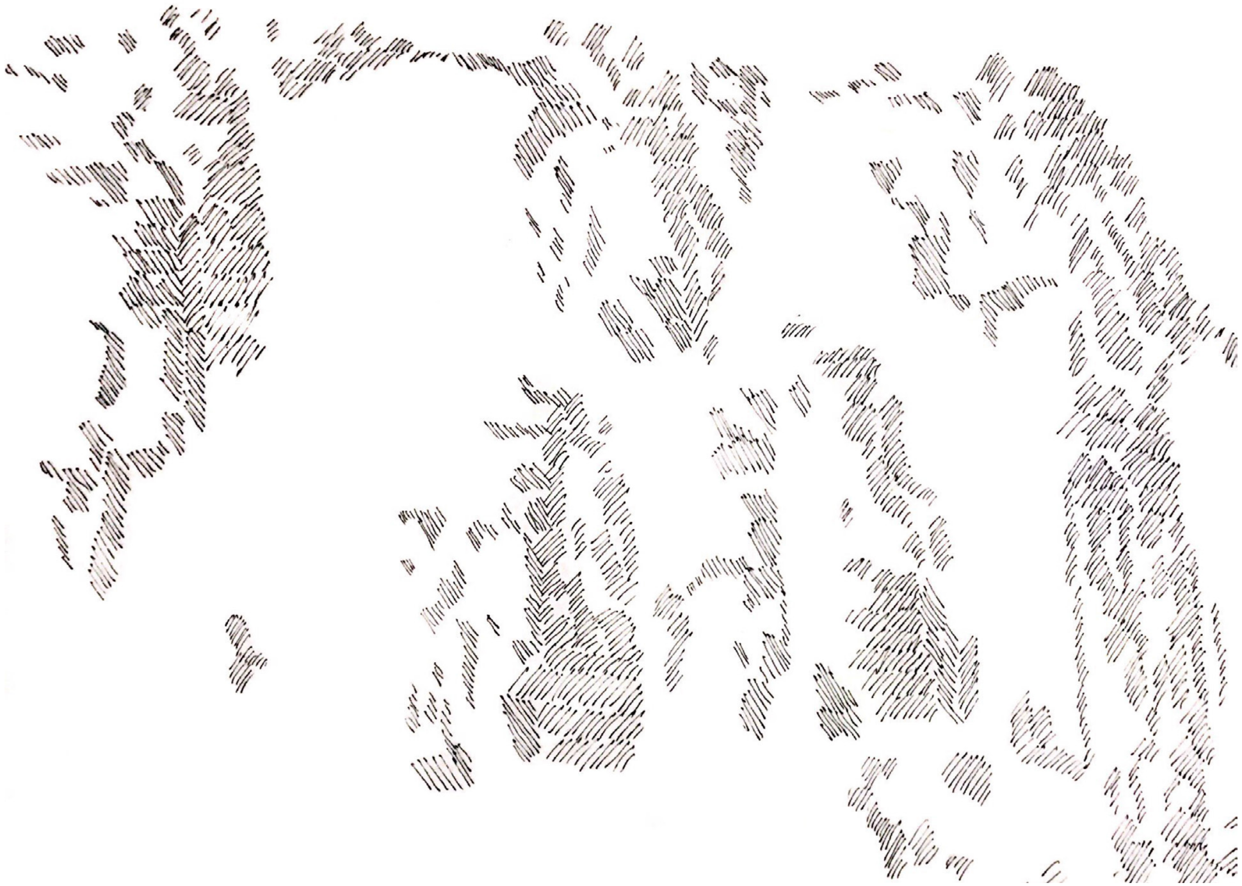
THE ARCHITECTURAL PRESERVATION OF THE KAROO'S BIRD OF DEATH

A CAPE VULTURE REHABILITATION CENTRE

HOFMEYR| EASTERN CAPE



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A Cape Vulture Rehabilitation Centre

This dissertation is submitted in partial fullfillment of the requirements for the degree M. Arch (Prof)

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Declaration of authorship

The work contained in this document has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge, this document contains no material previously published or written by another person except where due reference is made

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ABSTRACT

The world is facing extinction levels last experienced 65 million years ago, when the dinosaurs died out. Population growth, urbanization and deforestation have caused over 16 300 species to be classified as endangered on the International Union for Nature Conservation's Red list. The Cape Vulture is one of the species facing extinction due to human impact.

This dissertation proposes a Cape Vulture Rehabilitation centre as an architectural intervention that assists in the conservation of Africa's only true scavenger. The intervention is focused on the rehabilitation and supplementation of the Cape Vulture population in the Hofmeyr area of the Eastern Cape. The lack of vulture rehabilitation facilities in the Eastern Cape provides the opportunity to develop an intervention that has relevance in wildlife conservation.

The site is selected due to its close proximity to the existing breeding cliffs of a colony of Cape Vultures, and is situated in the Bamboes mountain range near the town of Hofmeyr. The personal interest of wildlife and experiences of the Karoo have steered the decision to focus the dissertation on Vulture conservation.

The dissertation aims at creating an architectural intervention that facilitates the preservation of Cape Vultures whilst creating awareness of ecological conservation of the Karoo. The theory of Biophilia which translates to the love of living things is explored and interpreted to assist in the development of an architectural response that aids in the transformation of misconceptions surrounding vultures.

The dissertation adopts explorative research methods into the topology, typology, morphology and tectonics relevant to the intervention. Challenges are identified and aims are set, research questions are developed to assist in solving said problems. The knowledge gained through analysis and the interpretation of theoretical literature guides the design development process and the ultimate synthesis of the proposed design.

Finally, the proposed solution is reflected upon to determine the accomplishment and failures of the investigation process

PART 1

PART 2

PART 3

PART 4

INTRODUCTION

incentive through personal experience

My interest in wildlife and the preservation of our natural environment motivated this design dissertation. Further to this is the first hand experiences I've had with Cape Vultures' diminishing number in the Hofmeyr District.

My Fascination with wildlife stem from my childhood on the farm, where vulture sightings were fairly common, I could spend hours observing these unique birds devouring a carcass. The sightings suddenly stopped in 2014 as the local colony that roost on the cliffs of the Bamboes Mountains near Hofmeyr were unintentionally poisoned by a farmer, killing hundreds of vultures. The colony slowly stabilised and vultures started reappearing in 2018. This illustrates the fragile nature of these birds and the increasing need for conservation.

Vultures are Africa's only true scavenger meaning they only feed on the decaying flesh of dead animals, also known as carrion. The role they play in our natural environment is crucial for the prevention and spreading of diseases that are accelerated by decomposing processes

All Southern African Vulture species are currently listed as threatened species on the International Union for Conservation of Natures Red List, due to the indirect impact Human activities have on these birds. Cape Vultures are Southern Africa's only endemic species of vulture, mainly distributed over the northern parts of South Africa where it shares its habitat with the other vulture species. A smaller population resides in the southern parts of the country like the Eastern Cape and isolated sightings in the Western Cape.

This dissertation proposes a Cape Vulture Rehabilitation Centre near Hofmeyr in the Eastern Cape, focusing on the rehabilitation, supplementation and ultimately the conservation of Cape Vultures in the Karoo.

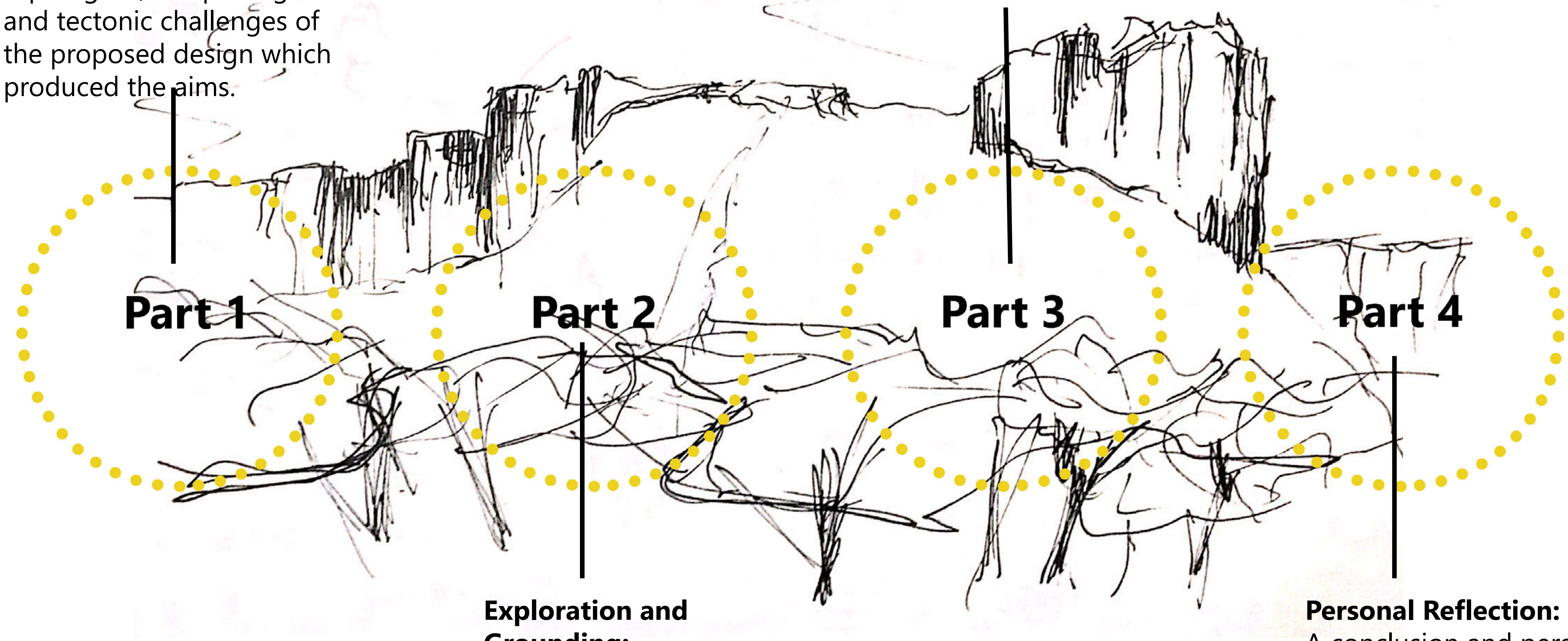
The theory of Biophilia which implies the love for living things (Wilson1984) is to be explored and how biophilic architectural principles can assist in the conservation and the transformation of the biophobic misconceptions associated with vultures. Misconceptions that will become apparent throughout this dissertation.

DOCUMENT FRAMEWORK

This dissertation aims at facilitating conservation by developing a design methodology grounded in our connectedness with nature that questions our misconceptions of vultures. This is achieved through cognitive analysis of the context, the exploration of our connectedness with nature through biophilia, and the investigation and reinterpretation of the typological bird rehabilitation centre.

Problem statements and aims:
Design challenges are identified through investigation into typological, topological, morphological and tectonic challenges of the proposed design which produced the aims.

Design Synthesis:
Presents the design development and technical synthesis which resulted in the design solution.



Exploration and Grounding:
Exploration through investigations and research to develop a design methodology based on the four themes of typology, topology, morphology and tectonics.

Personal Reflection:
A conclusion and personal reflection on the design process. Whether the aims were achieved and comments on the success of the dissertation.

RESEARCH METHODOLOGY

This dissertation encompasses exploratory research that is focused on achieving the final proposed design. The research is based on the four themes of typology, topology, morphology and tectonics.

Typology: the investigation of functional characteristics and requirements for the client and users. For whom to design?

Topology: determining the most suited location for the project, an investigation into the sensitivity of the landscape and the responsible engagement thereof. Where to design?

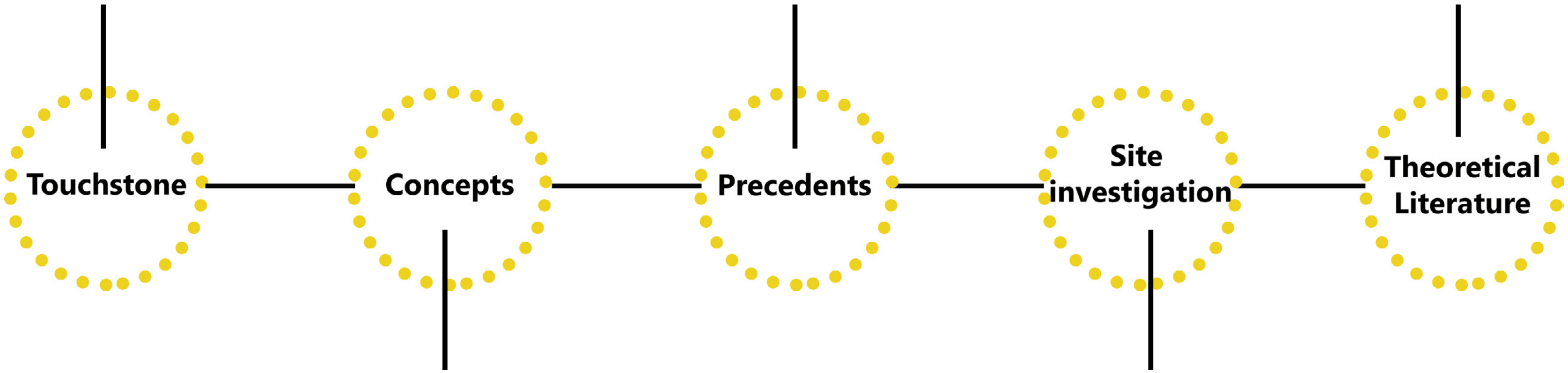
Morphology: Exploration of how the form is influenced by the theoretical approach of biophilia as well as the landscape. The geslalt of the design?

Tectonics: Investigation of the materials and technical design of the project, how this is influenced by the theoretical approach as well as the site. How the design is constructed?

A touchstone which captures the essence of the main issues and intentions of the project was created.

Architectural precedent studies assist in exploring the initial ideas and developing a conceptual framework.

Literature reviews are utilized to justify the conceptual approach as well as critical analysis of the functional requirement for the dissertation

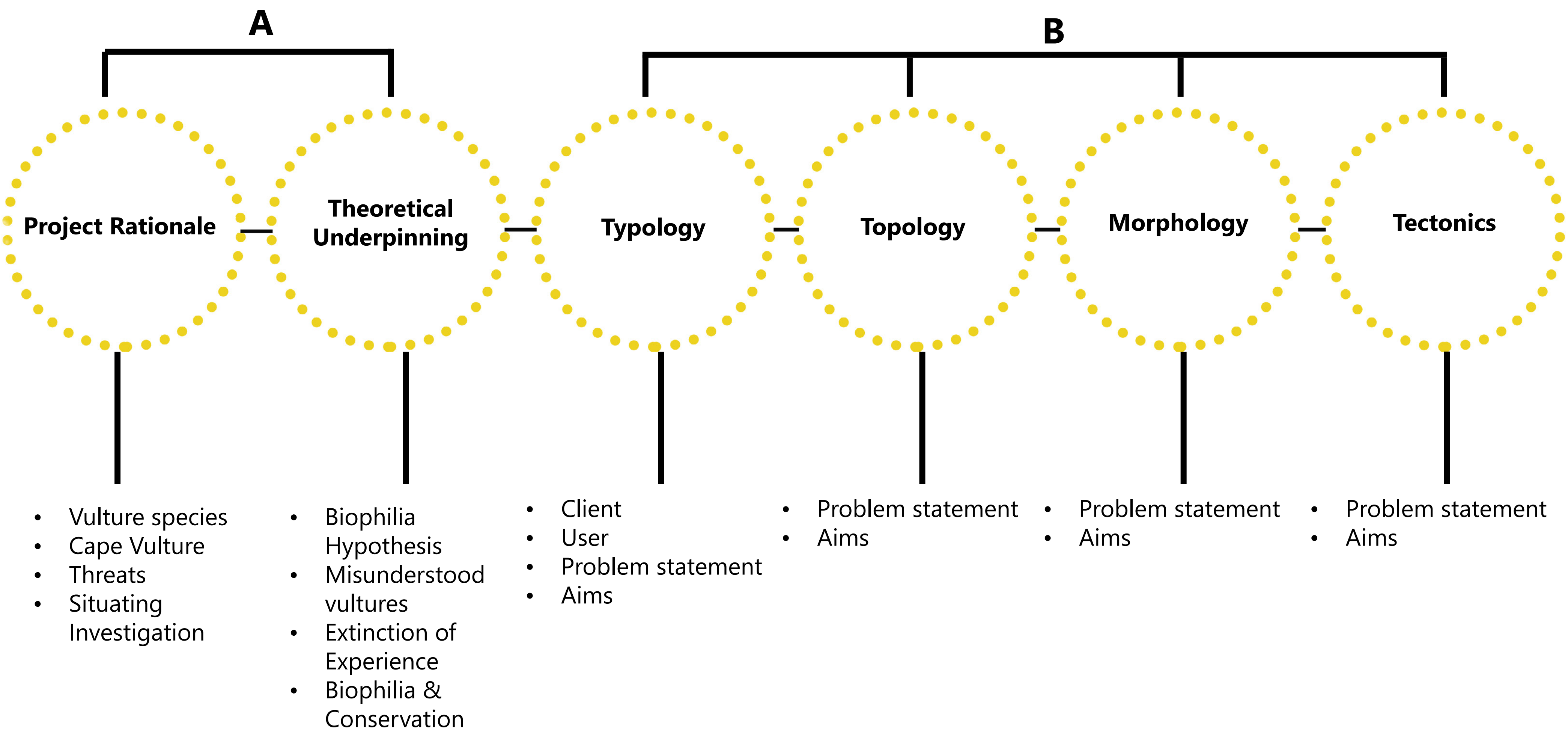


Concepts are developed around a central theoretical theme that provides the base for decision making throughout the design process.

A site investigation which focuses on quantitative (facts) data was concurrently conducted with a cognitive site analysis, focusing on the conceptual experience of the site

PART 1A
SITUATING THE INVESTIGATION

Figure 1 - Cliffs on site


A
B
Project Rationale
Theoretical Underpinning
Typology
Topology
Morphology
Tectonics
• Vulture species
• Cape Vulture
• Threats
• Situating Investigation
• Biophilia Hypothesis
• Misunderstood vultures
• Extinction of Experience
• Biophilia & Conservation
• Client
• User
• Problem statement
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1.1 PROJECT RATIONALE

A story of vultures

Figure 2 - Drawing of Vulture

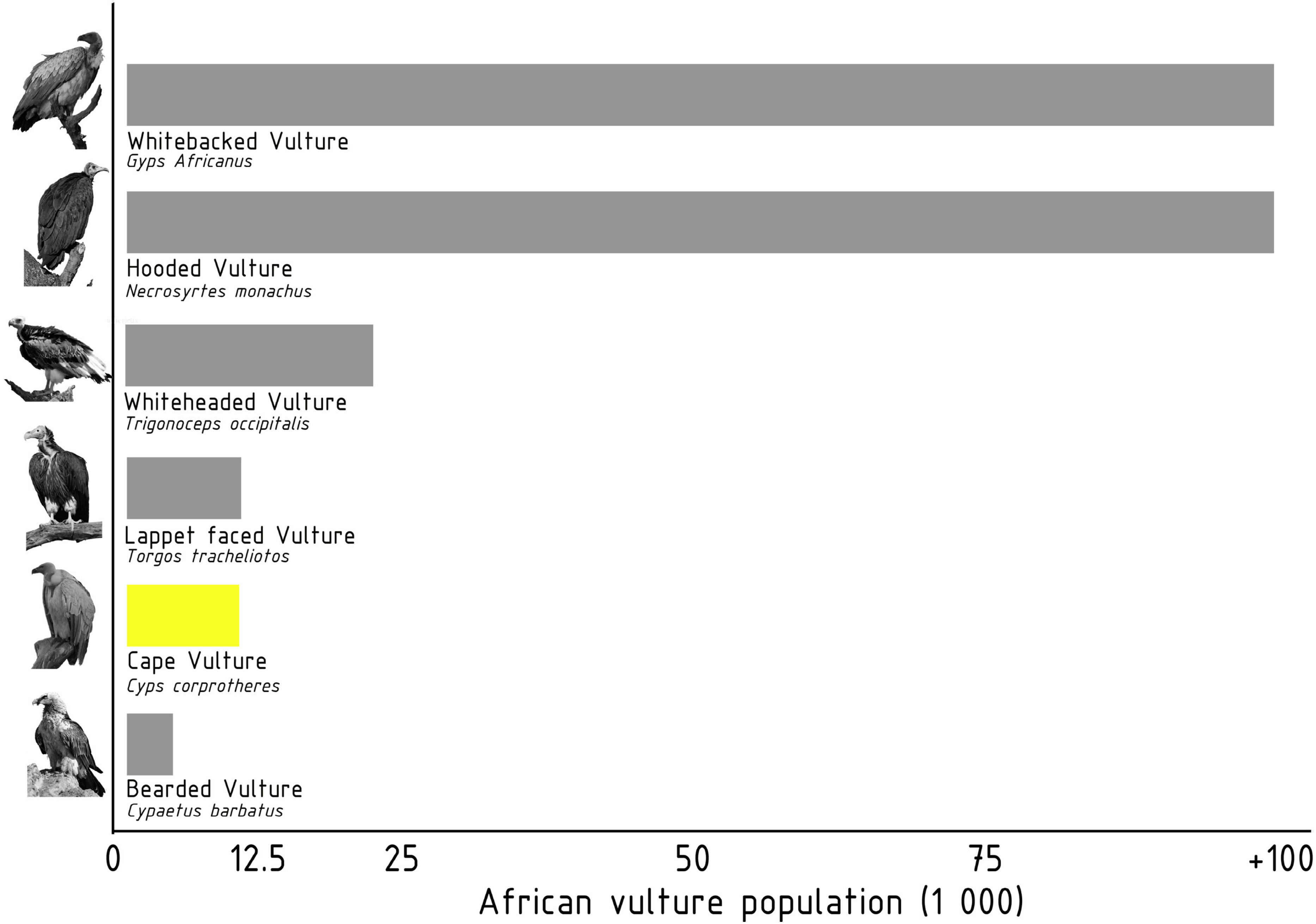
Our Planet is faced with the highest extinction rate since the age of the dinosaurs, to summarize: 1227 bird species are endangered (12%) whilst 41% of amphibians and 26% of mammals are threatened by extinction (Virani, 2017).

Part 1 includes an introduction to the vulture species of Southern Africa and the main reasons for the decline in vulture population elaborating on Cape Vultures. This is followed by situating the project along with the conceptual development and underpinning.

1.1.1 INTRODUCTION TO VULTURES

Southern Africa is home to nine species of vulture, all belonging to the subdivision Old Word vultures. Old World vultures are found on the continents of Africa, Asia and Europe, i.e., the old world and belong to the family Accipitridae which also include eagles and hawks. They are however not related to the similar looking New World vultures that are found in the Americas (Ferguson-Lees, 2001).

Both Old-and New World Vultures are typically characterised as large birds with massive wingspans that feed on the carcasses of dead animals. Their semi-bald necks make them easily identifiable among other birds. Old World vultures really solely on eyesight to find carrion (Ferguson-Lees, 2001). All vulture species in Southern Africa are on the IUCN's Red list for Endangered Species as illustrated in the following graph.


Whitebacked Vulture
Gyps Africanus
Hooded Vulture
Necrosyrtes monachus
Whiteheaded Vulture
Trigonoceps occipitalis
Lappet faced Vulture
Torgos tracheliotos
Cape Vulture
Cyps corprotheres
Bearded Vulture
Cypaetus barbatus
0
12.5
25
50
75
+100
African vulture population (1 000)

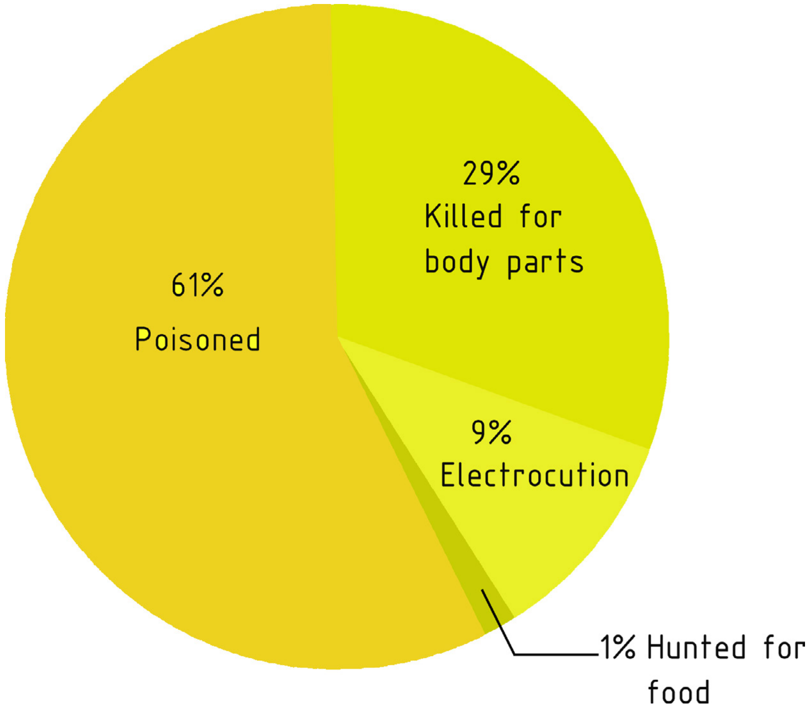


Figure 3 - Vulture deaths per %

1.1.2 POPULATION DECLINE

According to Virani in *The Time to Save Africa's Vultures is Now,* Vulture population numbers are rapidly declining around the world, with inherent biological features such as large body mass, a specialized diet and slow reproduction rate contributing to their demise. External factors like poisoning, vulture trade and electrocution are however far more threating to the birds. . The main reasons for the decline in vulture population are discussed below and illustrated figure 3.

Poisoning.

A carcass that is contaminated with medication, herbicide or pesticides can be lethal to vultures. The contamination can happen when pesticide is applied to a field in which the animal has died or when the carcass is intentionally contaminated to kill other predators, as seen in figure 4. Poachers often poison the carcass of the rhino or elephant intentionally to kill vultures that may attract or alert rangers to the carcass (Mayntz,2019).

African Vulture Trade

Across Africa, vultures are captured and killed for their body parts. The bush-meat trade is the main contributer but vultures are also killed due to traditional beliefs, vulture heads are believed to deliver clairvoyance (Bodin, 2014).

Electrocution

Vultures use electric pylons and other electrical structures to roost on, their massive wingspans do however result in occasional contact with the electric cables. This can cause death to the vulture as well as veld fires resulting from the sparks (Mayntz, 2019)

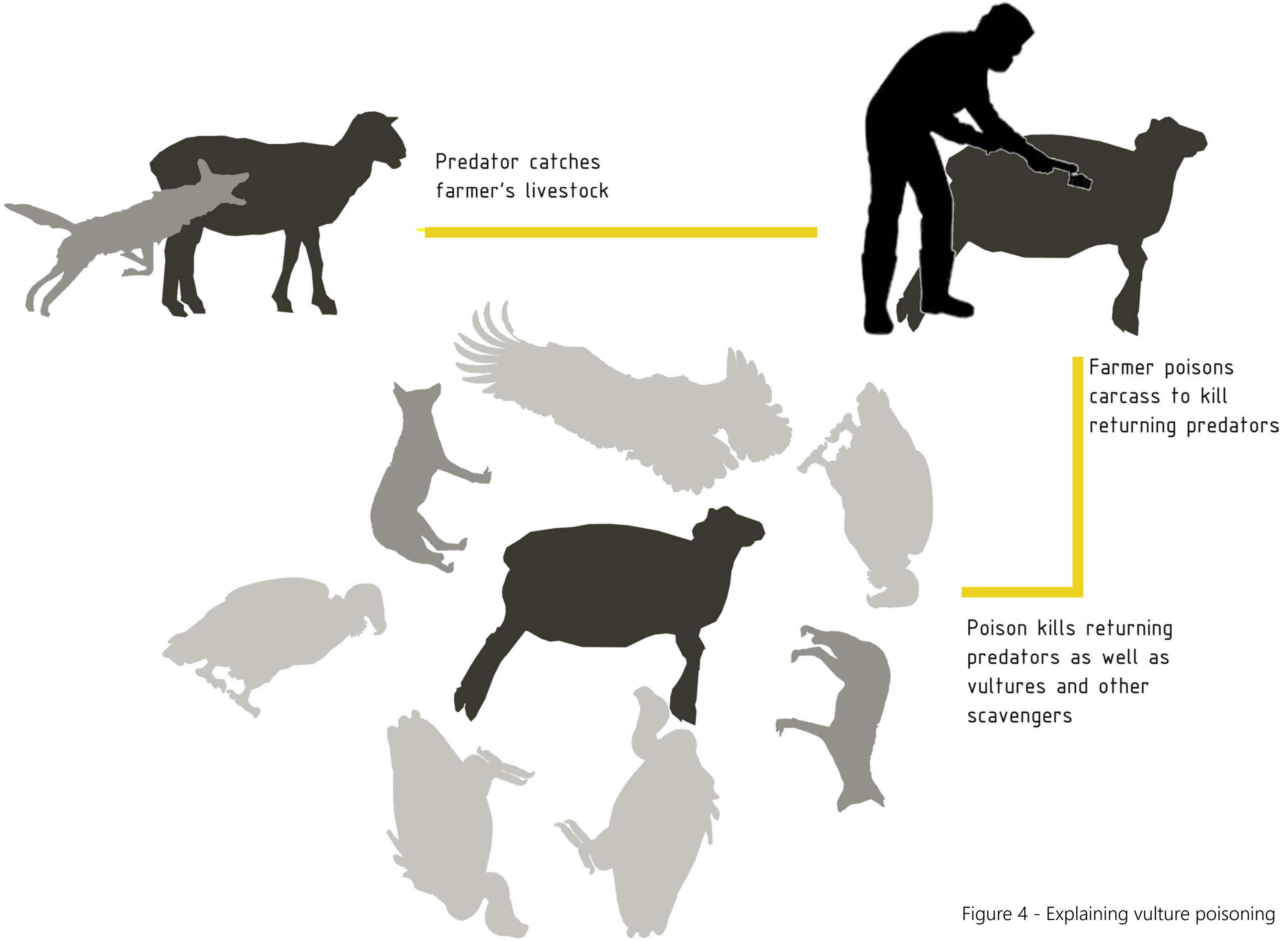


Figure 4 - Explaining vulture poisoning

Figure 5 - Vulture deaths making headlines

1.1.3 CAPE VULTURE
Gyps coprotheres

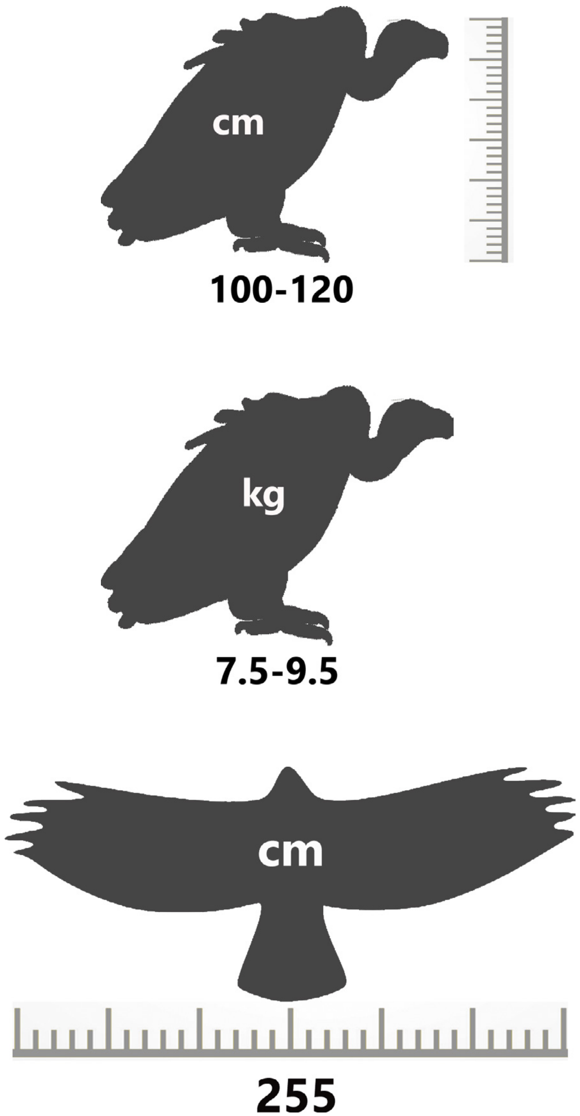


Figure 6 - Cape Vulture Characteristics

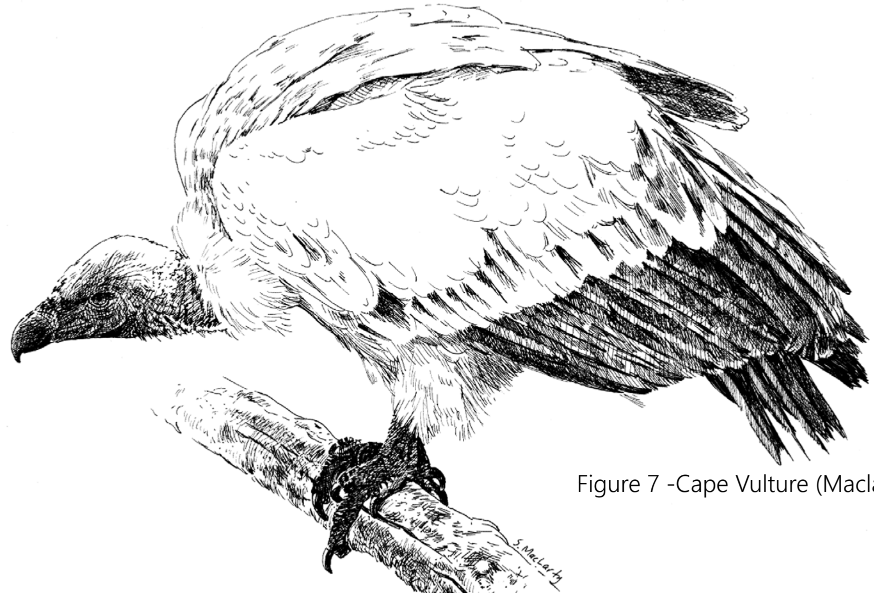


Figure 7 -Cape Vulture (Maclarty, 2005)

Cape Vultures are endemic to Southern Africa and the only vulture with an extended habitat in the Eastern Cape. The sexes appear very similar, with the female being slightly bigger.
Adults have bluish heads and necks that are covered in white hair-like feathers, with a bare face that turns red when excited. Larger ruff feathers surround the base of the neck as well as two bare patches on the chest (Roberts et.el, 2005).
Body feathers of Cape Vultures differ in regions, from off-white in the Western Cape to creamy-white in the Eastern Cape and russet in regions north of Gauteng (Roberts et.el, 2005).
The body feathers contrasts the blackish-brown color of the flight feathers and larger tail feathers, known as rectrices, with dark patches appearing on the greater converts and scapulars as well as black alulas The flight feathers on the underside of the wing are paler than those above, except for the primary feathers,the position of feathers on a wing is illustrated in figure 9. The horn-like bill of Cape Vultures are black as well as their bare legs and feet. Their eyes are Straw-yellow. Juveniles have a darker plumage with brown eyes and pink neck (Roberts et.el, 2005).

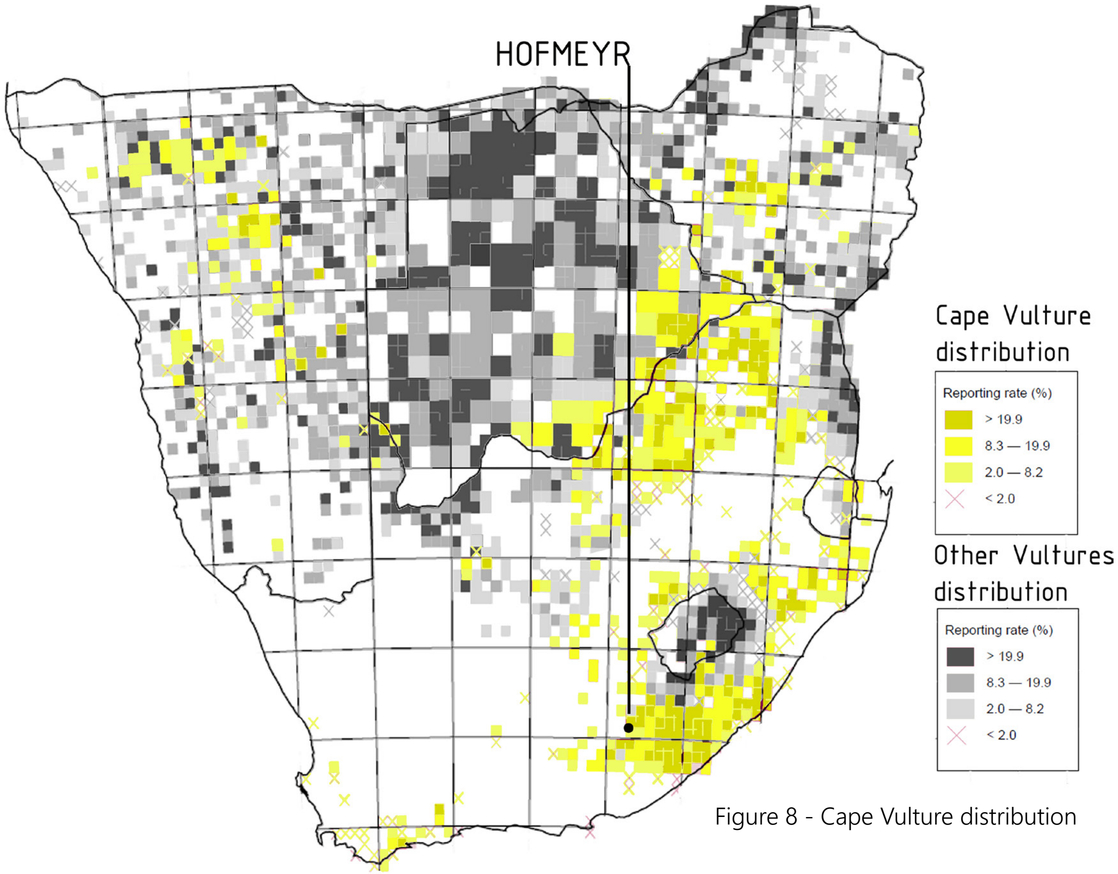


Figure 8 - Cape Vulture distribution

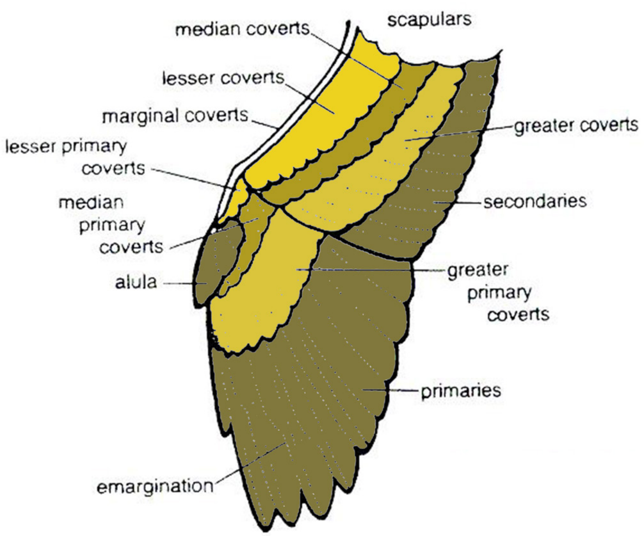


Figure 9 - Wing of Vulture (people.eku.edu, online)

Cape Vultures are found throughout Southern Africa near mountainous regions, in grasslands and savannas. The mountains provide the needed thermal draft that enable these heavy birds the ability of flight whilst the open grasslands provide opportunity for food.
Their distribution range has significantly reduced over the last 100 years with the current estimated area between 55 000- 1,2 million km² (Roberts et.el, 2005). 60% of the 4000 breeding pairs reside north of Gauteng in Botswana and the provinces of Limpopo and North West. 40% in KwaZulu-Natal and the Eastern Cape. Breeding colonies in Swaziland, Namibia, Zimbabwe and Mozambique have gone extinct.
Cape Vultures breed on cliffs in group called colonies between 100 and 250 individuals but can travel up to 750km from the colony during non-breeding season, on these long journeys they roost in smaller group on trees and electric pylons (Roberts et.el, 2005).

1.2 SITUATING INVESTIGATION

An existing breeding colony of Cape Vultures inhabit the cliffs of the Bamboes mountain range near Hofmeyr. This dissertation focuses on the rehabilitation and supplementation of this colony.

The site is located on the slope of the Bamboes mountain Range on the farm Riet Kuil near Hofmeyr in the Eastern Cape. The area forms part of the Eastern Upper section of the Nama Karoo biome (Palmer & Hoffman 1997). The decision of location situates the project in close proximity to the breeding cliffs of a colony of Cape Vultures

No existing infrastructure exists on the site, except a dirt road which is used by the farmer of Riet Kuil to monitor herds of sheep grazing in the mountains. The nearest homestead or village is 6km from the site while the nearest town is approximately 30km away. The isolated nature of the site presents various challenges that is discussed in part 2

Figure 10 - Photograph of cliffs on site (Author, 2019)

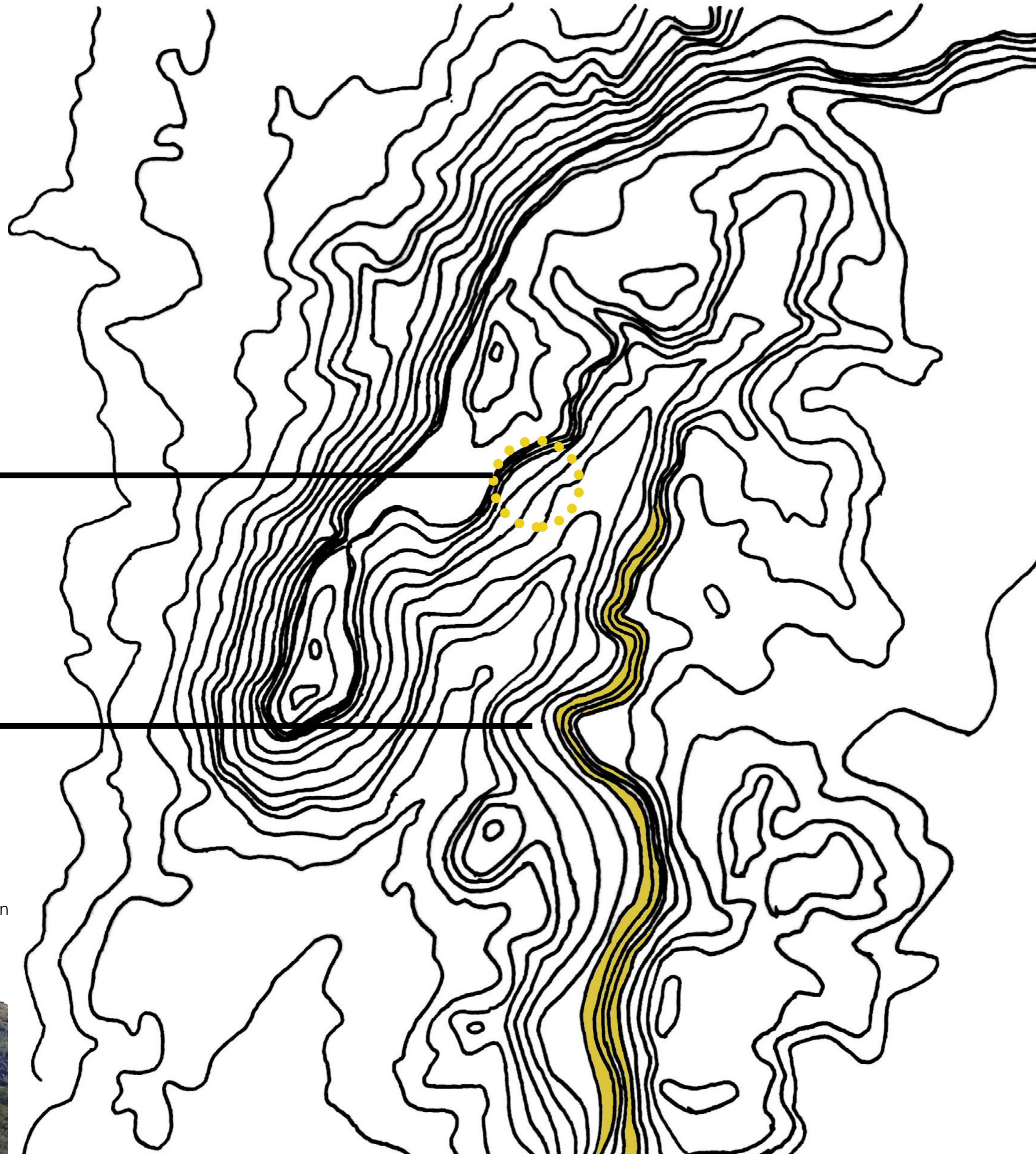


Figure 11 - Proposed site location

1.3 THEORETICAL UNDERPINNING

THE DISSERTATION EXPLORES THE THEORY OF BIOPHILIA AND HOW BIOPHILIC ARCHITECTURAL PRINCIPLES CAN ASSIST IN THE TRANSFORMATION OF MISCONCEPTIONS SURROUNDING VULTURES, ULTIMATELY CONTRIBUTING TO CONSERVATION THROUGH A VULTURE REHABILITATION CENTRE.

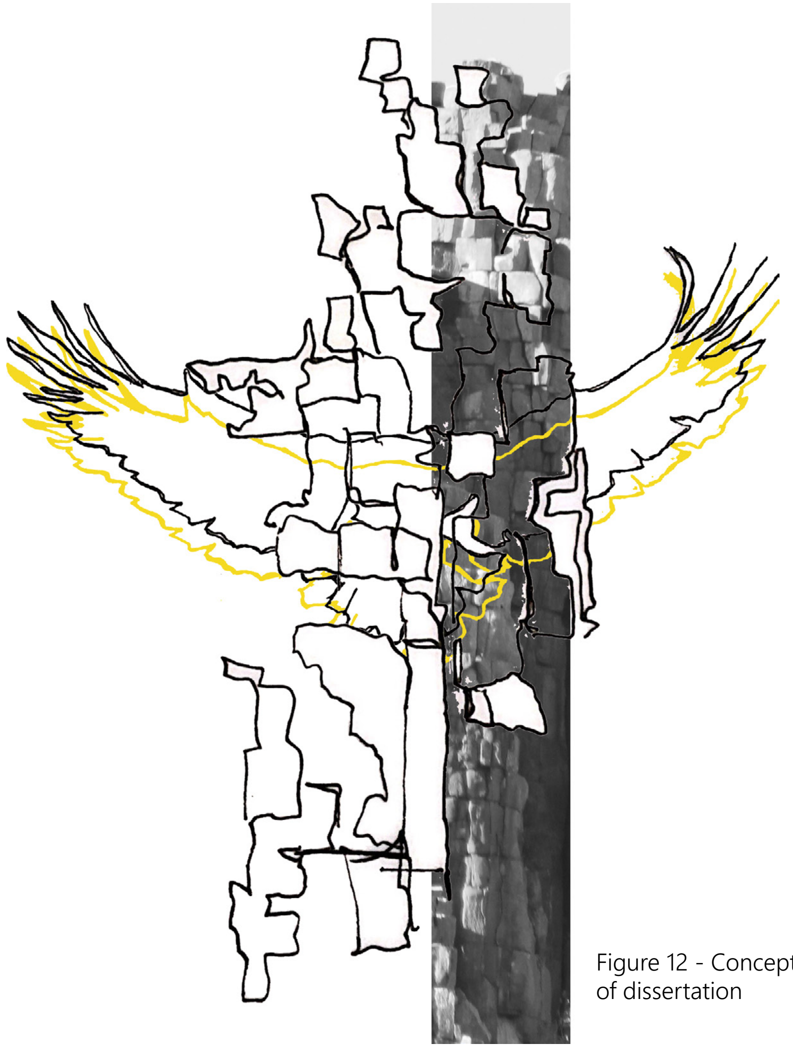


Figure 12 - Conceptual interpretation of dissertation

The following section explains the Biophilia Hypothesis and the misconceptions of vultures. This is necessary to understand the project challenges and aims as well as the conceptual underpinning and development.

Introduction to the Biophilia Hypothesis.
The word biophilia was first used in Anatomy of Human Destructiveness (1973) by psychoanalyst Erich Fromm who described it as “the passionate love of life and of all that is alive”. Edward O. Wilson adapts the meaning to “the innately emotional affiliation of human beings to other living organisms” in Biophilia (1984). This proposed that the love for nature and living things has a genetic basis and can be inherited. In The Biophilia Hypothesis (1993) Wilson suggests that biophilia exists through a process he describes as gene-culture co-evolution, which implies the evolution through natural selection in a cultural context. (Simaika, 2010)Evidence of the hereditary quality of biophilia is anecdotal and circumstantial and cannot be easily tested.

Biophobia and the misunderstood Vulture
Our innate connection with nature is easier understood through the study of biophobia (the fear of nature). Wilson explains this by elaborating on the relationship between humans and snakes in The Biophilia Hypothesis (1993):

- Poisonous snakes kill and cause sickness to mammals throughout the world.
- Apes and monkeys generally combine an innate fear with fascination for snakes. The whole group is alerted to the snake in close vicinity through vocal communication and specific “snake calls” in some species. The group’s attention is firmly fixed on the snake until they or it leaves.
- Humans are genetically hesitant towards snakes and are quick to develop phobias, usually without any negative snake encounters. Other elements in the natural world which provokes phobias include spiders, dogs, heights and running water. The amount of phobias for modern elements such as guns, knives and electric wires can hardly compare.
- True to our primate ancestry, people too are fascinated by snakes. We pay to see them in zoo’s and are common in stories, metaphors, myths and religious symbolism, often portrayed as evil.

Genesis 3: 14 states :
“The LORD God said to the serpent, “Because you have done this, Cursed are you more than all cattle, And more than every beast of the field; On your belly you will go, and dust you will eat all the days of your life”

In Nordic myth evil was represented through the serpent Nidhogg while Medusa is a famous snake-woman of Greek mythology whose gaze could turn life into stone (Geller, 2016).
People dream more about snakes than any other animal, often inspiring mystery and symbolism. Wilson summarizes his explanation of the Biophilia hypothesis as:

“The constant exposure through evolutionary time to the malign influence of snakes, the repeated experience encoded by natural selection as a hereditary aversion and fascination, which in turn is manifested in the dreams and stories of evolving cultures”

Thus snakes have gained an unwanted innate negative connection through evolution: from the primitive need for survival to mythology and religious symbolism. Another animal which has suffered the same fate is the vulture.

Throughout history vultures have carried the burden of being associated with death, carrion, battles and misfortune. Charles Darwin, the father of evolution described them as "disgusting birds that wallow in putridity". The two main physical attributes that cause people to fear and despise vultures are their appearance and their bad smell, from eating rotten flesh. Greek Mythology believed that they are so fond of rotten meat that they would reject meat if it were treated with myrrh (natural resin which was used as perfume). It was even believed that the smell of myrrh was fatal to vultures (Pollard, 1977).

Stratton-Porter suggested in as late as 1909 that vultures must have a bad sense of smell or else they wouldn't be able to bare themselves, she also commented that their sunbathing behaviour was done to air themselves out (Byrd, 2003).

Vultures also aren't particularly loved for their looks, Parmelee stated in *All Birds of the Bible* (1959) that the legend entails vultures refused to protect King Solomon from the sun and as a result is punished by having a naked neck. "They shall feel the heat of the sun, the bite of the wind and the beating of the rain of their necks forever". Leonard Lutwack elaborates in *Birds in Literature* (1994) that cultures considered vultures as evil due to their dark feathers and their uncanny ability to provide physical form to the notion of a death angel.

The Bible provides a few more examples of the bad connotation vultures had in Christianity: Leviticus 11:13 described them as an "abomination among birds". Revelation 19:17-21 states that everybody that disobeys God, all the birds were gorged with their flesh".

This innate negative connection with vultures isn't limited to religion and mythology but also present in pop-culture: In Disney movies vultures usually show up to foreshadow something bad is going to happen. This is evident in Snow White and the Seven Dwarfs where the vultures hover above the evil queen, they then fly down to eat her corpse when she falls to her death. The 1967 horror film,The Vulture, depicts a murderous bird with a human face wreaking havoc in the town of Cornwall.

Much like people's fear for snakes, people have adopted a biophobic approach towards vultures as the birds of death. It is now more important than ever to set aside these misconceptions in order to save the birds who are critically endangered on the International Union for Conservation of Nature's red list. Developing an approach from fear and dislike to biophilia could provide the foundation to the conservation of vultures.

The Extinction of experience hypothesis

Gullone states that although innate biophobia has been proven, it does not provide the framework to assume that biophilia is also a hereditary quality as suggested by Wilson in The Biophilia Hypothesis (1993). Evidence suggests that biophilia can be learned and is experiential, supporting the extinction of experience hypothesis which entails:

People, especially young children have less and less contact with nature, this results in the loss of emotional connectedness with nature and the decline in pro-environmental behaviour and attitudes. Accepting that our relationship with nature is experiential means that biophilia can be learned through lived experience. This bodes well for saving our children from the extinction of experience as well as transforming the misconceptions of vultures. (Katcher & Wilkins, 1993)

Biophilia and Conservation

The Biophilia concept rejects utilitarianism and economic reductionism. It is based on the common ethics, not for any immediate need but for the need of survival and life.

"A conservation ethic of care, respect, and concern for nature was regarded as more likely to emanate from the conviction that in our relationship to the natural world exists the likelihood of achieving a more personally rewarding existence" (Kellert, 1993)

As is suggested our health and well-being provides a far better incentive to the conservation of nature than the realization of wealth and material benefit (Kellert, 1993).

The dissertation explores how architecture which is based on biophilic principles can assist in the conservation of Cape Vultures thus contributing to the transformation of an innate biophobic misconception.

PART 1B
PROBLEM STATEMENTS & AIMS

Figure 13 - Photograph of site (Author, 2019)

1.4 TYPOLOGY

Problem statement & aims

It is essential to note that the essence of the design proposed in this dissertation is the conservation of the Cape Vulture specie. The typology of the project is that of a bird rehabilitation centre. Certain functional requirements are connected to this archetype. The investigation into Vulture rehabilitation centres assisted in determining the client, users and their needs which in turn helped in identifying typological problems, aims and brief of the project.

1.4.1 THE CLIENT

Vulpro is a non-profit organisation situated in Hartebeespoort, Gauteng. The organization adopts a multidisciplinary approach to vulture conservation, where both vultures and society benefits. (Vulpro, online)
Kate Webster is a Vulpro volunteer in the Eastern Cape where she rescues Cape Vultures and sends them of the Vulpro rehabilitation centre in Hartebeespoort, due to the lack of facilities in the Eastern Cape.
This dissertation will provide the needed facilities to assist Kate Webster in rehabilitating the vultures of the Eastern Cape without having to transport them for more than 1000km.

"VulPro combines education and good science, with networking, capacity building and knowledge generation. The veterinary disciplines of toxicology, pharmacology, clinical pathology and medicine are combined with the science of GSM/GPS telemetry and the banking of genetic and DNA resources, with the goal being to positively influence the well-being of our natural resources to ultimately benefit society." (Vulpro, 0nline)

1.4.2 THE USER

The primary function of the centre will be to rehabilitate and supplement the Cape Vulture colony of the Bamboes mountains. Required functions of such a facility are to be incorporated with the needs of both vultures and human staff. The intent is to rehabilitate but also provide a platform where the inherent misconception of the birds can be transformed. The users of the centre are Researchers, bird enthusiasts and conservationists. The centre will also be used as a destination for school field-trips and the general public

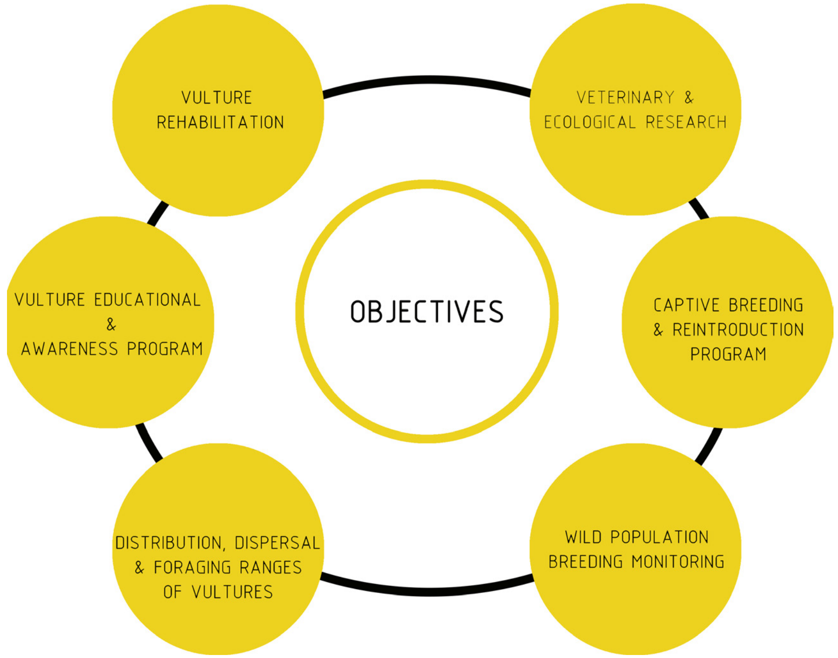


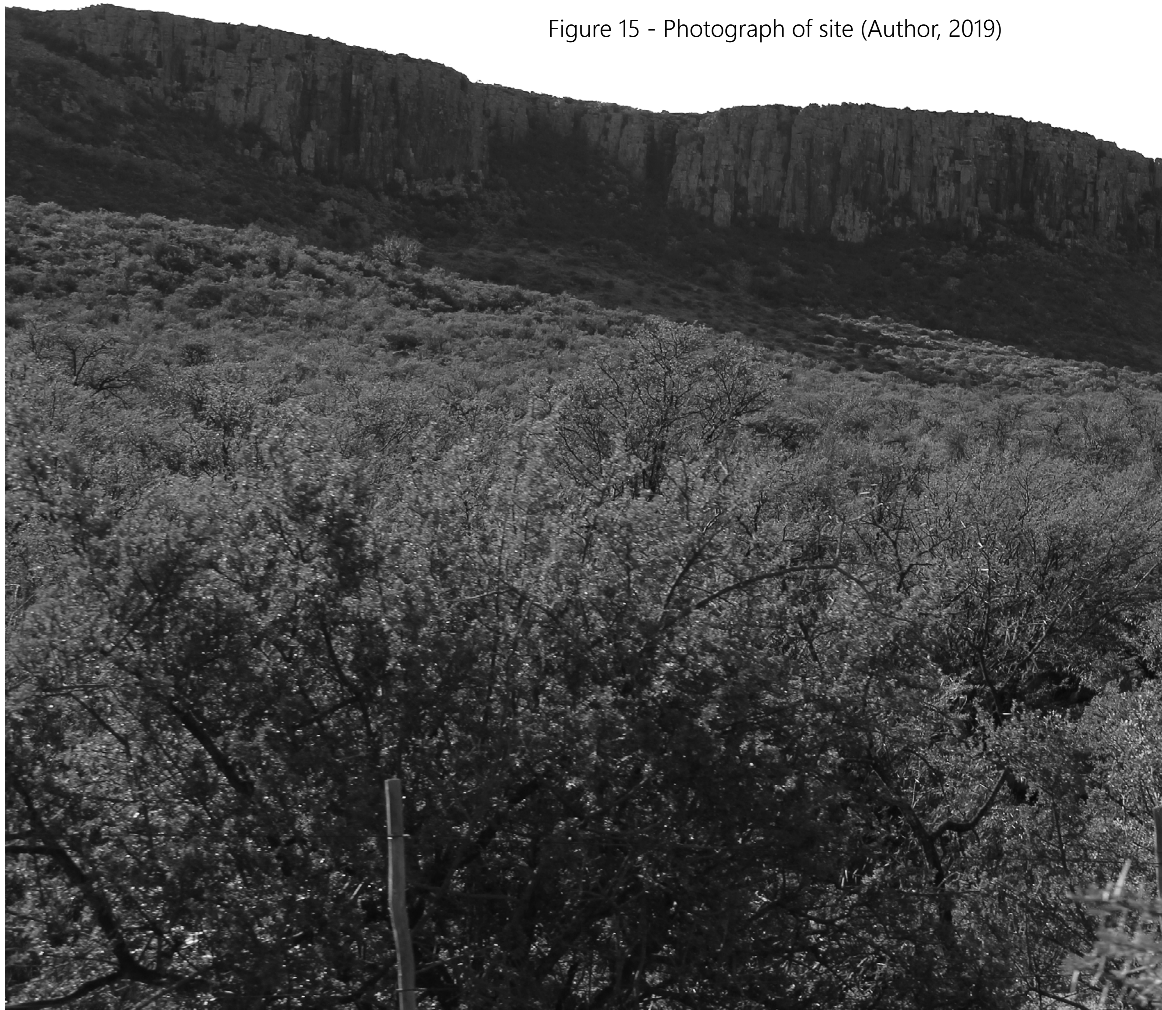
Figure 14 - Objectives of Vulpro

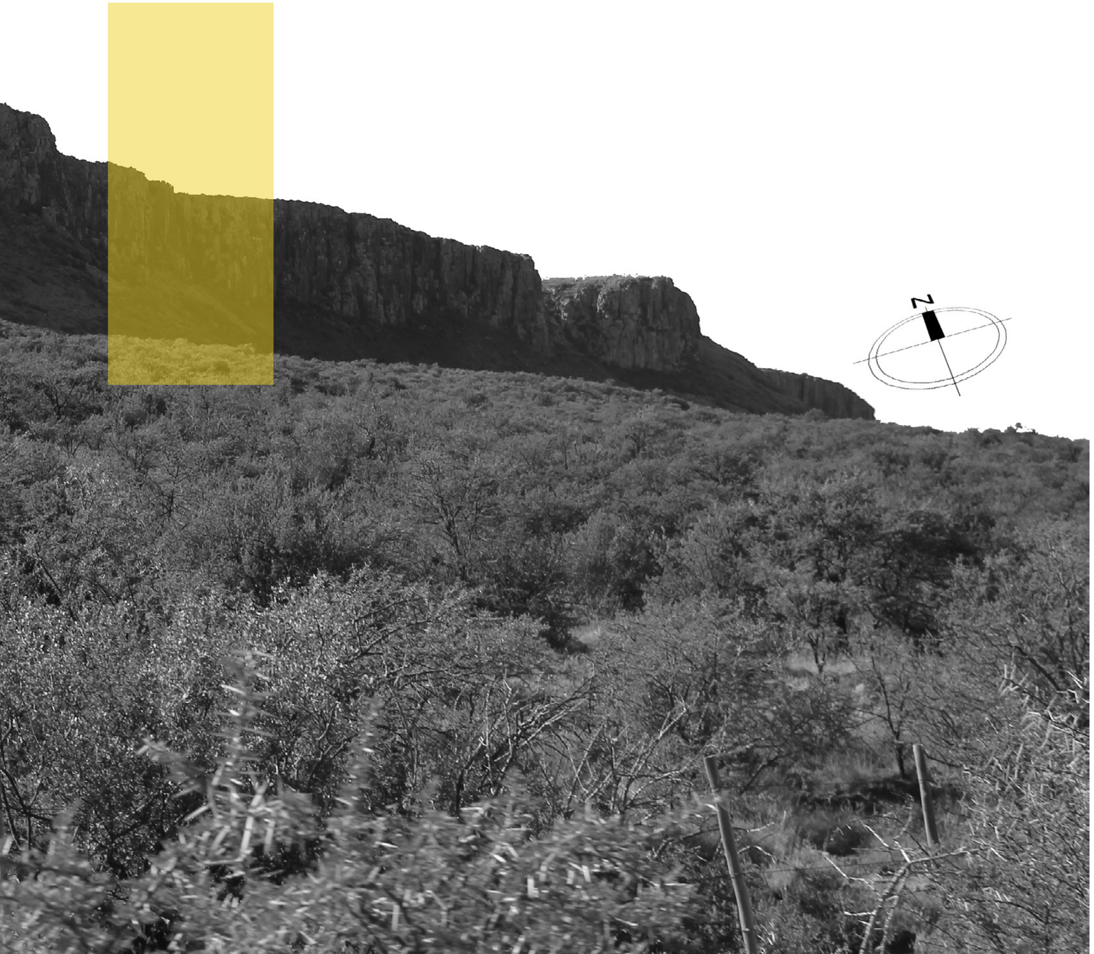
1.4.3 PROBLEM STATEMENT & AIMS

Bird Rehabilitation centres will be investigated as architectural precedents to establish the functional requirements of a typical rehabilitation facility. This provides the challenge of interpreting the information to specifically Cape Vultures. Bird Rehabilitation centres are typically designed with functionality and exhibition as the main contributing factors resulting in architecturally uninspiring buildings. A clear distinction exists between what the public is allowed to see and what not.
The aim of the project is to challenge and reinterpret the typological bird rehabilitation facility whilst adapting the strong objectives and requirements identified by the client, thus not compromising on functional integrity. A centre that is grounded in our connectedness with nature that brings vultures, users and context closer together, promoting conservation.

1.5 TOPOLOGY
Problem statement & aims

Figure 15 - Photograph of site (Author, 2019)





1.5.1 PROBLEM STATEMENT & AIMS

With Cape Vultures breeding on the South Western sides of the cliffs, the decision of positioning the intervention had to be made with minimum disturbance of the breeding colony in mind.
The original decision was to situate the project in the valley between cliffs. This however resulted in a sense of disconnect between the building and the context. The intervention would become invisible in comparison to the massive scale of the landscape.
The decision to move the site closer to the North-Eastern cliffs results in a connectedness between the architecture, birds and nature without disturbing the existing colony on the South-Western cliffs.
The Massive scale of the context dwarfs the intervention. The challenge is to create an intervention that will inevitably disrupt the natural context without disturbing the magic of the place
The project is grounded in our connectedness with nature through our love of life. This entails the love affair of nature, space, landscape and the building. The topological aim is to have a responsible approach to the site, one which does not impose itself on the already imposing landscape.

1.6 MORPHOLOGY

Problem statement & aims

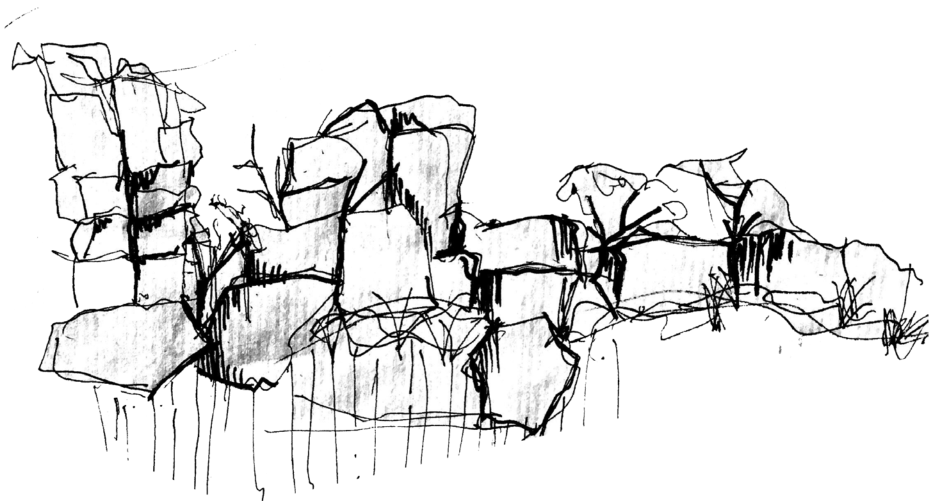


Figure 16 - Drawing of rocks on site

1.6.1 PROBLEM STATEMENT & AIMS

The design of the intervention is based on theoretical research that provides the base for biophilic design and is further discussed in part 2. The landscape also provides inspiration in the morphological composition of the building, referring to the rocks, cliff face, boulders and stones. Analysis of the topology on a cognitive and quantitative level along with theoretical literature on typology and the theoretical approach assist in creating an architectural intervention that realises the intentions of the project.

The site is located in a rural region, where infrastructure and accessibility are limited. This presents challenges regarding the sustainability of the intervention. The design and implementation of self sustaining systems are crucial.

The Greater Karoo vernacular architecture provide indications of how buildings in these rural parts have been built in the past assisting in the challenges presented by the isolated site. Cognitive analysis of the cliffs offer inspiration for the form. The typology of a bird rehabilitation centre consists of distinct archetypes that cannot be ignored. The challenge will however be to reinterpret these typological characteristics in the morphological composition without compromising on functionality and not overpowering the other influences on morphology.

Integrating all the influences on the morphology is crucial to achieve the aims of creating a building rooted in our connection with nature that amalgamates the users, the landscape and the vultures.

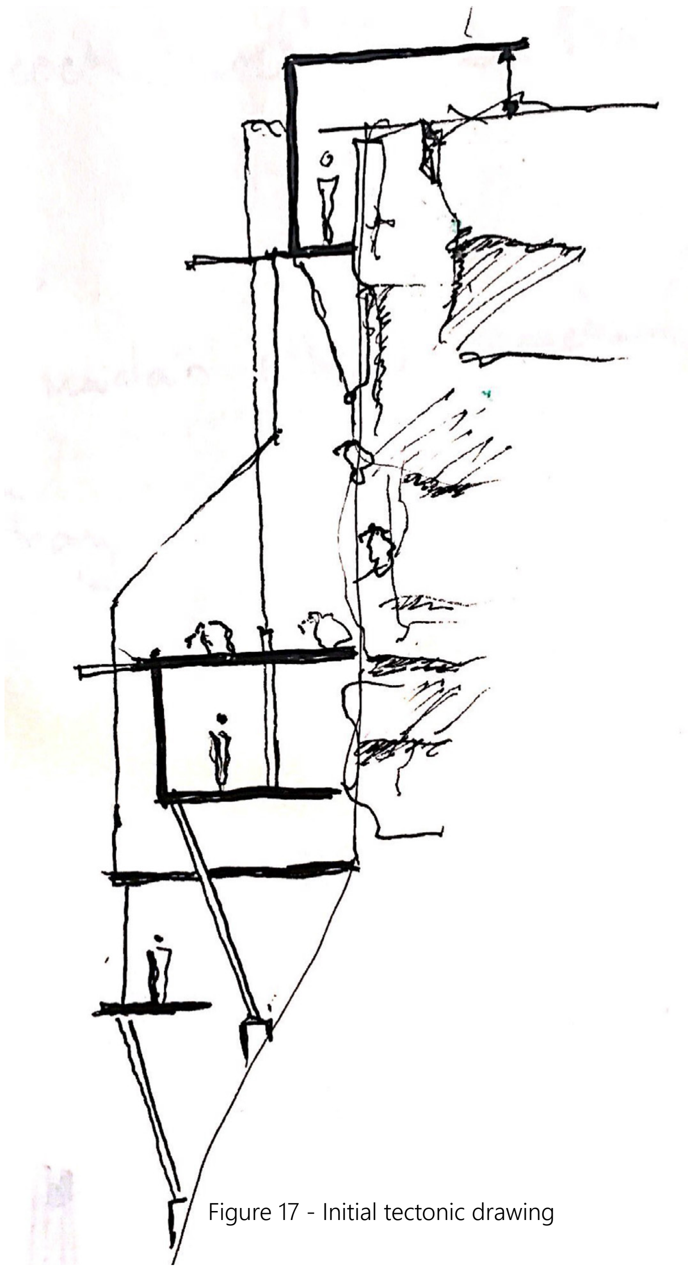


Figure 17 - Initial tectonic drawing

1.7 TECTONICS

Problem statements & aims

1.7.1 PROBLEM STATEMENT & AIMS

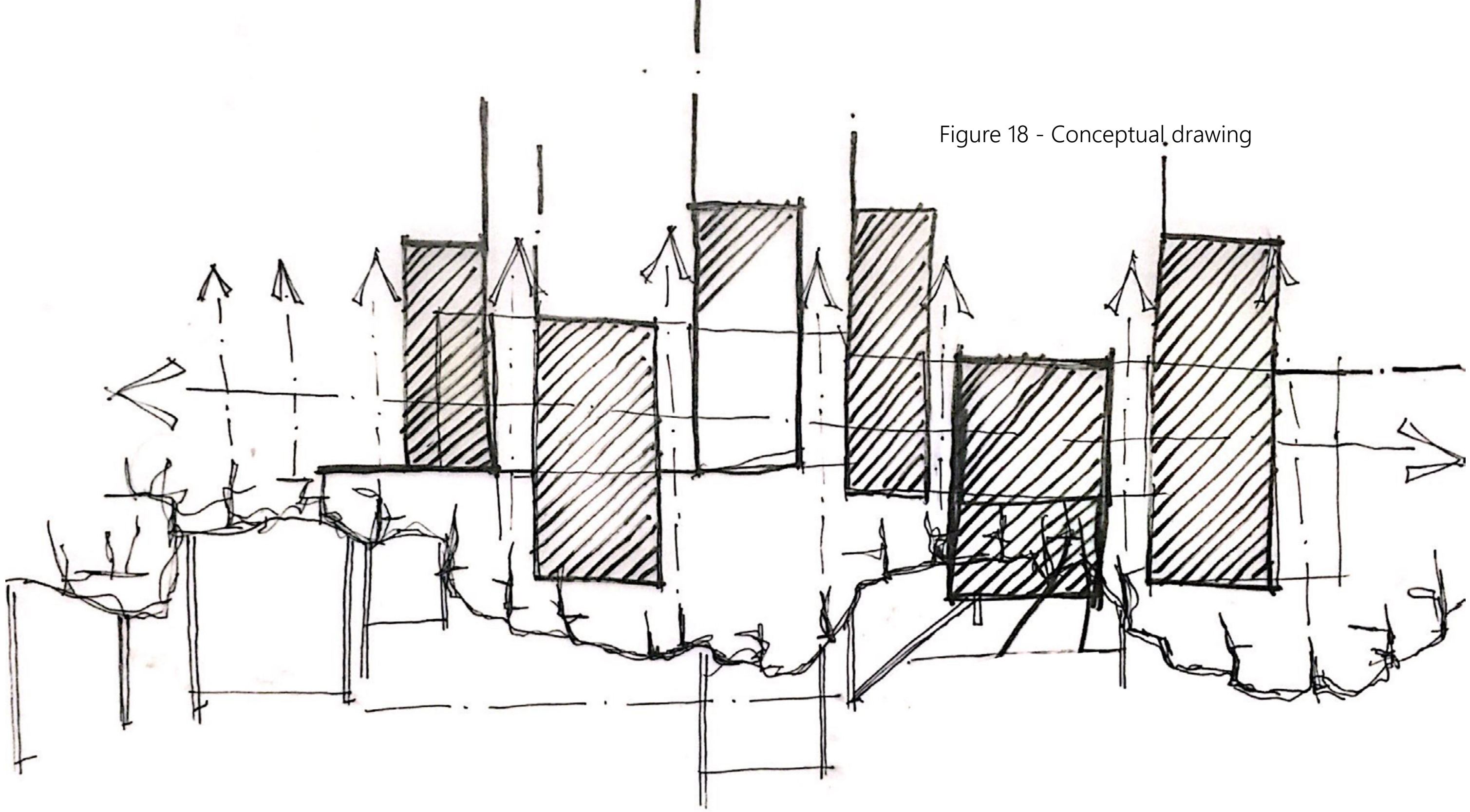
The tectonics of the intervention refers to the way in which the building is constructed.
The theoretical approach of biophilia influences the tectonic investigation along with the extensive analysis of the topology and typology.
The isolated site presents a challenge in the way in which such a project is to be constructed , due to the distance materials would have to travel on difficult terrain to get to site. Clues for the tectonics composition is presented by the theoretical framework and typology analysis. Architectural precedents of interventions in similar rural areas along with critical analysis of the Greater Karoo vernacular architecture provide inspiration of what can realistically be achieved.

1.8 RESEARCH QUESTIONS

The combined goals of the dissertation are to impact the landscape without disturbance whilst:

- Creating a space for the rehabilitation of Cape Vultures in the Bamboes mountain area
- Bringing about awareness for the transformation that will ultimately assist in conservation of Cape Vultures.
- Creating a building in a sensitive manner that does not overpower the landscape.

Figure 18 - Conceptual drawing



How can spaces be created that assist in transforming the misconceptions surrounding vultures?

What are Biophilic architectural principles and how can they contribute to the making of living space?

How can the gestalt of the landscape influence the architecture?

How can the typology of bird rehabilitation centres be reinterpreted?

How can the theory of Biophilia and the architectural principles thereof assist in the transformation of the misconceptions surrounding vultures, ultimately contributing to conservation of vultures in the Karoo through a vulture rehabilitation centre?

PART 2
EXPLORATION & GROUNDING

Figure 19 -Photograph of carcass near Hofmeyr (Author, 2019)


CONCEPTUAL DEVELOPMENT
BIOPHILIC PRINCIPLES OF ARCHITECTURE
DESIGN CONCEPTS
TOPOLOGY
TYPOLOGY
MORTHOLOGY
TECTONICS

2.1CONCEPTUAL DEVELOPMENT

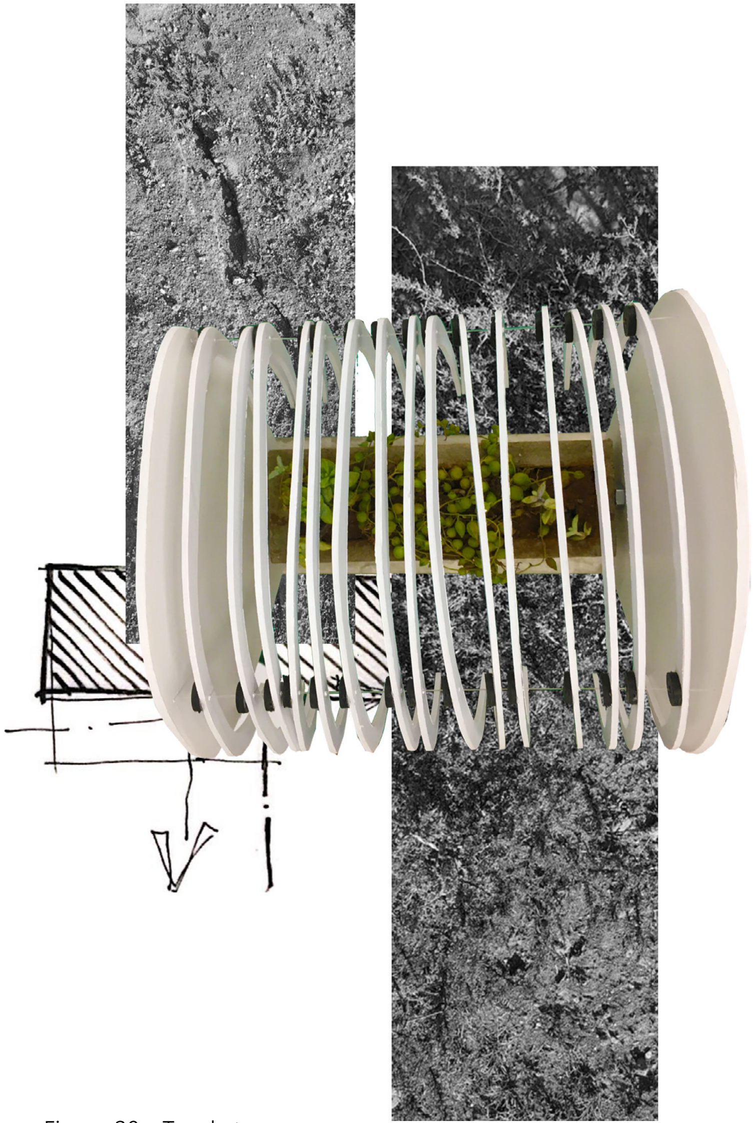
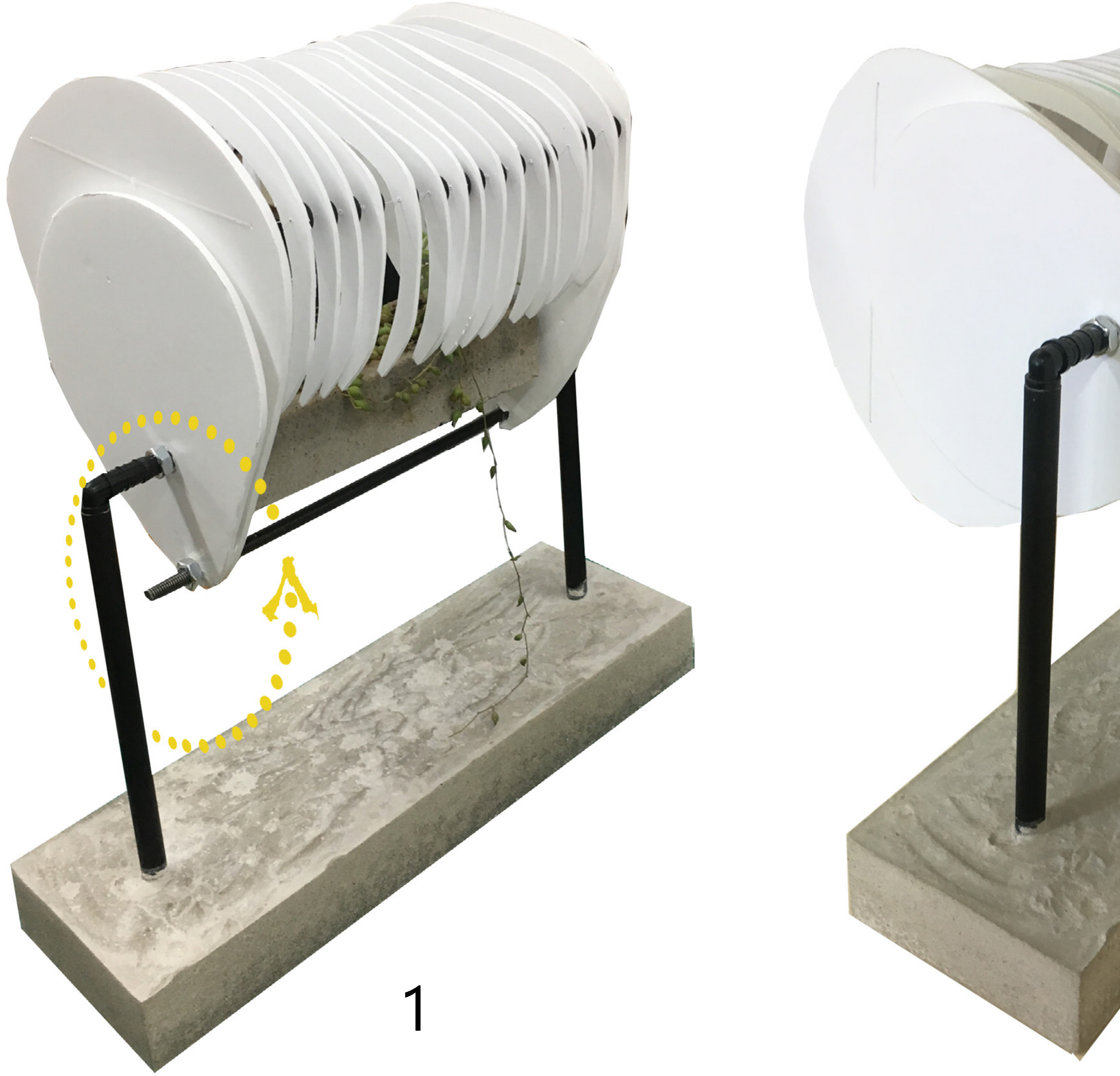


Figure 20 - Touchstone

2.1.1TOUCHSTONE



The oxford dictionary describes a touchstone as “something that provides a standard against which other things are compared and/ or judged”. It is also defined as a quintessential or fundamental part of something (Merriam-Webster, 2019). In this investigation an architectural touchstone was developed to assist in illustrating the core essence of the project.

Figure 21 - Touchstone

The touchstone attempts to demonstrate the potential transformation the dissertation envisions. A small planter box representing life is positioned underneath a rotating device that is a representation of death, relating to the carcass of a dead animal. The carcass is rotated 360° to reveal the planter box. The rotating action illustrates the conservation goal of the project in figure 1.

Cape Vultures are on the brink of extinction, represented by the carcass. Through conservation efforts (rotating action) hope can be given to these birds, represented by the revealing planter box.

The main theoretical approach of Biophilia and the transformation of vulture misconceptions is manifested in the touchstone. The carcass covering the plants is interpreted as vulture’s connotation with death. The design (rotating action) hopes to inspire the alteration of the biophobic connection to one that reflects biophilia.

The touchstone attempts to demonstrate the transitory nature of life, from death comes life and vice versa.

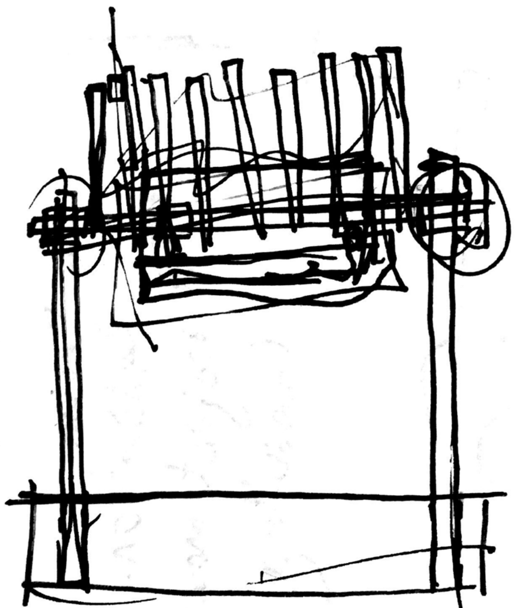


Figure 22 - Touchstone drawing

2.2BIOPHILIC PRINCIPLES IN ARCHITECTURE.

Stephen Kellert translates the biophilia hypothesis into architectural principles in Biophilic Design: The Theory, Science & Practice of Bringing Buildings to Life (2004). More than 70 principles are identified to evoke a biophilic experience. The principles are divided in three categories: Nature in space, Nature analogues and Nature of the space (Browning, 2014)
The concepts explored are based on principles form these three categories.

2.2.1NATURE IN SPACE

Implies the direct or physical presence on nature within a space. The nature is not only limited to plants but may also include, animals, sound, breeze or other elements (Browning, 2014). Nature in Space is achieved by creating direct connections with these natural elements through 7 principles:

Visual connection with nature

Non-visual connection with nature

Non-Rhythmic sensory stimuli

Thermal & airflow variability

Presence of water

Dynamic & diffuse light.

Connections with natural systems

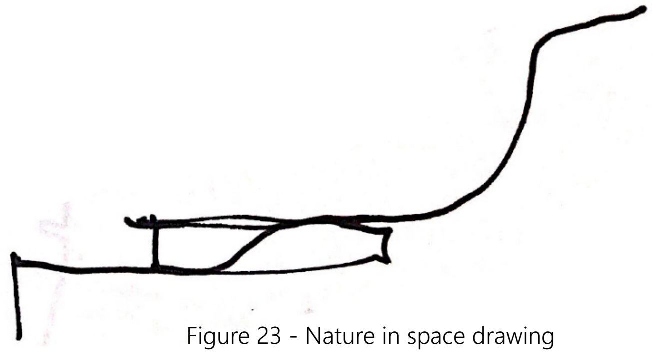


Figure 23 - Nature in space drawing

2.2.2NATURAL ANALOGUES

Includes the recreation of the imaginative evocations of nature. Colours, patterns and objects from nature are expressed in furniture, artworks or ornamentation in architecture. Natural materials such as granite counter tops and timber planks provide an indirect connection with nature yet are only representations of the materials in their natural state (Browning, 2014). Principles of Natural analogues are:

Biomorphic forms & patterns

Material connection with nature

Complexity & order.

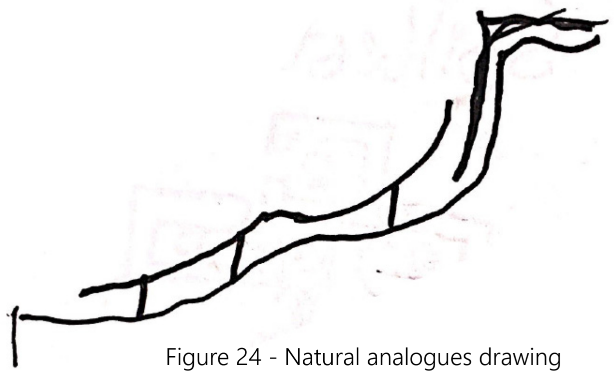


Figure 24 - Natural analogues drawing

2.2.3NATURE OF THE SPACE

Implies nature's spatial configurations. Humans are fascinated by the unknown and dangerous. Nature of the Space addresses our desire to find out that which is not in our immediate surroundings. Including revelatory moments and obscured views (Browning, 2014). Principles of Nature of the space include:

Prospect

Refuge

Mystery

Risk/Peril

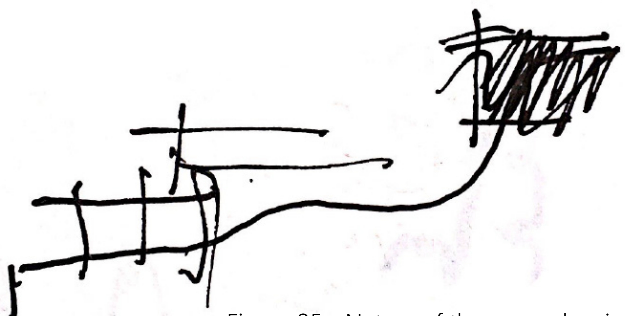


Figure 25 - Nature of the space drawing

2.3.1DESIGN CONCEPT

01

Three formative conceptual ideas were generated supported by the three categories of biophilic design. Concept 1 is based on Nature in space and investigates certain principles thereof:

Visual connection with nature:

Based on the necessity of a view towards natural processes and elements of nature. Browning describes it as grabbing one's attention while being calming and stimulating. Visual connection with nature results in the reduction of stress levels (Browning, 2014). Research on visual preferences indicates looking down on a slope with natural biodiversity being the preferred view. Key considerations of creating a strong visual connection with nature include:

- Prioritizing nature in its natural state to simulated nature.
- Prioritizing biodiversity in nature to quantity.
- Natural elements to be visually accessed at least 20 minutes a day.
- Designing spatial layouts to complement the views of nature.

(Browning, 2014)

Connections with natural systems.

The awareness of natural processes, including the temporal and seasonal changes of a healthy ecosystem. Browning describes the experience as being relaxing and enlightening. Experiencing natural processes creates a perceptual shift in the understanding of what is experienced (Kellert, 2008). The purpose of this principle is to heighten the awareness of natural processes and encourage the care of natural ecosystems. Key considerations of creating strong connections natural systems include:

- Integrating a sustainable approach for example rainwater catchment that is reused in the intervention.
- Designing for interactive opportunities.
- Incorporating natural materials that are subject to change.

This principles involves a strong temporal element.

- (Browning, 2014)

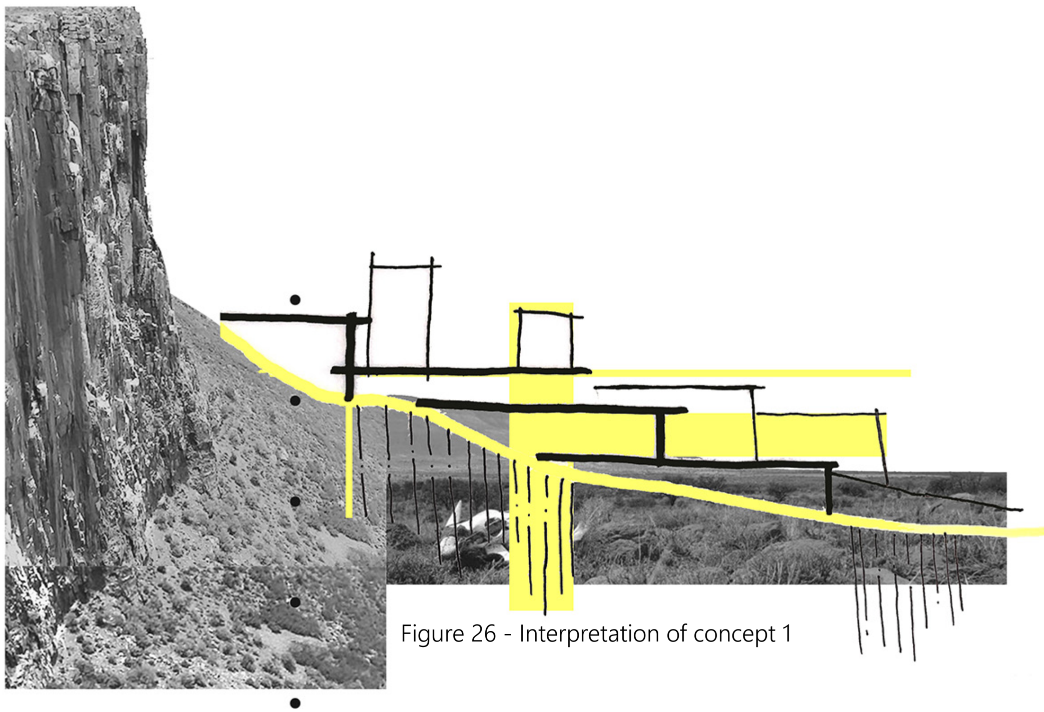


Figure 26 - Interpretation of concept 1

Concept 1 is based on Nature in space and the elements of visual connection and the connection with natural systems. How these principles can be applied in the specific site to allow the building to be sensitively positioned without overpowering the landscape. The essence of the concept is to converge space and nature. Bringing nature into the space, not creating space on nature.

Figure 27 - Concept 1 model

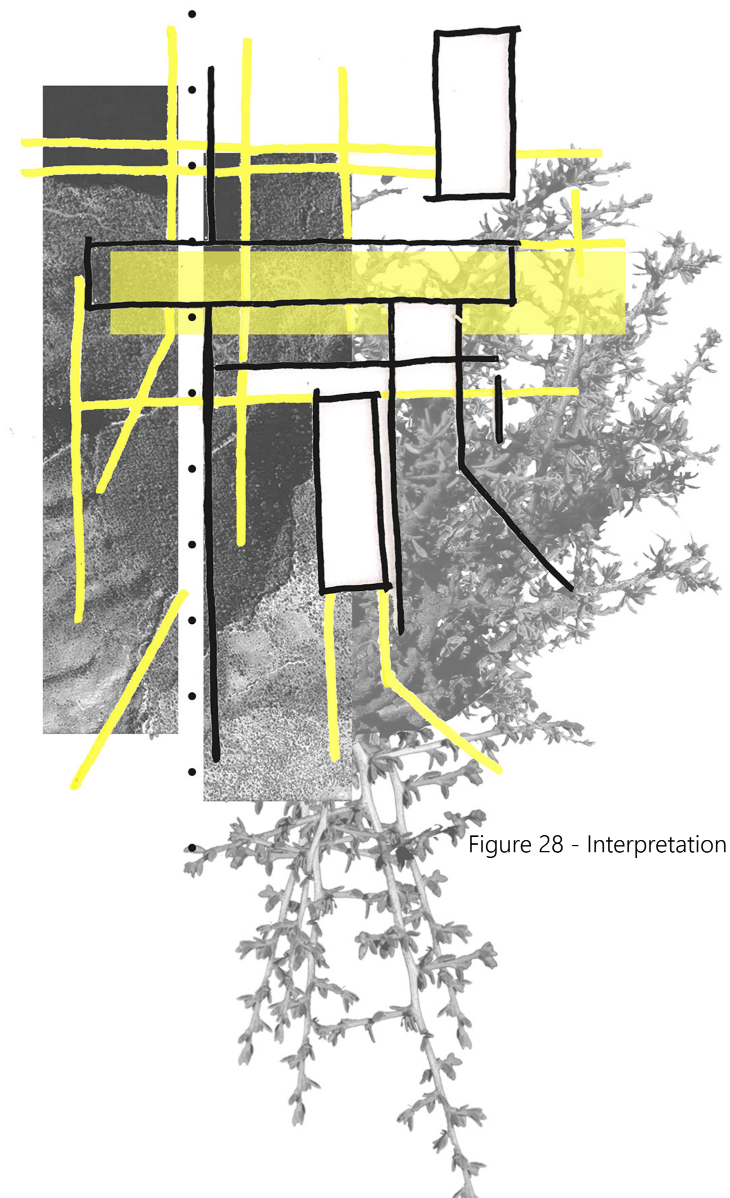


Figure 28 - Interpretation of concept 1

2.3.2DESIGN CONCEPT

02

Concept 2 is based on Natural Analogues and certain elements thereof:

Biomorphic forms & patterns.

Symbolic references to patterns, textures or object that occur in nature. Browning describes the experience of this principles as captivating and absorptive. Humans tend to describe biomorphic forms as representations of life even though we know they aren't living things (Vessel, 2012). The purpose of biomorphic forms & patterns are to provide a cognitive connection experience that allow people to formulate a representational connection with nature. Key considerations of implementing biomorphic forms include:

- Applying of ,multiple dimensions to increase frequency of interaction
- Avoiding the overuse of thereof that may result in visual toxicity
- Introducing the principles early in the design process of the intervention.

(Browning, 2014)

Material connection with nature

Materials from nature that represent the local topology, geology and ecology, creating a distinct sense of place. Browning describes the experience as authentic and warm. The purpose of implementing natural materials is to evoke a cognitive and physiological connection to the place (Browning, 2014). Although materials are processed and altered from their natural state, the product such as timber planks and granite countertops remain analogues of their natural state and able to evoke a cognitive experience of place. Key considerations of implementing natural materials include:

- Colour and quantity of material should be specifically determined for the functionality of the space.
- Minimal processing of materials. Real materials are preferred to synthetically produced ones.

(Browning, 2014)

Figure 29 - Interpretation of concept 2

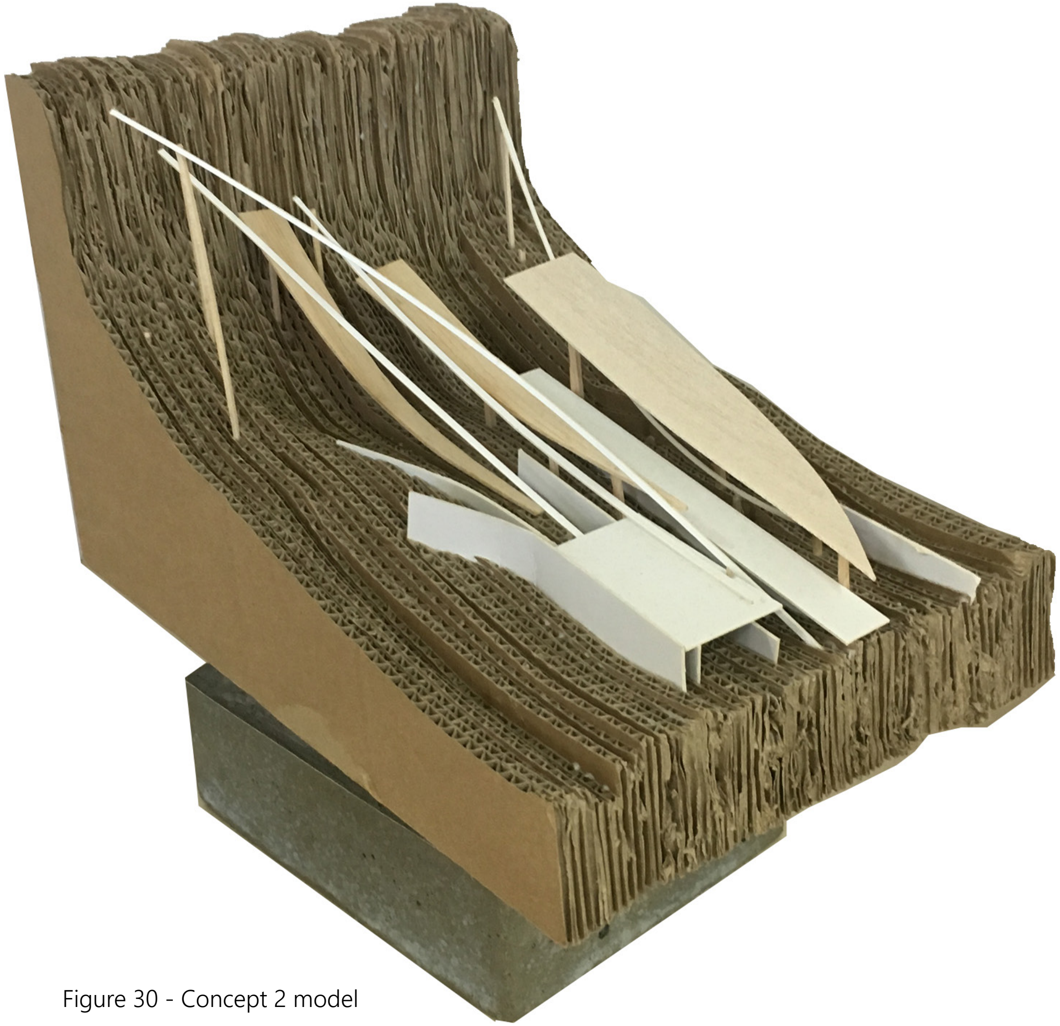


Figure 30 - Concept 2 model

Concept 2 is based on Natural analogues and the elements of biomorphic forms and material connection with nature. The thermal drafts used by vultures to gain height in flight is interpreted as biomorphic architectural concepts. The model attempts to capture this sense of ascending/ lines of flight on the landscape.

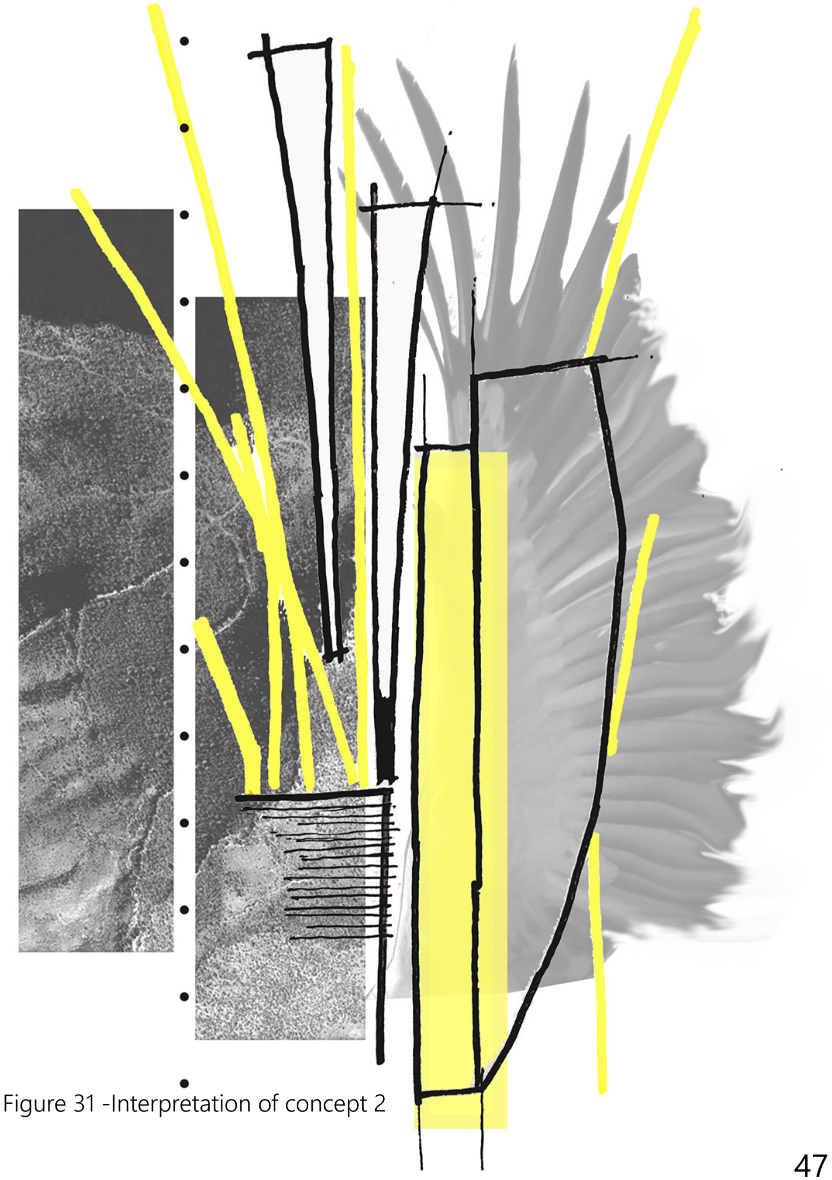


Figure 31 -Interpretation of concept 2

2.3.3DESIGN CONCEPT

03

Concept 3 is based on Nature of the space and certain prospects thereof.

Prospect

Implies the unimpeded view over a distance or something. Browning describes the experience as freeing with a sense of safety in unfamiliar environments. The purpose of the principle is to enable the user to visually survey the immediate environment for opportunity and danger. Prospect in the landscape is characterised as the unimpeded view form an elevated position. Interior prospect however does also exist and implies the view from one space to another (Browning, 2014). Key considerations for incorporating prospect are:

- Orientating the building to optimize visual connections.
- Design with or around the natural ecosystems on site, assists in enhancing the richness of the prospect view.
- Situating windows and opening to assist in creating prospect.

(Browning, 2014)

Risk

An identifiable threat connected with a sense of safety. Browning describes the experience as exhilarating, dangerous and intriguing. Risk is triggered by a biophobic response of imminent danger. The difference between risk and fear is the sense of control and safety presented by risk (Rapee, 1997). Controllable risk results the release of dopamine and the experiences of pleasure (Browning, 2014). The purpose of risk is to draw attention and evoke a cognitive experience of curiosity (Browning, 2014). Key considerations of including risk in the design are:

- Risk designs are deliberate and will thus not be applicable to all users.
- The element of safety protects the user from actual harm, without reducing the risk experience.

(Browning, 2014)

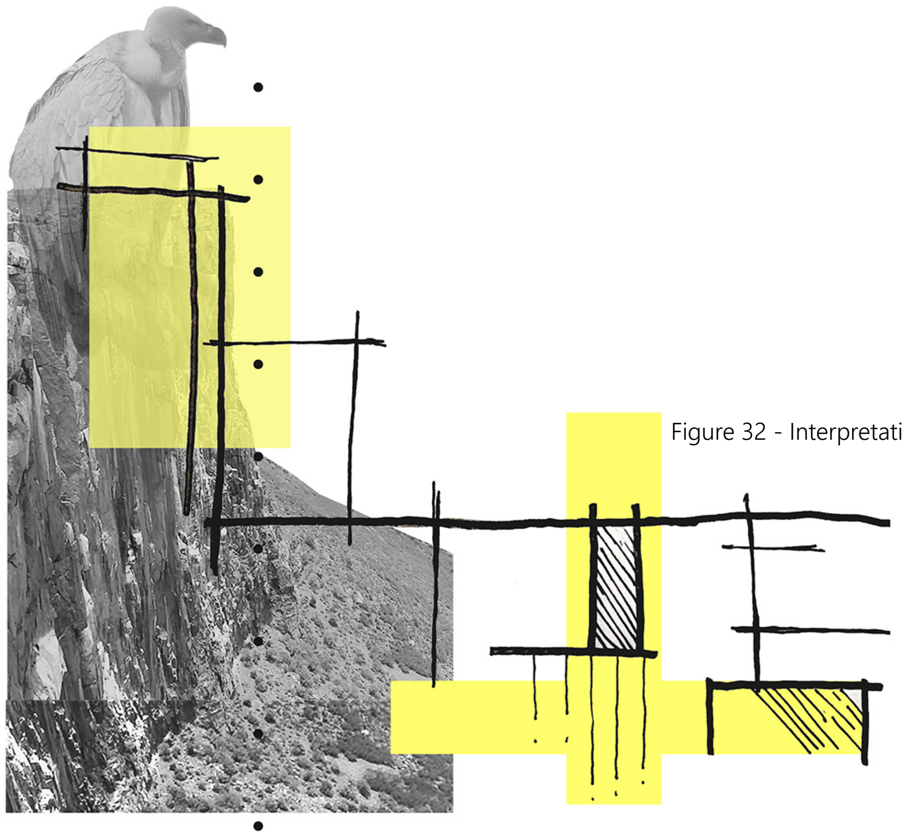


Figure 32 - Interpretation of concept 3

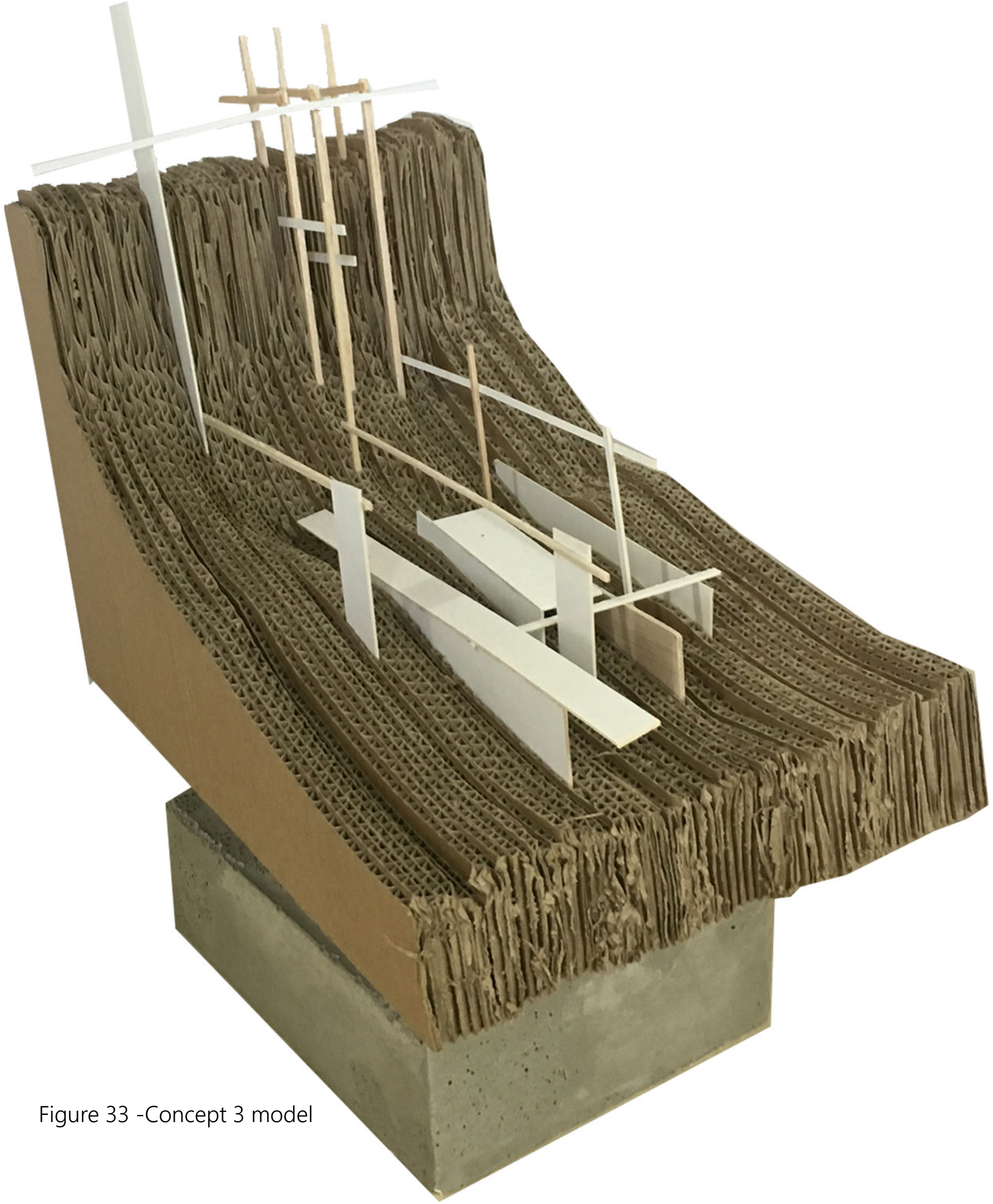


Figure 33 -Concept 3 model

Concept 3 is based on Nature of the space and the elements of prospect and risk. The Cape Vulture's visual reliance on finding food is represented architecturally in the concept. How vultures are reliant on both the cliffs and the valley to breed and find food respectively. The concepts attempts to establish a connection between the cliffs and the valley, creating prospect between the two. The sense of risk is evoked through this connection, implying that architecture will be built on the cliff face.

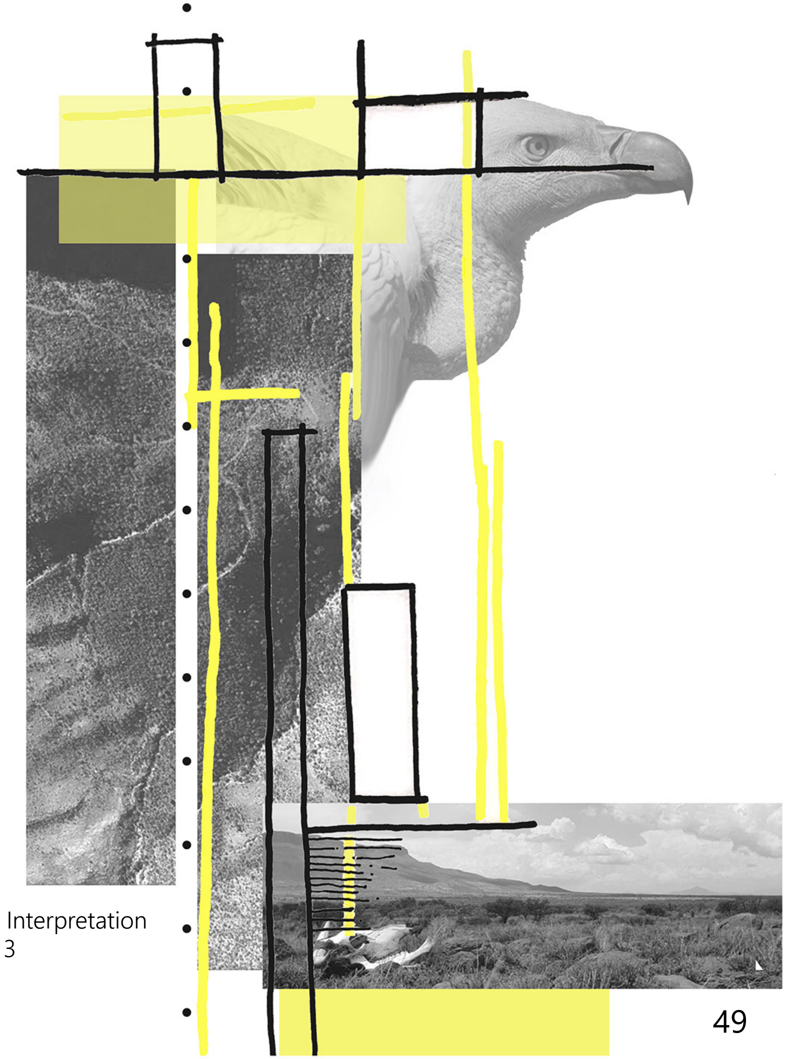


Figure 34 - Interpretation of concept 3

2.3.4CONCEPTUAL FRAMEWORK

The overall aim of the dissertation is to investigate the how biophilia can assist in the transformation of misconceptions, ultimately leading to conservation. The biophilic architectural principles explained are grounded in the theoretical underpinning explained in part 1. The interpretation of these principles through the three concepts provide the conceptual framework to the design process and addressing the problems and challenges identified. An approach that is rooted in our connectedness with nature. Not one specific concept was chosen to initiate the design process but rather the amalgamation of all three. It is important to note the principles of biophilic design are reinterpreted in the design, along with the theoretical concepts of transience.

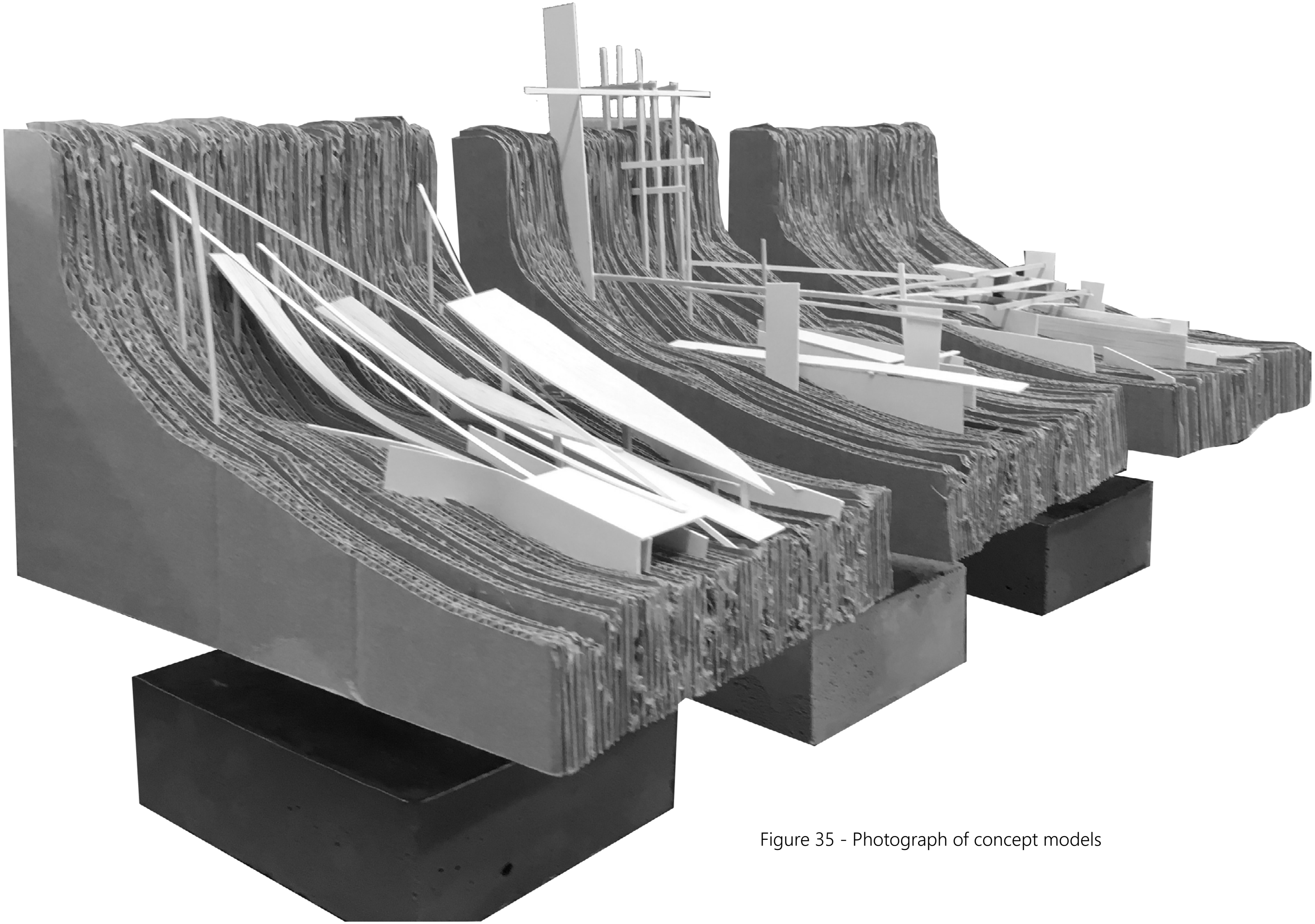


Figure 35 - Photograph of concept models

2.4 TOPOLOGY
analysing the site

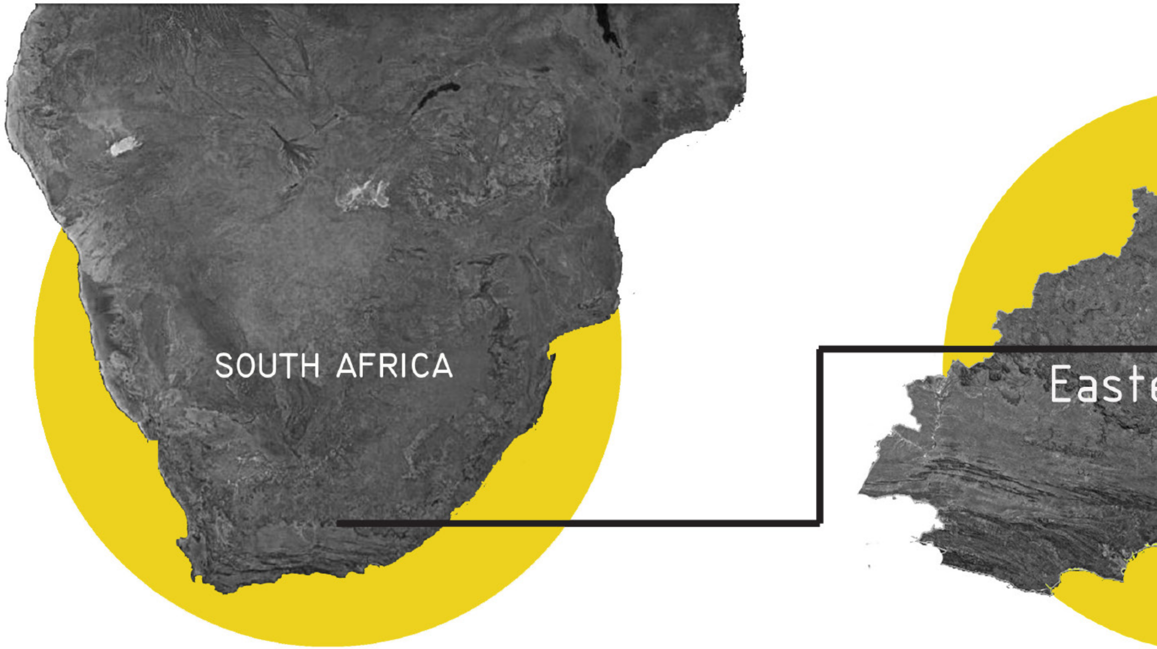


Figure 36 - Locating the site

ern Cape
Chris Hani District
Hofmeyr

2.4.1MACRO ANALYSIS

Exploring the greater context

THE NAMA KAROO

The Nama Karoo biome is located on the western central plateau of South Africa.
Dwarf shrubs and grasses dominate the ground covering of this biome, their abundance dictated by rainfall and soil conditions increasing aridity results in increasing shrubs and decreasing grasses from the western part of the biome to the east, where the site is located (Palmer & Hoffman 1997) Annual rainfall increases from west to east and ranges between 100-500mm.(Palmer & Hoffman 1997

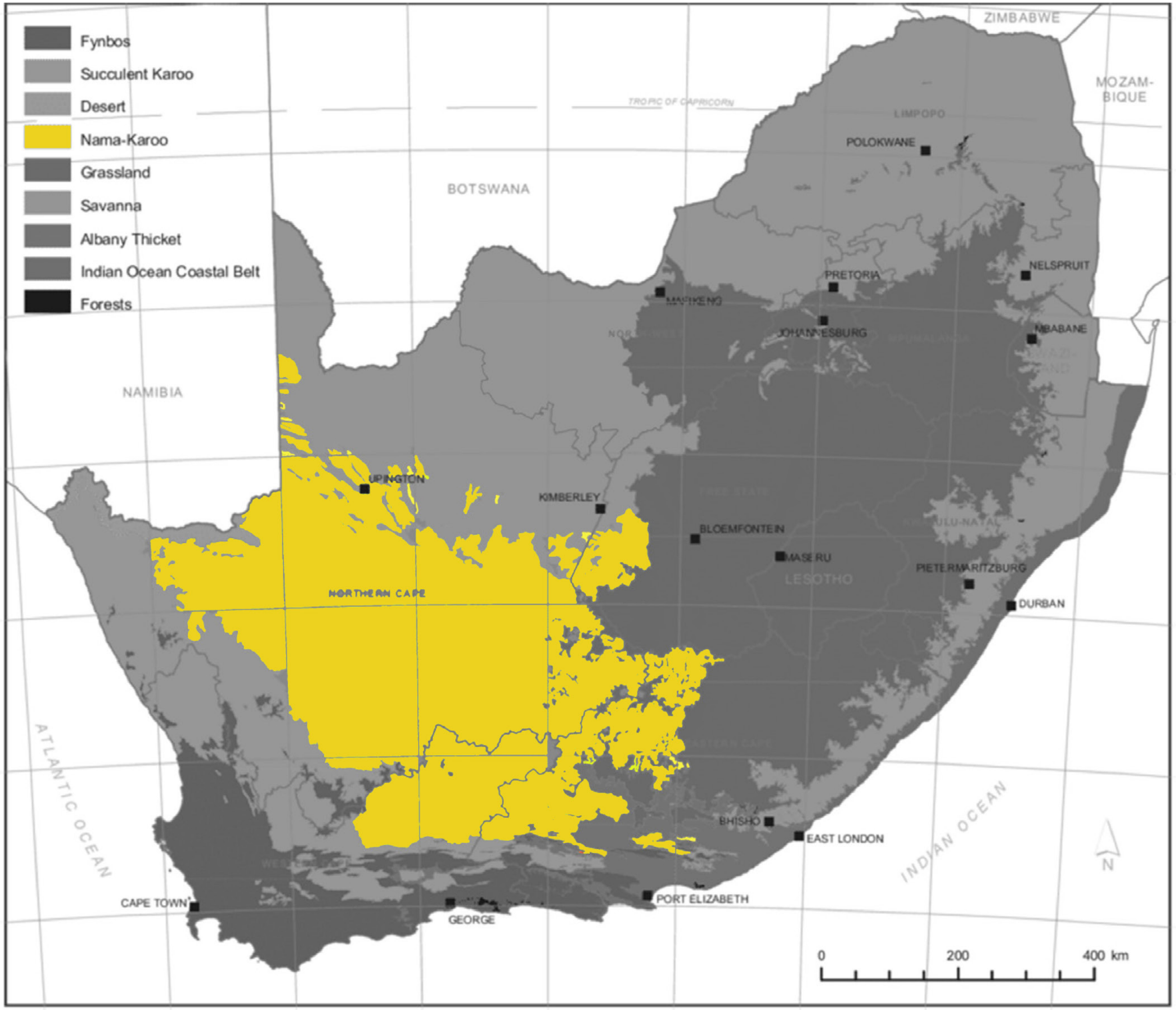
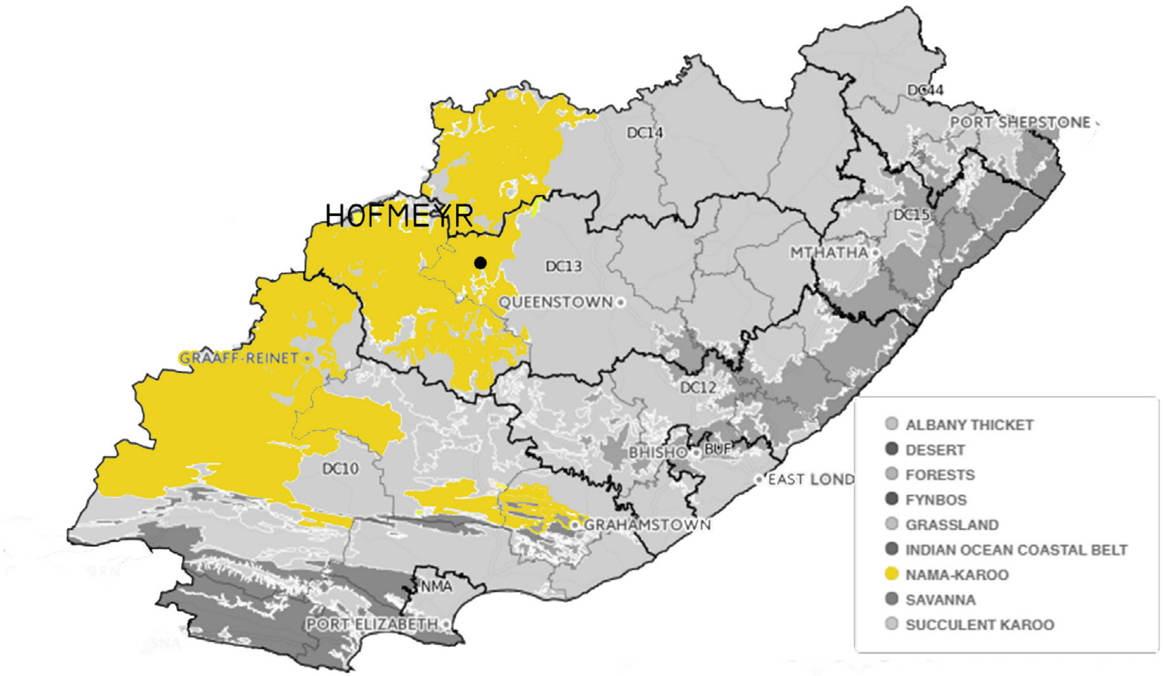


Figure 37 - Nama karoo biome, not to scale

Figure 38 -Nama karoo biome in Eastern Cape
not to scale



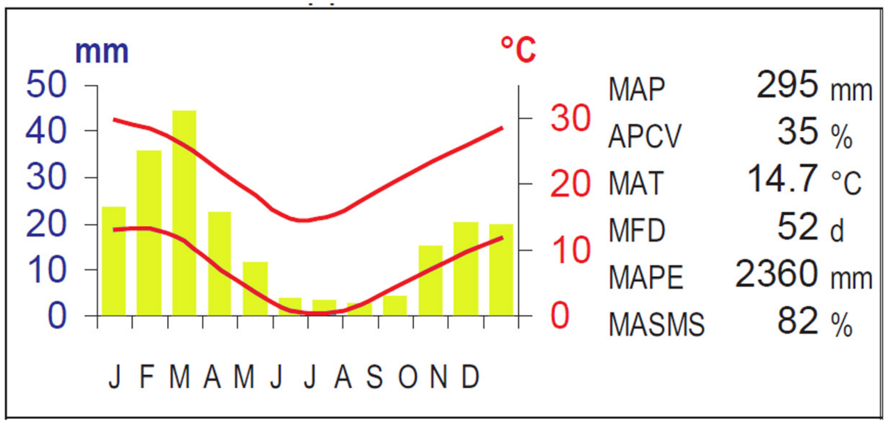


Figure 39 -Hofmeyr rainfall (Rutherford, 2006)

EASTERN UPPER NAMA-KAROO

The site is situated in the Eastern Upper Karoo section of the Nama-Karoo biome. This region is characterised by flats and gently sloping plains dominated by dwarf microphyllus shrubland that are intersected by Besemkaree Koppies. (Rutherford et.el,2006)

Rainfall mainly occurs during late summer and autumn, peaking in March and increases from 180mm annual rainfall in the West to 430mm in the East. (Rutherford et.el,2006)

Figure 40 -Site & surrounding towns
not to scale

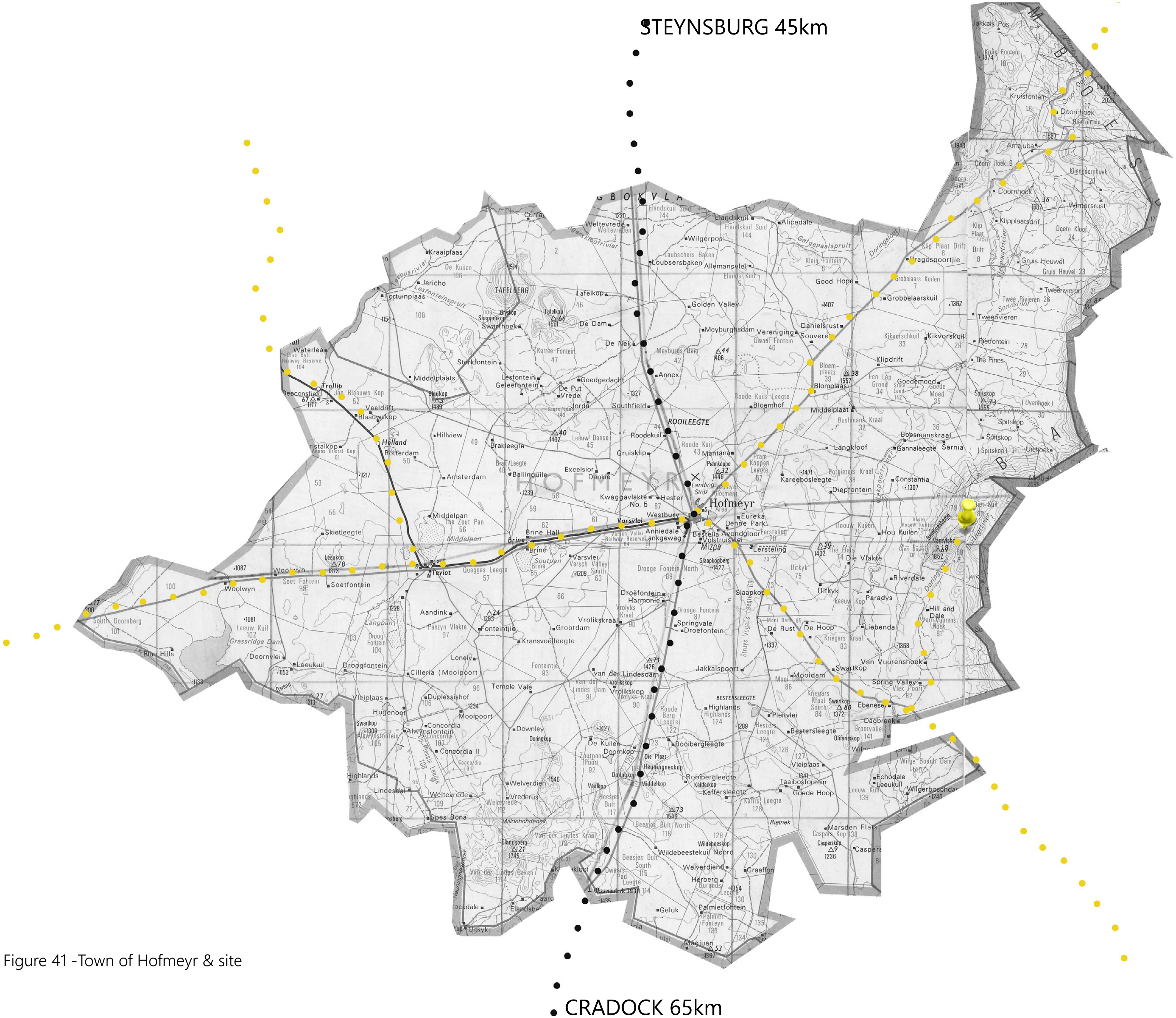


Figure 41 -Town of Hofmeyr & site

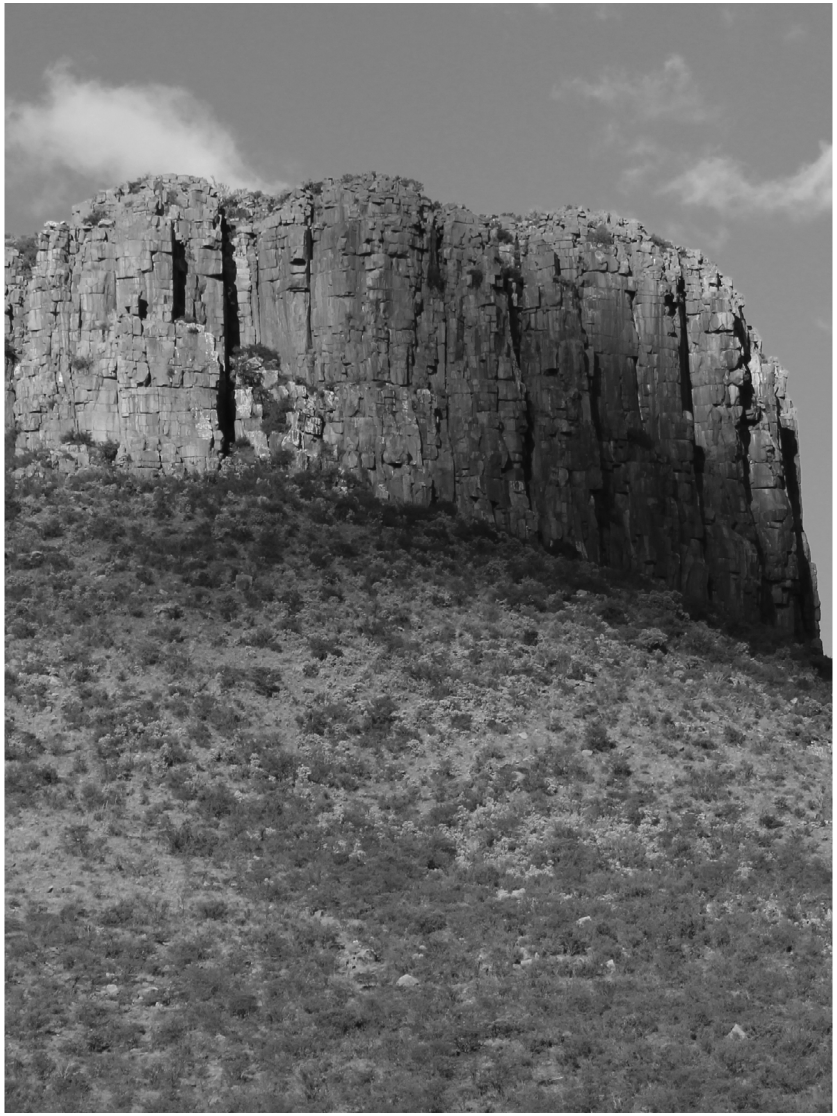
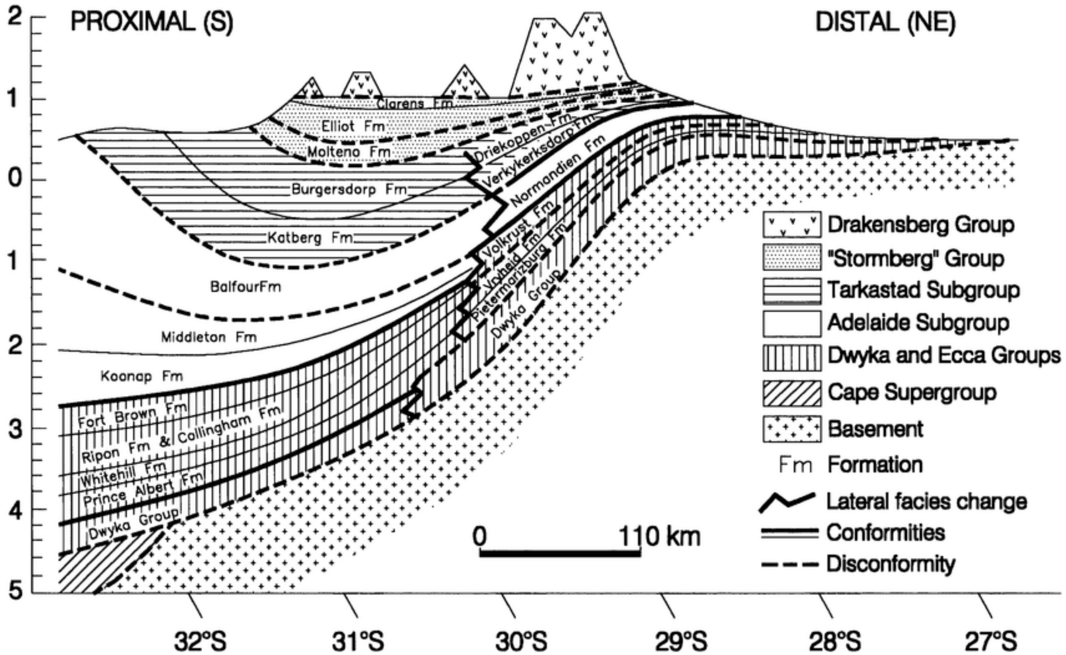


Figure 42 - Photograph of rock formation on site (Author, 2019)

GEOLOGY

The region generally consists of lime rich soils underlayed by the Ecca, Beaufort and Dwyka formations which created the Karoo Supergroup. The region of Hofmeyr primarily consists Of the Tarkastad Subgroup which together with the Adelaide Subgroup create the Beaufort Group.(Smith et.el 1993) Dolerite ridges and cliffs are common in this subgroup.
The Tarkastad Subgroup is characterised by the presence of both sandstone and mudstone. Dolerite sills and dikes protect these softer shales of the Tarkastad subgroup from erosion. (Smith et.el 1993)

Figure 43 - Formation of the Karoo Supergroup (Smith, 1993)



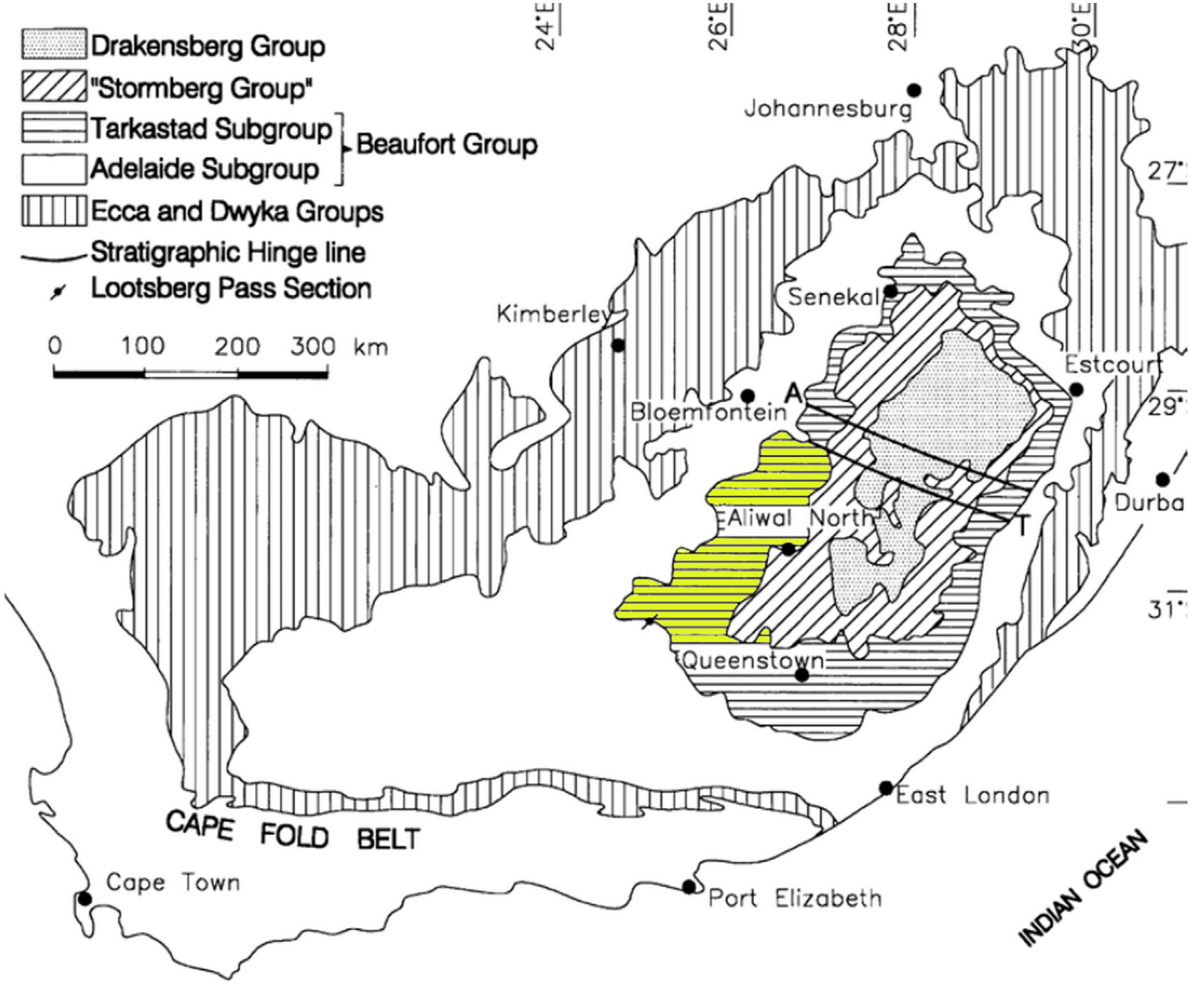


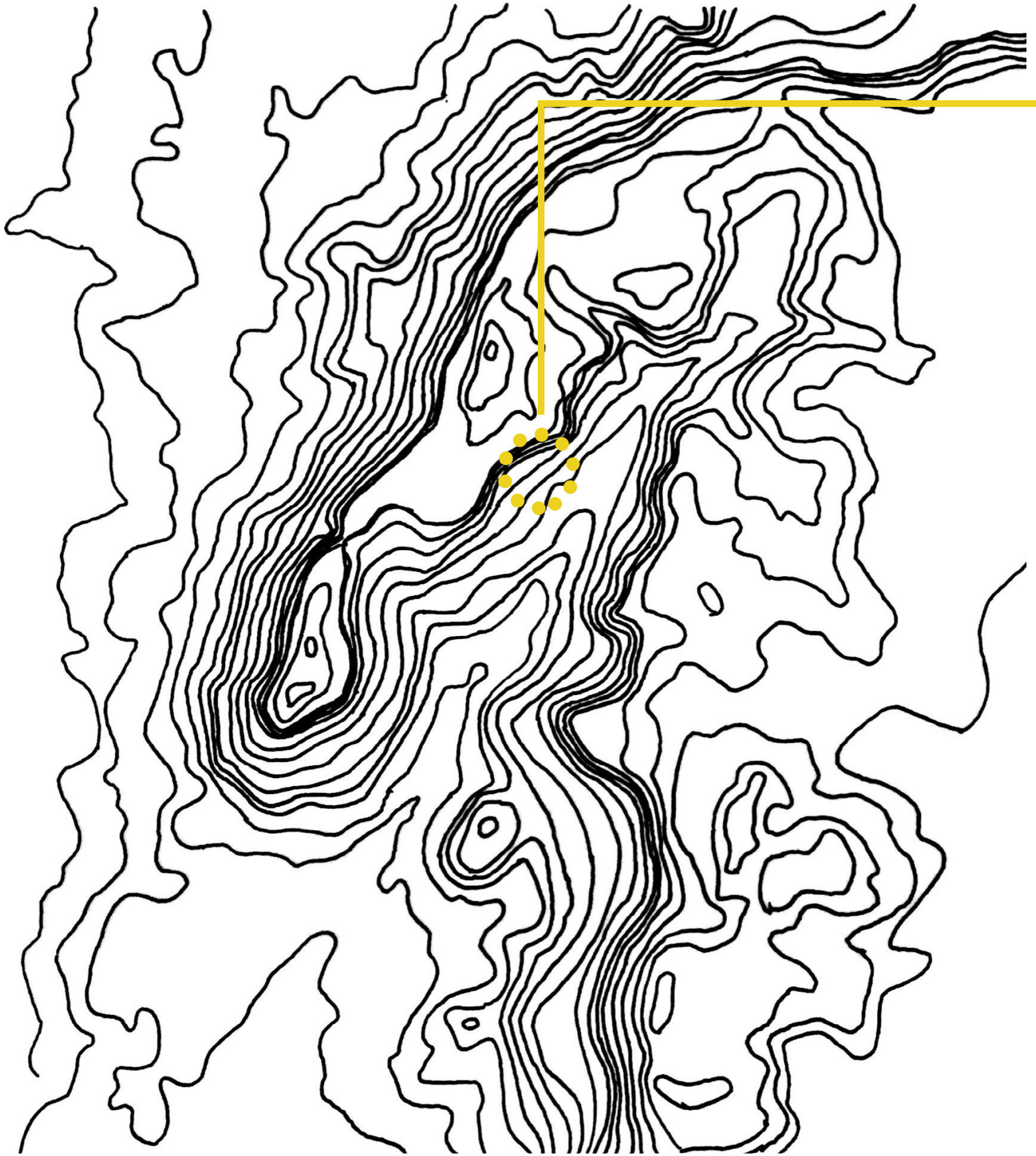
Figure 44 - Distribution of Tarkastad subgroup
(Smith, 1993)

Figure 45 -Photograph of site
(Author,2019)

2.4.2 MESO ANALYSIS

Analysis of surroundings

The Bamboes mountain range is a small group of mountains on the eastern border of the Hofmeyr district. The site is situated in a valley on the farm Riet Kuil. A colony of Cape Vultures breed on the South-West facing cliffs. He goal of the meso site investigation is to analyze the surrounding influences on the site in order to make informed decisions during the design process.



PROPOSED SITE

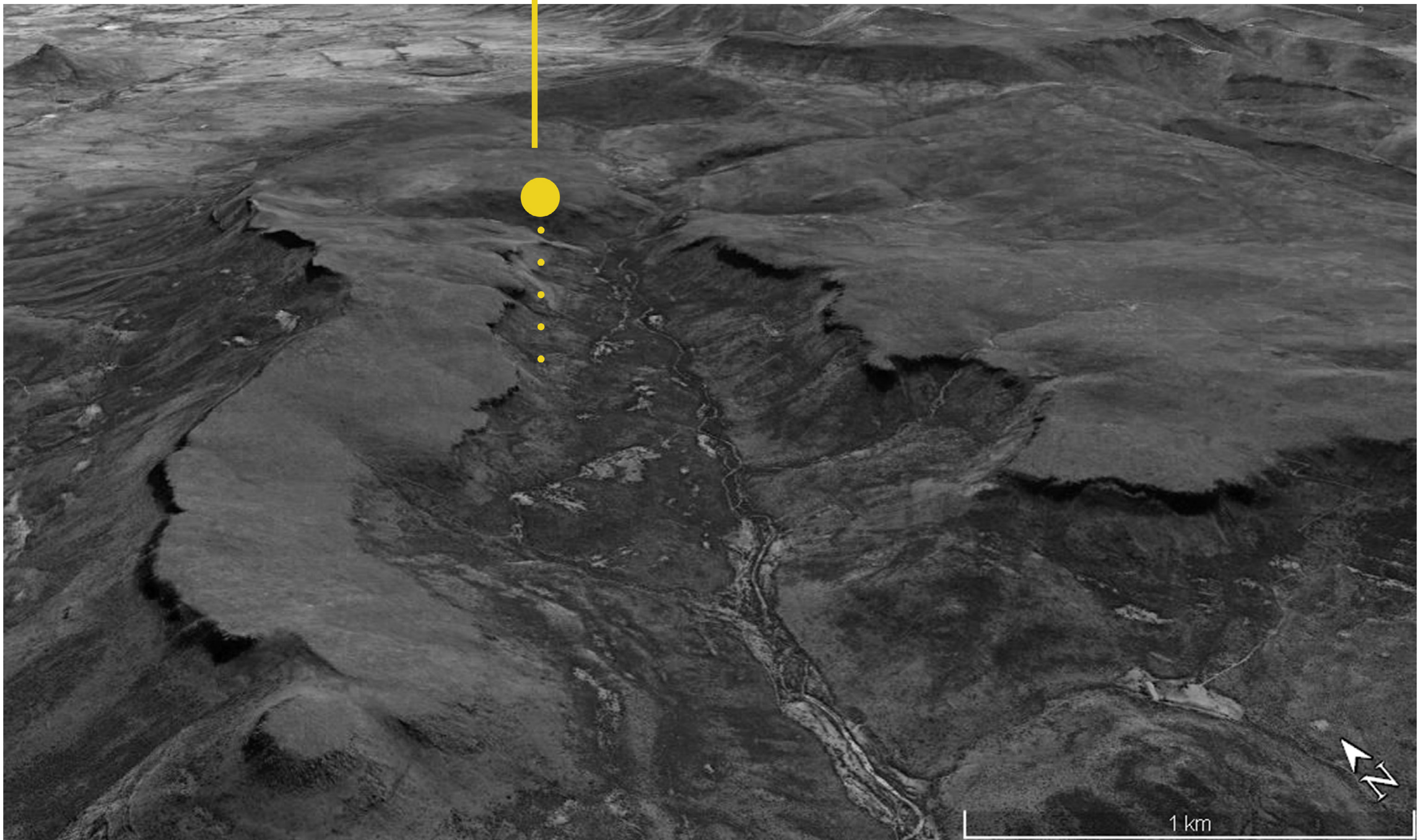
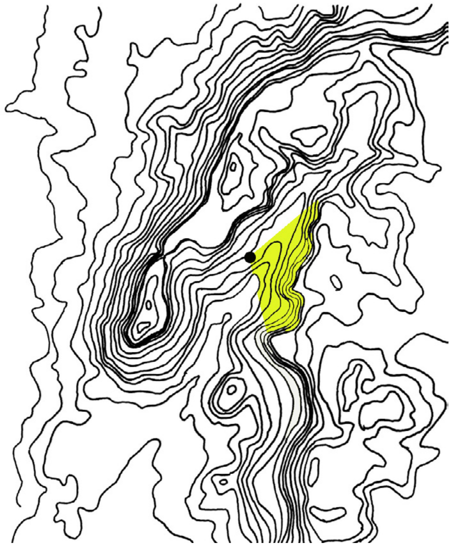


Figure 46 - Location of site (Googleearth.com, online)
not to scale

VIEW FROM SITE



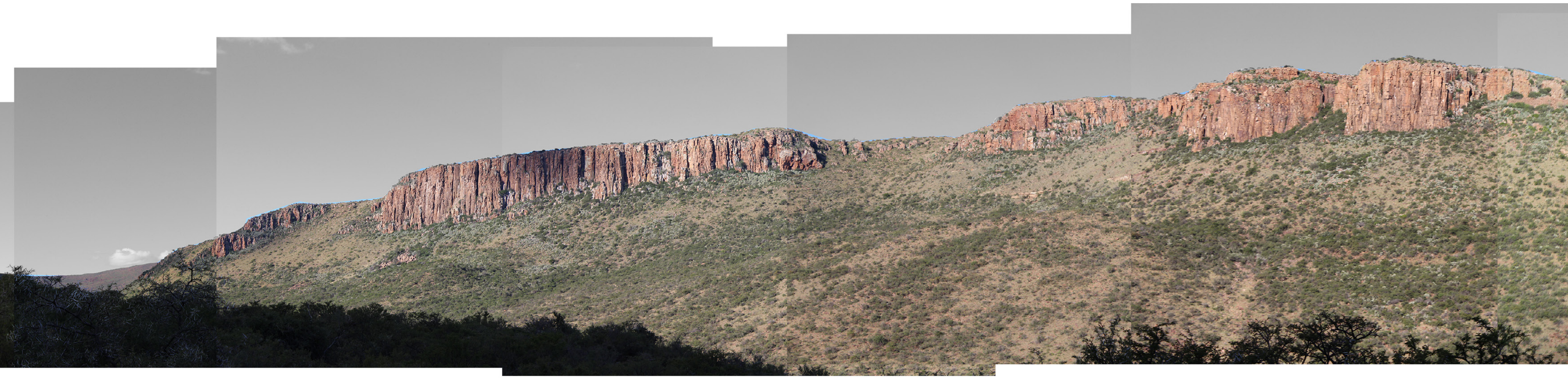


Figure 47 -Panorama photograph of opposite cliffs (Author, 2019)

VIEW OF SITE

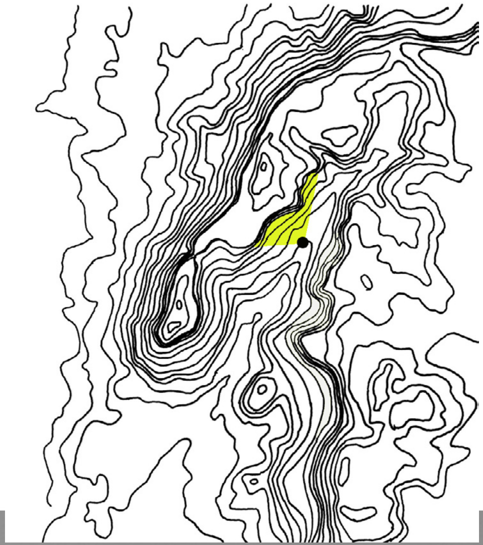


Figure 48 - Panorama photograph of cliffs on site

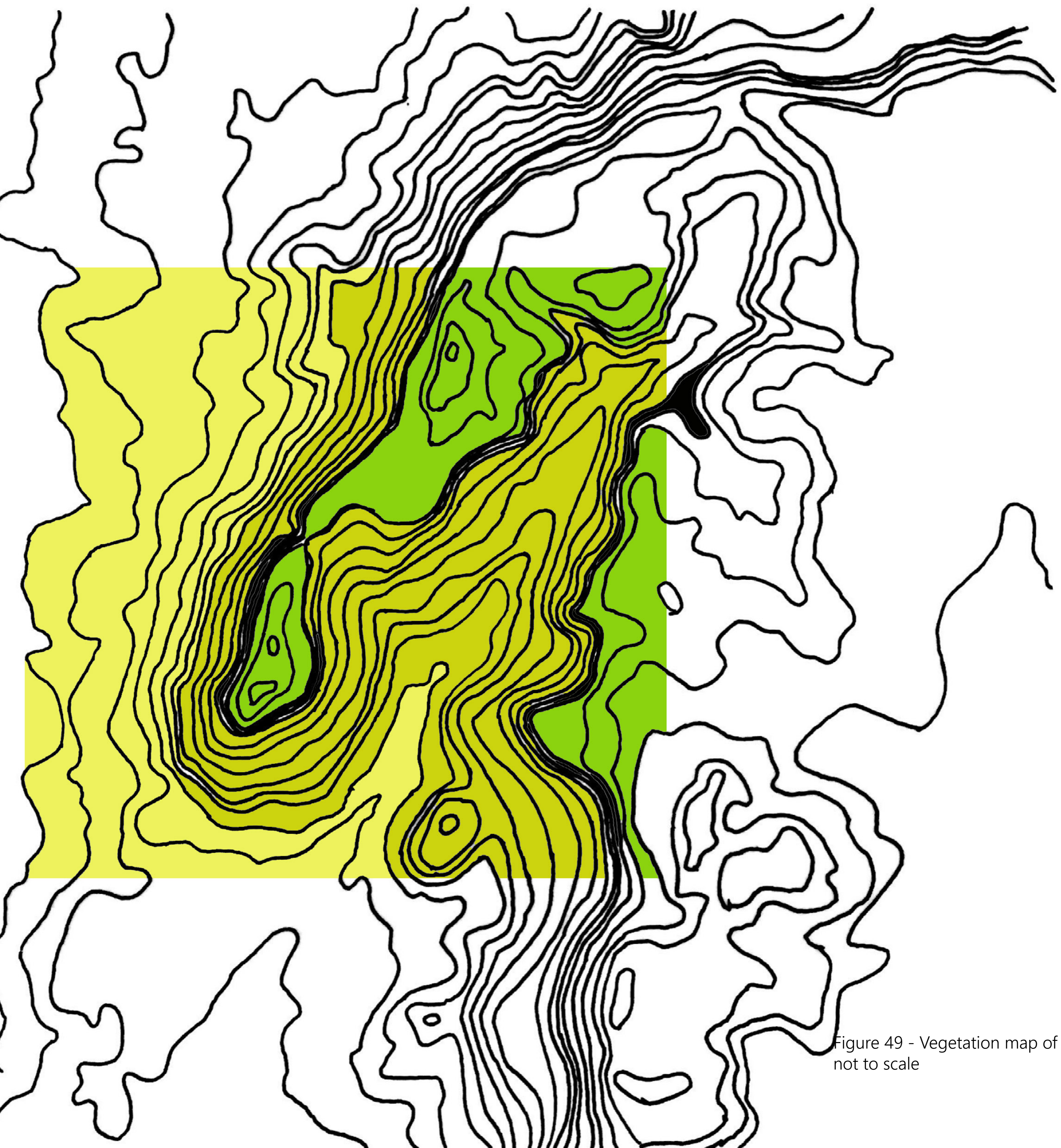


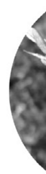
Figure 49 - Vegetation map of site
not to scale

Figure 50 - Grassland

Tall shrubs

Lycium cinereum

Lycium horridum



Low shrubs

Eriocephalus ericoides

Aptosimum procumbens

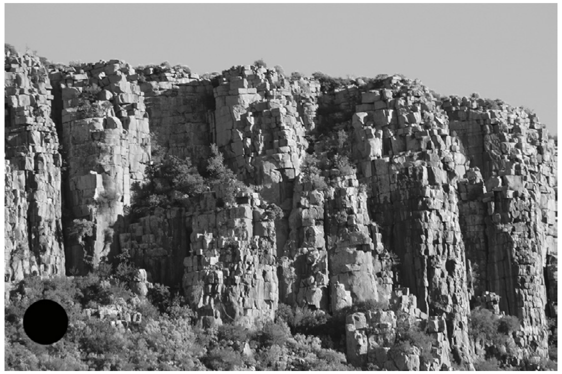


Figure 51 -Dolerite cliffs

Figure 52 -Bushland

Figure 53 -Karoo shrub-land

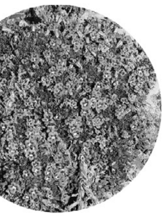
IMPORTANT FLORA

Lycium oxycarpum

Aspalathus acicularis
Endemic

Nenax micropylla

Rosenia geniculata



Felicia muricata

Succulent shrubs

Ruschia intricata

Rabiea albinota
Endemic

Herbs

Syringodea concolor

WIND ANALYSIS
Valley & Mountain breeze

During the day, the sun heats up the mountain air faster than the air in the valley, The hot air rises, sucking the cool air from the valley creating a valley breeze. During the night the air cools and descends down the slopes of the mountain creating a mountain breeze. (Christopherson, 1992)

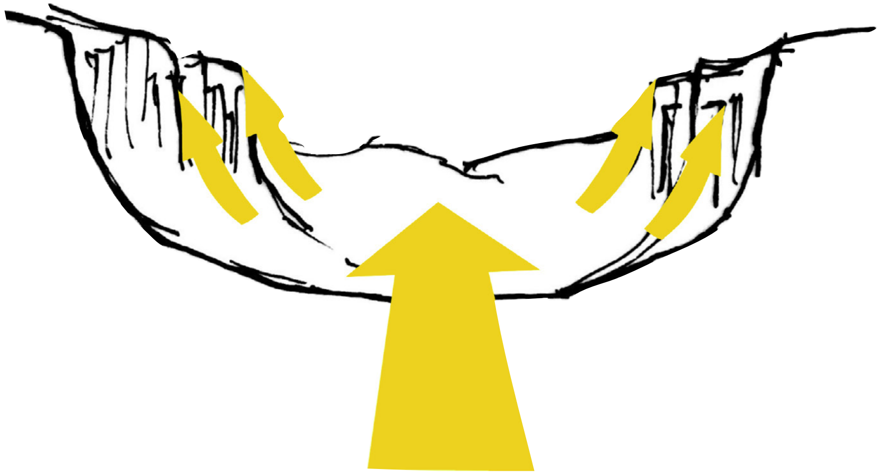
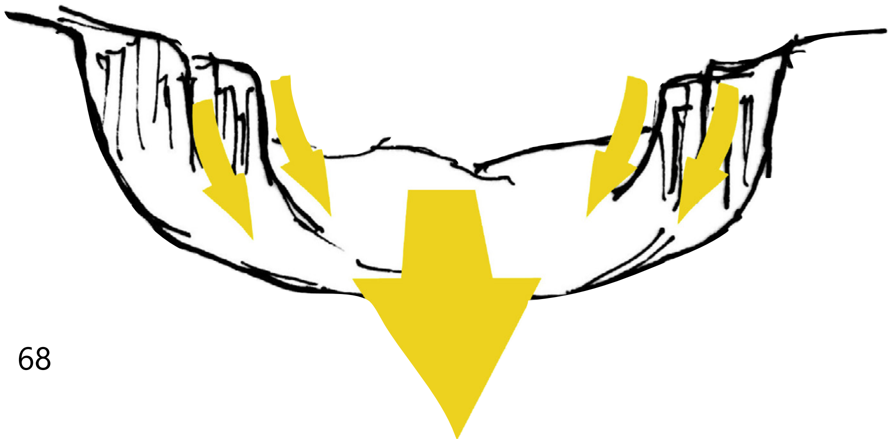
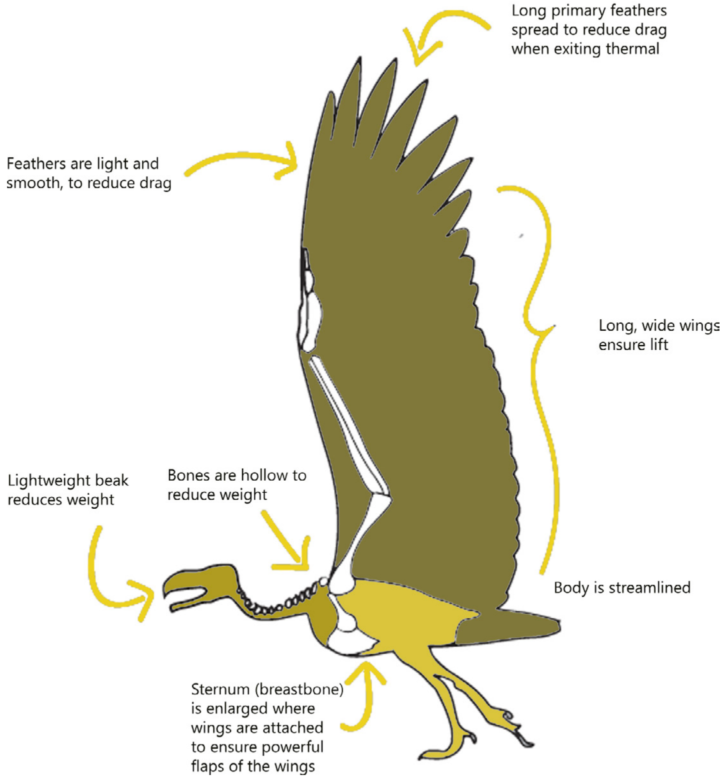


Figure 54 - Valley & Mountain breeze



Hot air pushing up against the cliffs create thermal lifts. These thermals are created by the sun heating up the ground, the Hot air rises which provides vultures with the opportunity to gain height explained in figure 56, once the vultures reach the top of the thermal lift they fly out and descend in their desired direction. (Mundy, 1992)

Figure 55 - Vulture biological traits



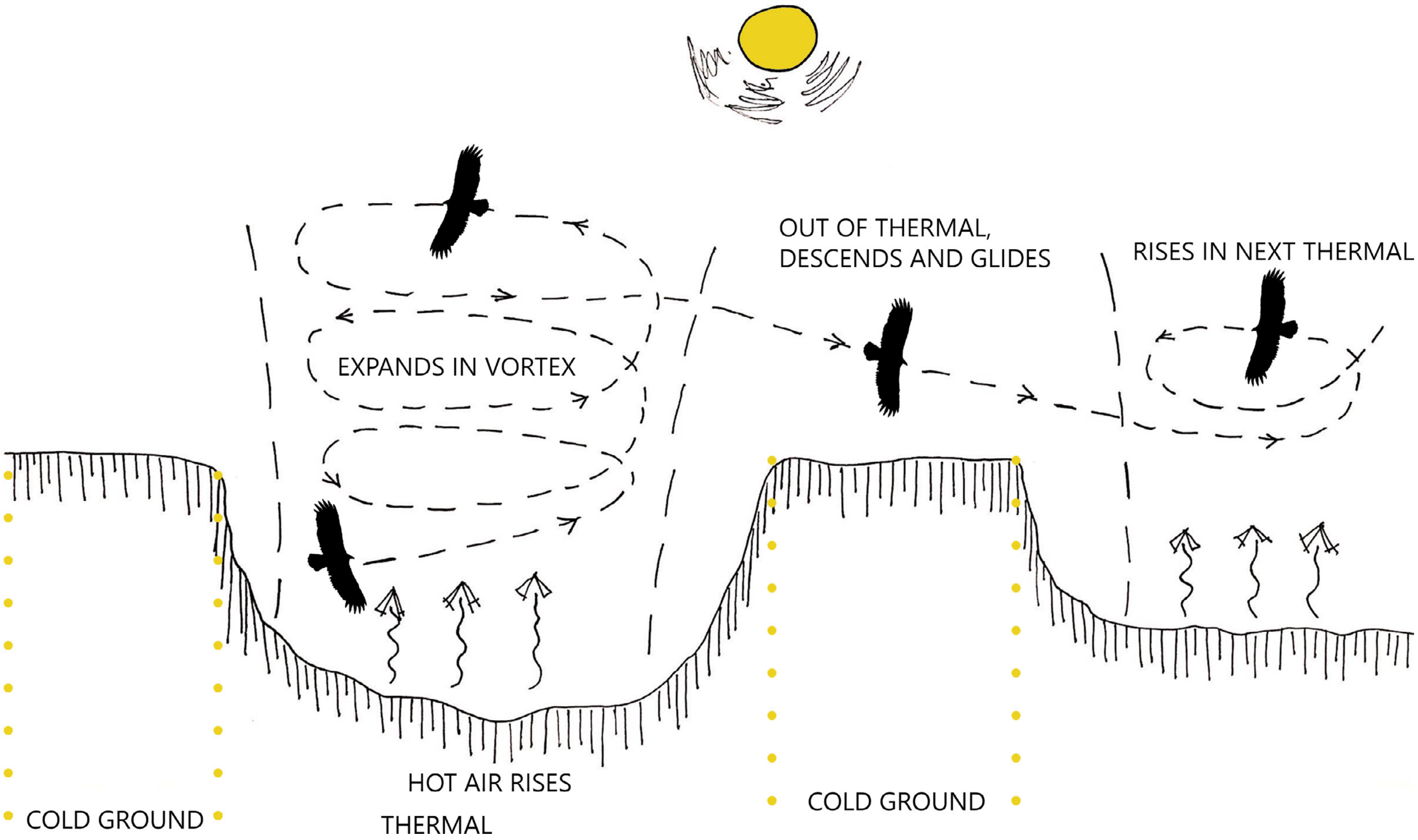
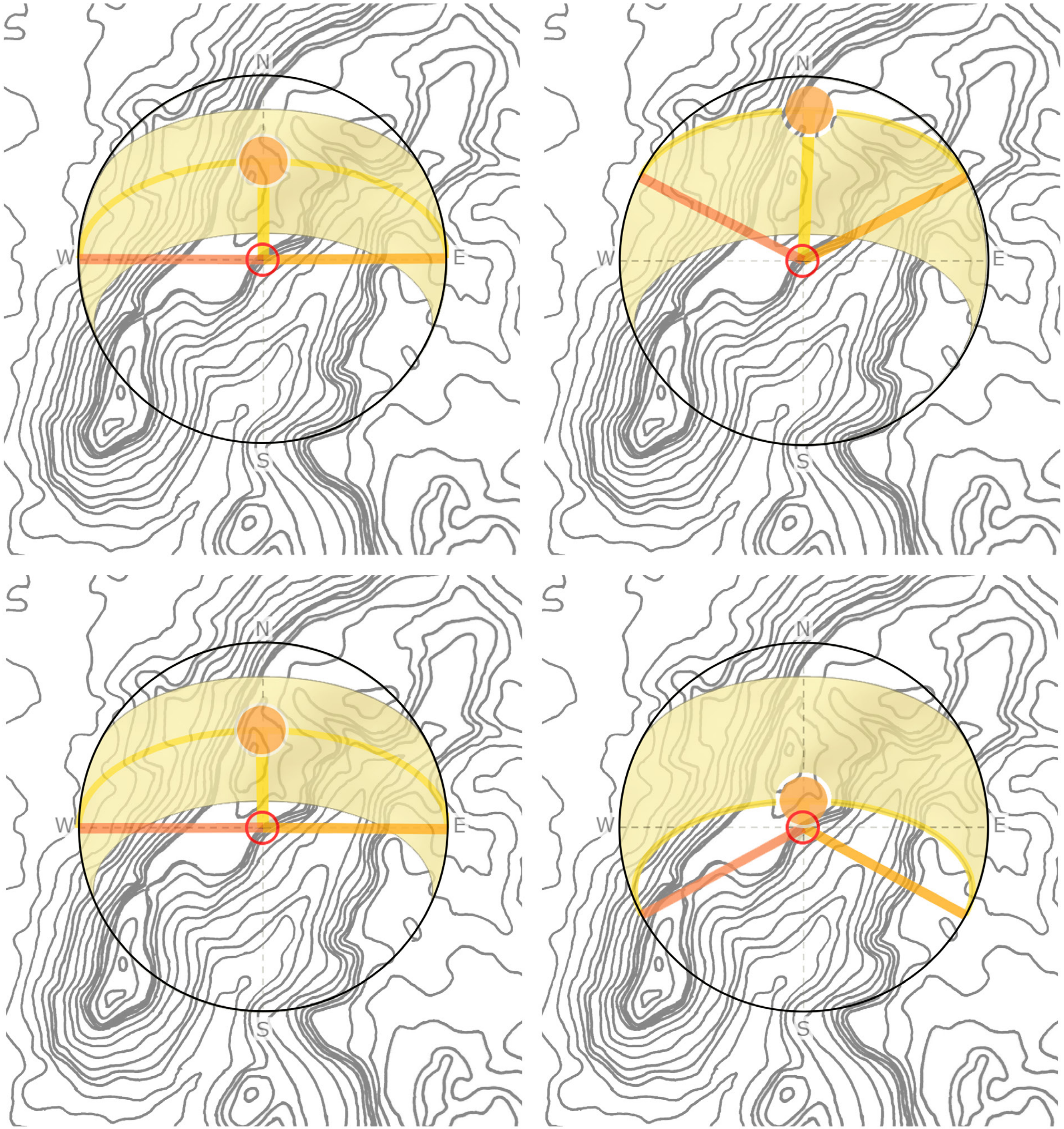


Figure 56 - Explanation of thermals

SUN ANALYSIS



A mean maximum temperature of 36.6°c in January and mean minimum of -4.2°c in July both exceed the human comfort range. (Rutherford et.el,2006)
The cliffs on the North-Western edge of the cliff poses the challenge of getting enough sun to certain parts of the site.

Figure 57 - Sun study

BREEDING COLONY OF CAPE VULTURE

Figure 58 - Breeding spots close to site
not to scale

2.4.3 MICRO ANALYSIS
The Site

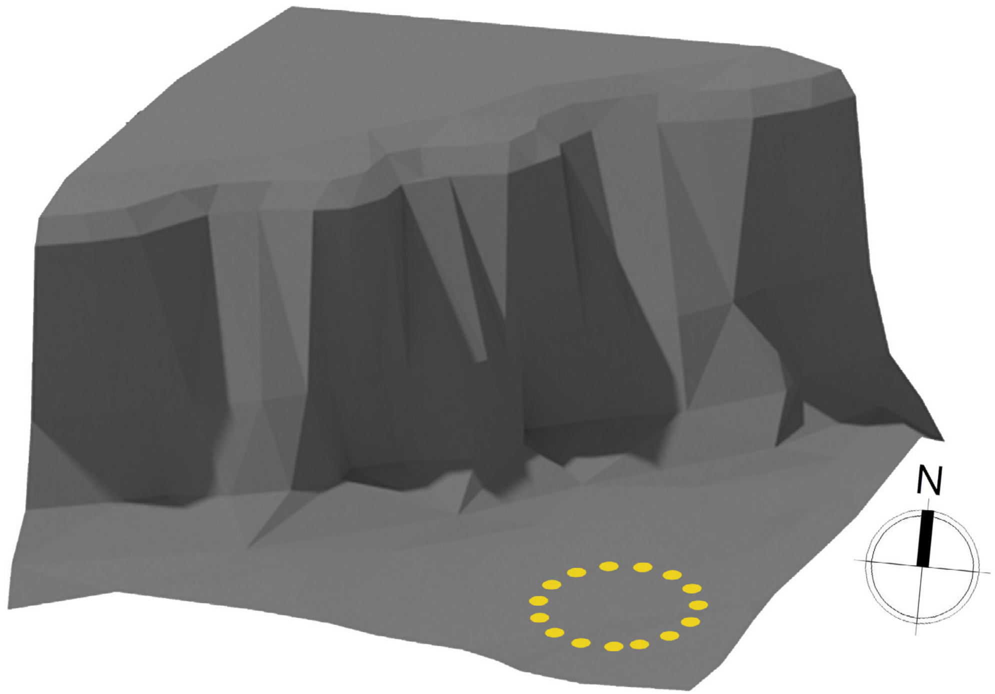
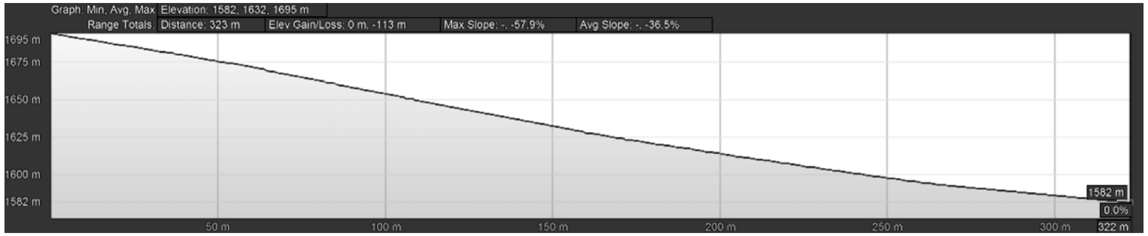


Figure 59 - Location of site close to cliff

Figure 60 - Slope of site



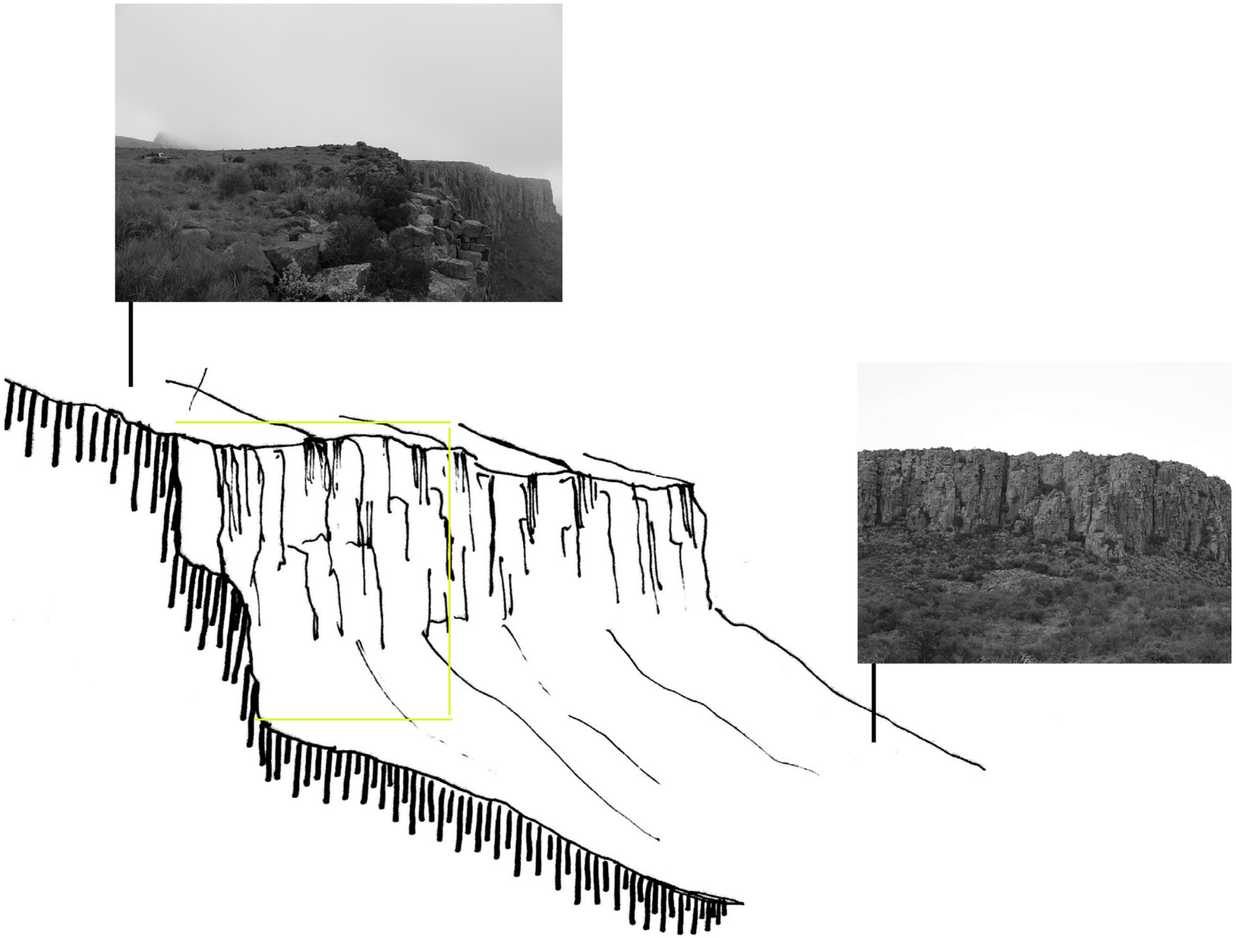
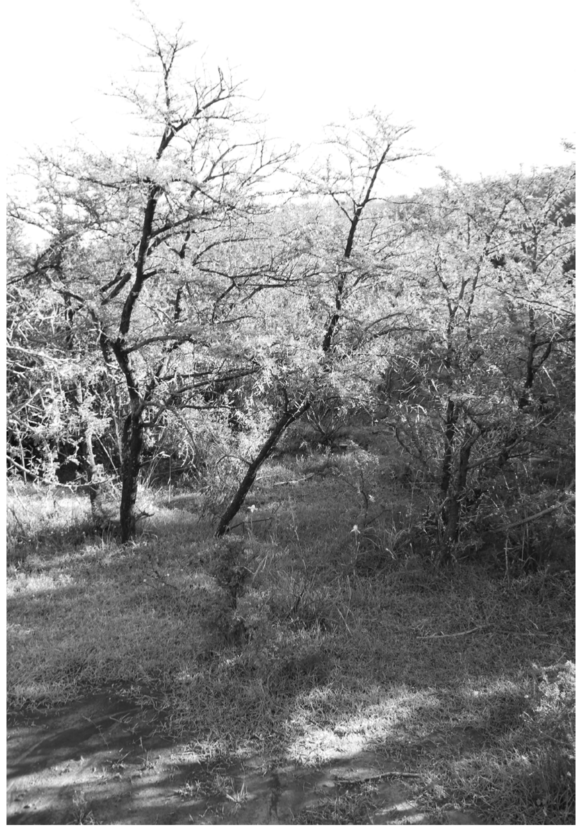


Figure 61 - Slope of site & vegetation

Figure 62 - Photograph of vegetation on site



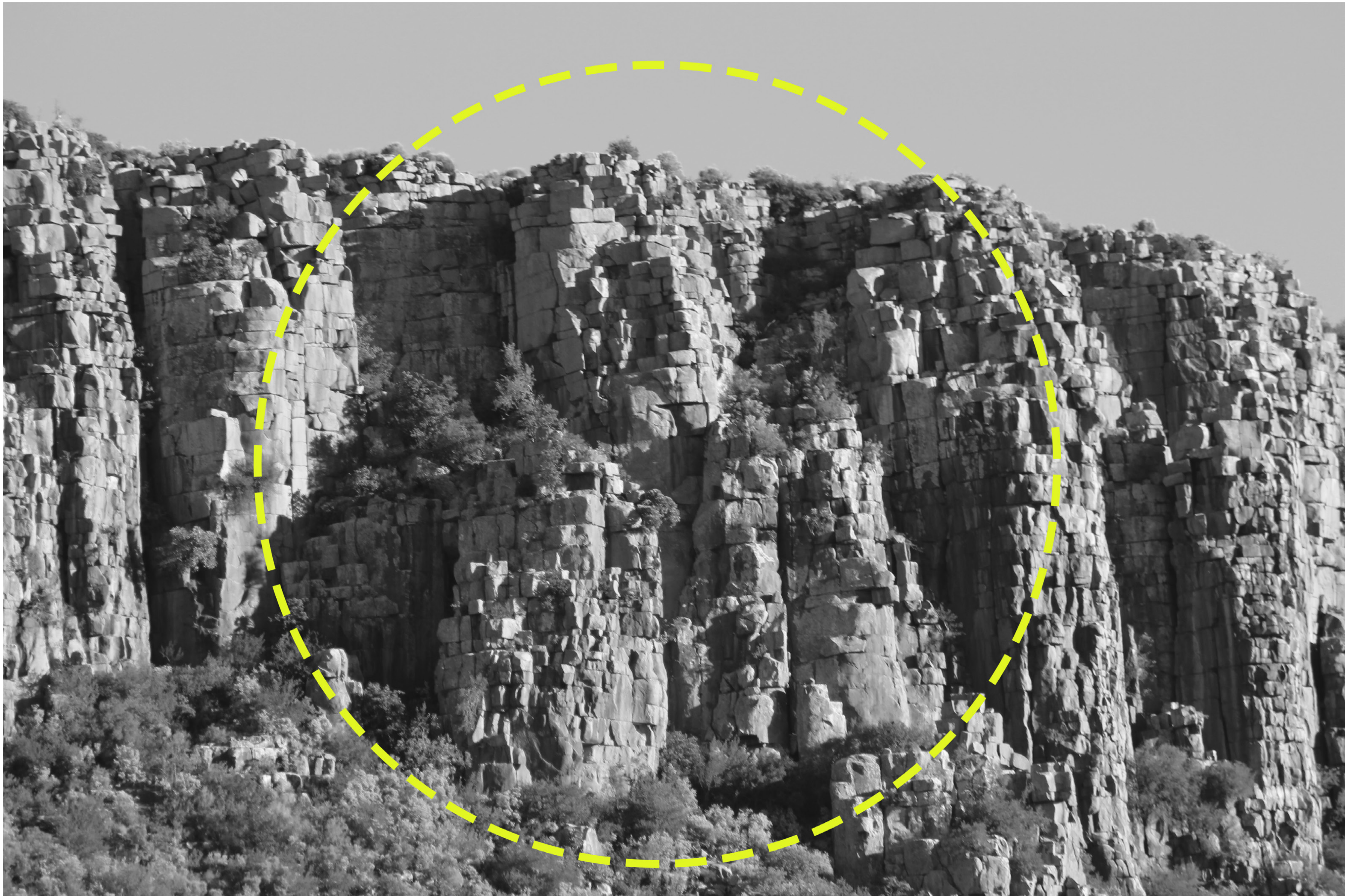


Figure 63 - Photograph of Cliff face on site (Author, 2019)

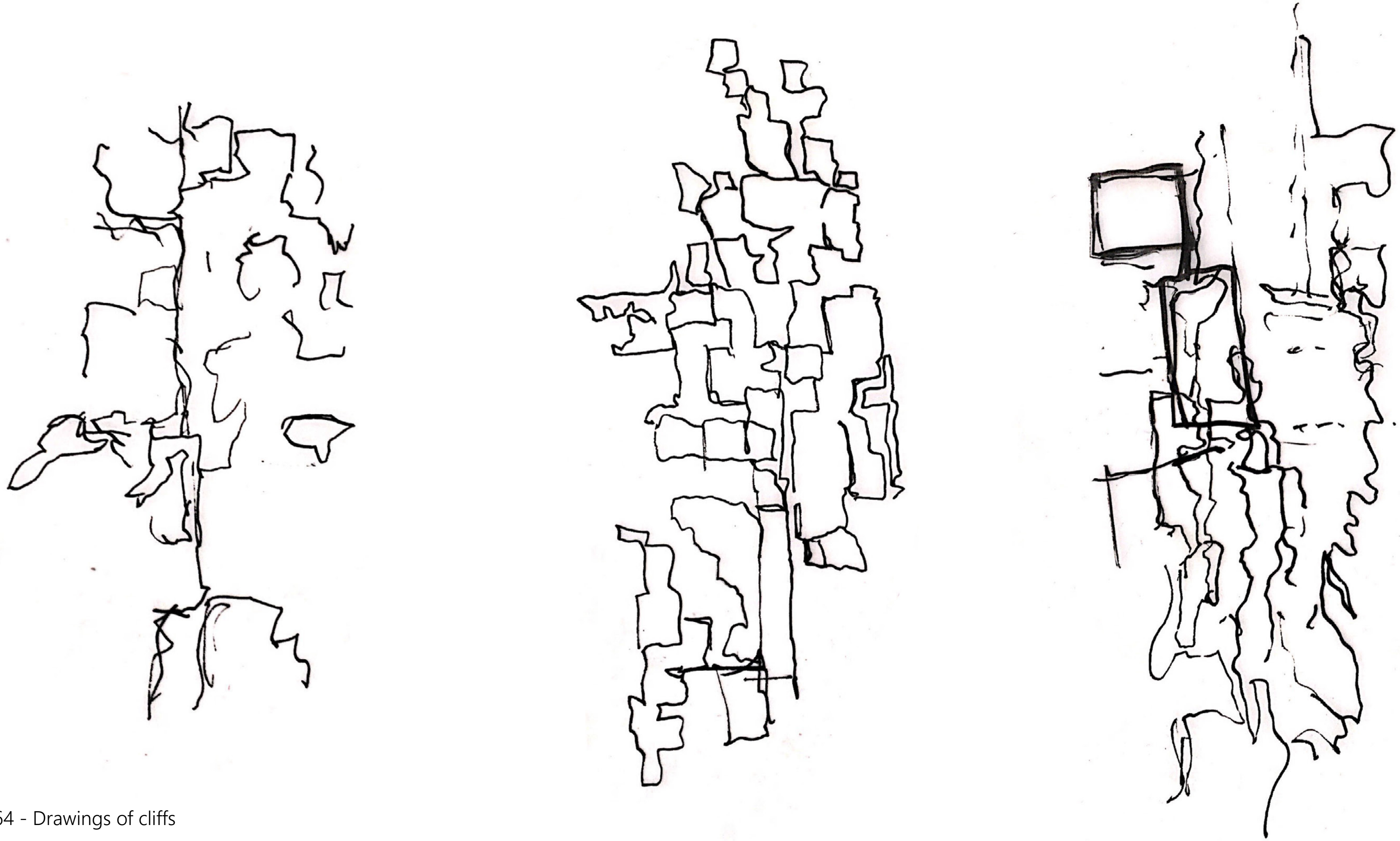


Figure 64 - Drawings of cliffs

PHOTOS OF THE SITE

Figure 65 - Photograph of soil on site

Figure 66 - Site Photograph

2.4.4 TOPOLOGICAL PRECEDENTS

KAROO WILDERNESS CENTRE
FIELD ARCHITECTS

The Karoo Wilderness Centre aims at redefining the relationship between the natural world and the build environment in a way that is beneficial to both. Life in the Karoo is tough, every animal and plant has evolved to survive with very little water, non other is more successful than the Aloe Ferox. The architects of the Karoo Wilderness Centre reinterpreted the water retaining leaves of the aloe into the roof of the building,enables the building to harvest its own water, whilst acting as a passive cooling system. (Henry, 2011)

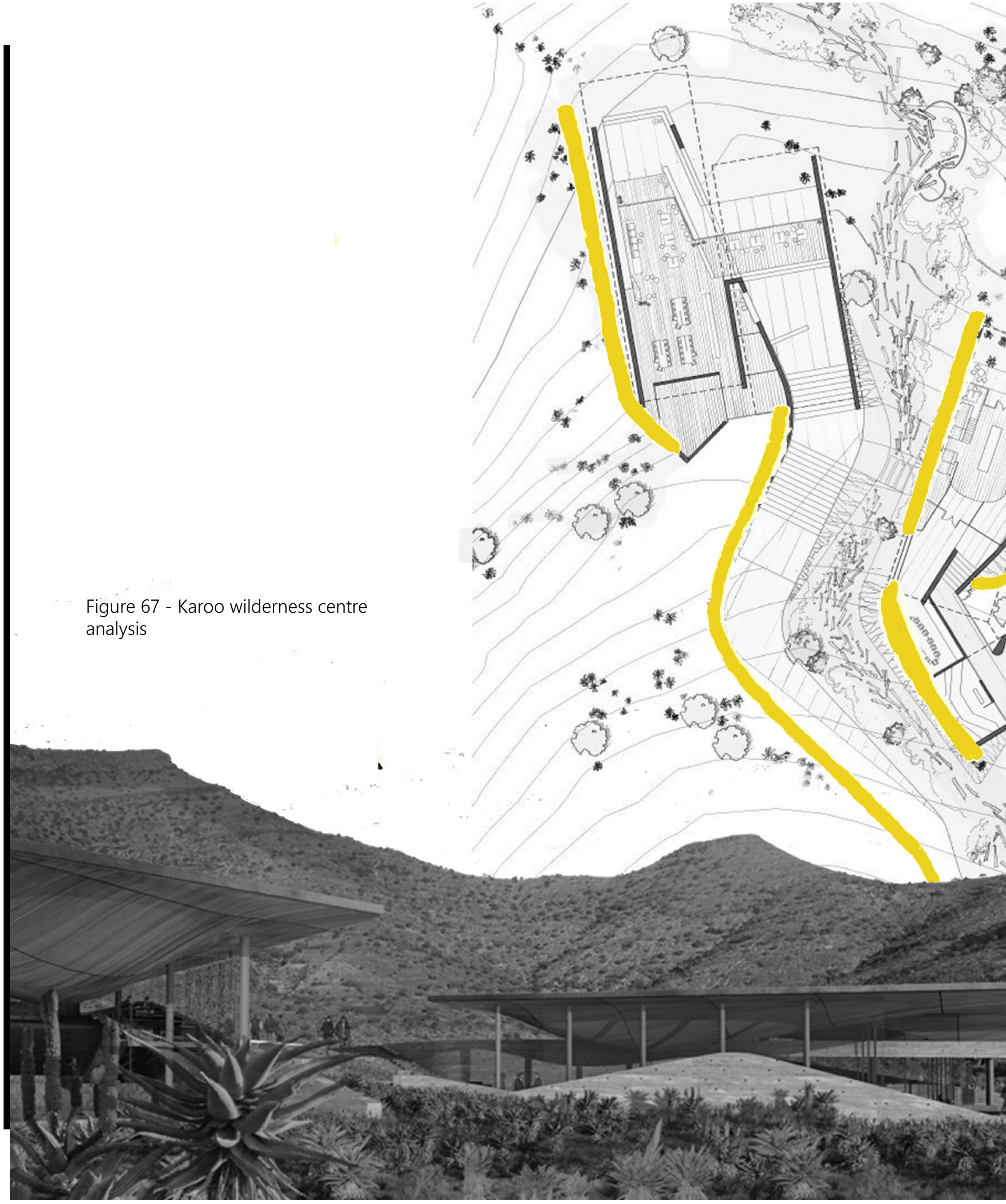
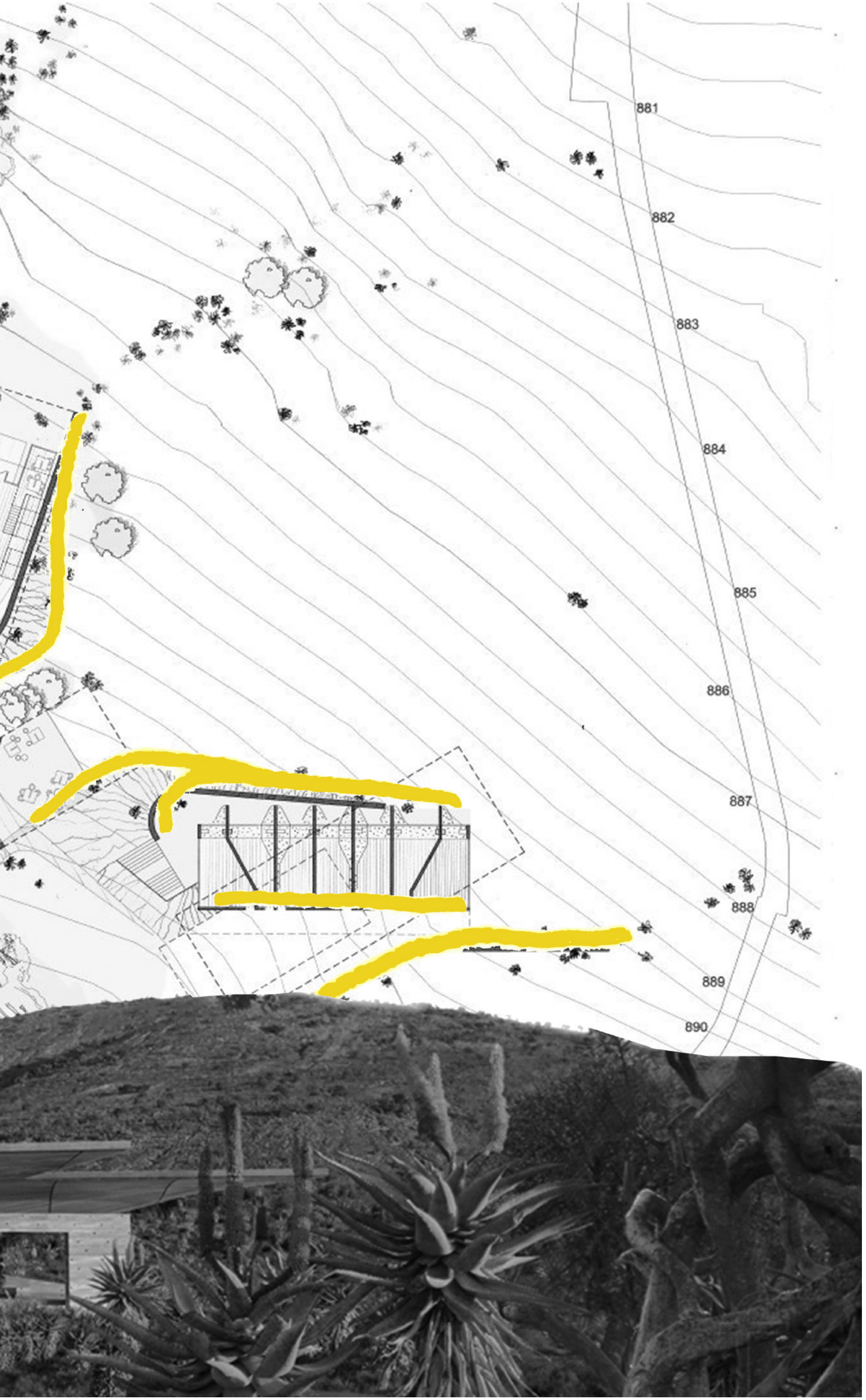
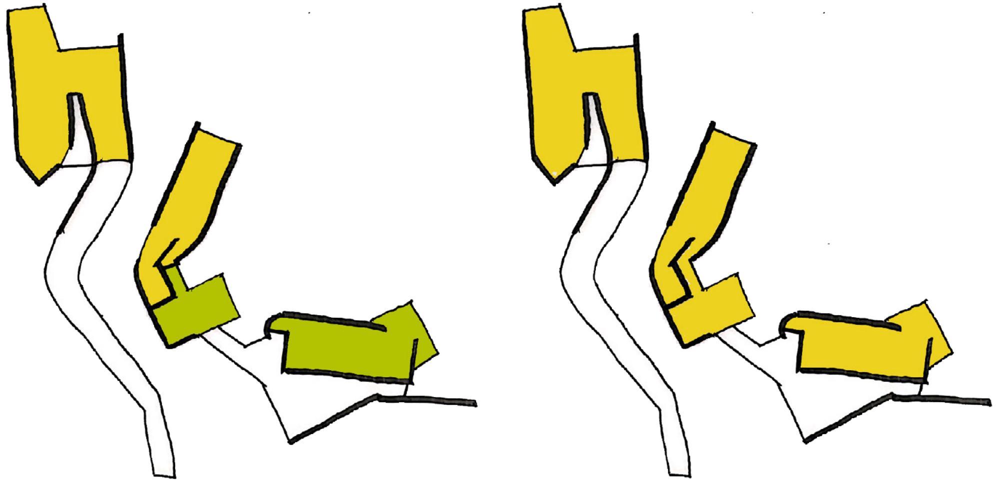
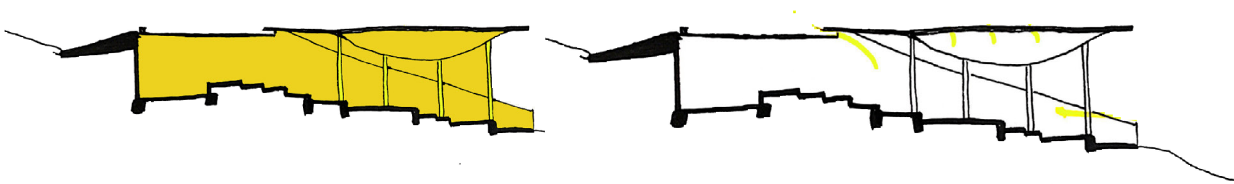


Figure 67 - Karoo wilderness centre analysis





- Strategic placing of spaces to optimize views
- Separation of served and serviced spaces



- Building stepping down with the site
- Wind pushing up mountain assisting natural ventilation

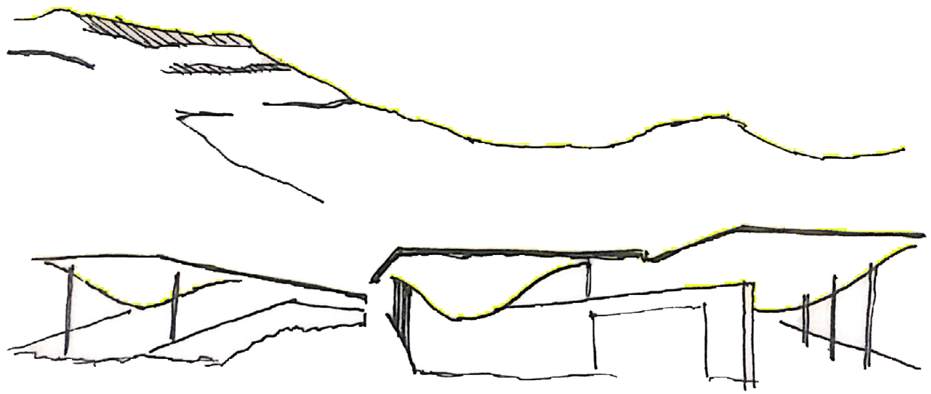


Figure 68 -Karoo wilderness centre analysis

LESSONS LEARNT

Way the building reacts to the contours of the site
Distinction between stereotomic walls and tectonic roof structure

Figure 69 - Karoo wilderness centre (Archdaily.com, online)

Allmannajuvet Zinc Mine Museum | Peter Zumthor
SAUDA| NORWAY

The buildings designed as tourist attractions with the purpose of bringing the mining history of Sauda back to life is inspired by the the hard life of being a miner and the everyday operations of the mine.
Although the landscape differs greatly from that of the Karoo, the way in which the laminated wood structure is constructed on the steep site provides clues how to approach designing on the proposed site.
The transience nature of the materials used enables the building to nestle in the landscape without dominating which might have been the case if the structure was steel. (Berntsen, 2016)

Figure 70 - ZInc mine museum (Archdaily.com, online)

Figure 71 - Timber structure of Zinc mine museum (Archdaily.com, online)

BYRNE HOUSE WILLIAM BRUDER SCOTTSDALE ARIZONA

"The structure's angular geometry grows from the asymmetrical, tapering alignment of a 'canyon".
William Bruder 2015

The conceptual approach to the residence involves the creation of abstract canyon walls and spaces that emerge as metaphors to the geology of the site and desert.
(Bruder,2015)

Figure 72 - Byrne house (byrneresidence.com, online)

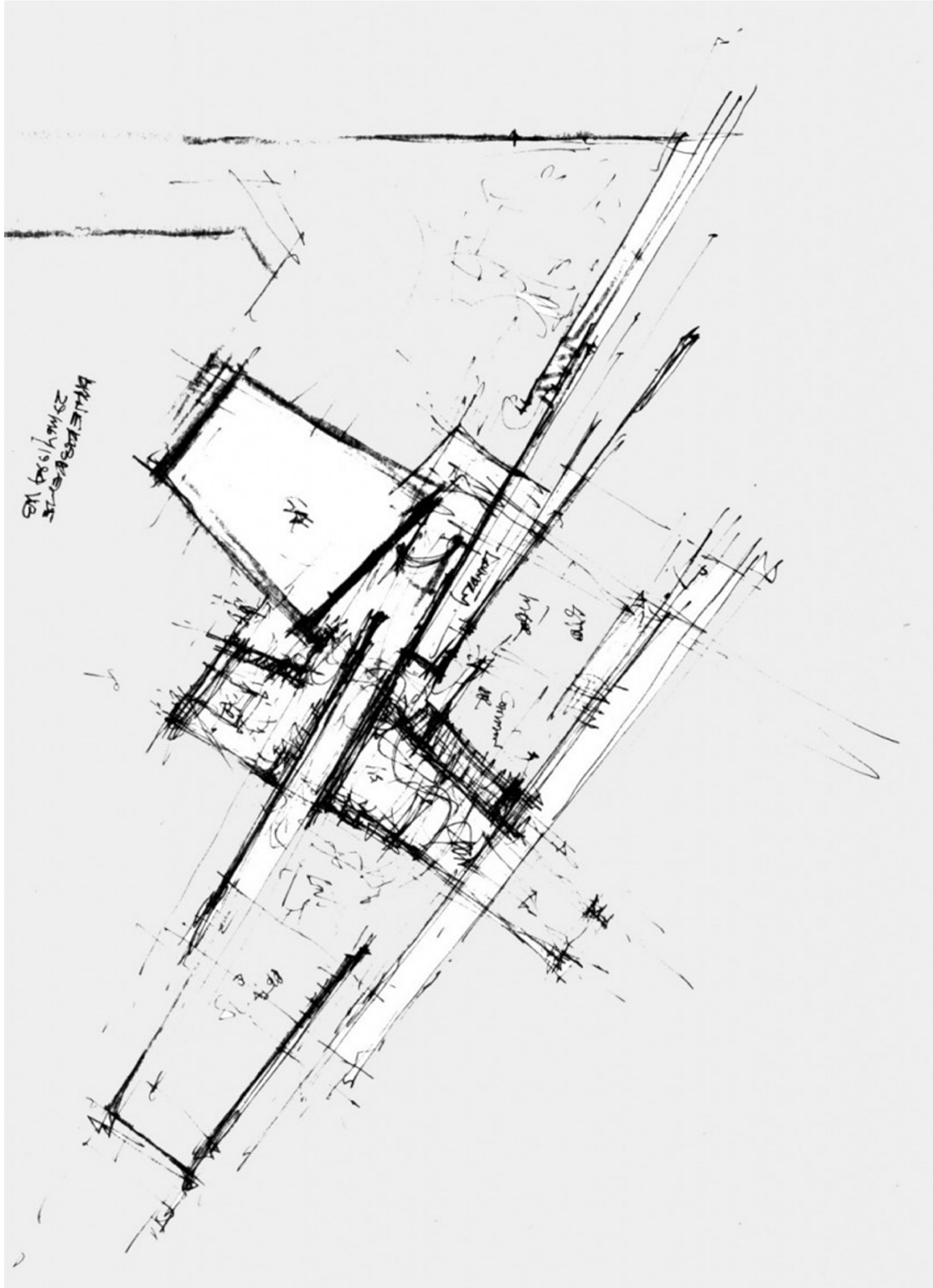
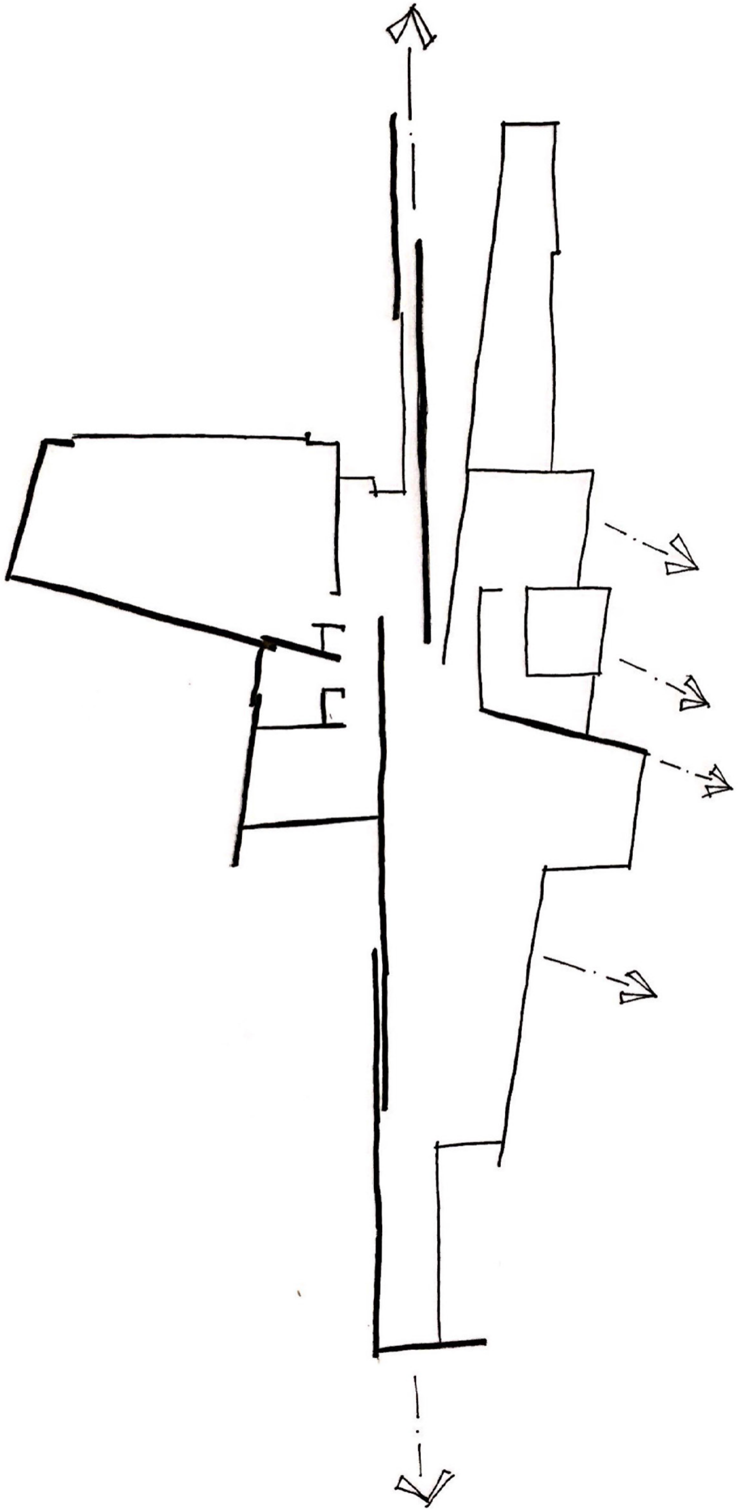


Figure 73 - Conceptual drawing of Byrne house (byrneresidence.com, online)

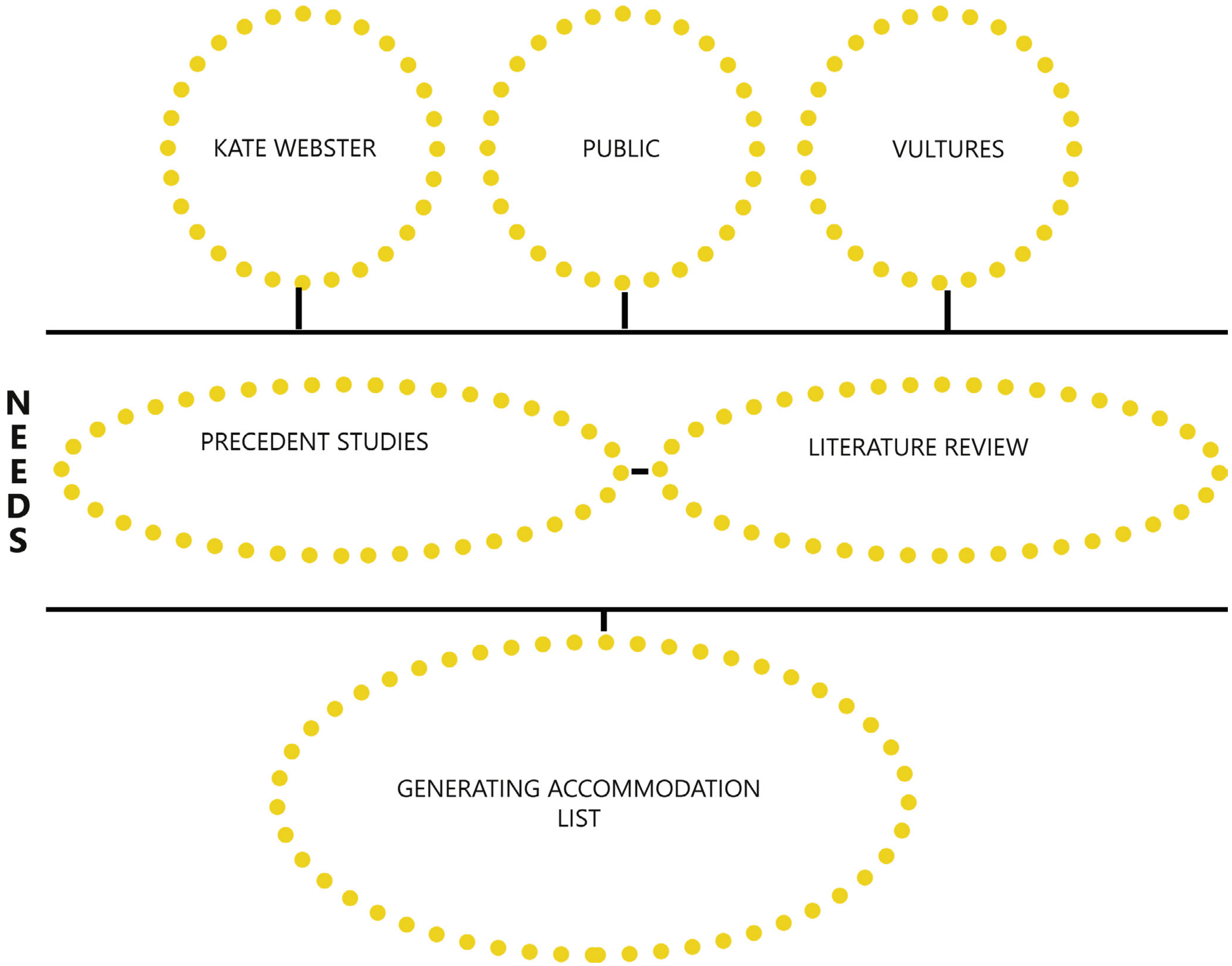


LESSONS LEARNT
Asymmetrical walls creating spaces that mimc the asymmetrical assembly of rock of a cliff.
Asymmetrical walls extend the building into the landscape
Materiality and textures used compliment the landscape

Figure 74 - Materiality of byrne house
(byrneresidence.com, online)

2.5 TYPOLOGY
An explorative study

The needs of the client and users must be identified in order to generate a comprehensive accommodation list. Literature reviews and similar building typologies are analyzed to establish the functional requirements of a bird rehabilitation centre. This provides the foundation for the reinterpretation of the mostly uninspiring architectural typology.


KATE WEBSTER
PUBLIC
VULTURES
NEEDS
PRECEDENT STUDIES
LITERATURE REVIEW
GENERATING ACCOMMODATION LIST

2.5.1 CLIENT

VULPRO REHABILITATION CENTRE HARTEBEESPOORT| NORTH WEST

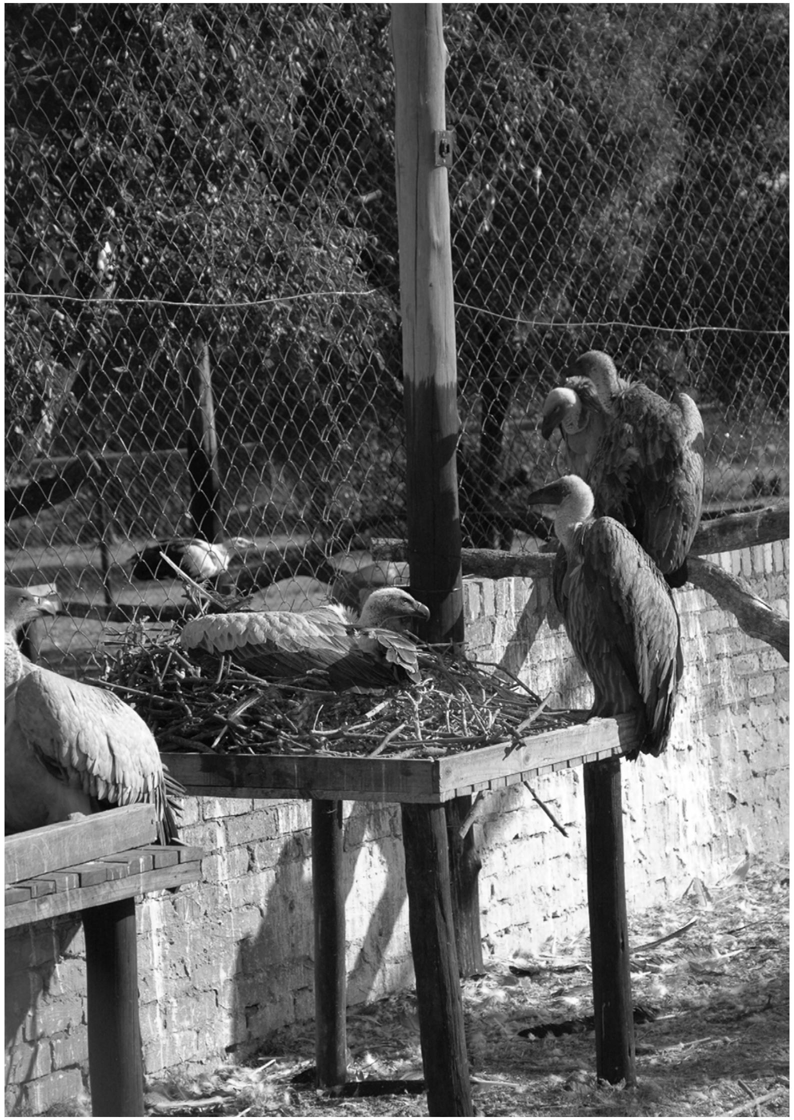


Figure 75 - Vulture enclosure (Vulpro.com, online)

Kate Webster is a Vulpro volunteer in the Eastern Cape where she rescues Cape Vultures and sends them of the Vulpro rehabilitation centre in Hartebeespoort. The aim of the project is to provide her with the similar facilities as vulpro's rehabilitation centre to assist in conserving the Cape vultures of the Eastern Cape.

The analysis of the Vulpro facility assist in formulating an accommodation list.

Rehabilitation
Vulpro rehabilitates injured vultures with the goal of returning them to the wild. If this is not possible the vultures are added to their ex-situ population, where they are bred with the goal of supplementing the wild population by releasing the offspring. Vulpro currently houses approximately 222 vultures, most of which are unreleasable (Wolter 2018).

Breeding
Vulpro's breeding program was initiated in 2011 with on incubator and a small colony of Cape Vultures. The increase of non-releasable vultures has resulted in the expansion of their breeding colony with 10 chicks raised in 2017 without any human contact (Wolter 2018).

Breedimg enclosure

The Enclosure houses 45 Cape vultures that are unable to be released in the wild. A 18m long south facing cliff makes up the one end of the enclosure, the cliff provides ledges for 20 potential nesting sites, the stepped nature of the cliff allows vultures that are unable to fly to hop from one ledge to another. The potential nesting sites differ from 1m to 5,5m high (Wolter 2018)

Figure 76 - Breeding cliffs at vulpro rehabilitation centre, (Wolter, 2018)

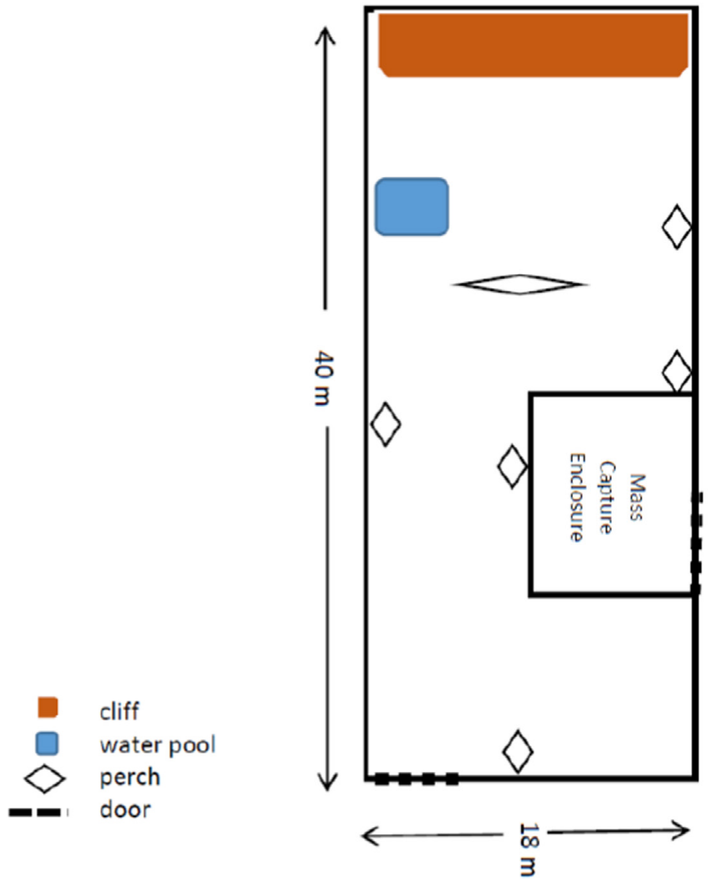


Figure 77 - Vulture enclosure dimensions (Vulpro.com, online)

Figure 78 - Artificial nest (Vulpro.com, online)

Figure 79 - Hatchling (Wolter, 2018)

NESTING MATERIAL

Nesting materials must be free of chemicals that can be harmful to the birds, Vulpro uses Rhus lancea which is a fast growing tree that is proven to be non toxic. Thin branches are cut from the trees and placed in the enclosure, allowing the birds to build their own nests. the birds uses the branches as the base of the nest while leaves and feathers make up the soft inner-lining.

Artificial nests can be added if the birds are unable to build their own. (Wolter 2018)

EGGS & INCUBATION

Cape Vultures lay 1 egg, once the egg is layed, a decision is made whether to remove the egg for artifitial incubation. The egg is replaced by a dummy when removed.

first time breeding pairs are allowed to keep their egg the second season, if they successfully incubate the dummy egg during the first season. (Wolter 2018)

SWAPPING OF EGGS

Two staff members are required to safely remove eggs from the enclosure, A full face mask is required when removing the egg as vultures can be extremely aggressive when incubating. The egg is placed in a box of cotton wool until transferred to the artificial hatchery. (Wolter 2018)

ARTIFITIAL INCUBATION

Vulpro uses a Grunbach Hatching Incubator set at 37.20c and 50% humidity. The egg stays in the incubator for approximately 54 days before hatching. (Wolter 2018)

RETURNING CHICK

The egg is returned to the incubating pair, as soon as the chick begins to pip the egg internally. (Wolter 2018)

ENCLOSURE DENSITY
the maximum number of vultures recommended in an enclosure by Vupro is 40 to 45 individuals, Cape Vultures can't be randomly paired, they need multiple individuals to choose from and might still never choose one. (Wolter 2018)

DISTURBANCE
Interaction with the vultures should be kept at a bare minimum during breeding season and when chicks are present. The enclosure should only be entered to clean the water pool, provide nesting material and dropping food. It is strongly recommended that the breeding enclosure is not open to the public during this period to avoid stress. (Wolter 2018)

SAFE FOOD PROVISIONS
It is recommended to feed whole carcasses, whether it be livestock or game. Whole carcasses stimulates the birds naturals feeding habits as well as providing nutrients that aren't present in small pieces meat. The Carcasses should be free of veterinary medication such as antibiotics. The animal should not have been killed by a lead bullet to avoid lead poisoning.
Feeding occurs every third day in non-breeding season and daily when chicks are present. (Wolter 2018)

CALCIUM SUPPLEMENTATION
Bone chips up to 10cm is provided year round to prevent thin egg shells, broken wings and bone deformation. Vulpro employees manually break dried bones of adult carcasses with a sledgehammer and supply them to the enclosures. (Wolter 2018)

Figure 80 - Bone chips (Wolter, 2018)

RESEARCH

Vulpro's research program stretches of various fields, from veterinary, breeding biology to monitoring.
Through Vulpro's research in pharmacology conducted on Cape Vultures, the toxicity of Diclofenac, an anti-inflammatory drug present in livestock medication, was confirmed. The data led to the legislative ban of the drug in veterinary application in countries like India and Iran. Vulpro's is also a front runner in toxicology research on ketaprofen, Flunixin and Carproferen and their effects on vultures (Wolter 2018). Vulpro boasts one of the largest ex-situ populations of vultures in the world. This enables them to do research on the veterinary treatment of bumble-foot caused by staphylococcus bacteria, establishing a veterinary baseline for the treatment of captive and wild vultures (Wolter 2018). The study of movement patterns of wild vultures play a crucial role in monitoring regular locations for feeding and bathing as well as identifying unknown breeding and nesting sites (Wolter 2018).

Figure 81 - Vulpro Analysis (Googleearth.com, online)

1. Admin & Veterinary functions

2. Aviaries

3. Vulture restaurant

2.5.2 TYPOLOGICAL PRECEDENT DULLSTROOM BIRD OF PRAY REHABILITATION CENTRE

DULLSTROOM| MPUMULANGA

The Dullstroom Bird of Pray Rehabilitation Centre was originally founded as an education centre promoting conservation and creating awareness of raptor species.
The centre has since grown into a rehabilitation centre as well.

A clear separation exists between the functions of the facility: the visitors centre, rehabilitation and aviaries. The facility, like Vulpro Rehabilitation Centre provides an example of the functional requirements of the aviaries as well as the materiality and aesthetic quality these aviaries possess.

Figure 82 - Dullstroom Rehabilitation centre (birdsofprey.co.za, online)

1. Aviaries

2. Admin & Veterinary functions

3. Flying demonstrations

VULPRO REHABILITATION CENTRE

Fragmented ordering

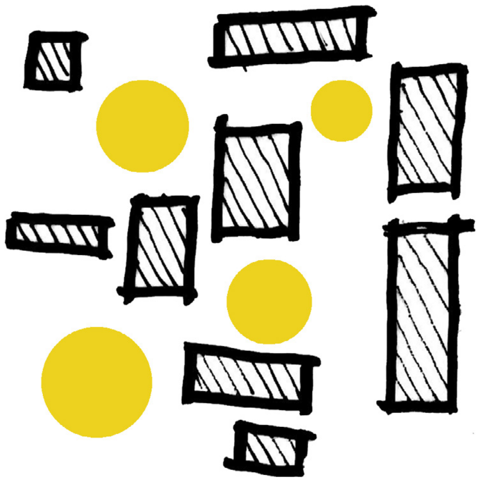


Figure 83 - Vulpro analysis

Separation of Functions

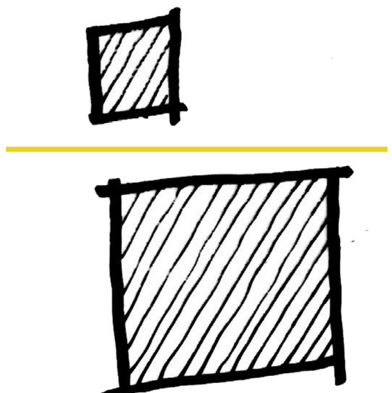


Figure 84 - Vulpro analysis

DULLSTROOM BIRD OF PRAY REHABILITATION CENTRE

Grid ordering

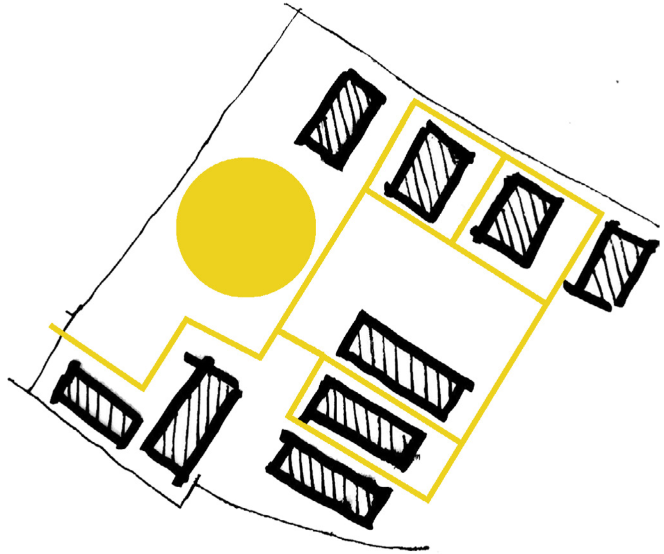


Figure 85 - Vulpro analysis

Separation of Functions

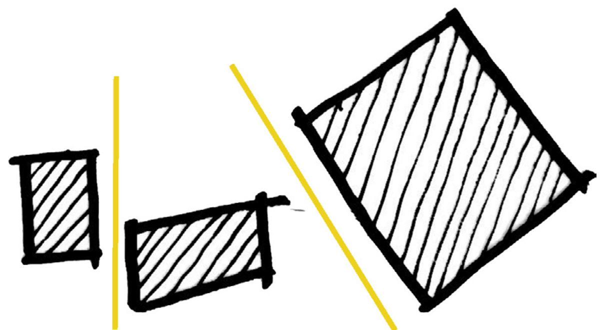


Figure 86 - Vulpro analysis

INITIAL PROGRAM

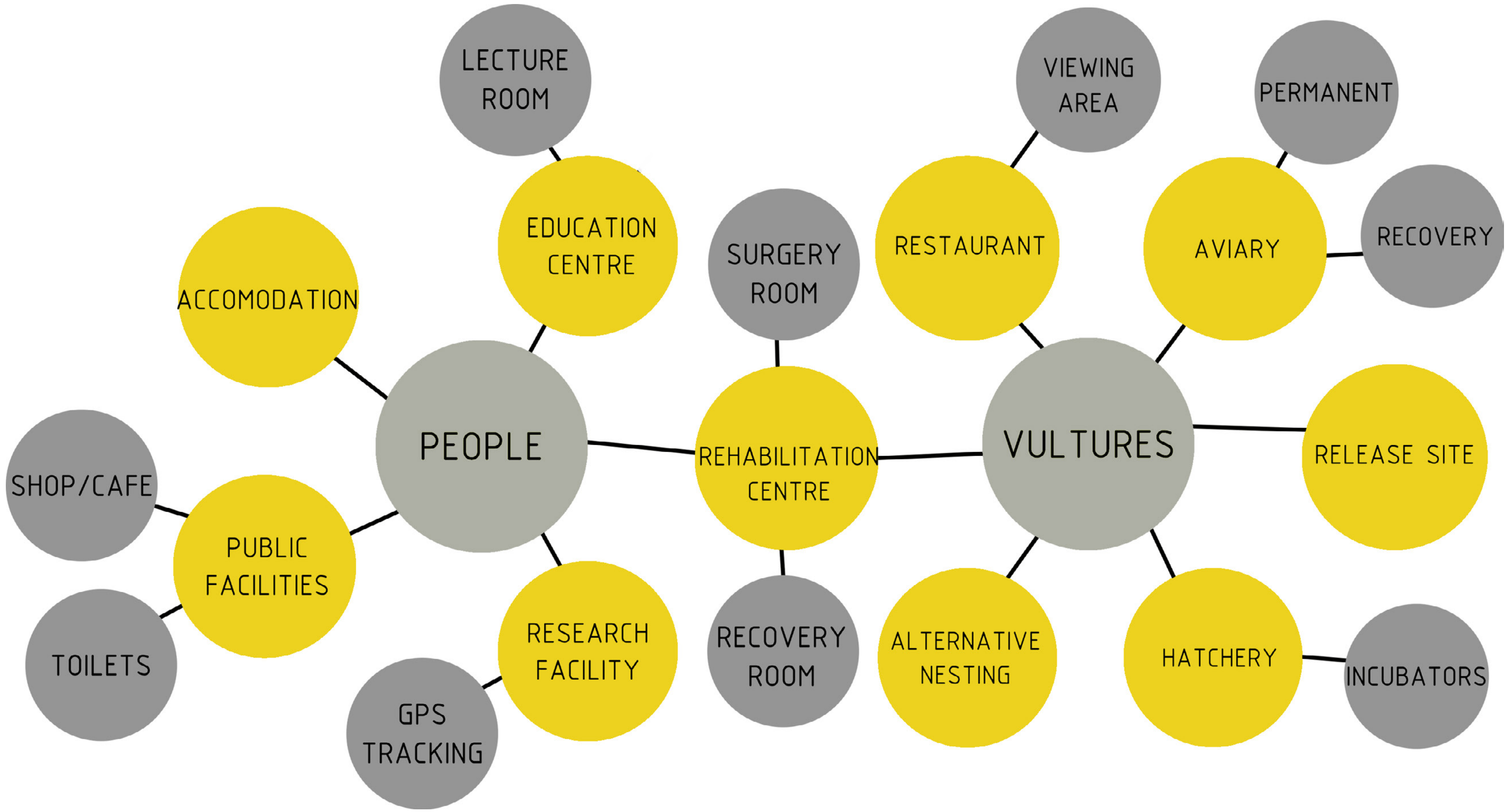


Figure 87 - Initial program

2.5.3 ACCOMMODATION LIST

1
REHABILITATION & RESEARCH

- Surgery
  - preparation room
  - wash room
- Examination room
- X-ray room
- Sterilisation room
- Medical waste disposal
- Intensive care enclosure
- Laboratory
- Recovery enclosure
- Observation room
- Food preparation
  - dry storage
  - freezer room
  - preparation

2
VULTURES

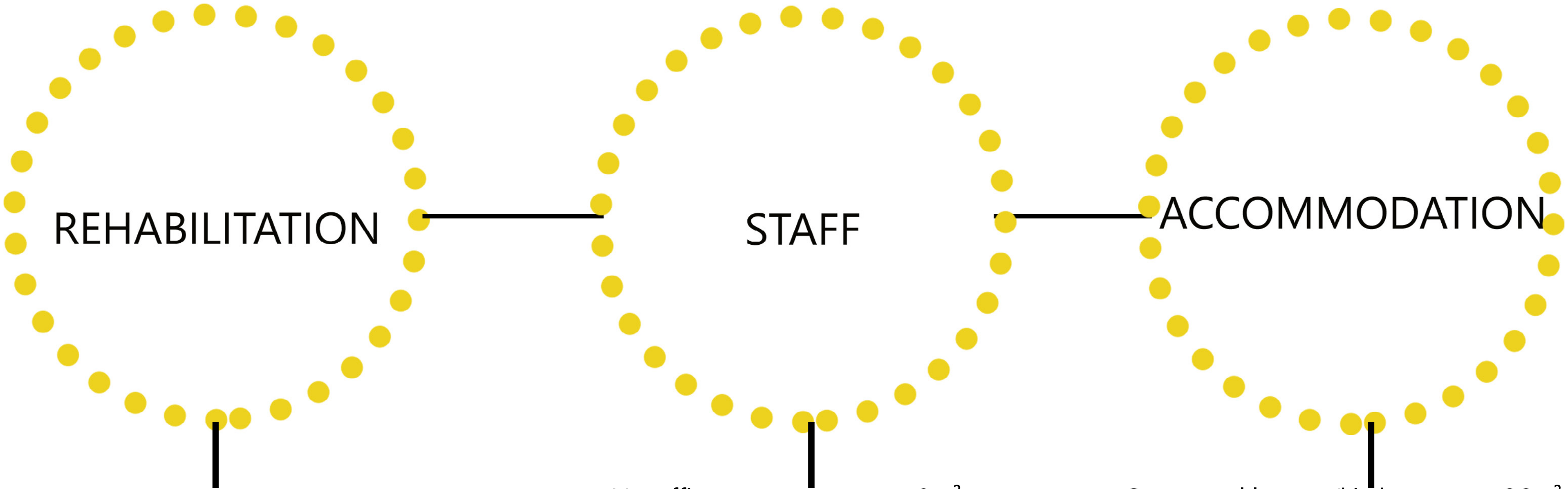
- Aviaries
  - Permanent Aviary
  - Breeding Aviary
  - Open air Aviary
  - Recovery Aviary
  - Vulture restaurant
- Hatchery

3
STAFF

- offices
  - Veterinarian office
  - Research office
- Archive
- Refuse
- Staff room
- Kitchenette
- Storage
- Accommodation
  - Living units
  - Covered parking
  - Communal Recreational area
  - Laundry Room
  - Kitchen

4
VISITORS

- Entrance
- Reception
- Waiting area
- Ablution
- View points
- Gift Shop



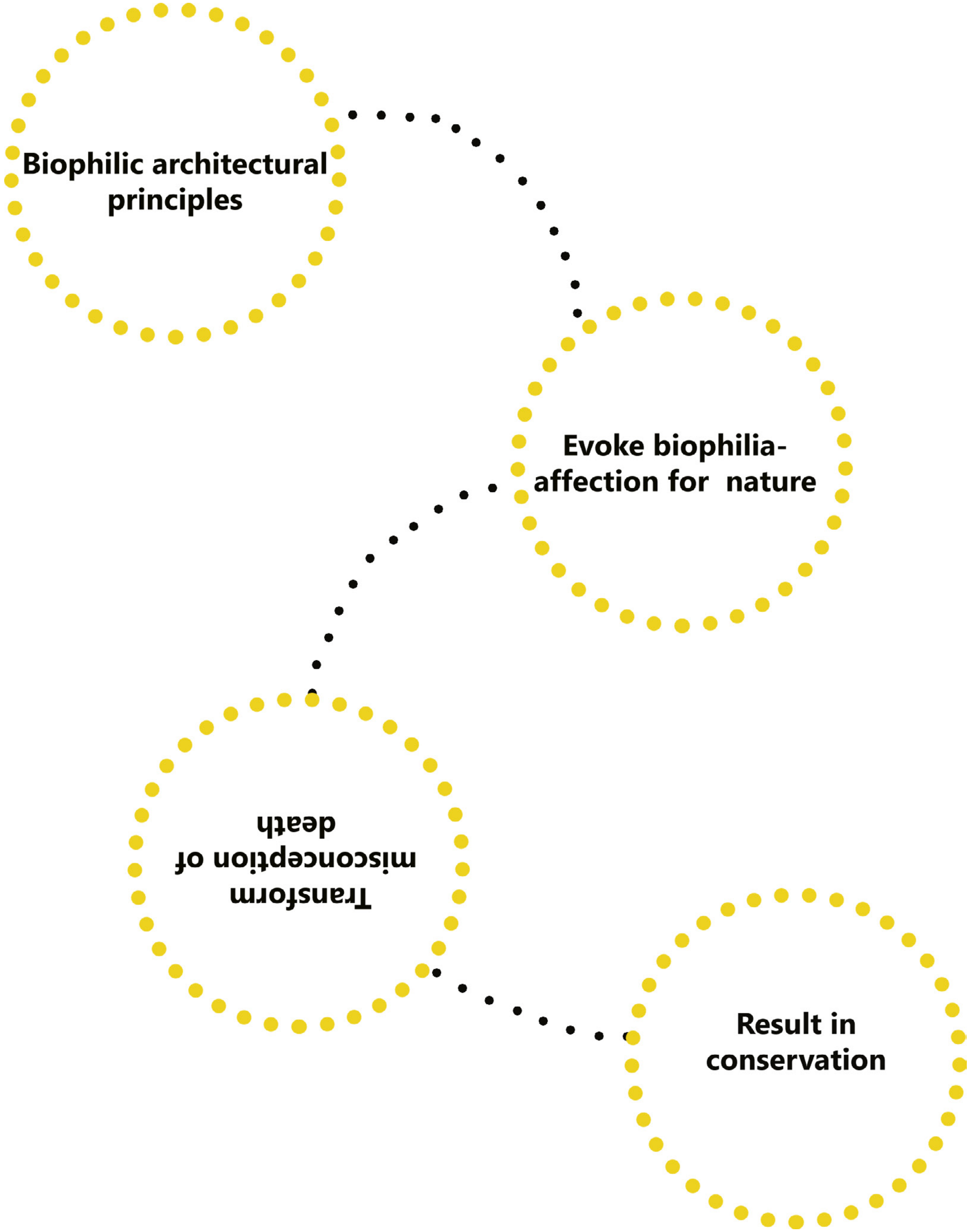
Laundry room	13.5m^2
Laundry storage	5.5m^2
Medical waste disposal	4m^2
Generator room	4 m^2
Sterilisation room	10.5m^2
Surgery room	24m^2
Surgery prep	12m^2
Vulture prep	18m^2
Equipment storage	4.5m^2
Pharmacy	4.5m^2
Corridor	25.5m^2
Food prep	37.5m^2
Cold storage	10m^2
X-ray room	7m^2
Examination room	42m^2
Night enclosure	8m^2
Day enclosure	30m^2

Vet office	8m^2
Director's office	8.5m^2
Open lab	25.5m^2
Storage	4m^2
Research office	10m^2
Board room	15m^2
Staff lounge	20m^2
Archives	5m^2
Reception/info	49m^2
Accessible wc	3.2m^2
Male wc	10m^2
Female wc	12.5m^2
Briefing room	36m^2
Storage	7m^2
Cleaning storage	6m^2
Staff dressing room	9m^2

Communal lounge/kitchen	36m^2
Laundry room	7m^2
Bedroom 1	39m^2
Bedroom 2	12.5m^2
Bedroom 3	12.5m^2
Bedroom 4	12.5m^2
Corridor	42m^2
Living unit 1	
Lounge/Kitchen	40m^2
Pantry	2.5m^2
Bedroom	22m^2
Bathroom	3.7m^2
Living unit 2	
Lounge/Kitchen	40m^2
Pantry	2.5m^2
Bedroom	22m^2
Bathroom	3.7m^2

2.6 MORPHOLOGY
Theoretical discourse

The purpose of this chapter is to explain the theoretical influences on the design decision making. An introduction to Biophilia is provided in Part 1 of the dissertation, followed by the biophilic design principles in Part 2 (Conceptual development). The project explores how biophilc design principles can assist in the ultimate goal of conserving the Cape Vultures of the karoo. In other words, how can the interpretation of biophilc design principles assist in evoking a biophilic experience of the space that implies the care and love for living things. Through encouraging biophilia the project aims to transform the negative connotation vultures have with death ultimately contributing to conservation.


Biophilic architectural principles
Evoke biophilia- affection for nature
Transform misconception of death
Result in conservation

2.6.1 EXPRESSIONS OF BIOPHILIA

This chapter explains Biophilia through exploring nine essential aspects of our affiliation with nature as developed by Stephen Kellert in 1993. The hypothesized reasons for our connectedness with nature.

Utilitarian

The human exploitation of nature. The physical expenditure of nature, forming a fundamental base for being human. Humans have always benefitted from exploiting nature for food, clothes, tools and other biological advantages. Recent years have seen the increased interest in the hidden material value of nature such as the genetics of obscure species like plastic eating fungi. Undiscovered species in the oceans and jungles of the world are seen as possible resources as we expand and exploit the world's genetic stockpile (Kellert, 1993).

Naturalistic

The satisfaction gained through the direct contact with nature. The sense of awe and wonder associated with the natural world's complexity and the intimate experience thereof (Kellert, 1993). This aspect involves human's tendency of curiosity and the urge to explore the natural world. Edward Wilson describes in Biophilia (1984) that our interest in biodiversity stems from our evolutionary roots, as the diversity of species existed before humanity, thus have we not fathomed the limits thereof. Our curiosity continues to grow, the more we discover, the bigger the mystery. Humanity continues to search for unexplored terrains but some part of us craves the world to be mysterious and infinite (Kellert, 1993). Hugh Iltis states in The Meaning of Human Evolution to Conservation (1966) that:

"Involvement with nature ... may be in part genetically determined; human needs for natural diversity... must be inherent. Man's love for natural colors, patterns and harmonies... must be the result ... of... natural selection through eons of mammalian and anthropoid evolution".

The naturalistic view plays an important role in why people seek to do outdoor activities like hiking, climbing and camping. The benefits of these activities include stress relief, relaxation and enhanced creativity through observing biodiversity (Kellert, 1993).

"Nature matters to people. Big trees and small trees, glistening water, chirping birds, budding bushes, colorful flowers-these are important ingredients in a good life." (Kellert, 1993)

Ecological- Scientific

It is important to distinguish between our scientific and ecological relationship with nature. Both are based on the urge for precise study and the belief that nature is understood through practical studies thereof.

Ecological approach: focusses on the interconnection and interdependence of components in nature and the integral synthesis of living and non-living elements manifesting the flow of energy in an ecosystem (Kellert, 1993).

Scientific approach: Focusses on the physical and mechanical aspects of living organisms, Stressing on issues such as taxonomy and morphology. The scientific approach is seen as reductionistic due to the fact that the organism is analysed withdrawn from its relationships with other species and its natural habitat (Kellert, 1993).

Aesthetic

The physical beauty of nature. Experienced through awe at the extraordinary aesthetic impact of the natural worlds like the varying colours of a sunset or the magnificence of a mountainous view. Wilson suggests in Biophilia (1984) that our aesthetic response is based our curiosity and search for the ideal in nature. The harmony and symmetry or lack thereof as lived human experience. The aesthetic experience is coupled with feelings of psychological well-being, tranquillity and self-confidence. Kaplan & Kaplan suggest in The Experience of Nature (1989) that:

"Human genetic needs for natural pattern, for natural beauty, for natural harmony, [are] all the results of natural selection over the inimitable vistas of evolutionary time."

Symbolic

The Human use of nature to facilitate thought and communication. This is most evidently represented in the development of languages and the use of nature as symbol. The question arises whether modern industrial life has provided sufficient substitutes for natural symbols as primary means of communication. The characters of children's books are predominantly animals and children are taught to distinguish between species like sheep and goats (Kellert, 1993).

Humanistic

Reflects deep emotional connections with elements of nature. Typically directed at larger mammals. One's relationship with a pet can be seen as humanistic, as a companion animal is often loved not unlike the relational status with other human, such as family members. The humanistic experience results in feelings of care and nurture for individual elements in nature (Kellert, 1993)

Moralistic

Implies the feelings of ethical responsibility, affiliation and appreciation of the natural world. The moralistic approach suggests an essential meaning and harmony in nature implying a spiritual connectedness between humans and nature (Kellert, 1993). Native tribes of North America envision the earth as a living being and the presence of a complex link between the natural landscape and lived experience.

"We are of the soil and the soil is of us. We love the birds and beasts that grew with us on this soil. They drank the same water as we did and breathed the same air. We are all one in nature. Believing so, there was in our hearts a great peace and a willing kindness for all living, growing things." (Luther Standing Bear, 1933)

Dominionistic

The desire to dominate the natural world. The dominionistic experience in modern times is associated with the despoliation and destruction of the natural world. The pioneer however would have struggled to survive had he not acquired the necessary skills to subdue and dominate the wilds of the frontier.

Negativistic

The unpleasant experience of nature, characterised by fear and the antipathy towards aspects of nature. Activists for conservation note the alienation from nature as destructive and leading to unintentional harm (Kellert, 1993). Biophobia is categorised under this experience and explained in Part 1

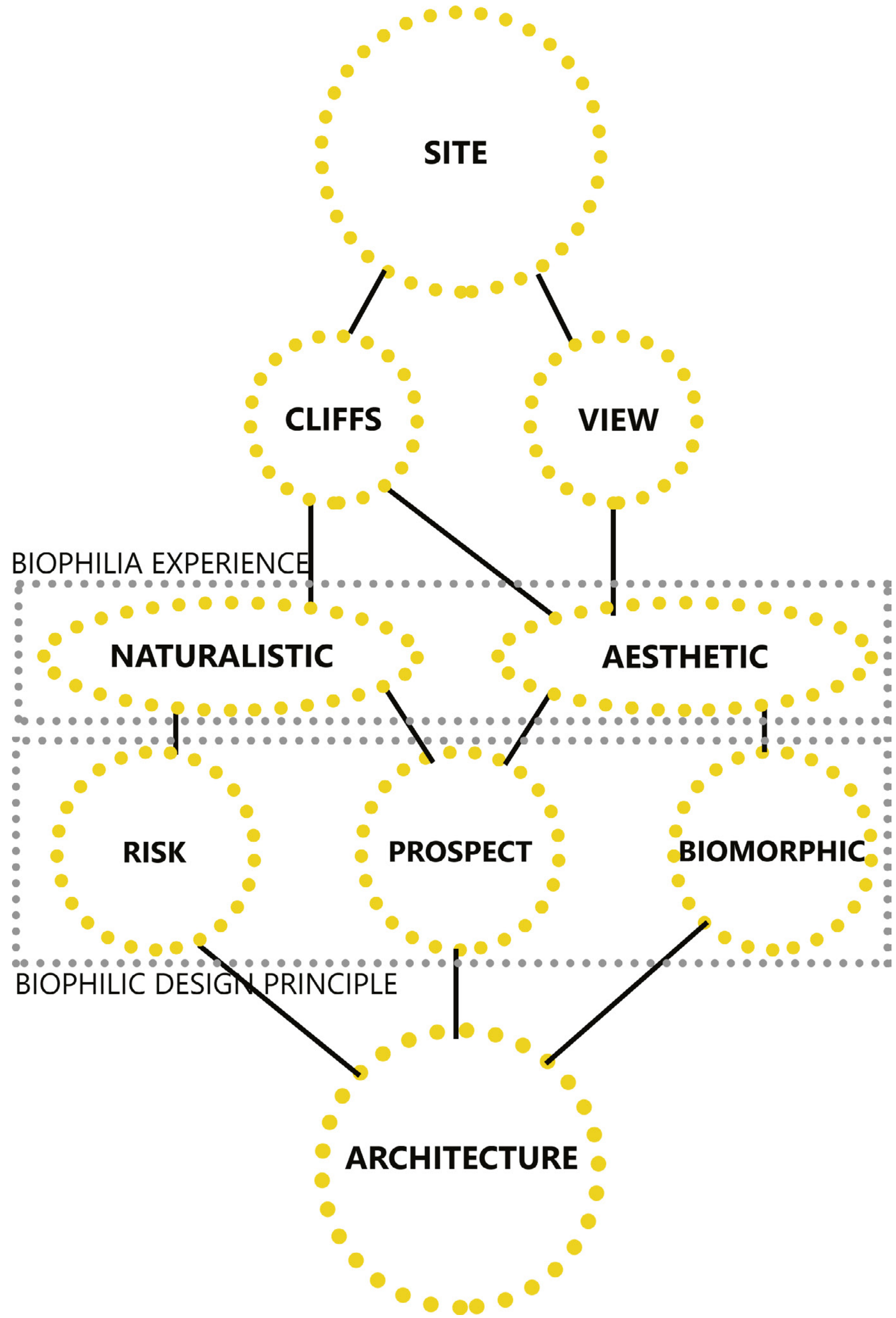
1	UTILITARIAN	Physical sustenance/ security
2	NATURALISTIC	Curiosity, outdoor skills, physical development
3	ECOLOGICAL-SCIENTIFIC	Knowledge, observational skills, understanding
4	AESTHETIC	Inspiration, harmony, peace
5	SYMBOLIC	Communication, mental development
6	HUMANISTIC	Companionship, group bonding, sharing
7	MORALISTIC	Order and meaning in life, kinship
8	DOMINIONISTIC	mechanical skills, physical prowess, ability to subdue
9	NEGATIVISTIC	Security, protection, individual fulfillment

The Biophilic expressions described underline our dependence on nature as well as our connectedness with it. Conservation is there for crucial to sustain who we are. Aesthetic and moral reasons that fulfil the emotional, cognitive and spiritual needs of human should out way the economic considerations. There for the ethical responsibility falls upon us humans to preserve the natural world, if not for compassionate concern, for biological imperative and self-interest

2.6.2 THE SITE

The decision of site was intentionally made to evoke the aesthetic experience of biophilia. The sense of awe and magnificence is evoked by the sheer scale of the cliffs surrounding a person on three sides when one is standing in the valley. The design attempts to maintain and supplement the aesthetic experience through a sensitive approach that encompasses and interprets biophilic principles of design such as prospect and biomorphism. Investigating the rock formations provides clues to the biomorphic approach chosen whereas prospect implies the visual connection between things or spaces. The concept of prospect relevant to the site is interpreted as the connection between the building and the cliffs.

The design principle of risk arouses attention and involves human's innate tendency of curiosity. Curiosity is a key aspect of the naturalistic experience of biophilia. The cliff face provides the opportunity to evoke this experience through incorporating the biophilic design principle of risk in the design proses.



2.6.3 THE VULTURE

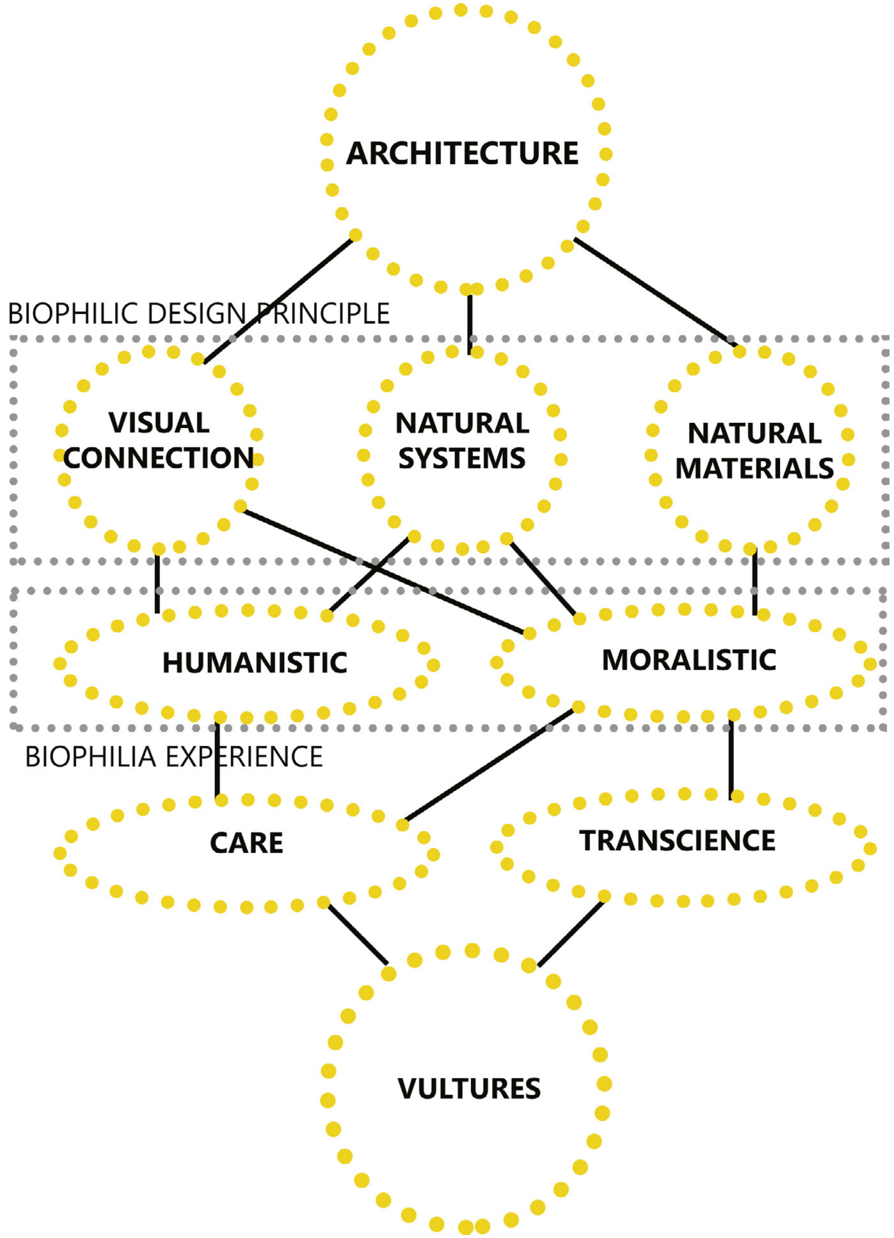
Over the course of history humans have been inclined to avoid vultures as explained in Part 1. This has resulted in the undesirable association with death. Humans have adopted a negativistic biophobic perspective of vultures as expressed by Padriac Colum, a leader of the Irish literary revival, in the poem Vultures:

FOUL-FEATHERED and scald-necked,
They sit in evil state;
Raw marks upon their breasts
As on men's wearing chains.

Impure, though they may plunge
Into the morning's springs,
And spirit-dulled, though they
Command the heaven's heights.

Angels of foulness, ye,
So fierce against the dead!
Sloth on your muffled wings,
And speed within your eyes!

The aim of the project is to transform these misconceptions society has attached to vultures through evoking the other experiences of Biophilia by using biophilic design principles to encourage these experiences. The desired expressions are humanistic and moralistic. The humanistic approach implies the deep emotional connectedness with elements of nature. Creating a connectedness between vultures and humans that result in the feeling of care and nurture for the birds. Feelings that crucial to conservation. Stephen Kellert quotes (1993) Rene Dubos as saying "Conservation is based on human value systems; its deepest significance is the human situation and the human heart".
The mention of conservation being based on human values relates to the moralistic experience. Humans have the moral responsibility to protect the natural world, in this case vultures. This implies our spiritual connectedness with nature as described previously. A connectedness that is accentuated through evoking moralistic and humanistic experiences.
These experiences are evoked by interpreting and implementing biophilic design principles. The visual connection with nature as a principle can apply to this particular dissertation as the visual connection between the vultures and the users. Exposing natural systems e.g. the breeding process of vultures, creates a perceptual shift in the understanding of what is experienced resulting in awareness and ultimately conservation (Kellert, 2008). This is achieved through interpreting the biophilic design principle of; Connections with natural systems. The use of natural materials evokes a cognitive and physiological connection to the place. The raw natural state of the materials arouses as transient quality that can be associated to the transient nature of the state of vultures.



2.7 TECTONICS

The technical report

The purpose of the technical report is to investigate the technical aspects of the design process and how this influences the morphological development of the dissertation. The report investigates the conditions of the site and surrounding context that directly influences the technical development of the building. Exploring sustainability, materiality and the tectonic articulation assists in developing the technical resolution of the design proposal.

The Cape Vulture Rehabilitation Centre focusing on the rehabilitation, supplementation and conservation of Cape Vultures in the Karoo.

SITE LOCATION

Cadastral Information
refer to Part 2: Topology

SUSTAINABILITY AGENDA

Natural Material
Adobe
History of clay in Karoo
Water & Electricity
Accessibility & Sun

MATERIALITY

Adobe
Timber
Floor
Retaining walls
Roof

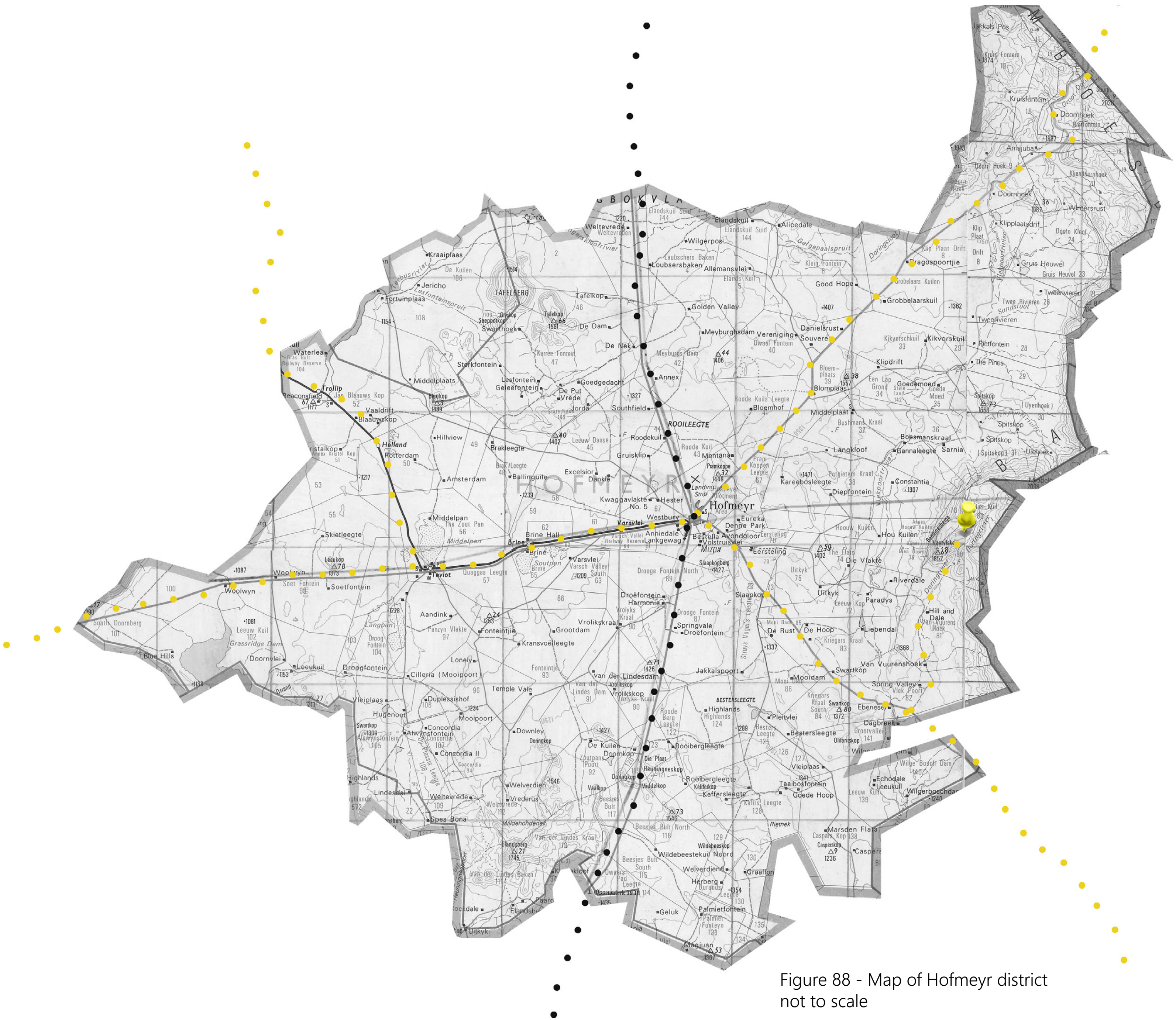
STRUCTURAL INVESTIGATION

Load-bearing masonry
Timber framed
Circulation
Functions
Structural Philosophy

SERVICES

Septic tank & French drain
Vulture Rehabilitation

2.7.1 SITE INFORMATION



DISTANCE FROM HOFMEYR
Road: 30km
Beeline: 18km

Figure 88 - Map of Hofmeyr district
not to scale

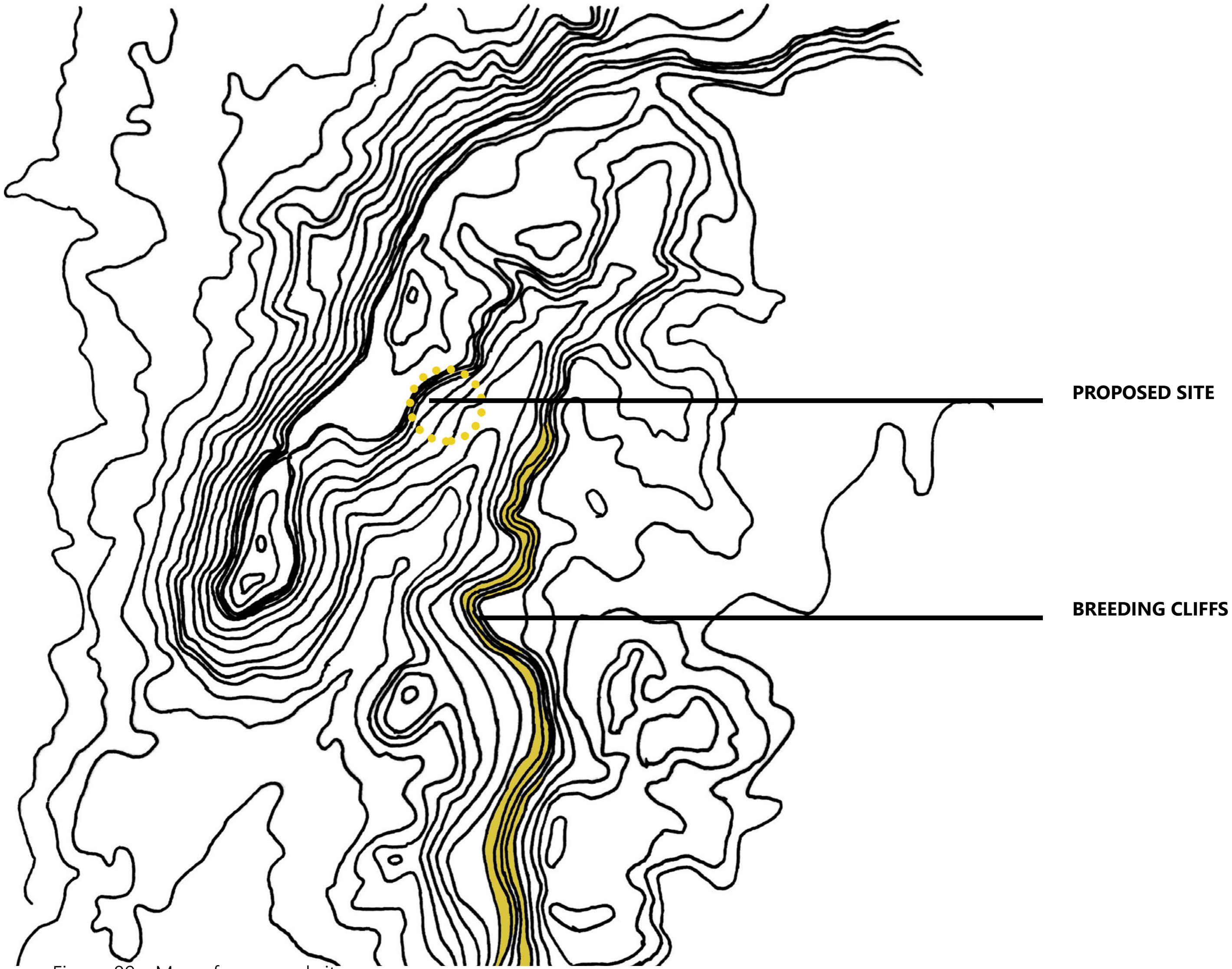


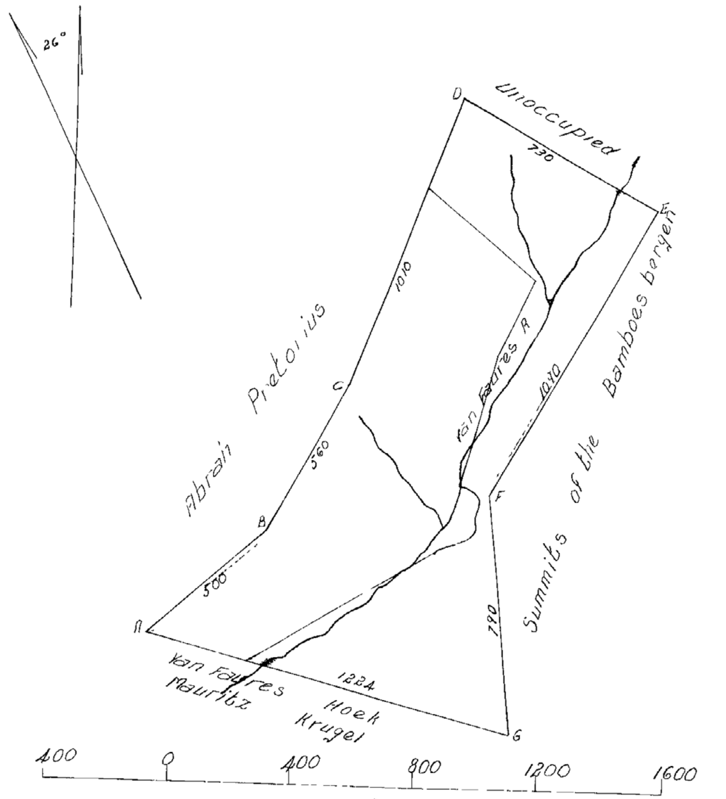
Figure 89 - Map of proposed site
not to scale

The site is located on the slope of the Bamboes Mountain Range on the farm Riet Kuil near Hofmeyr in the Eastern Cape. The area forms part of the Eastern Upper section of the Nama Karoo (Rutherford et. El, 2006) discussed in Part 2 under topology. The carefully selected location of the site situates the project in close proximity to the breeding cliffs of an existing colony of Cape Vultures.

CADASTRAL INFORMATION

SG DIAGRAM

S.G. DGM. NO. 794/1837.



Rhynland Roods. The farm Riet Kuil No. 80

The above Diagram A . . . . . . G represents 2334 Morgen of Land in the ˣdistrict of Somerset and Field Cornetcy of Tarka being the place Riet Kuil on the van Faure's River, the property of J. van Zyl Senior. ˣNow Div of Maraisburg

Extending and bounded as above described.

Surveyed by,
(Sgd) C. F. Bird,
Govt. Surveyor.

C

Quitrent Som.Q.7-49 Sheet DP.5

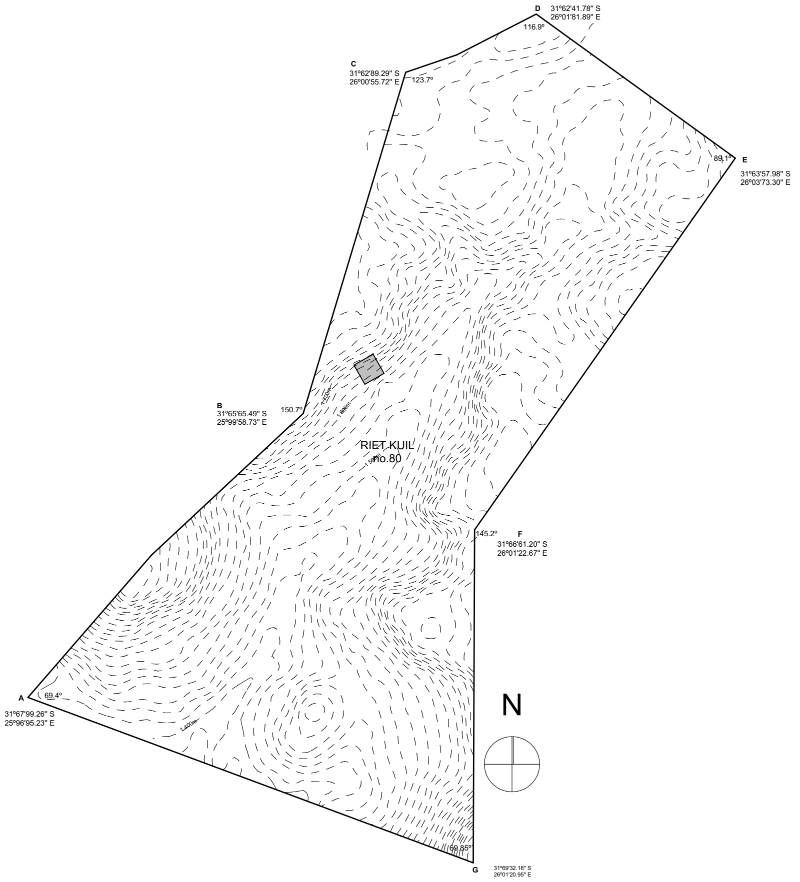
31st March, 1837.

J. van Zyl, Senior.

Figure 90 - Surveyor general diagram

15.10.1956

H.N.80



SCALE 1:25 000

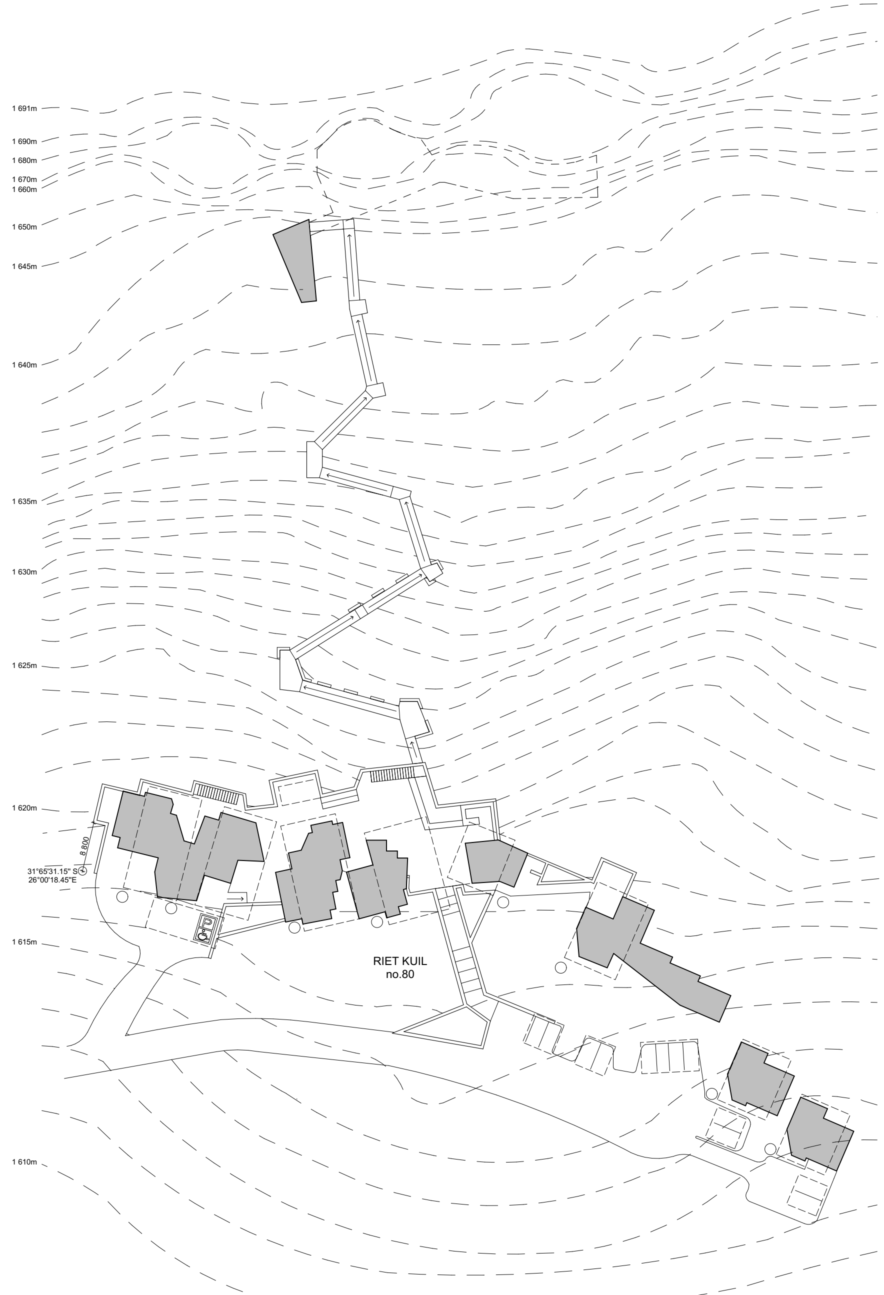


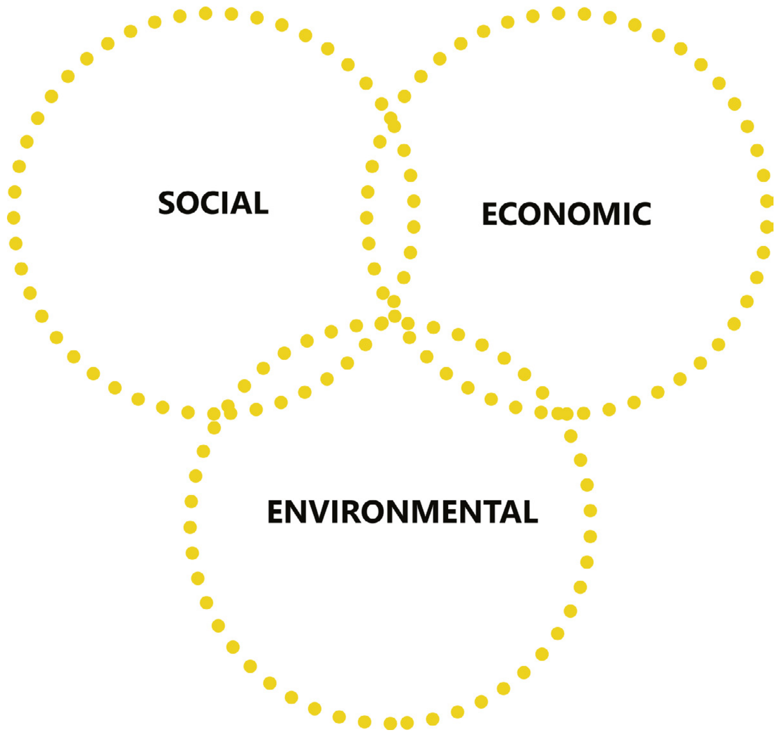
Figure 91 - Location plan

2.7.2 SUSTAINABILITY AGENDA

Amany Ragheba describes the concept of sustainability in Green architecture: a concept of sustainability as:

> "The theory, science and style of building designed and constructed in accordance with environmentally friendly principles. Green architecture strives to minimize the number of resources consumed in the building's construction, use and operation, as well as curtailing the harm done to the environment through the emission, pollution and waste of its components"

Sustainability is discussed on an economic, social and environmental level and how these "key characteristics" contribute to the overall sustainability of the intervention.



ENVIRONMENTAL

The theoretical underpinning of interpreting Biophilic principles with the goal of conserving Cape Vultures results in the necessity to incorporate environmental sustainability characteristics that avoid the depletion of natural resources and the contamination of the environment. (Norton, 1999). Vultures form an important part of our natural ecosystem, they are however facing rapid population decline due to human activity as discussed in Part 1. The dissertation envision the conservation of vultures holistically, focusing on the challenges vultures face at the top of the food chain to have a sustainable impact on the ecosystem as a whole, thus contributing to the sustainability of the environment.

Vulture rehabilitation (Wolter, 2017)**:**

- Treat vultures which are injured, sick or unable to fly due to various reasons such as the absence of thermal drafts discussed in Part 2: topology.
- Release all birds that have been successfully rehabilitated and will be able to survive in the wild.
- Monitor all released birds through GPS tracking

Captive Breeding programme (Wolter, 2017)**:**

- Facilitate the breeding of Cape Vultures through incorporating captive breeding enclosures in the intervention.
- Supplementing the wild population of Cape Vultures through releasing captive bred chicks one they are able to survive on their own in the wild.
- Locating suitable sites to reintroduce Cape Vultures into the wild; close to the existing wild breeding colony.
- Monitoring all released captive bred chicks through GPS tracking.
- Determining the breeding success and the trends of the existing wild colony, through the monitoring released birds.

Awareness programmes (Wolter, 2017):

- Present educational talks at schools and other institutional settings, creating awareness of the conservation of vultures.
- Incorporate educational services at the facility: Presentations, information boards.
- Assist when conflict arises between vultures and farmers.

Research (Wolter, 2017):

- Researching the toxicity of prducts such as pesticide and lead on vultures
- Study the success of Vulture restaurants
- Researching veterinary treatment for vultures
- Researching the affect vultures have in preventing the spread of disease.

Environmental sustainability is not only limited to the conservation of Cape Vultures but also provides the opportunity to reduce the carbon footprint of the building. The approach is grounded in the biophilic principles of architecture and specifically Nature in space explained in design concept 1 discussed earlier in Part 2. Incorporating natural materials that are subject to temporal change assist in creating a connection with natural processes (Browning, 2014) e.g. the change of season and the circle of life and death.

NATURAL MATERIALS

Natural materials include wood, earth, straw and stone. Using these materials that are locally readily available minimize; the cost of transportation and energy-consuming processes required to produce modern construction materials. Natural materials possess a positive environmental footprint compared to modern materials due to the low amount of energy required, limited disruption or disturbance of the surrounding environment and renewability (Horn, 2019). Construction methods using natural materials are usually labor intensive which provides the opportunity to utilize the local community as labor, meaning more money is spent on developing skills and providing jobs than on materials and transport, thus contributing to the social sustainability of the intervention (communityoutreachbuilding. com,online)

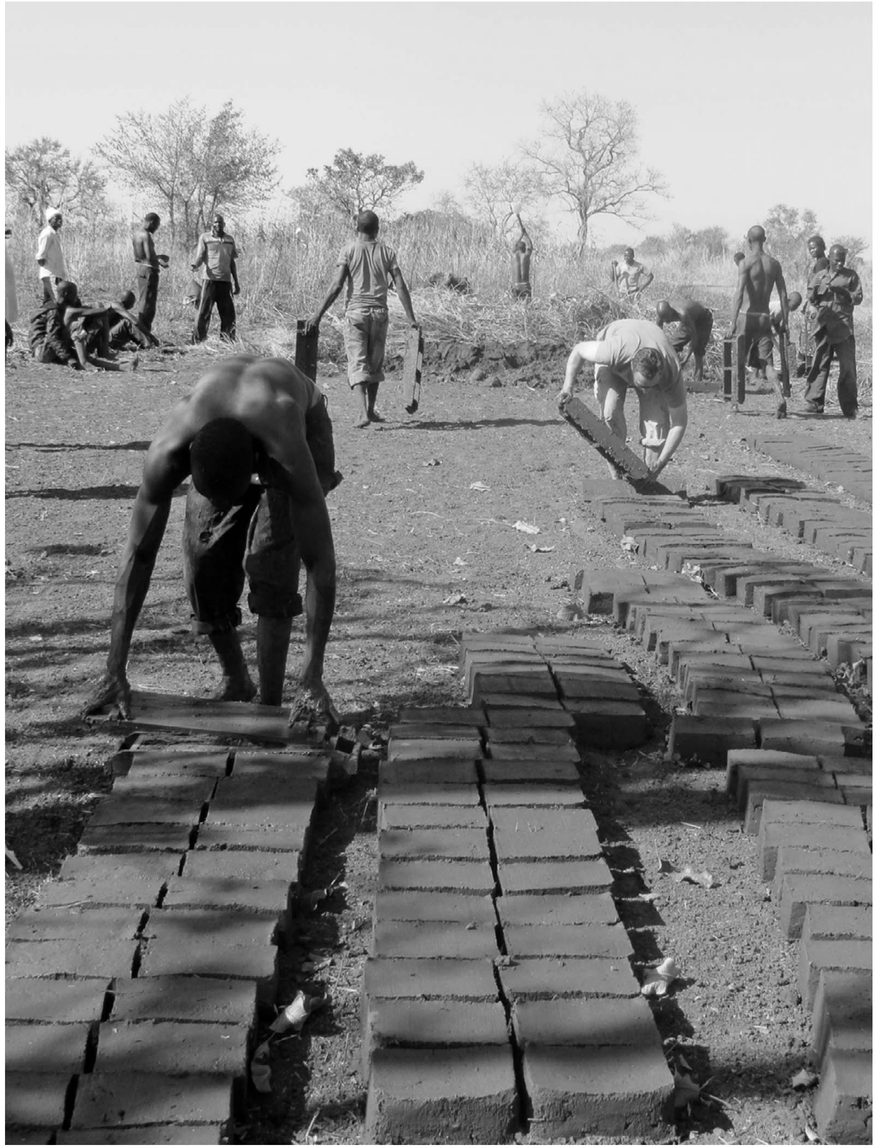


Figure 92 - Adobe brick production (outreachuganda.org, online)

Adobe

The soil compilation on site consists primarily of clay soil which is covered by a small layer of sand and mudstones, Mudstone is a mixture of clay and silt, characterized by irregularity in fracture planes on the bedding (Schulter 20016). The presence of clay soil on site provides the opportunity to use clay/mud bricks which is manufactured on site from the soil excavated. This contributes to sustainability as it reduces the amount of building rubble and energy loss when constructing the building. The thermal mass of adobe construction is high and thus also contribute to passive cooling and heating.
 Thermal mass is described as the ability of a material to absorb and store heat (Patience, 2016). Materials with high thermal mass (concrete & brick) require more heat energy to change the temperature of the material than materials with low thermal mass e.g. timber & steel.

Figure 93 - Photographs of soil on site

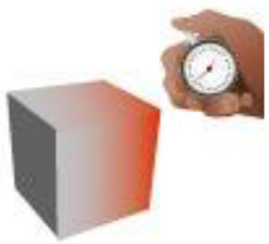
Factors that determine thermal mass

Specific heat capacity

Specific heat capacity refers to a material's capacity to store heat for every kilogram of mass. A material of 'high' thermal mass has a high specific heat capacity. Specific heat capacity is measured in J/kg.K

Density

The density refers to the mass (or 'weight') per unit volume of a material and is measured in kg/m^3. A high density material maximises the overall weight and is an aspect of 'high' thermal mass.



Thermal conductivity

Thermal conductivity measures the ease with which heat can travel through a material. For 'high' thermal mass, thermal conductivity usually needs to be moderate so that the absorption and release of heat synchronises with the building's heating and cooling cycle. Thermal conductivity is measured in units of W/m^2K

Figure 94 - Factors of thermal mass (Patience, 2016)

The effectiveness of some common materials:

	Material	Specific heat capacity	Thermal conductivity	Density	Effectiveness
	water	4200	0.60	1000	high
	stone	1000	1.8	2300	high
	brick	800	0.73	1700	high
	concrete	1000	1.13	2000	high
	unfired clay bricks	1000	0.21	700	high

Figure 95 - Thermal mass of adobe compared to other materials
(Patience, 2016)

History of clay in the Karoo

The use of clay/mud bricks link to the heritage of constructions methods in the Karoo. Judy Maguire writes in Building in stone in the Karoo: possible explanations for the restricted distribution of corbelled houses that the oldest houses still standing in the southern Karoo date back to the 1700's and are constructed with clay walls, even though stone was readily available. The walls were constructed on stone foundations using the opgekleide (shuttered) technique similar to rammed earth. The clay walls were used together with stone walls resulting in a patchy appearance. Animal manure was applied as plaster in the oldest examples. The roofs of these houses were the brakdak type: a layer of salty clay and ant heap soil covers a layer of cereal straw that lie on a ceiling of closely tied reeds that are supported by Karee beams. (Maguire, 2004) Thus using abode bricks as a construction method contributes to cultural sustainability

Figure 96 - Vernacular earth brick house (Maguire, 2004)

Figure 97 - Photograph of clay brick ruin in Hofmeyr (Author, 2019)

WATER & ELECTRICITY

Dense concentrations of boreholes are found throughout the Eastern Great Karoo, where groundwater is abstracted from Primary aquifers and fracture dolerite aquifers. The town of Hofmeyr is solely dependent on groundwater reservoirs.

The presence of aquifers potentially resolves the obstacle of providing water to the site. Ground water has traditionally been extracted through wind pumps, Farmers in the Hofmeyr area have however started replacing wind pumps with solar water pumps. This is due to lower maintenance required as well as better control provided. Solar pumps and solar panels addresses the water and electricity issue posed by the isolated site

Figure 98 - Solar pump replacing windpump, (solarpumps.com, online)

Accessability & Sun angles

The remote site poses the challenge of accessibility as the building can only be accessed via a 30km gravel road from Hofmeyr. Designing accommodation units on site with enough storage to sustain the staff for a week is crucial in lowering the carbon emissions that would have been produced if frequent trips to town had to be made.

The 40m high cliffs situated north-west of the site poses the challenge of natural light, situating the building too close to the cliff will result in the site being completely shaded for most of the day. The decision was made to situate the building approximately 100m from the cliff face to allow for enough northern sun to achieve thermal comfort. The 36.5°average slope of the site from north to south contributes to the challenge of getting enough Northern sun on the site.

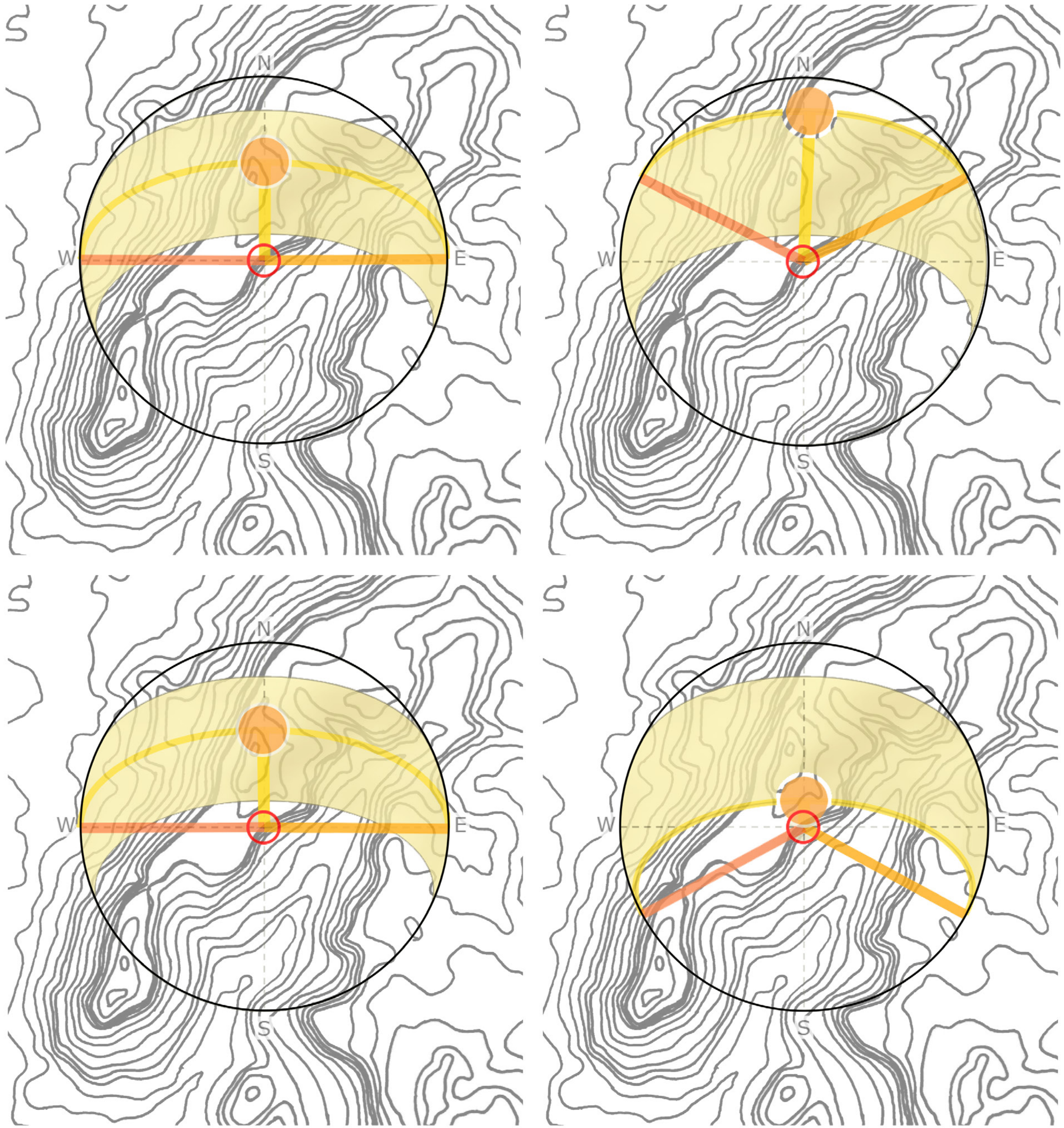


Figure 99 - Sun study

2.7.3 MATERIALITY

Figure 100 - Materiality model

Conceptual investigation of Earth construction

The model is constructed interpreting the method of rammed earth construction on a much smaller scale which ultimately resulted in a method that much more resembles adobe mud brick, rather than earth construction. The use of earth bricks relates to the concept of nature in space, as the natural materials used in construction ultimately makes the space.

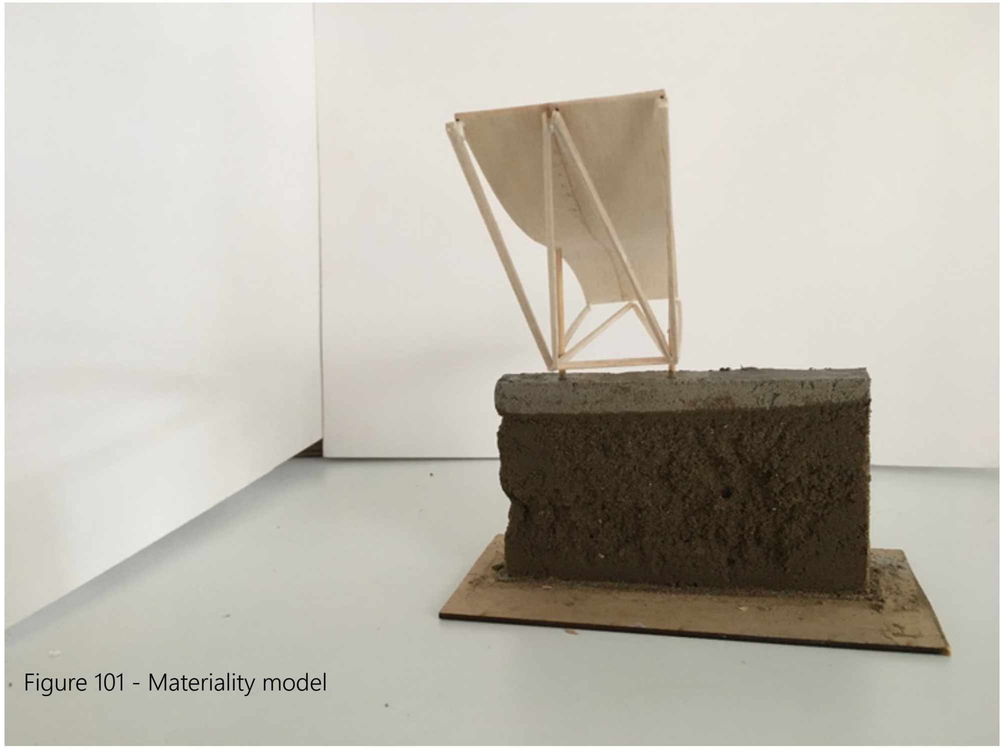


Figure 101 - Materiality model

As discussed in the sustainability agenda, the theoretical approach of the dissertation implies the use of natural materials. The materials are selected due to their readily availability and connection to the theoretical approach.

ADOBE/MUD BRICKS

The mixture is prepared by mixing clay soils with straw. and manually compacted into molds that provide the form of the bricks. After the molds are removed the bricks are left in the sun to dry. The longer the bricks are left the stronger they get. Adobe is a low-tech method of construction that provides a number of sustainability advantages. The isolated location and geology of the site contributes to the consideration of adobe (Downton, 2013).

BENEFITS OF ADOBE

- Increases job creation and community skills
- Raw materials are readily available on site and don't require specialized tools.
- Thermal stability is provided by the high thermal mass of the material
- Thermal comfort of indoor spaces is provided by clay's ability to moderate humidity levels (Horn 2019)
- Sustainable and renewable material
- Inexpensive building material
- Less waste is created.

FOOTINGS
Footings for mud bricks are usually concrete strip or raft foundations, it is however possible to create footings out of rubble, a splash course or fired clay bricks are used as the first courses to prevent erosion from flowing water after heavy rains (Downton, 2013).

JOINTS & CONNECTIONS
Conventional masonry principles apply regarding bricks being bonded with mortar as well as the pattern in which bricks are laid. The bricks are laid in a thick mortar mix that is fundamentally the same material as the brick but only in its wet state. It is however common in the commercial mud brick industry to use mortar that is a mixture between sand and cement. When dried the muddy mortar represents a similar color to the bricks. This continuous characteristic results in a monolithic appearance that would not have been possible if exposed fired clay bricks and cement mortar was used (Downton, 2013).

FIXINGS
Embedding plugs or dowels into the wall to allow for strong fixings, this is necessary due to the low "pull out" strength of adobe walls.

OPENINGS
Timber is the most common material used for lintels in adobe construction, any structurally applicable material can however be used. The reason for the use of timber is that lintels and beams can be formed from untreated timber and used in conjunction with the adobe construction process (Downton, 2013).

FINISHES
After brushing the dried wall to achieve a smooth surface a layer of watery mud is applied, the layer can be the final waterproofing coat e.g. a mud and animal manure mixture. Turpentine and linseed oil can also be used to apply a final finish and aids in protecting the walls from insect infestation (Downton, 2013).
.

MAKING ADOBE BRICKS

Adobe bricks consist of clay, straw and sand. The wet mixture of these three components are compressed in open frames, the frame is removed once the bricks have initially set. The bricks are left in the sun to dry. Clay plays a similar role as cement in concrete blocks, as a binding element, holding the brick together. Soil with too much clay results in shrinkage cracks, where soil with too much sand result in bricks that crumble easily (Newcomb, 1981). Sand acts as a filler between the clay particles in an adobe brick, much like gravel in concrete. Most types of sand can be used except beach sand, due to its high level of salt. The uniform building code for earth construction adopted by most counties in the United States of America provides a set of building standards that can be used as a bench mark when producing adobe bricks for the purpose of this dissertation:

- The clay content of the soil used is required to be more than 25% and less than 45%
- Bricks are not permitted to absorb more than 2.5% of water, based on the weight of the dry brick.
- No bricks are permitted to have more than 3 shrinkage cracks, Shrinkage cracks shall not exceed 7.5cm in length and 0.5cm in width.
- Each brick should have a minimum compressive strength of 21kg per cm^2

(Newcomb, 1981)

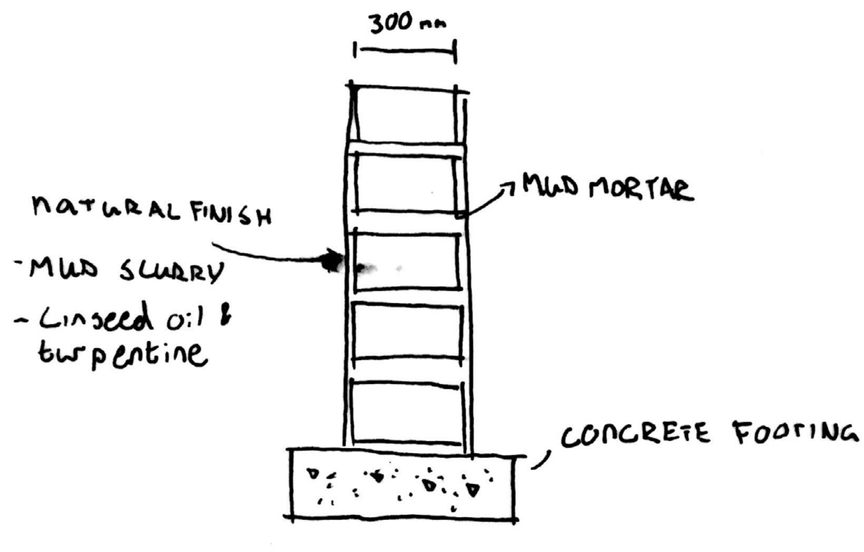


Figure 102 - Adobe wall section

Figure 103 -Photograph of soil on site
(Author, 2019)

TIMBER POLES

The design concept of biophilia and "nature in space", inspired the exploration of using timber poles in the construction rather than steel or concrete. Timber poles are used in a structural system that provides support for gravity loads while resisting lateral forces.

Comparing building materials.
Carbon dioxide is a direct by product of producing cement. While steel production is also an energy intensive process. Approximately 8% of all greenhouse gas emissions are accredited to the steel and concrete in the construction industry. In contrast when a tree grows it absorbs carbon dioxide and produces oxygen as a by-product. If the tree is left to live out its lifespan and eventually rots, it releases the same amount of carbon dioxide it has absorbed throughout its life, The same happens when a tree is burned. When building with timber the CO2 that is inhibited in the timber gets locked away. One cubic meter of timber stores 0.9 tonnes of carbon dioxide. (Cronje, 2013)

Benefits of gumpoles (Cronje, 2013).

- Renewable material
- Low amount of energy required in production and construction process.
- Natural material, links to the concept of biophilia.
- Lighter in weight compared to materials like concrete and steel, thus easier to handle and work with during construction.
- Cheaper material than steel.
- Links to persishability

FOOTINGS
Embedded poles
The pole is embedded in the ground, surrounded by an unyielding backfill. The pole is embedded between 1,5m and 2,5m deep, the backfill is compacted around the pole with a minimum width of 100mm. Materials for the backfill include River gravel and crushed rock with maximum aggregate size of 10mm. No-fines concrete can also be used to provide structural support as well as allowing for the drainage of moisture away from the pole (woodsolutions.com.au, online).

Base Plates
Fixing base plates to the timber poles are challenging due to the irregularity in shape from pole to pole. As a result, poles that are to be connected to base plates are designed as columns with pinned bases (woodsolutions.com.au, online).

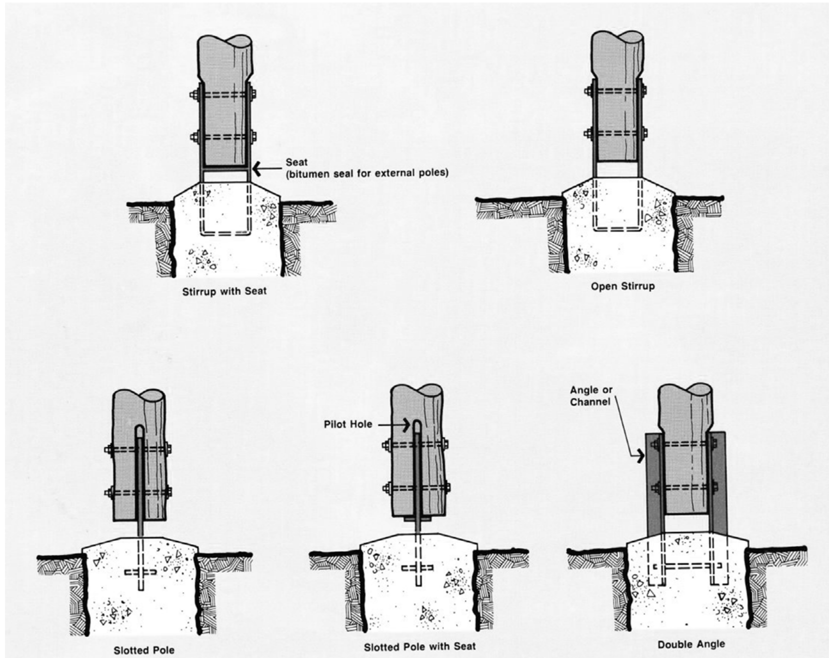


Figure 104 - Gumpole footings
(woodsoutions.com.au, online)

JOINTS & CONNECTIONS

The timber poles are connected to the concrete foundation with a steel stirrup (base plate) with a seat for exterior poles. The poles are connected with doweled connections i.e. with bolts and threaded rod (Burdzik, 1997). Round poles are used in pairs as a column system that increase the bearing weight compared to the use of a single pole as a column. Poles that are tapered along the length of the pole are used as beams. This allows for easier connections between the primary structure of gum poles and the pine timber trusses.

FINISHES

Timber poles are treated with Copper-Chrome-Arsenate which protects the timber from insect attack and fungal decay i.e. rotting (Cronje, 2013).

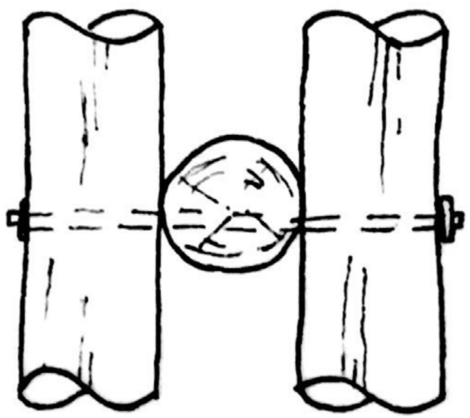


Figure 105 - Gumpole connection

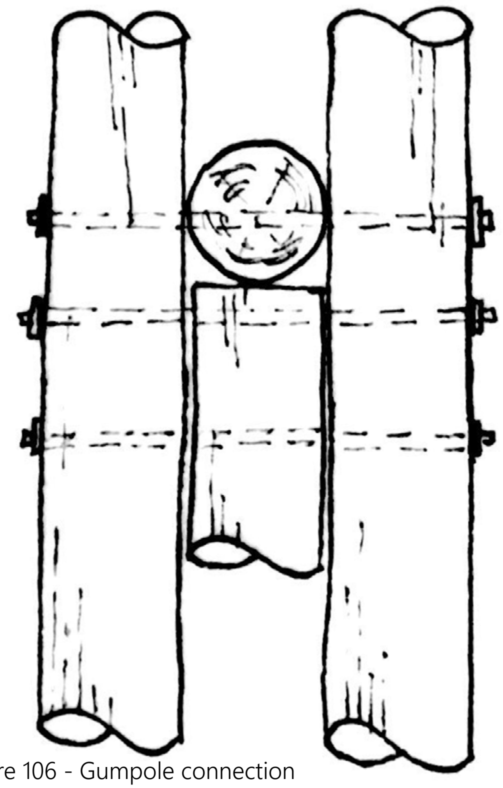


Figure 106 - Gumpole connection

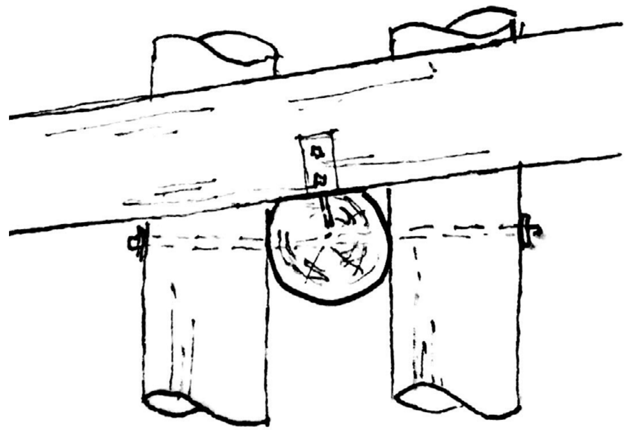


Figure 107 -Gumpole connection

FLOOR

Cemcrete cretestain will be used to treat the concrete floors. Applying cretestain provides a natural warm appearance to the cold gray concrete floors.
Benefits of Cretestain (Cemcrete.co.za, online):

- Can be applied with a brush or a roller
- Stains any concrete surface
- Is unable to flake or peel
- Enhances mottling, The appearance of random stains and spots which contribute to a natural appearance
- Suitable for exterior as well as interior use.
- Can be diluted with water if a lighter shade is required.

RETAINING WALLS

Gabion walls are used as the retaining walls in the intervention, using the natural stone on site allows for the material connection with the site and contributes to the design concept of nature in space. The benefits of using gabion walls are (Freeman, 2000):

- Easy transportation and handling of steel gabion boxes
- Uses natural material from the site
- Quick installation
- Labour intensive, contributing to the social sustainability
- Cheap, as only the steel boxes need to be purchased/ produced
- Permeability, assists with water drainage

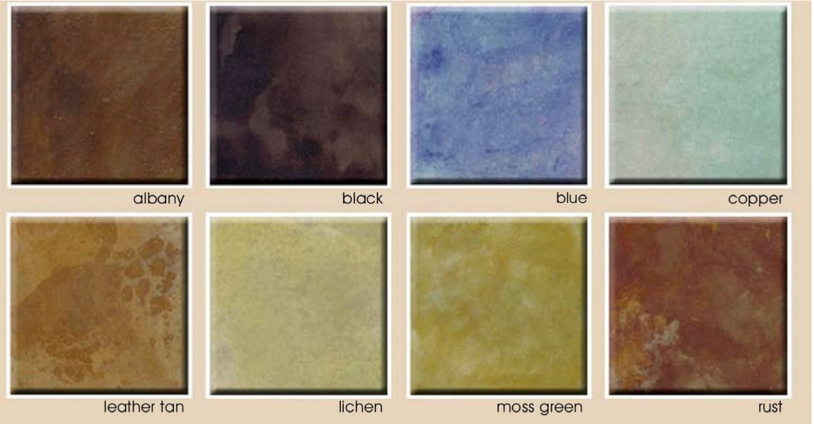


Figure 108 - Colours of Cemcrete (cemcrete.co.za, online)

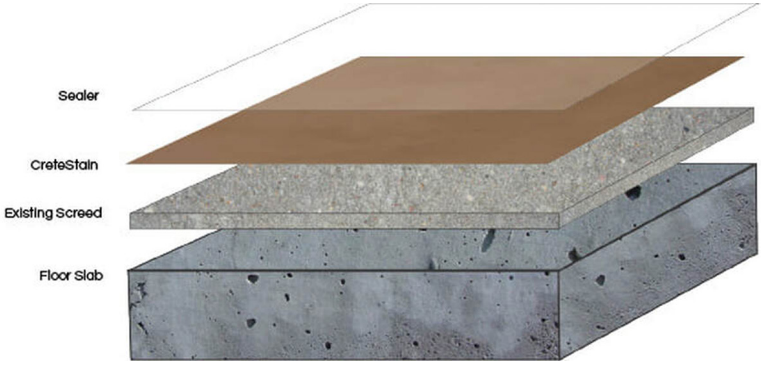


Figure 109 - Cemcrete appication (cemcrete.co.za, online)

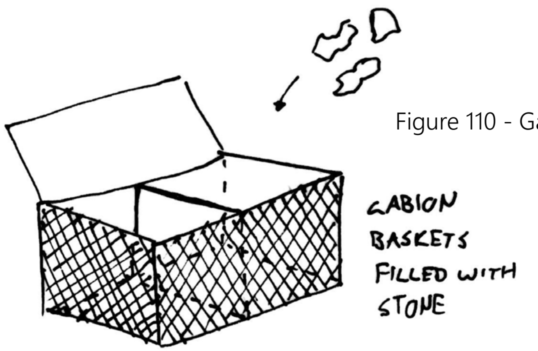


Figure 110 - Gabion basket

ROOF

SA pine timber trusses are supported on a gum pole structure. The decision to use 228mm x 76mm rectangular timber trusses provides a sense of sophistication that would not have been there if the whole roof was constructed of gum poles. This also aids in the transition from monolithic stereotomic walls to a lighter roof structure relating to the design concept of ascending, discussed in part 2 the decision to use Klip-lock roof sheeting also contributes to the idea of ascending. Klip-lock offers several benefits compared to corrugated iron sheeting (globalroofs.co.za, 0nline):

- Easier installation
- Easier to handle
- More durable.
- Can be installed at a lesser angle than corrugated iron.

The use of transparent canvas netting allows for natural ventilation as well as bringing natural light into the building.

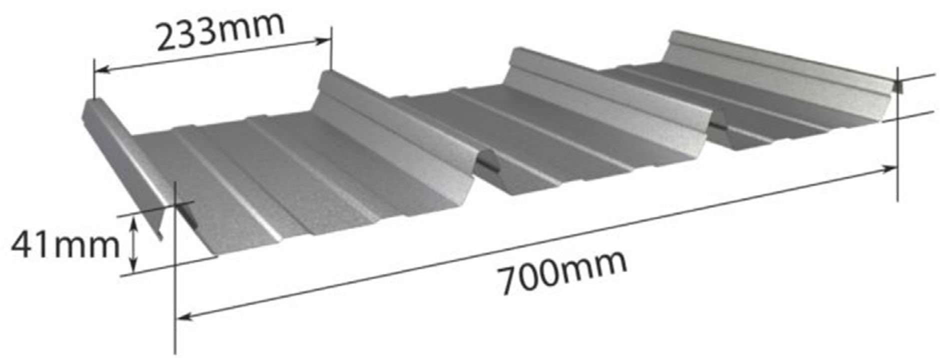


Figure 111 - Kliplock 700 (globalroofs.co.za, online)

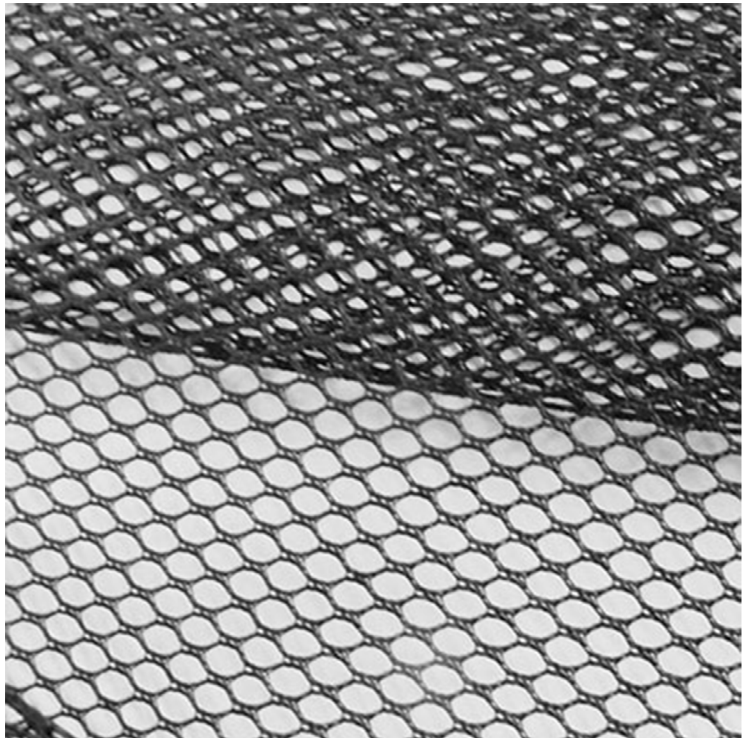


Figure 112 - Transparent cotton canvas (zsfabics.com, online)

Green roof

The green roofs implemented draws inspiration from the vernacular Brakdak roofs found throughout the Karoo. Interpreting the method of traditional green roof construction allows for the use of timber as primary roof structure. Benefits of using timber green roof (Van Lengen, 2008):

- Lighter than concrete.
- Renewable material
- Quick installation
- Inexpensive

Figure 113 - Brakdak roof (Fagan, 2008)

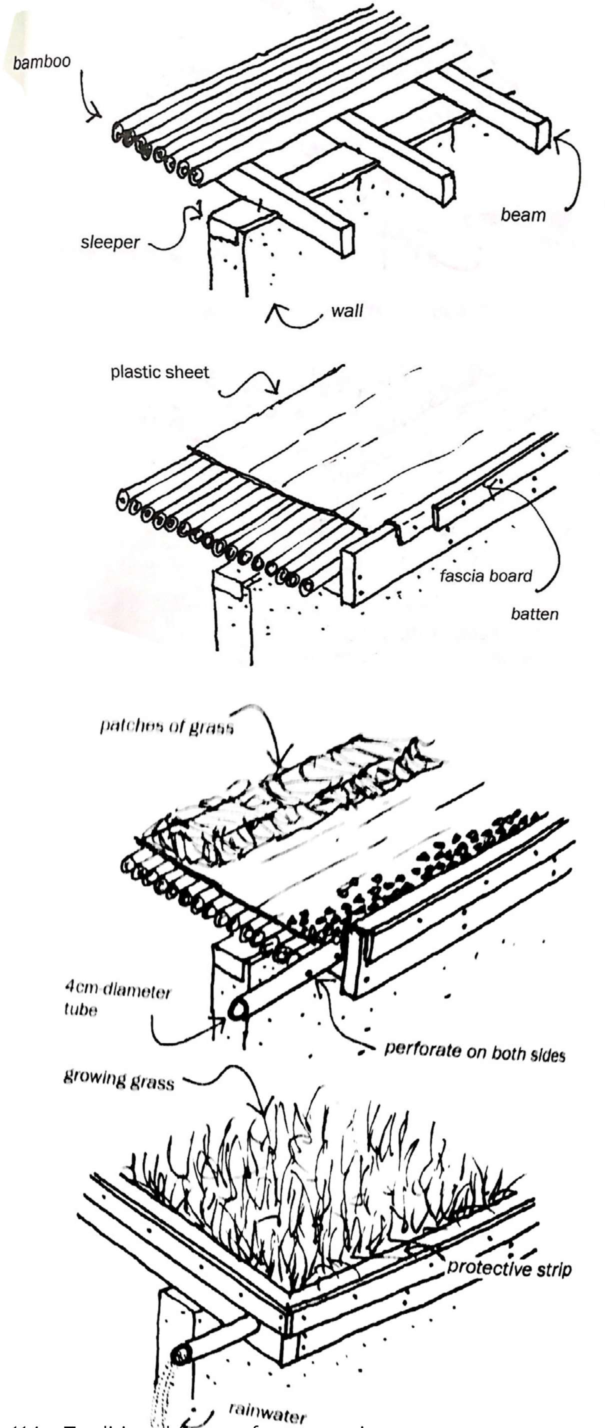


Figure 114 - Traditional flat roof construction (Van Lengen, 2008)

2.7.4 STRUCTURAL INVESTIGATION

LOAD BEARING MASONRY CONSTRUCTION

Load bearing masonry construction was the most commonly used construction method for large buildings from the 1700 to the mid-1900. Today load bearing masonry is mostly confined to residential projects (Civilengineer.org, 2019). This construction method consists of thick walls made of brick or stone that support the entire structure including the roof and concrete floor slabs. This implies that each wall carries the load of that which is above. The structural integrity would be compromised if walls are knocked down or new openings made (Pienaar, 2013).

Advantages of load bearing masonry (Civilengineer.org, 2019:

- Provides substantial fire resistance
- Materials needed are economical and readily available
- Low tech construction method, does not require specialized skills.
- Provides durability and strength to the building

Disadvantages (Civilengineer.org, 2019:

- Labour intensive
- Weight of the building is high compared to framed construction
- Material intensive
- Lacks thermal insulation qualities

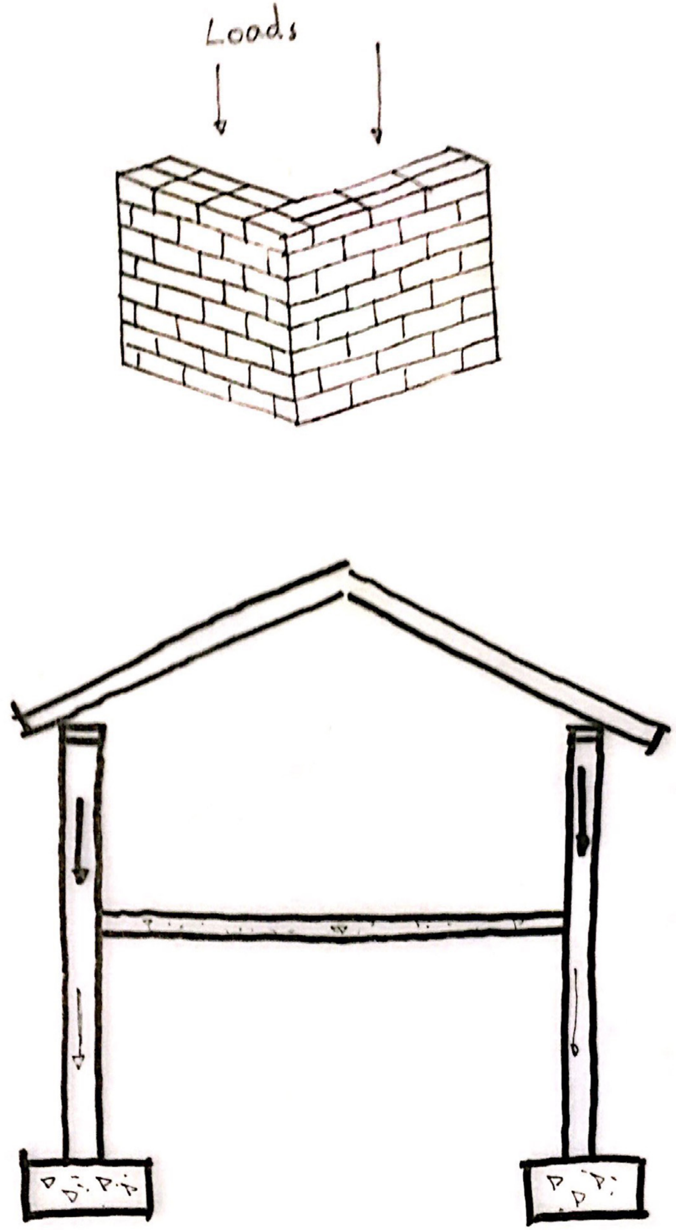


Figure 115 - Load-bearing masonry construction

TIMBER FRAMED CONSTRUCTION

Timber construction is the only renewable construction method (Smit, 2013). Trees that are used for construction allow new trees to grow, constantly renewing the material. Timber only results in 5% of material used in the building industry in South Africa, compared to 47% in the USA (Smit, 2013). Timber requires a lot less energy to produce then other building materials such as cement, glass, steel and Aluminium:

Cement: 5 times more energy
Glass: 14 times more energy
Steel: 24 times more energy
Aluminium: 126 times more energy

Advantages of timber framed structure (Smit, 2013):

- Durable & strong
- Natural material
- Elements can be reused and recycled
- Provides design flexibility
- Easy to join and cut
- No load bearing walls allows for flexibility in the floor plan
- Produces low amount of waste
- Weight of building is low compared to masonry construction.

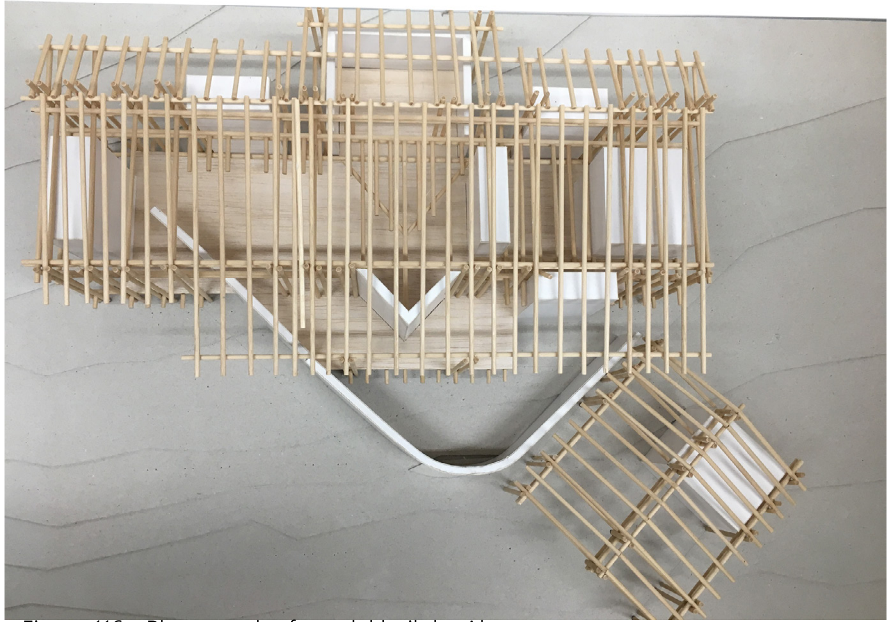


Figure 116 - Photograph of model built by Alex Kuhn of House Tzaneen by Ora Joubert

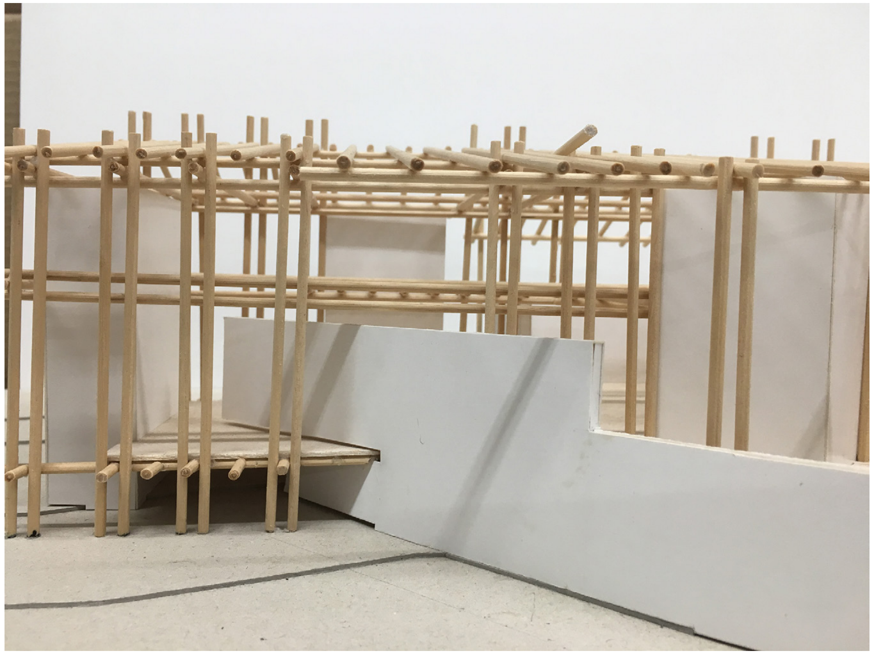


Figure 117 - Photograph of model built by Alex Kuhn of House Tzaneen by Ora Joubert

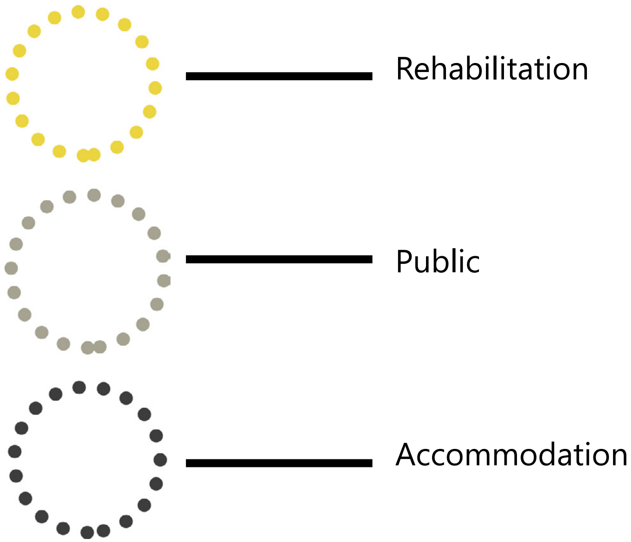
ORIENTATION

The orientation of the intervention is influenced by the topography of the site. The buildings are positioned along the contours sloping from North to South. Fragmenting the buildings allow enough natural light to enter from the North-East. The decision was made to position the buildings approximately 100m from the Northern cliff face, to allow sufficient sunlight on site.

Figure 118 - Circulation plan

FUNCTIONS

The intervention of a Cape vulture rehabilitation centre including recovery enclosures. Accommodation is added due to the seclusion of the site. Integrating a public aspect to the intervention creates educational opportunities as well as creating awareness for vulture conservation



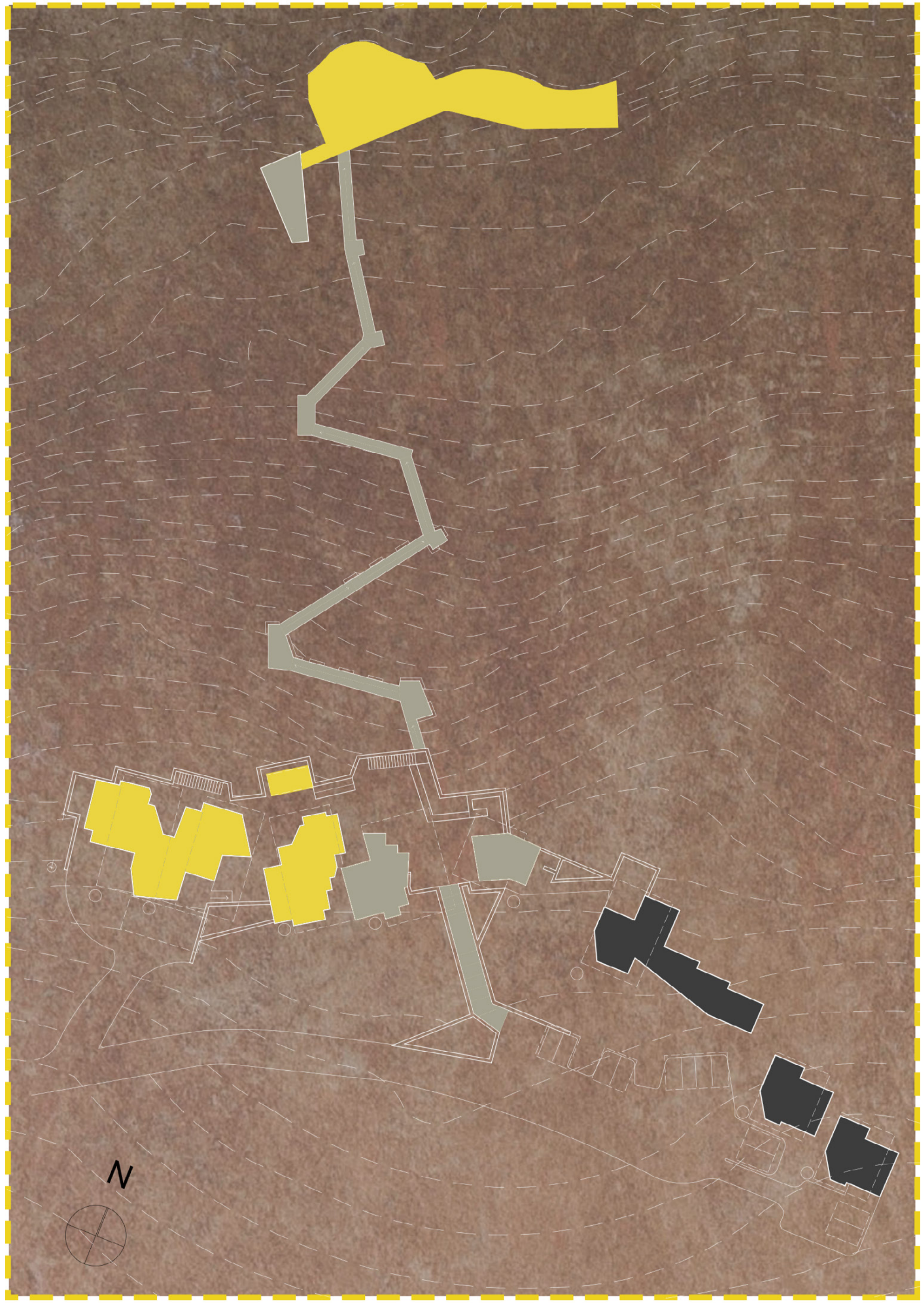
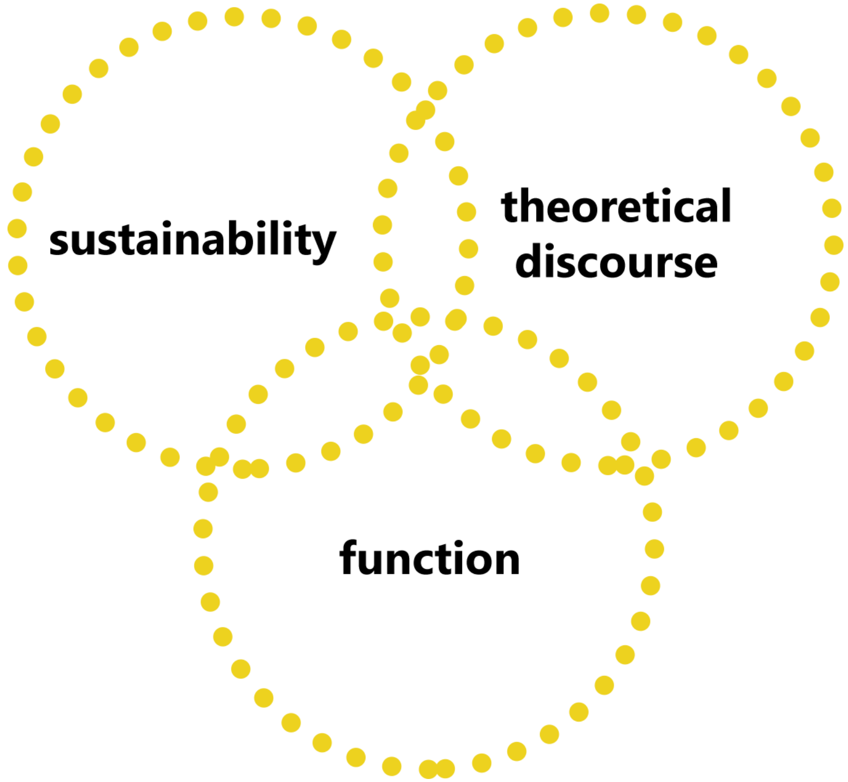
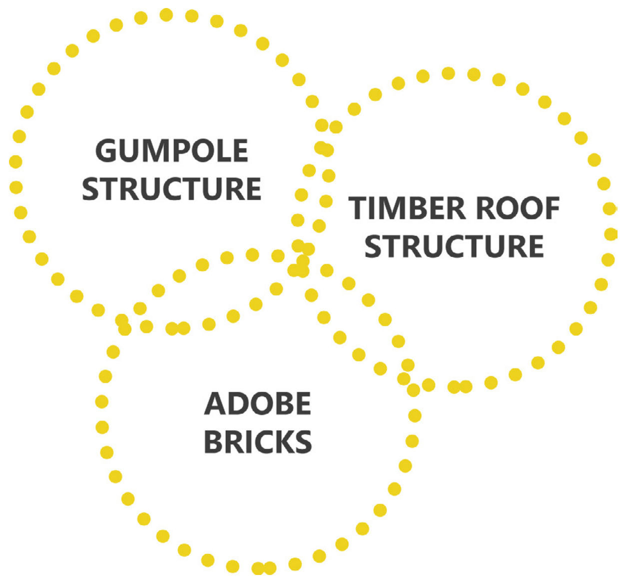


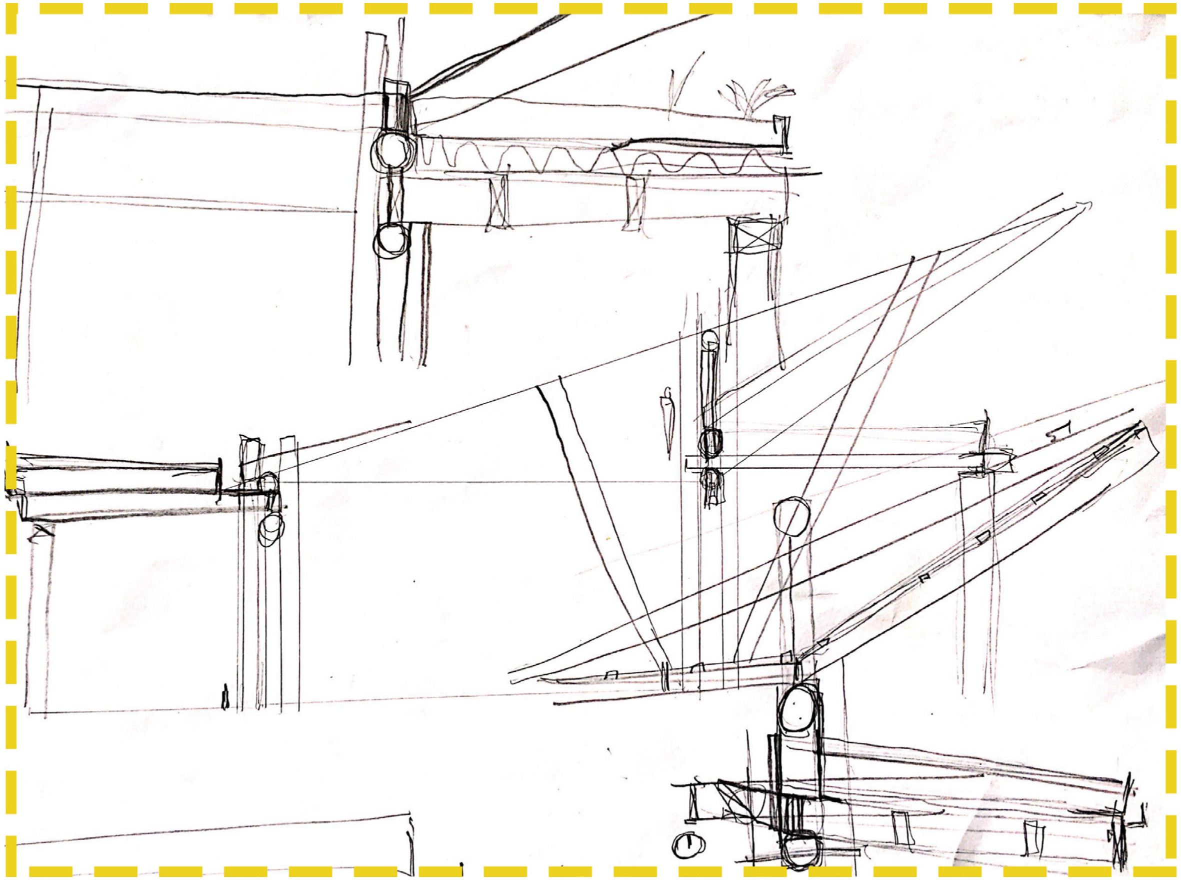
Figure 119 -Functions

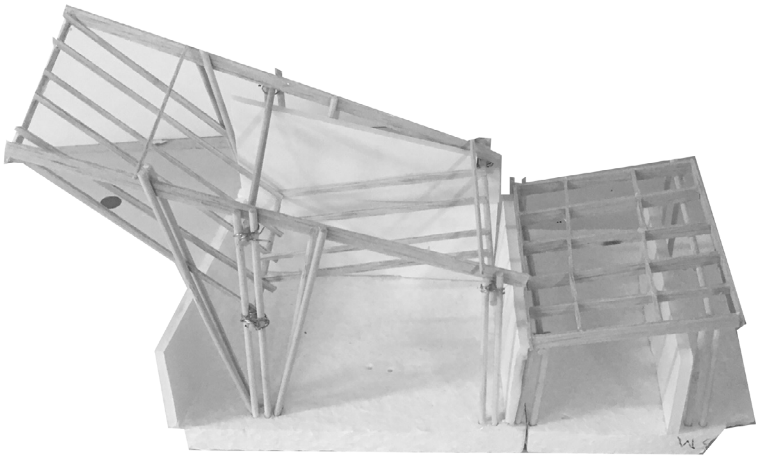
STRUCTURAL PHILOSOPHY
Tectonic interpretation & application

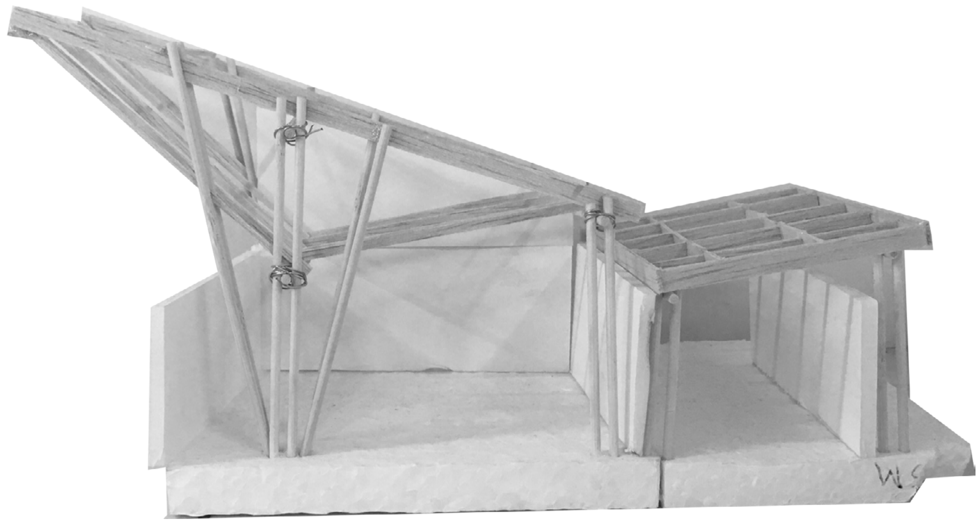




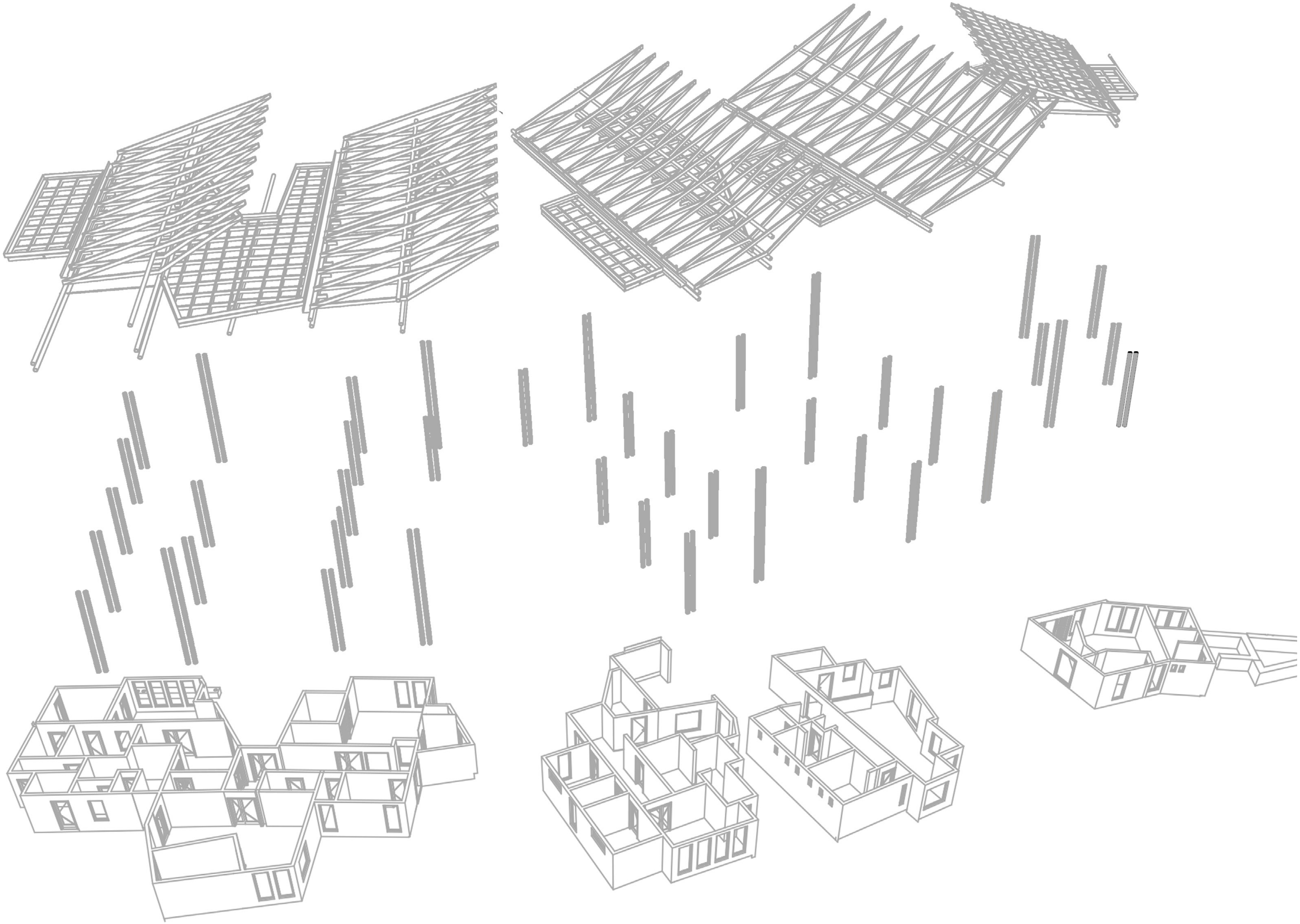
STRUCTURAL EXPLORATION



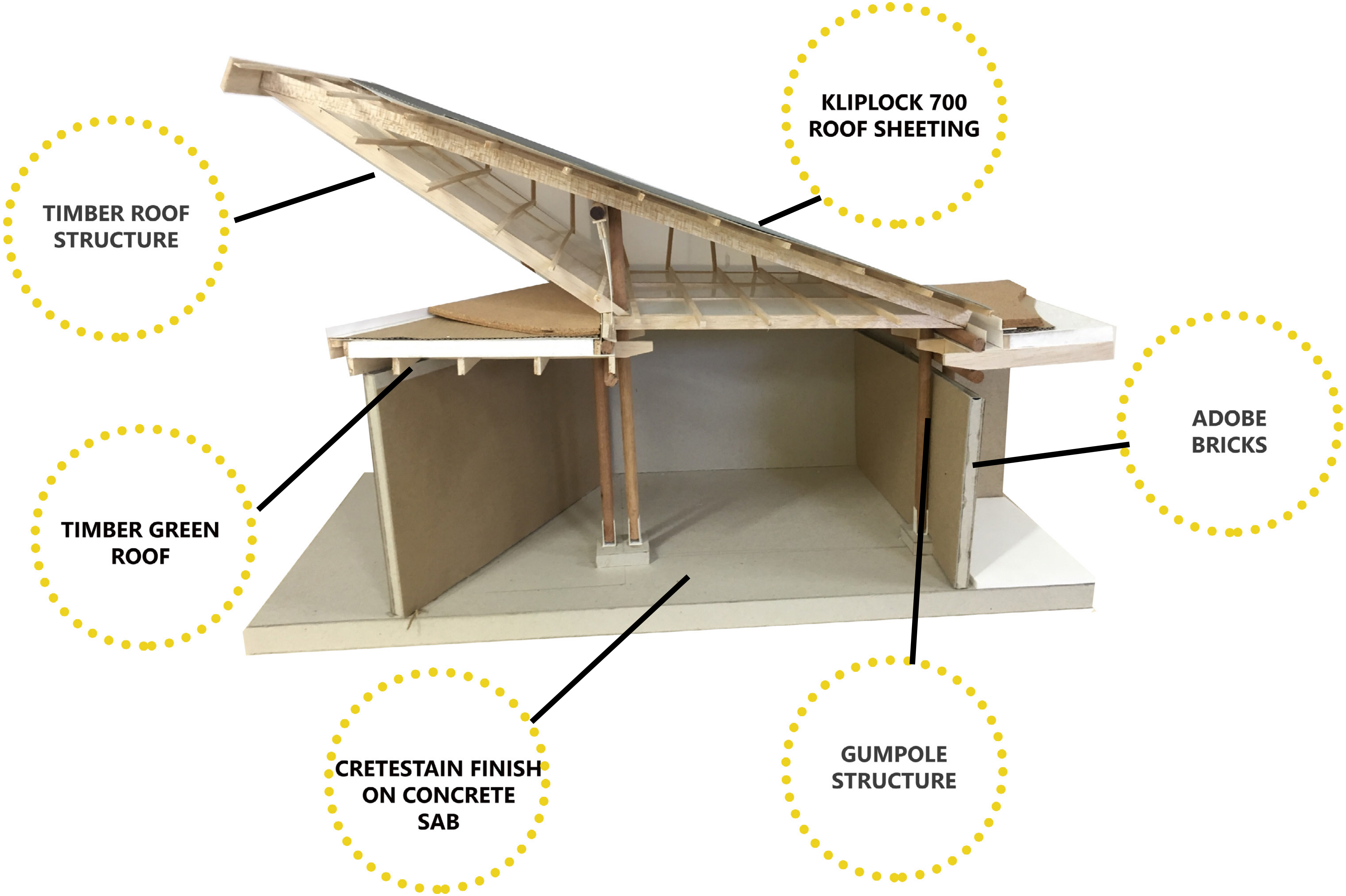




STRUCTURAL AXONOMETRIC



ANALYSIS OF STRUCTURAL MODEL



ANALYSIS OF STRUCTURAL MODEL

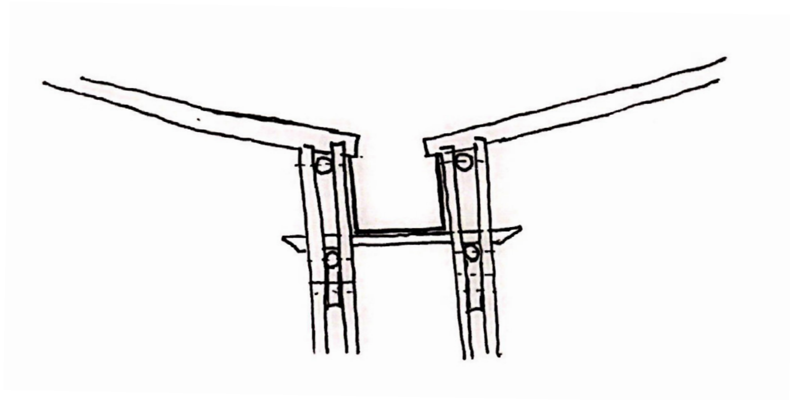
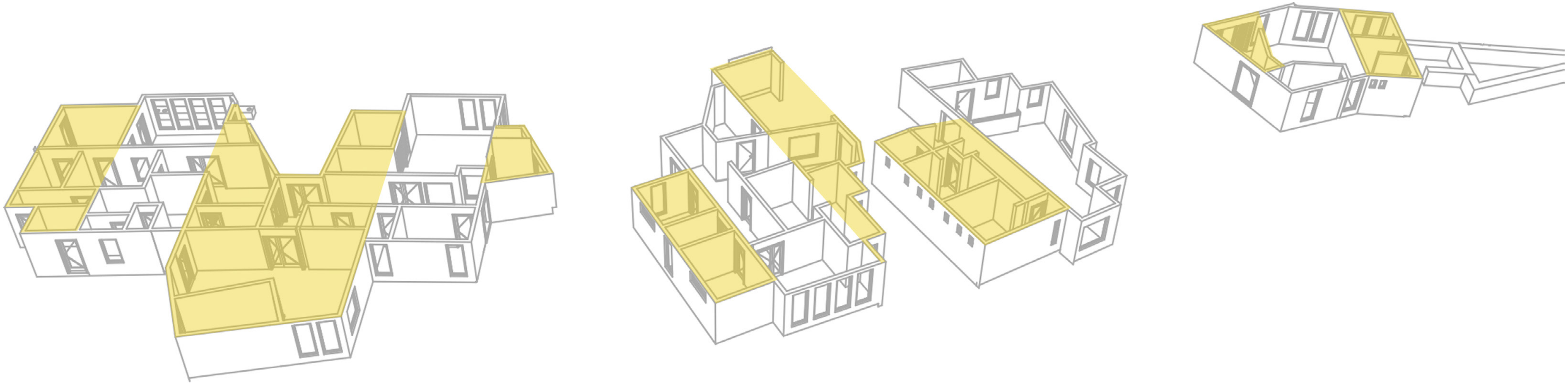
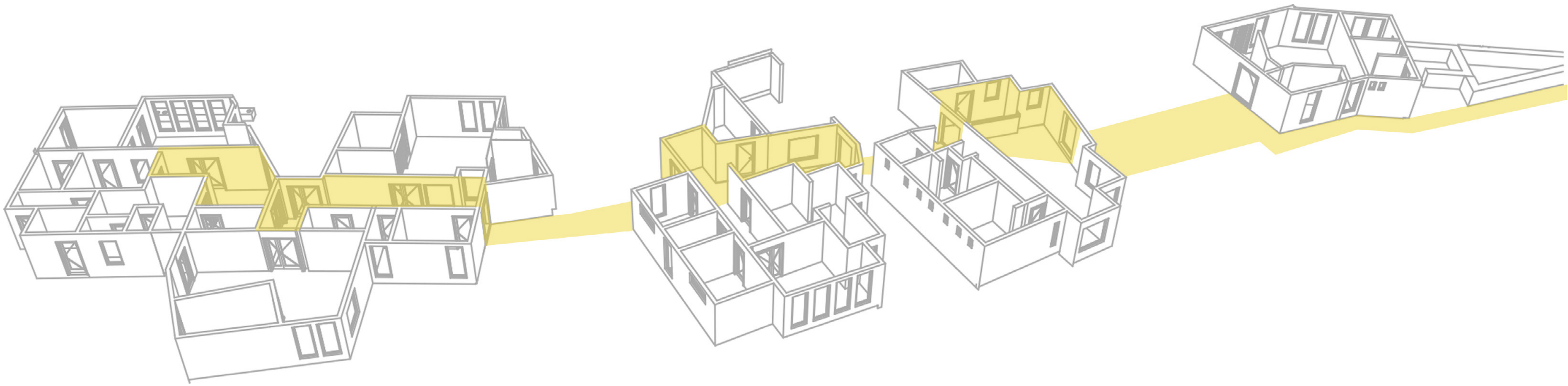


Figure 120 - Structure of gutter

LOADBEARING WALLS



CIRCULATION



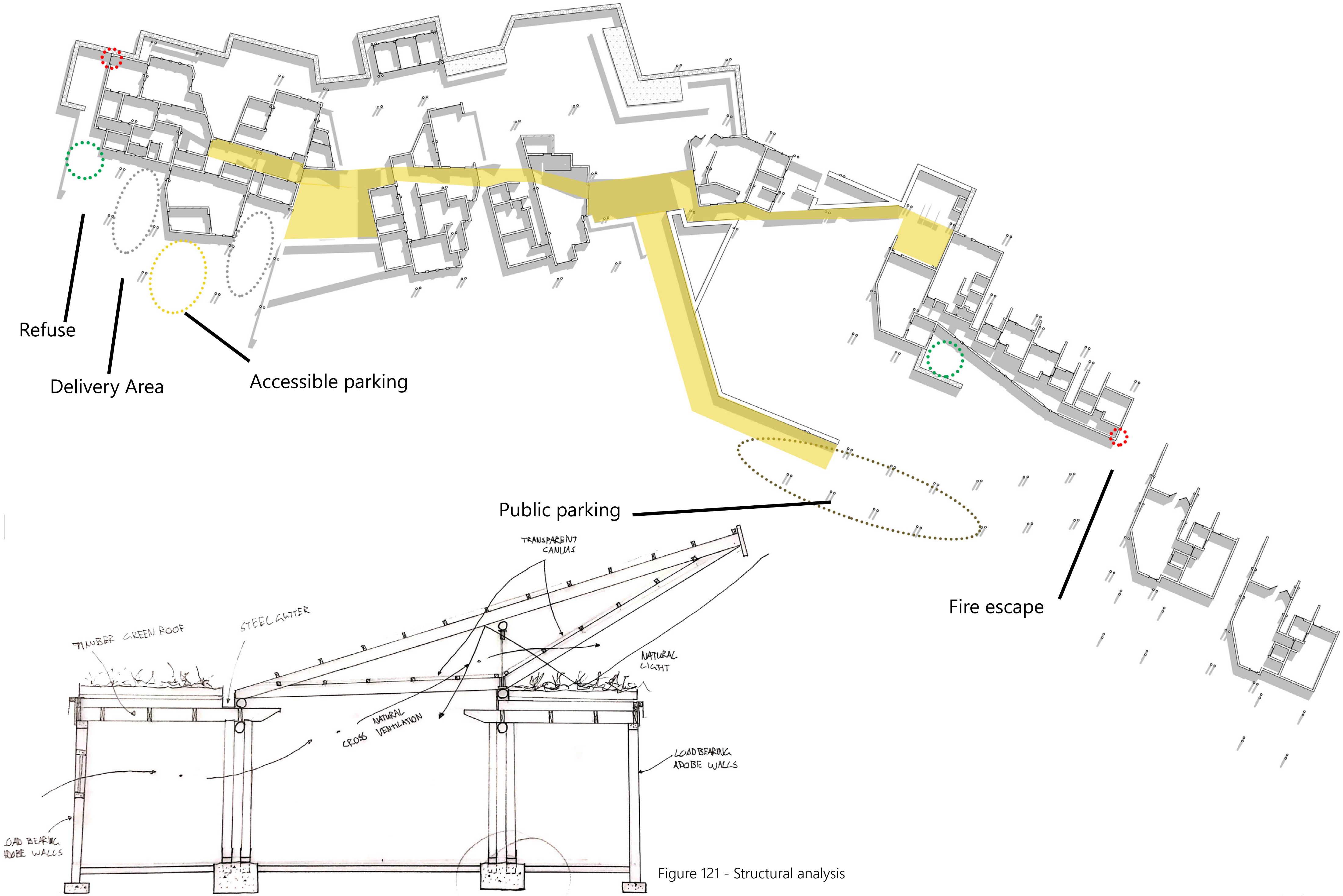


Figure 121 - Structural analysis

2.7.5 SERVICES

SEPTIC TANK & FRENCH DRAIN

Septic tanks and French drain are commonly used as sewerage waste treatment on rural sites where there aren't municipal sewerage services available. Brick built septic tanks usually consist of three chambers which allows the waste water to separate (Steynberg, 2019). The solids sink to the bottom while the scum floats on top, leaving the waste water to flow through the outlet pipe to the French drain. The French drain disposes of the effluent water through perforated pipes in loose gravel. Micro-organisms and bacteria decomposes the solids that remain in the septic tank (ballamwaterslot.co.za, online).

Benefits of Septic tanks & French drains (ballamwaterslot.co.za, online):

- Environmentally friendly: Uses natural filtration systems to treat waste water, minimizing pollution
- Doesn't require much care and maintenance
- Easy to install
- The water that is released through the French drain initiates plant growth

Considerations for French drains (ballamwaterslot.co.za, online):

- The French drain should be located further than 2 meters from the septic tank on a downward slope.
- The French drain should not be constructed within 50 meters of a bore hole or public stream
- The perforated French drain piping should be at no greater fall than 1 in 500 to ensure the equal distribution of effluent water throughout the pipe.

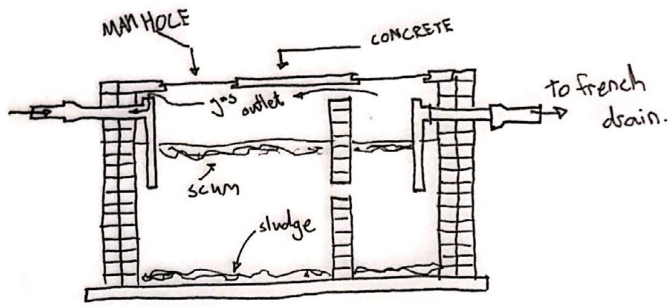


Figure 122 - Septic tank

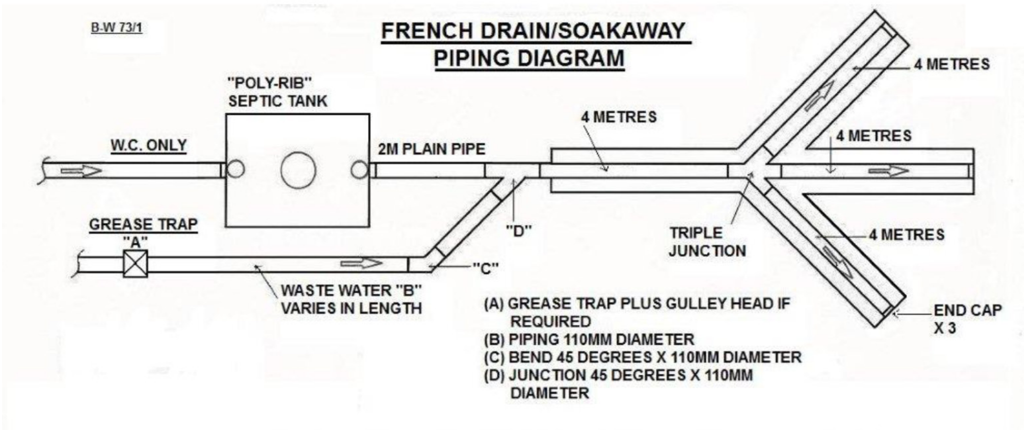


Figure 123 -Septic tank & french drain (Ballamwaterslot.co.za, onine)

VULTURE REHABILITATION

Enclosures

Temporary enclosures:

To be considered when vultures are to be housed for more than 3 hours to 3 days. Managing stress levels is critical when housing an injured or ill bird. The enclosure should be in a quiet location, away from apparent dangers like dogs or other pets. Sufficient shade should be provided, temperature control is critical if the bird is not mobile, as it wouldn’t be able to move in and out of the shade. A large 10 liter bowl of water should be provided.
The size of the enclosure should be large enough to allow the bird to spread its wings fully but not exceed 10m to prevent the bird from attempting to fly, potentially injuring it further.
In a small temporary enclosure it is essential to remove all sharp objects that may include injury, it is acceptable to line the enclosure with shade netting or towels (Wolter, 2017).

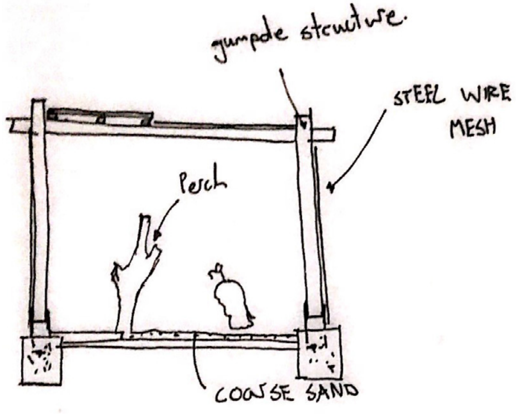


Figure 124 - Temporary vulture enclosure

Figure 125 - Vulture enclosure
(Vulpro.com, onine)

Long term enclosures

Enclosures should be constructed of strong yet flexible material to prevent vultures from injuring themselves when flying in the enclosure. 60mm x 60mm diamond mesh is sufficient when the interior is lined with shade netting to reduce the chance of vultures colliding with the perimeter fence. 90% shade netting is required in places to provide sufficient shade. A solid roof is recommended over 30% of the enclosure to protect birds from rain or other extreme weather conditions. Coarse sand as substrate provides comfort and assists in keeping the enclosure clean, fine sand can result in bumble foot and pressure sores. Shade netting in 5m long strips should be used on the long sides of the enclosure to help birds see the ends of the enclosure and prevent collisions (Wolter, 2017).

Figure 126 - Long term enclosure (Vulpro.com, online)

Enclosure furniture

Vultures aren't particularly good at gripping with their feet, thus large perches and plenty of landing space within the enclosure is required. It is essential to provide perches and stumps of various forms and sizes creating gripping exercises. Perches and stumps should be removed before they become smooth to avoid the risk of bumble foot. Cape vultures are colonial birds and thus require breeding cliffs, 1m x 1m nesting cliffs should be constructed for breeding pairs. The cliffs should accommodate more than 10 nesting sites to allow vultures to breed as a colony rather than in isolation (Wolter, 2017).

Enclosure hygiene

Vultures tend to regurgitate when disturbed after eating, thus the food left over should be removed twice a week, preferably two days after the vultures have eaten. Castings, feathers and fur should be regularly removed to avoid parasite build-up. Decaying perches and stump are to be removed and burnt. Water ponds are refilled every day and cleaned every second. Use a hard broom or brush to scrub out with clean water. It is essential that no chemicals are used in cleaning the water pond. All brush bristles that break off are to be removed (Wolter, 2017).

Figure 127 - Breeding enclosure (Vulpro.com, online)

Vulture feeding and food preparations

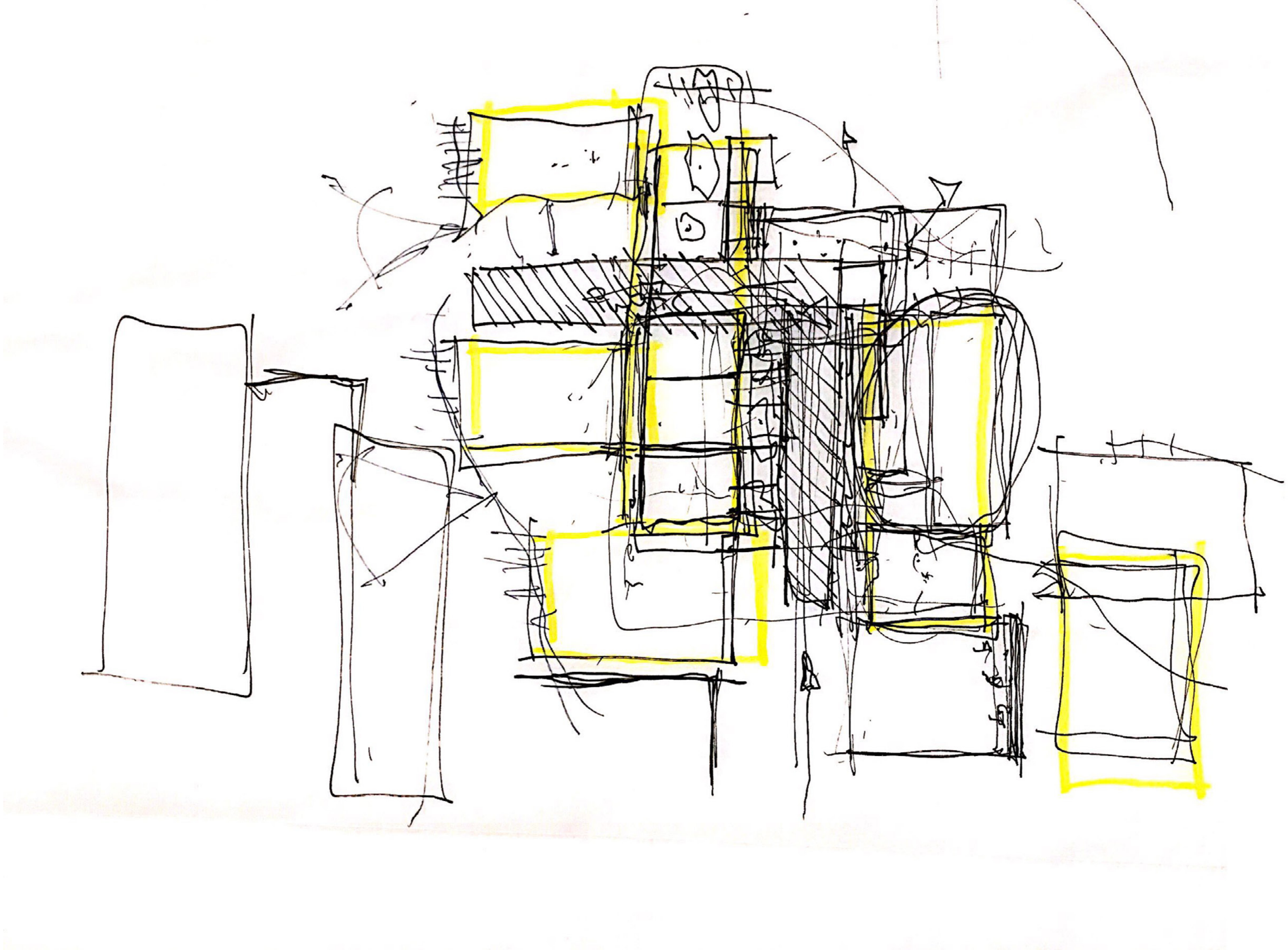
Vultures are feed twice a week with whole carcasses and bone fragments. Bone chips are provided to provide adequate calcium intake, especially in the breeding season. A mallet is used to manually smash the jawbone, ribcage and spinal column of a carcass. Large pieces of carcass or ideally whole carcasses are fed to provide the birds with the natural nutritional requirements they would have got in the wild. It is critical that the carcass be free of any veterinary dugs that may poison the vultures. If the animal has had any parasitical dip treatment the skin can be removed prior to feeding. If the anima has been shot through the head, it should be removed to avoid exposure to lead and other metals used in bullets like zinc or iron (Wolter, 2017).

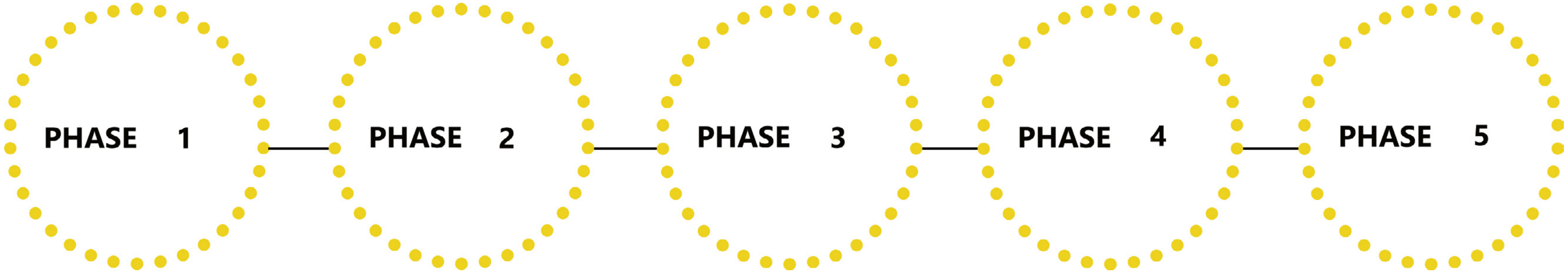
Recommended carcasses:

- Rats & mice
- Donkey
- Cattle
- Sheep
- Pigs
- Wild game
- NO adult chickens or other birds should be fed to vultures, to avoid the spread of avian diseases.

If the bird is unable to feed on its own, due to illness of injury it is fed pieces of meat and bone from whichever carcasses are available. 2 litre containers are packed with meat when a fresh carcass is available and frozen until needed to feed the birds. Once the meat is defrosted it cannot be frozen again and should be kept in the refrigerator until feeding. The frozen meat should not be microwaved, as this cooks the meat, making it indigestible. Vultures only eat raw, preferably fresh meat (Wolter, 2017).

PART 3
DESIGN DEVELOPMENT

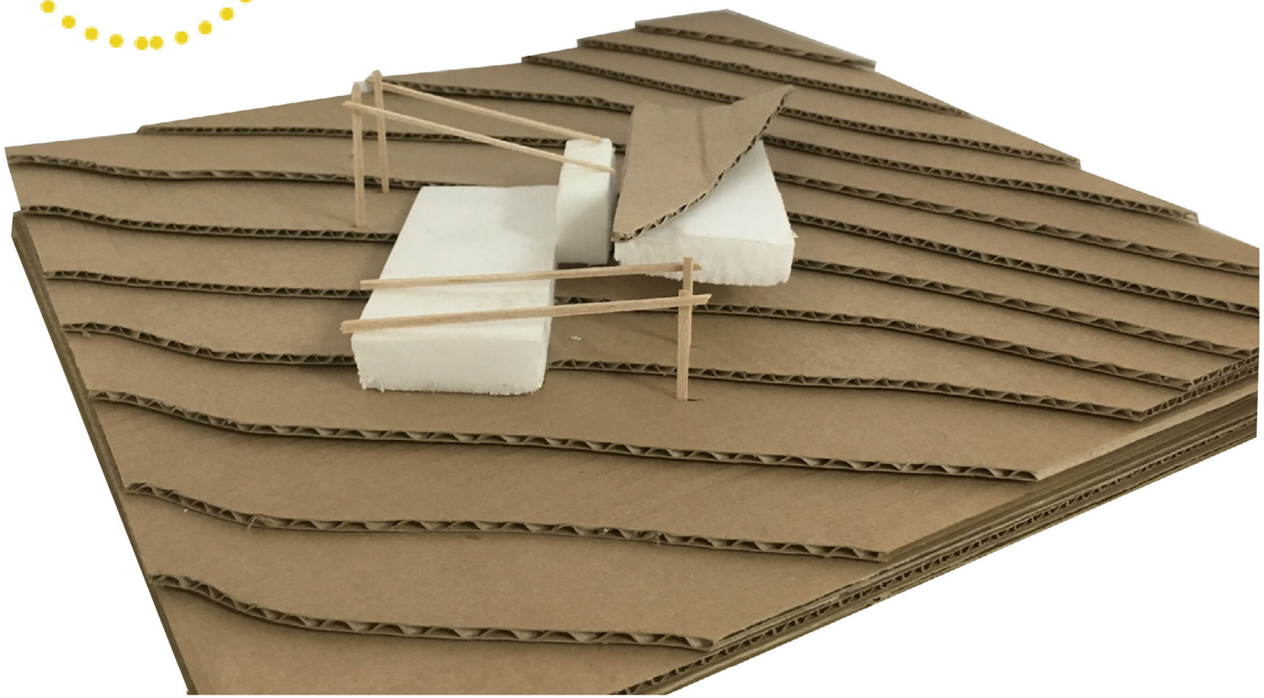


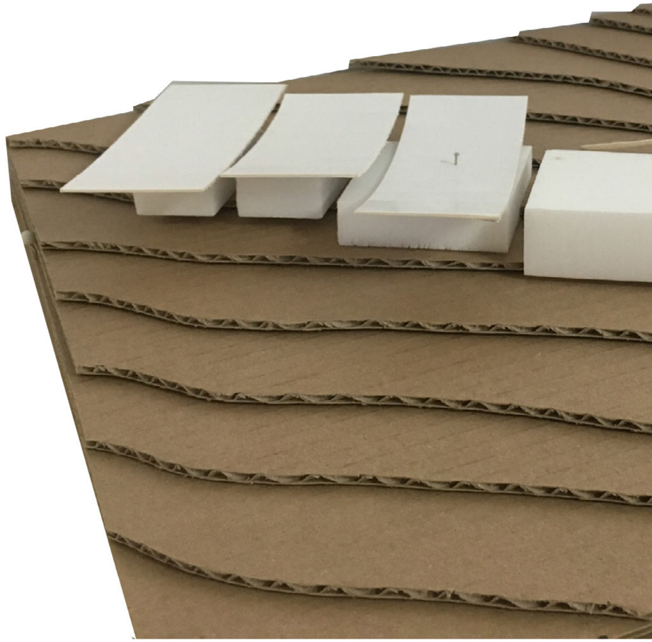


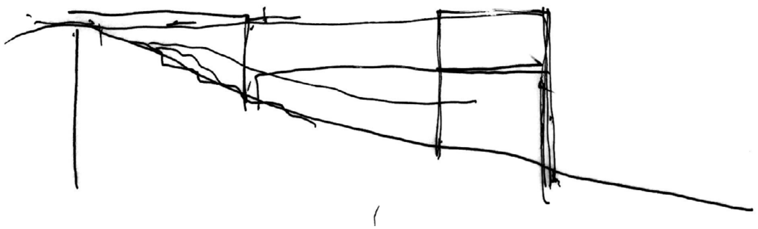
Part 3 demonstrates the process followed in developing the design of the intervention. Knowledge gained through explorative research discussed in part 2 into the typology, topology, morphology and tectonics of the dissertation aids in the developmental process and ultimately achieving a design proposal.

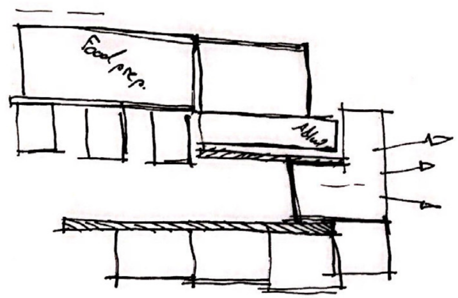
PHASE 1

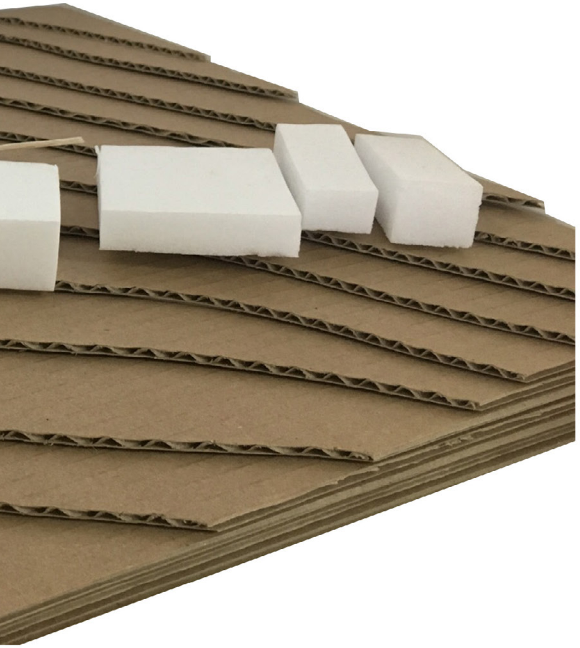
EXPLORING MASSING ON SITE + INITIAL INTERPRETATION OF THE 3 CONCEPTS

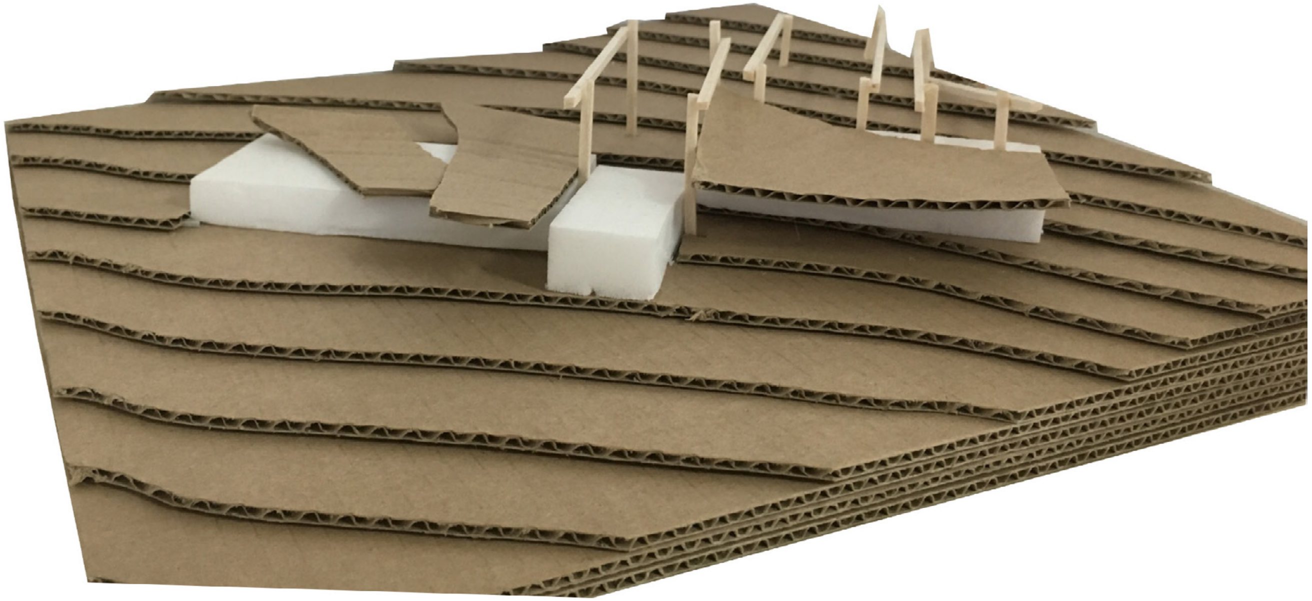


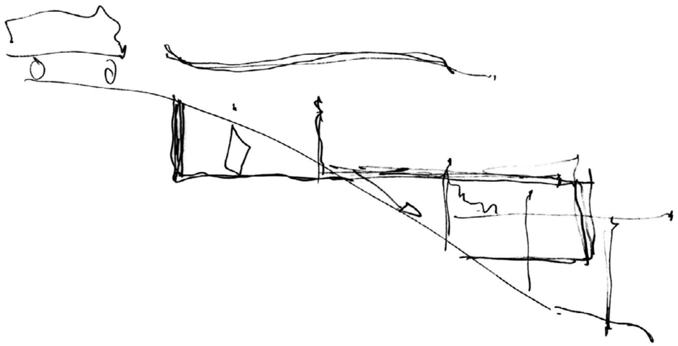


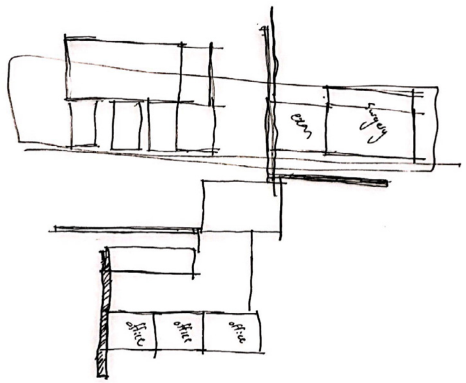











exam
surgery
office
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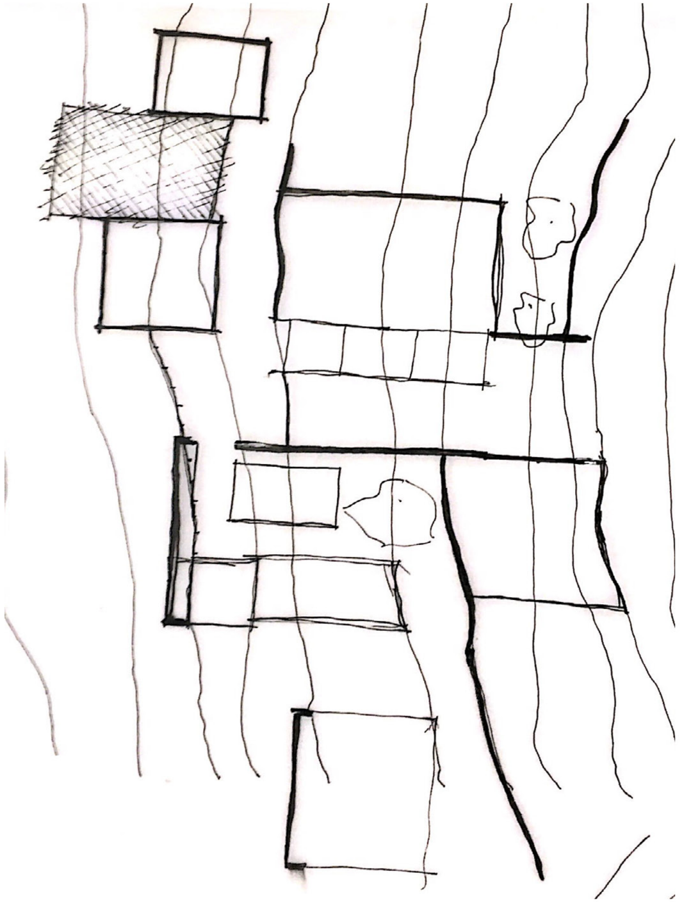
DEVELOPMENT OF PLAN

1



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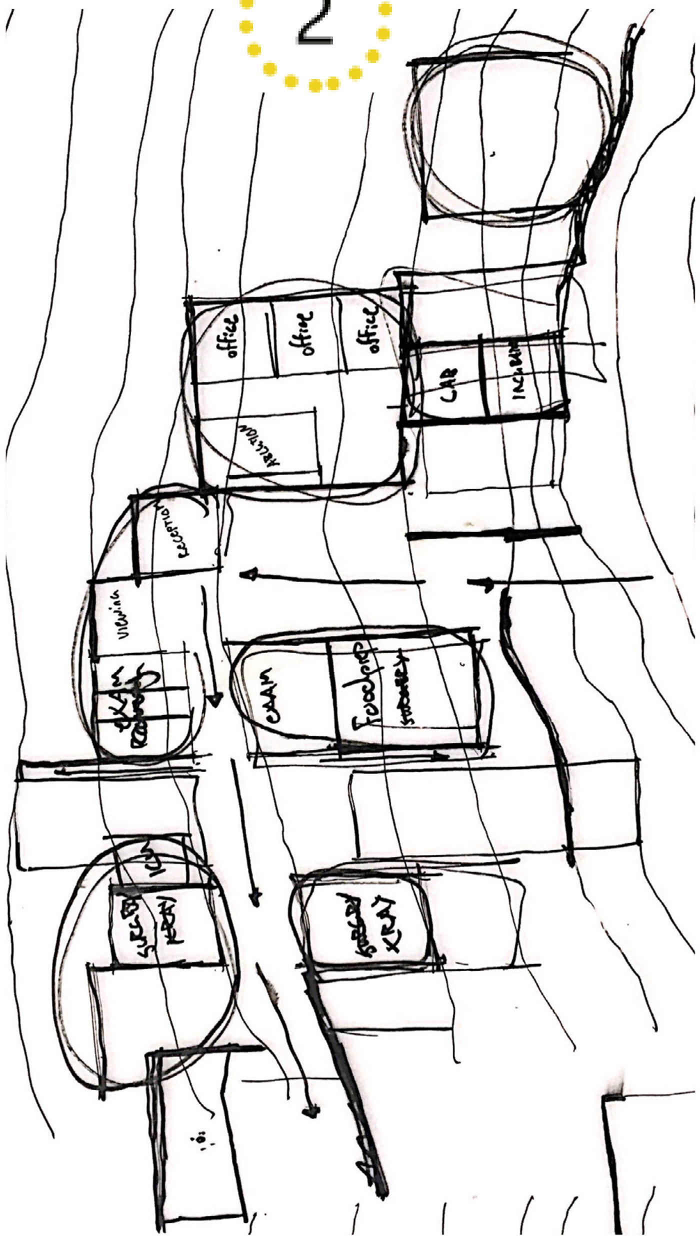

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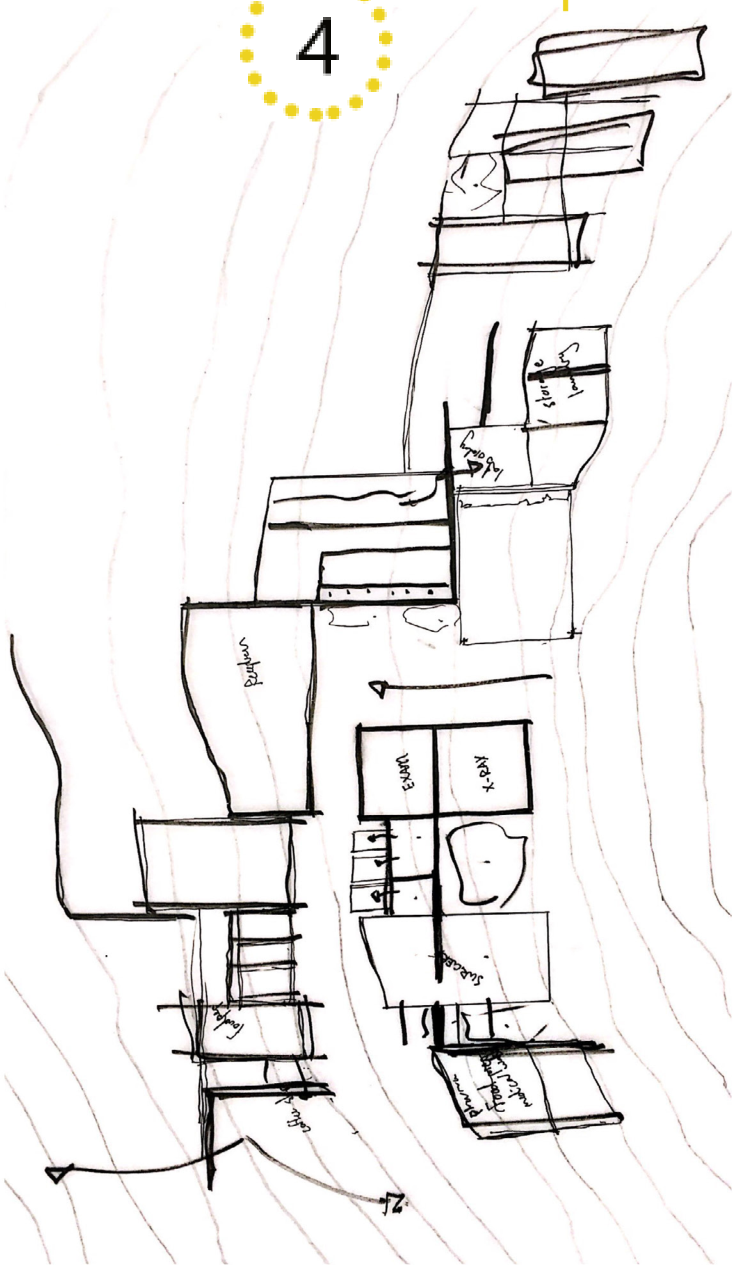

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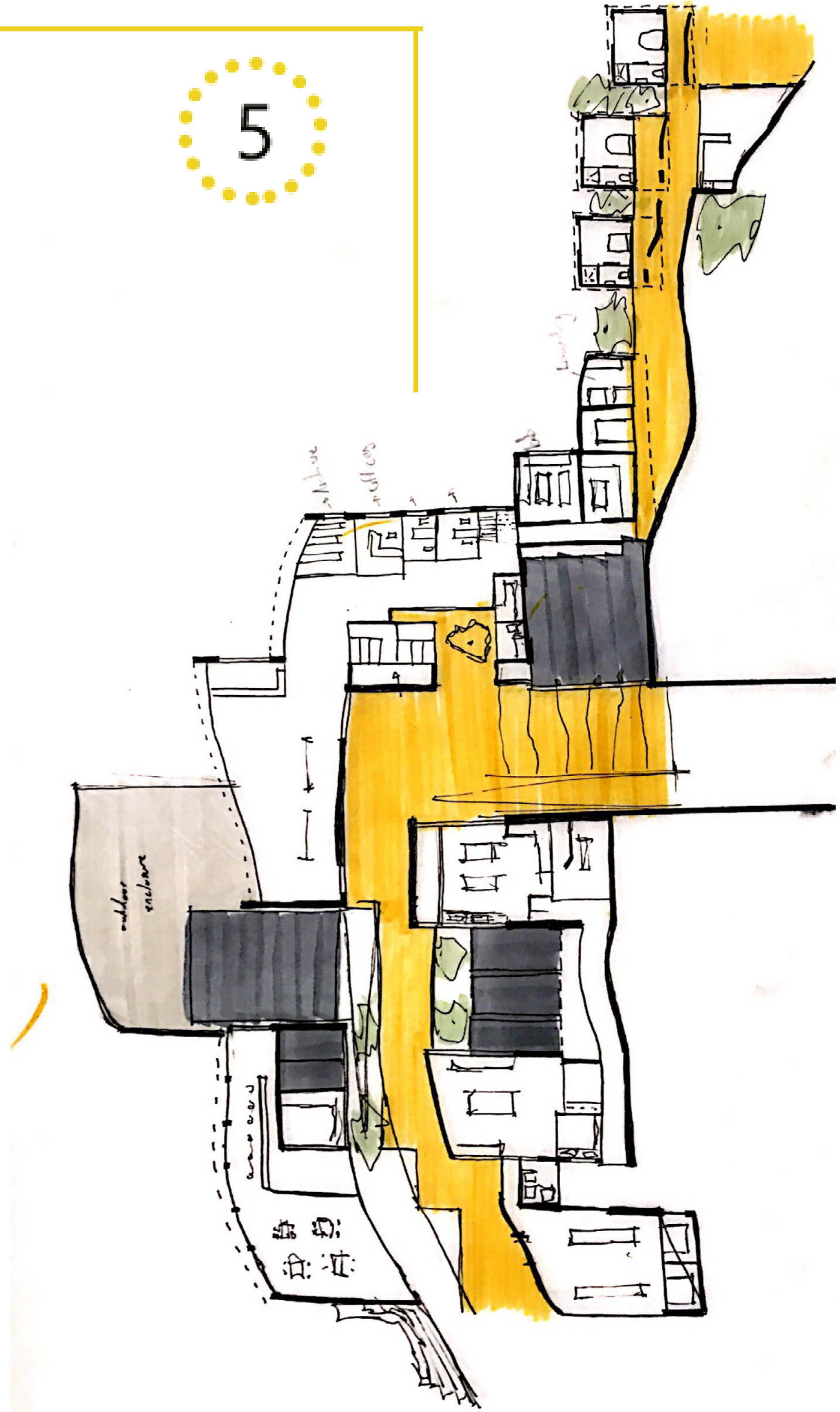
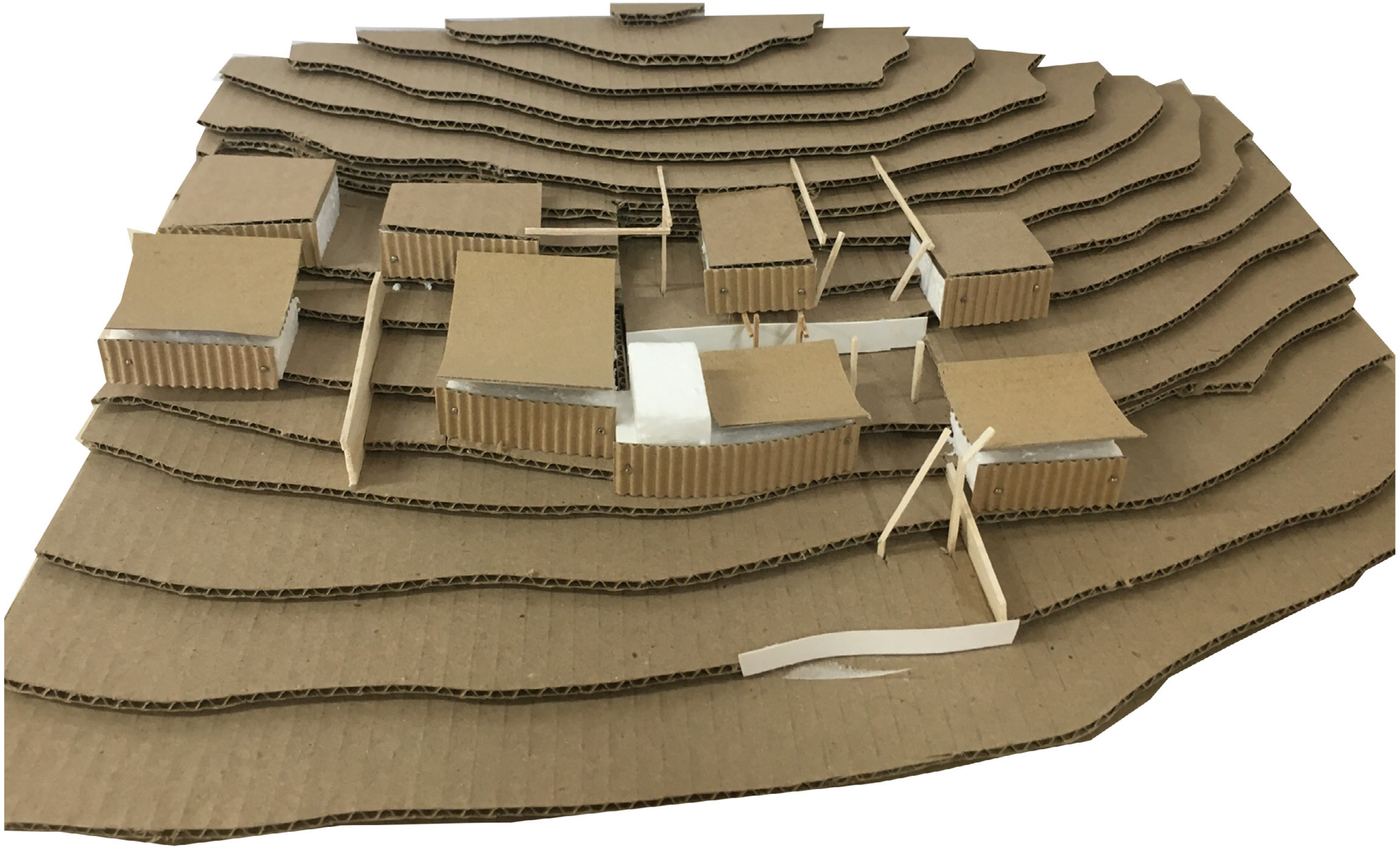
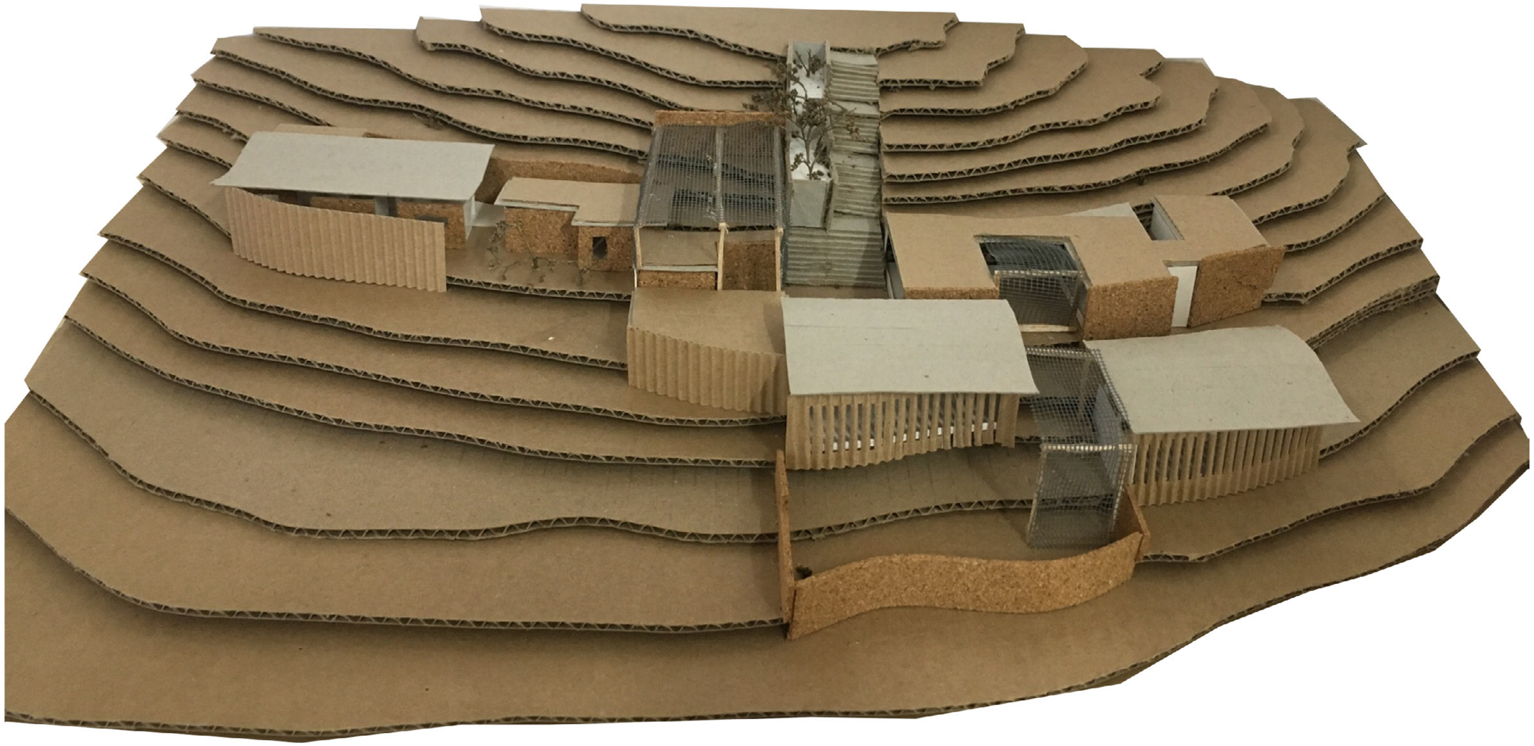
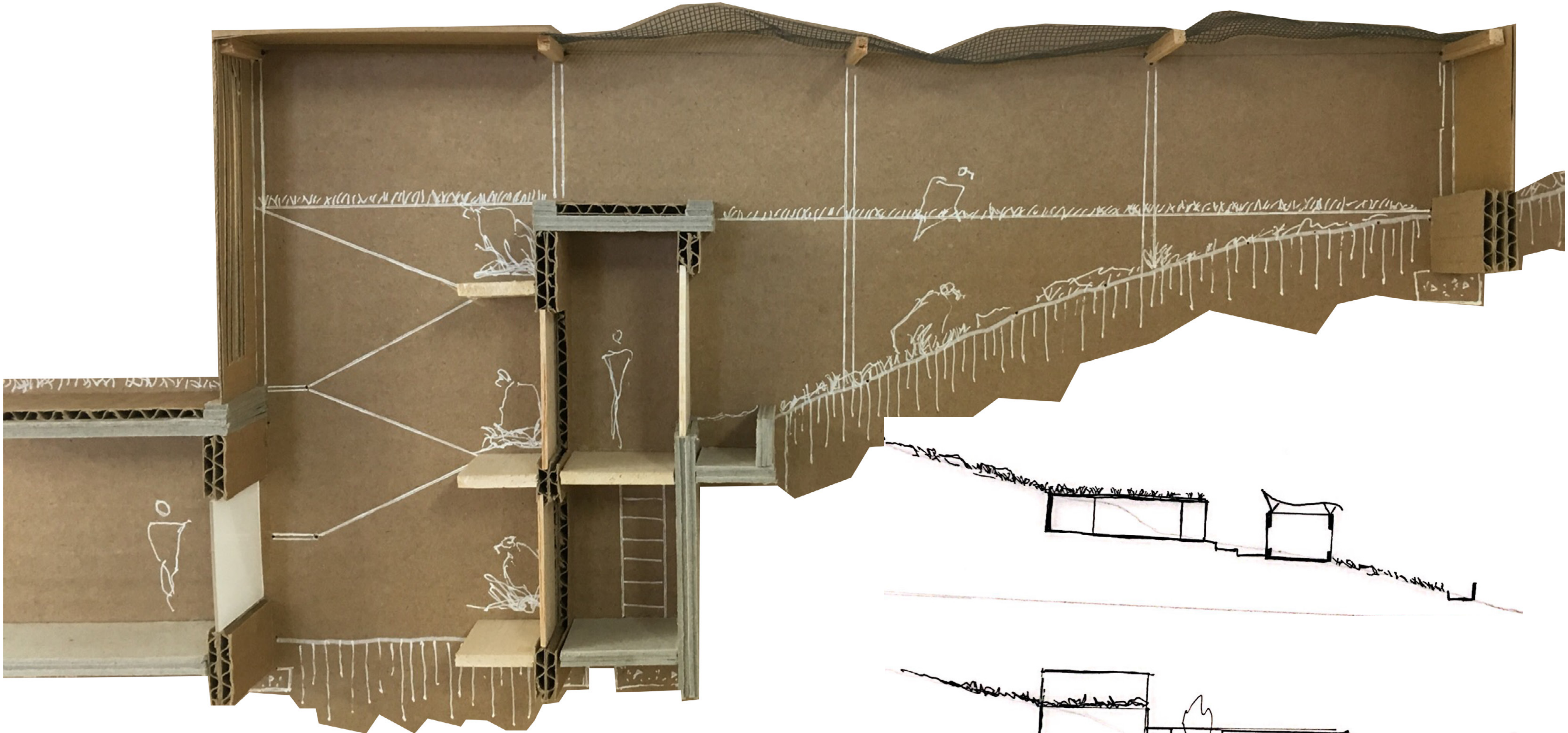
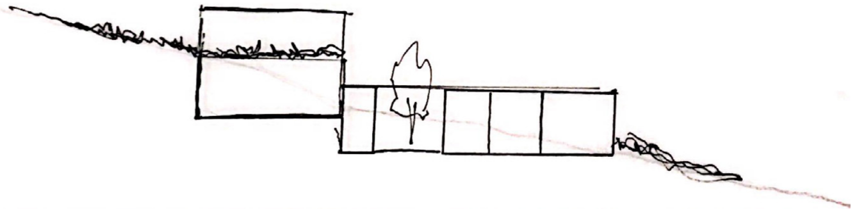


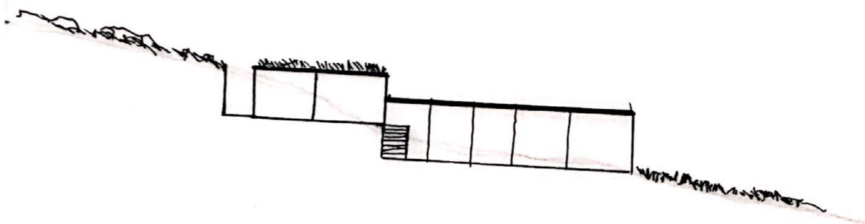
DEVELOPMENT OF PHASE 1

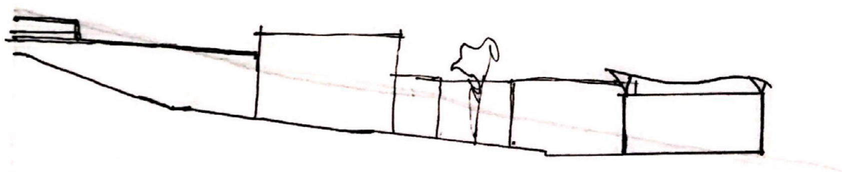












PHASE 1

LOUVERS MIMIC CIFFS BEHIND

NOT COMPATIBLE ENOUGH WITH THE THREE CONCEPTS

NOT SENSITIVE TO LANDSCAPE

RIGID

NOT EXPLORATIVE

TOO CONJESTED

The decision was made to rethink the approach to incorporate the three concepts discussed in part 2.

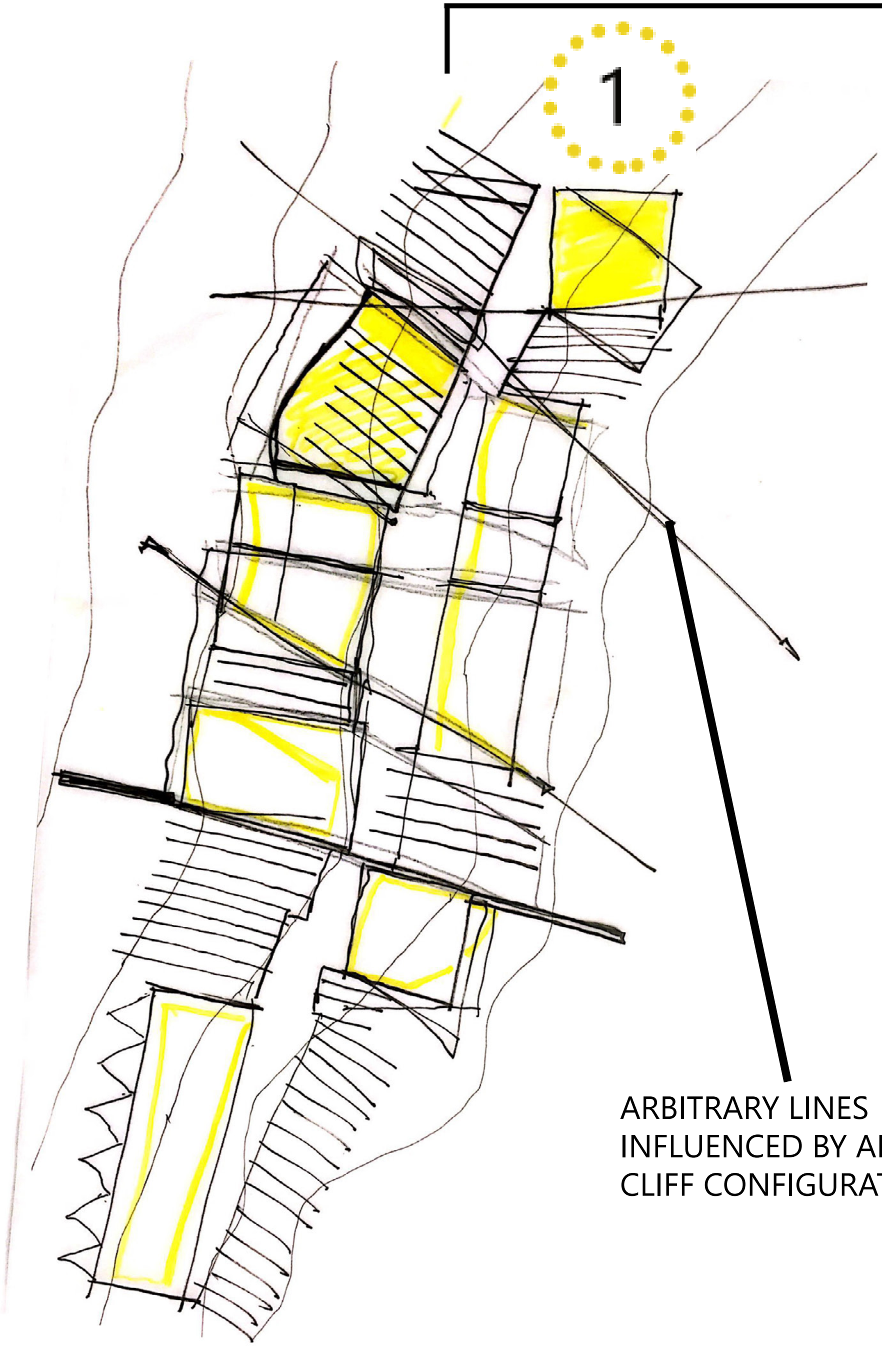
PHASE 2

BUILDINGS FRAGMENTED MORE

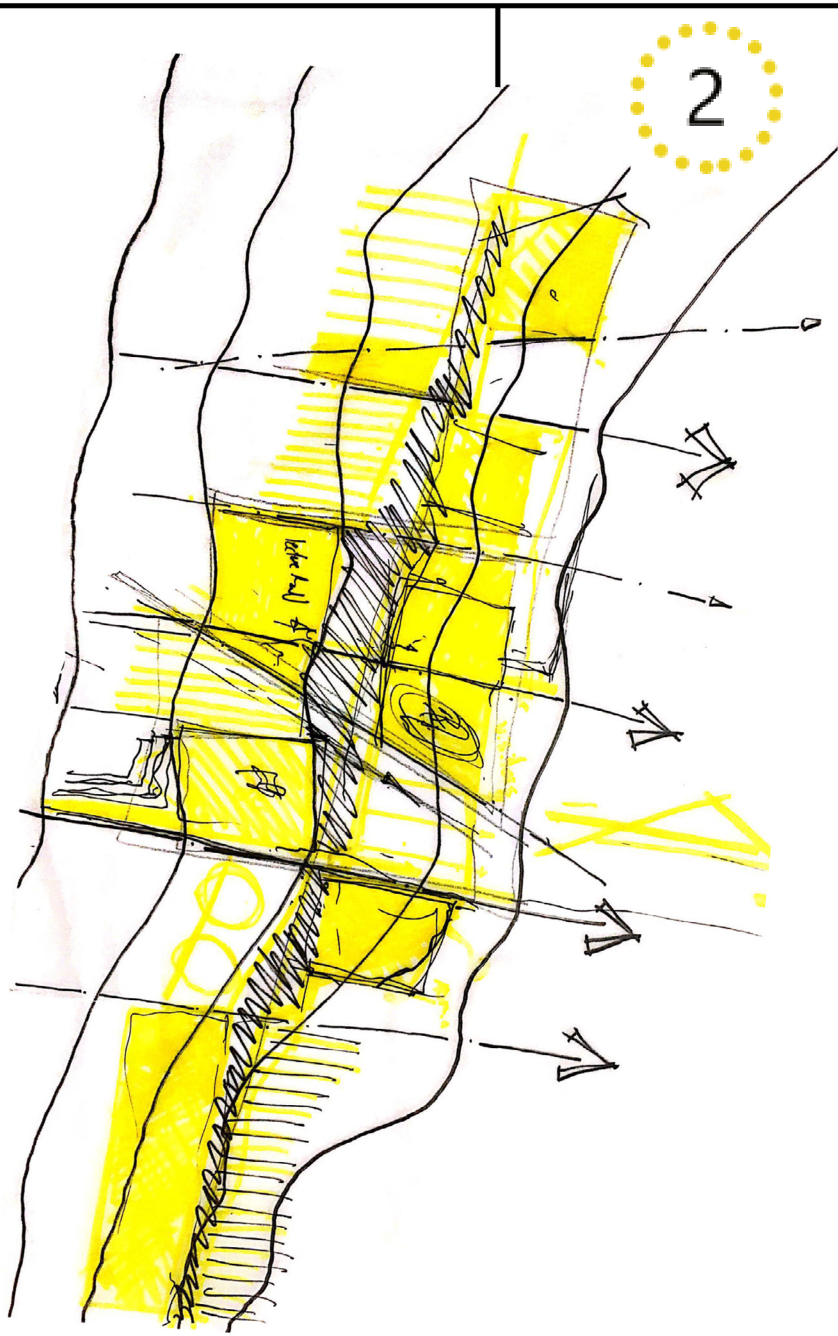
PLANNING MOTIVATED BY FRAGMENTED FORMATION OF CLIFFS

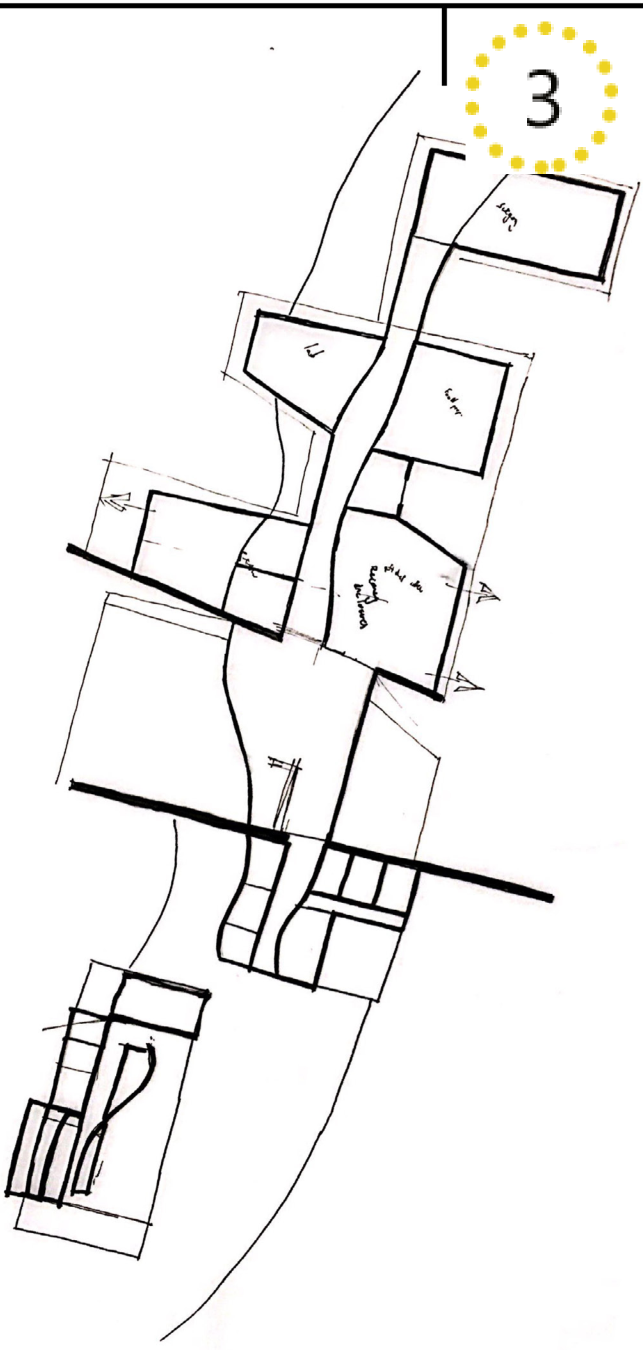
BUILDINGS FRAGMENTED ALONG CONTOURS OF THE SITE

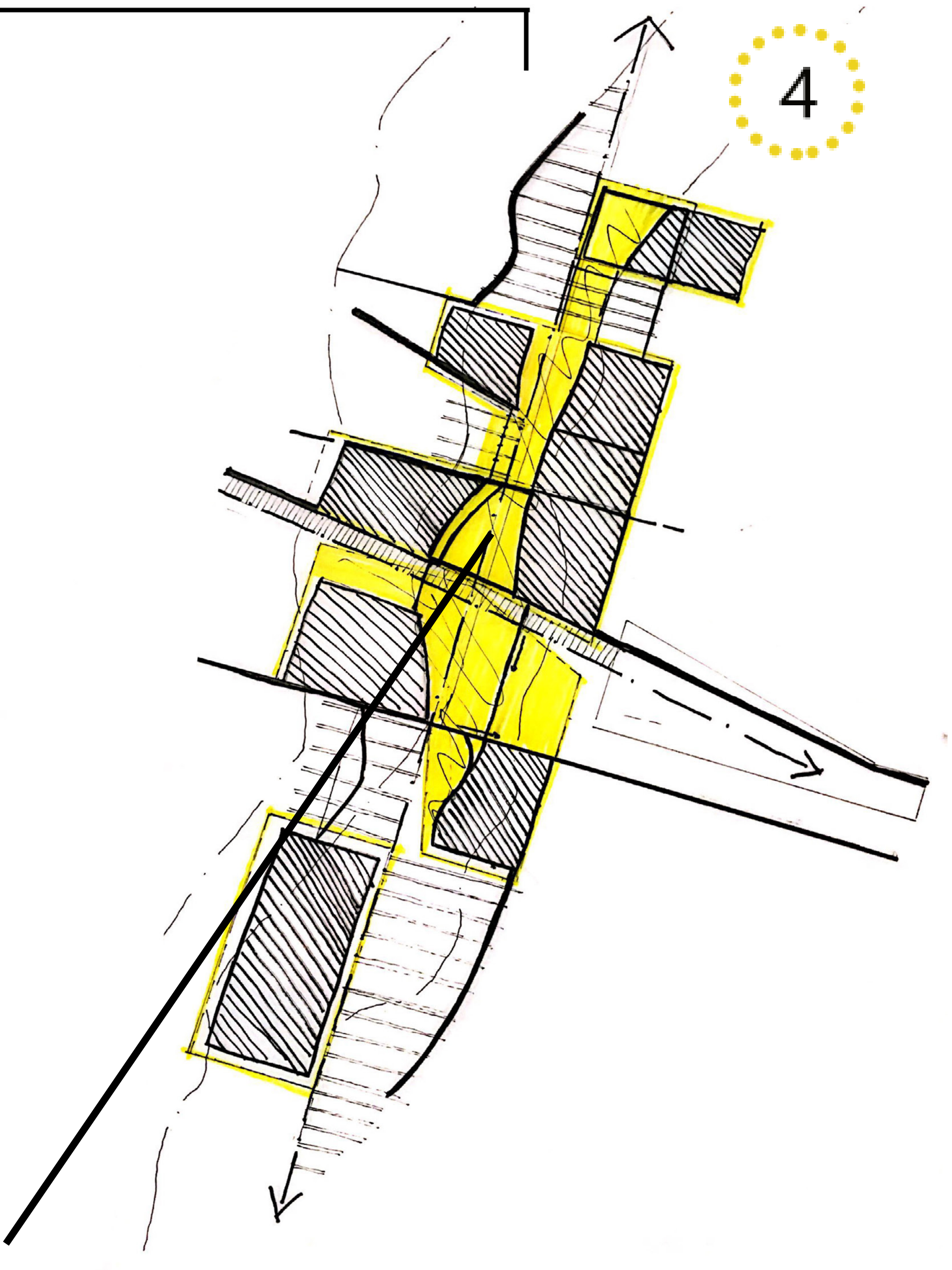
DEVELOPMENT OF PLAN



ARBITRARY LINES
INFLUENCED BY ARBITRARY
CLIFF CONFIGURATION



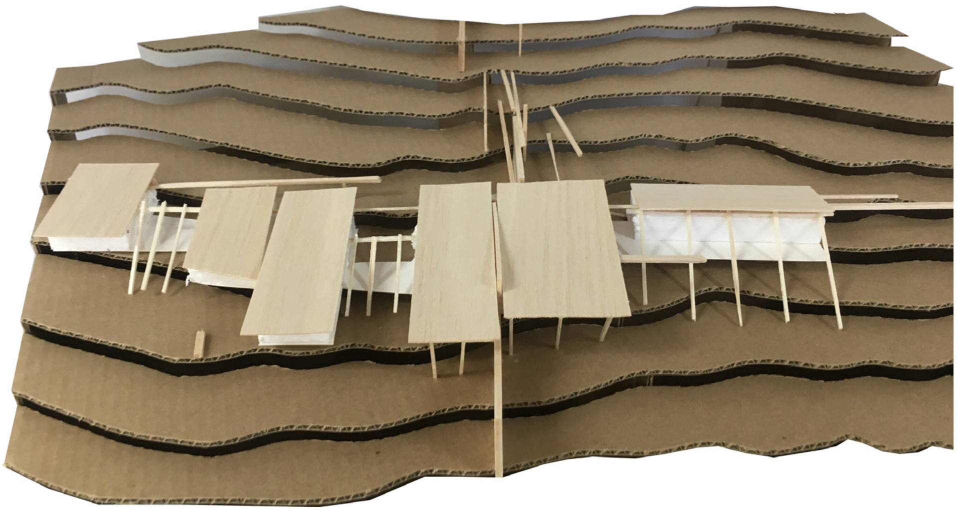


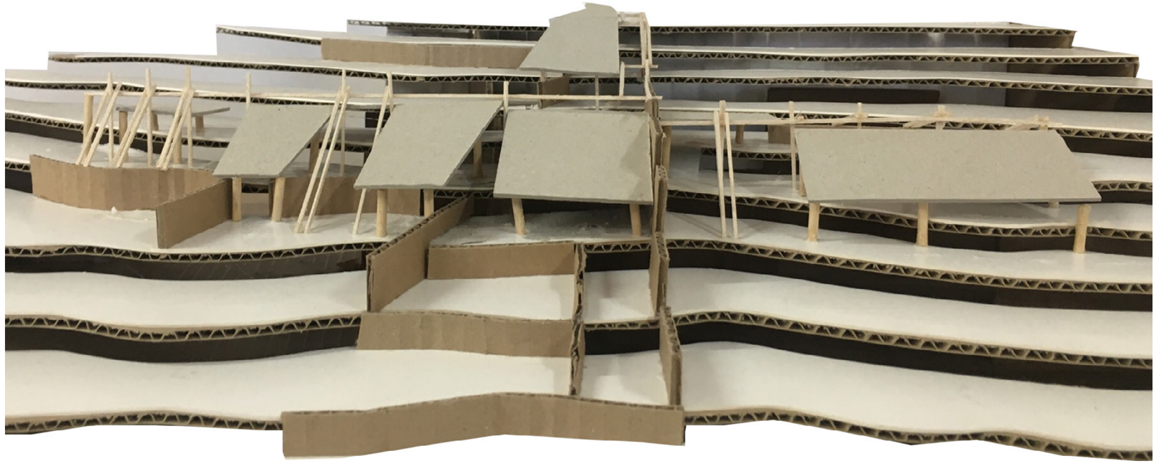


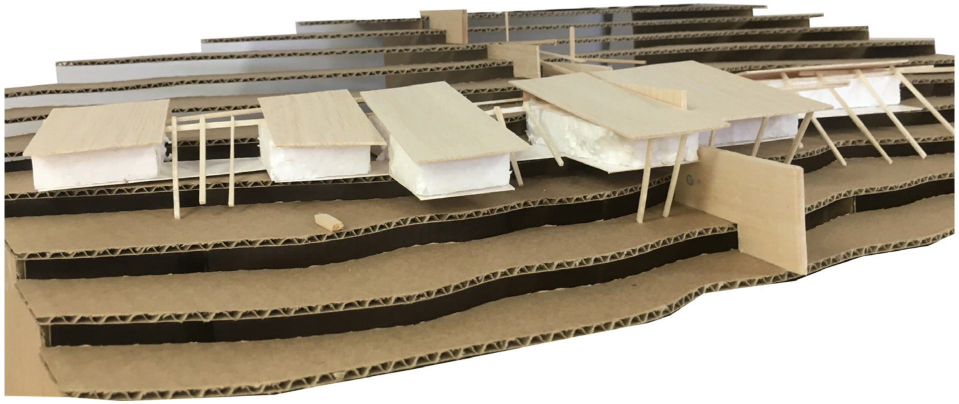
CENTRAL CIRCULATION INTERPRETATION
OF SCARS IN CLIFF.

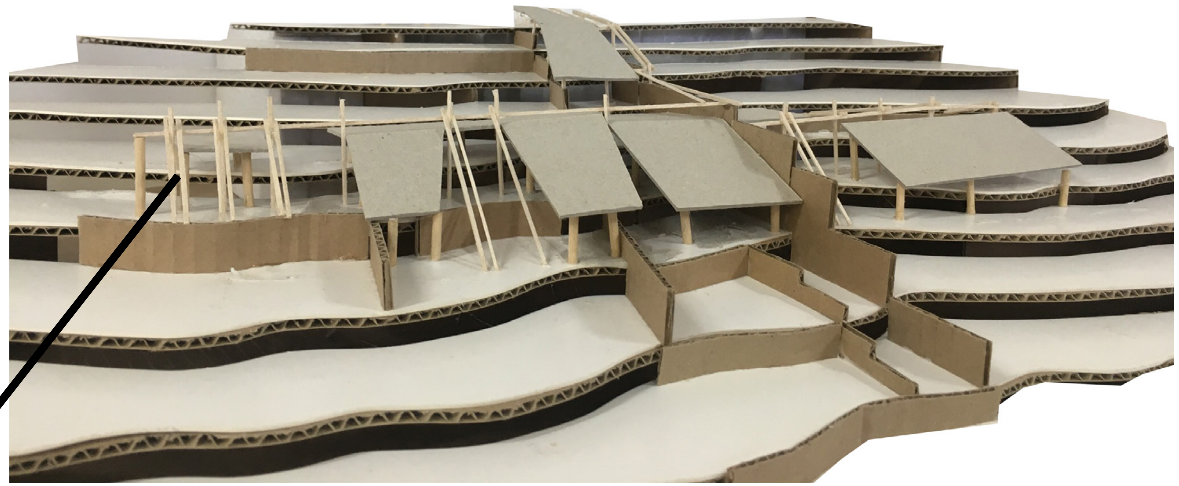

CONNECTION WITH CLIFFS
Food prep
foyer
admin

PHASE 2 MODEL DEVELOPMENT

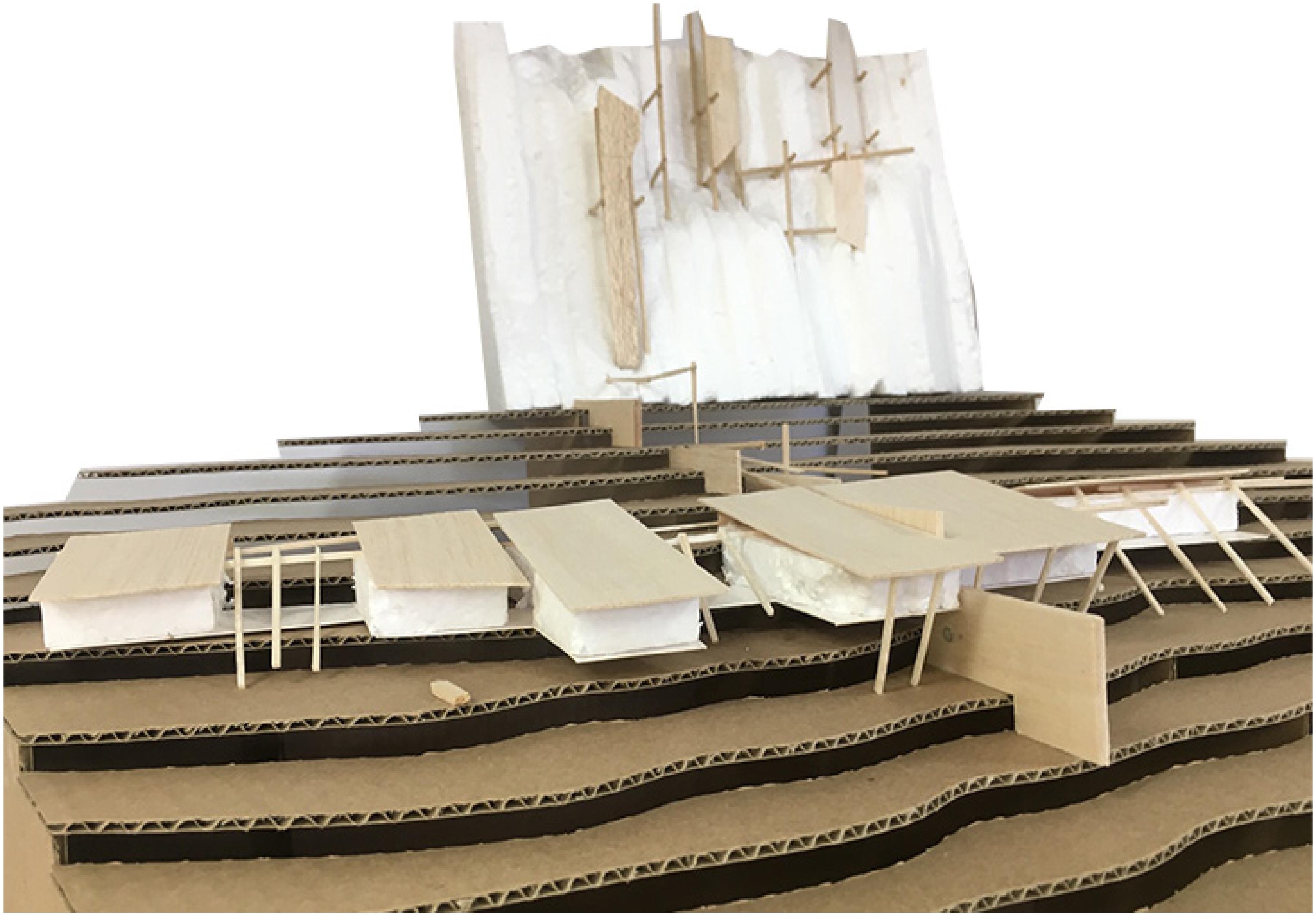




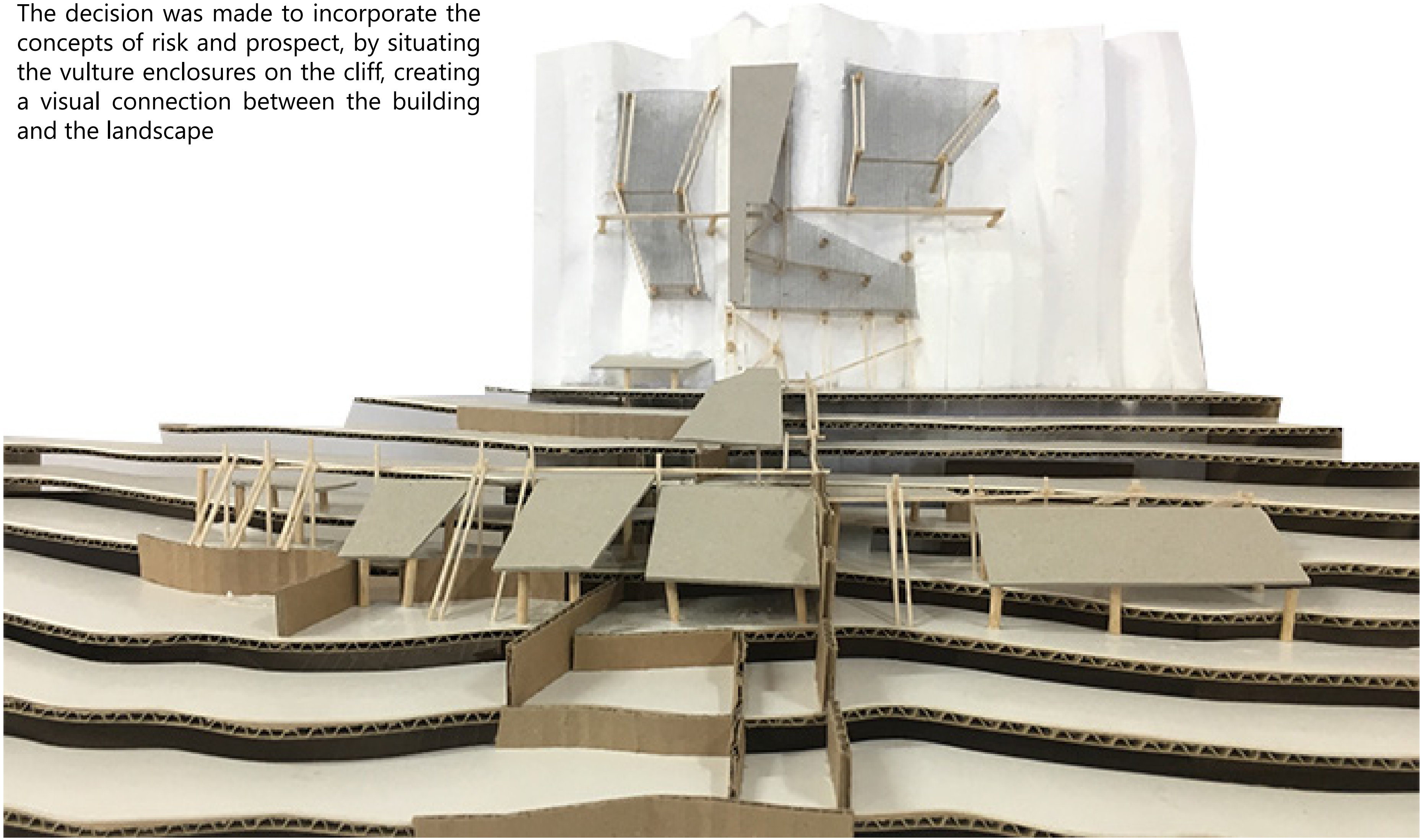




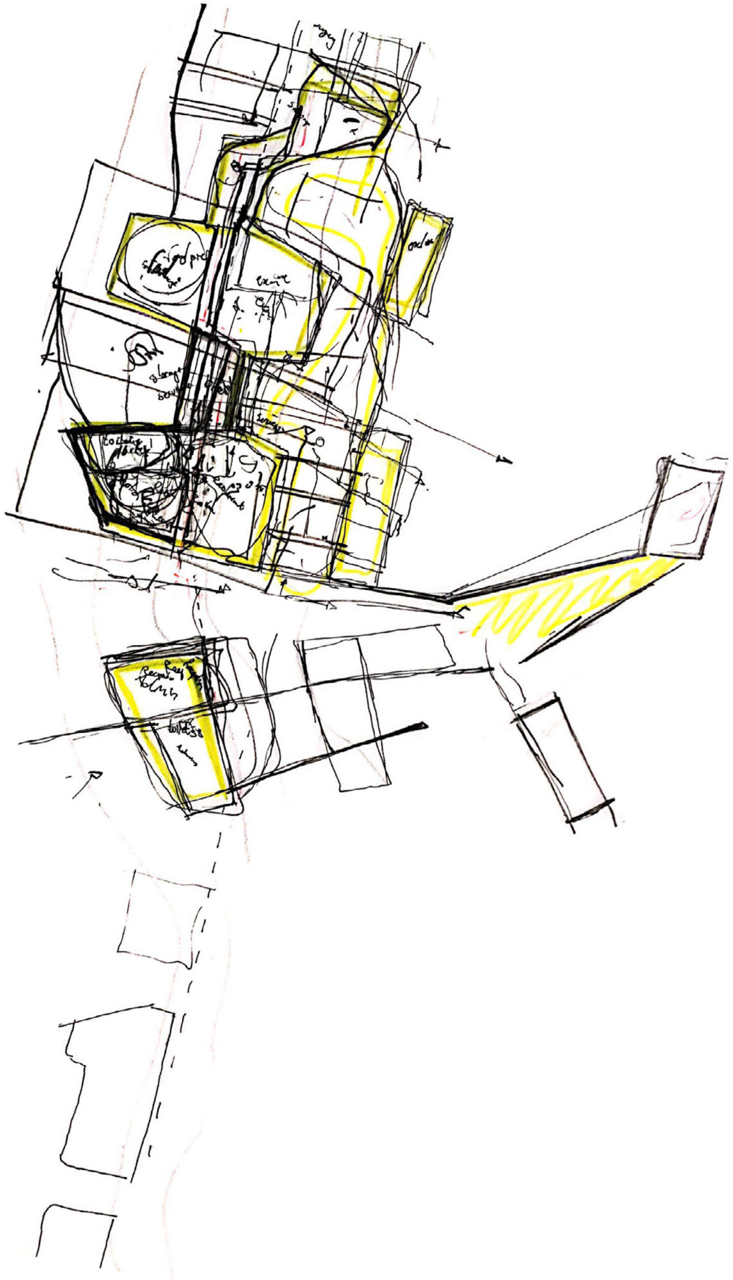
INITIAL APPLICATION OF GUMPOLE CONSTRUCTION

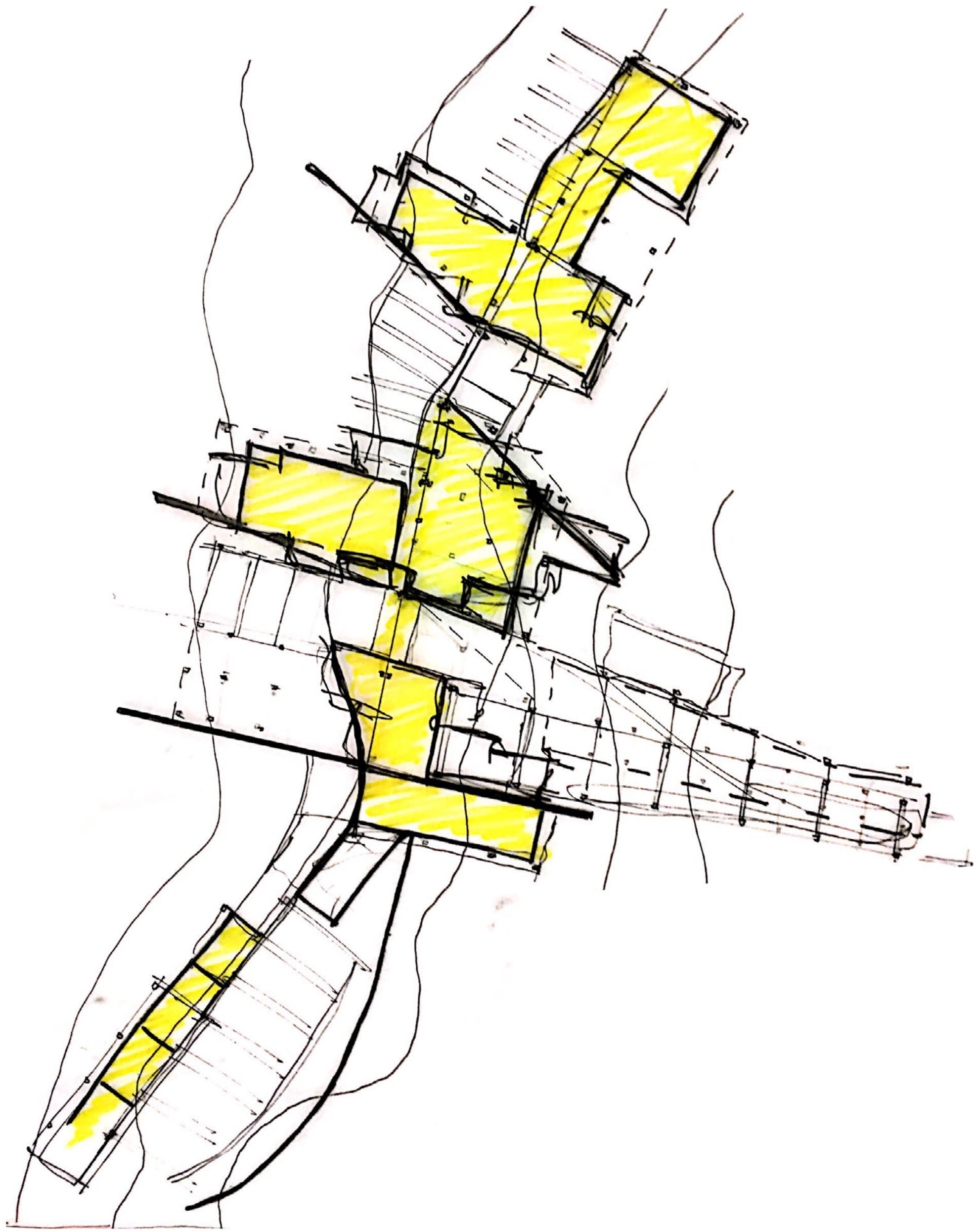


The decision was made to incorporate the concepts of risk and prospect, by situating the vulture enclosures on the cliff, creating a visual connection between the building and the landscape

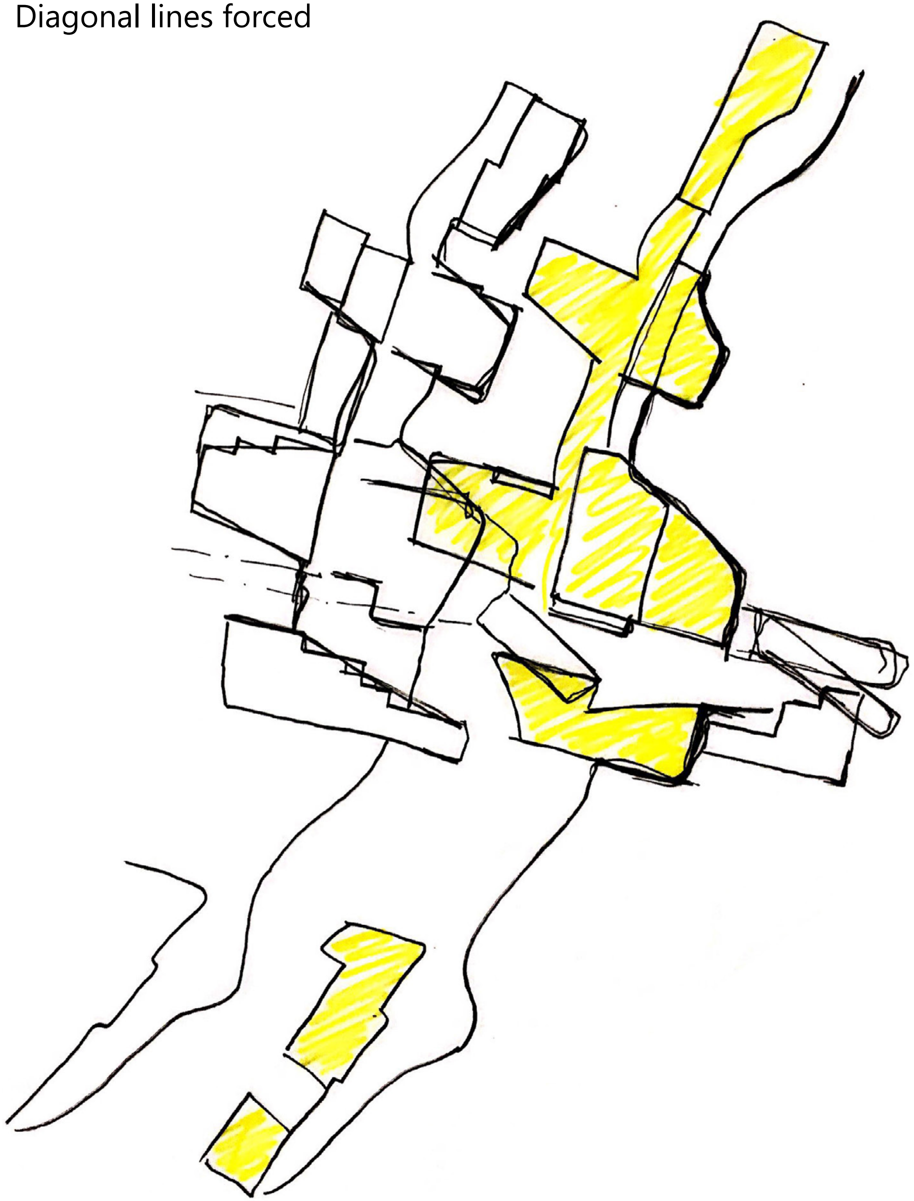


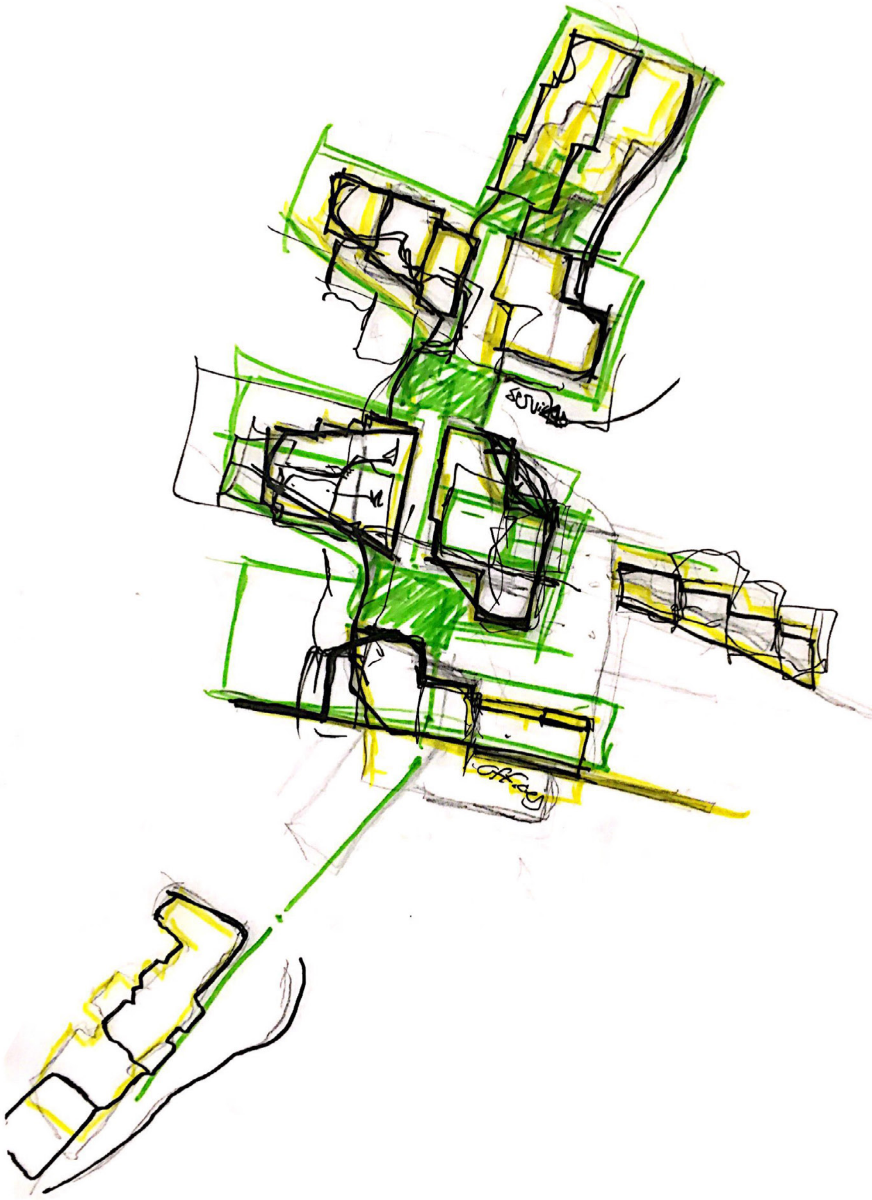
DEVELOPMENT OF PHASE 2





Diagonal lines forced

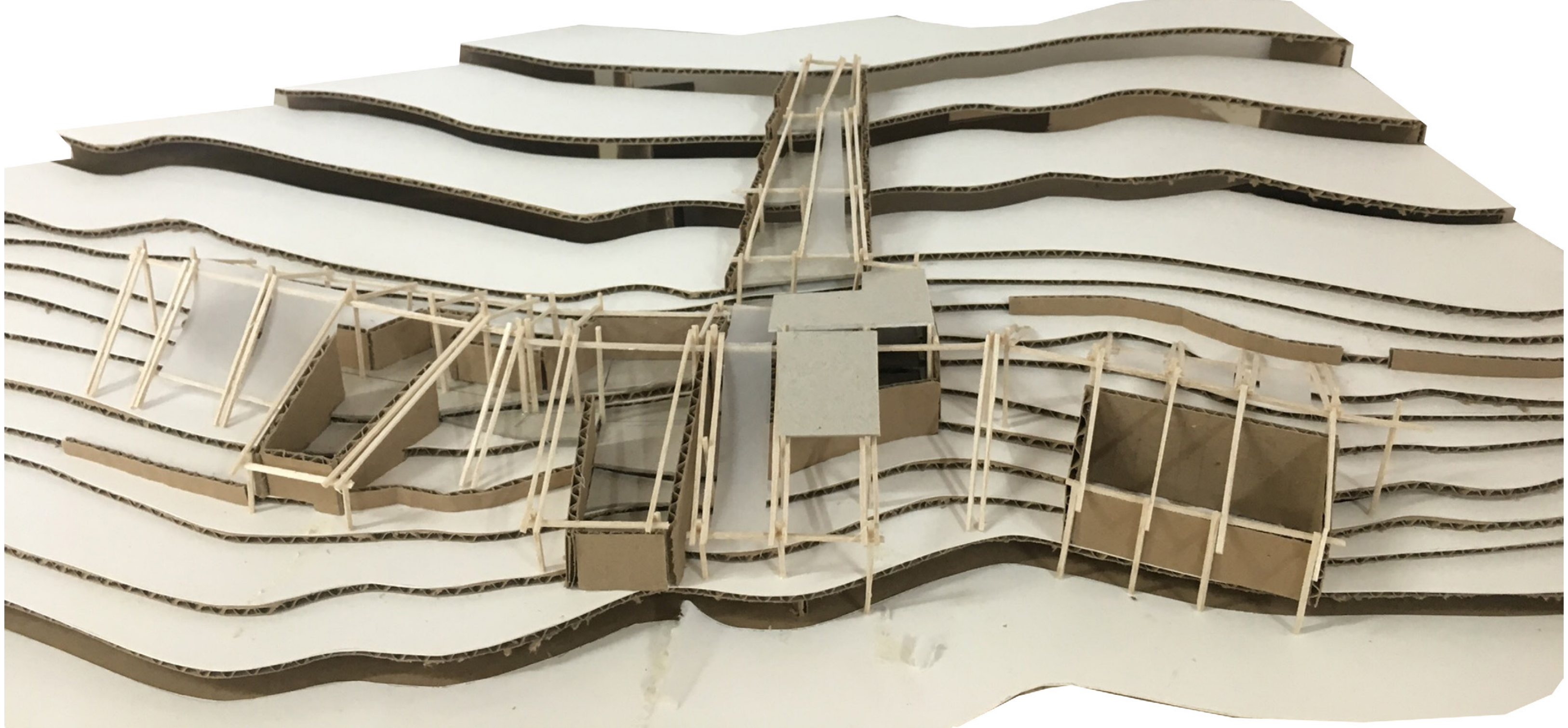


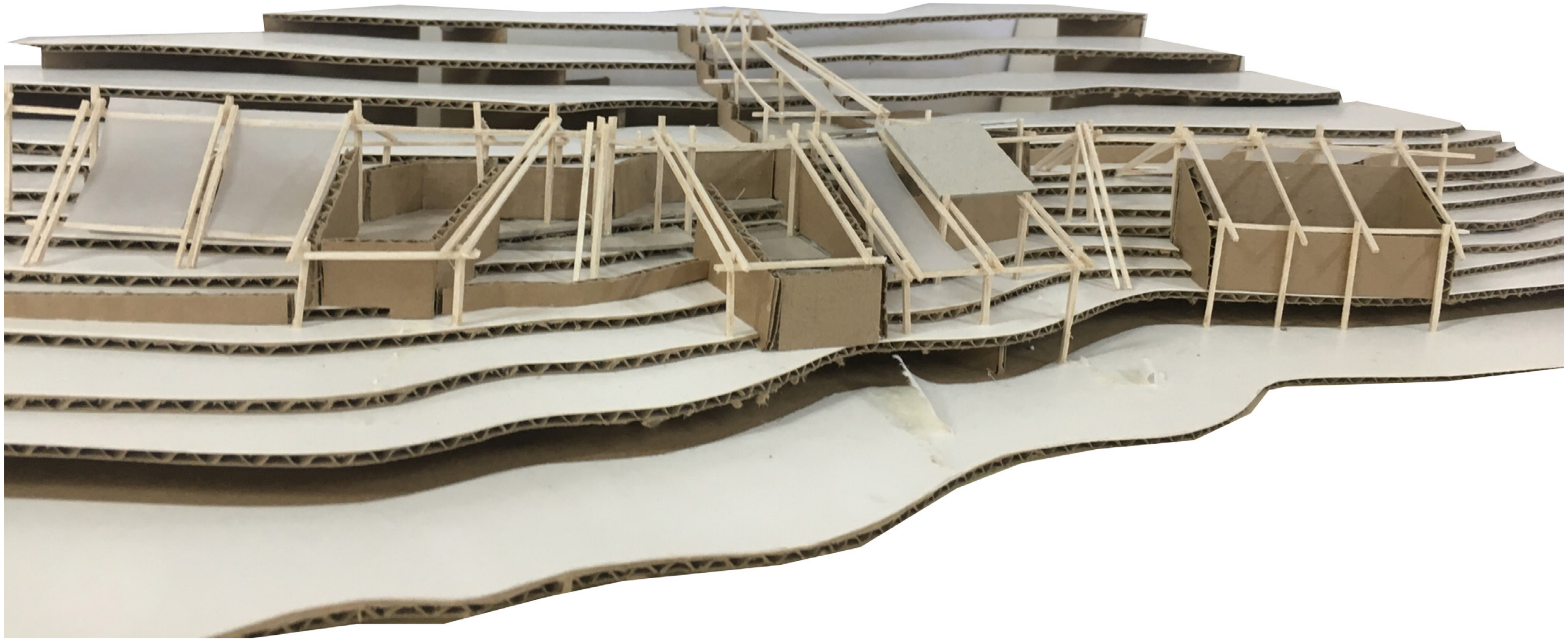


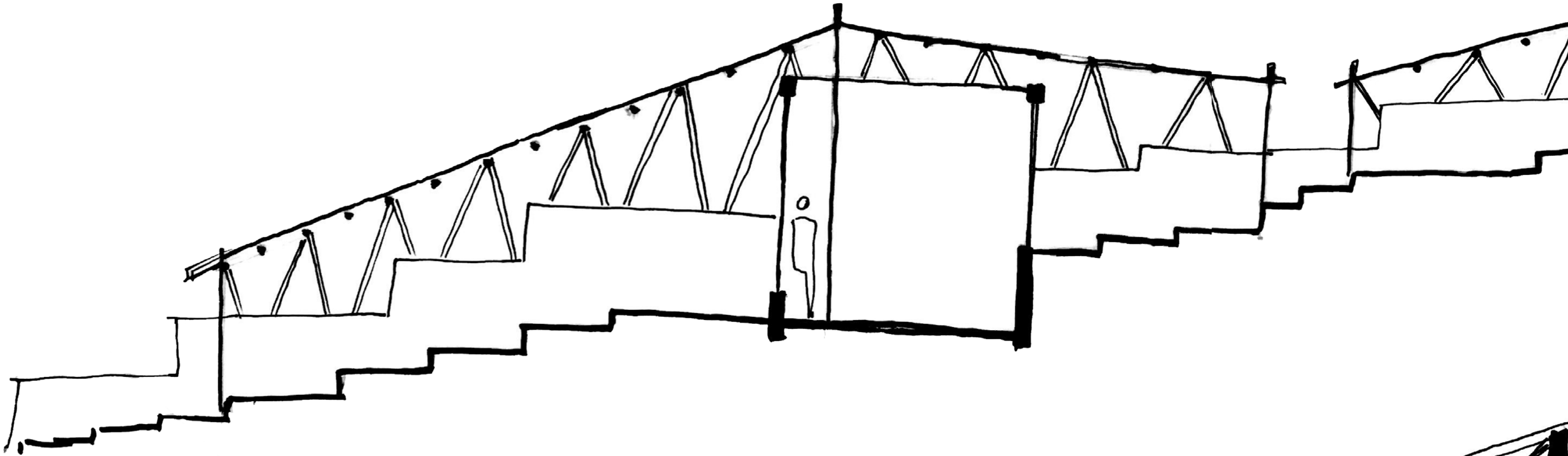
PLANNING MORE INFLUENCED BY CONTOURS

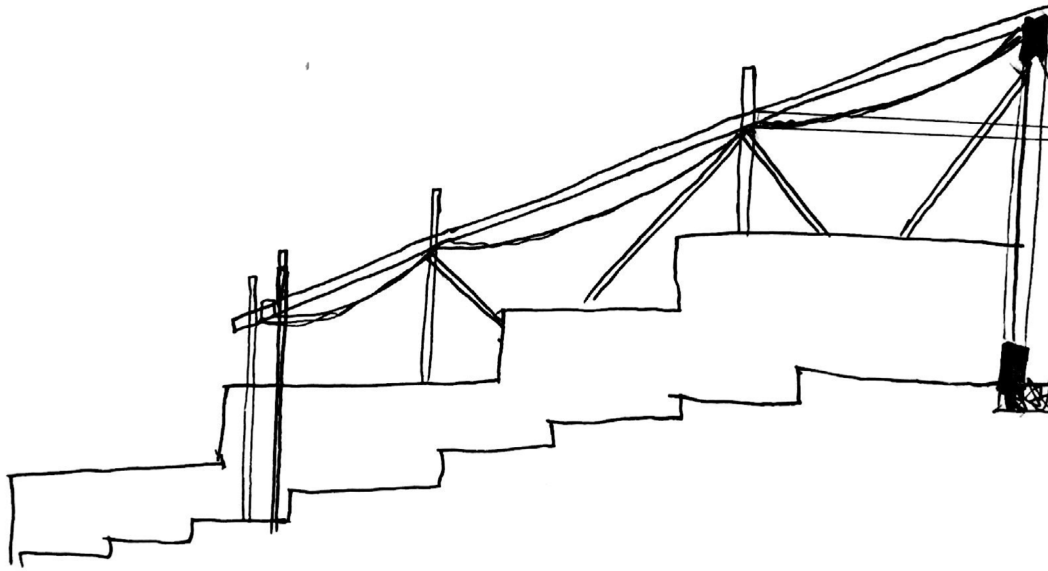
LINES AND FORMS ARE FORCED

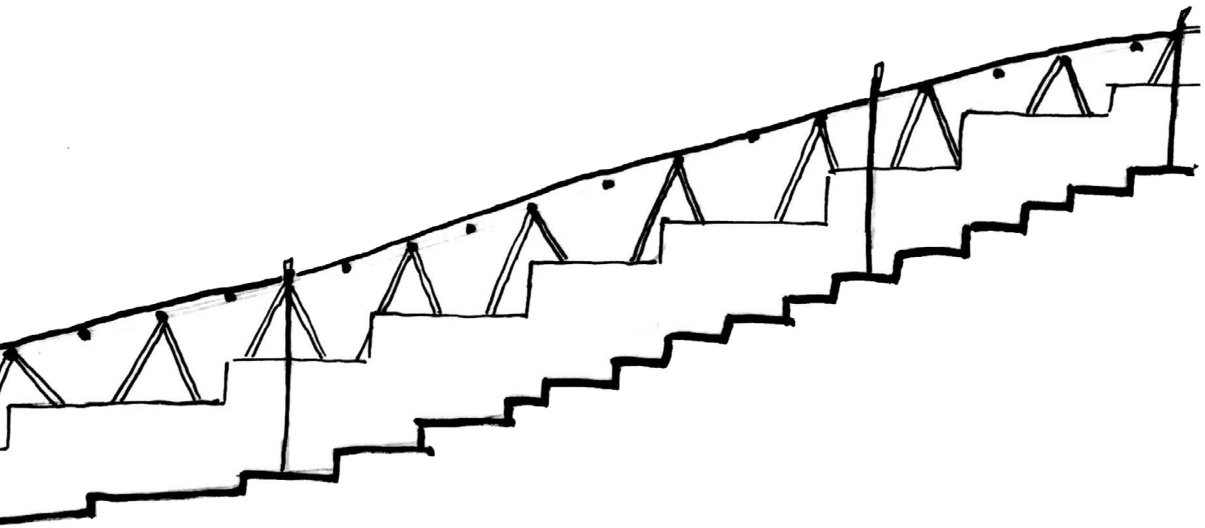
ROOF STRUCTURE NOT EXCITING

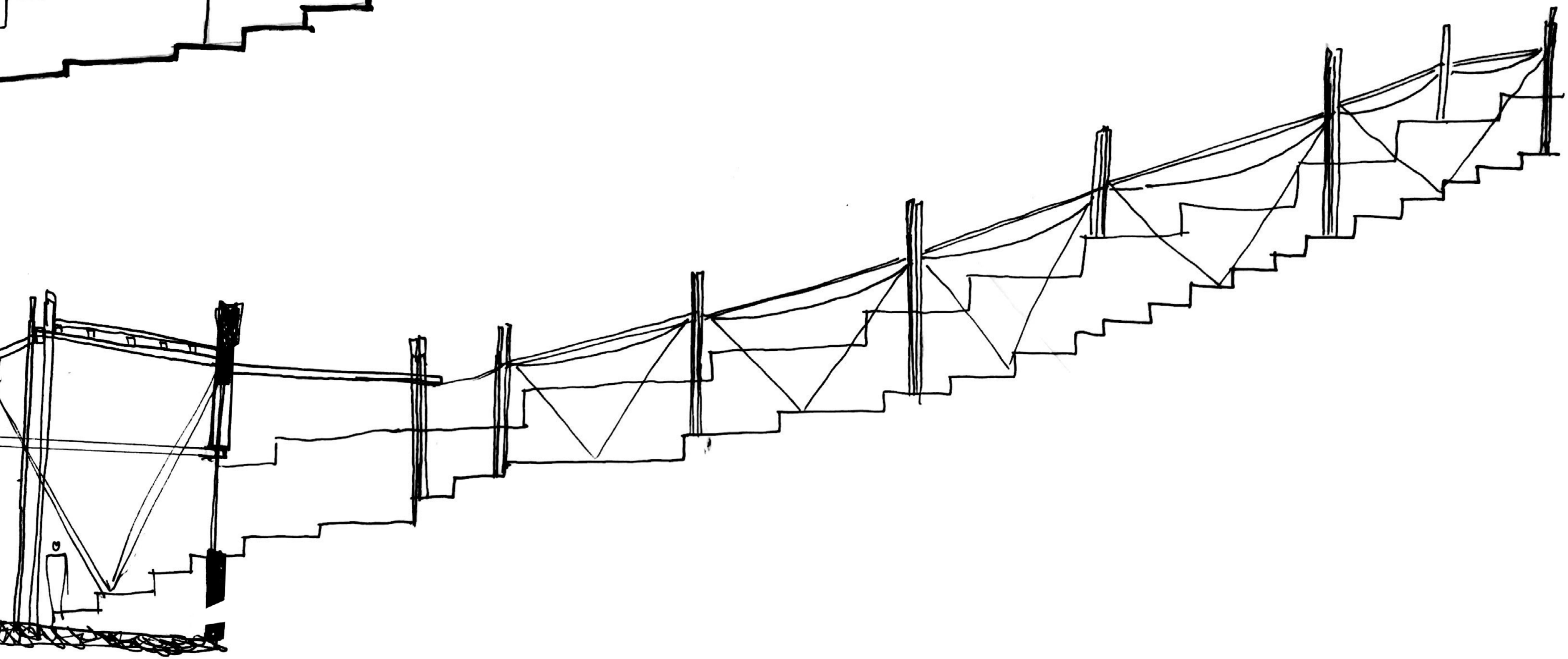




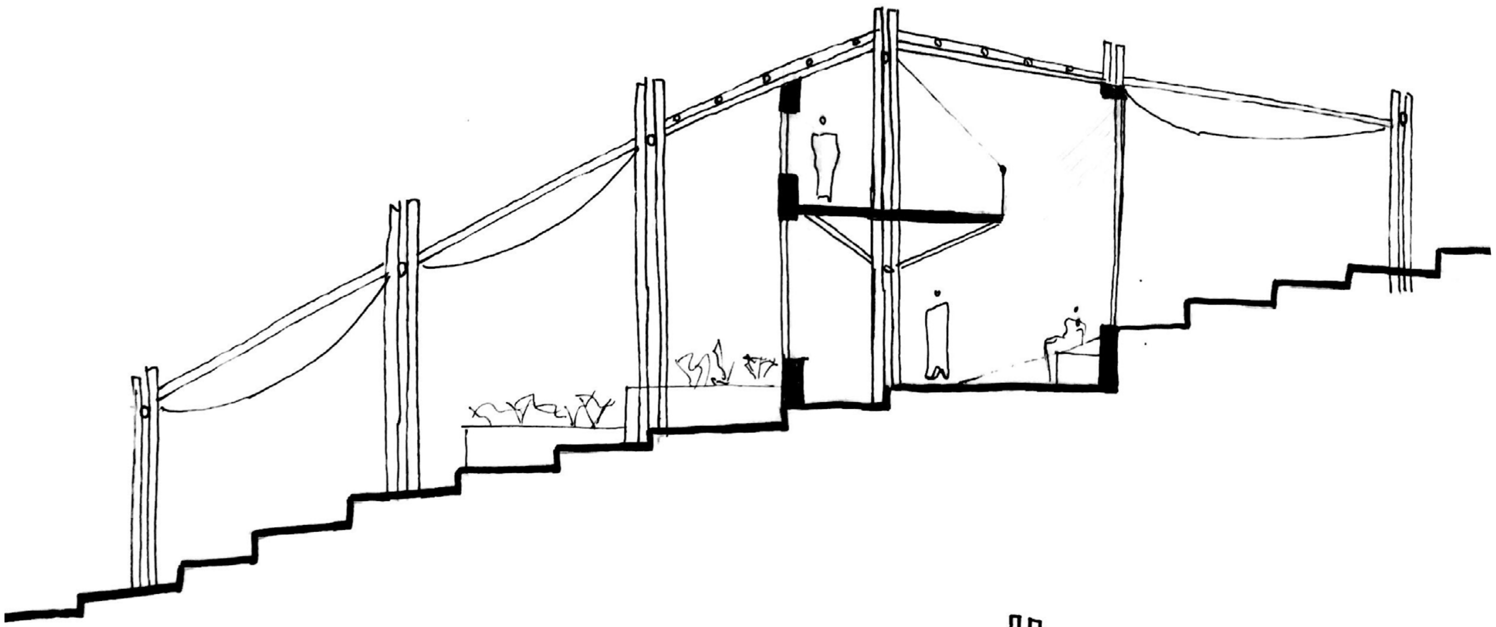


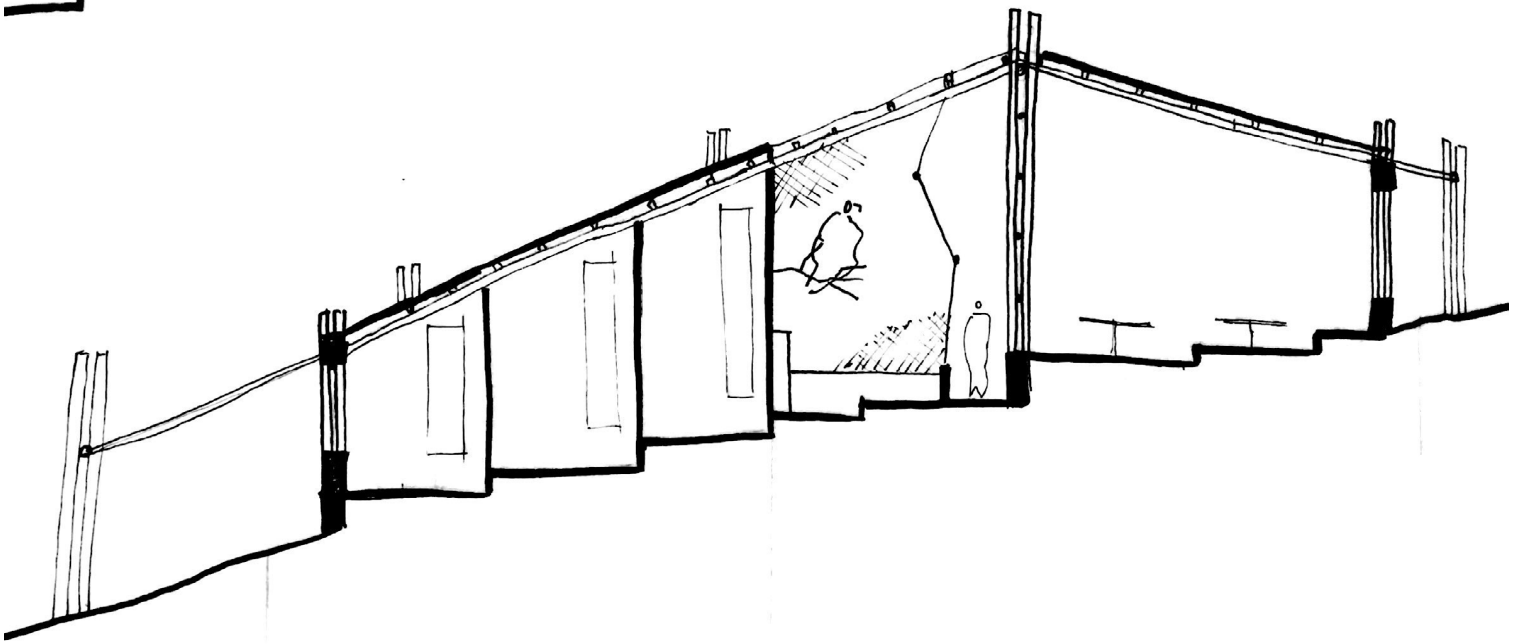


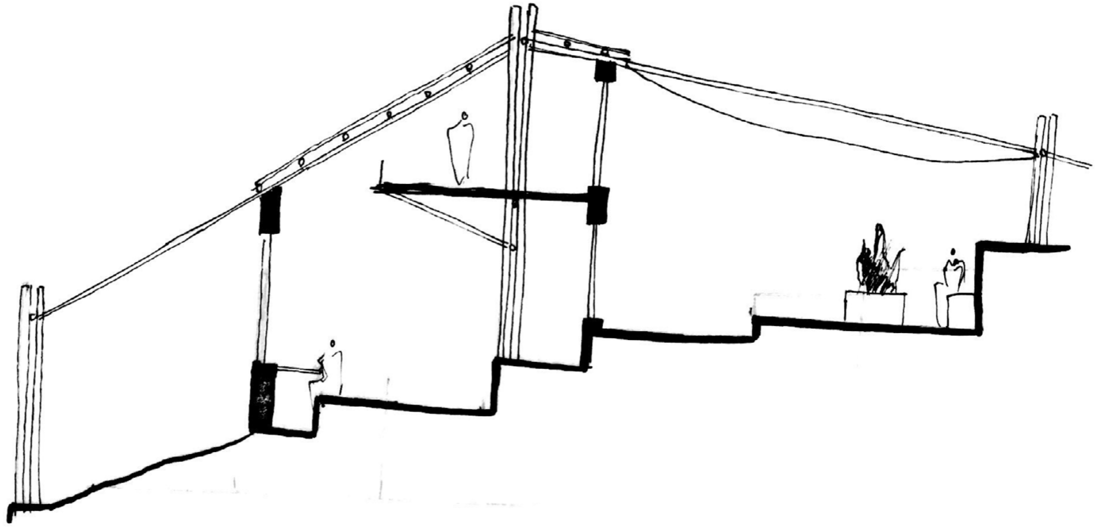


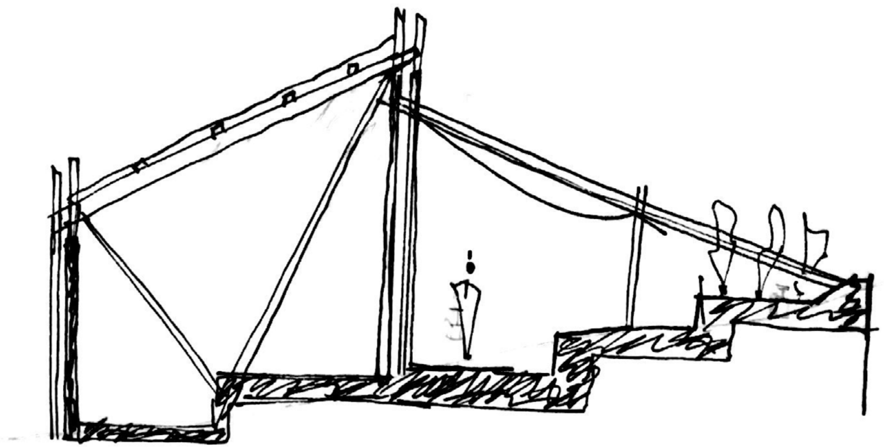


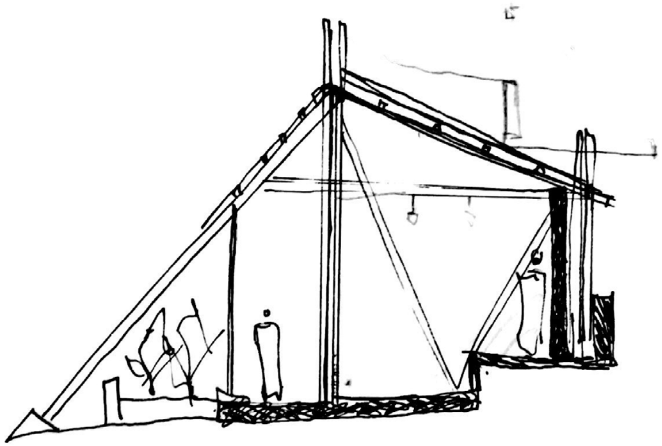
SECTIONAL DEVELOPMENT

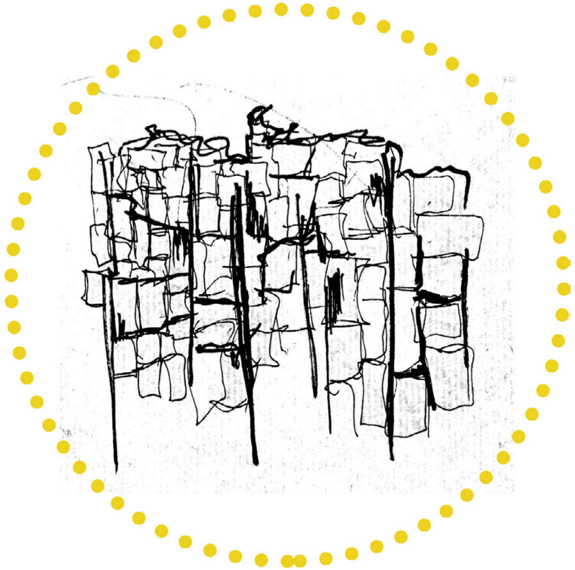






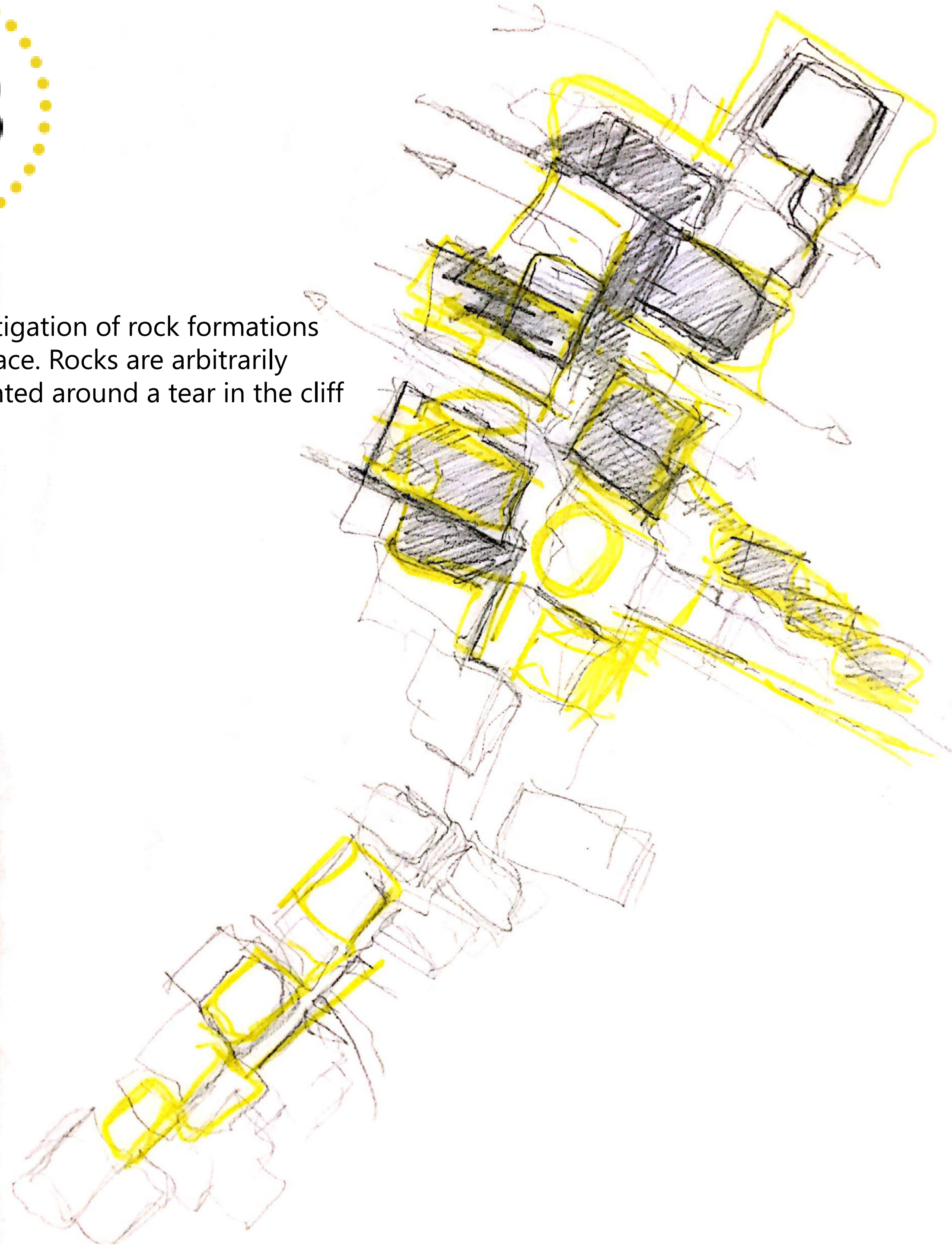


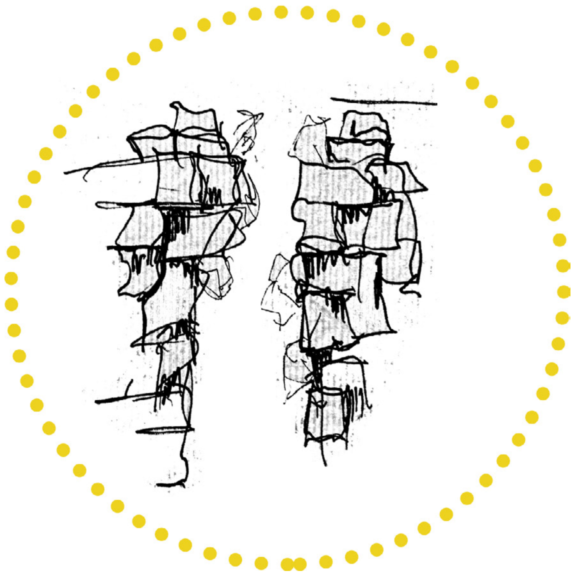


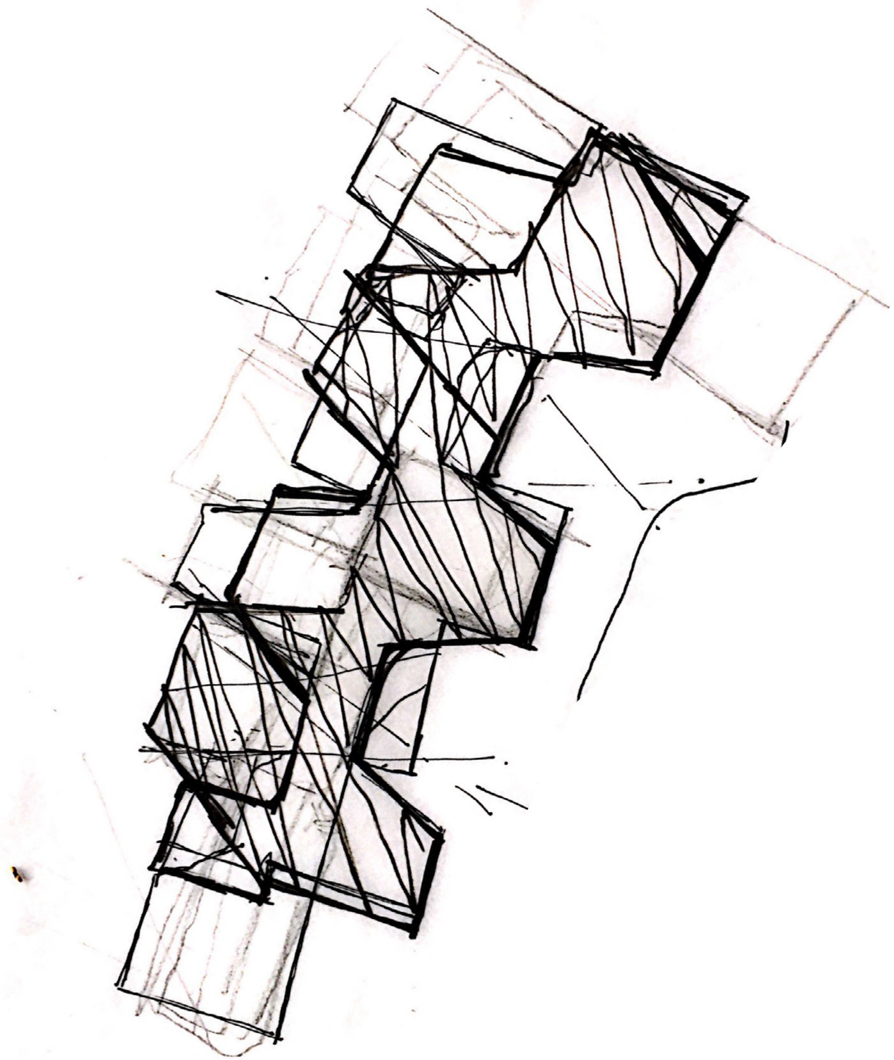


PHASE 3

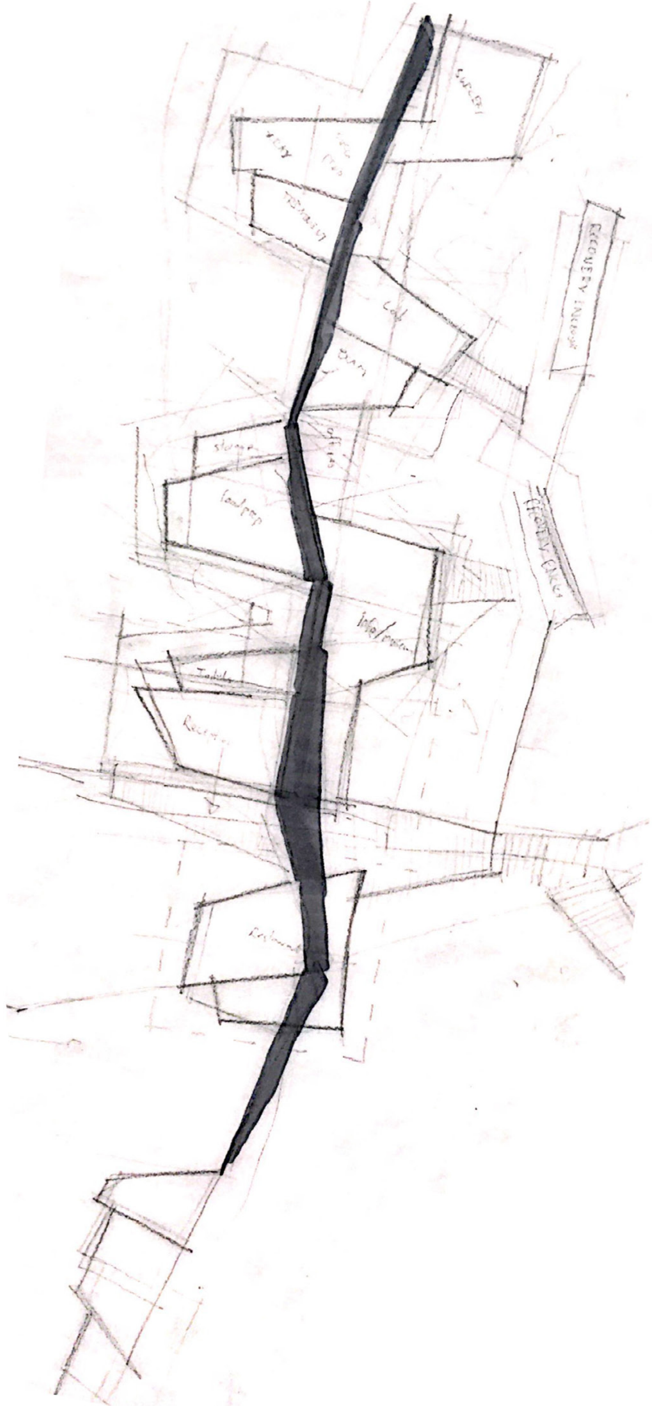
Reinvestigation of rock formations of cliff face. Rocks are arbitrarily fragmented around a tear in the cliff



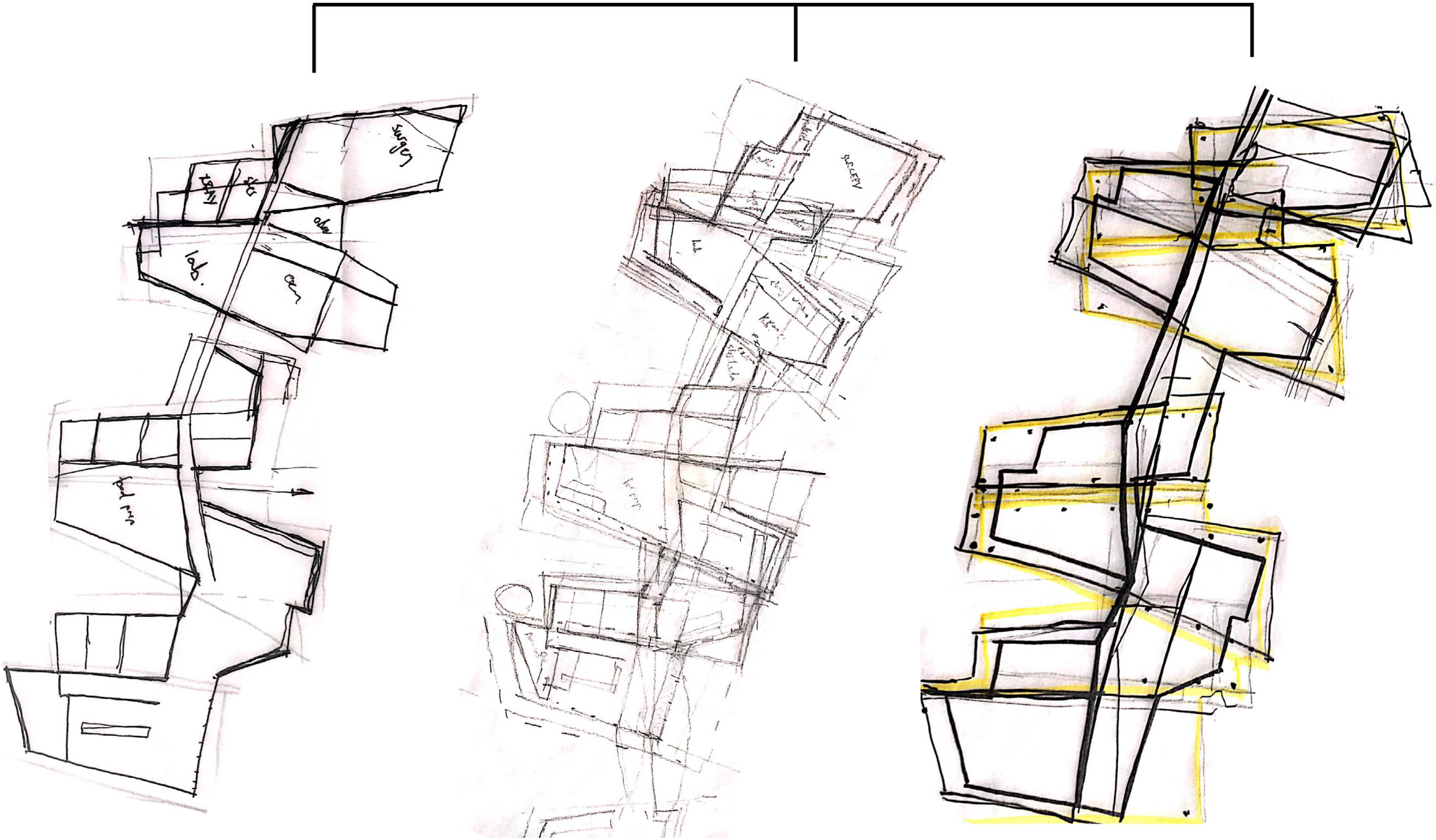


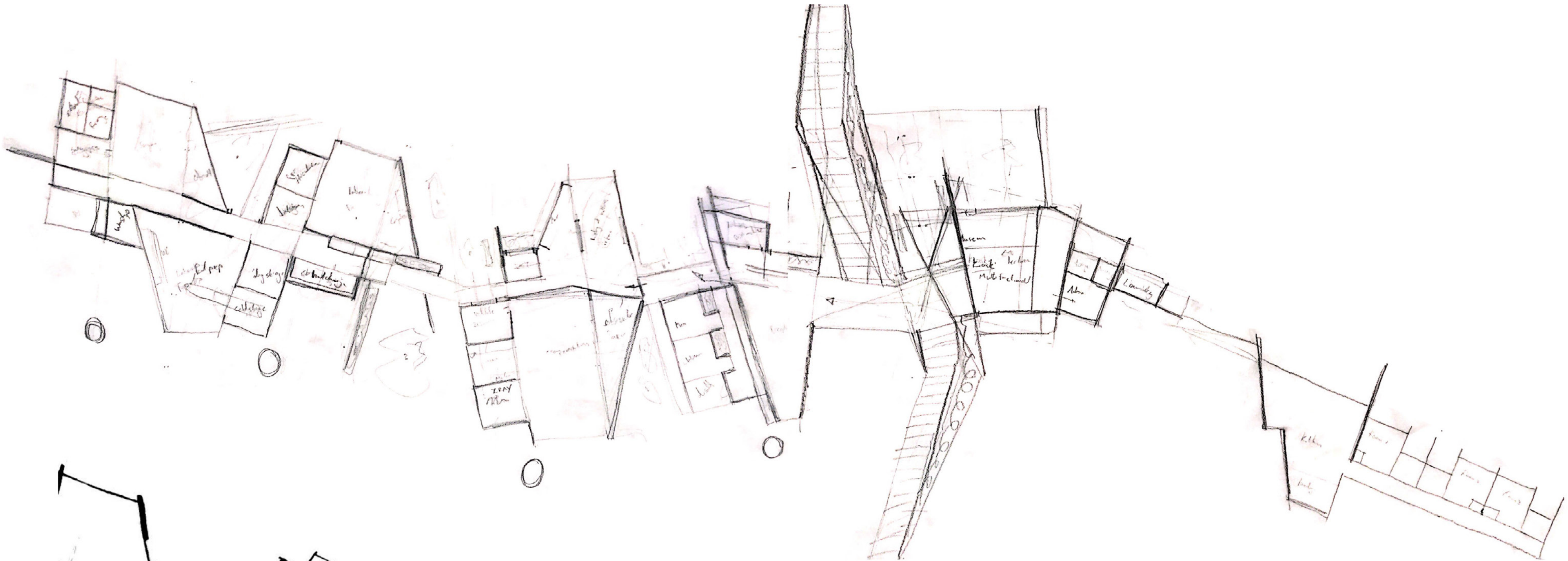


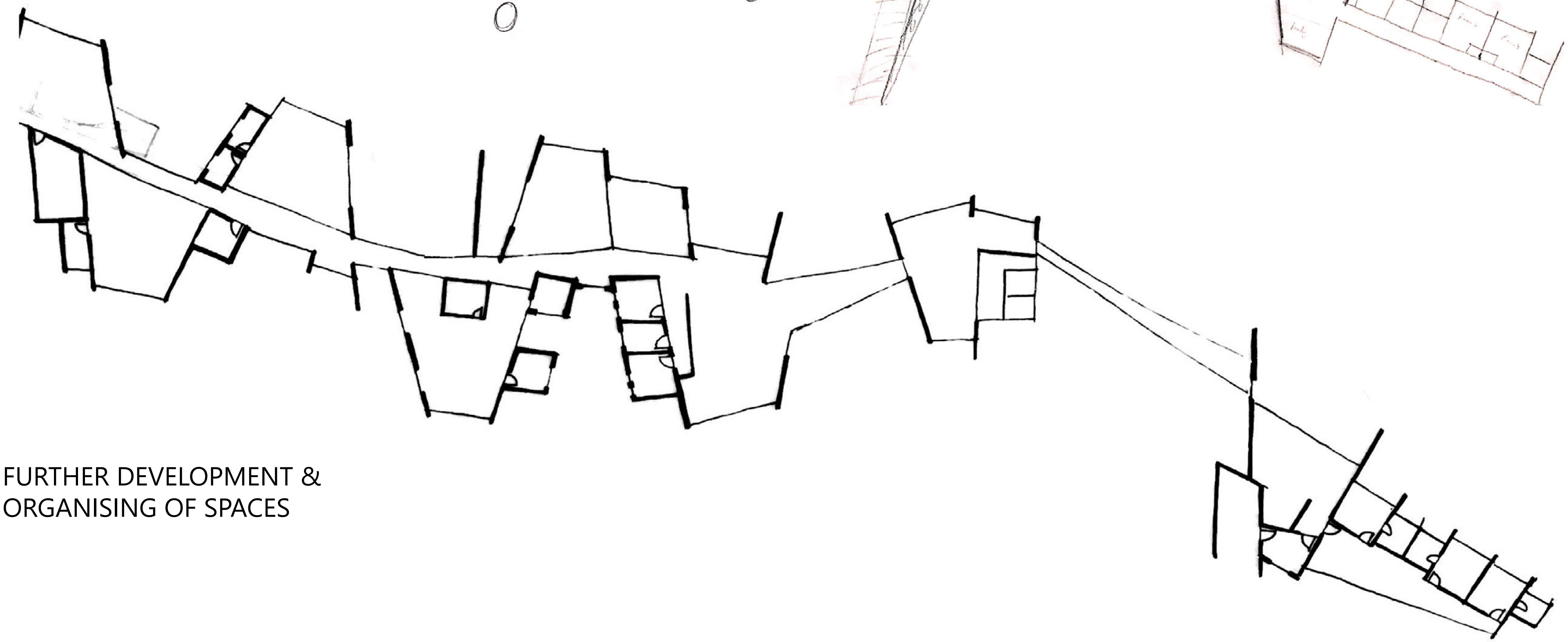
Spaces are fragmented around central tear



DEVELOPMENT OF PLAN

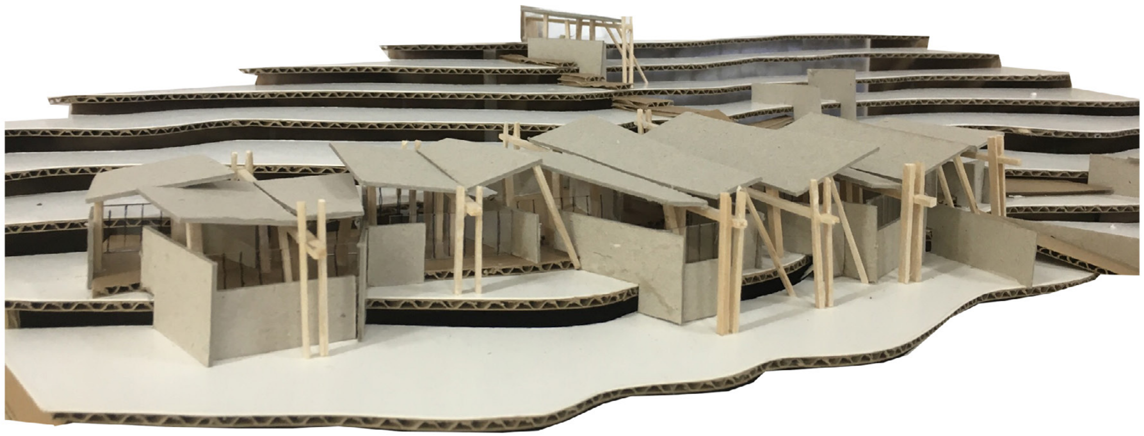






FURTHER DEVELOPMENT &
ORGANISING OF SPACES


SURGERY
XRAY
SURGERY PREP
STORAGE
LAB
OFFICE
EXAM
STORAGE
FOOD PREP
RECOVERY
MUSEUM
INFO
TOILETS
ARCHIVES
Reception
RECOVERY
RESTAURANT
KITCHEN
Kitchen
Room 2
Room 1



Reinvestigation of roof structure

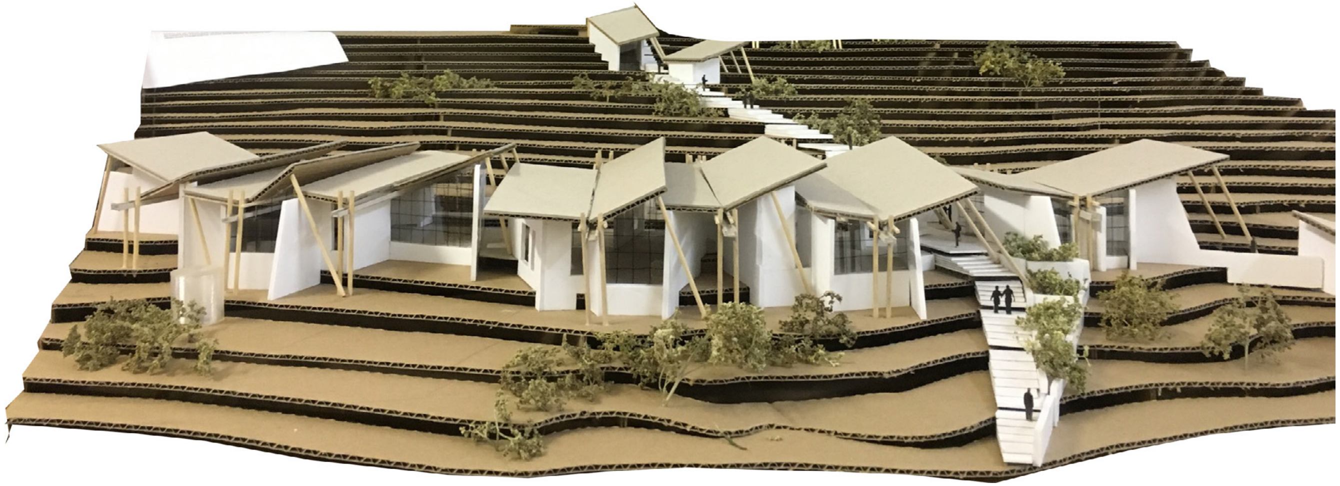
Incorporating ascending concept

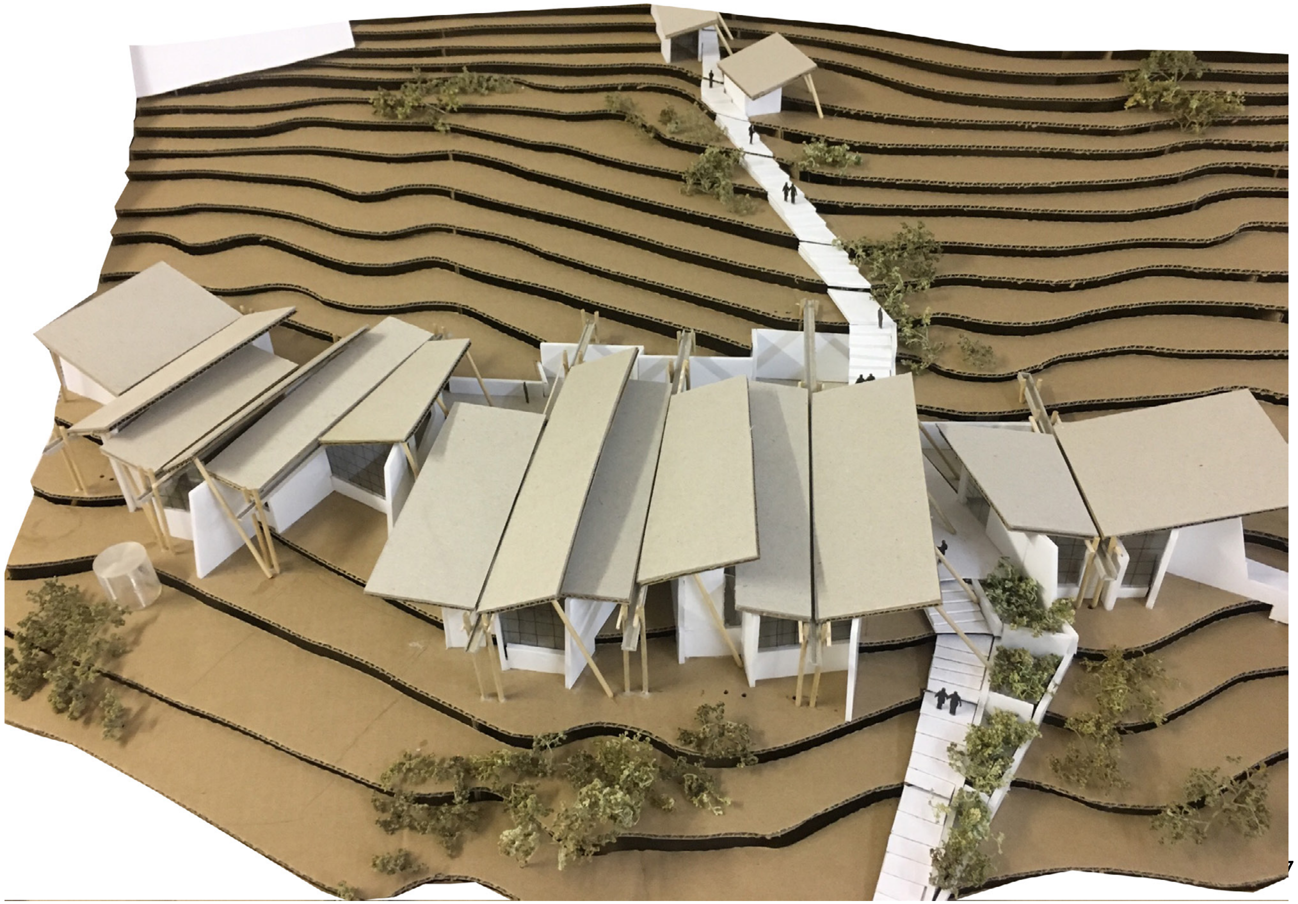
Monolithic walls to light tectonic roof

Roof structure as interpretation of flight.

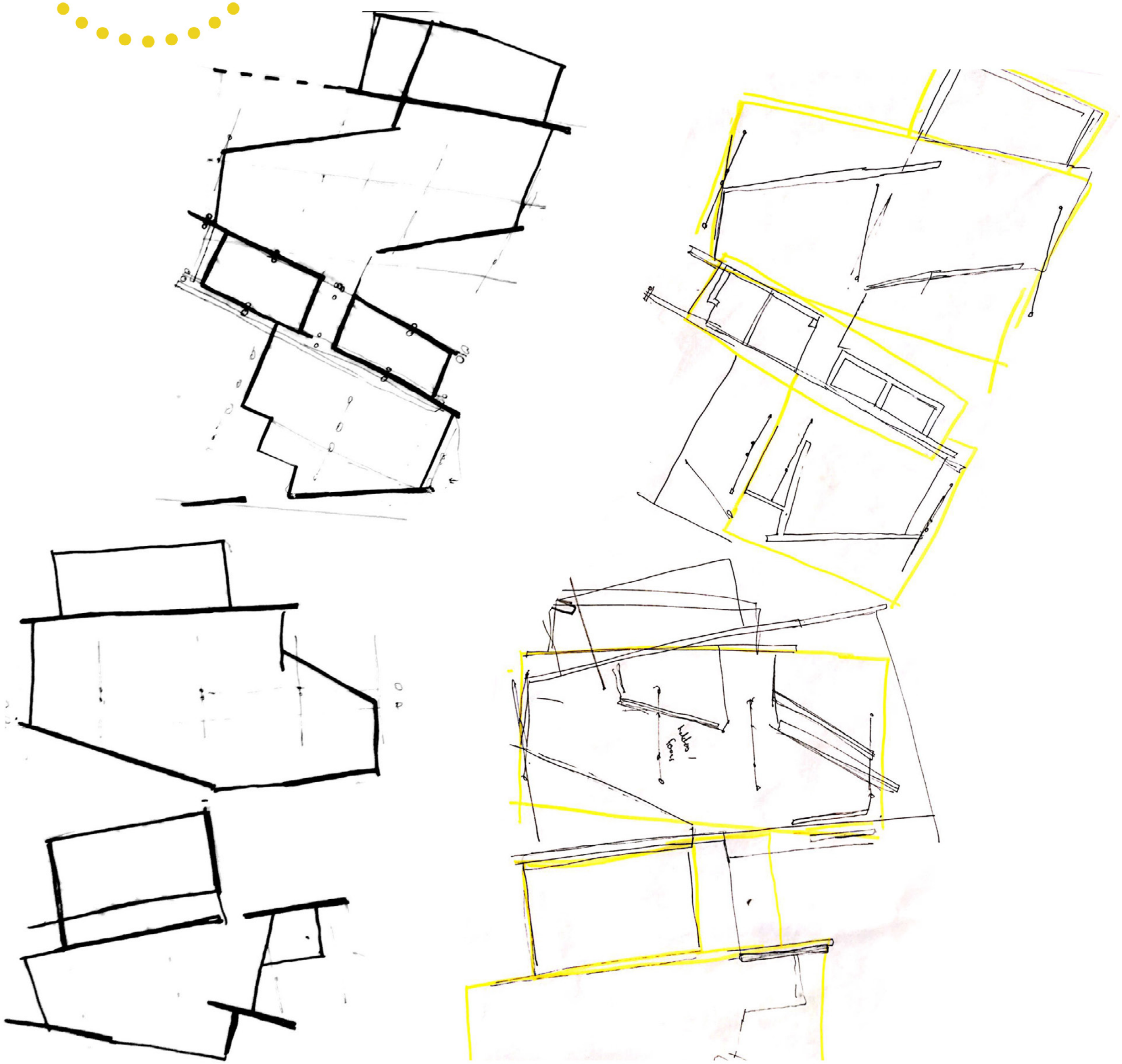
Complex roof structure

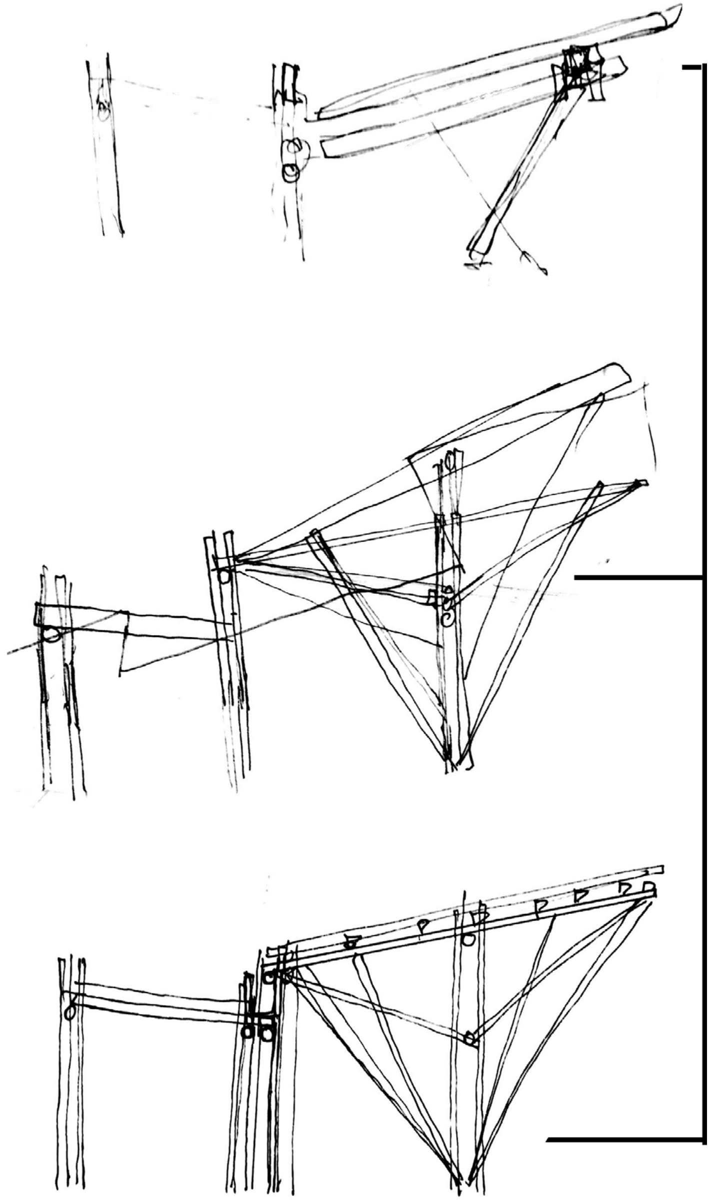
no correlation between roof and walls

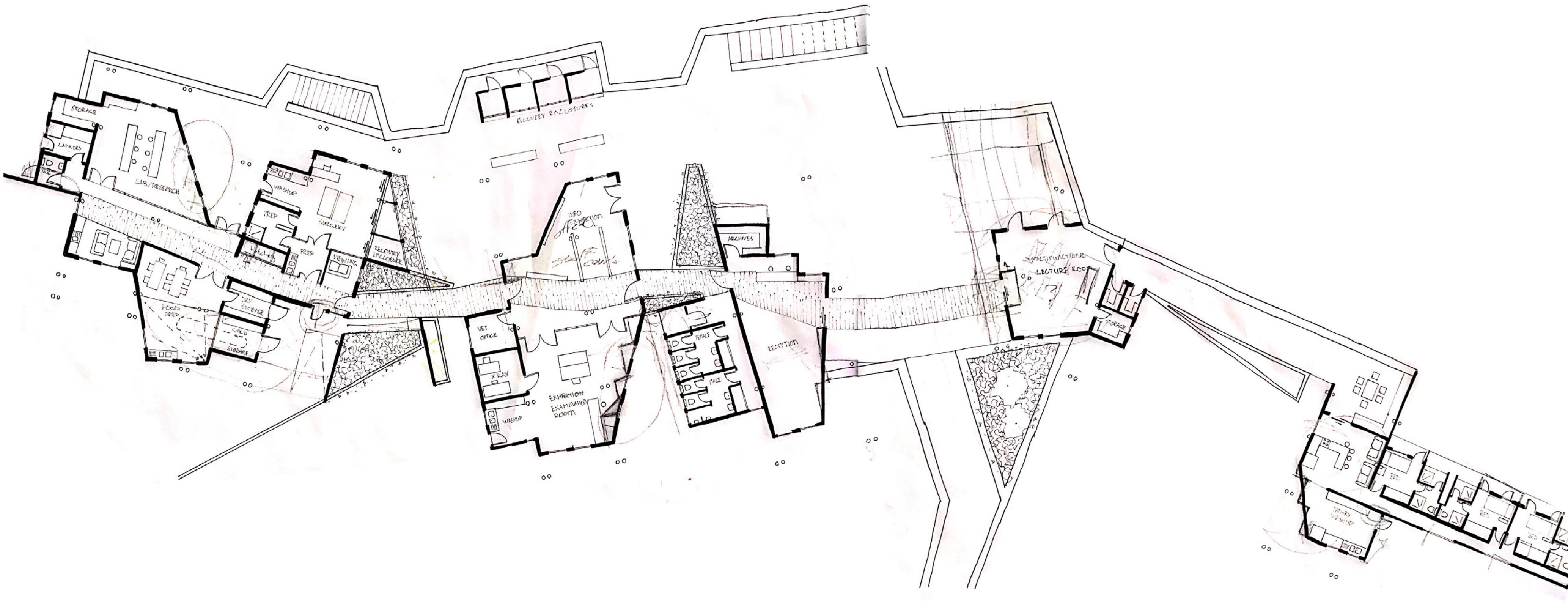




DEVELOPING OF NEW ROOF STRUCTURE






STORAGE
LAUNDRY
LAB/RESEARCH
WASHUP
PREP
SURGERY
VIEWING
RECOVERY ENCLOSURE
RECOVERY ENCLOSURES
ARCHIVES
LECTURE ROOM
STORAGE
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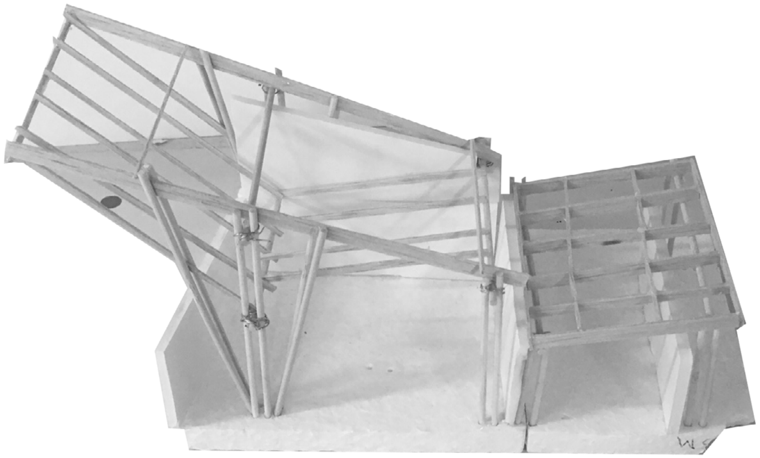
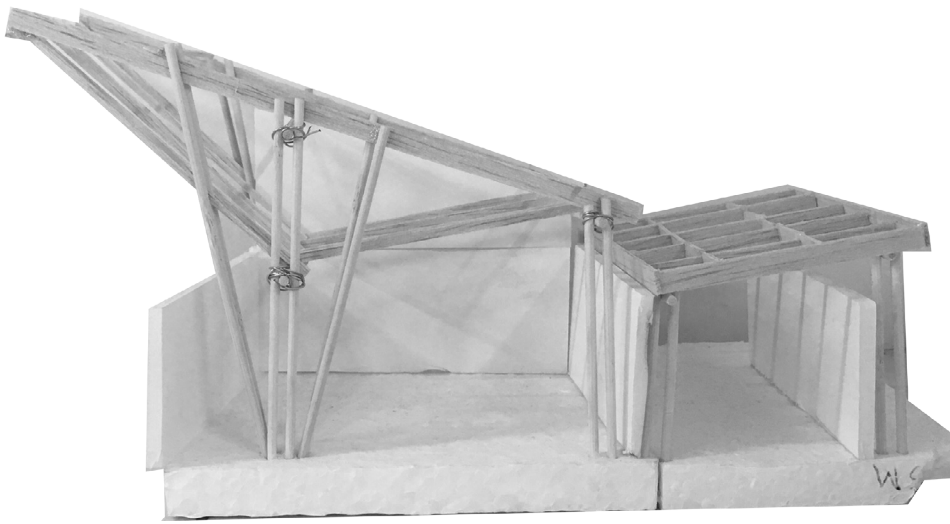
MALE
RECEPTION
FOOD PREP
DRY STORAGE
COLD STORAGE

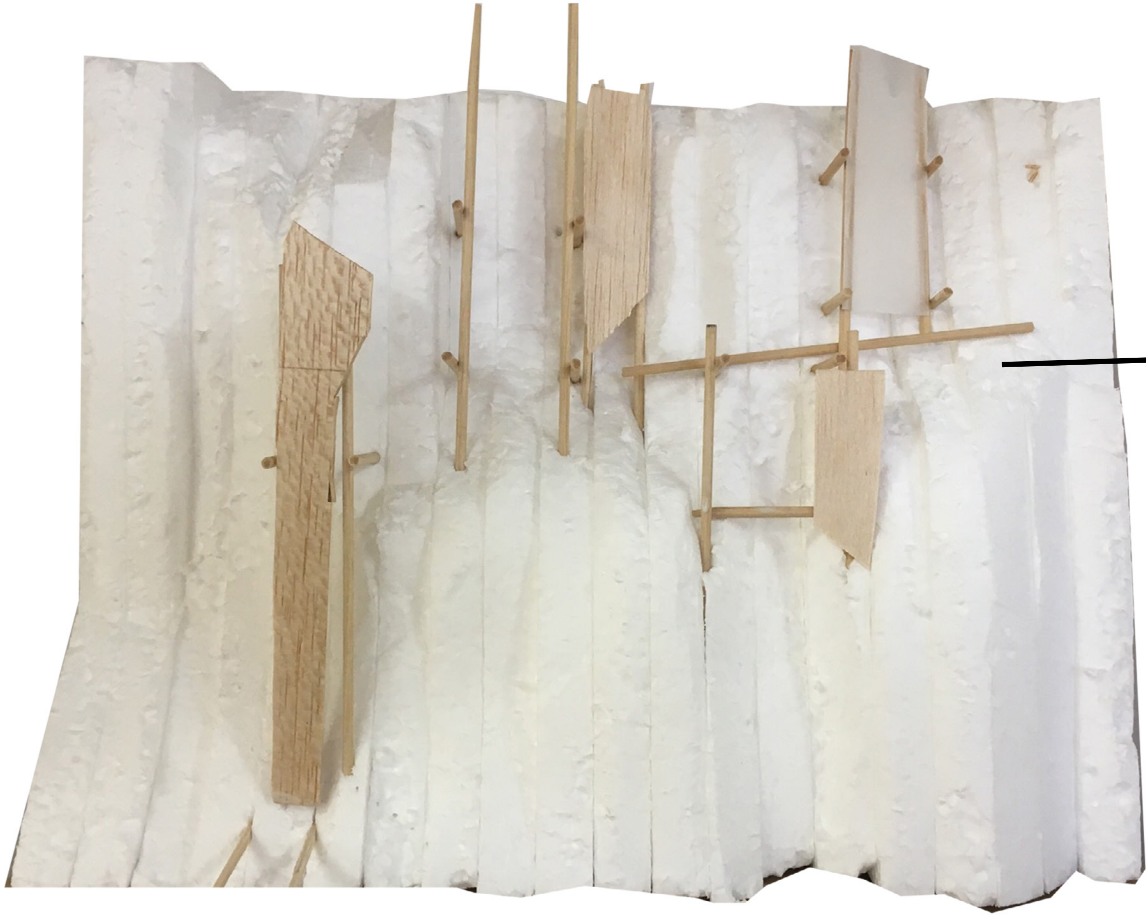




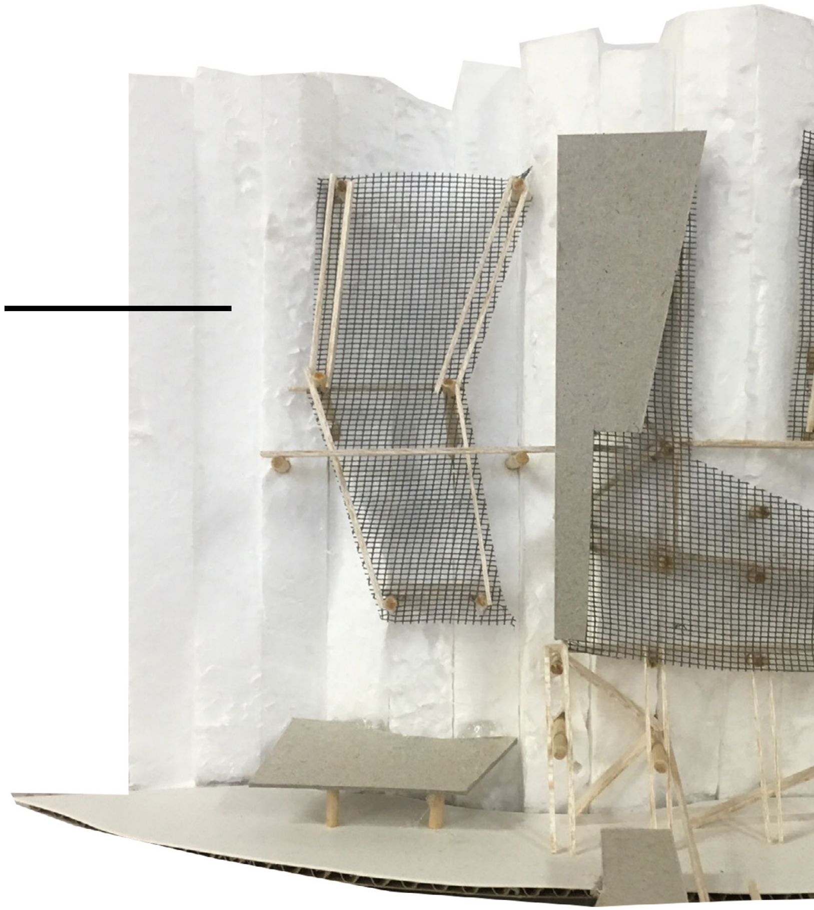
PHASE 4 Model

PHASE 4 Model

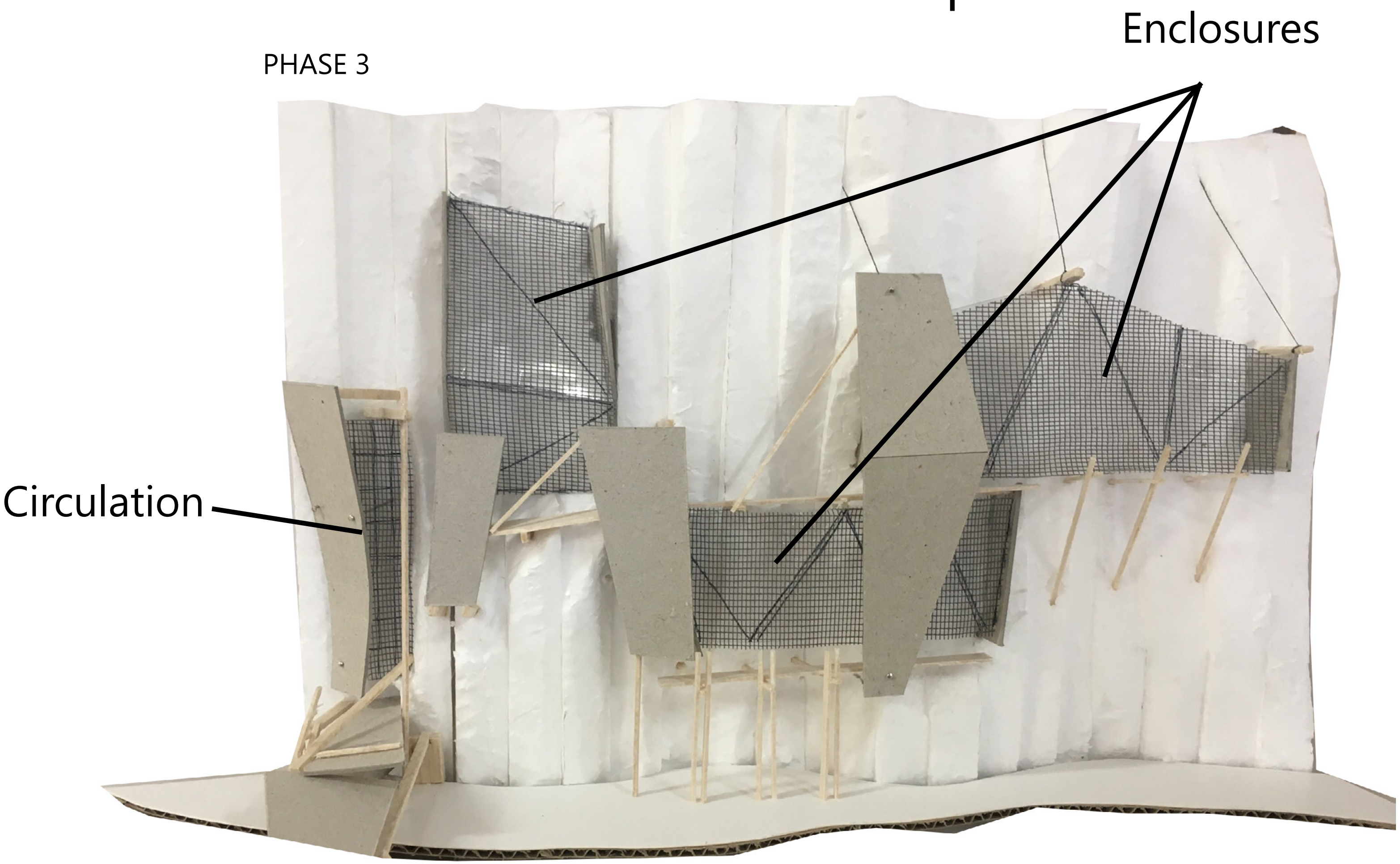
ENCLOSURE DEVELOPMENT



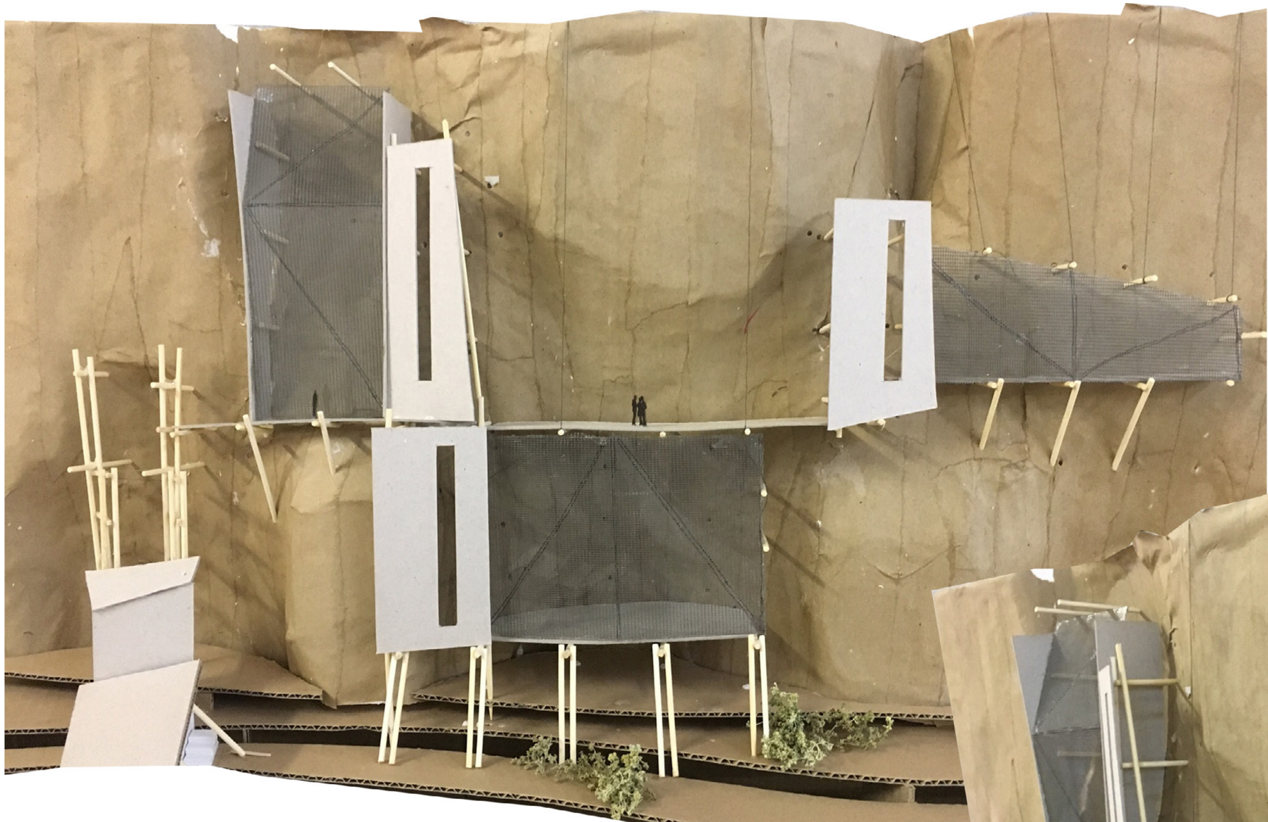
PHASE 2



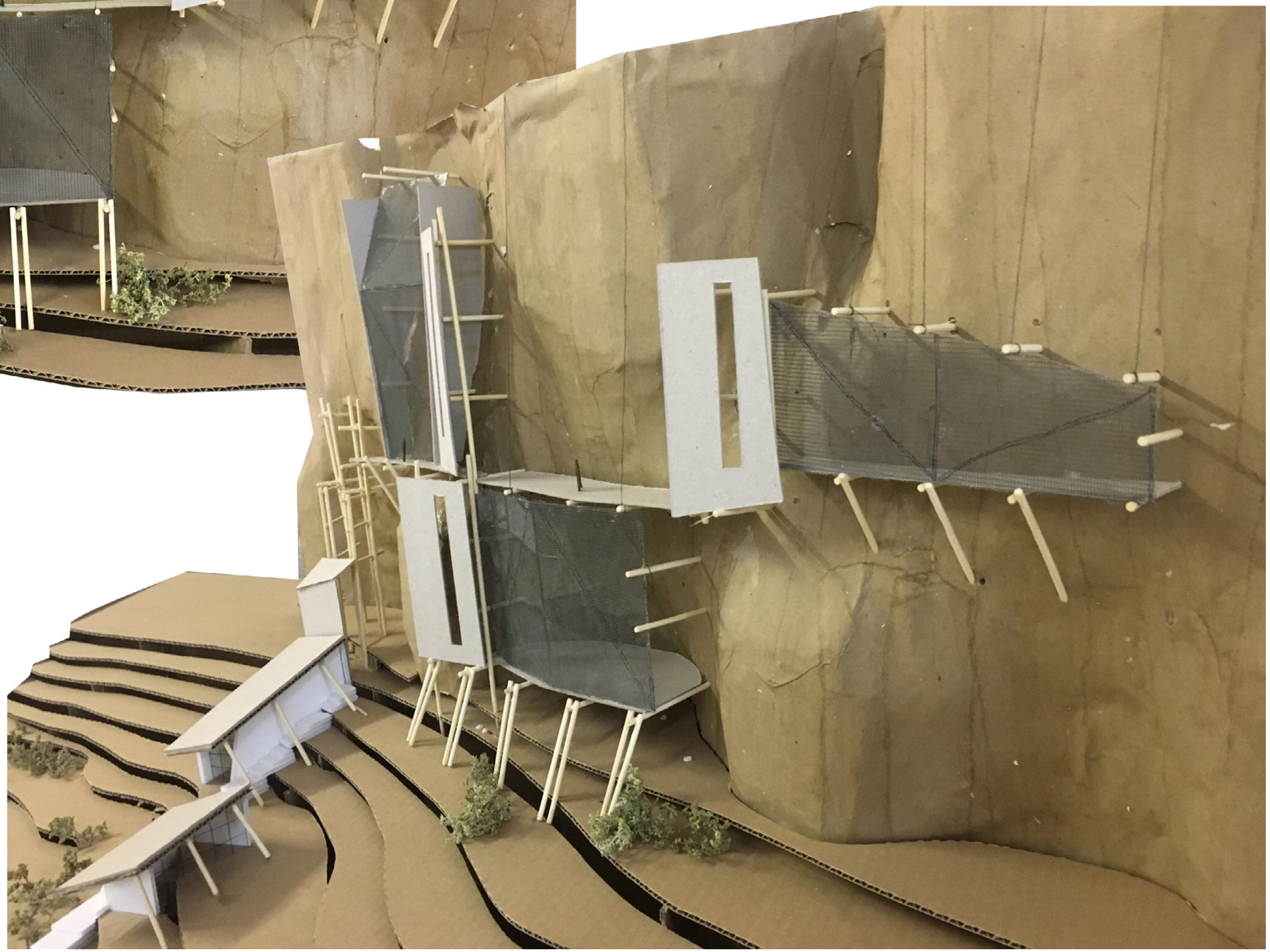
PHASE 3



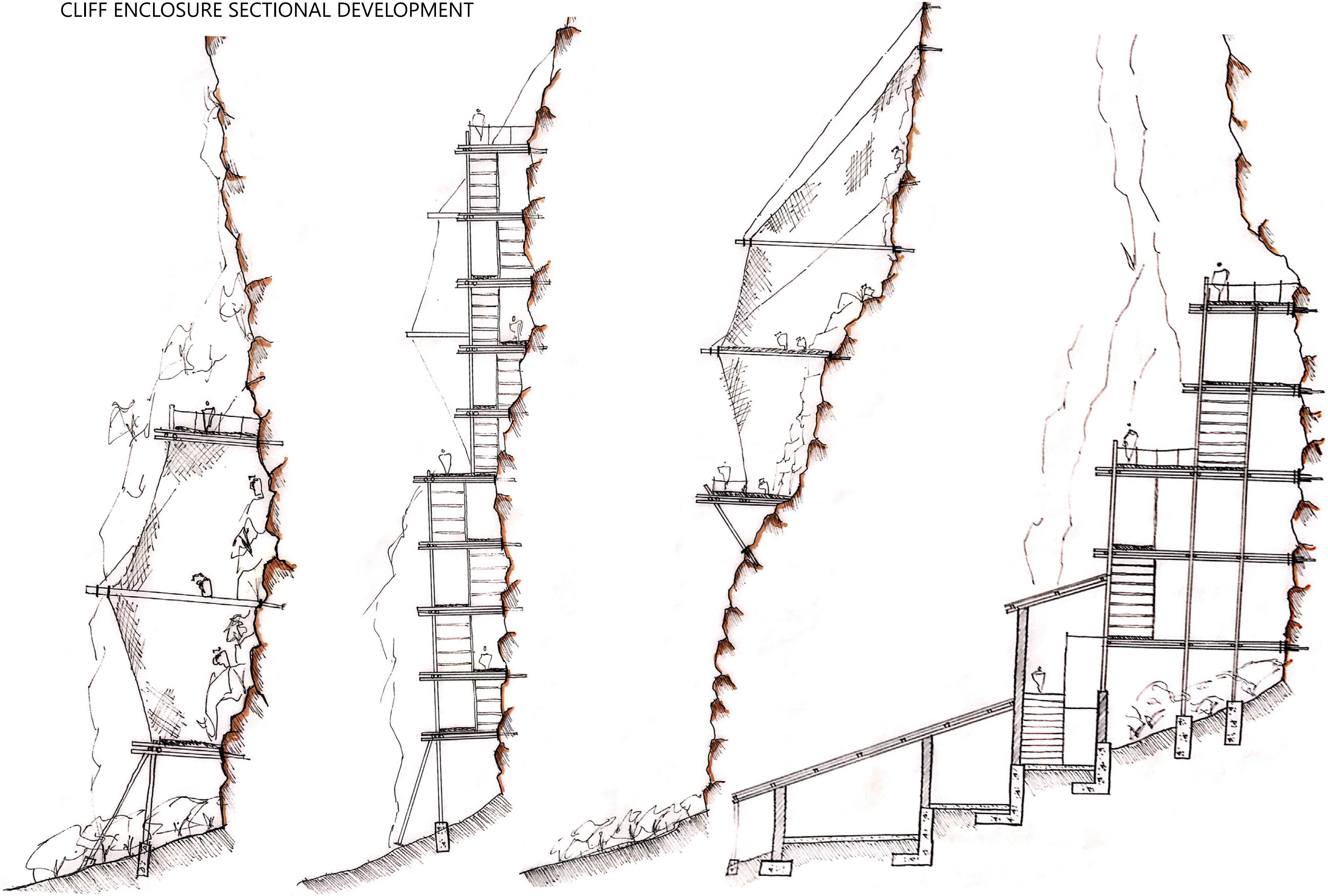
Mimics fragmentation of floorplan as well as diagonal ordering lines



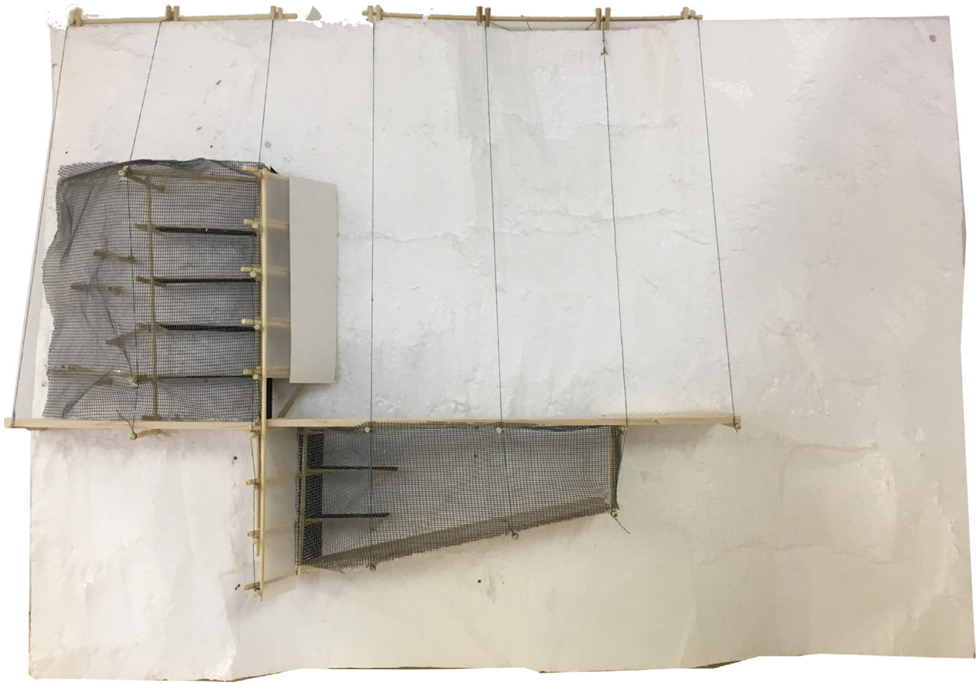
PHASE 3



CLIFF ENCLOSURE SECTIONAL DEVELOPMENT



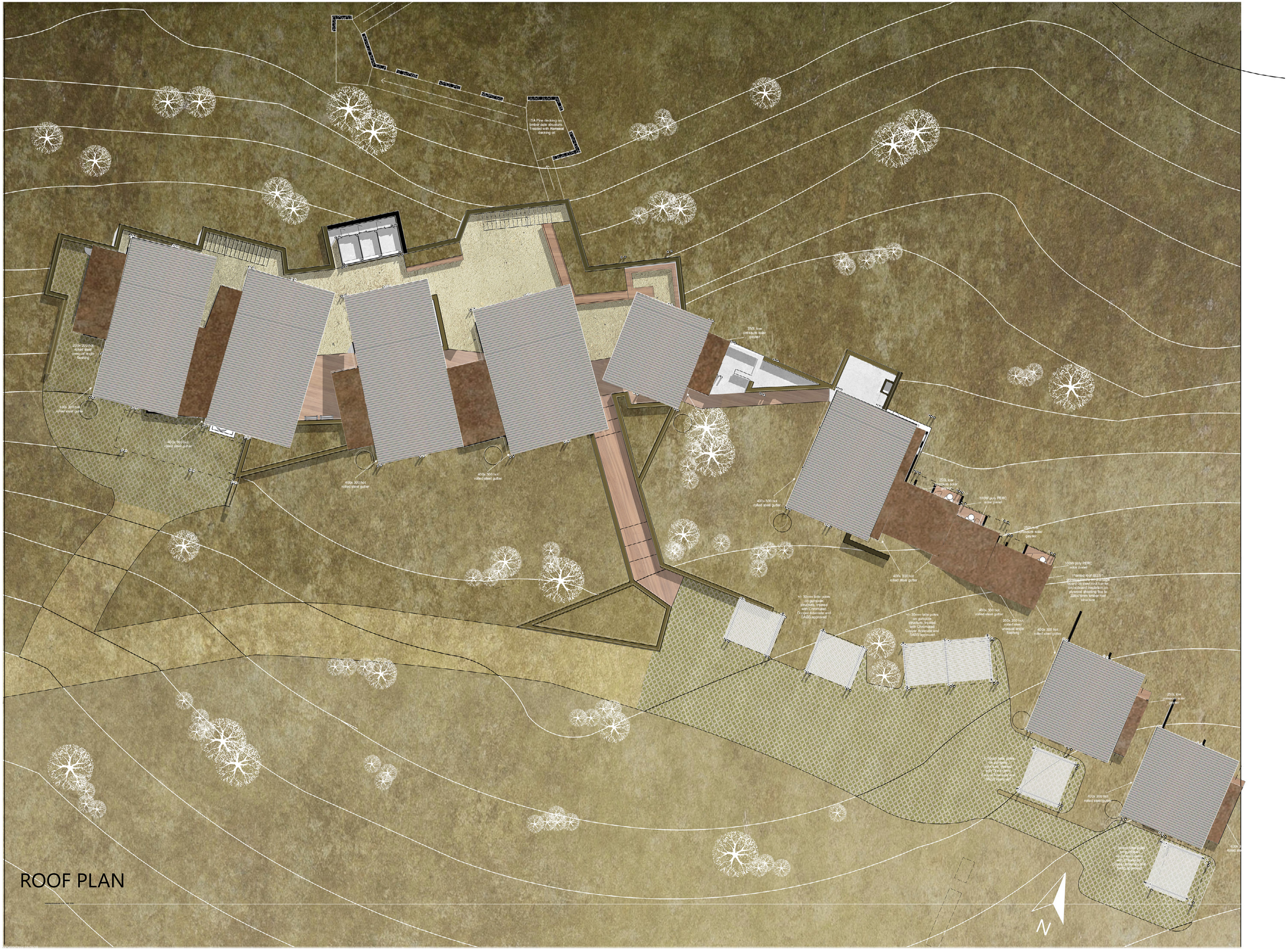
PHASE 4



TOWARDS A FINAL DESIGN
PROPOSAL

LOCALITY PLAN

The buildings are situated approximately 100m from the cliff face. Form of pathway leading to the cliffs is an interpretation of initial plan sketches motivated by the arbitrary rock formations.

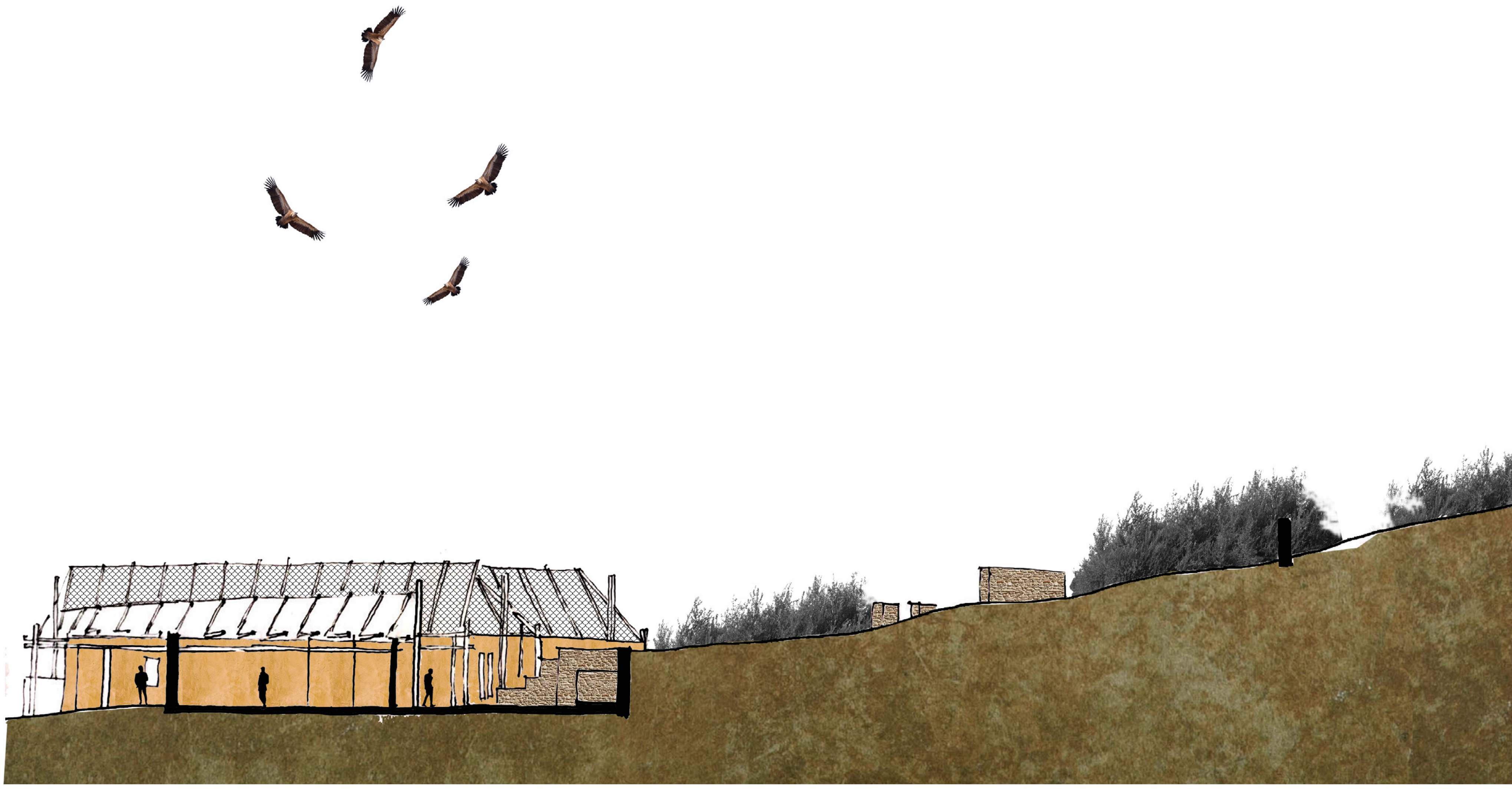


ROOF PLAN

FLOOR PLAN

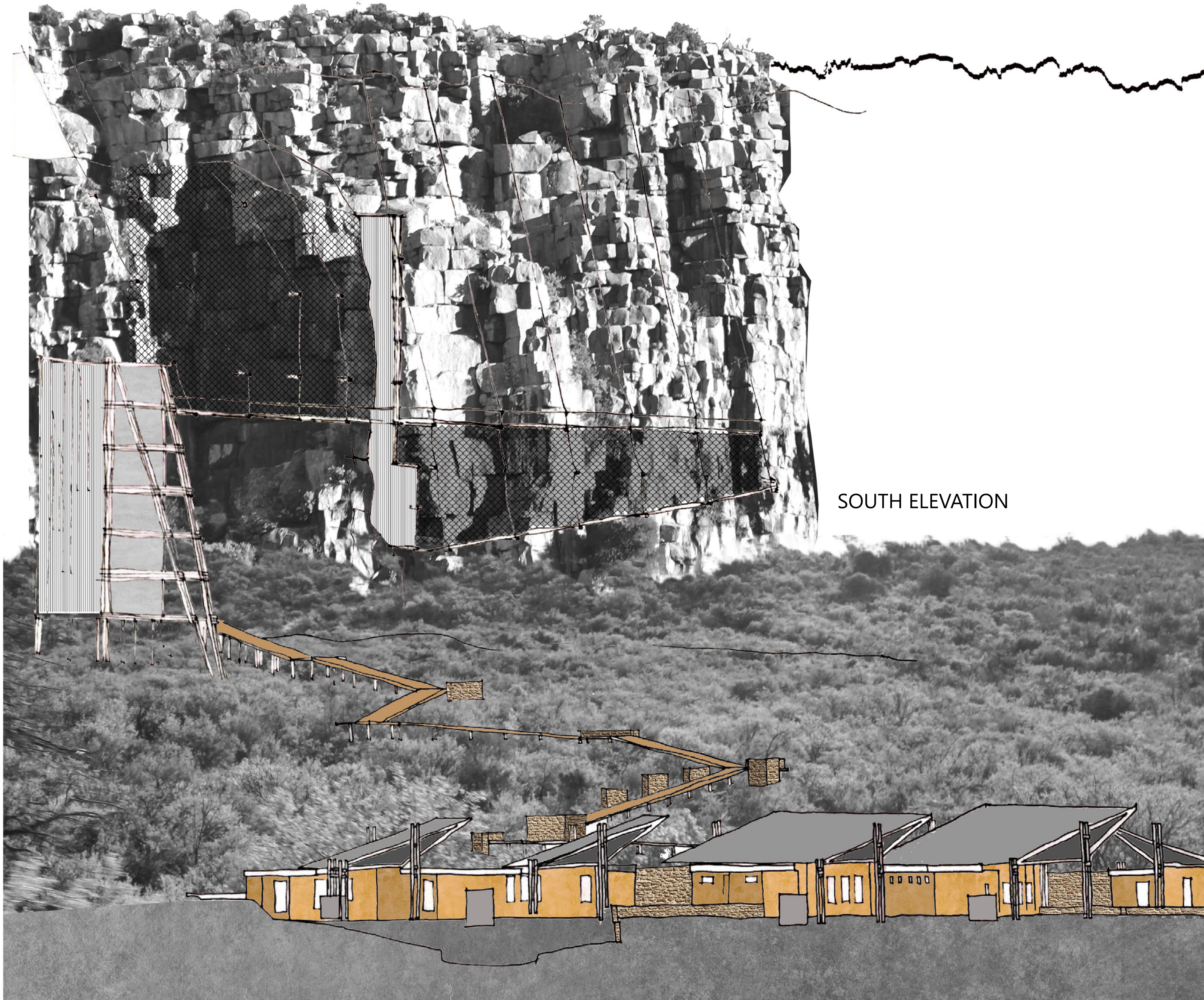
The difference of surface material emphasises the circulation routes. Fragmented configuration of floorplan is motivated bt fragmented assembly of rocks on cliff face

SECTION A-A

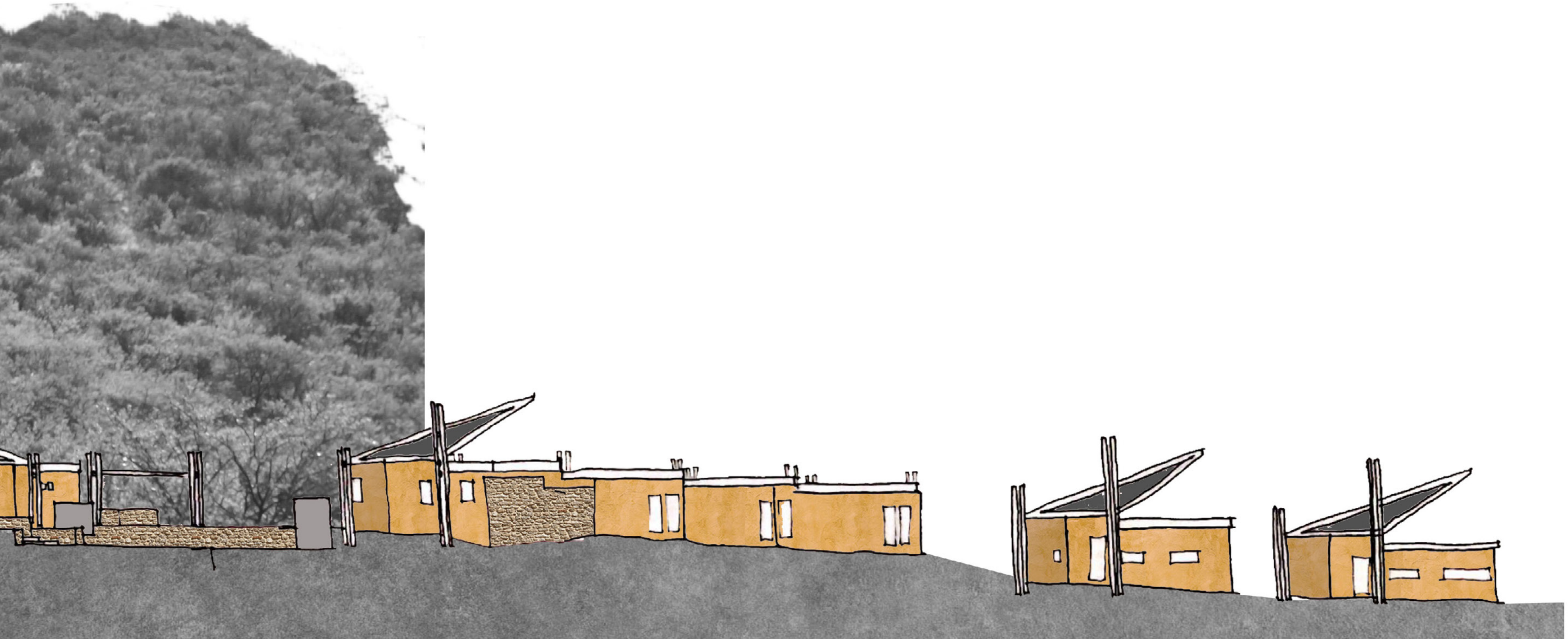


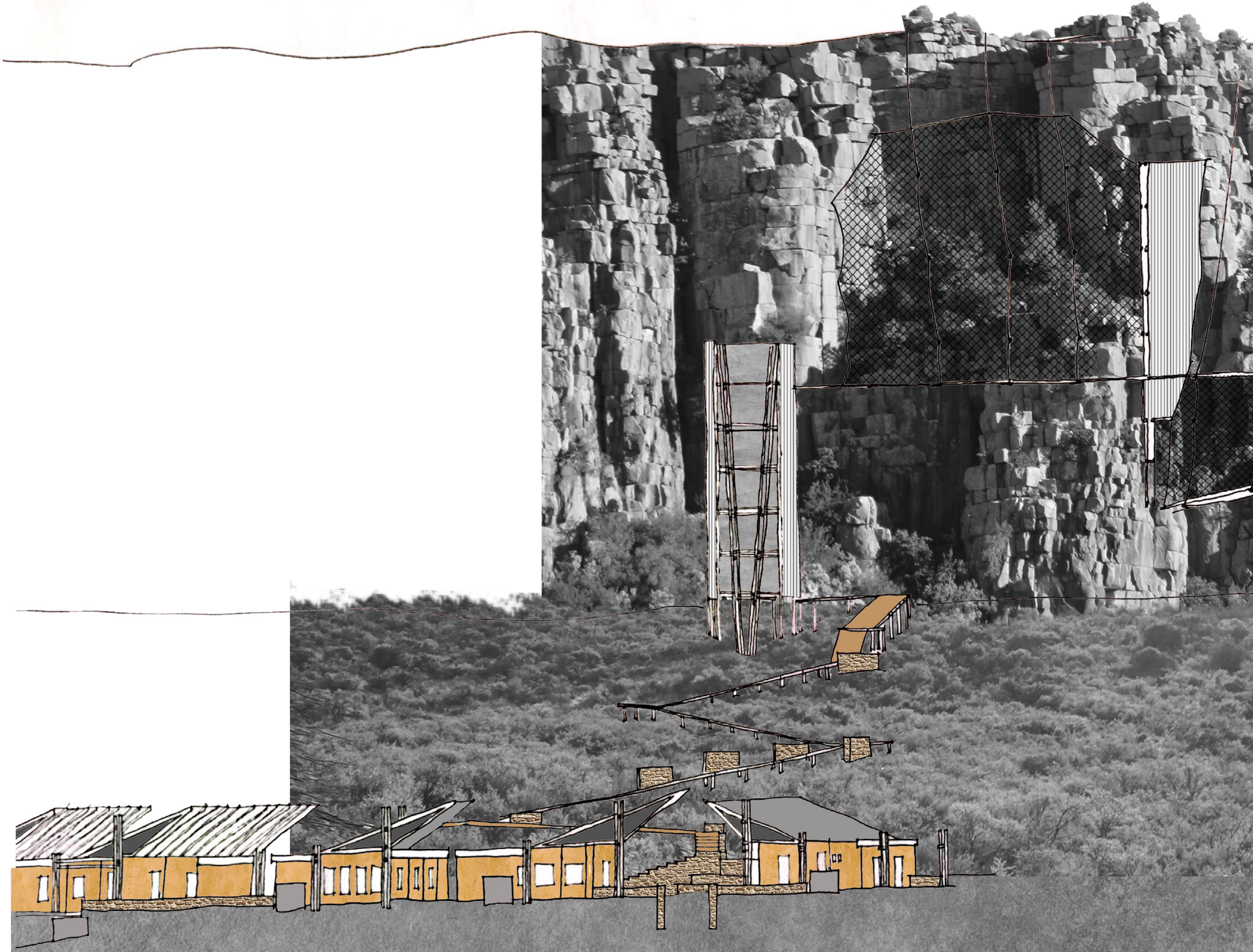
SECTION B-B

SECTIN C-C



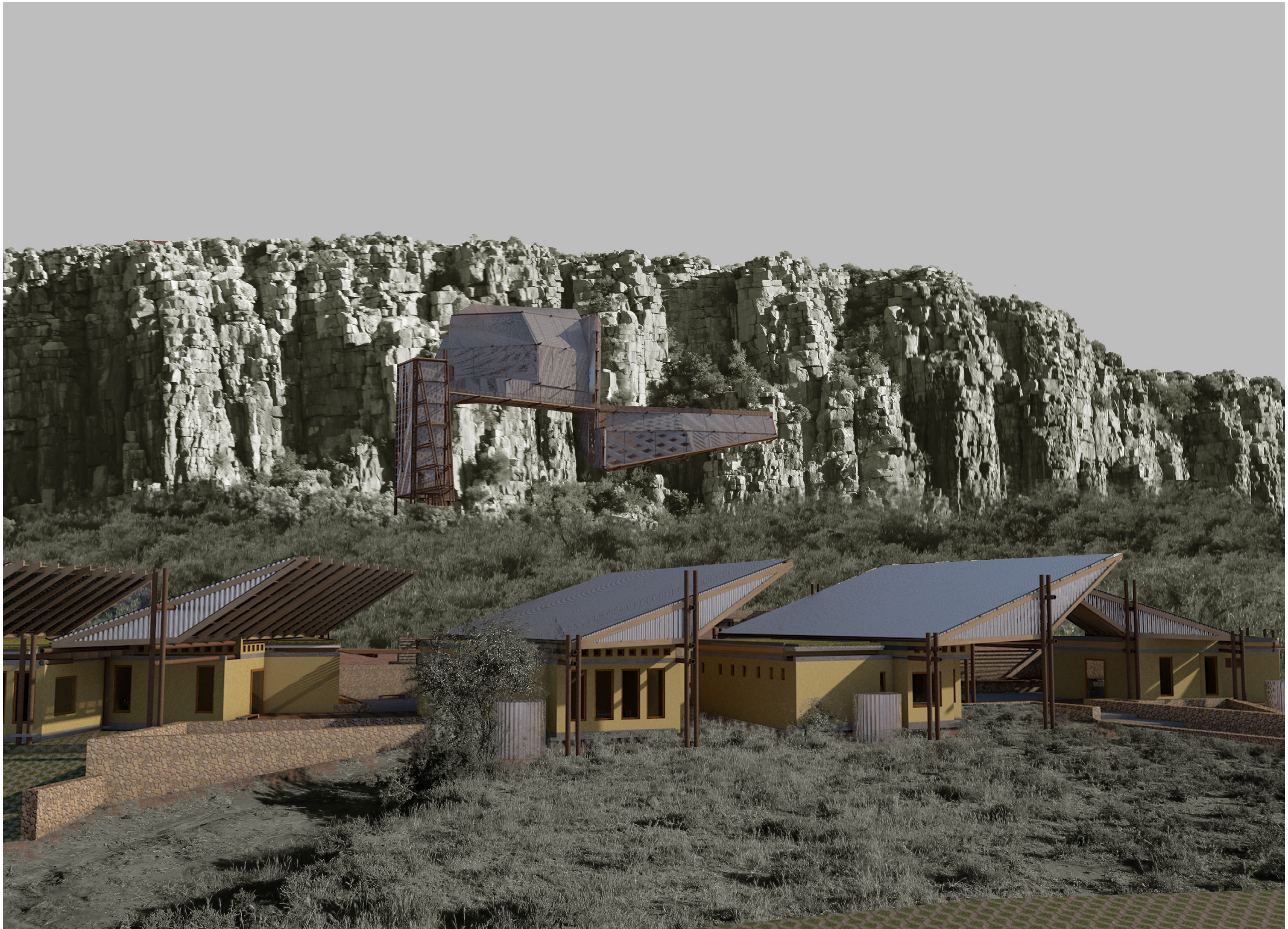
SOUTH ELEVATION

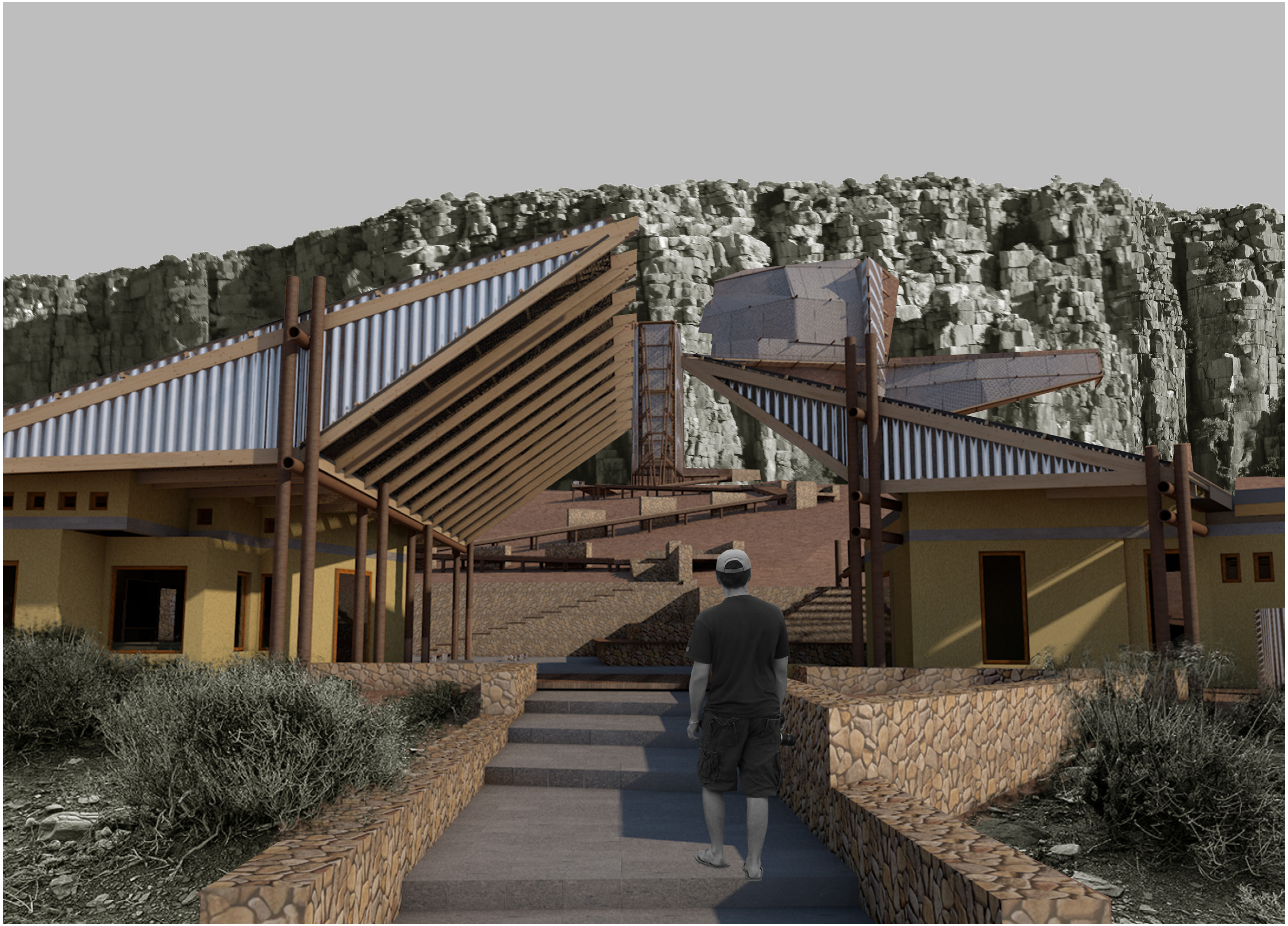


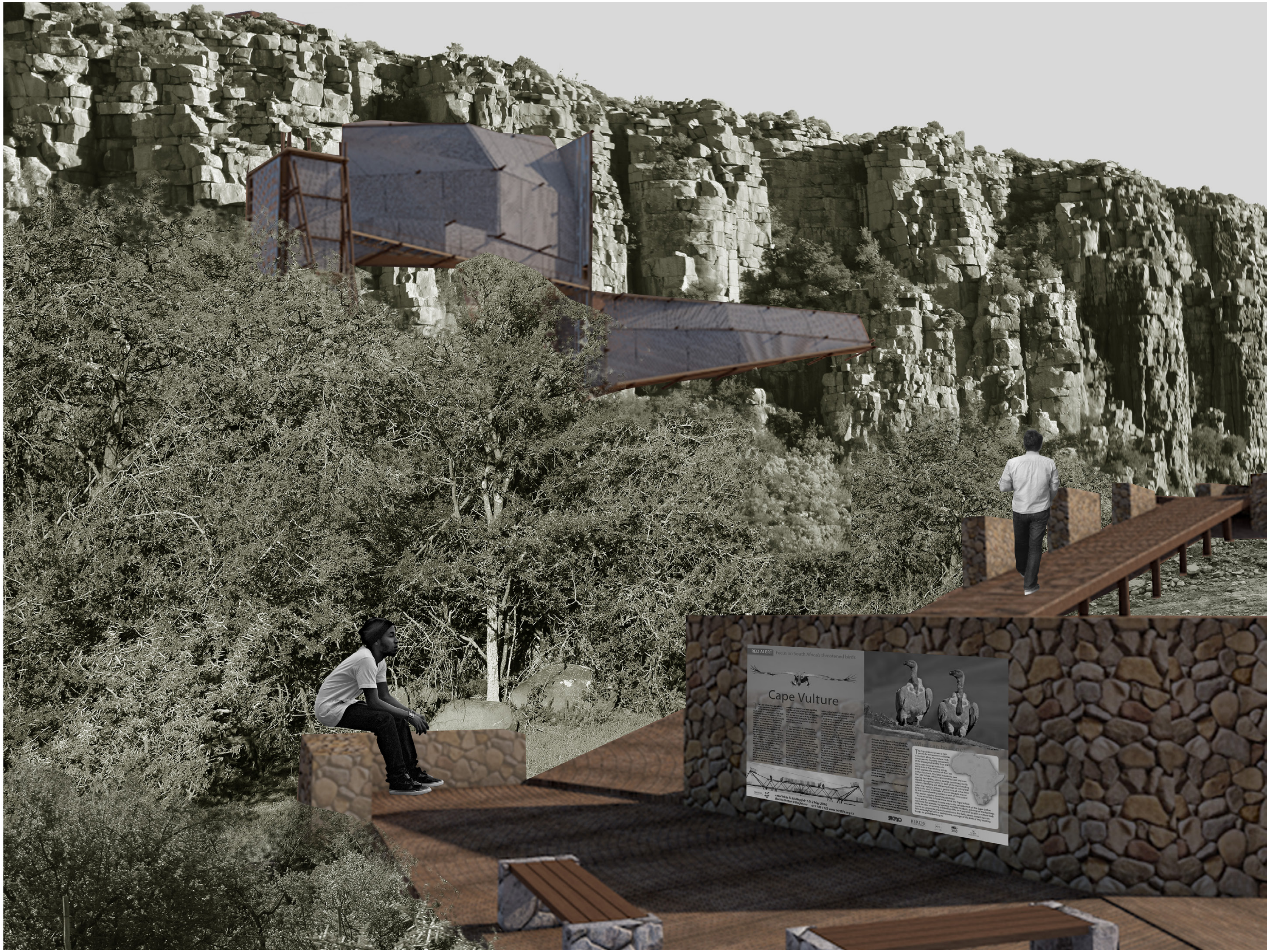


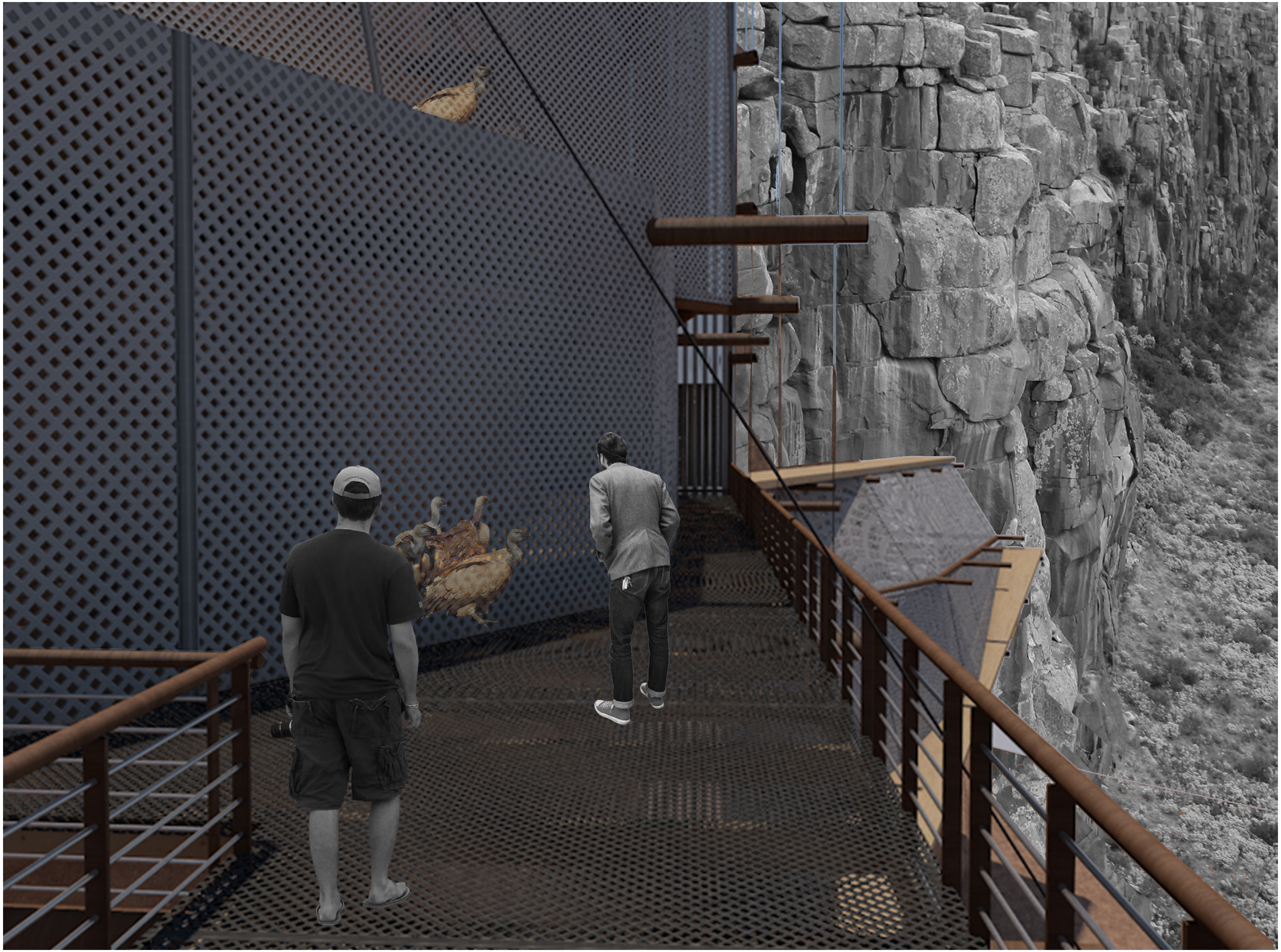
SOUTH-EAST ELEVATION

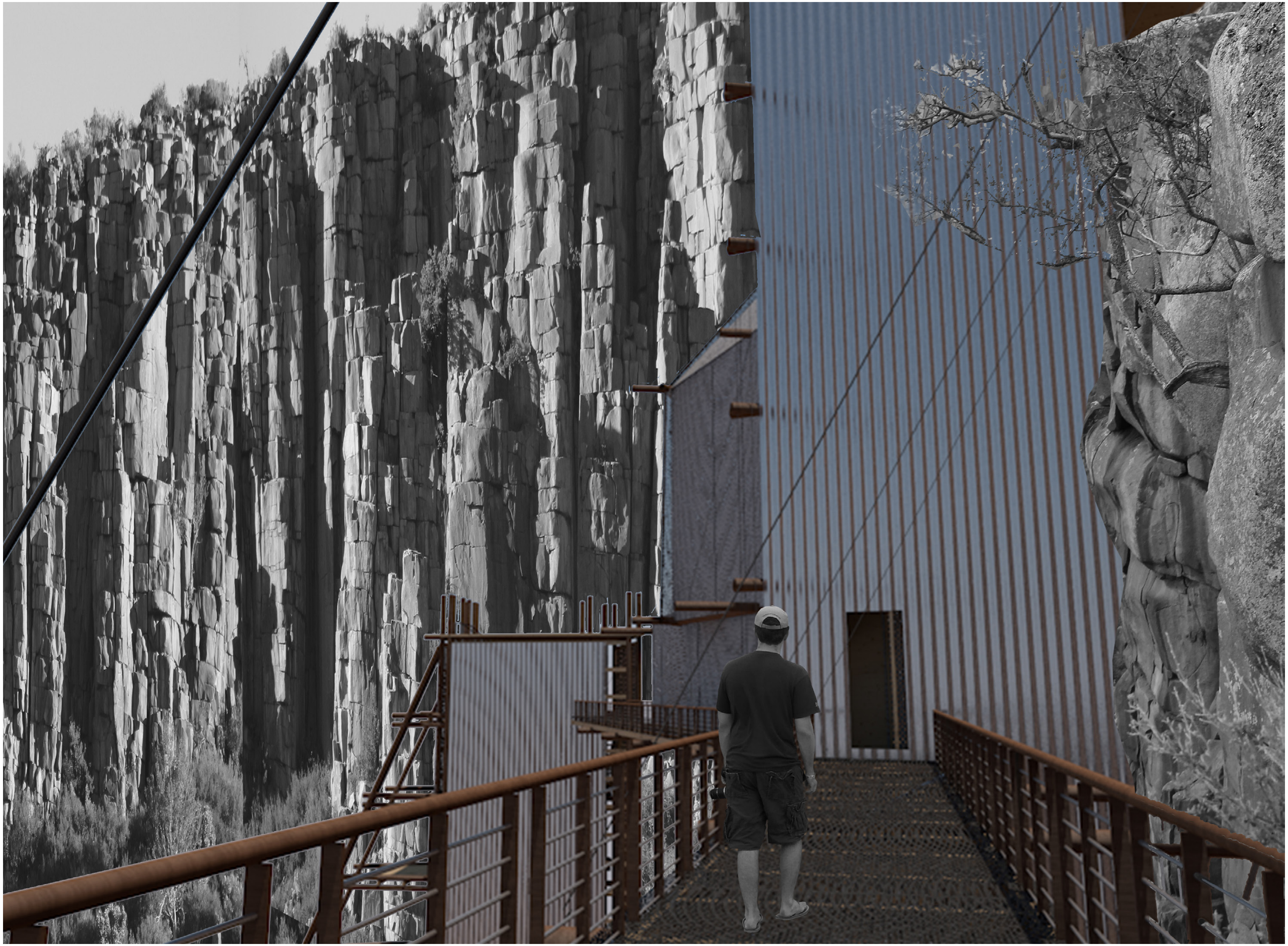
NORTH ELEVATION

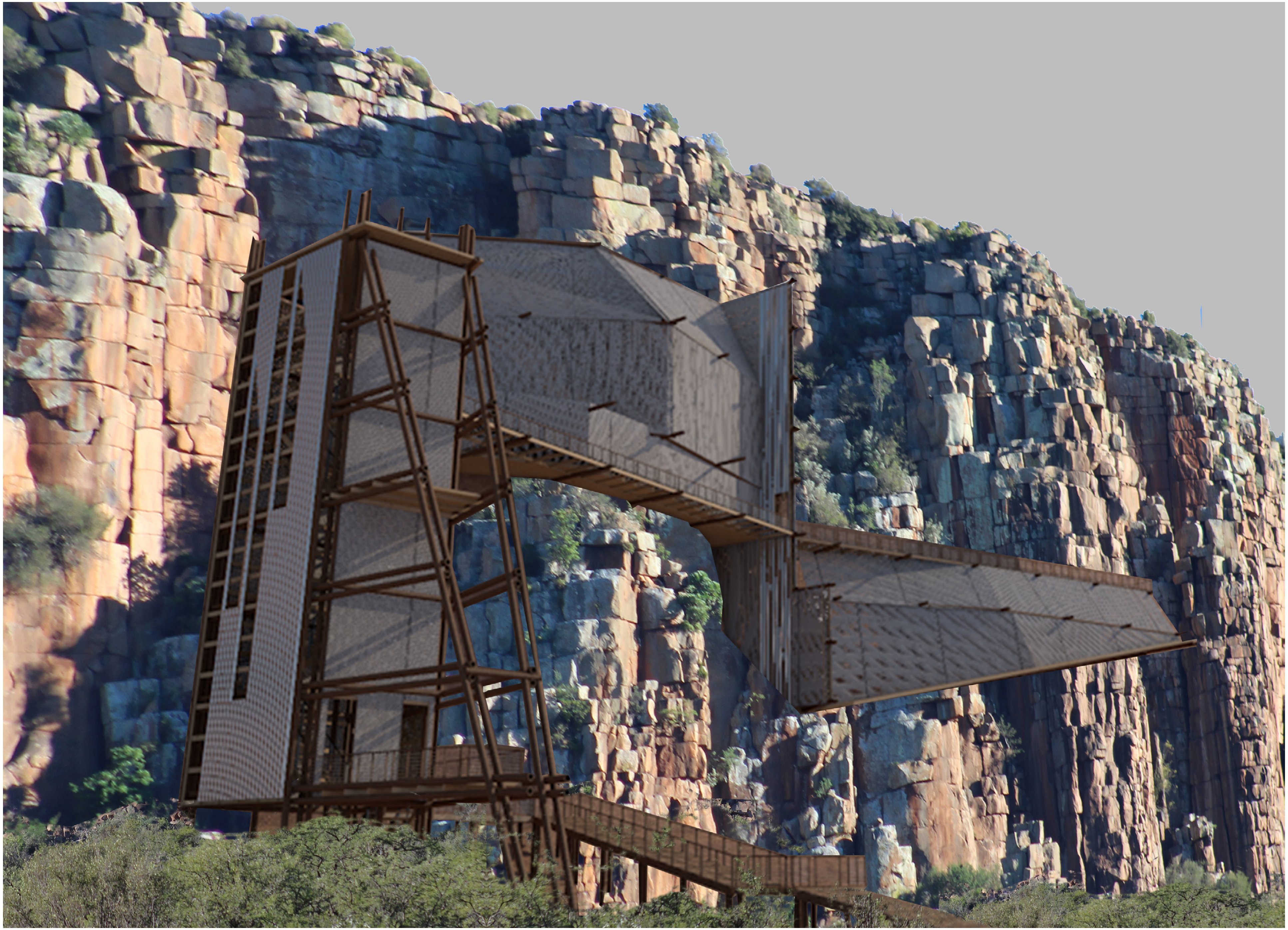





RED ALERT
Focus on South Africa's threatened birds
Cape Vulture







PART 4
REFLECTION

The aim of the project was to create an architectural intervention that facilitates the preservation of Cape Vultures whilst creating awareness for the conservation of the Karoo. The proposed intervention is contextually sensitive and ultimately accomplishes the goals set in terms of conservation. The site posed several challenges, especially the decision to position the enclosures on the cliff face. Various opinions throughout the year resulted in multiple reinvestigations and changes in the design approach as is apparent in the amount of design phases. The constant development through lots of models and sketches assisted in the decision making during the process. A process that was grueling at times but ultimately resulted in the proposed design, a design that in my opinion fulfills the aims set in the initial phases of the investigation.

Upon careful consideration and mixed reviews of design phase 3 the decision was made to change the roof structure of the intervention to what it is now. A decision I have come to rue since. If time permitted and under different circumstances I would have developed phase 4 more, as I feel it resonates more of the conceptual approach than the ultimate design solution. It is slightly disheartening to feel that the developed proposal is not necessarily better than that form which it developed, but I am overall satisfied with the dissertation I produced, the challenges I set and my approach to accomplishing them.

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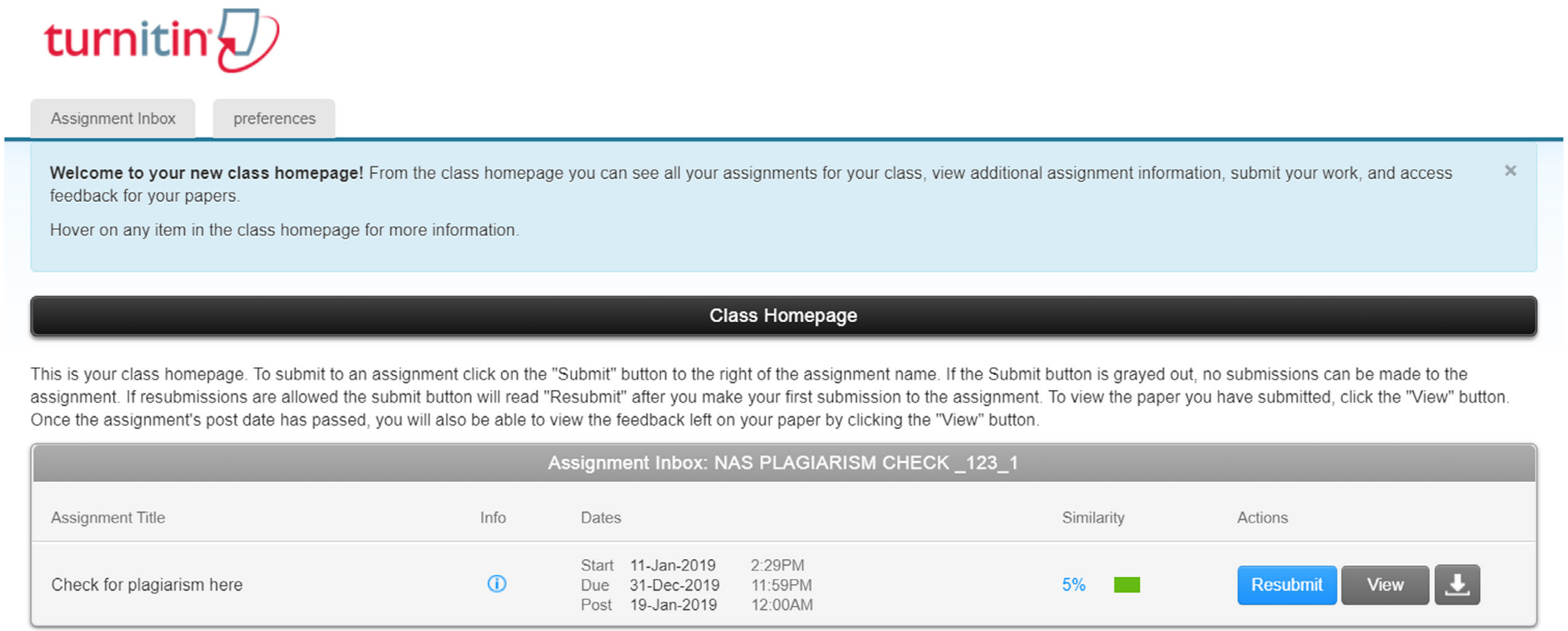
ADDENDUM


turnitin
Assignment Inbox
preferences
Welcome to your new class homepage! From the class homepage you can see all your assignments for your class, view additional assignment information, submit your work, and access feedback for your papers.
Hover on any item in the class homepage for more information.
Class Homepage
This is your class homepage. To submit to an assignment click on the "Submit" button to the right of the assignment name. If the Submit button is grayed out, no submissions can be made to the assignment. If resubmissions are allowed the submit button will read "Resubmit" after you make your first submission to the assignment. To view the paper you have submitted, click the "View" button. Once the assignment's post date has passed, you will also be able to view the feedback left on your paper by clicking the "View" button.
Assignment Inbox: NAS PLAGIARISM CHECK _123_1
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Info
Dates
Similarity
Actions
Check for plagiarism here
Start 11-Jan-2019 2:29PM
Due 31-Dec-2019 11:59PM
Post 19-Jan-2019 12:00AM
5%
Resubmit
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PEER REVIEW LETTER

To whom it may concern

I was asked by Nicholas Kotze to peer review his Master thesis entitled "A CAPE VULTURE REHABILITATION CENTRE". This request was made with specific emphasis on language and grammatical assessment.

It is imperative to disclose that I grasp no formal understanding of the field in which this particular study is conducted. My contribution is strictly centred on, and indeed limited to the use of language and writing structure. My academic background as a qualified English teacher with a Bachelors of Education degree equips me with adequate language proficiency in this regard. In addition, I had also obtained a Bachelors of Education Honours degree with specialisation in Learning Support, as well as a MAGISTER EDUCATIONIS all from the Faculty of Education (University of Pretoria). I had therefore offered my assistance based on (and limited to) my field of expertise. I hope that the individual or individuals who accept this review letter as credible, will view my efforts in this capacity.

For the purpose of this study, I reviewed the body of work and had given the candidate feedback on the use of language content with some suggestions on structure. Upon reading this body of work, I found the content to be captivating with an unwavering capacity for a worthwhile contribution to society. It was indeed a privilege to play a part (although very brief) in this candidate's academic journey. I wish him well in his future endeavours.

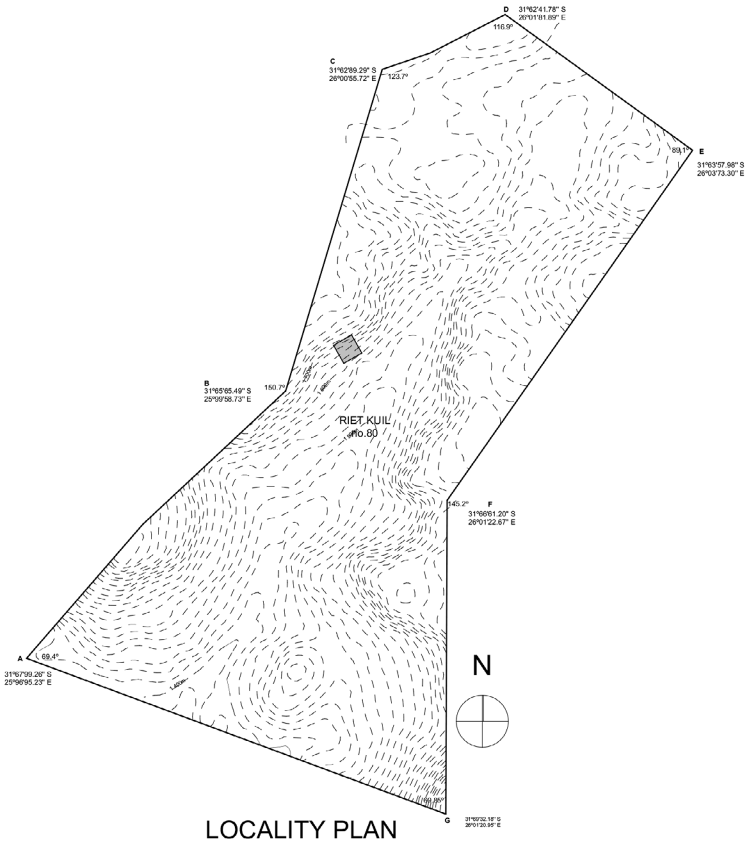
This is to indicate that I, Jacques Jurgens Theron, ID No 860520 5016 08 0 have reviewed the academic article entitled "A CAPE VULTURE REHABILITATION CENTRE" by Nicholas Kotze.

The onus is, however, on the author to effect the corrections and changes suggested.

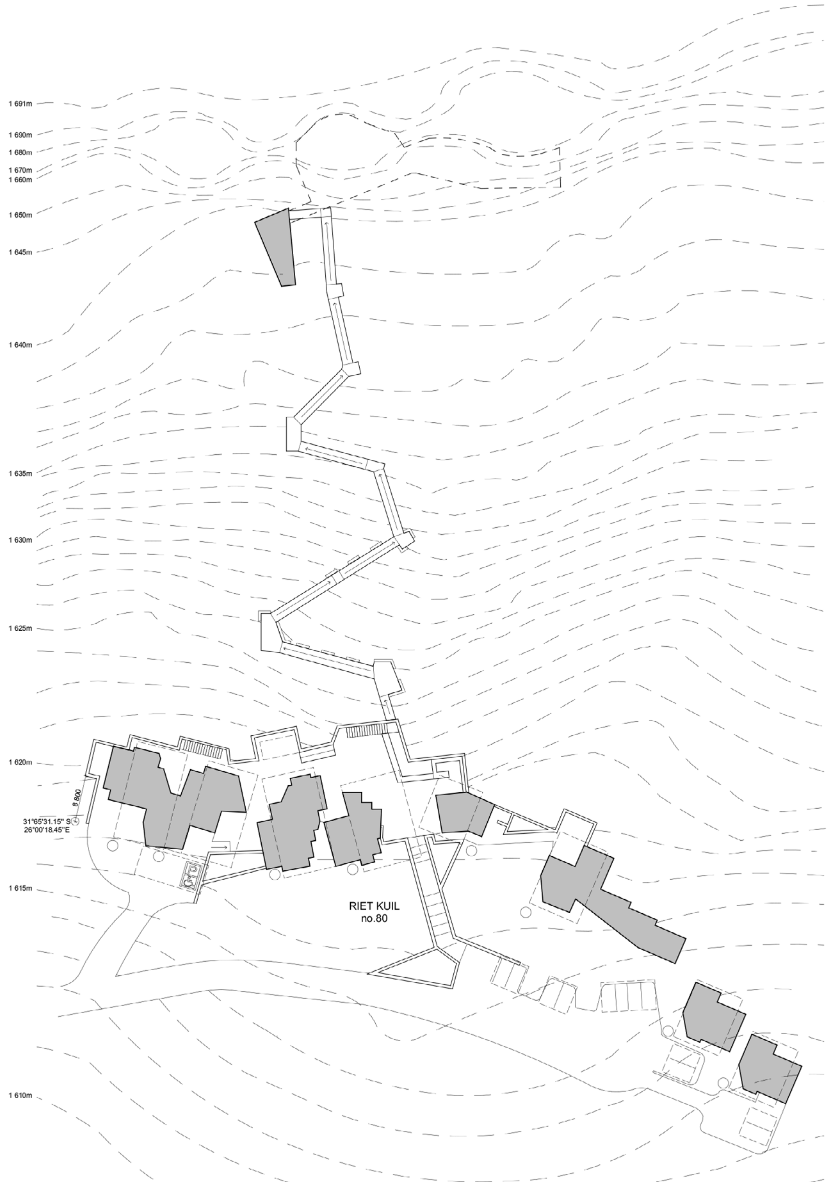
Sincerely

Jacques J. Theron

---oOo---



LOCALITY PLAN
SCALE 1:25 000



SITE PLAN
SCALE 1:500

CAPE VULTURE
REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

NICHOLAS KOTZE
2014034280

DESCRIPTION		DRAWING NO.
LOCALITY PLAN & SITE PLAN		A101
SCALE	DATE	SHEET
1:25 000 & 1:500	2019-010-29	1/1

CONS 5709

N

NOTES

CAPE VULTURE REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

NICHOLAS KOTZE

2014034280

DESCRIPTION		DRAWING NO.
ROOF PLAN		A103
SCALE	DATE	SHEET
1:200	2019-010-29	1/1

CONS 5709

N

NOTES

CAPE VULTURE REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

NICHOLAS KOTZE

2014034280

DRAWING NO.	DESCRIPTION	
A102	GROUND FLOOR PLAN	
DATE	SCALE	SHEET
2019-10-29	1:100	1/2

CONS 5709

N

NOTES

GROUND FLOORPLAN
SCALE 1:100

CAPE VULTURE REHABILITATION CENTRE
no. 80 RIETKUIL farm
HOFMEYR

NICHOLAS KOTZE
2014034280

DRAWING NO.	DESCRIPTION	
A102	GROUND FLOOR PLAN	
DATE	SCALE	SHEET
2019-10-29	1:100	2/2

CONS 5709

N

NOTES

CAPE VULTURE REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

NICHOLAS KOTZE

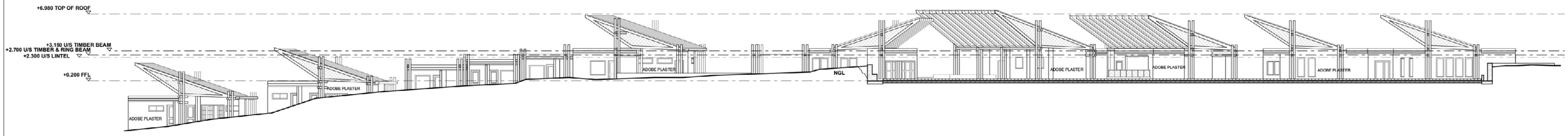
2014034280

DESCRIPTION		DRAWING NO.
DETAILES PLAN OF SURGERY UNIT		A104
SCALE	DATE	SHEET
1:50	2019-010-29	1/1

CONS 5709

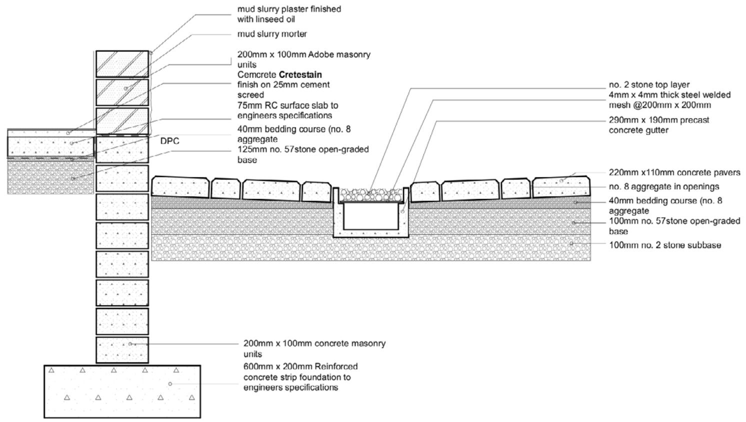
N

NOTES



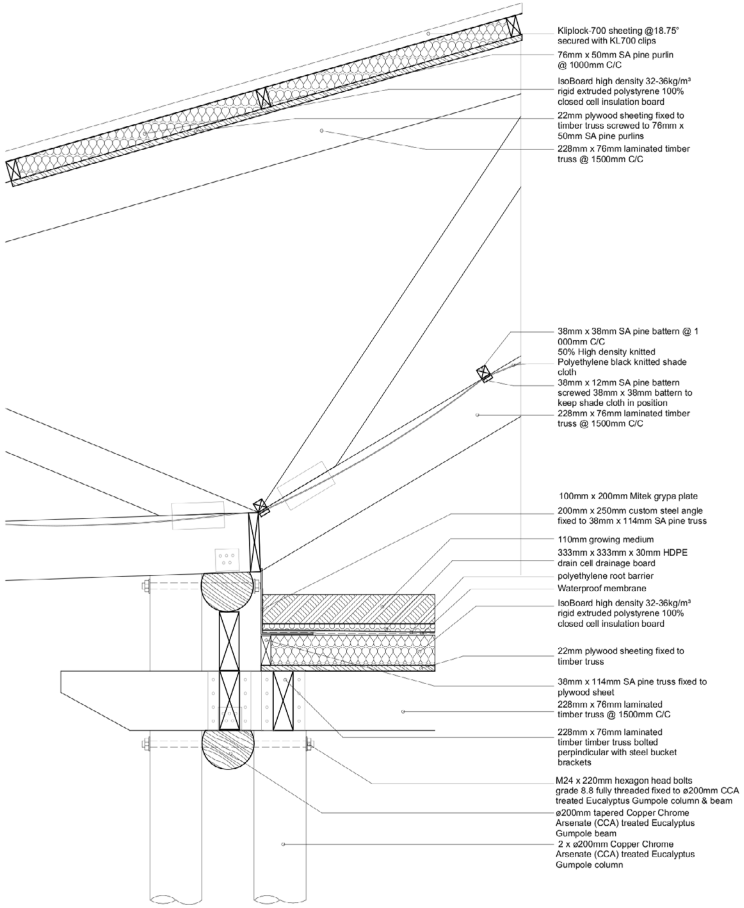
NORTH ELEVATION

SCALE 1:200



DETAIL 5

SCALE 1:10



DETAIL 6

SCALE 1:10

CAPE VULTURE REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

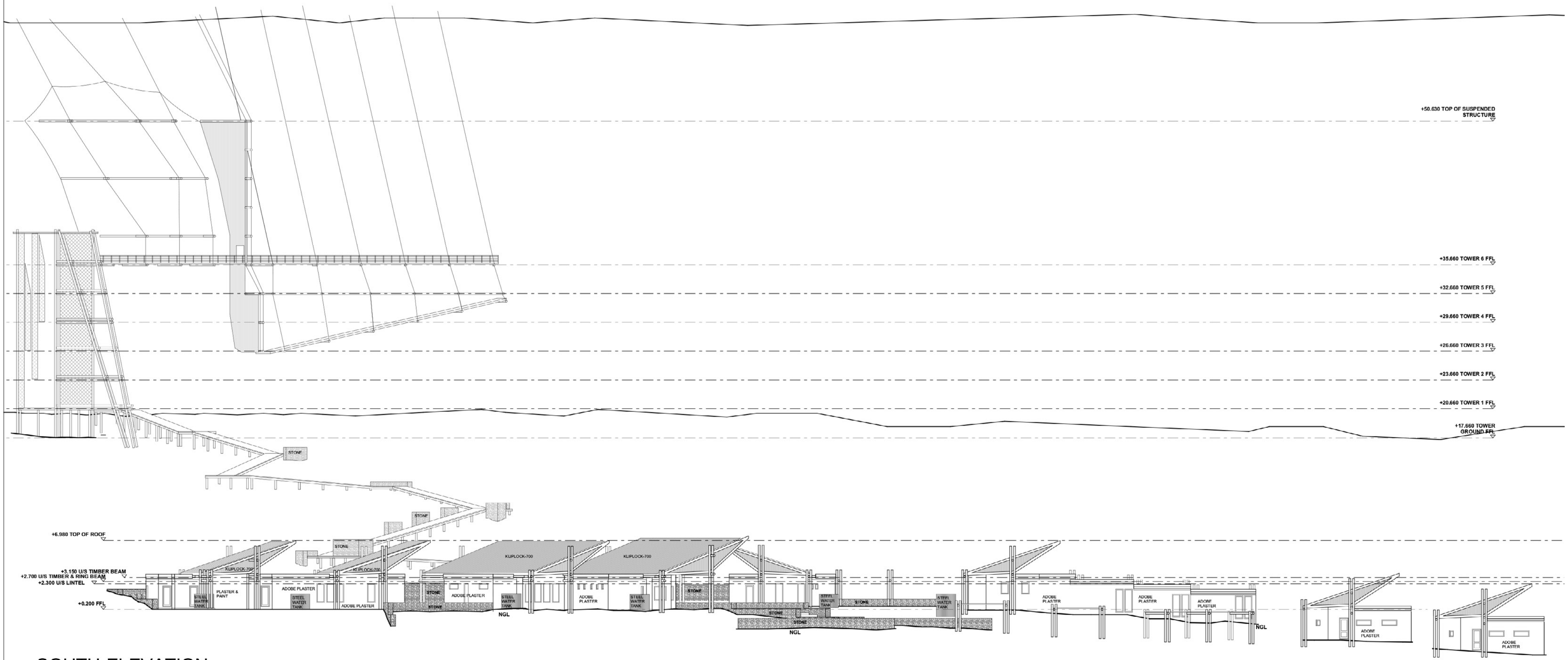
NICHOLAS KOTZE

2014034280

DESCRIPTION		DRAWING NO.
NORTH ELEVATION & DETAILS		A201
SCALE	DATE	SHEET
1:200 & 1:10	2019-010-29	1/1

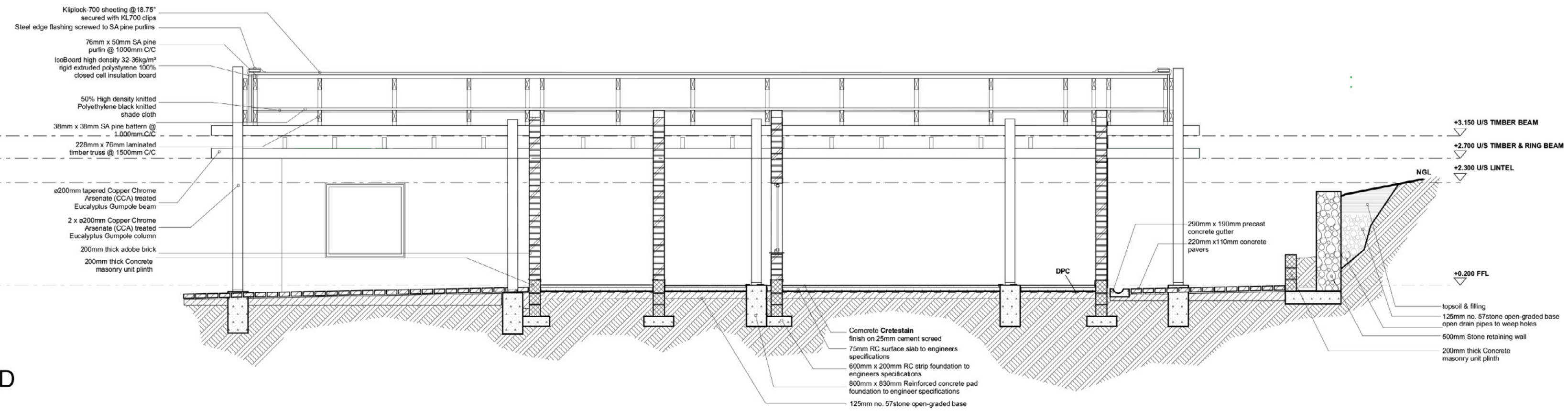
CONS 5709

NOTES



SOUTH ELEVATION

SCALE 1:200



SECTION D-D

SCALE 1:50

CAPE VULTURE REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

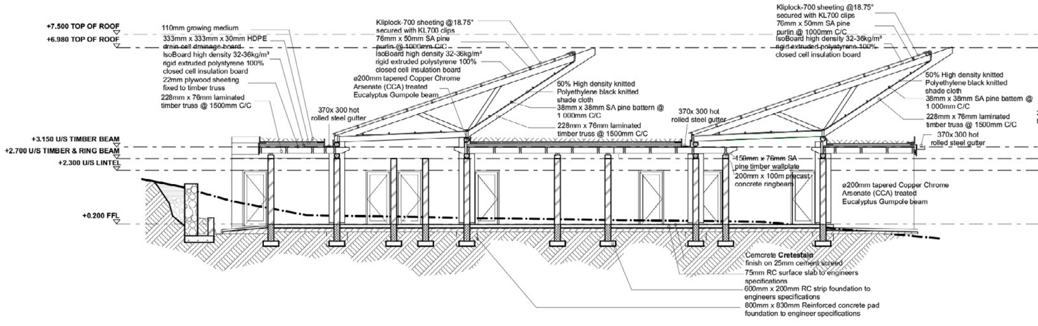
NICHOLAS KOTZE

2014034280

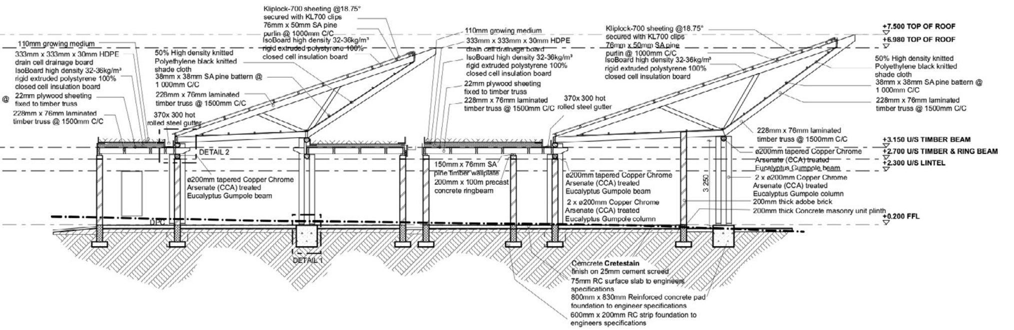
DESCRIPTION		DRAWING NO.
SOUTH ELEVATION & SECTION D-D		A202
SCALE	DATE	SHEET
1:200 & 1:50	2019-010-29	1/1

CONS 5709

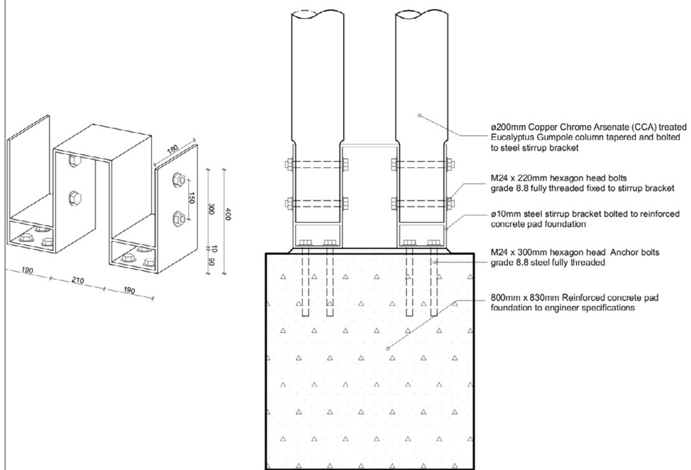
NOTES



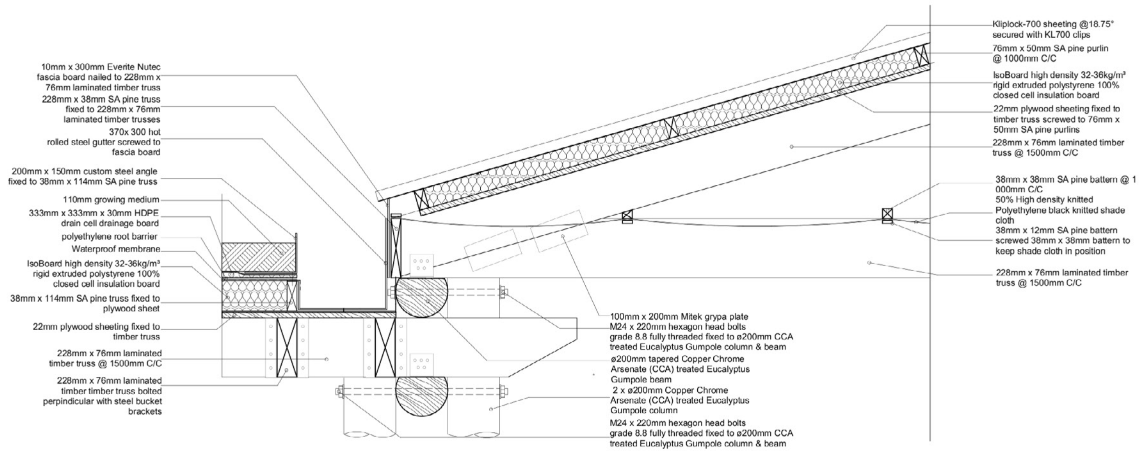
SECTION A-A
SCALE 1:100



SECTION B-B
SCALE 1:100



DETAIL 1
SCALE 1:10



DETAIL 2
SCALE 1:10

CAPE VULTURE
REHABILITATION CENTRE

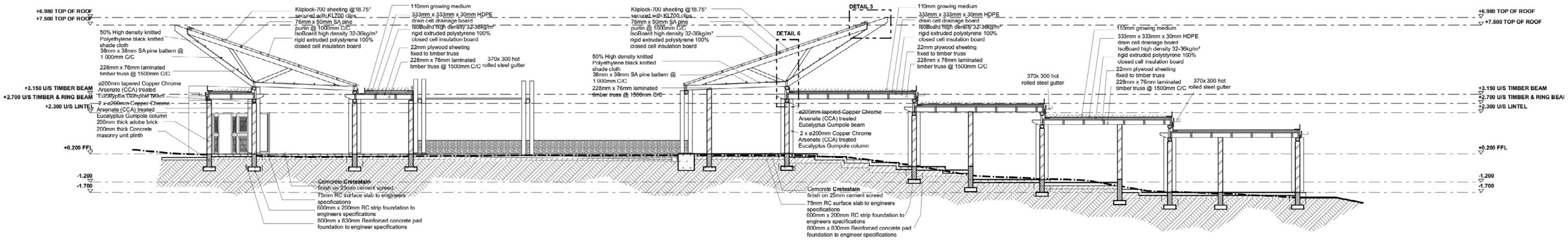
no. 80 RIETKUIL farm
HOFMEYR

NICHOLAS KOTZE
2014034280

DESCRIPTION		DRAWING NO.
SECTIONS & DETAILS		A301
SCALE	DATE	SHEET
1:100 & 1:10	2019-010-29	1/1

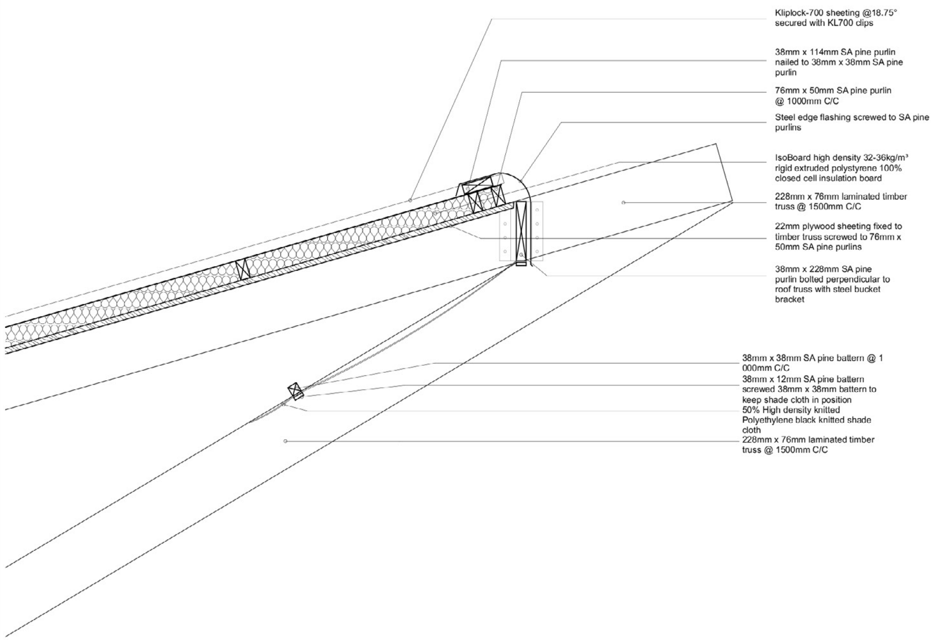
CONS 5709

NOTES



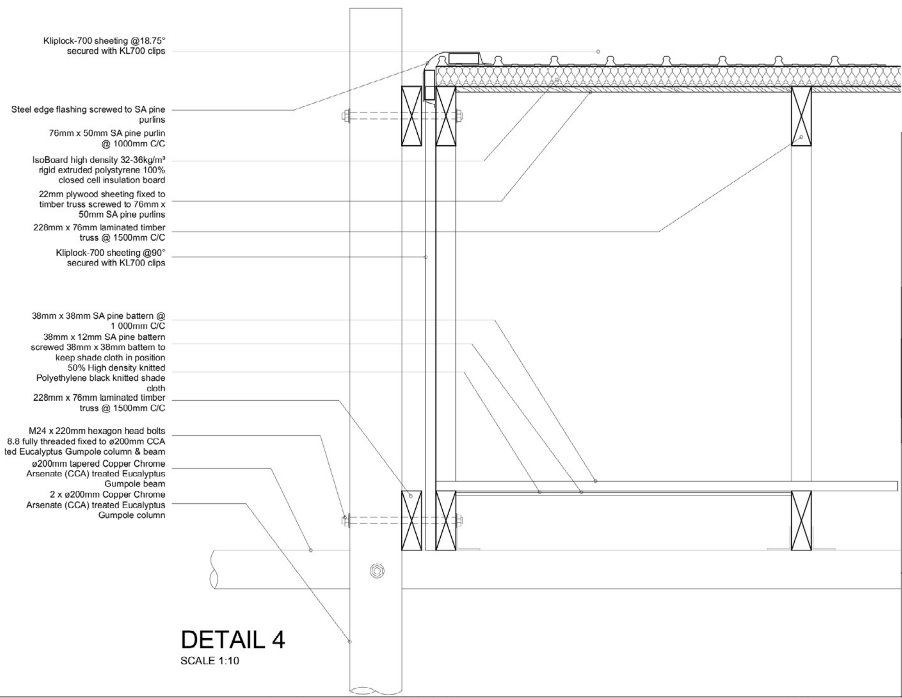
SECTION C-C

SCALE 1:100



DETAIL 3

SCALE 1:10



DETAIL 4

SCALE 1:10

CAPE VULTURE REHABILITATION CENTRE

no. 80 RIETKUIL farm
HOFMEYR

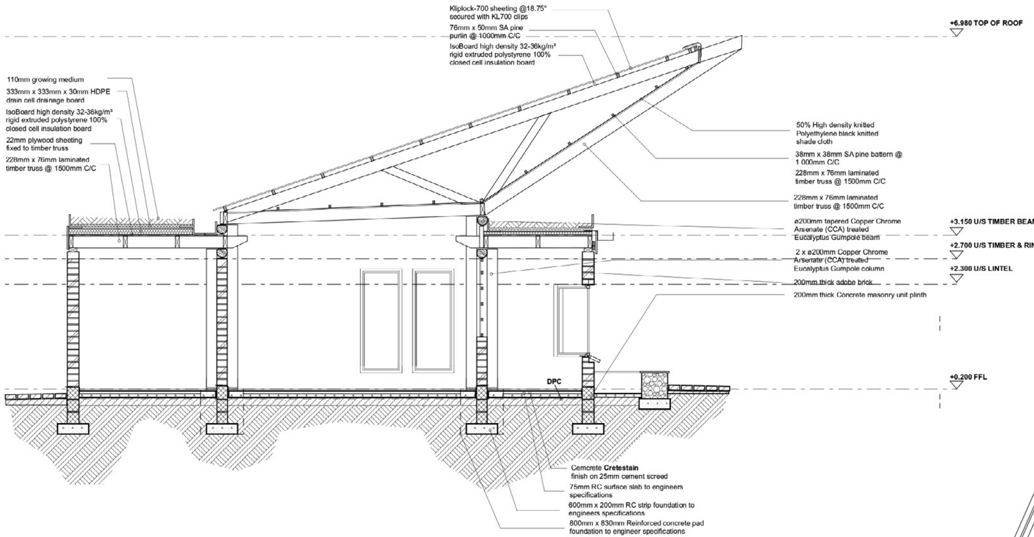
NICHOLAS KOTZE

2014034280

DESCRIPTION		DRAWING NO.
SECTIONS & DETAILS		A302
SCALE	DATE	SHEET
1:100 & 1:10	2019-010-29	1/1

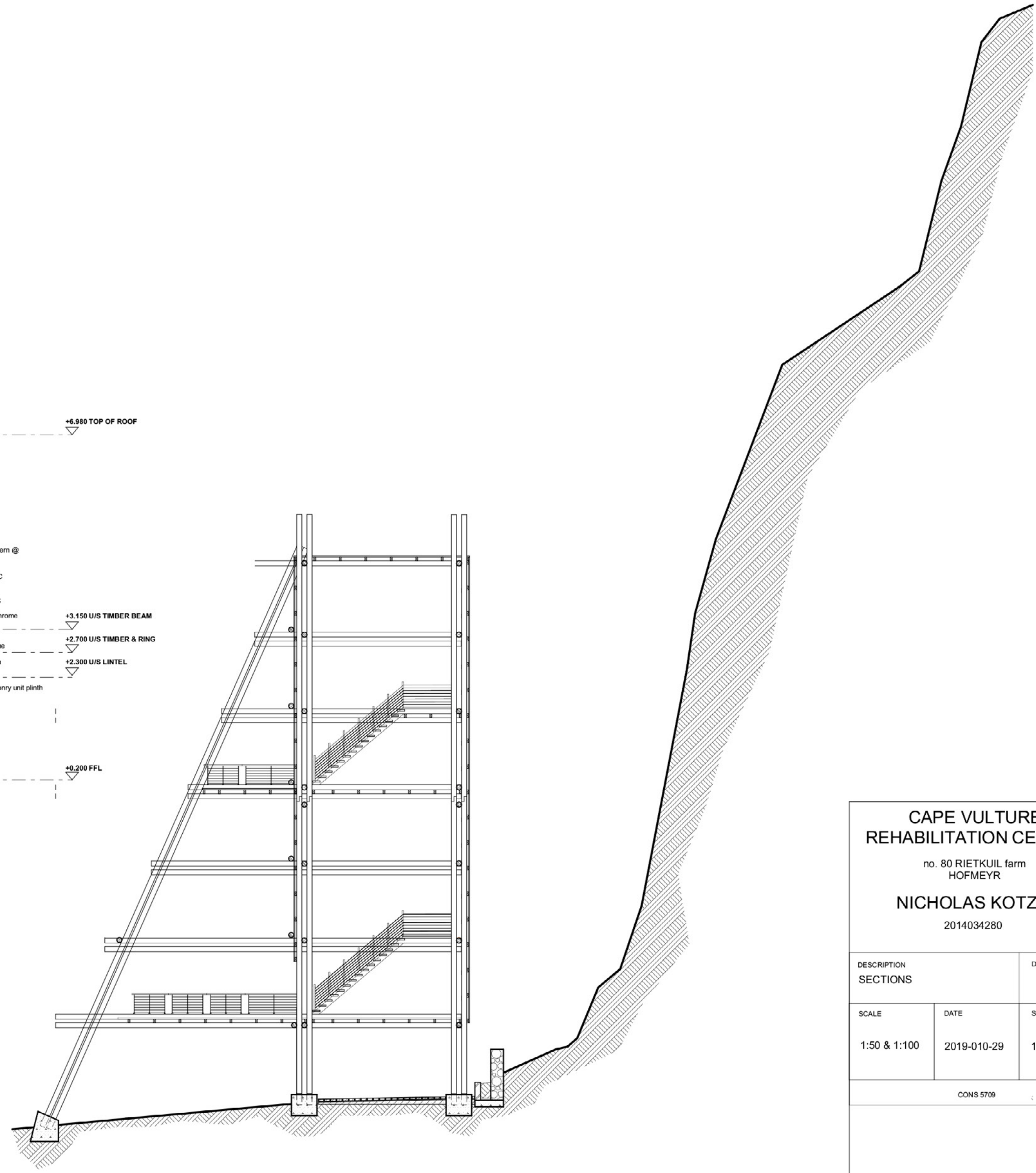
CONS 5709

NOTES



SECTION E-E

SCALE 1:50



SECTION F-F

SCALE 1:100

CAPE VULTURE REHABILITATION CENTRE no. 80 RIETKUIL farm HOFMEYR NICHOLAS KOTZE 2014034280		
DESCRIPTION SECTIONS		DRAWING NO. A303
SCALE 1:50 & 1:100	DATE 2019-010-29	SHEET 1/1
CONS 5709		
NOTES		

A CAPE VULTURE REHABILITATION CENTRE
NICHOLAS KOTZE