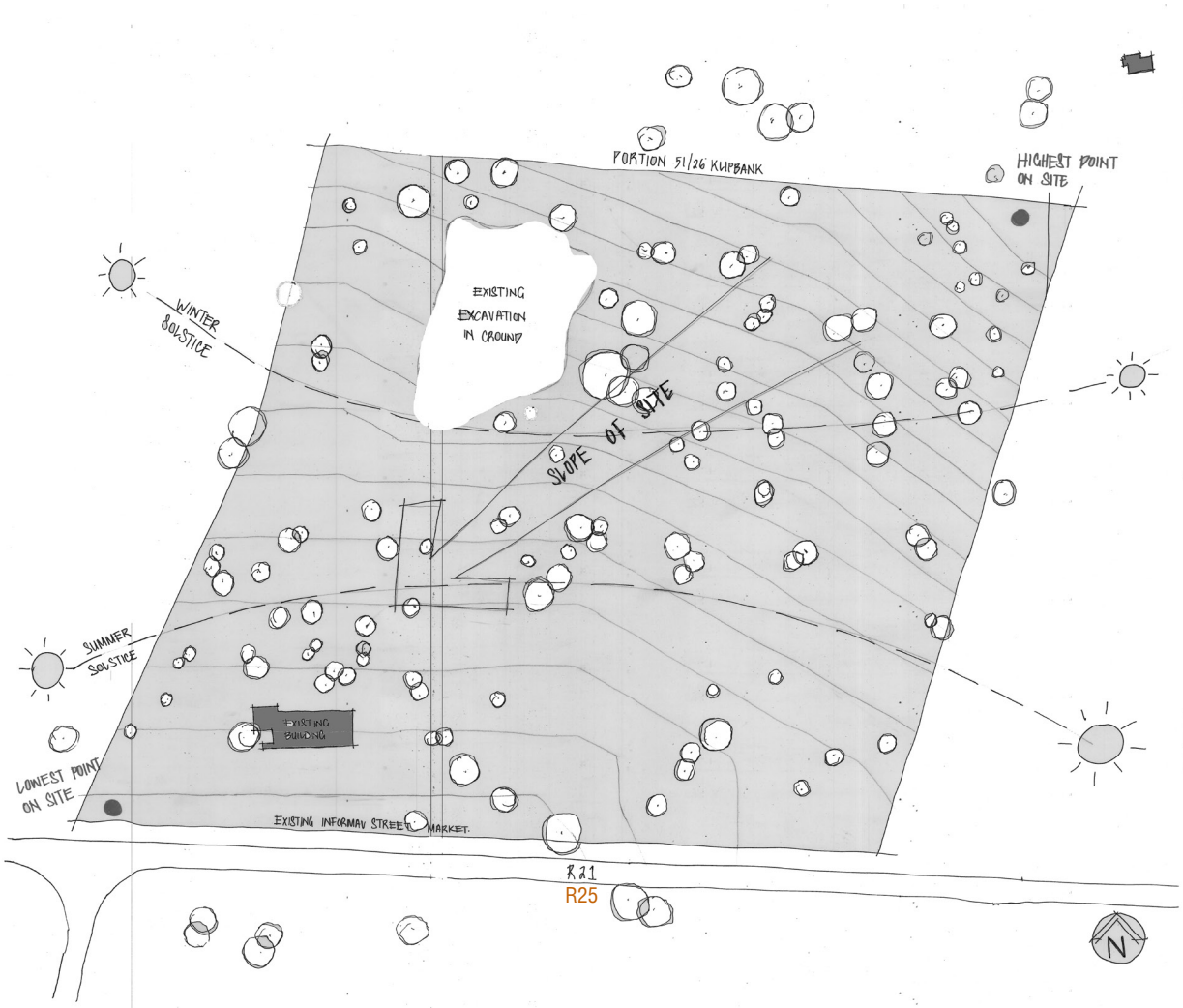


Figure 4.33. Geographic Study.

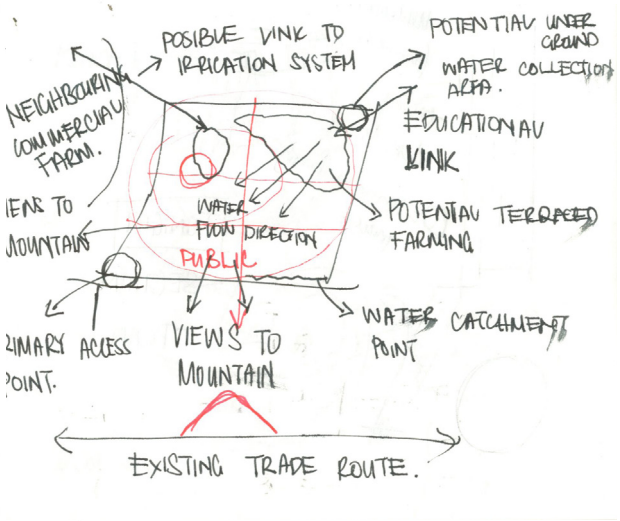


Figure 4.34. Site connection to surounding context.

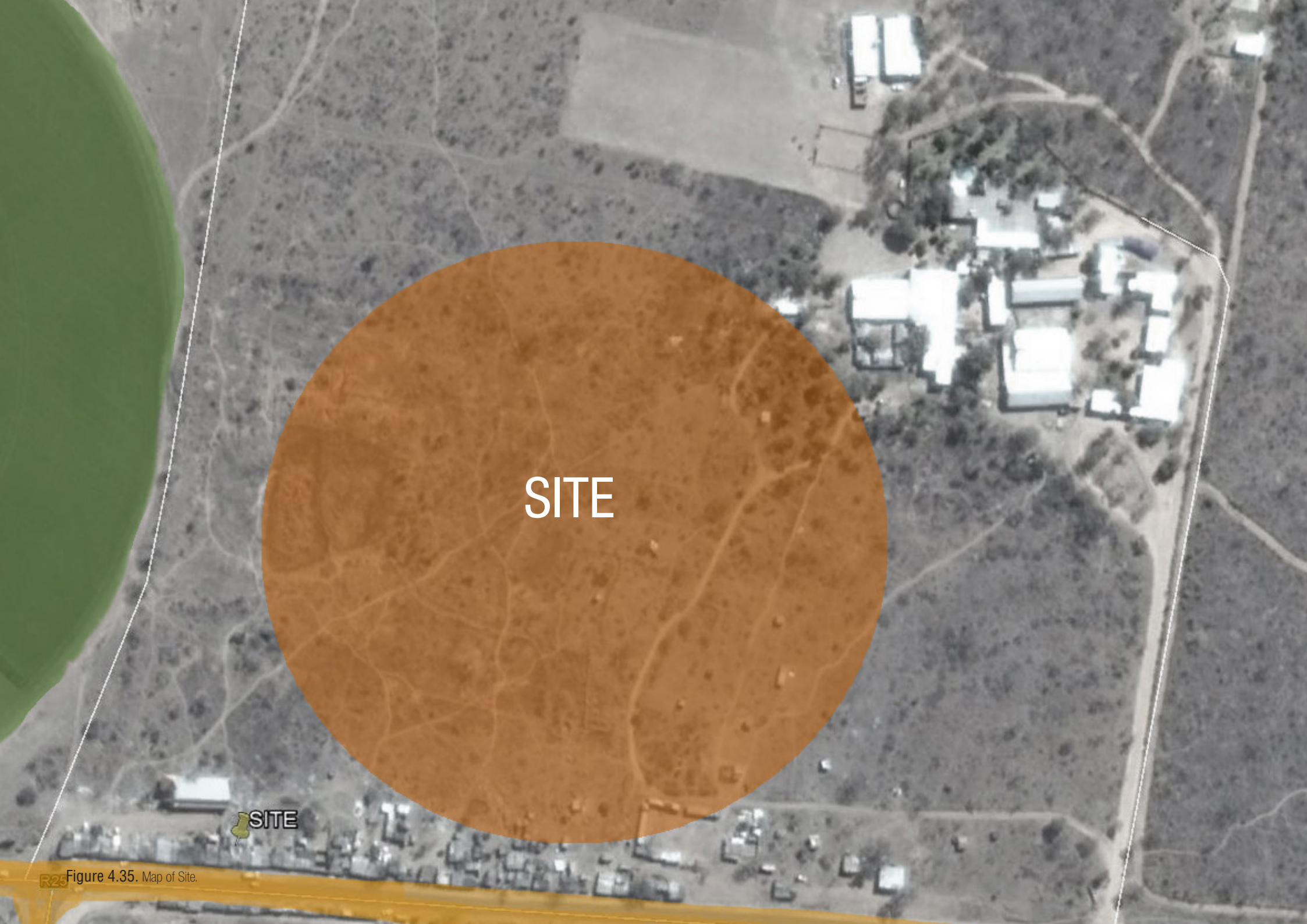


Figure 4.35. Map of Site.

05 DESIGN BRIEF

Indigenous crops require minimum production input; people are accustomed to them and know how to cultivate and prepare them. African leafy vegetables grow quickly and can be harvested within a short period of time. They grow on soils of limited fertility; provide good ground cover; are relatively drought tolerant; and are often cultivated without pesticides or fertilisers *(Shiundu, 2002: 364)*. Campaigns promoting these vegetables should focus on the younger generation, as they have less knowledge regarding wild green leafy vegetables *(Modi et al., 2006:45)*.

This design brief aims to address the issues of a declining practice of traditional ways of farming in rural communities. The Agro- Pod agricultural precinct aims to create a ethos of knowledge exchange, introduce cultivation, processing and trading of traditional African crops and heritage, as well as open a new market of fish harvesting. The main inhabitants of this precinct would be rural women whom will be responsible for cultivation in the community. The facility would be maintained and managed by joint participation of the local Department of Agriculture; the Agriculture Research Council of South Africa and an NGO representing rural communities.

Figure 5.1. The aim is to up-skill subsistence farmers to produce a surplus which the can therefore selling for an income.

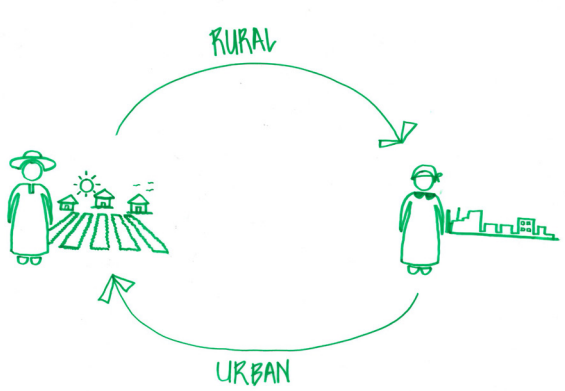


Figure 5.2. Interconnected Process

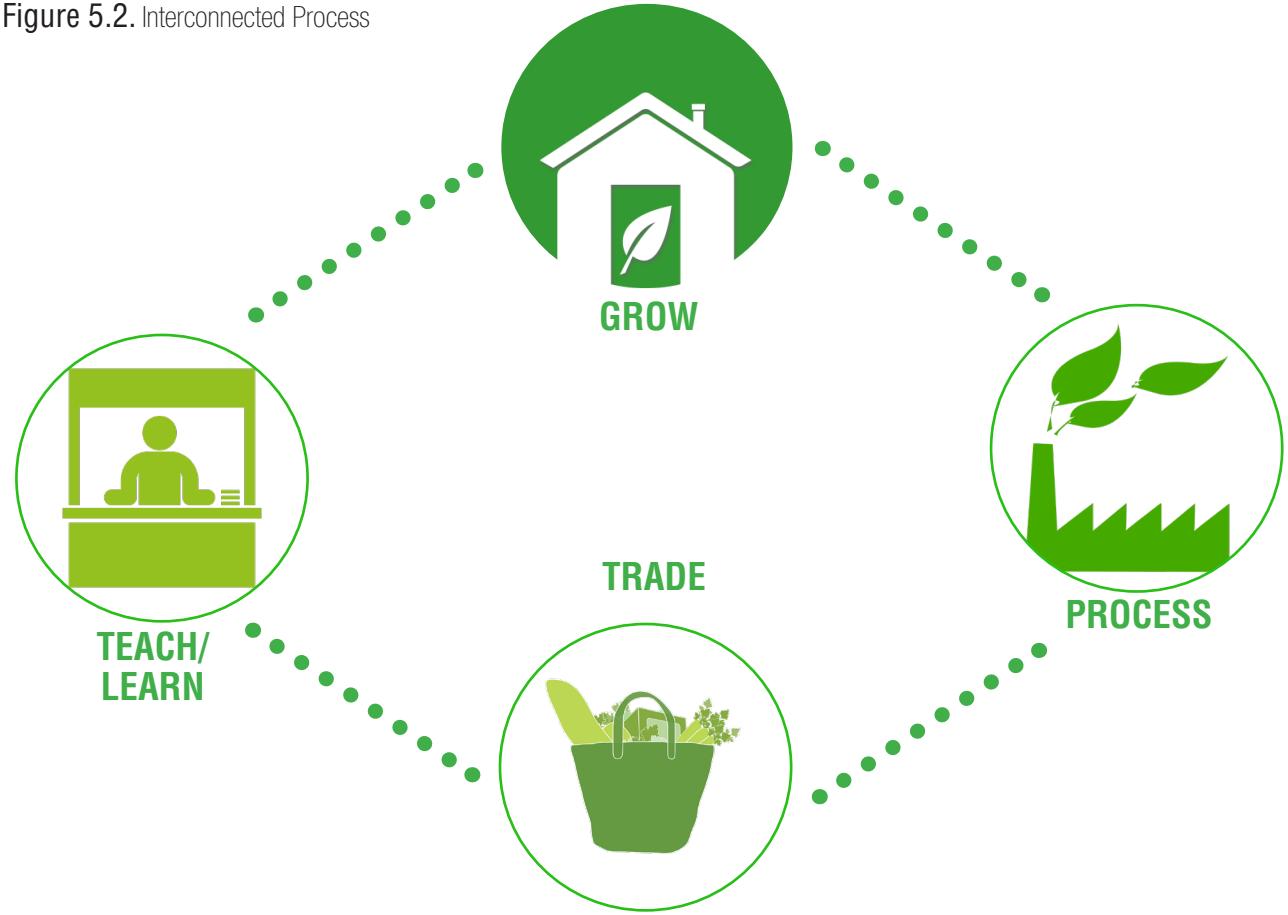
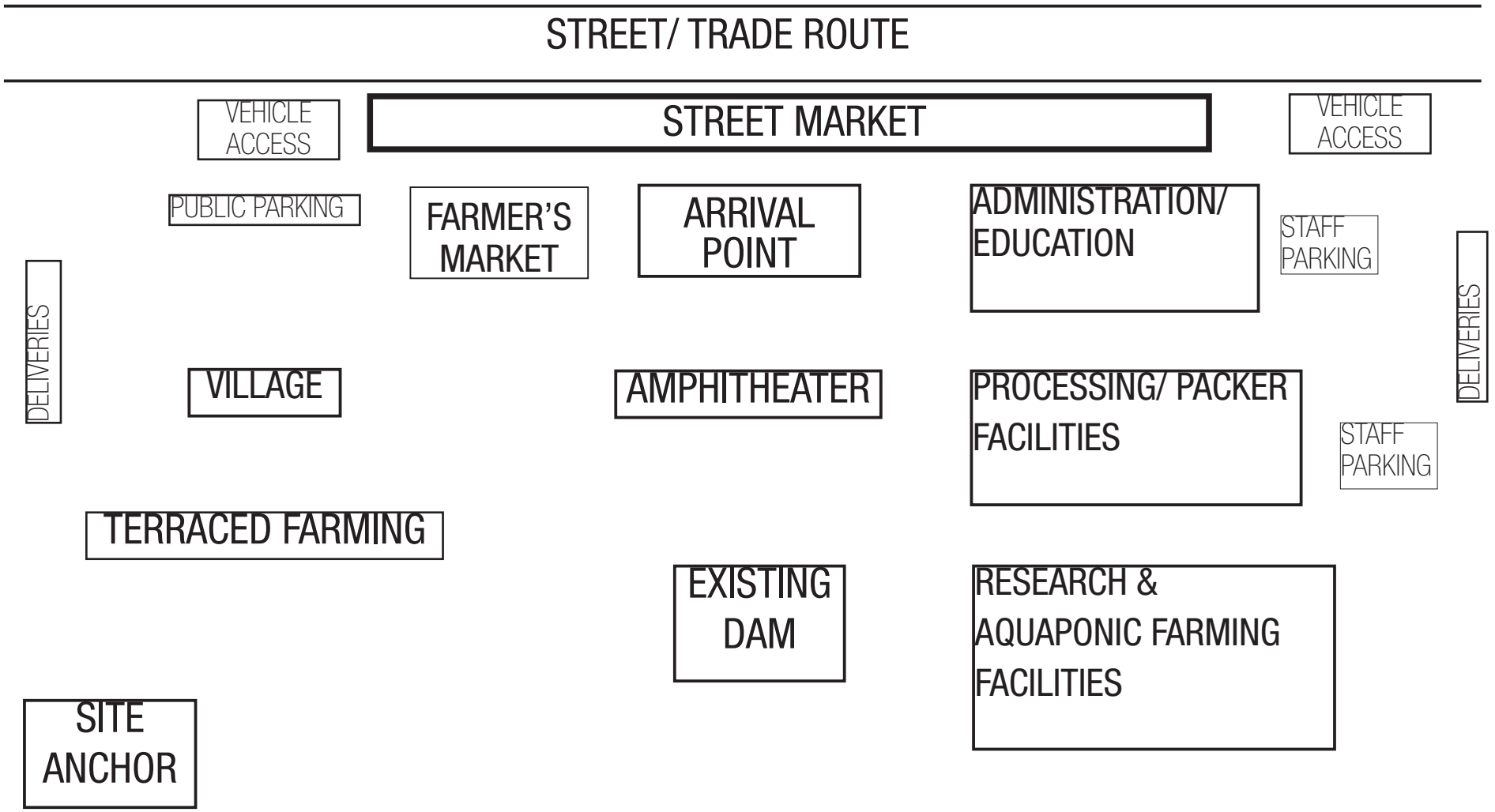
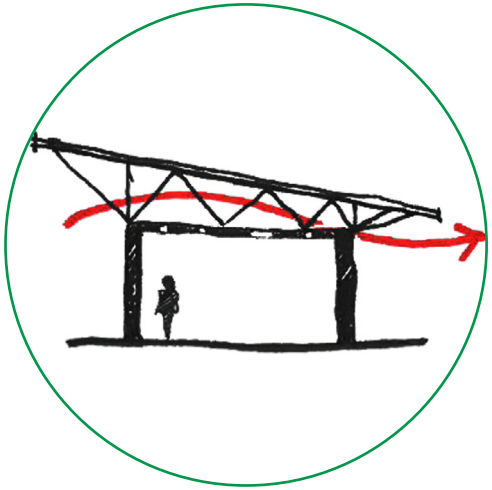


Figure 5.3. Program Organogram.

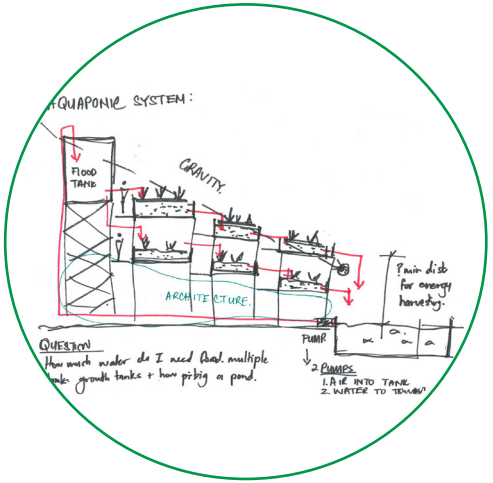




ARCHITECTURE

The intention is to use low tech architectural systems and employ the use of participatory design processes by employing local labour, materials and construction methods to enable the end uses to maintain the premise at low costs and by not compromising the architectural esthetics's in the process.

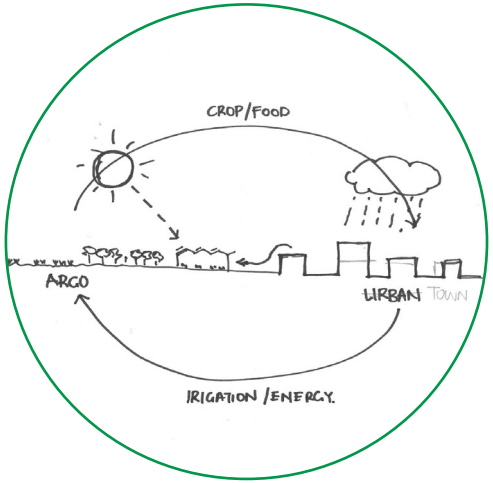
The use of sustainable design methods and techniques will result in low energy consumption. The collection and storage of rainwater will assist irrigating the crops, hence reducing water consumption costs.



AGRICULTURE

By employing traditional farming techniques such as terraced farming, the design intends to utilise the existing slope conditions of the site, hence preventing wastage of water runoff & soil erosion. Permaculture techniques will also be used by planting crops that share soil nutrients adjacent to each other to prevent damaging of the soil.

The design will employ a water collection, storage & irrigation system that will recycles and re-use water.



RURAL DESIGN STRATEGY

The design intends to create a full sustainable cycle by harvesting the town's grey- water for dual irrigation together with partnering with the neighboring farm to tap into their existing irrigation channel source from the nearby Mooi River irrigation scheme.

The design also intends to use the existing information, transportation and trade network in the municipality to commence the knowledge, produce & product trading system that will penetrate both rural and urban markets.

Programme

AGRICULTURE	NUMBER OF PEOPLE	AREA (m^2)
CONVENTIONAL FARMING SPACE	-	varies
EXPERIMENTAL AGRICULTURAL FACILITIES	-	850

[AGRO] PROCESSING		
FOOD PROCESSING FACILITIES	50	500
PACKER FACILITIES	30	350
STAFF OFFICES & FACILITIES	15	150

[AGRO] EDUCATION		
RESEARCH LABORATORIES	10	600
LIBRARY OF TRADITIONAL KNOWLEDGE	30	250
SKILLS TRAINING SEMINAR ROOMS	50	150
VISITORS CENTER	-	100
OPEN EXHIBITION SPACE/ AMPHITHEATER	-	500
ADMINISTRATION OFFICES	10	250

[AGRO] LIVING		
TEMPORARY ACCOMMODATION FACILITIES	200	2500

[AGRO] NOMICS		
STREET MARKET EDGE	50	500
OPEN FARMERS MARKET SPACE	25	200
RESTAURANT	100	150
BOOKSTORE	-	50

MARKET STALL

ROAD

FARMERS MARKET/ RESTAURANT

EXHIBITION SPACE

CROPS PROCESSING PLANT

EXPERIMENTAL FARMING

CONVENTIONAL FARMING

06 DESIGN DEVELOPEMENT

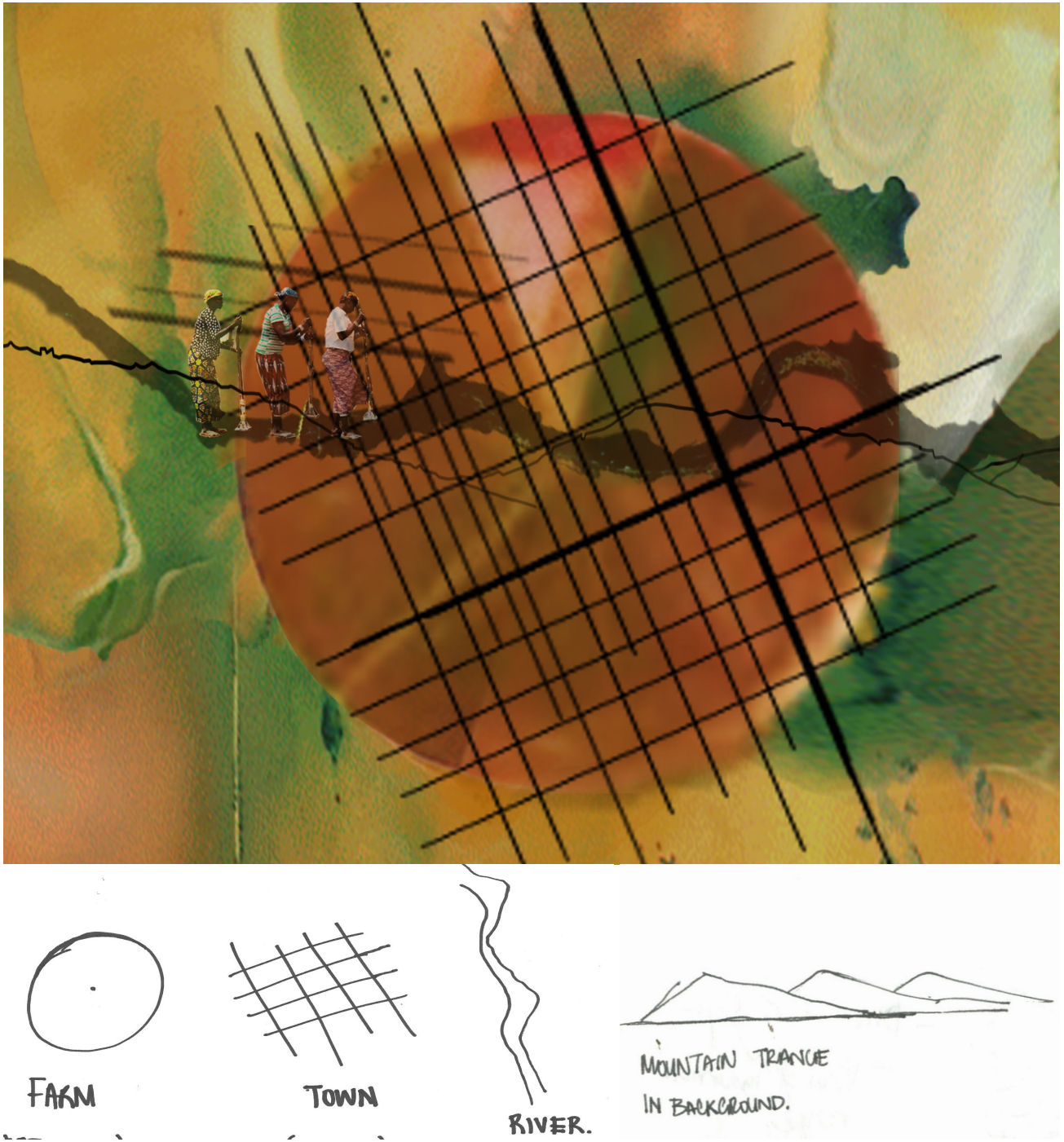
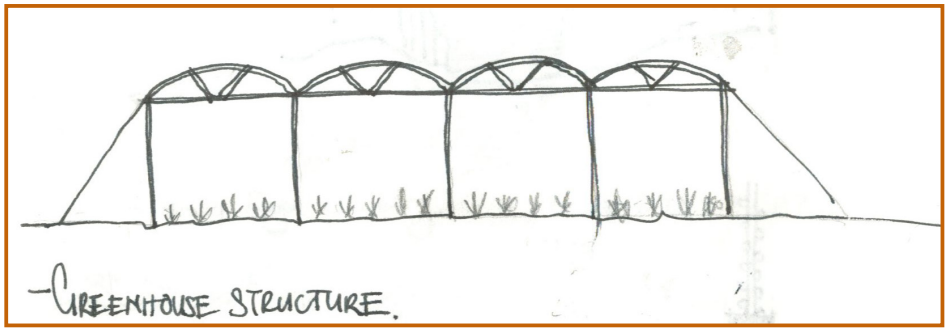
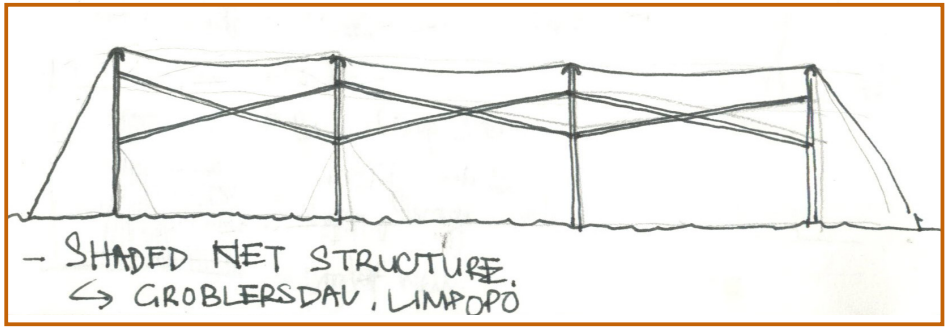
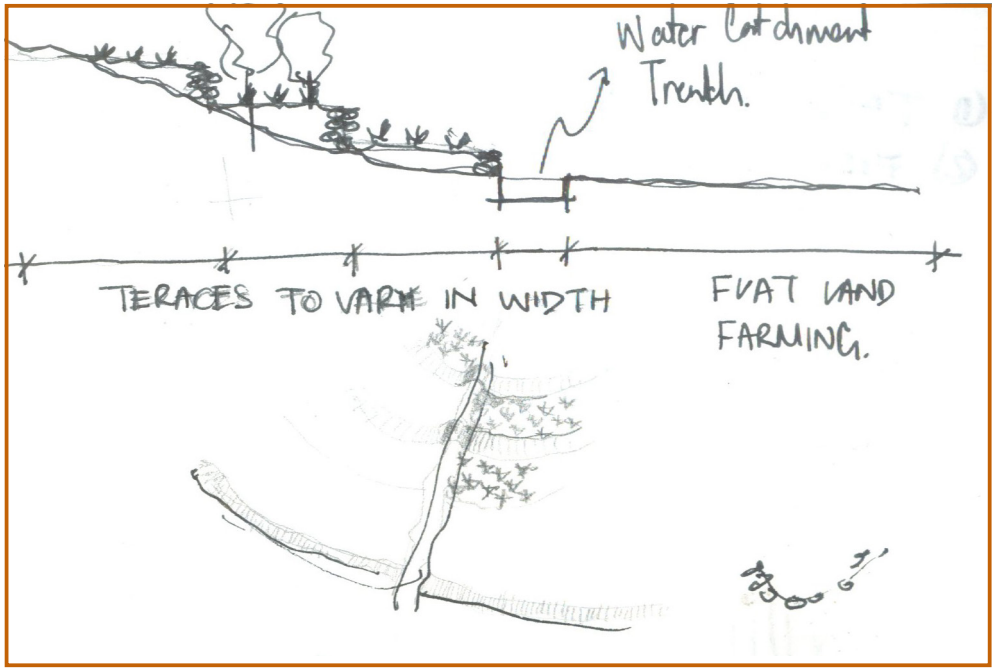
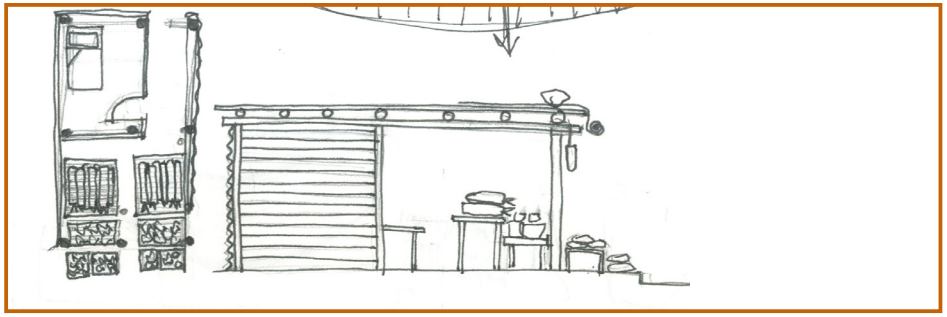


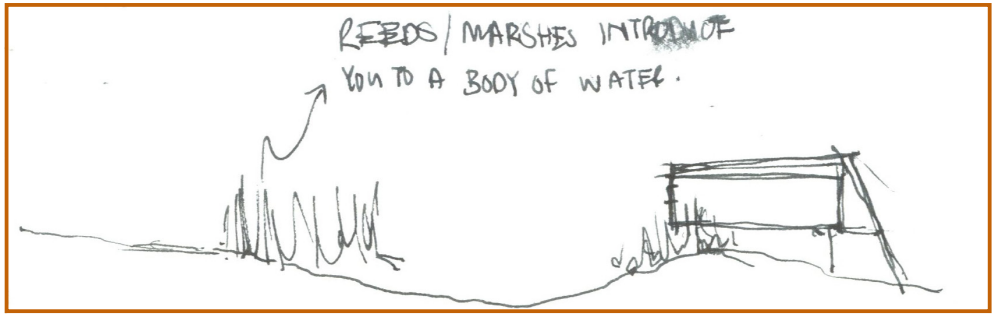
Figure 6.6. The Underling framework is informed mainly by the conditions of the context, both organic and rectilinear. The farming crop circles seen on area photographs, but hardly experience on ground due to their scale. The towns rigid grid, the organic flow of the rivers, and the mountains that border the site on the south - east end are the main informants that brought about my concept. Also on the immediate site, the height of the trees, slope of site and footpaths played an intricate role in the design process.

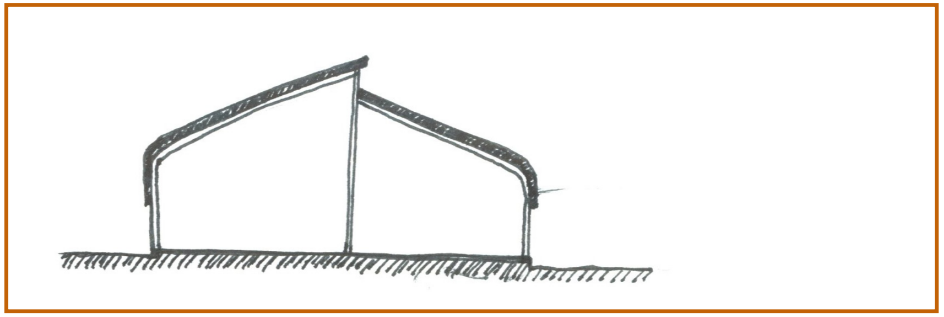


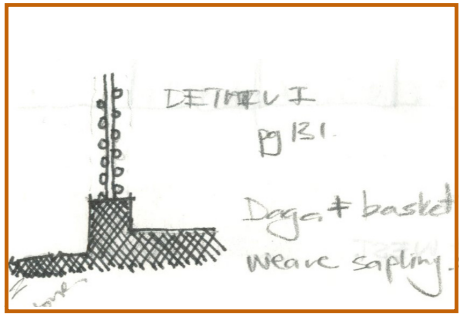












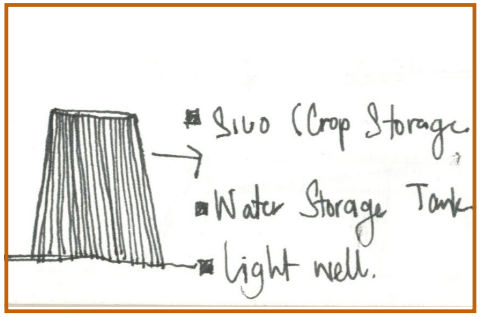


Figure 6.2. Typology Study.

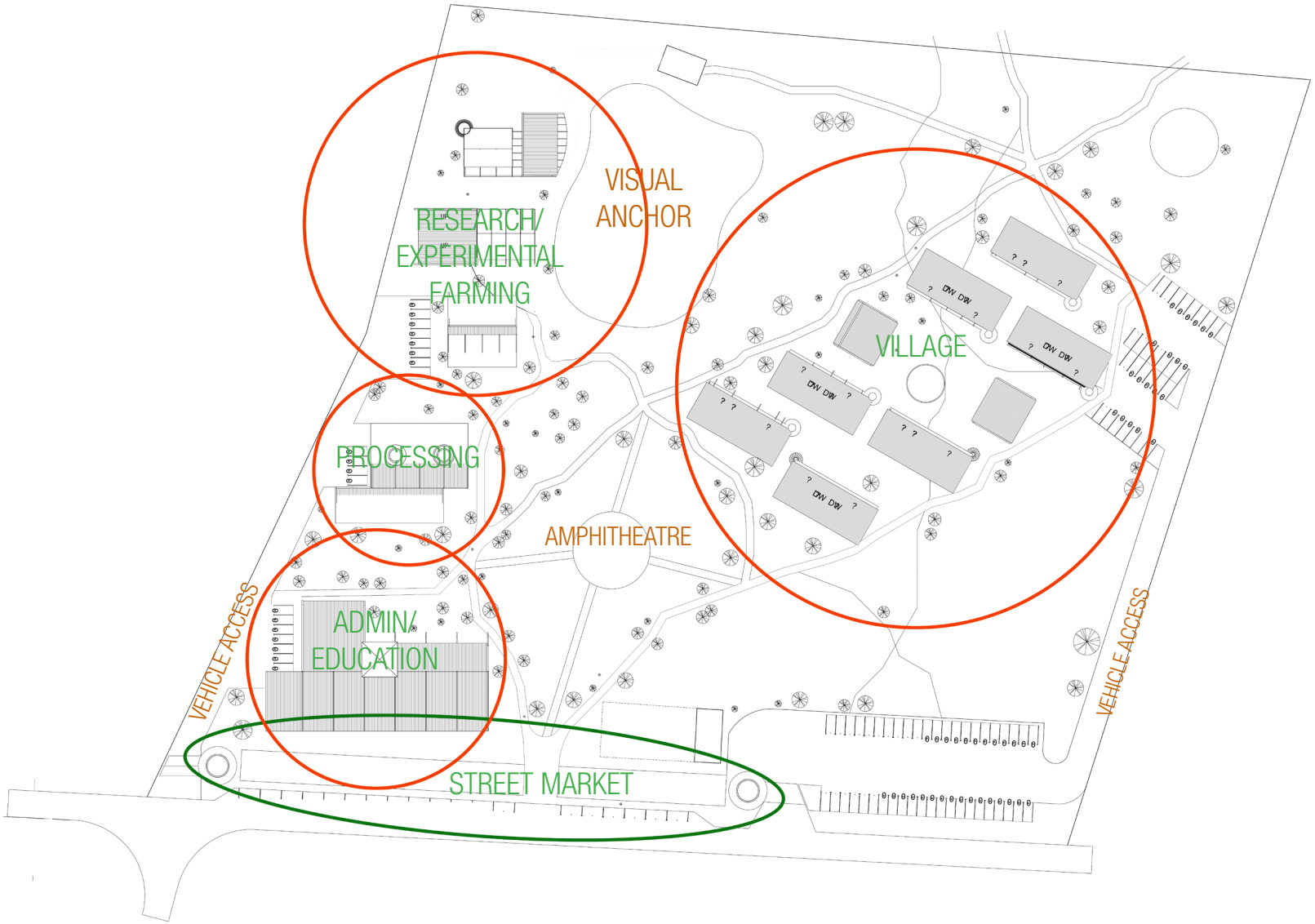
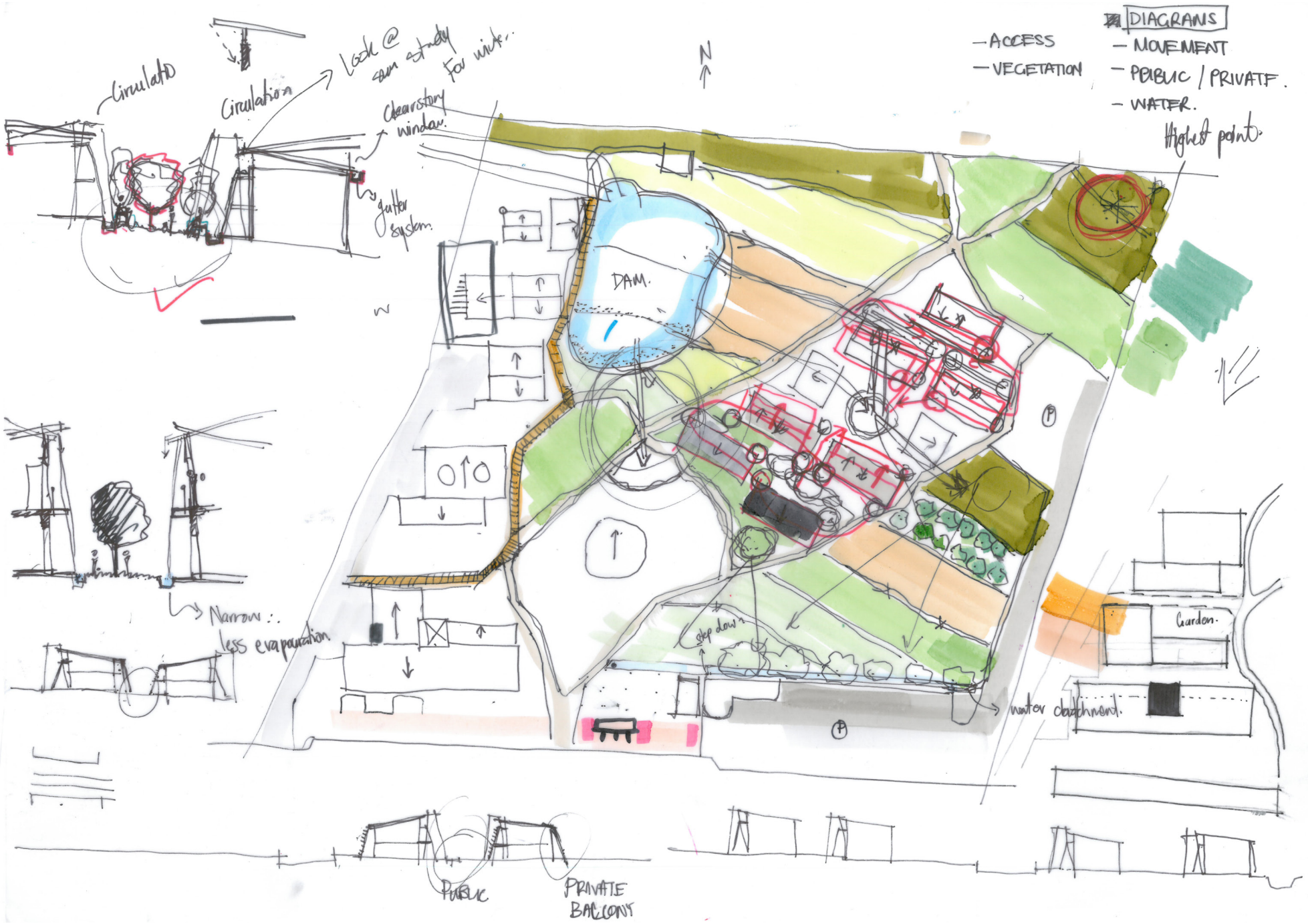
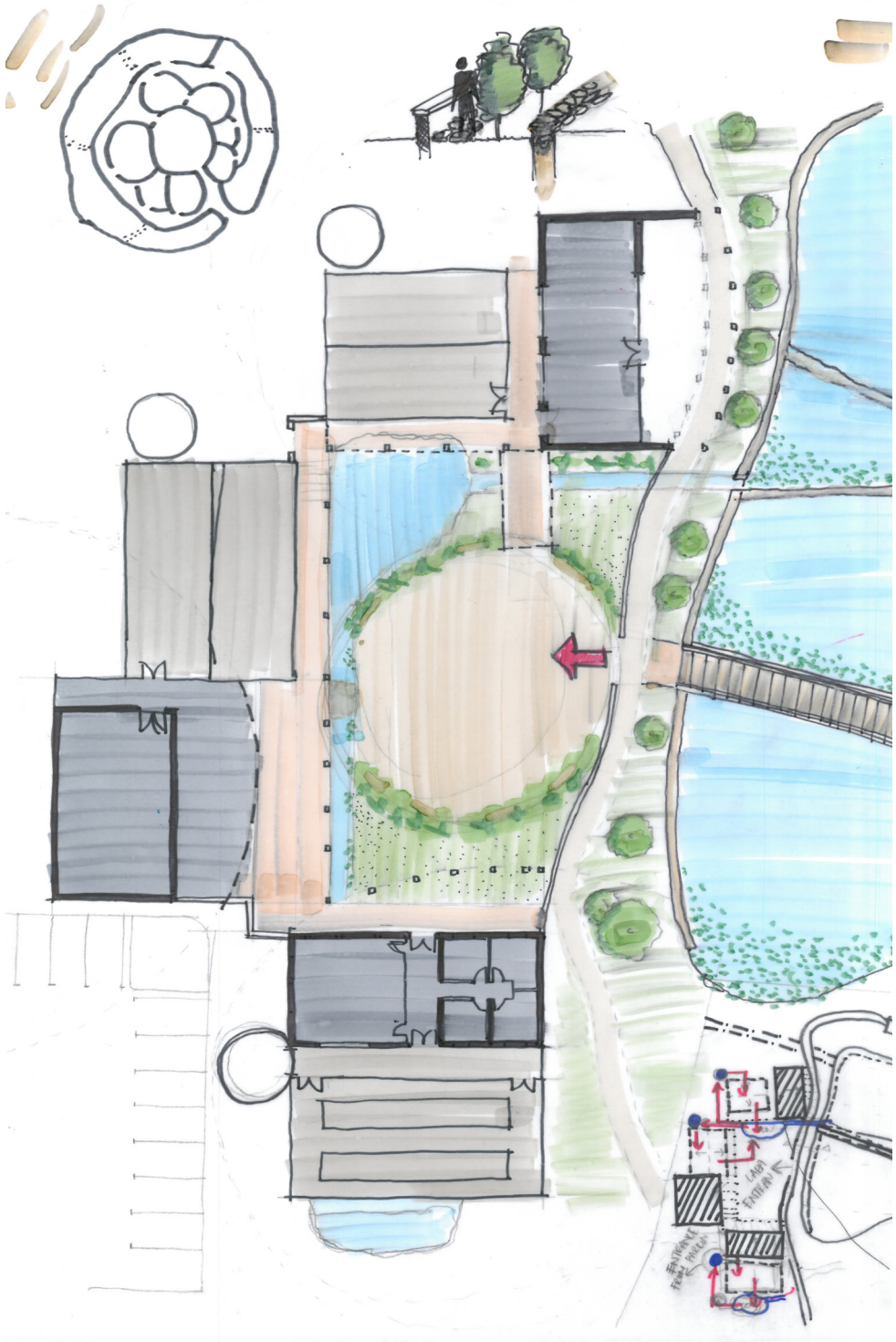
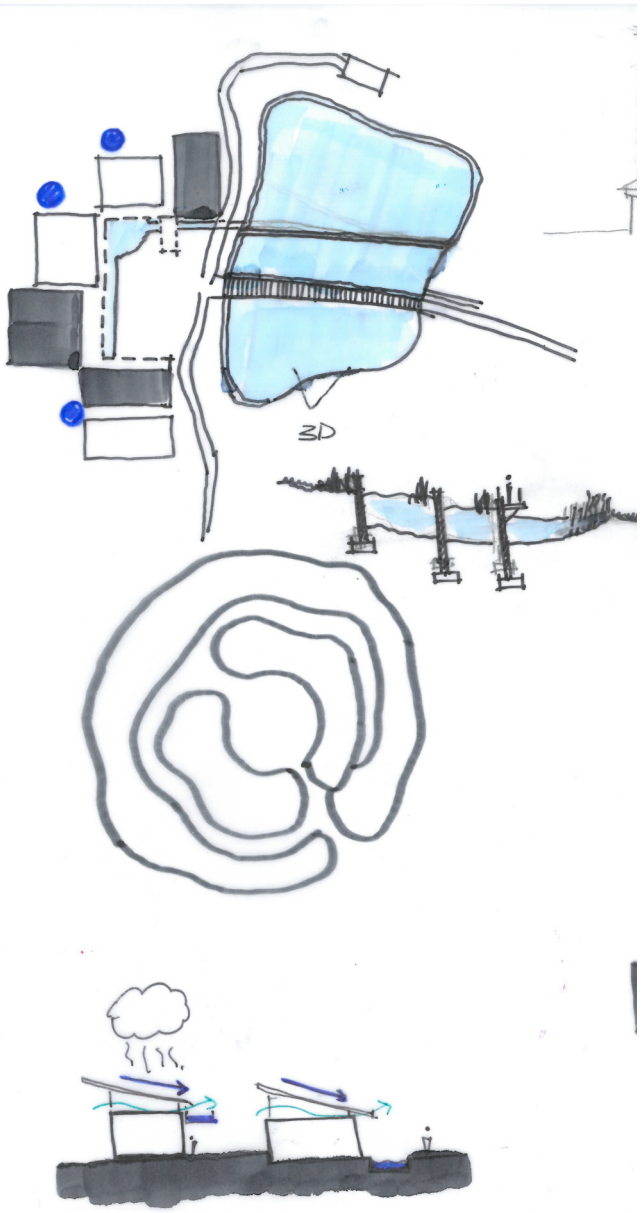


Figure 6.3. Access to Site.

Figure 6.4. Public/ Private .

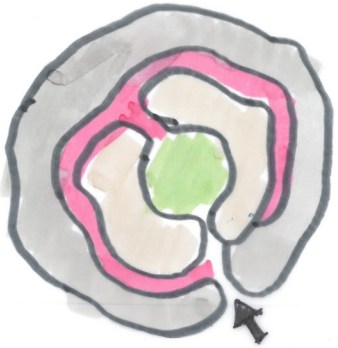

DIAGRAMS
– ACCESS
– VEGETATION
– MOVEMENT
– PUBLIC / PRIVATE.
– WATER.
N
Circulation
Look @ sun study for winter.
Clearstory window.
gutter system.
Highest point.
DAM.
Narrow :. less evaporation
step down
Garden.
water catchment.
PUBLIC
PRIVATE BALCONY




3D

↳ HARD ~~EDGE~~ with SOFT EDGES CENTRE

↳ GREEN EDGES WITH OPEN SQUARE FOR CEREMONIES.

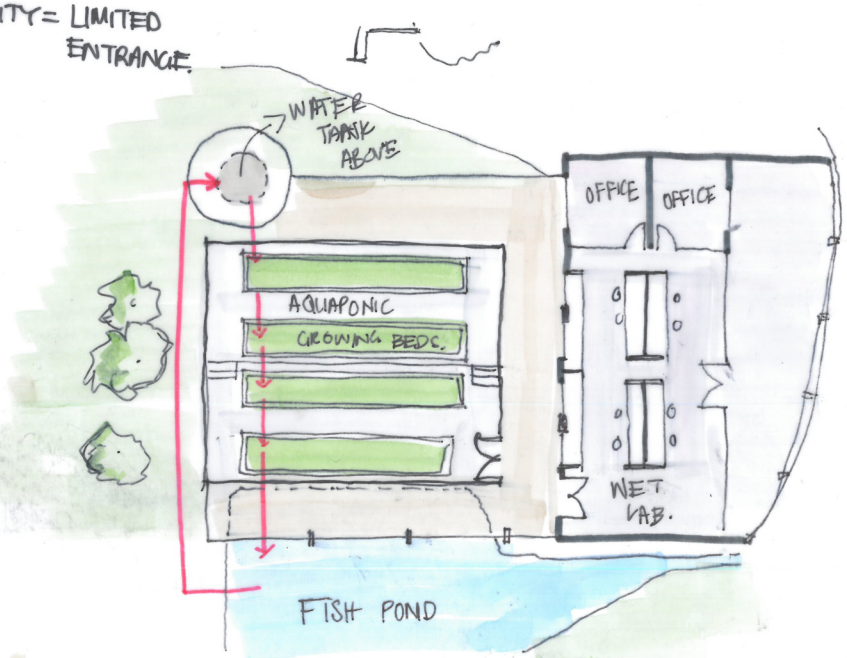


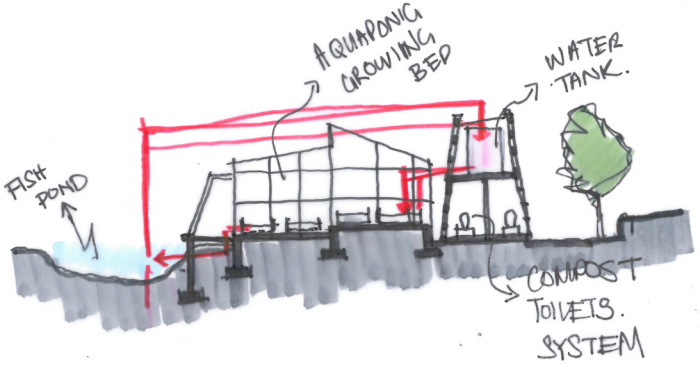
↳ SOFT CENTRE with HARD EDGES.

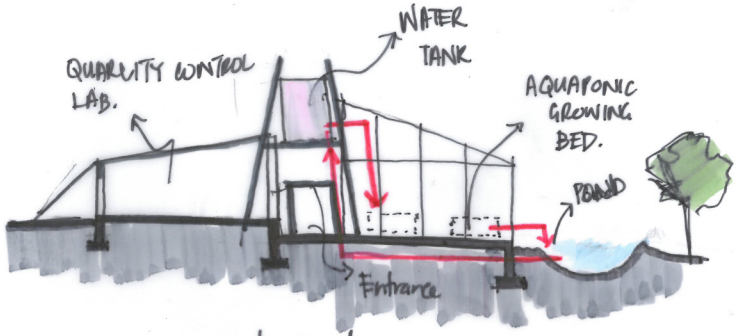
↳ LAPA around TREE/NATURE @ CENTRE.

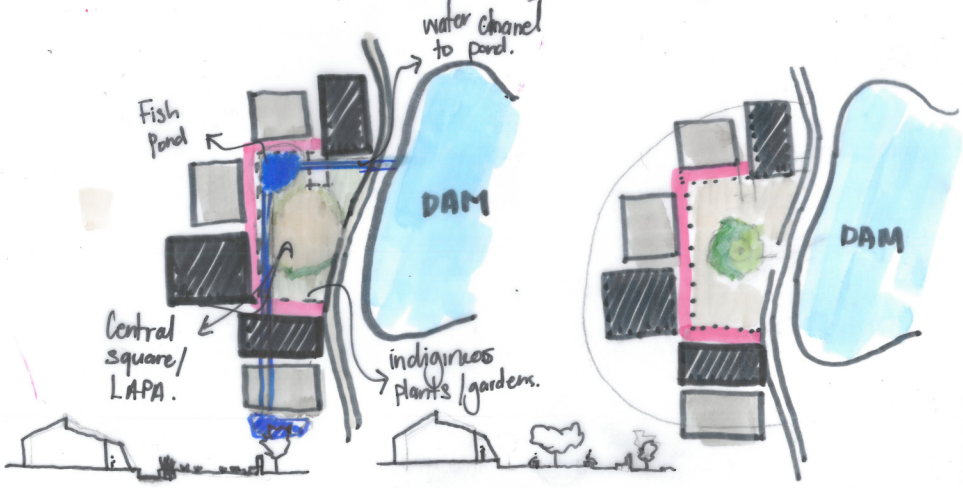
PEDI CULTURE

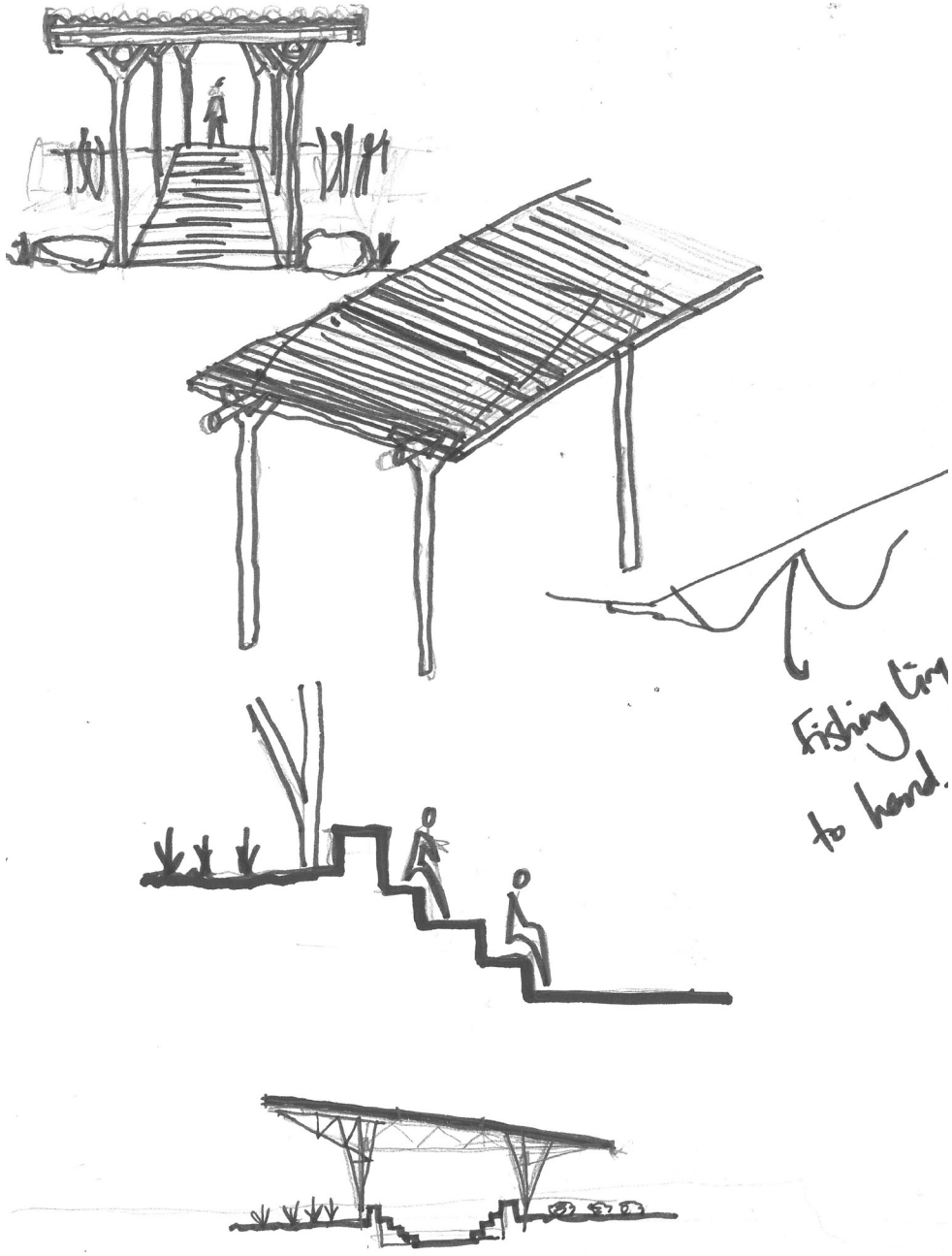
- PRIVACY = RESPECT.
- LAYERING.
- HEIRARCHY.
- SECURITY = LIMITED ENTRANCE.

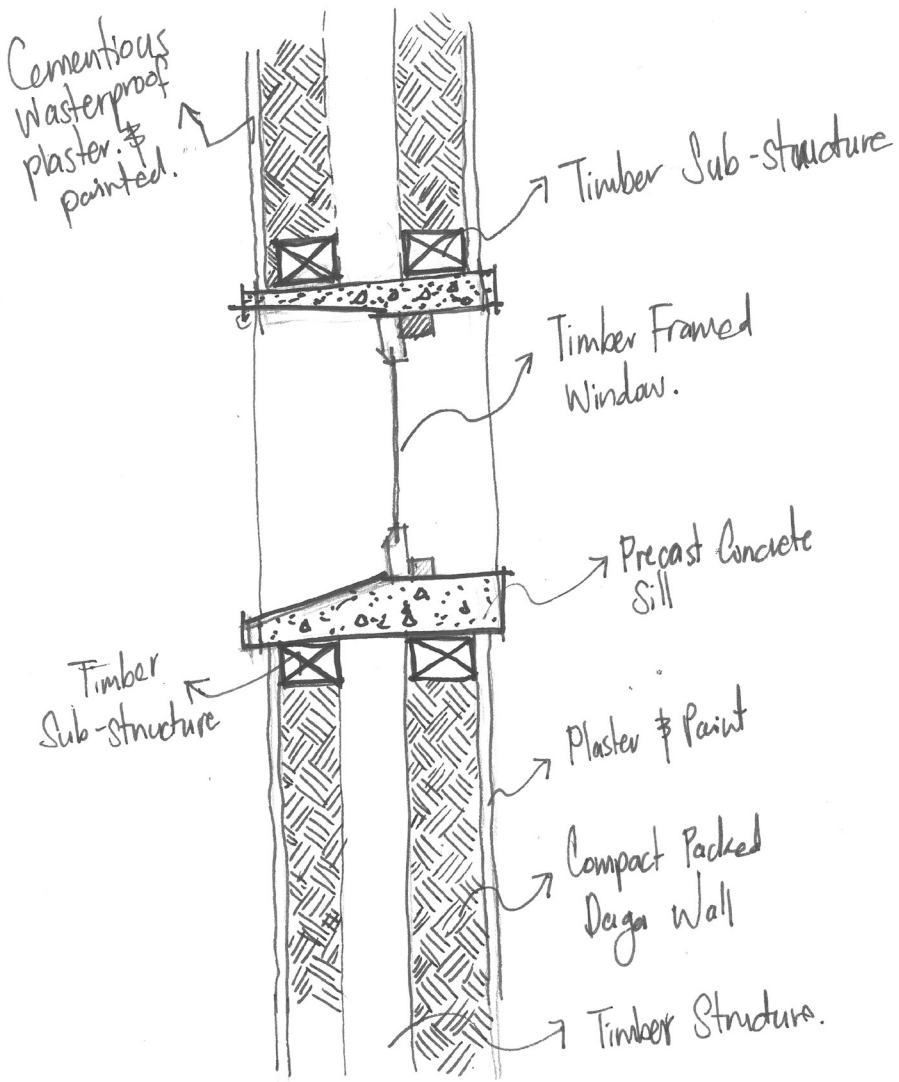


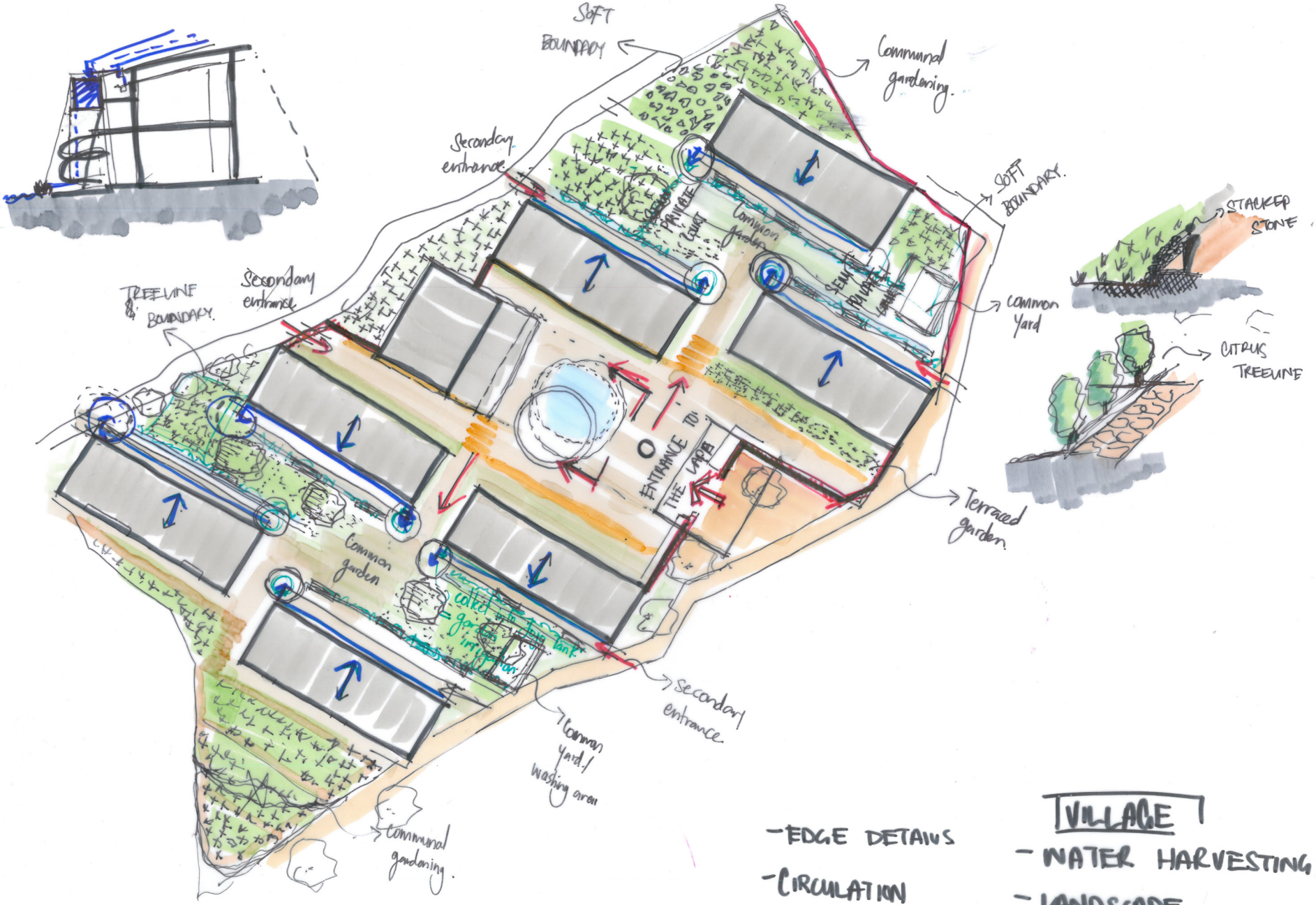







Fishing line to hand.


Cementious Wasterproof plaster & painted.
Timber Sub-structure
Timber Framed Window.
Precast Concrete Sill
Timber Sub-structure
Plaster & Paint
Compact Packed Daga Wall
Timber Structure.


SOFT BOUNDARY
Communal gardening.
Secondary entrance
SOFT BOUNDARY.
STACKED STONE
TREELINE BOUNDARY.
Secondary entrance
Common Yard
CITRUS TREELINE
ENTRANCE TO THE VALLEY
Terraced garden
Common garden
Secondary entrance
Common Yard / washing area
Communal gardening.
- EDGE DETAILS
- CIRCULATION
VILLAGE
- WATER HARVESTING
- LANDSCAPE.
- PUBLIC / PRIVATE.

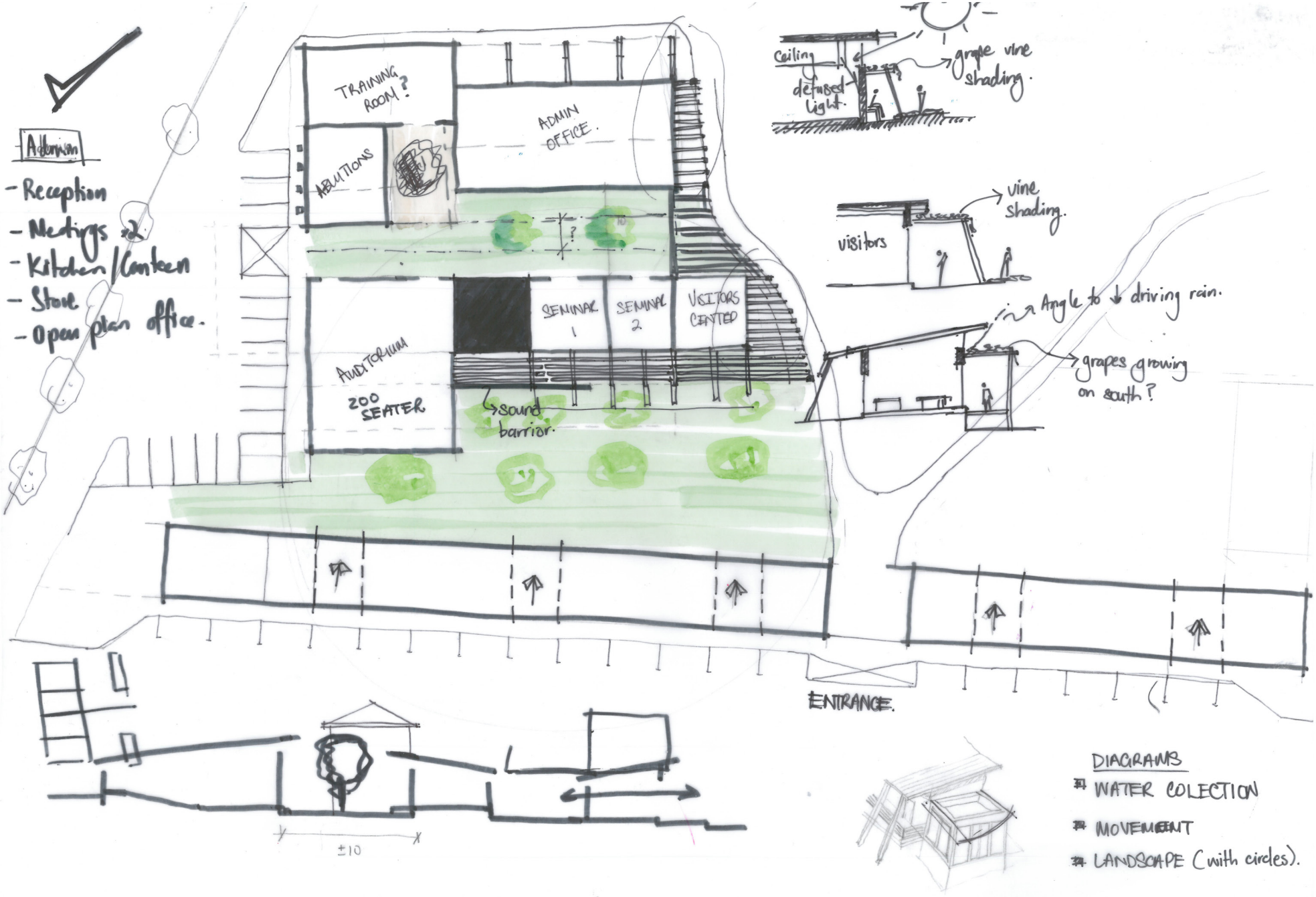

Admin
- Reception
- Meetings x2
- Kitchen/Canteen
- Store
- Open plan office.
TRAINING ROOM?
ABLUTIONS
ADMIN OFFICE.
SEMINAR 1
SEMINAR 2
VISITORS CENTRE
AUDITORIUM
200 SEATER
sound barrier.
ENTRANCE.
ceiling
grape vine shading.
diffused light.
vine shading.
visitors
Angle to ↓ driving rain.
grapes growing on south?
±10
DIAGRAMS
WATER COLECTION
MOVEMENT
LANDSCAPE (with circles).

Figure 6.5. Materiality.

07 TECHNICAL RESOLUTION

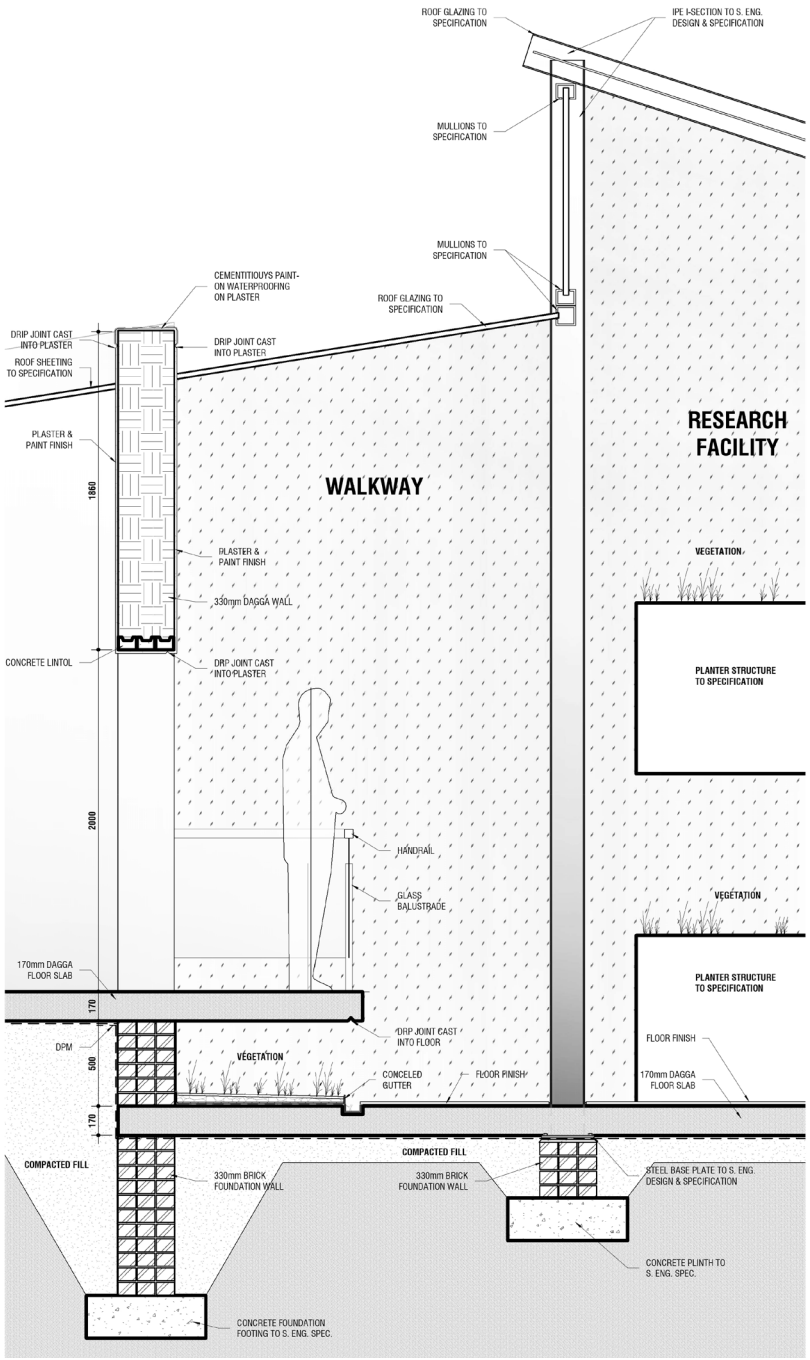


Figure 7.1. Detail of Research Facility - Type A

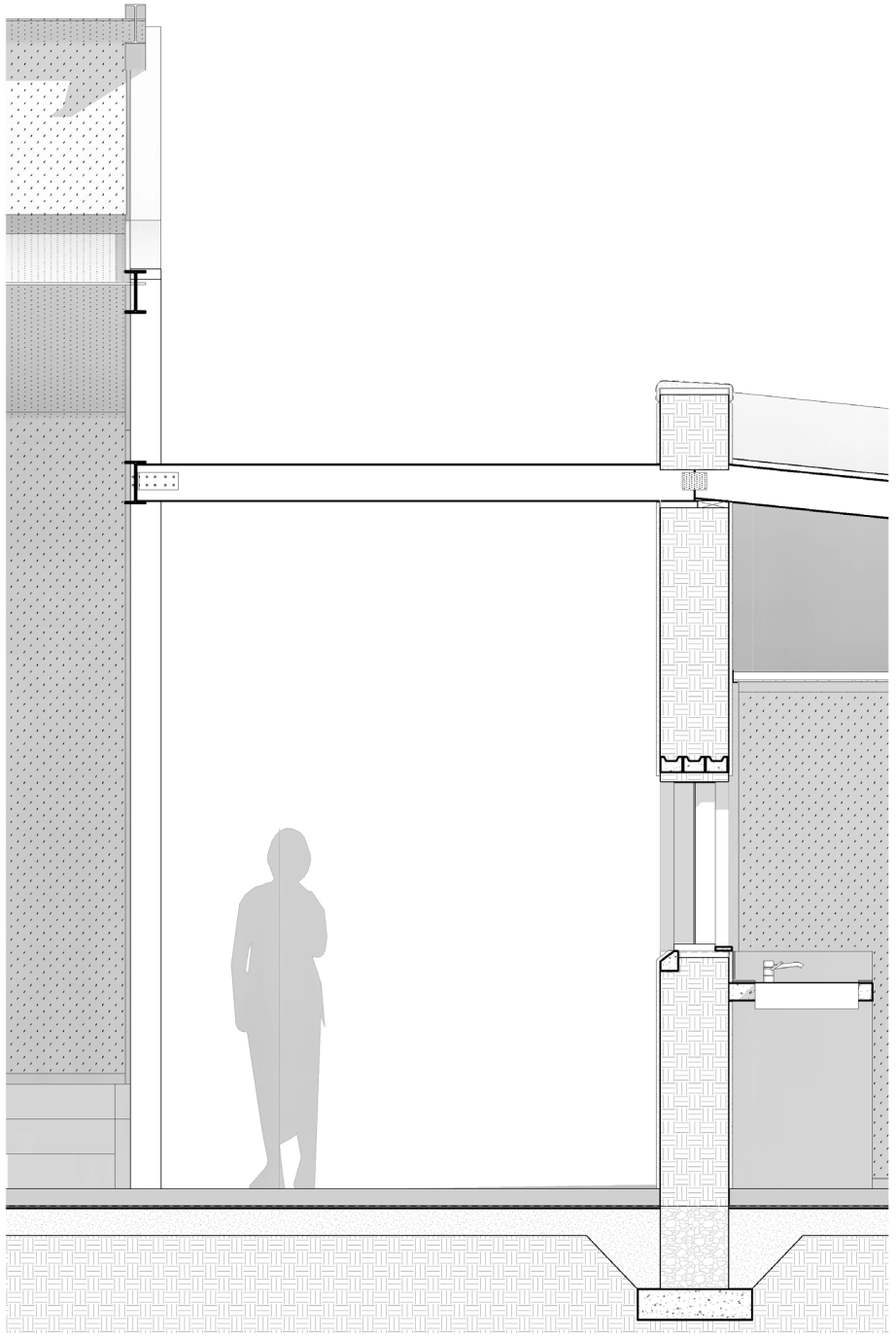


Figure 7.2. Detail of Research Facility - Type B

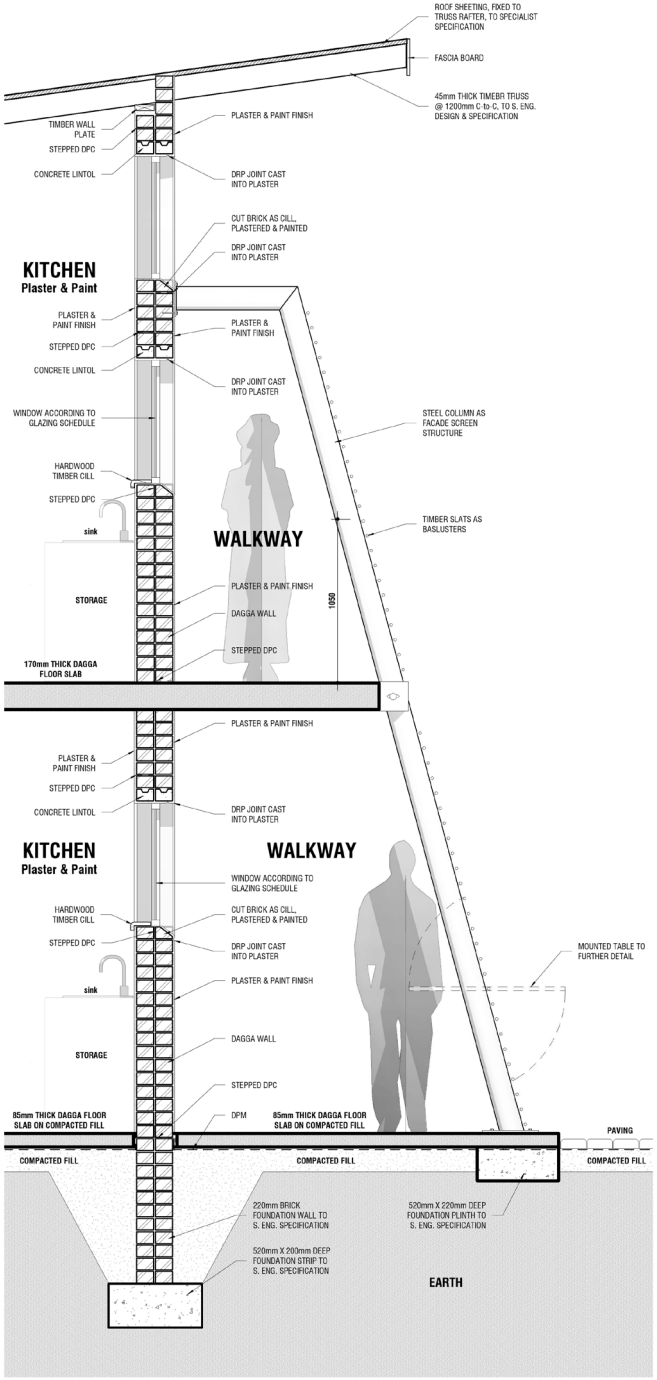


Figure 7.3. Detail of Housing Facility.

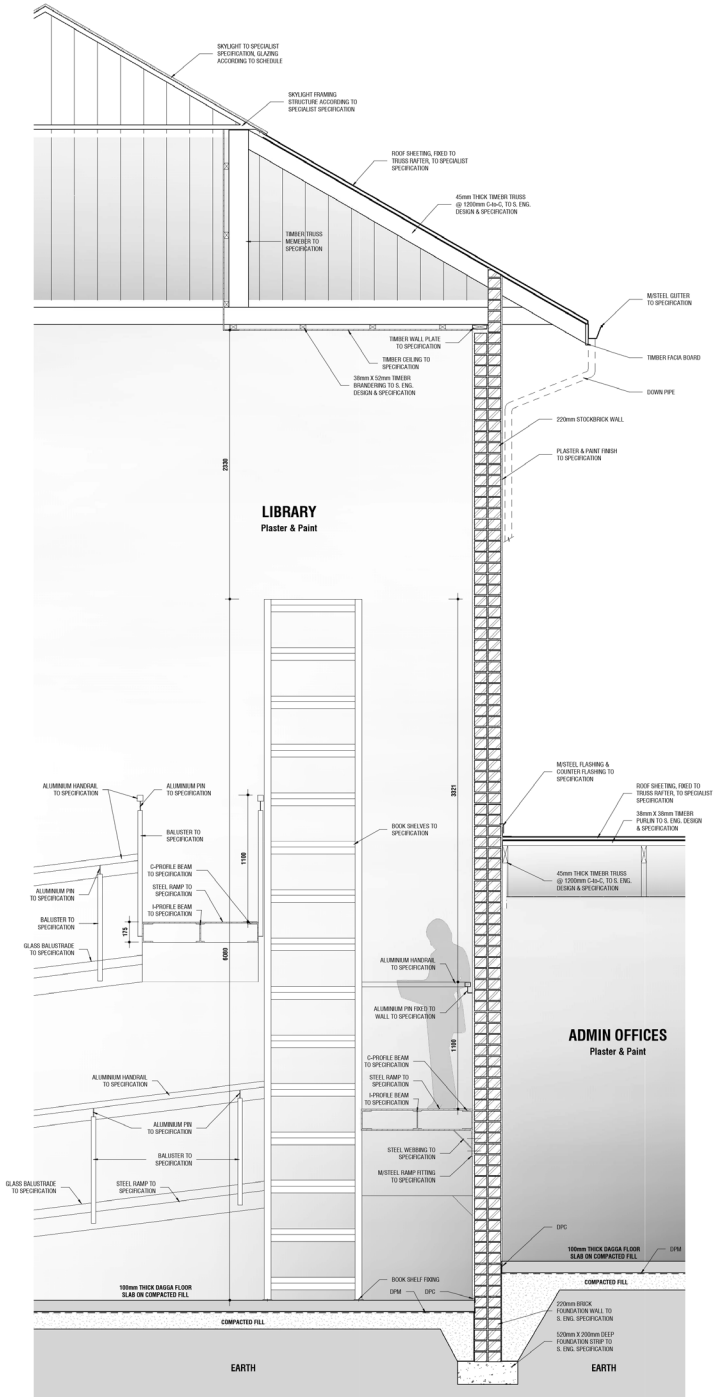
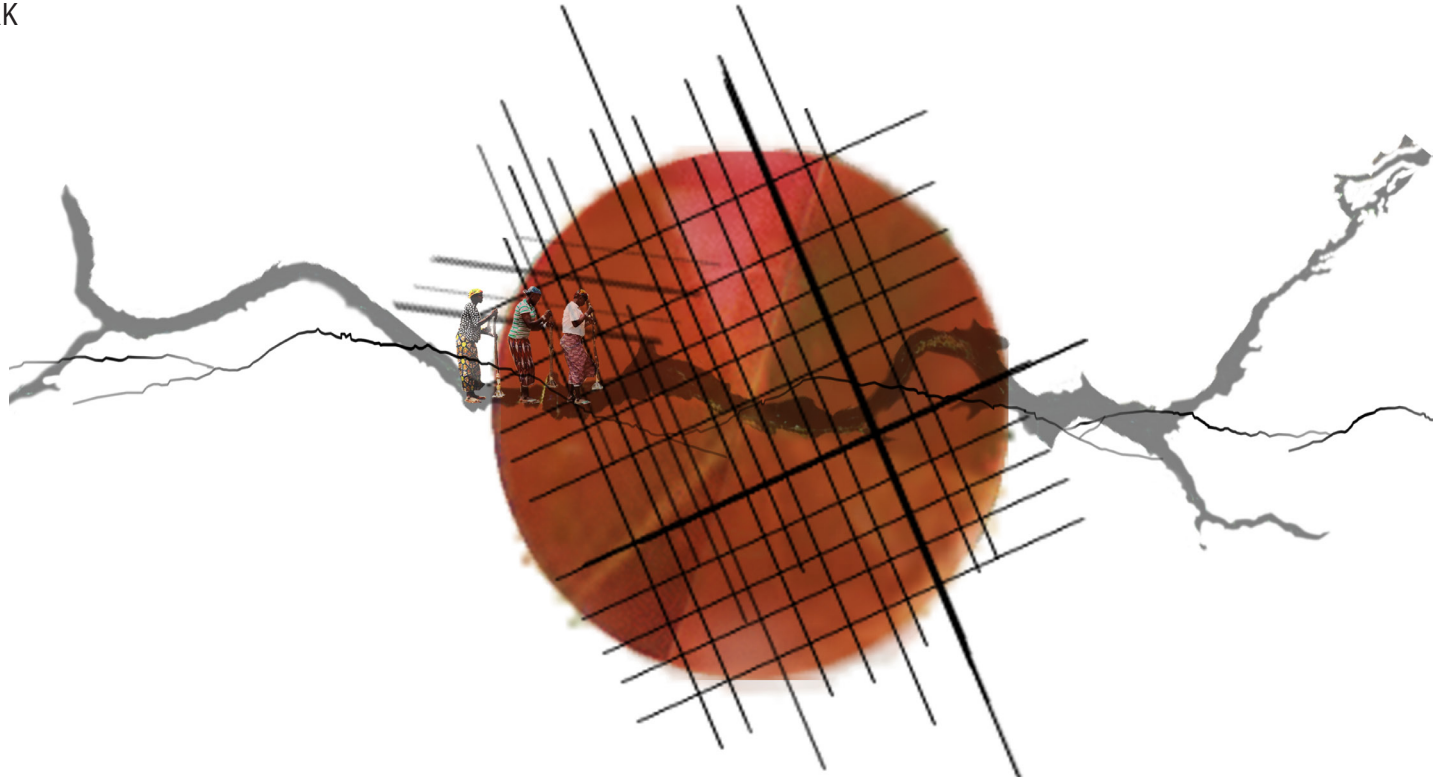
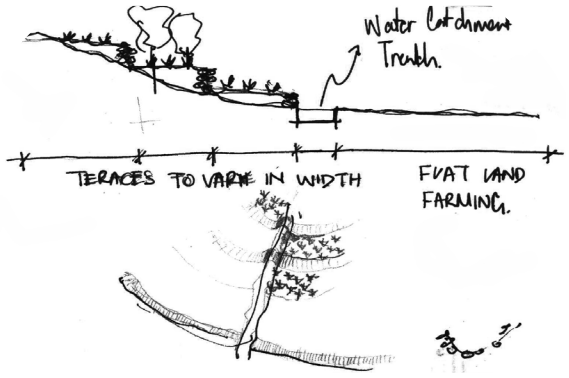


Figure 7.4. Detail of Educatioinal Facility.

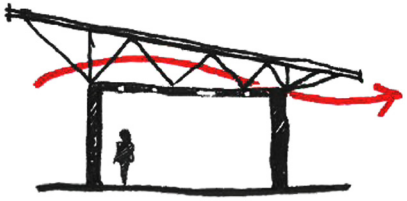
Image Render - The Street view the market along R-25.

08 DRAWINGS

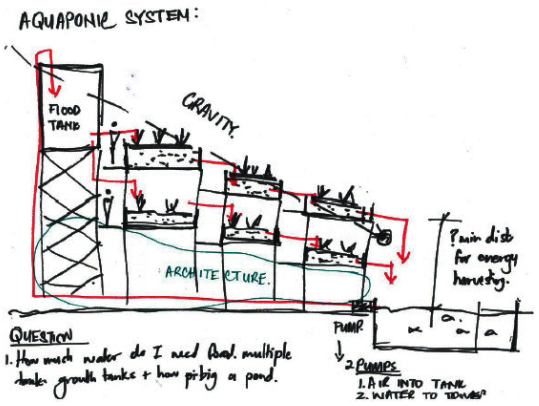




TERRACED FARMING



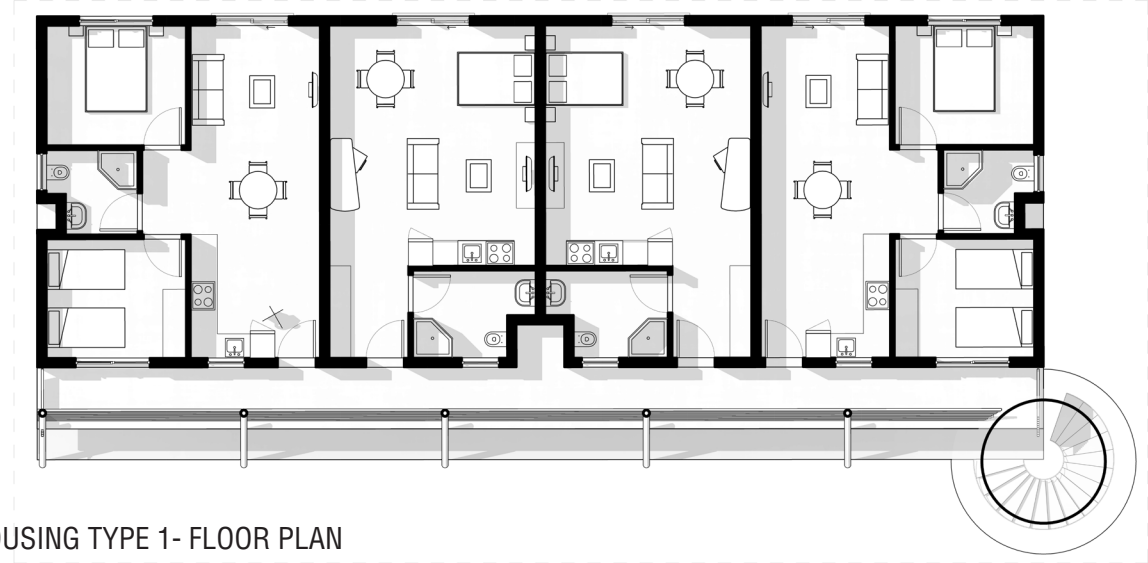
VERNACULAR ARCHITECTURE



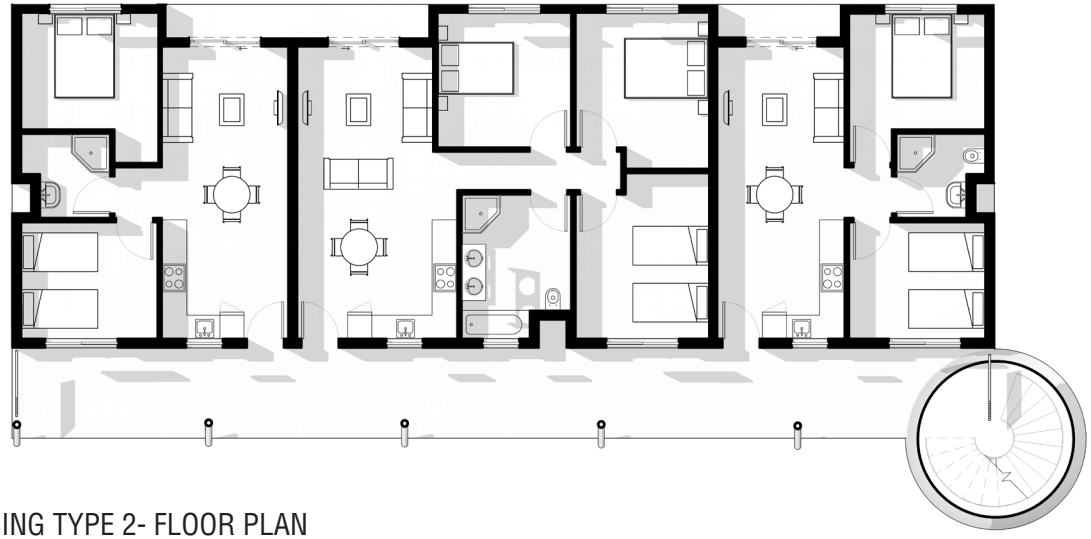
AQUAPONIC FARMING SYSTEM

SITE PLAN

VILLAGE GROUND FLOOR PLAN

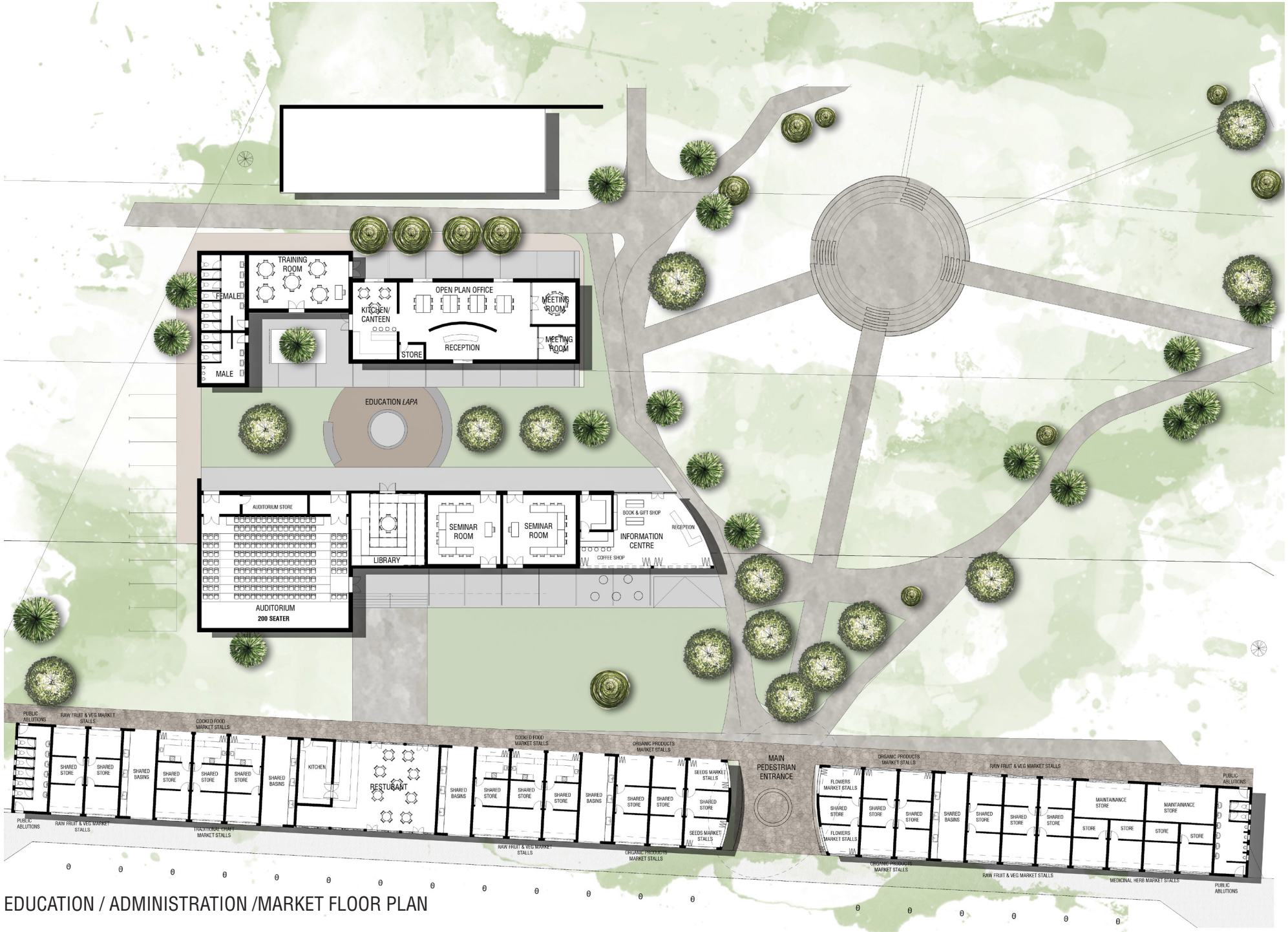


HOUSING TYPE 1- FLOOR PLAN

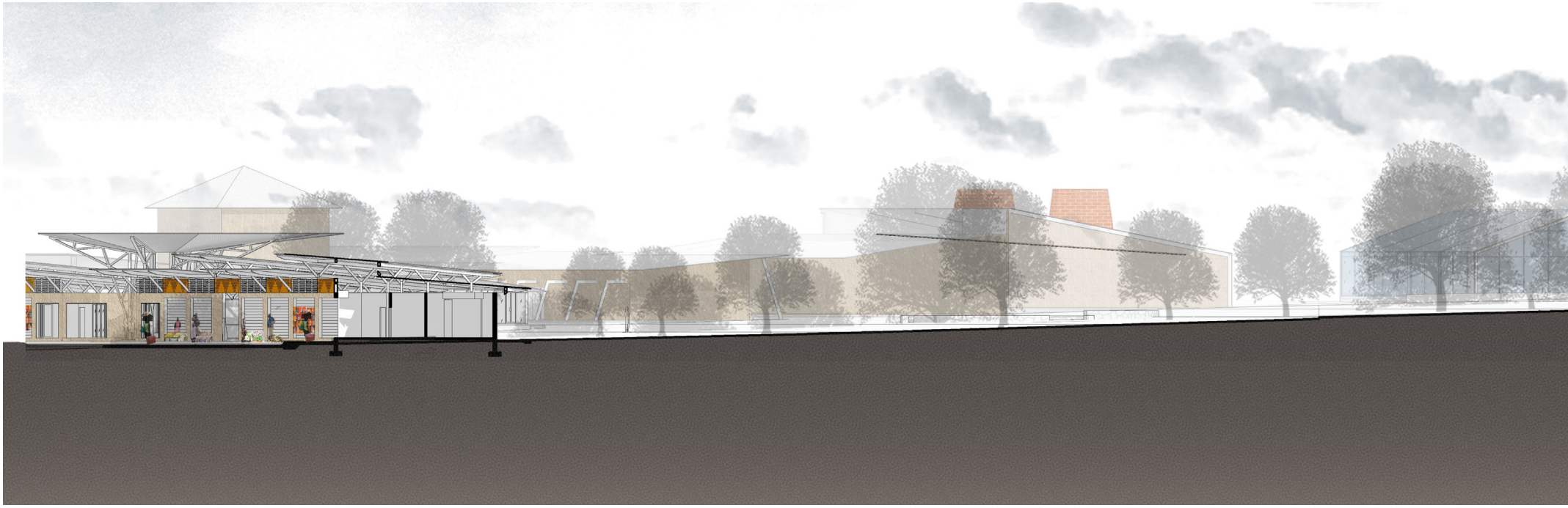


HOUSING TYPE 2- FLOOR PLAN

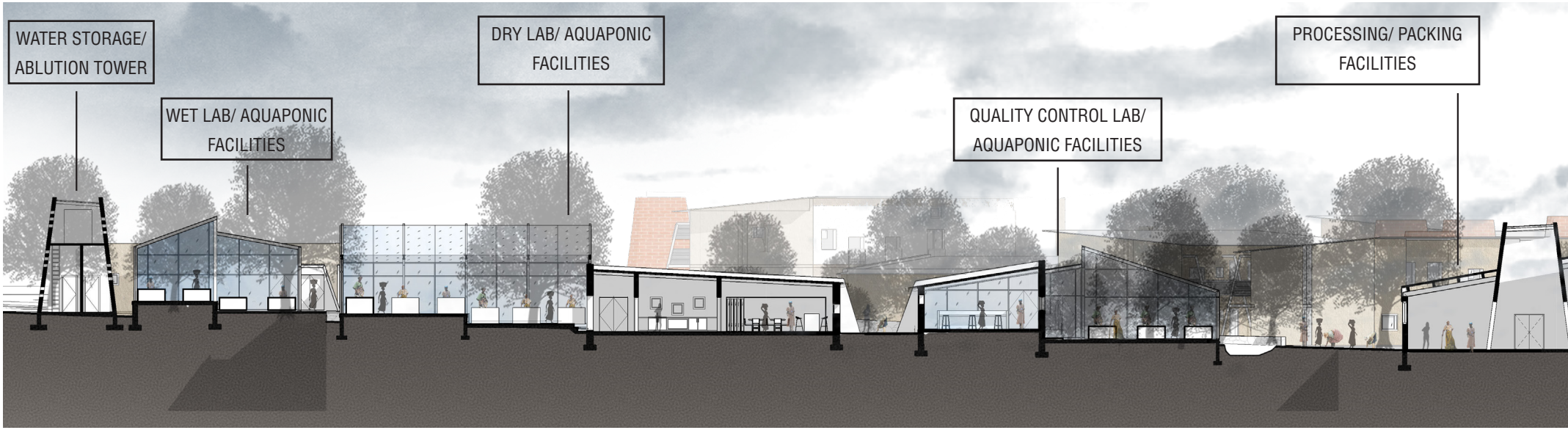
RESEARCH CENTRE / AQUAPONIC FARMING FACILITIES FLOOR PLAN



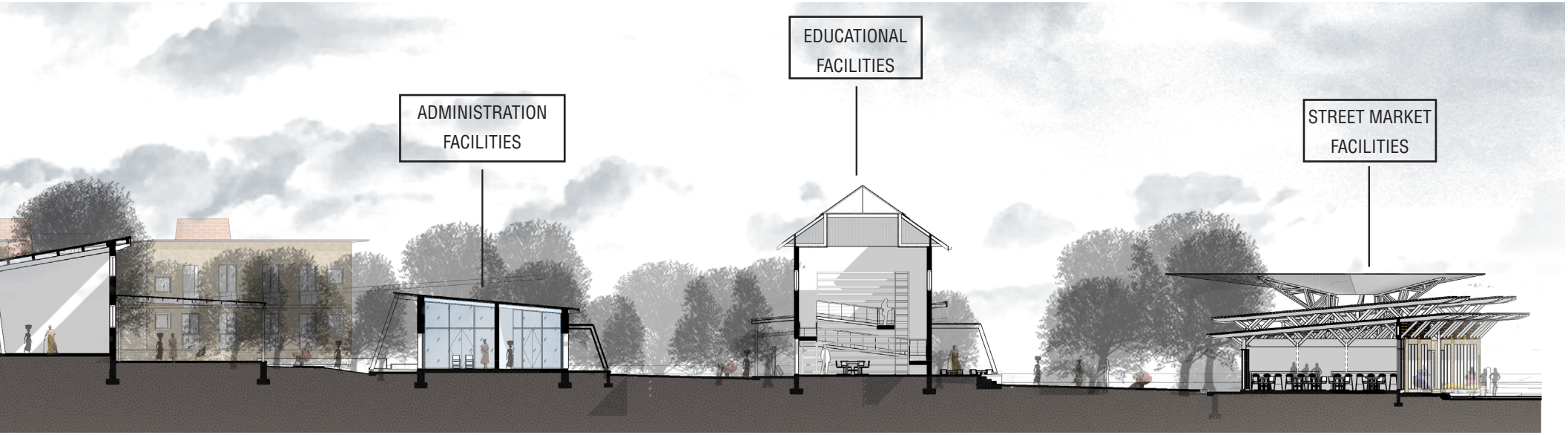
EDUCATION / ADMINISTRATION /MARKET FLOOR PLAN



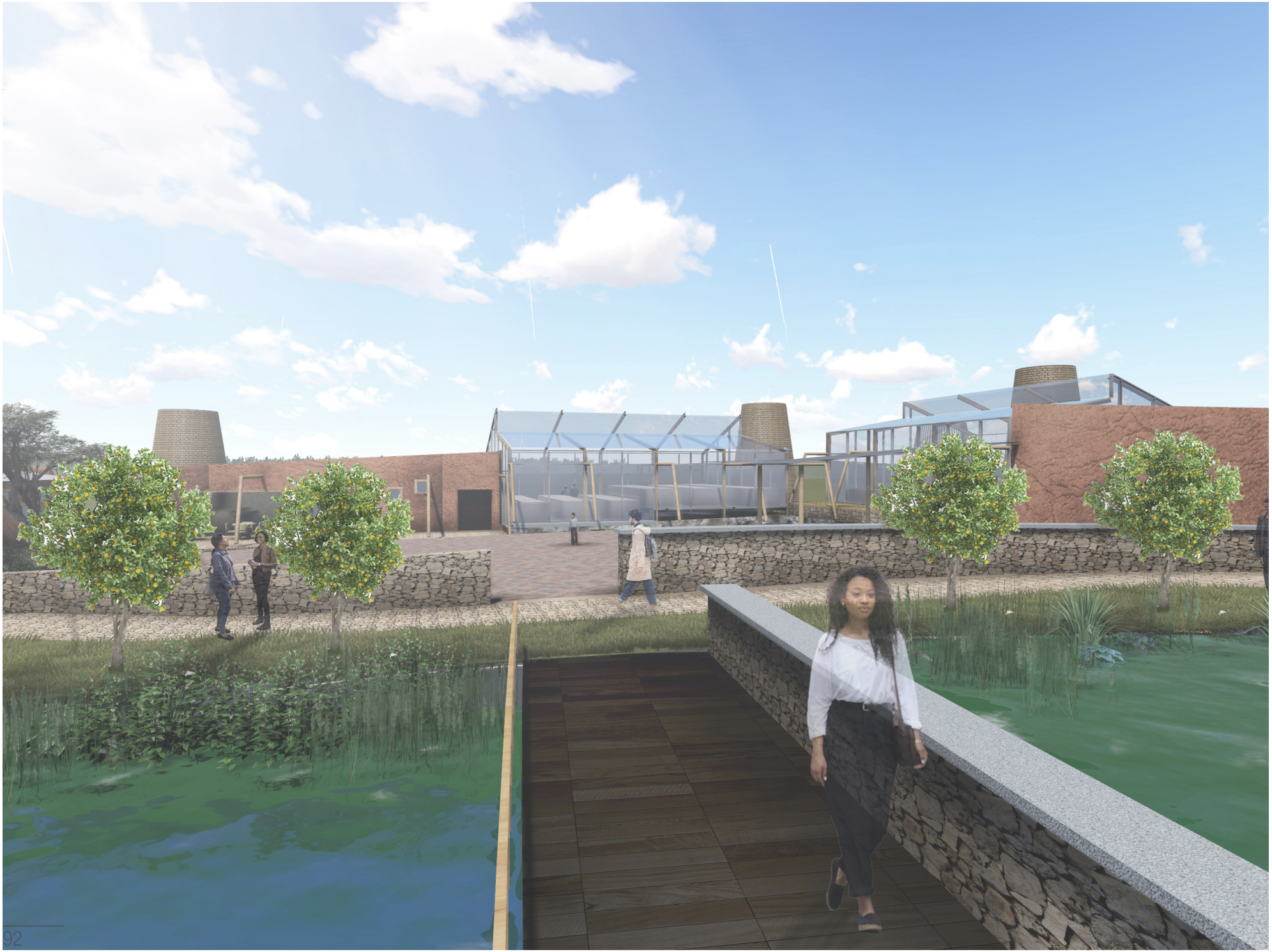
VILLAGE/ MARKET SITE SECTION

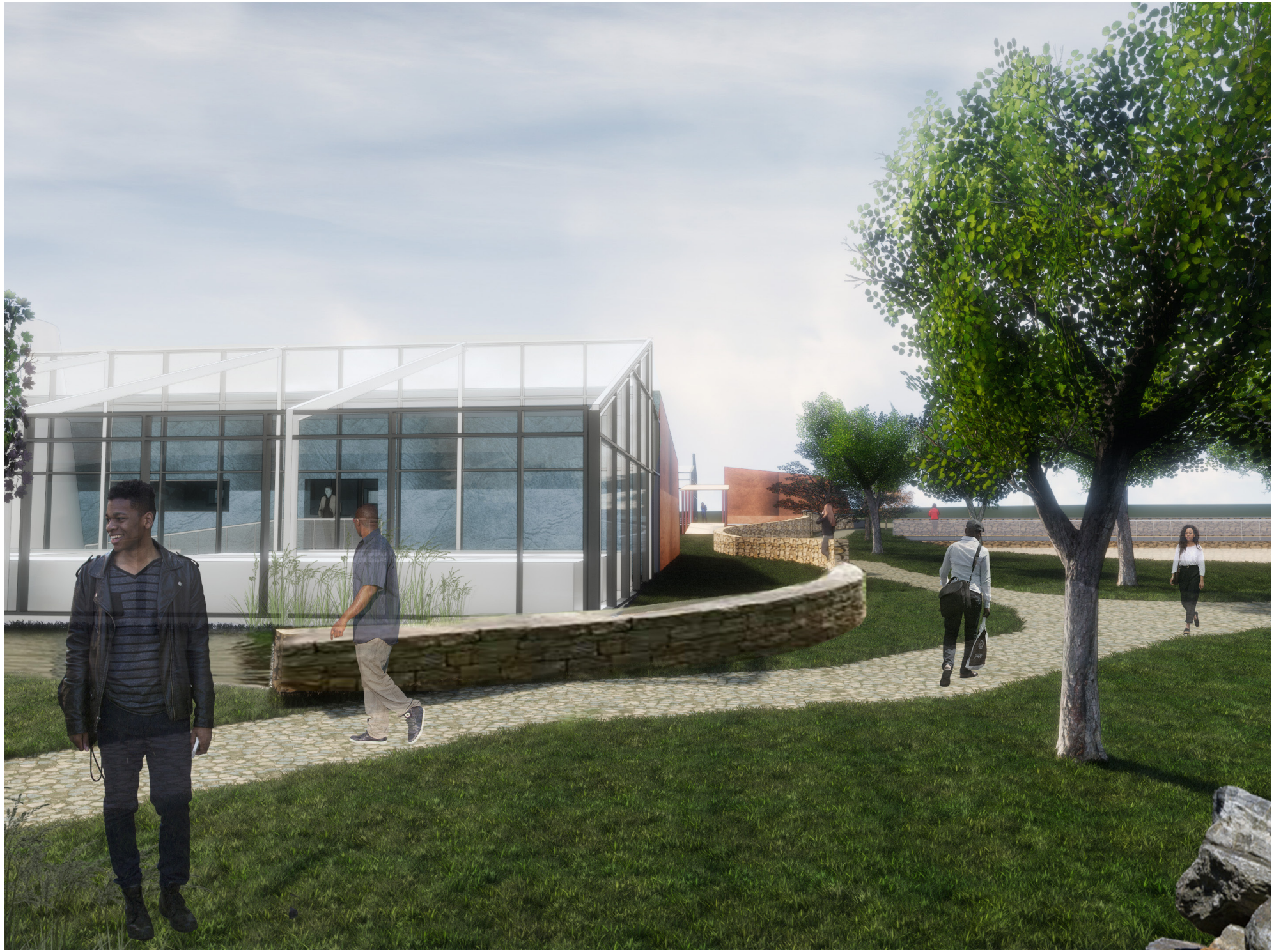



RESIDENTIAL AREA WITH SEMI-PRIVATE *LAPA*
VILLAGE SHARED FACILITY AND *LAPA*
RESIDENTIAL AREA WITH SEMI-PRIVATE *LAPA*


ADMINISTRATION FACILITIES
EDUCATIONAL FACILITIES
STREET MARKET FACILITIES

STREET MARKET/ MAIN PEDESTRIAN ENTRANCE ELEVATION





07 REFERENCE

IMAGE REFERENCES

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03 Background

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- 3.4. Map showing displacement in East Africa. (Image source: Horn of Africa: Humanitarian Impacts of Drought – Issue 9 (10 Aug 2017) [WWW Document], 2017. Relief Web. URL https://reliefweb.int/report/somalia/horn-africa-humanitarian-impacts-drought-issue-9-10-aug-2017. Accessed 10 July 17).3.5 Arable land in Africa. (Image source: A green evolution, 2016. The Economist. Sourced: Ramankutty et al. 2008. IFPRI, FAO, Haver Analytics. Accessed 10 July 2017).
- 3.6. Fisher, R. 1995, Permanent farming systems based on animal traction: a farmer's handbook. ISBN: 358020849, GTZ, Eschborn, Germany.
- 3.7. A simple aquaponics system. (Image sourced: Aquaponics Do It Yourself : Aquaponics Ideas Discovers A Brilliant Process Of Growing Plants And Fishes By 10xs The Average Wit, n.d. Accessed 12 September 2017).
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- 3.9. In text (Section of wall built terracing at Verlorenkloof) Deluis P, Maggs T, Schoeman A.2014, Forgotten World: The stone-walled settlements of the Mpumalanga Escapement, Wits University Press, Johannesburg.
- 3.10. The types of morogo grown in Northern parts of South Africa.
- 3.10.1. Tepe. (Image source: Rensburg, W.J. van, Averbeke, W. van, Slabbert, R., Faber, M., Jaarsveld, P. van, Heerden, I. van, Wenhold, F., Oelofse, A., 2007. African leafy vegetables in South Africa. Water SA 33. https://doi.org/10.4314/wsa.v33i3.49110. Accessed 01 January 2017)
- 3.10.2. Dried out morogo. Author's photograph
- 3.10.3. Lerotho. (Image source: Rensburg, W.J. van, Averbeke, W. van, Slabbert, R., Faber, M., Jaarsveld, P. van, Heerden, I. van, Wenhold, F., Oelofse, A., 2007. African leafy vegetables in South Africa. Water SA 33. https://doi.org/10.4314/wsa.v33i3.49110. Accessed 01 January 2017)
- 3.10.4 Mphodi. (Image source: Rensburg, W.J. van, Averbeke, W. van, Slabbert, R., Faber, M., Jaarsveld, P. van, Heerden, I. van, Wenhold, F., Oelofse, A., 2007. African leafy vegetables in South Africa. Water SA 33. https://doi.org/10.4314/wsa.v33i3.49110. Accessed 01 January 2017)
- 3.10.5. South African Ethnic foods. (Image source: Ethnic [WWW Document], n.d. URL http://www.mzansicook.co.za/browse.html. Accessed 03 January

2017).
- 3.10.6 Cowpeas. (Image source: Rensburg, W.J. van, Averbeke, W. van, Slabbert, R., Faber, M., Jaarsveld, P. van, Heerden, I. van, Wenhold, F., Oelofse, A., 2007. African leafy vegetables in South Africa. Water SA 33. https://doi.org/10.4314/wsa.v33i3.49110. Accessed 01 January 2017)
- 3.11 Leafy greens grown in a Aquaponic Facility. (Image source: What is Aquaponics [WWW Document], n.d. URL https://www.theaquaponicsource.com/what-is-aquaponics/. Accessed 12 September 2017).
- 3.12 Types of Fish used in Aquaponic Systems:
- 3.12.1. Tipalia fish. (Image source: NW Tilapia, Nile O. Niloticus, Pure, Red, and White [WWW Document], n.d. URL http://www.nwtilapia.com/ourbreeds.html. Accessed 08 July 2017).
- 3.12.2. Catfish. (Image source: Catfish | Facts, Information and Habit of the Catfish Group, n.d. .Animal Corner. Accessed 08 July 2017).
- 3.12.3 Stripped bass fish. (Image source: Striped Bass Fishing Techniques | Sport Fishing Magazine [WWW Document], n.d. URL https://www.sportfishingmag.com/new-techniques-for-atlantic-striped-bass. Accessed 08 July 2017).
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- 3.13 Map of the Bantu expansion. (Image source: Bantu expansion, 2018. . Wikipedia. Accessed 02 February 2017).
- 3.14 Map of the tribal expansion of the Bantu speaking people. (Image Source: Janzen, J. (1992). Ngoma: Discourses of Healing in Central and Southern Africa. University of California Press. Retrieved from http://www.jstor.org/stable/10.1525/j.ctt1pph77. Accessed 02 February 2017).
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- 3.16. Frescura F, 1981, Rural Shelter in South Africa: A survey of the architecture, house forms and constructional methods of the black rural peoples of Southern Africa, Ravan Press, Johannesburg. Pg 152.
- 3.17 Frescura F, 1981, Rural Shelter in South Africa: A survey of the architecture, house forms and constructional methods of the black rural peoples of Southern Africa, Ravan Press, Johannesburg. pg 152
- 3.18. Deluis P, Maggs T, Schoeman A.2014, Forgotten World: The stone-walled settlements of the Mpumalanga Escapement, Wits University Press, Johannesburg. Pg i
- 3.19. Deluis P, Maggs T, Schoeman A.2014, Forgotten World: The stone-walled settlements of the Mpumalanga Escapement, Wits University Press, Johannesburg. Pg 66
- 3.20. Authors sketch form: Deluis P, Maggs T, Schoeman A.2014, Forgotten World: The stone-walled settlements of the Mpumalanga Escapement, Wits University Press, Johannesburg. Pg 66
- 3.21. Author's analytical sketches from: Deluis P, Maggs T, Schoeman A.2014, Forgotten World: The stone-walled settlements of the Mpumalanga Escapement, Wits University Press, Johannesburg. Pg 75
- 3.22. Author's analytical sketch.
- 3.23. Author's analytical sketch.
- 3.24. Author's sketch from: Frescura F, 1981, Rural Shelter in South Africa: A survey of the architecture, house forms and constructional methods of the black rural peoples of Southern Africa, Ravan Press, Johannesburg. pg 146
- 3.25. Author's sketch from: Frescura F, 1981, Rural Shelter in South Africa: A survey of the architecture, house forms and constructional methods of the black rural peoples of Southern Africa, Ravan Press, Johannesburg pg 158
- 3.26. Frescura F, 1981, Rural Shelter in South Africa: A survey of the architecture, house forms and constructional methods of the black rural peoples of Southern Africa, Ravan Press, Johannesburg. pg 12
- 3.27.Author's analytical sketch.
- 3.28. Frescura F, 1981, Rural Shelter in South Africa: A survey of the architecture, house forms and constructional methods of the black rural peoples of Southern Africa, Ravan Press, Johannesburg. pg 131
- 3.29. Author's analytical sketch of her grandmother's homestead.
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04 Site

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- 4.5. Site images by author.
- 4.6. Author's graphic sketch of location of vendors produce in relation to the chosen site.
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- 4.13 Author's photographs of chosen site.
- 4.14. Author's analytical sketch of site contours.
- 4.15. Author's analytical sketch of existing footpaths on site.
- 4.16. Author's analytical sketch mapping the connecting nodes.
- 4.17. Author's photographs conditions & materials found along site.
- 4.18. Author's analytical sketch of site analysis.
- 4.19. Authors graphic representation of site, underlay Google maps (source)

05 Design Brief

All graphic material and sketches was produced by the author.

06 Design Development

All graphic material, sketches and drawings was produced by the author excluding:

- 6.1. Materiality
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- 6.1.2 Author's analytical sketch vernacular daga house.
- 6.1.3 Reclaimed wooden cladding, https://www.scoop.it/t/reclaimed-timber, Accessed 10 August 2017
- 6.1.4 Author's sketch section.
- 6.1.5 Author's photographs of grandmother's homestead.
- 6.1.6 Author's photographs of site
- 6.1.7 Operating Manual [WWW Document], n.d. URL https://web.uri.edu/greenhouse/operating-manual/, Accessed 15 August 2017.
- 6.1.8 Author's sketch of tensile shading material used in surrounding farms.
- 6.1.9 Deluis P, Maggs T, Schoeman A.2014, Forgotten World: The stone-walled settlements of the Mpumalanga Escapement, Wits University Press, Johannesburg. Pg 56
- 6.1.10 Author's analytical sketch of site analysis.

07 Techincal Informants & 08 Drawing

All sketches, drawings and renders by authors

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