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A L E X A N D R A
H O W E L L

d e c l a r a t i o n

I, Alexandra Louise Howell, 303277, am a student registered for the course Master of Architecture (Professional) in the year 2014.

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Alexandra Louise Howell
31 October 2014

This document is submitted in partial fulfilment for the degree: Master of Architecture [Professional] at the University of the Witwatersrand, Johannesburg, South Africa, in the year 2014.

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The Garden

Who is it tends the Garden,
The Garden oh so green?

'Twas once the finest Garden
That ever has been seen.

And in it God's dear Creature
Did swim and fly and play:

But then came greedy Spoilers,
And killers them all away.

And all the Trees that flourished
And gave us wholesome fruit,

By waves of sand are buried,
Both leaf and branch and root.

And all the shining Water
Is turned to slime and mire,

And all the feathered Birds so bright
Have ceased their joyful choir.

Oh Garden, oh my Garden,
I'll mourn for evermore

Until the Gardeners arise,
And you to Life restore.

– The God's Gardeners Oral Hymnbook

Margaret Atwood

Fig. 1

CHAPTERS

Fig. 2

a b s t r a c t

'Unless someone like you cares an awful lot,
nothing is going to get better,
it's not.'

(The Lorax, Dr Seuss)

How can architecture play a role to make us understand and realise the vulnerability of Fynbos? The Western Cape is the habitat for one of the six species of the floral kingdom, Fynbos. This botanical treasure is in danger of becoming extinct. There are thousands of types of Fynbos, each endemic to a specific region within the Western Cape and it is important to raise awareness of this unique species as creating a familiarity and deeper personal connection with the plant can help to protect this endangered flora.

I propose a Fynbos Research and Education Centre set in Clanwilliam, a historical area within the Cederberg Mountain Range. The centre will be created to allow a deeper understanding of Fynbos and to this effect, aims to educate people about Fynbos so as to give them a better knowledge about sustainable living and the value of this plant species. It will be a place of calm and learning and the landscape will have a fundamental effect on the form. A vital part of the work to be carried out by this centre will be research into methods of conservation as well as into possible medical and cosmetic uses inherent in this species.

Looking to plant structure, organic architecture and the analogy of nature, and its influence on architecture from both the geology of the region and the natural landscape setting, to discover what this then means for the architecture of the centre. The idea of Nature's constant generation and degeneration, life coming from death and the influence of ruins on architectural imaginations will be fundamental in this building. Fynbos is endangered but this centre will aim to prevent it from becoming a memory and perhaps once it has been saved the structure will be left for nature to take over once again.

The relationship between Fynbos and the landscape will shape and determine the architecture and materiality. Organic rammed earth walls will rise out of the sandstone formations which are the foundation of the Cederberg, to create this centre. The walls, made up of the very sand that sustains the Fynbos will exemplify it as at one with nature. As fire reignites life within the Fynbos seeds which lie dormant beneath the soil, so too can the building and the garden ignite passion to save this species, incorporating various design mechanisms into the architecture representing fire and its giving of life, in the case of the Fynbos, or preventing destruction in terms of the building.

The creation of an education centre, restaurant and research facility will encourage a steady stream of visitors to Clanwilliam throughout the year. This will help to build tourism and eco-tourism to the town and surrounding areas, giving a much needed economic injection by creating job opportunities. Importantly, it will also increase awareness and exposure to the Fynbos species, with the building encouraging the visitor to linger and get involved with the plants and site and to develop a deeper affinity with this dwindling flora.

This thesis aims to take its visitors on a journey, by means of architecture, creating a human experience and therefore a connection with their surroundings, exploring and uncovering the landscape of the Cederberg and its local identity and heritage, creating a bond forged by a new understanding.

i n s p i r a t i o n

Chris and Annette du Plessis own a Rooibos farm called Ecolandes Tourism, which can be found between Clanwilliam and Lamberts Bay. The farm has been in Annette's family for generations and now provides accommodation and Fynbos tours around the property. A visit to this farm was what inspired me to centre my thesis around the conservation of Fynbos as gaining an understanding of the species allowed a deeper caring for this highly complex plant and its continued existance. A summery of the tour is included so as to help the reader better understand the many layers of the Fynbos species.
The following is the summery:

The name Fynbos came from the early Dutch settlers who referred to the plants in the Southern Western Cape as 'De Fyne bosses' which means plants with small leaves and the reason they predominately have small leaves is to protect them against the hot summer conditions, the smaller the exposed area, the less evaporation occurs. Chris explained that Fynbos is unique because botanically the world is split into six regions, tropical rain forests, temperate forests, savannah, deserts, tundra, alpine regions and then the Fynbos, the smallest by far and the only one that occurs in a small part of one country. Fynbos, by square kilometre has the most diverse plant species by far, including the Amazon jungle.

There are five hundred identified types of Fynbos found in the Cederberg which is less than twenty percent of the total number of the species type, and almost twice as many types of plants grow in the Cederberg area as in the whole of Europe. The Cederberg is a small area which stretches from just north of Clanwilliam to just south of Citrusdal, from the Cederberg to the Olifants River Mountains, and is roughly a hundred kilometres by forty five.
Chris showed the group a rocky outcrop indicating that they should walk no further as there were tens of thousands of seeds that were about to germinate and which would result in flowers that would cover the rocks in sheets of colour. In summer the shallow pools of water formed during the winter rain, in indentations in the rock surface dry up leaving a black sediment. The seeds survive in that sediment in temperatures of over 70 degrees and do not react to any rare summer rain or they would die in the subsequent heat, it is only when the winter rains start that they germinate. Chris indicated patches of moss clinging to the rocks, which were beginning to turn green and pointed out thousands of tiny flowers starting to

emerge from bulbs hidden in the moss, which will bloom in late August resembling tiny delicate tulips in their millions, in between other species also in flower. They survive the incredibly harsh conditions by fusing the outer skin of the seed which becomes impregnable so that no moisture is lost.
There are three kinds of rosemary, all part of the Fynbos species and Chris indicated one of these plants growing in a crack in the rocks and reiterated that every single of the myriad of plants growing as far as the eye could see was Fynbos.

Chris pointed out a bush that looked very thorny, but explained that these were not thorns but the leaves, each leaf ending in a sharp dry point in order to protect the plant against grazing but also forming the plant's defence against the hot dry summer, the heat is relayed to the tip of the leaf where it is dissipated into the air. It also has magnificent flowers, the common folk name of the plant is 'Little Bird Cannot Sit' because of the thorn like leaves. The plant has long roots following the cracks in the rock which is like a sponge holding any rain that has fallen.

Chris said that another reason why most of the Fynbos have got small leave is as a tactic against the extreme heat as when it is very hot they fold up against the branches displaying the white underside which reflect the sunlight and then when it is cooler the leaves will open again. But in Fynbos, there are also plants with fairly big leaves – Chris pointed out one of the Protea species, which might indicate a vulnerability to the summer heat, but these plants have developed several defence mechanisms, new leaves are dark red protecting them against the ultra violet rays and which also contain an insect repellent, so the insects will only eat the old, hard leaves leaving the young ones. Once the leaves get bigger, they turn grey and produce a thin layer of wax which covers the leaf, stopping evaporation, they are also able to move during the day so that the sharp edge is always facing the sun so that the surface is never presented, again preventing overheating. Chris then indicated a different variety of Protea and explained another protective mechanism this species has developed, the leaves are covered in silvery coloured hairs in order to reflect the sun's energy, silver being an excellent reflective colour. The second purpose of the hairs is that during osmosis the plant draws water from the soil which is used in the leaves to produce starches and then most of the water evaporates from the leaves, as the moisture vapour escapes, the tiny hairs catch some of it forming a microscopic layer of moisture on the surface which cools the leaf as it evaporates, protecting the plant against the fierce heat. The so called petals of the Proteas are actually different coloured leaves encircling the flower in the middle, as Proteas are mostly pollinated by sun-birds, in order to reach the nectar (thereby gathering pollen) they need something to balance on and so use the feathery but strong leaves surrounding the flowers to reach down into the flower.

In the flowering season the area is ablaze with every colour, shape and texture bloom imaginable and this is because each flower is trying to attract the relatively few insects in order for pollination to occur, and thereby ensure the survival of the species.

In terms of survival mechanisms Chris gave the example of the daisies of which

there are many, many different varieties, all closing at night or in cold weather to conserve energy because the insects that they need for pollination do not come out at those times, another reason they close is to protect the pollen from being washed away by the rain. The seeds are formed at the bottom of the flower and when they are ripe they are enclosed in a disk of about five or six millimetres, which will be dispersed far and wide by the wind. Chris explained that there are two dangers facing the daisy family's survival for the next generation, the first is that if there is a pest they can all be eaten and then there will be no seeds. The second thing happened in 2012 where there was good rain in April, they all started to germinate, for the next six weeks the temperatures soared and there was no further rain, so the seedlings all died. However the plant makes provision for both of these dangers, at the very end of the petal where it enters the stem, the plant forms a secondary seed which is not in a disk like the primary ones are and they stay attached to the petal so the wind cannot disperse them, those secondary seeds will not germinate after the first or second rains, but only when the soil is wet and there is more rain securing their survival should the seedlings from the first seed disc perish.

Chris showed the group a plant with the common name of Beetle Daisy, these daisies can only be pollinated by beetles. The plant attracts the beetles by only flowering when it is their mating time, the flowers they produce have perfect three dimensional imitations of the beetle, the real beetle lands on the flower and does a mating dance, picks up the pollen, then goes off to find a proper beetle thereby effecting the pollination.

There are many species of lilies in the area that have leaves that only appear in the cold season, they die off in summer, then the plant flowers seemingly from bare earth, Chris said that there are areas where you can see tens of thousands of these lilies. One particular species has leaves that when they appear look like corkscrews which die back and then at the very hottest time of the year, delicate lilies appear from the burning sand, white, yellow and light pink with a heavily perfumed scent, the reason they flower at the very apex of the hot season is because nothing else is flowering and so they are certain to be pollinated.

Chris pointed out a plant commonly named the Tortoise Berry, he explained that in the middle of May through to August each leaf develops a lilac flower at its apex, which will cover the bush so totally that not a hint of green can be seen, green berries then form and in late October develop into a translucent orange, which then become dark red in late November, they are now very tasty which human, animal and bird all try to eat, however each branch ends in a sharp thorn and as the would be eater reaches in to pick a ripe berry, the point sticks and that part of the bush vibrates and the berries drop to the ground where the tortoises are waiting to feast on them. This is because the pip inside the berry has to first go through the digestive system of a tortoise in order to germinate.

Chris explained that if you have undisturbed vegetation then for each pest there is a predator which keeps the balance. He said that in that area of the Cederburg the balance was being kept, however that was not always so in other Fynbos areas.

Chris then talked about Buchu of which there are more than two hundred different varieties. Some of the Buchu species have been used as a medicine for many thousands of years and which today are farmed and exported to France to be used in the production of perfume because of their wonderful scent. The leaves of the Buchu have tiny oil glands and on warm days they secrete oil which forms a cloud around the plant which keeps insects away, the cloud also helps protect the plant against the hot dry air, which is why they flower in late winter, early spring when it is cold and they don't have to release the oil, allowing the insects to pollinate. Apart from their wonderful smell, many of the Buchu species also have spectacular flowers.

Not only do the Fynbos species survive during the summer but most of them also grow, including the Rooibos, even with humidity at ten or twelve percent and temperatures of up to 70 degrees and this growth is aided by the very sandstone rock on which they survive. Chris explained how sandstone had developed, saying that when the rivers got to the flat plains, they split into deltas depositing sand, stones, pebbles, large rocks and quartz and over a period of two hundred to two hundred and fifty million years the deposits built up to over two thousand metres. Then, because of movement in the earth's crust and climate changes, rivers dried up or changed course, but the

enormous areas of sand, silt and quartz deposits were left. The sand consists chiefly of silicone and under the right conditions the silicone reacted with oxygen and water and formed silicate crystals, where that process went its full course the end result was immensely hard rock, but in areas where that process or reaction didn't take place or started and stopped, sand was left which is perfect river sand as it came down with the rivers more than two hundred million years ago. As it is exposed to the air because of erosion it forms the soil of the Fynbos area.

Most of the Fynbos plants grow in summer but they can't grow without water and the secret, Chris explained, is in these sandstone rocks which absorb rain water and hold it like a sponge. As the air warms in summer the water is slowly released, some of it running into tiny steams which join and eventually form rivers, the majority seeps into the soil and then underground back to the sea and it is that underground water which these plants utilise for growth and that is why their root systems are enormous, a medium sized Rooibos plant's roots would probably go down to six metres or more, ensuring its survival.

Chris explained that the examples he had given were merely a drop in the ocean of the many and extraordinary survival tactics that this fascinating and inspiring species has adapted over time.





SPRING

01_Intentions

02_Theoretical Motivations

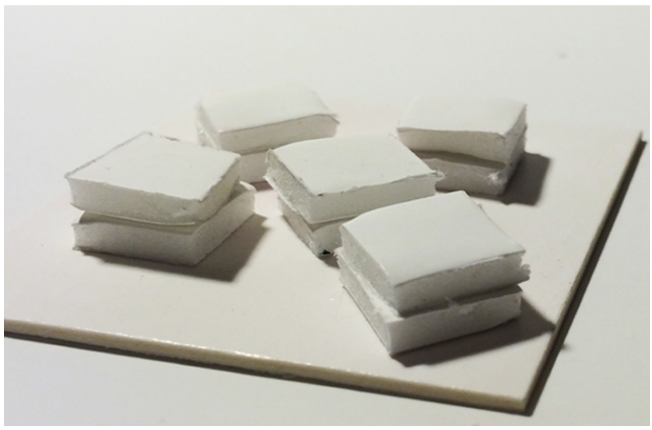
- Essay: Fragility in Landscape
- Essay: The Practical and the Poetic

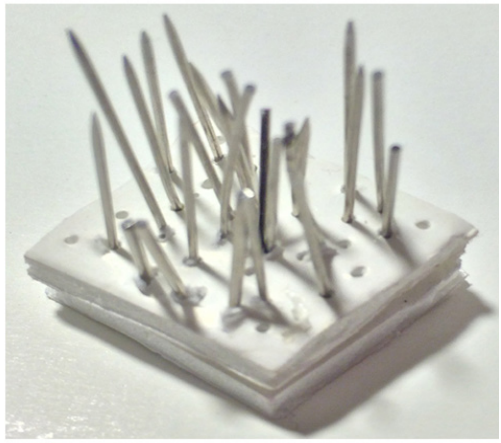
03_Objectives

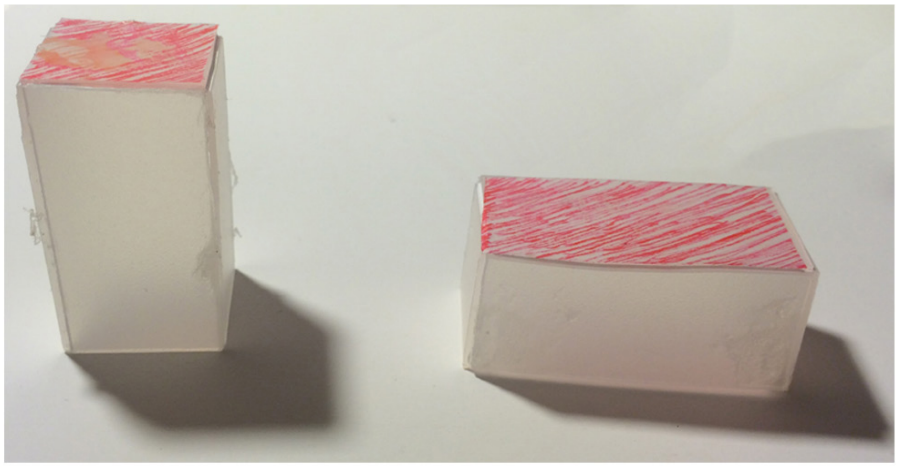
i n t e n t i o n s

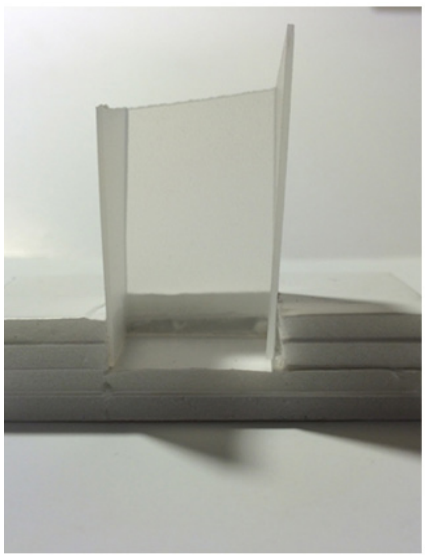
The intention for this thesis is to expose the Fynbos species to as many people as possible and try to learn from the landscape of the Cederberg and how the Fynbos grows and survives in this extremely harsh environment so as to come to a conclusion as how to design and respond to it.

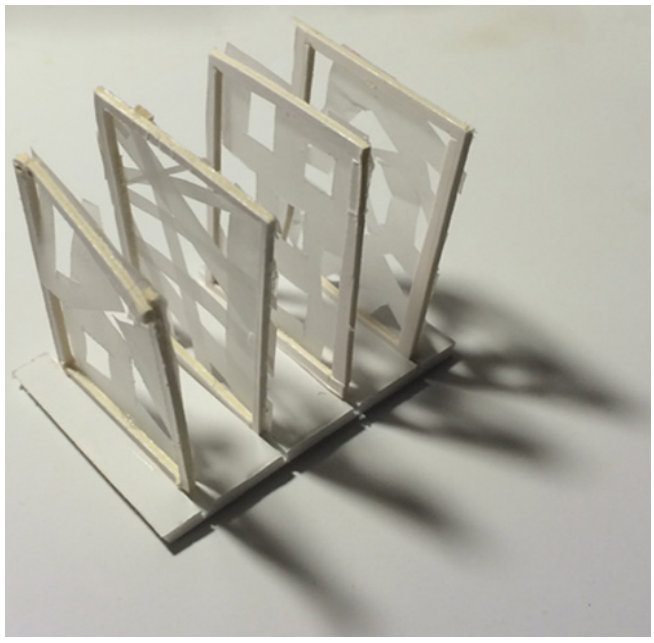
This thesis does not aim to solve the issue of the endangered Fynbos species but rather to serve as a way for people to understand the environment, with architecture as the catalyst. Conservation is a problem throughout the Western Cape but Clanwilliam is in a particularly special site as Rooibos is found only in this area, and so becomes the perfect vehicle through which to help educate and discover more about the species. Within this rural setting, where community and nature is so important, it is essential that both understand the other so as to learn and thrive together and the architectural response will form the root of the investigation. The proposed building will bring tourism and work for the community and help to teach people about Fynbos. Different research will also be conducted into methods for sustainable farming as well as looking at other uses inherent within the Fynbos itself. Through this thesis, it is hoped that the reader will be awakened to this unsung hero, using this document to create a closer relationship with the Fynbos, as the building will through its architecture.
This is a poor and undeveloped community dependent on the land, mainly through agriculture and from the tourism brought by the Fynbos when it flowers and this will form half of the reasoning, the other is the fact that Fynbos is an endemic species that is particular to the area. The architecture will help to teach visitors of the problems this community faces and create a possible solution by bringing in more people throughout the year.











theoretical.motivation

F r a g i l i t y . i n . l a n d s c a p e

'To see the world in a grain of sand
And heaven in a flower
Hold infinity in the palm of your hand
And eternity in an hour'

-Auguries of Innocence by William Blake

This thesis aims to create a space to explore the relationship between endangered plant and man and how a building can form a link between the two and break the man-made boundaries that have developed. It will build understanding as to what is needed in designing a piece of architecture that evokes the desire and wish to learn more and help prevent the destruction of the landscape in which the Fynbos lives. The architecture needs to be more that walls and roofs but to delve deeper into the experience of the environment in which the Fynbos survives and to relate it back to the architecture so that the visitor can arrive at an intimate understanding of the environment, one which is constantly being changed by time and weather. As with the climate and land formation in which, for no explicable reason, the Fynbos thrives except that it does, the architecture must also form a careful balance between the arrangement of spaces, movement and time to create the link between the architecture and the Fynbos within its natural landscape.

Landscape influences architecture and the spaces we inhabit and explore. By recognising the importance of our past and decaying landscape we can grow and design for a future that is in touch with nature and all its possibilities. Being in nature, in a primitive environment, one opens oneself to the possibilities of our senses and we become aligned with the landscapes of the past, informing design decisions and paths.

Focusing on the Cederberg region of the Western Cape, rich in history and natural beauty, one can easily find the lost connections to the past and bring alive the routes of the architecture found deep within the sandstone formations. The sandstone brings life to the Fynbos flora, hidden jewels within the harsh landscape that holds thousands of unique species that have yet to be explored. Rooibos, Buchu and Honey Bush are just some of the products of the landscape, yet certainly there are still many more possibilities to be discovered. This is a region full of history and new agriculture forming the ever-changing landscape, death and renewal, the decay of lives lost and the birth of the new that each season brings in harvest, flora and architecture.

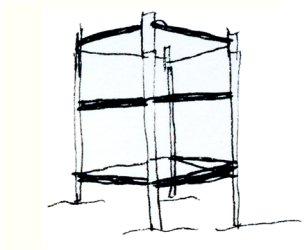
In modern society where, due to the speed in which most of our lives happen, spaces and architecture have become aimed at the sense of vision, and even so if there is a space set up for that visual sense, one often still passes through without a second look. 'The everyday is enduring and solid, humble and taken for granted' (Lefebvre cited from Harris & Berke, 1997;19). People in the busy cities barely stop to take a break and enjoy the spaces they inhabit. People lose their connection with how the body experiences building spaces and the language is soon lost, becoming 'isolated in the cool and distant realm of vision' (Holl, 1994:29). In the city scape everything is rushed, people don't touch and move through the spaces without a pause. No connection is felt in a very unattached and impersonal metropolis. Materials have become synthetic and fabricated and the 'essence of material and detail [has been] displaced' (Holl, 1994;91').
The fragility of landscape, in essence forces one to experience every surface, texture and tactile difference because the materials and planes have a richly complex language that has developed and changed over time. Exposed in an open field with no built form to deflect the elements, one is truly speaking to the

space around, no longer a smooth floor tile to walk upon or a generic white wall but one is made to identify with the difficulty of travelling through the landscape directly through the body, highlighting each sense and igniting them through the experience, not just the sense of vision, but smell, touch, sound and even taste. Each element – smooth rock or crunchy Fynbos – tells a story through time, the history and fragility as nature first shaped the landscape and then how human influences have tried to reshape it. Landscape is rediscovered in architecture, no longer just forming the backdrop or decoration for a building but utilised as an object or intervention for the architecture to form part of. Each aspect of analysis becomes a complimentary function but in essence, all inhabitants of the site are merely nomads in this historical setting. 'The connotation of nature, however, embedded as it is in the very discourse of forms, is still always present' (Baudrillard, 1996:62).

In Vitruvius' Ten Books of Architecture, he describes how through nature the development of human interaction started and then evolved from the discovery and need of people. He explains how the encounter with fire, formed by nature with the wind perhaps vigorously rubbing tree branches together, prompted people to find that the heat could benefit them, and they soon began to gather around the warmth. To communicate, gestures were used and slowly grunts and shrugs turned into a form of communication, words turned into conversations and this 'gift of nature' (Rowland, 2006:34) – fire had created a language. Within the landscape, people then started to mould and shape it to form shelter and protection from the elements. This vast space that was here before humans and which will be here long after they no longer traverse its contours is the foundation of our existence, it feeds and provides for our needs through the grains of its soils and is a force we must learn from and rediscover.

T h e . p r a c t i c a l . a n d . t h e . p o e t i c

Designing for a landscape site, one needs to be aware of the natural surrounds but also how one deals with the actual building process. How the architect designs and details is a craft in itself which needs to be considered. There are essentially two notions of thinking, the practical and the poetic. The disciplines of structure versus the vernacular traditions of construction and craft.



The architect is related to what he creates like an artist but also has to rely on the external agencies to create, bringing another element to the design component, an element of abstraction. The craft of architecture has, by definition, two sides: that of the designer and that of the builder or maker. In Gothic times the architecture and the construction process were a single entity (Kostop, 1977), but as the creative and the construction process becomes more and more separated so too does the fragmentation of the building process. This was accelerated by the industrial revolution 'driving the design and making the functions in architecture even further apart' (Louw, 2002:6) as machine technology developed from the processing of raw materials to mass production, this was applied to architectural components, eliminating the handmade expertise from the design process, creating a divide between the architect and the craft of the building. Although earlier in architectural education it was deemed important to spend some time in the building process, experiencing building, it was soon found to be undesirable by upcoming architects who wanted to be classified in a professional category, separately classed from the builders who made their creations a reality. This is a snobbery that has had a bigger effect on the industry than was first realised.

The world is too much with us; late and soon,
Getting and spending, we lay waste our powers;
Little we see in Nature that is ours;
We have given our hearts away, a sordid boon!
This Sea that bares her bosom to the moon;
The winds that will be howling at all hours,
And are up-gathered now like sleeping flowers;
For this, for everything, we are out of tune;
It moves us not. - Great God! I'd rather be
A Pagan suckled in a creed outworn;
So might I, standing on this pleasant lea,
Have glimpses that would make me less forlorn;
Have sight of Proteus rising from the sea;
Or hear old Triton blow his wreathèd horn.

-William Wordsworth (1770 - 1850)

Fig 3 & 4

Wordsworth's industrial England was moving further and further away from nature's influence and with the new push of the industrial revolution and the speed at which buildings could now be built within the production line, the profession was split in two: those that still saw architecture as an art and those that saw it more as a business. This then created a division in the ranks within the profession and allowed for a hierarchical environment with architects that designed and architects that drew, forming a split between the creative and the construction, as well as now within the creative. This added a social and cultural gap between the architects and the building trade. The design process itself adds to the destruction of spacial awareness and although architects live through images and a visual representation, the process denies it. Henri Lefebvre observes that

> 'The separation between spatial practices and representations of space has become complete. The very process of architectural representation has contributed to the aestheticization of design itself, a process serving to obscure many underlying constraints that govern architectural practice.'
>
> (Cited Leach, 1999:10)

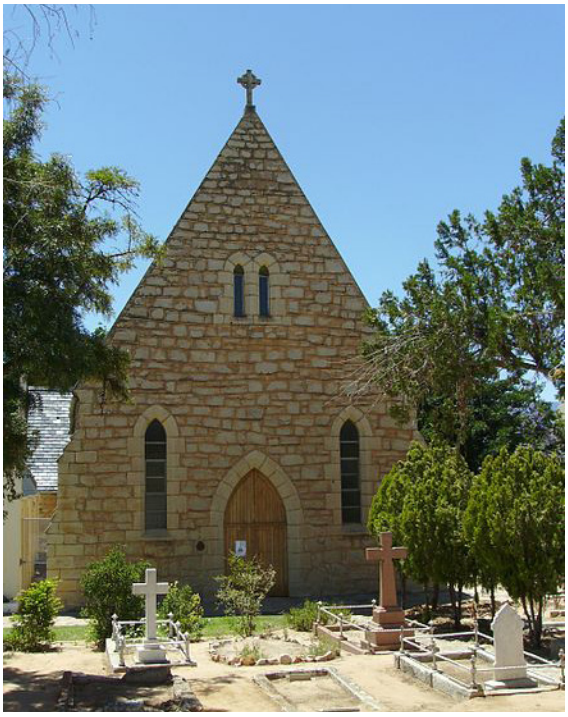
The Arts and Crafts movement was inspired by strong socialist beliefs in which a high moral intent was used to improve and develop the best method for

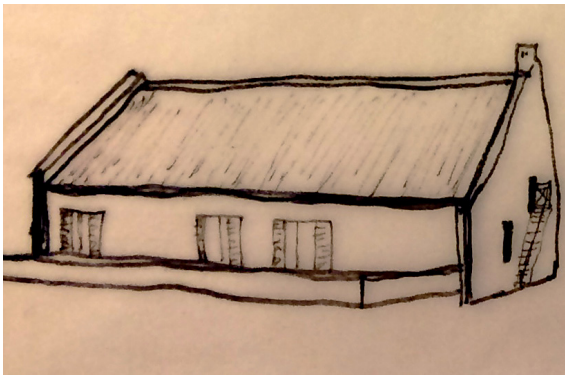
Fig 5

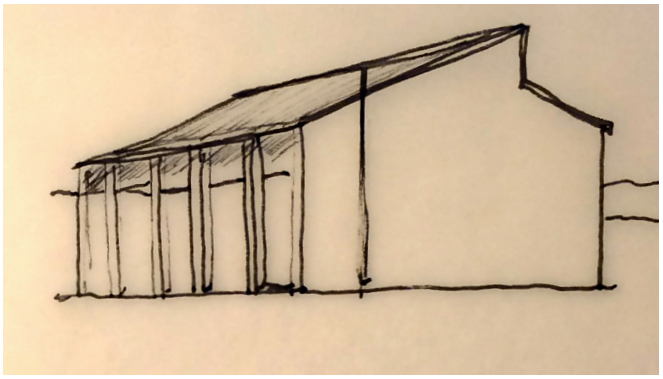
production. Failure to make the case for the craft of workmanship as an essential and unalienable ingredient of architecture is still with us, and with the onset of the Modernist movement, the Arts and Crafts principles were disregarded and architects latched onto what the avant garde artists were advocating and removed anything ornamental, which for years had been the 'chief creative outlet for architectural craftsmanship... and the tradition found of individualistic expression for architects and craftsmen.' (Louw, 2002:13) Universities have moved towards a 'beaux-arts-inspired school system' (Louw, 2002:14) which moved away from the Arts and Crafts movement into routing the new academia of architects in both arts and sciences but ignoring the art of detailing and focusing on the practical.

The poetics need to be consulted though, and the movement of Critical Regionalism focused on the reintroduction of historical knowledge and cultural practises that the Arts and Crafts movement thought were so important. After the annihilation of the ornamental by Modernism and Post Modernism following the second world war, Regionalism was created. This movement focused on work that emerged out of 'the specifics of an individual situation' (Lefaivre & Tzonis, 2003:10) where the design gave priority to the 'identity of the particular rather than to the universal dogmas' (Lefaivre & Tzonis, 2003:10). This brings up the conflict between globalisation and international intervention - local identity verses a desire

Fig 6



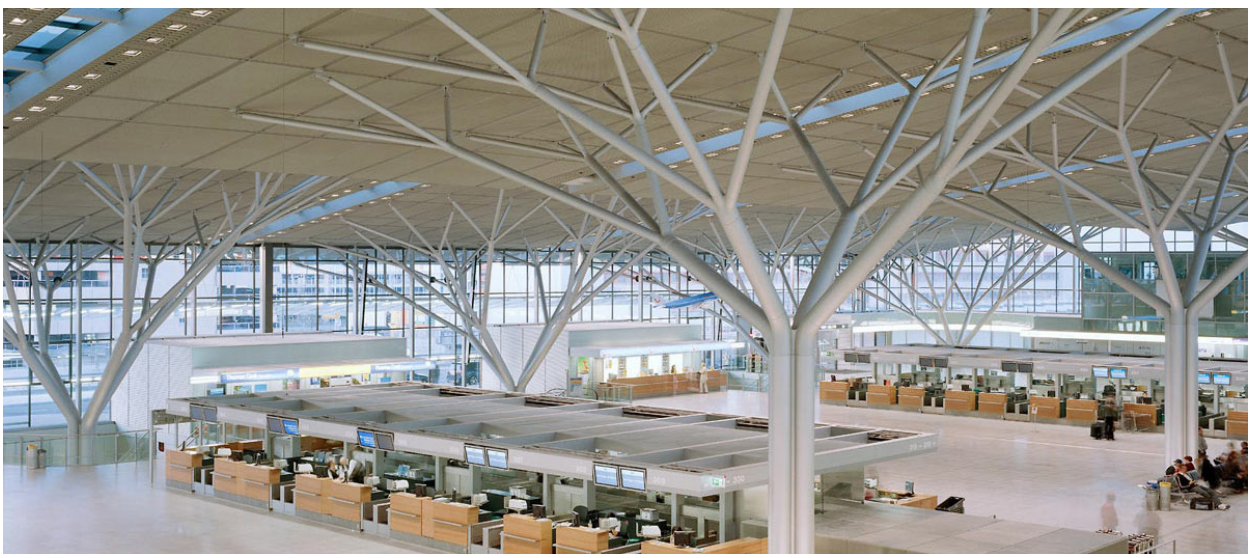




for ethnic insularity. It is important to recognise the identity of a local physical, social and cultural situation, especially in a small community such as Clanwilliam which has a very rich past that is expressed within its built form. Within such a setting one cannot simply impose a narcissistic formula onto the architecture but a subtle geniality is needed to support the surrounding principles. The needs of the context must be addressed with attention paid to the ecological, political and the community, both historically as well as through aims for the future.

The entire area of the Cederberg was populated by nomadic San people for over 20,000 years, and a profusion of rock art bears testament to their presence and displacement from the area. The land was first settled by white farmers in 1726; Jan Dissels started one of the first farms, building a homestead close to the wagon track route from Table Bay. In 1808 a garrison was constructed to try to deal with the problem of cattle rustling by the San people. The hot and arid farming conditions further dissuaded families from settling there, and the first British settlers were, in fact brought to the area by the British government to create a human buffer in a grand scheme to stabilise the border from further tribal incursions. Only six original families remained and, when the village was renamed in 1814, there were only 16 families living in the area. The new name was given by Sir John Cradock, the Governor of the Cape, in honour of his father-in-law, the Earl of Clanwilliam. Despite being a strong Afrikaner region, the name has remained. In 1820, the English administration of the Cape established a Magistrate's Court. In the beginning, the settlement grew very slowly, and a fire in 1901 destroyed almost all of the houses. A few of the original buildings still stand today, seven of which were declared historical buildings prior to 1980, these include the Clanwilliam Museum (Old Goal Building) where tools and utensils used by the San are on display as well as memorabilia from the poet, Louis Leipoldt and the Anglo Boer War. As one of the oldest settlements north of Cape Town, Clanwilliam features a number of interesting historical buildings including the original farm house of Jan Dissels (2, Park Street), the Officers' Residence between 1808 and 1858 (5, Park Street), the aforementioned Old Goal Building (Museum), the Flower Church (Old D.R. Church) designed by architect Sophia Grey as well as an 1820 settler's house which is situated behind the Criterion in the Main Road. The presence of old Cape Dutch architecture is strong within the design of these old buildings with a heavy input from English architecture as well as being influenced by the very harsh environment in which they are situated. (SA History)


METROPOLITAIN



Connecting architecture and the identity of a particular group is not a new idea though, and can be seen as far back as ancient Greece. The Greeks used 'architectural elements to represent the identity of a group' (Lefaivre & Tzonis, 2003:11). Once they had established their first trading colony in Egypt in about 566BC, the temple they built was adorned with flowers and hanging leaves, motifs all local to their home, Greece, inserting their local identity, history and culture into distant lands. Vituriuvius speaks too about Regionalist design, discussing how natural causes and human rationality helps to influence the built form and how the different physical environments will shape the architecture from region to region.

'Regionalism architecture incorporates regional elements in order to represent aspirations of liberations' (Lefaivre & Tzonis, 2003:13) In this case the 'liberation' would refer to the destruction of the Fynbos and would uphold an architecture that would represent the survival qualities of the plant to be implemented within the architecture.

Goethe states that architects have the power to make people aware of their common past and participate in their collective memory. In his manifesto he placed importance on the attributes of materials and details that evoke a reaction and an awareness of the collective past. Buildings need to be able to be understood within their context without requiring an interpreter. Through the use of local materials and craft by the architect, the observer is drawn into an intimate relationship with the building as they are already comfortable with the materials and there is a 'sense of emotional familiarization' (Lefaivre & Tzonis, 2003:16). The observer can see his own identity within the building as it is a local identity and outside visitors can learn and observe the indigenous traditions and materials from viewing the architecture. Another way of doing this is to bring nature into the design as people feel at ease and familiar in nature and can therefore relate to it. Two examples of this are the Airport Terminal 3 in Stuttgart, Germany where they have used a analogy for trees as the structure to hold up the roof and the Paris Métro or Métropolitain which was influenced by the Art Nouveau movement, also heavily influenced by nature. Both of these examples create a direct metaphor with nature and use its innate integrity to make people feel at one with the architecture.

'It is the ethics underlying routine and the aesthetics of familiar settings'
(Cited Berke & Harris, 1997:3)

Fig 7:*Greek Column*, Fig 8:*Garlis*, Fig 9:*Paris Métropolitain,* Fig 10:*Airport Stuttgart Terminal 3.*

There needs to be co-operation between the built and natural environments through a revival in craftsmanship and vernacular technologies, designing for the site and climate and using the materials that nature has provided with which to build. Although there are many methods for passive design that will aid a building to naturally regulate and enable it to function to its best abilities, such as orientation or passive cooling, a new sustainable architecture has brought an emphasis on the scientific realm to the field. Thermal conductivity, material, photovoltaic technology, computer simulations and life cycle analysis seem needed to determine if a building is satisfactorily working as a piece of 'sustainable architecture'. But these are merely in place to help to bring out the best of the building.

As a paradox, the preservation of Fynbos is also determined by science and quantitative dimensions because as the sustainable architectural aims to take pressure off the very environment that is causing the extinction of Fynbos, so too must there be a concerted effort for Fynbos, researching various topics, but importantly the ability to harvest the seeds mechanically and then replant them so as to ensure the flora's continued existence. Both should set an example

for people to learn from as there needs to be a change in the thinking in both sustainable architecture building practices as well as the culture of ignoring this precious species, Fynbos.

The architecture needs to be able to change or manipulate the perceived view of this hardy plant species to one of love and admiration so that people, through knowledge of Fynbos, will be better aware of the necessity to save and conserve it. As with most human conditions if there is self-gain people will be more willing to become involved. Although the phrase 'sustainable architecture' is a rather broad and ambiguous term that can be defined in many ways, socially, economically, politically and can mean very different things to different people, it can still be used here to define what is trying to be achieved.

'In another natural way ... establish a unity between the built form and the men using it' (Cited Berke & Harris, 1997:90) How then can we establish a unity between man and Fynbos that allows us not to destroy it but to build with it.

Fig 11

o b j e c t i v e s

This thesis hopes to explore and discover possible solutions to where architecture fits between nature and landscape:

_How architecture can play a role to make us understand and realise the vulnerability of Fynbos.
_How much architecture has to learn from a historical landscape setting.
_What hints and clues the landscape can give in determining a site and intended structure.
_How people can learn more about the harsh environment through being within the architecture of the centre.
_How its presence and visitors will affect the landscape and the Fynbos which grows upon it.
Within the architecture:
_To interrogate how ecological education is taught and the spatial relationship the architecture has with its patrons.
_How creating and pushing for a 'sustainable' world advances a rethinking of sustainability and promotes a better understanding of the ecology of a site and its landscape.

SUMMER

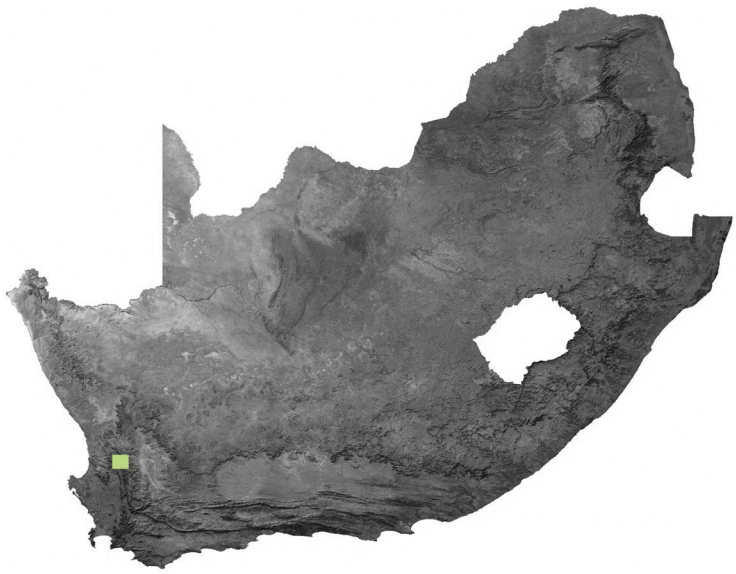
01_Site

- Photo Analysis
- Graphic Analysis of Clanwilliam
- Introduction to Ramskop Nature Reserve
- Essay: Poetic Landscapes
- Interview
- Rooibos: History
- Conservation: Conservation and Sustainability
  Interview
  Case Study: Kenilworth
  Racecourse

'The form reflects the place, the place is just so so, and the use reflects this and that'

Zumthor, 2006, 69

s i t e



The site for this thesis formed the reason and meaning behind the project investigation. The Cederberg is home to a variety of different types of Fynbos, more specifically the Sand Fynbos as well as being the only area in the world where Rooibos, a type of Fynbos, is grown.

Clanwilliam is a small town set in the Cederberg Mountain Range in the Western Cape, just two hours drive from Cape Town. It is a small but diverse town with income derived from tourists brought by the Fynbos, as well as from the Rooibos industry and agricultural farming in the surrounding areas. The site where the building is located is in the Ramskop Nature Reserve on the edge of Clanwilliam. The Cederberg Region is an beautiful area with a large number of wild Fynbos species which bloom in late August, early September. The region was named after the Cedar tree which is now endangered due to the wild fires which regularly occur in the area. The town is still very segregated with racism rife between not only local white and coloured people but also between coloured and black people who were recently moved from the Eastern Cape in some sort of a political ploy for their votes. Alcoholism is a big problem within the community as there is high unemployment. But during the flower season this community comes together in an effort to transform the town and there is a joining together over the Fynbos.

Fig 12


AUGSBURG LANDBOUGIMNASIUM
AGRIMARK
CLANWILLIAM
ROOIBOS


CLANWILLIAM EXPO
APRIL


DE KELDER
RESTAURANT & BAR

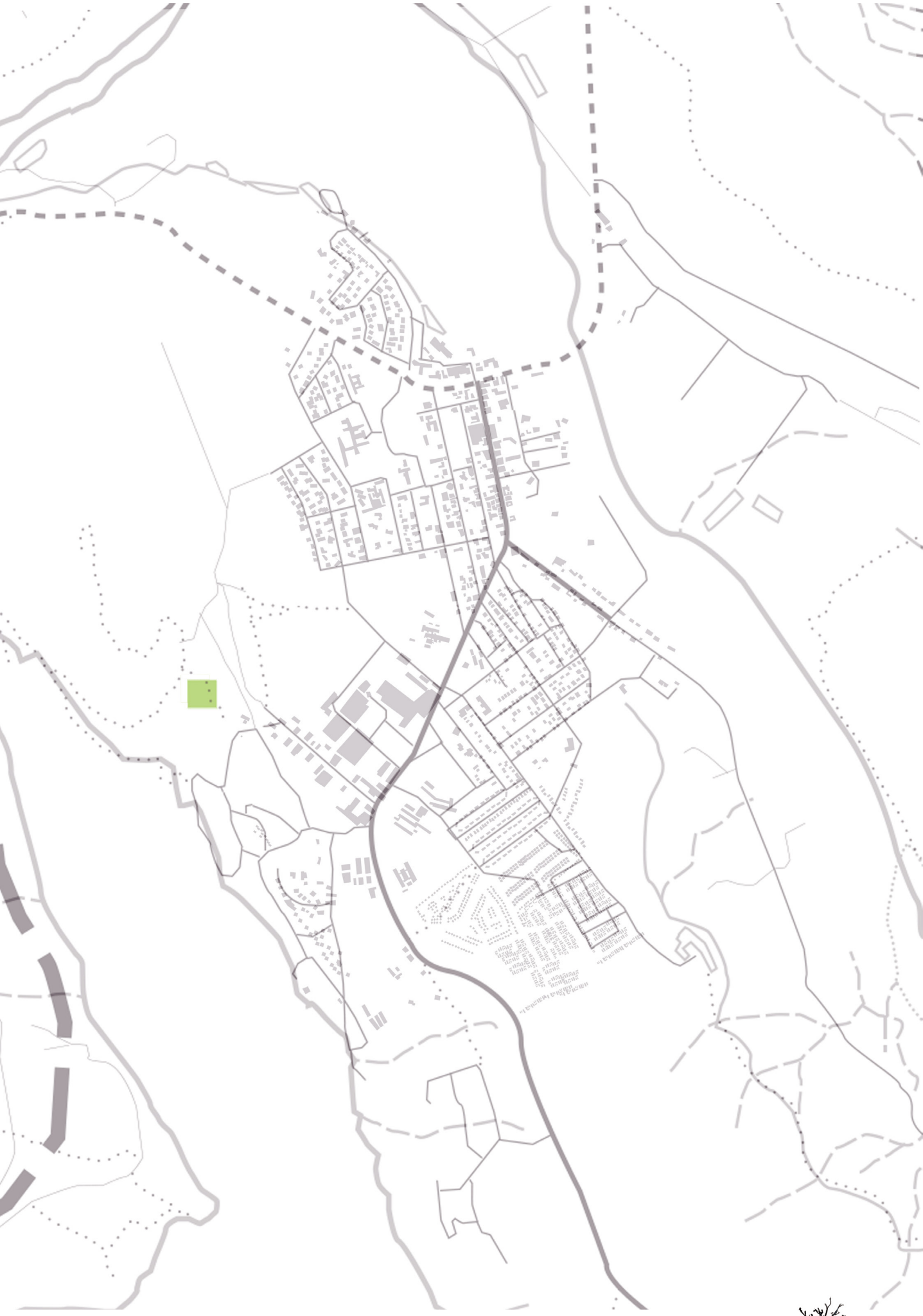

CLANWILLIA
HOTEL

_Clanwilliam

Fig 13

_Built form

The built form acts as an analysis for the land use density. The town of Clanwilliam has two main streets with shops, restaurants and churches and is then mainly residential. Most buildings are single story with the exception of the two main streets which have some one story buildings, mainly the hotel and the new shopping centre. The Rooibos factory lays quite a claim in the built form, it is the largest group of buildings and is situated near to the centre of the town. This is the Rooibos LTD factory, which is the biggest producer and supplier of Rooibos with customers all over the world. The open land surrounding the town is a combination of agricultural and natural landscape, showing that Clanwilliam is a town still very routed in nature.



_Grain

The grain of Clanwilliam shows the pattern of building footprints on the ground of the town.

The configuration of larger buildings towards the north and much smaller buildings towards the south, also with far less space between them, indicates the lower income group which are situated to the south of the town. A large factory building near the centre proclaims that this industry brings in a major part of the income of this town as it has not been pushed to the outskirts but is almost celebrated and joins the larger dwellings with the low income houses as a connecting point.

_Internal street pattern

The internal street pattern of Clanwilliam developed as a grid from off two main roads, Hoof Street and Park Street which are connected by an obtuse angle. The town grid then grew perpendicular to those two roads and as it developed further, secondary roads continued to connect intersections, reflecting the structured development of the area. To the north, the grid becomes less formal, this is where new residential buildings were placed calling for bigger plots than the original 1820 settlers layout of the centre of the town. The street pattern also changes from a structured grid to an organic pattern to follow the formation of the land.


Hod Street
Park Street

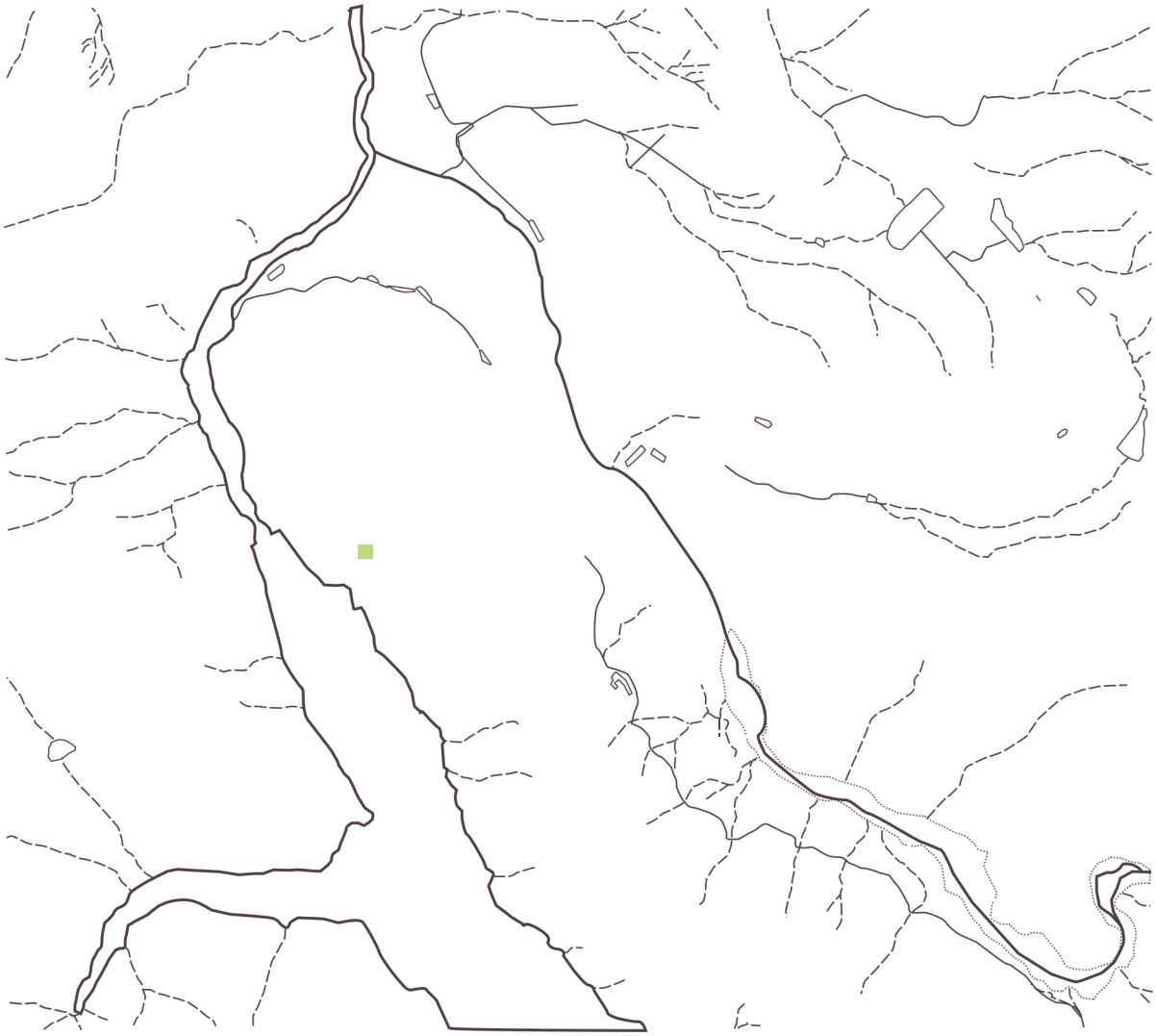
_Movement pattern

Pedestrian footpath movement is the dominant structure facilitating access and circulation in and around the Ramskop Nature Reserve as well as unused landscape and agricultural land around the two. This suggests that because it is such a small town and a poor community, most people do not have access to private vehicles and are more reliant on walking than public transport, which is provided by taxis. The town has two main roads with the town centre and higher income homes having direct access and then secondary roads for areas further away from the centre towards the lower income based housing. The national road is the main route to Cape Town and breaks from Clanwilliam, left to Lamberts Bay or up north to Namibia.

National roads
Main roads
Secondary roads
Dirt roads
Pedestrian footpaths

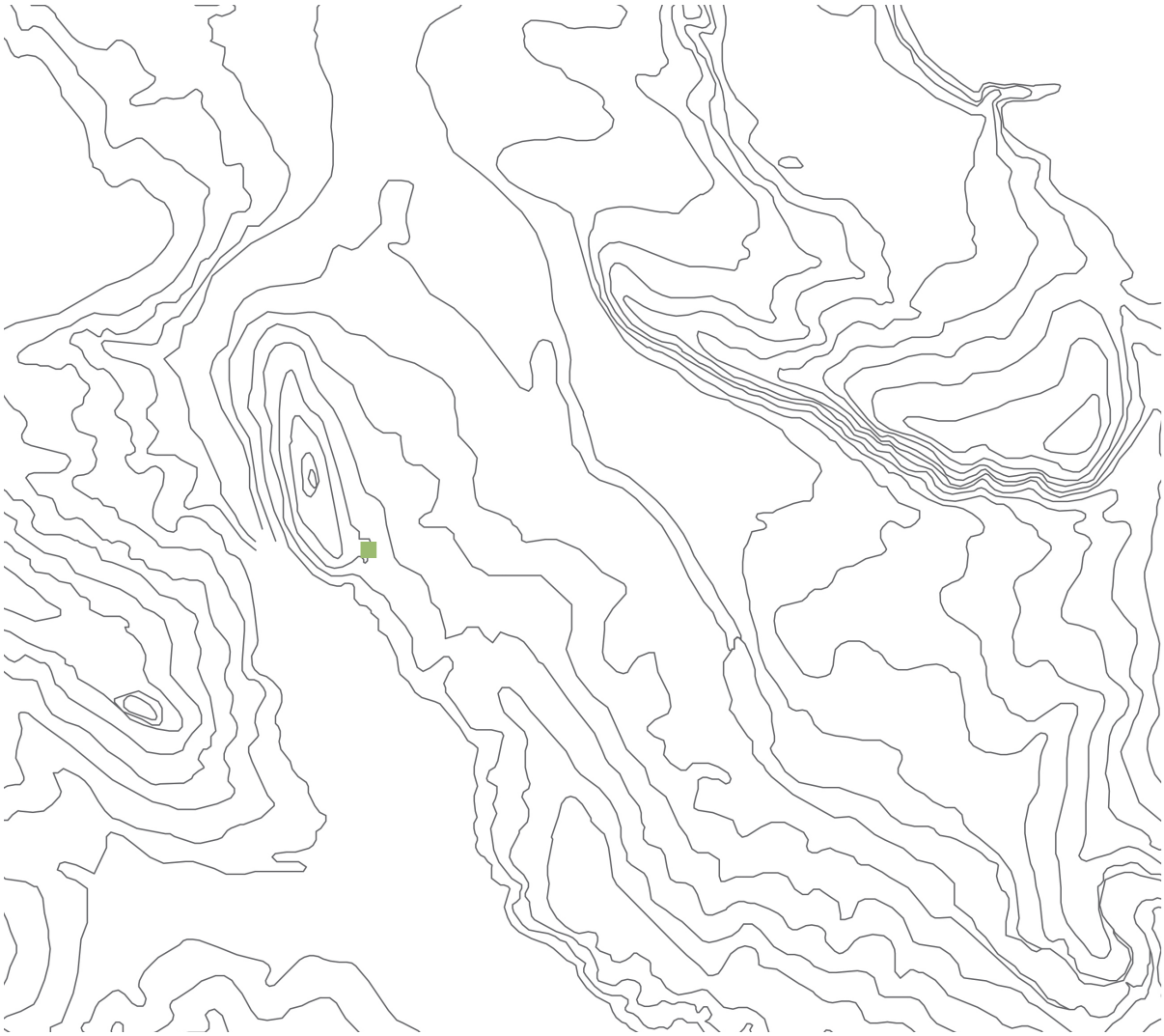
_River pattern

As the town sits between the Clanwilliam Dam, which feeds off the Olifants River, to the south and the Jan Dissel River to the north of the town, there are a lot of rivers flowing through the area as well as a natural flood plane. As this area has a great deal of agricultural activity, there are a few small reservoirs and perennial water which is used for irrigation.



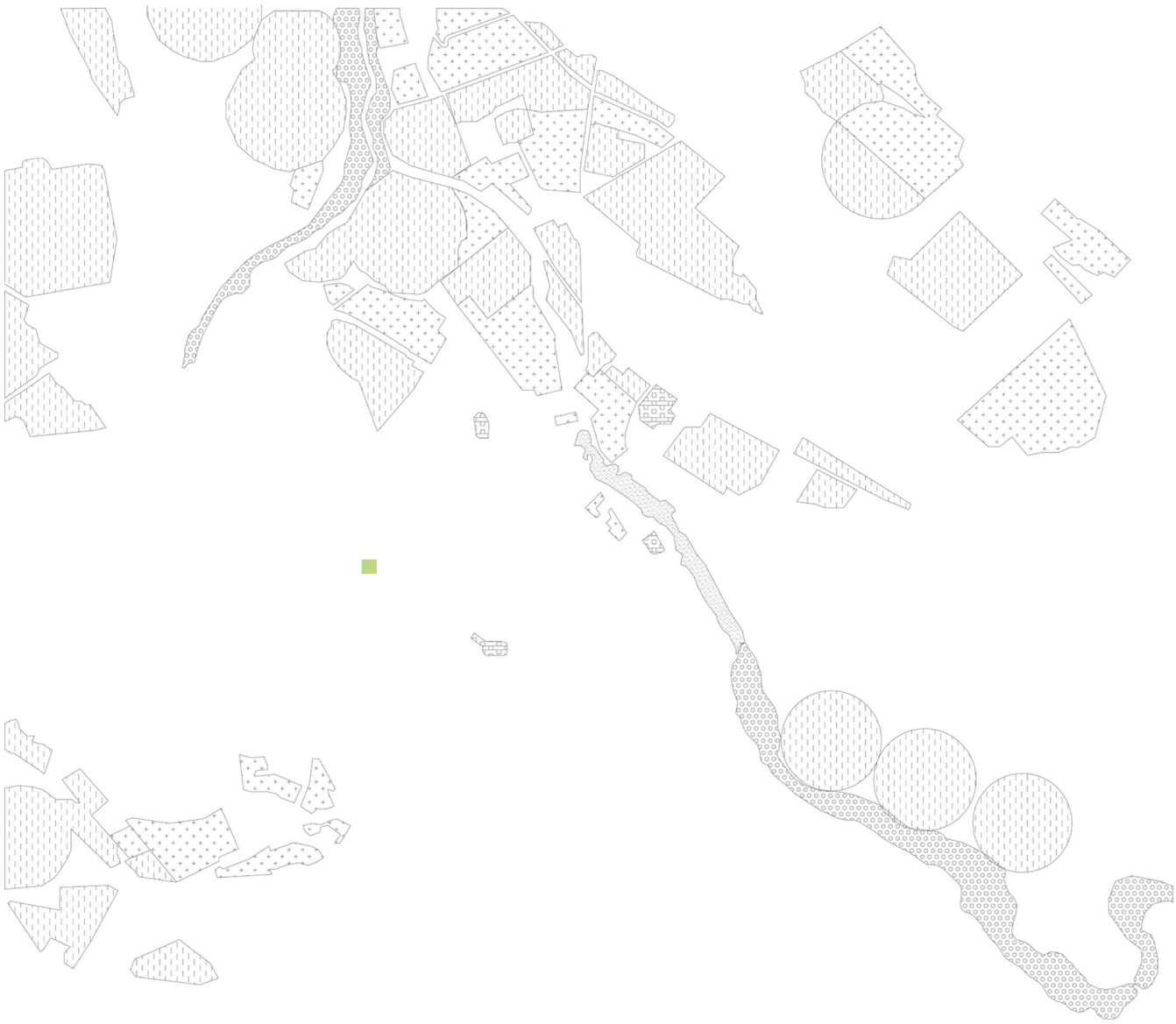
_Contour pattern

As the town sits between the Clanwilliam Dam, which feeds off the Olifants River, to the south and the Jan Dissel River to the north of the town, there are a lot of rivers flowing through the area as well as a natural flood plane. As this area has a great deal of agricultural activity, there are a few small reservoirs and perennial water which is used for irrigation.



_Agricultural pattern

Clanwilliam survives off the land of the area and agriculture plays a vital role, with farming being an important aspect of life in the area especially with Citrusdal (the heart of citrus farming) so close to Clanwilliam. The area around the town grows many products such as citrus, oats and watermelon, but most importantly Rooibos, which only grows in the area around Clanwilliam. As there are two large water sources as well as numerous smaller ones, this is a very valuable area for agriculture especially during the summer months when there is no rain and irrigation is key to the growth of the produce.



R a m s k o p . n a t u r e . r e s e r v e

The Ramskop Nature Reserve is a 66 hector protected area adjacent to the Clanwilliam Dam, surrounded by plantations of Rooibos tea and orange groves and with the Cederberg Mountain Range as its backdrop. The reserve has a wild flower garden which has more that 350 examples of Fynbos drawn from all over Namaqualand as well as the local Sand Fynbos which is endemic to the area around Clanwilliam. It is a planted garden which acts as a showcase for different types of Fynbos species so as to educate people when they visit about the very many different types of Fynbos. The reserve has a series of paths leading through the Fynbos that are easy to follow and give one access to spectacular views out over the mountains and Clanwilliam's dam.

The Ramskop Nature Reserve is owned and run by the Clanwilliam Municipality but the annual flower show is organised by the Flower Association which also helps with the running of the reserve, as well as donating money to its upkeep. This committee consists of local community members who all play an active role in Clanwilliam's agriculture with most owning farms in the surrounding areas. As Clanwilliam is such a small town and is so reliant on the Fynbos for its survival, the community gather together during the flower blooming time and make Clanwilliam into a festival space with flower exhibitions, talks and tea-rooms. The Nature Reserve is underused though and mainly receives visitors during a small period in winter during the flower season and to a lesser extent during Cape Town's peak season of December and January where a pop up tea shop is erected in the reserve for people to have a light meal, which brings in extra income.

The Ramskop Nature Reserve is rural and in touch with the surrounding communities. The Fynbos Research and Education Centre would help bring more tourism into Clanwilliam, which survives mainly on the agriculture in the area and the tourism the Fynbos attracts. The centre would provide education for the community, teaching them about Fynbos and the many possibilities of the species as well as providing jobs for guides who will conduct tours through the reserve, and jobs involving maintenance. The hope for the Research and Education Centre is that it will bring people to the reserve throughout the year. With permanent research facilities it will be fully occupied, and the introduction of the education facilities will bring schools and tours to the reserve for seminars, lectures and guided walks through the Fynbos.


The Ramskop Nature Reserve
Site Location
Clanwilliam Town
The Clanwilliam Dam

Clanwilliam Dam Wall

Clanwilliam Dam

The Ramskop Nature Reserve

SITE

The Cederberg Mountain Range

The view to the north, north east of the site shows the Cederberg Mountains and the town below.

The view to the south of the site shows the Clanwilliam Dam which is one of the longest and thinnest dams in South Africa.

P o e t i c . l a n d s c a p e s

Traditions crumble and therefore we lose our cultural identities and 'everything merges into everything else and mass communication creates artificial world of signs' (Zumthor, 1998:16) Clanwilliam, an isolated town buried in the Cederberg has remained mainly untouched by modern architecture. In a world where 'everything beyond our own personal bibliography seems vague, blurred and somehow unreal' (Zumthor, 1998:16), it is refreshing to see a town so proud of its heritage, celebrating its 200 year anniversary in 2014. Behind the post-modern life of signs and blurred cultural lines there is still a presence, no matter how hidden, of the natural world. The sun, the earth, water and landscape, in a setting such as Clanwilliam, cannot be denied as they are the livelihoods of the town. It is perfectly situated within the landscape and we find a piece of our consciousness and a connection to a memory of our history. Understanding the past explains the setting and the object finding its perfect harmony. Similar to when the flowers of the Fynbos blossom, the multicolours do not clash or overwhelm but rather have the perfect balance of understanding the landscape and an overwhelming beauty develops from the power of an ordinary flower, 'we only have to look at them long enough to see it' (Zumthor, 1998:17). No one pays special attention to the scruffy and drab Fynbos when not in bloom but the thought of it no longer being there is beyond imagination. The building must become as much a part of its surroundings as is the Fynbos. The 'change of nature only is realised from the memory that remembers the previous seasons' (Crowe, 1995:123), so too this building must enter into a meaningful dialogue with the surrounding context and site. There needs to be an understanding of remembering the landscape in order for the architecture to be accepted into the genius loci of a space, to form a sensual connection with the past so that the building can be conscious of how it is inhabiting its site and so that together they can form a synergy.

"So the spider with its web, so every subject weaves relationships between itself and particular properties of objects; the many strands are then woven together and finally form the basis of the subject's very existence."

(Jakob von Uexkyüll 1956)

The geology of the Cederberg region forms part of Cape and Karoo Super-groups. Millions of years ago rivers traversed the area and over the great flat landscape deltas formed, depositing sand, silt, quartz, pebbles and huge stones which were brought down from the mountains to the Cederberg region. Over a period of 2,5 million years these deposits built up and then, because of movements in the earth's crust and climate change, the rivers dried up or changed course, leaving behind the enormous deposits of sand and silt. The sand consists of mainly silicone and under the right conditions it reacted with oxygen and water to form silicone crystals. Where the process went its full course it created an immensely hard rock - sandstone, but where the conditions were not correct it remained river sand as it had been millions of years ago. As it is exposed to the elements and there is erosion of the sandstone the sand disperses back into loose river sand which then forms the soil of the Fynbos area. The distinct reddish colour of the rock is a result of minerals like iron and manganese that formed part of the sediment when it was laid down. This is also the colour of the Rooibos plant once it has ripened and is ready for harvesting. It is inevitable that everything has a connection and in nature this is even more prominent. Each object is made up of a line, a group of DNA links that create its possibilities and connects it to the next as each thing evolves from the one before, the line becomes a trace, a path of its journey. We all have a beginning and an end and in nature it is never so near and intricately connected and this beautiful landscape links that line and weaves it through each realm of thought and perception, opening our eyes to the infinite possibilities it creates. A river once passing through the land now forms the habitat for a plant that could only survive in the nutrient-less properties of the sand soil which covers the region.

'Always think of the universe as one living organism, with a single substance and a single soul; and observe how all things are submitted to the single perceptively of this one whole, all are moved by its single impulse, and all play their part in the causation of every event that happens. Remark the intricacy of the skein, the complexity of the web.'

(Marcus Aurelius. Cited from Long, 2002:29)

Fig 14

The Fynbos Biome falls in its own Floral Kingdom, the Capense.

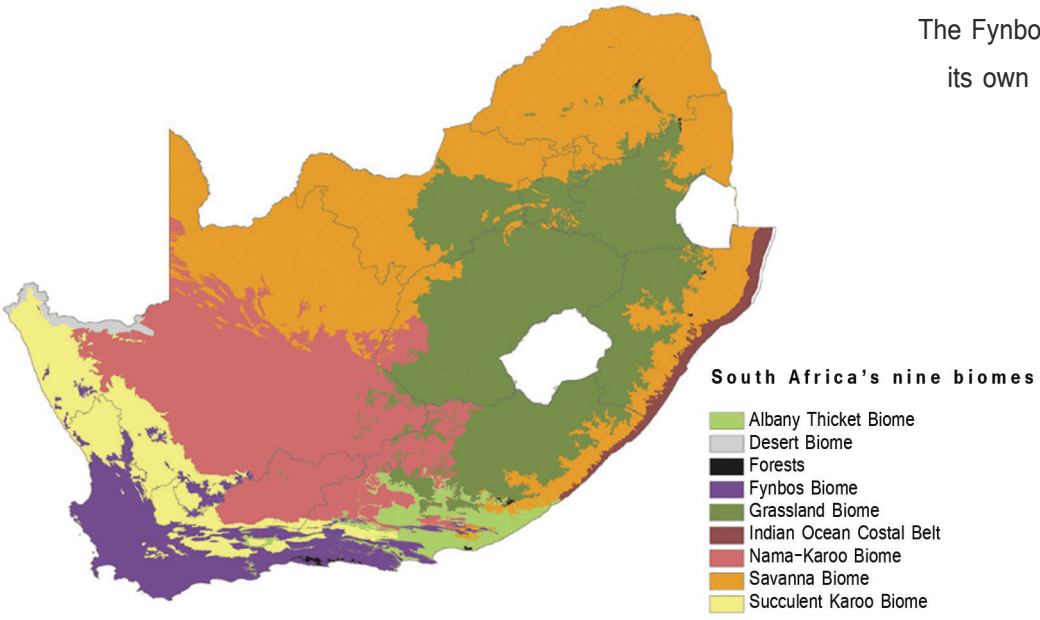


Fig 15

Solar radiations shows the hot and arid area in which the Fynbos grows.

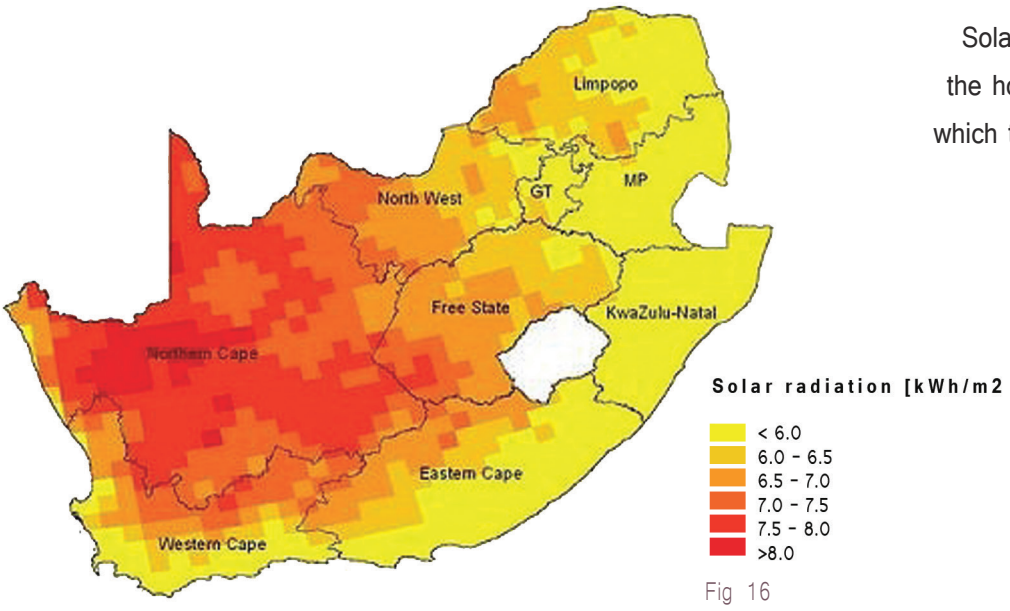


Fig 16

This harsh sandstone soil forms the perfect environment for Fynbos. The botanical kingdom is split into six types of flora, Fynbos is the smallest one and the only type to be found in a small region of South Africa alone, mainly in the Western Cape. It is also the most diverse plant species found per square kilometre than anywhere else in the world. Fynbos, because of the harsh environment in which it grows, has adapted to survive. Its natural habitat has more fires than most and so the Fynbos plant has been designed so that it flourishes after each blaze. Fire, instead of destroying ignites the growth of the plant and it is therefore very rare to find a Fynbos plant that is over twenty years old.
As previously discussed, the early Dutch settlers named the plants of the region Fynbos, meaning 'small leaves'. The plant has developed like this in order to protect itself against the sun and harsh climate and to limit the loss of moisture through the leaves. These plants have all adapted to outwit and survive the extremely variable climate. The area experiences very high temperatures in summer, very cold winters and rain only in the winter and each plant has devised a clever solution to thrive in this landscape. For instance the Buchu plant, this Fynbos variety is part of the citrus family and releases a beautiful scent and so is often farmed and sent to France where it is used in commercial perfume production. Its tiny leaves contain oil ducts which send out a small mist which surrounds the plant during the extremely hot summers, this protects the Buchu varieties from being eaten by insects when its leaves are most needed. It then blooms in late winter or early spring when there are fewer insects and no mist is required and so that it can attract the pollinators so necessary for its ultimate survival.

Although, for most of the year many people see Fynbos as a rather drab shrub on the side of the road or on mountain slopes, it is greatly misunderstood as it is in hibernation, trying to survive the extreme conditions and make it to the rainy season but even so, each type of Fynbos, of which there are thousands has an aesthetic individualism. As with most species, the growing period for Fynbos is in the summer but it is in the winter when the rains occur that the miracle happens. These rains do not only bring relief to the farmers but also to the Fynbos. They open a door to the fury of bright and beautiful colours that emerge from the species. Each plant is different from the next and each unique but together they form a blanket over the Cederberg region of complete beauty, each plant trying to outdo the other in the ever more colourful flowers they produce in order to attract the insects for pollination and so to survive another year.

Fig 17

Fig 18

Fynbos, as mentioned grows in summer but as with all plants it needs water to do this and to survive the hot, dry summers, but as the Fynbos species grows in the Western Cape it receives only winter rainfall. The secret of its endurance goes back to the geology of the area and can be found in the rock formation. When it rains the sandstone rock absorbs the rain like a giant sponge. As the weather starts to warm up the water is slowly released. Some of it forms streams or merges into rivers, but most of the water seeps into the soil, the long roots of the Fynbos tap into this water, helping the plants to survive and even grow when there is no rain. The root systems are enormous, digging deep down into the crevices of the sandstone for the moisture that will mean life. The geology of the area makes it possible for the Fynbos to grow and so these plants have adapted to their landscape with each having formed different ways of surviving.

Through this evolution of environment with the landscape, like the natural features of the land so too did the human element have to change and adapt to the environment. Learning and exploring the landscape, the Khoisan people, who were first indigenous to the area, learnt much from the land and were completely reliant on it for survival, much like the Fynbos. As they discovered new uses for plants or sand, so it seeped into their culture and traditions like using Rooibos as a sweet drink and other types of Fynbos to cure medical problems. The Khoisan also discovered that ochre, which is an iron oxide that occurs naturally in river beds as a soft, finely grained mud-stone, could be used to draw on rock faces. The expression of the Khoisan rock paintings is one of a sensual experience, using the rock face of the sandstone as their canvas, an intimate connection to explain personal stories of day to day living that ultimately describes the life they lived. After viewing them, one feels personally connected to the experiences they went through. These paintings are set in a gallery of the landscape. Hundreds of years old, they tell their story, with visitors lucky enough to view the exhibition, but unlike galleries which change their exhibitions frequently, these will stay for decades or even hundreds more years or until the authority of time and decay see fit. As in a gallery the space between the objects has a connotation of emptiness. While in a landscape that is not empty, this space defines their relationship. (Cited Baudrillard, 1996;61) Each Fynbos plant and tree, where the architecture is sited or how the river moves through the landscape, has been placed with the intention to create a gap between and have that pause space intervene for a time of contemplation. The architecture should form the framing device for those spaces between so that new life can flourish within the 'empty spaces' in the landscape and form a strong relationship between inhabitant and environment.

There is a strong movement to de-sensualised living in the modern world, a step away from reality, forever in the next space, never dealing with the now. Painting and exploring one's self-expression have moved away from those simple rock paintings using fingers and ochre, to a de-sensualised form of expression removing the intimacy that one feels in the fragility of the landscape. The weathered and aged paintings speak volumes of what the landscape has undergone and make them that much more valuable. The Fynbos and rock paintings are merely decorations above a level that speaks so much more of the time and the fragility of nature than what lies beneath the surface. Millions of years have shaped the landscape of the Cederberg, where rocky outcrops force themselves out into the light and expose the thousands of years that have come before imprinted into the layers of rock, telling the stories the landscapes have lived through like the circles on the trunk of an old tree. Like the ruins that remain within the landscape, so too must this new piece of architecture be able to weather and age in the temporality of this landscape and be able to let nature take over once again when the centre's use becomes redundant.

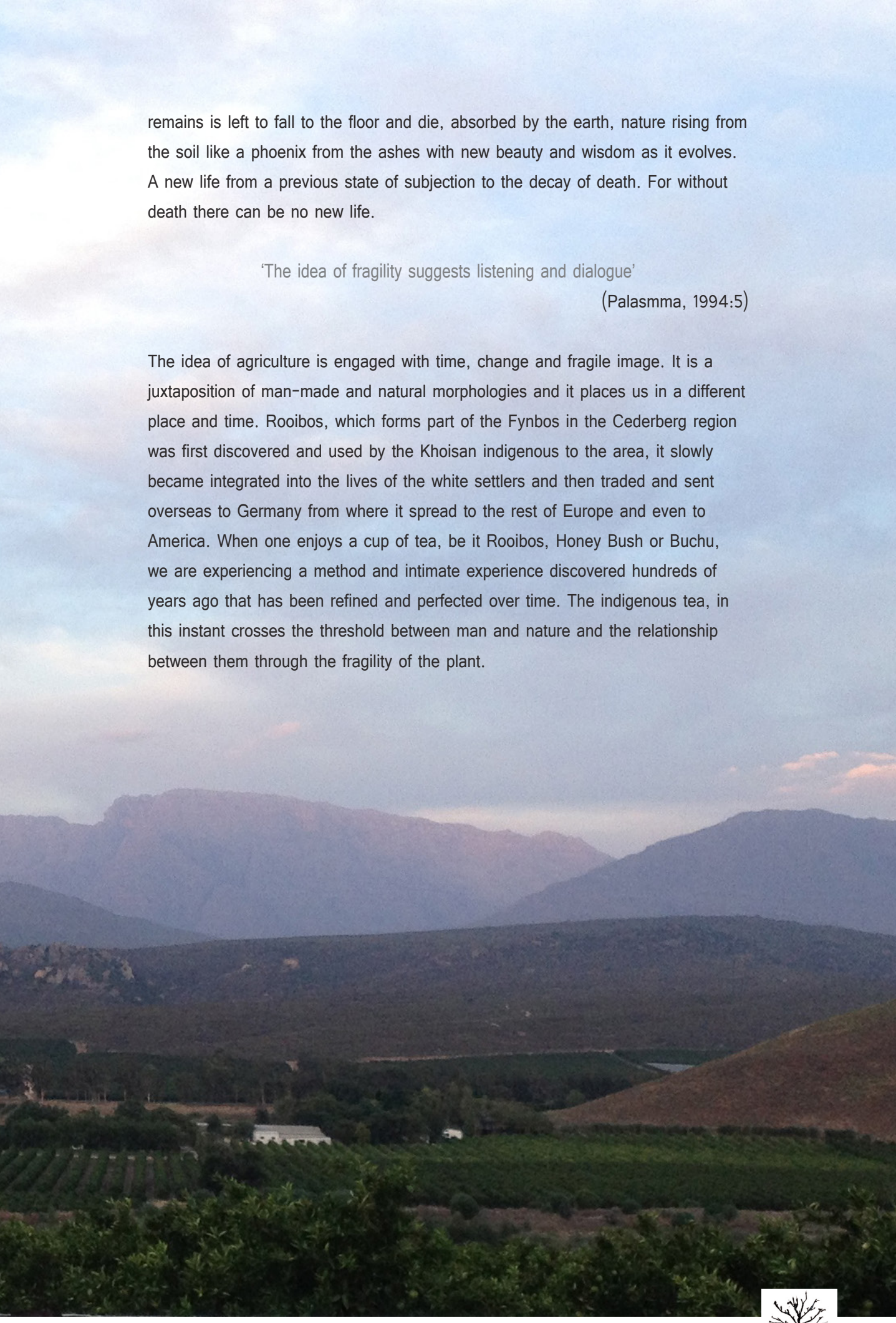
Clanwilliam and the whole Cederberg region is a maze of agriculture colouring the landscape with sweet smells of citrus and tea. Rows of produce all emerging from the land, establishing a new order out of the randomness of the area to reproduce new life. Everything is always dying and regenerating. After each harvest what

remains is left to fall to the floor and die, absorbed by the earth, nature rising from the soil like a phoenix from the ashes with new beauty and wisdom as it evolves. A new life from a previous state of subjection to the decay of death. For without death there can be no new life.

'The idea of fragility suggests listening and dialogue'

(Palasmma, 1994:5)

The idea of agriculture is engaged with time, change and fragile image. It is a juxtaposition of man-made and natural morphologies and it places us in a different place and time. Rooibos, which forms part of the Fynbos in the Cederberg region was first discovered and used by the Khoisan indigenous to the area, it slowly became integrated into the lives of the white settlers and then traded and sent overseas to Germany from where it spread to the rest of Europe and even to America. When one enjoys a cup of tea, be it Rooibos, Honey Bush or Buchu, we are experiencing a method and intimate experience discovered hundreds of years ago that has been refined and perfected over time. The indigenous tea, in this instant crosses the threshold between man and nature and the relationship between them through the fragility of the plant.



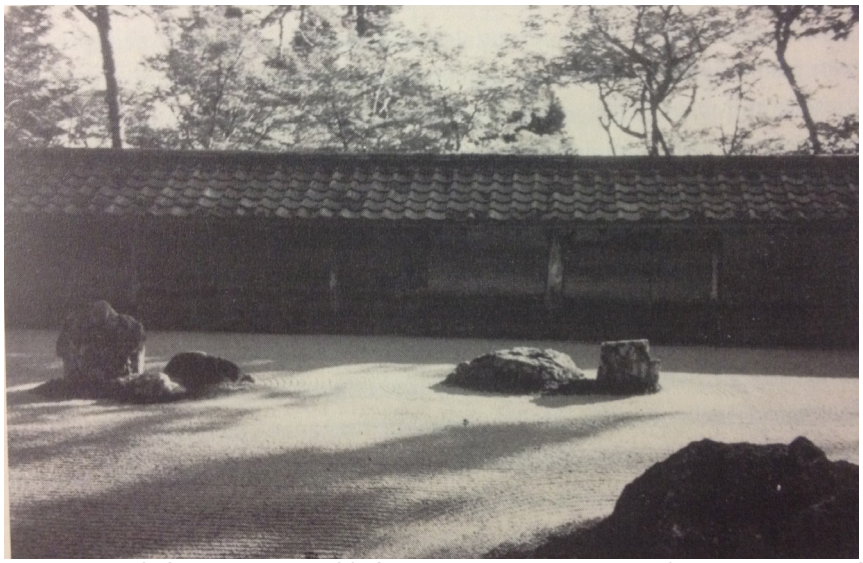


Fig 19:*Central Park*, Fig 20:*Garden Vaux-Le-Vicomte*, Fig 21:*Japanese Kare-Sansui*.

The Khoisan lived off the land and the landscape formed their architecture and daily means, the rock face their canvas and the soil their form of expression. They lived off the earth and in doing so discovered a number of unique treasures such as the Rooibos, Buchu and Honey Bush plants, all types of indigenous Fynbos, and the extraordinary value lying within each of the plants.

From nature all is gathered and it is with our imagination that we collect and build onto the knowledge that the landscape has given us. The passing of seasons, death and the renewal of life all forming part of our collections of memory over time, with the spatial richness of the landscape adding the flavour. (Crow, 1995;4) All built form is created within nature and becomes a type of 'second nature', a world within a world, trying to create a space into which we can settle and thrive in much the same way as the early settlers. Trying to recreate the perfection that nature has already achieved over millions of years as 'the fundamental sources of all our knowledge, however, still remain rooted in nature' (Crowe, 1995;4).

Although the relationship between the human intervention and nature is a complex one, perhaps the design of the garden shows this relationship in a more transparent way. Architect Norman Crowe uses as an example three types of garden designs that are all fundamentally different but which deal with the landscape and the built form within, Central Park in New York, Vaux-Le-Vicomte in France and a Japanese Kare-Sansui Dry Garden. Central Park gives the illusion that it was the original landscape of New York and the heavily dense built form grew up around it, the park was actually designed and constructed, with lakes created and boulders brought in and placed to try and create a natural feeling in touch with the cosmic body, bringing primal elements to create a space that people would be able to retreat to. New York became such a built up urban environment that it needed a pause space, a sense of nature for people to escape to. Vaux-Le-Vicomte is possibly the complete opposite in the thinking behind the design of the garden from that of Central Park. This garden landscape is not trying to pretend it is a natural landscape but rather it reorders nature with the grand house at its centre, creating an 'idealized world of perfect geometry' (Crowe, 1995;15). This is a very classical approach and looks to symmetry and composition for its order within the landscape, juxtaposed against the surrounding natural woods which exemplify the order of the garden. The Japanese Kare-Sansui Garden is a metaphor for the built form within the dry garden. The sand, symbolising the sea, is raked each day, a contemplative action which allows the visitor to think of the 'ever changing patterns on the surface of the sea' (Crowe, 1995;15). Central Park is nature replicated within an urban frame, Vaux-Le-Vicomte is a geometrical urban form made from nature in a rural setting, but the Japanese Kare-Sansui is

perhaps the only type of garden that acts as a metaphor for the natural landscape and form before human invasion started to dominate it.

Each of the three gardens is an example of the history and culture of the particular setting and the influence is clear. Each, however different, still becomes a creation of the gardener, its maker, and over time each garden too will become dependent and incapable of surviving without them. This breaks the connection of the garden with nature and is then forced to rely on, and require the human hand for survival in its superficial landscape. (Crowe, 1995;14-20) The art of the Japanese garden is engaged with time, change and the idea of the fragile image. It is an architecture that can be liberated from the manufactured geometry, a juxtaposition of the man-made and natural morphologies; an architecture that puts us in a different place and time and explores the threshold between man and the surrounding landscape.

'The rural landscape ... can give rise to careful observation, one in which the eye grows restful and contemplative'

(Birksted, 1999:3)

Mara Millar writes in her essay, Time and Temporarily in Japanese Gardens how Japanese architecture is submerged within its surroundings and that the gardens are acutely unique in their design and sensory involvement as everything within them is from the local habitat making the gardens very site specific. They use natural materials, locally sourced and focus on creating a calm environment meant for reflection. It can, perhaps be said that they are so popular within the Japanese culture as they offer what the cities are lacking - in an industrialised world coming back to nature and natural

elements in a space of calm. They also represent time that the visitor is able to control and structure, which is often not the case in our daily lives. Different scales of time are made evident through the use of nature, such as showing seasons passing through the planting of trees, and geological time by using moss that only grows in certain conditions. The garden plays with all the senses; using light and shadow to create different realms of 'space'. The noise of running water not only focusses our hearing but also shows the passing of time as is traditional in Buddhist culture.
This theory of time within the garden, however was interpreted differently in other parts of the world. In England in the 18th century, the great gardens were planned and planted for the future, such as trees that would grow large and remain for generations, looking at time in the long term, whereas Louis XIV in his gardens in Versailles required that they were adjusted seasonally. Japanese gardens would bring the history of time through the use of regionalism such as placing fences used in the local farming community or lights shaped as they had been historically. The gardens create an intimate interaction with the environment as they are always changing and developing, creating different personal experiences for each person who visits.
In order to create an architecture within the landscape that is more prominent than just the garden, but of walls and spaces, understanding the time and decay of the site is important, it must be sensitive to frame the external environment from within. Just as by looking at a face one can see memories etched, so through contact with the materials and elements of a site and the complexity and texture they hold, a new depth is revealed from within the landscape.

The Cederberg region was formed over millions of years creating the sandstone and equally importantly, the sand that becomes the soil of the area, all of which form the harsh and isolating environment in which the Fynbos thrives. The fire that, instead of destroying, brings a rejuvenation and a new start to the landscape, and the rains which bring an immense abundance of beauty in the floral display that covers the region once a year and then the products of the Fynbos plant which enable pieces of the region to travel all over the world and which will, perhaps ensure its continued being. The landscape has created a perfectly balanced language between each facet that together is completely in harmony. There is a linearisation within each joining element, like how the rock paintings are drawn on sandstone which is the only place where Rooibos grows, which is the same colour as the deep red ochre which is used in the paintings and comes from the riverbeds which helped to create the sandstone and sand which allows the area to grow.

INTERVIEW: Carl Anhaeusser

Geologist

I met with Professor Carl Anhaeusser who works in the Witwatersrand School of Geosciences in economic geology research, to understand a bit more about the land formations in the Cederberg area that have become the home of the Fynbos species.

He explained that the soil found in the Cederburg area derives from the erosion of what is called the Table Mountain Group, which forms a siliceous, whitish, fine ground sand, covering an area which extends down past Port Elizabeth, across to Cape Town and then up the west coast towards Clanwilliam, so as Professor Anhaeusser noted, there must be something additional in the soil that makes the Rooibos prefer only that small Clanwilliam area, probably a combination of climate, soil and maybe something else that we don't even know about.

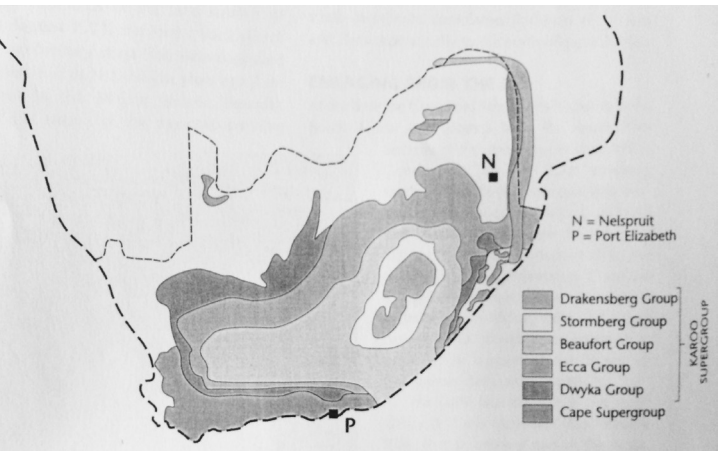
The Cederberg was formed over five hundred and fifty million years ago. The Cape Super Group had formed before the continents broke apart and is made up of three different formations, the Table Mountain Group at the base, which is overlain by the Bokkeveld Group and finally both groups are overlain by the Witteburg Group – forming three layers of rocks stacked on top of each other, all with different distinguishing geological characteristics but the main sandstone component is found in the Table Mountain Group. There was an elevated region to the north of the Cape area which was eroded down into the rivers which formed a delta area or shallow ocean where the sand was deposited, the waves of this sea cleaned the sand of impurities, leaving behind the sandy quartz like material which makes up the bulk of the Table Mountain Group. In short, the whole region underwent erosion, deposition into deltas that led into a shallow ocean where the deposits gathered and then subsequent geological events caused the area to be crumpled, so that you get the whole sea area being buckled and producing the mountain chain.

After the crumpling, other tectonic events occurred which crushed the rocks and they were then squeezed into a strongly deformed mountainous region. The rocks had been laid down as sand initially and with time, the load of more material

deposited on top caused the sand to crush together and form quartzite, a very hard rock. The lose sand compacted and a pressure reaction caused the grains to weld together forming quartzite. So, millions of years ago, that layer developed and then was compacted, deformed and produced the mountainous chain that extends all the way around the Cape.

Professor Anhaeusser explained that when the sediment was deposited in the relatively shallow ocean, the marine environment promoted certain types of early life, which can still be found in the Cederberg and other areas as fossils. After the Cape Group Mountains were formed they were covered by the Karoo and then the two were involved in crushing because of tectonic movement with Antarctica pushing up and even folding the Karoo rocks.

When explaining how the present soil evolved, Professor Anhaeusser noted that whatever goes up must eventually come down, as a mountain goes up by being squeezed tectonically, as soon as it goes above sea level it starts to erode which may take longer in certain areas than others, initially rocks will shed off the high peaks being slowly worn down to sand until it forms a screed which lies on the slopes of the hills. So, it first starts as a sand, forms into a hard rock and then breaks up again, a cycle that goes on and on. The whole region underlain by the Table Mountain Group does contain some sediments but the dominant rock is a quartzite or a sandstone, when that breaks up it produces a sandy material which is generally very siliceous without any obvious minerals like iron and calcium but there do seem to be some clay minerals and units of shale which will both add a little quality to the soil. Because silica soils are relatively sterile, they support a specific kind of vegetation like the Protea, but, as the Professor noted, clearly there must be some nutrient in the soil that allows the diversified flora of the Cape to thrive, although he thought a lot of this was due to adaptation of the plants to the environment. The soil contains enough nutrients to sustain the vineyard system to the south and the citrus to the north, but as he noted, some plants just like to struggle, but he couldn't say exactly what is in the soil that helps them survive.



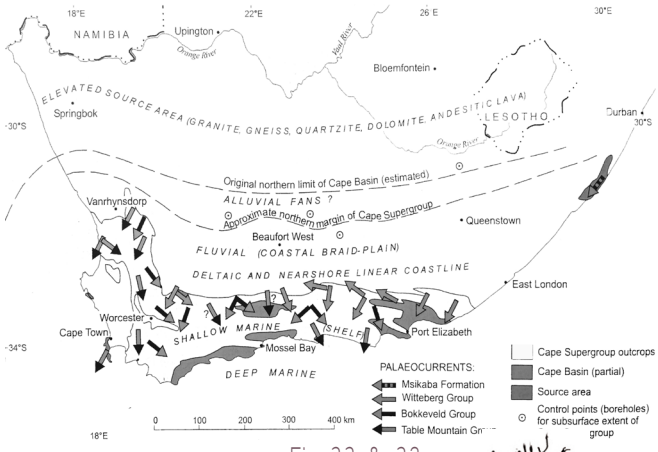


Fig 22 & 23

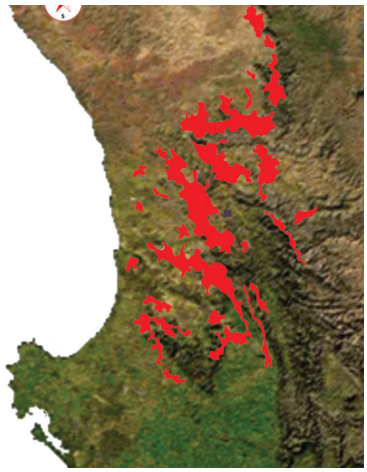
r o o i b o s

'Architecture is a little bit like agriculture in as much as it needs the cross fertilisation of ideas to produce new, stronger vigorous forms……life giving, life changing, game changing.'

(McCloud, K)

Rooibos formed the initial reason for the siting of the thesis within Clanwilliam as it is the only town that benefits directly from the Rooibos plant, or Aspalathus Linearis as it is scientifically known. This special plant has become famous for the warm drink produced from its leaves as well as other inherent qualities which are still being researched.

The history of Rooibos has many claims on who first found it but according to Rooibos LTD, the biggest Rooibos producer, in 1904, a German settler named Benjamin Ginsberg first realised the red tea the local people drank was something special. He was a merchant and was the first person to start exporting the drink to Europe. He bought it from the local Khoisan people who produced a tea from the plant during the summer months.



Only by 1930 was the tea properly recognised for its additional health benefits and the foundation of the Rooibos industry began. The farmers increased their production as the demand for Rooibos escalated and the area needed for cultivation grew to 36 000 hectares, mainly in and around Clanwilliam and the Cederberg Region. As the area needed for cultivation increased, more and more pressure was placed on the natural biodiversity of the area, which was mostly Fynbos. The Biodiversity Initiative was formed to control the expansion of the Rooibos fields and minimise the damage to the natural landscape and destruction of the Fynbos.

Rooibos tea used to be made up of a mixture of different types of Rooibos species (Aspalahus species) from the Cederberg region, but today it is made using only the 'red ' or 'Rocklands' type to ensure quality. This Rooibos is further divided into two different categories, the Nortier type which is cultivated, and the Cederberg type, which is grown wild.

The Cederberg type has broader, coarser leaves, whereas the Nortier type has leaves which are bright green, and needle-like, forming on straight, slender branches with relatively short inter nodes. Both types of leaves go red when bruised.

The Rooibos tea market grew in demand because of the shortage of oriental tea as a result of the Second World War. The Clanwilliam Co-operative Company was formed in 1948 to improve marketing conditions for the Rooibos tea producers. In 1954 the Rooibos Tea Control Board was established to help stabilise the industry in what was an unreliable market. The Rooibos Tea Control Board was eventually abolished and replaced in 2005 when the South African Rooibos Council (SARC) was established to coordinate marketing and deal with research, development and sustainable natural resource management. (Joubert, E. 2011)

The industry has grown from strength to strength so that the unique goodness of Rooibos may today be enjoyed by people all over the world. The area surrounding Clanwilliam is the only place in the world where Rooibos is cultivated as an agricultural crop. It is processed, packaged and dispatched worldwide, with more than 2,000 metric tons being exported annually. Seventy-five farmers from Wupperthal and surrounding communities currently participate in a programme moving from wild harvesting to sustainable cultivation of a product suitable for export to the world market. Many of these farmers used to harvest the Rooibos in the wild. Growing Rooibos organically is not particularly difficult and brings farmers a better price. As a result, all the Wupperthal farmers are now growing Rooibos organically. (www.wupperthal.co.za)

Fig 24

c o n s e r v a t i o n

South Africa's conservation of Fynbos is critical for the survival of this botanical treasure and it is important to promote the species by raising people's awareness, through education of biodiversity, particularly in the Cederberg's biome, and to cultivate a sensitivity for the conservation. Further research into some of these plants will, it is believed, help with the conservation of Fynbos. Many people don't realise that although there may be many nature reserves which protect Fynbos, each area has a very unique type of Fynbos dependent on that specific region. So it is important that as much Fynbos is protected throughout the Western Cape as possible, as once it is gone, a whole variety could have been obliterated which will never be found again.

The discovery of certain types of Fynbos such as Rooibos, Buchu and Honey Bush has brought the added benefit of an economic value to Fynbos. Scientific investigation into Rooibos has instigated many claims of its health and cosmetic value stating to its impact on cancer and diabetes. Research into Rooibos has only just begun and researchers believe that they have only skimmed the surface of what could be other benefits of the plant. The development of Green Rooibos tea is a new innovation, with research into it at an embryonic stage, compared to the vast amount done into normal green tea. Research into the Buchu and Honey Bush plants is also still in the early stages with many new discoveries lying ahead.

Although Buchu and Honey Bush tea production are new industries and still very young in terms of processing and demand, the clamour for Rooibos has sky rocketed over the last few years with its promises of health and beauty benefits. By jumping on the Rooibos brand, people can be educated about the importance of preserving the Fynbos flora. No Fynbos – no Rooibos.

INTERVIEW: Lizette Joubert

Specialist researcher

Lizette Joubert is a specialist researcher working at the Agriculture Research Council of South Africa (ARC). I met with her at her offices in Stellenbosch where she was able to tell me about some of her research into Rooibos and other types of Fynbos.

Lizette's background of how she became interested in Rooibos research was that she had a bursary from the Department of Agriculture and they asked if she wanted to stay with them to complete her Masters, at that stage the department had a problem with their Rooibos research, there was lots of waste in the sealing process, and so she became involved in solving this and then stayed. Lizette's first trip to Clanwilliam was in 1981 and then in 1984 there was a problem with salmonella contamination and all the tea had to be withdrawn, she was then involved in working on the steam pasteurisation system which is now used to sterilise the tea. She observed that processing was now more mechanised but that the method used is still the same, using open air processing as it takes a certain time to develop colour and flavour which is still dependent on nature. The only other innovation that has been introduced is Green Rooibos, which derived from Lizette's research and only because she thought that if the Japanese can drink green tea, then maybe Green Rooibos would also work. Initially, everybody thought that she was mad but Green Rooibos now makes up a small segment of the market. Then, in early 2000 a company in Paarl started to make extracts, the process which Lizette had pioneered during her Masters, taking sixteen years until the research information was taken up by industry. The extracts are removed using a hot water process, with another process used to concentrate it, the results are then spray dried ending in a powder which is used in all kinds of food products and beverages, as well as creams and cosmetics. Lizette said that she is probably the longest living researcher involved in Rooibos because the previous one had been her professor and he had died in 1980, he had done his Masters on the composition of Rooibos in the late fifties. Lizette thinks that further research into the Rooibos plant is very important and that researchers are still just scratching the surface of its unique properties. She said if you compare research into Japanese green tea, there are thousands of papers on its properties, and there are not even ten percent of that on Rooibos so there are so many things still to be researched.

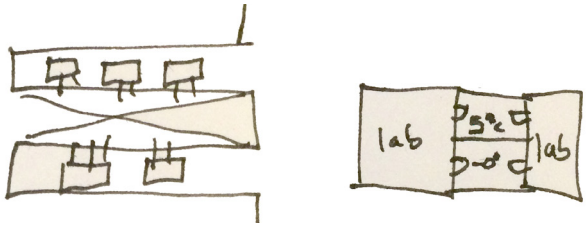
Lizette explained that she had been working on a six year project focusing on the development of objective quality parameters, the first phase had developed a Honey Bush century wheel which is a quality control tool, it was then validated and refined and a flavour kit is still in the process of being developed. This will help differentiate the flavours and could be used in quality control, using shared terminology so as to standarise the industry. The other research Lizette is currently busy with is to study the medical properties of Rooibos which she is working on with the Medical Research Council. Lizette is also involved with the Diabetes Discovery Group, looking at properties of Fynbos that might be linked to the metabolic syndrome, obesity and insulin resistance. A lot of work has also been done on how Rooibos could help with various cancers and ARC had been investigating properties of the plant that could help with skin cancer.

The Rooibos Council has funded a lot of the work, as has a spice company from Germany who were interested in the extracts and the anti-oxidants, and who have funded the unit for over eight years.

The unit concentrates mostly on research into Honey Bush and Rooibos and they are finding the same medicinal properties in Honey Bush as they have found in Rooibos. Lizette observed that the Honey Bush industry is still very young but it has more species than Rooibos, so has more potential in terms of flavour. The Honey Bush industry is still very small though compared to Rooibos, although growing fast.

Lizette noted that a sterile environment is not essential as they are food scientists, so their biggest interest is processing and analytical work. She noted that if you produce a food product there must be certification, if it is anything medicinal, guidelines from the pharmaceutical industry must be used which are very strict and you cannot use the same laboratories for both streams, the food additives and the medical would have to be split. Because of these complications and strict guidelines, Lizette's advice was that the research centre proposed by this thesis should concentrate on research into the extracts and medical properties and leave the production entirely, outsourcing that if necessary.

Lizette felt that in a laboratory, ideally what was needed was a dust free environment with strong extractors, no direct light, space, and storage. Storage could be shared by different laboratories, using a middle area between them, ideally the storage should go from freezing to cold, having a walk-in fridge, coupled with an adjacent cold storeroom. She said that there should be an additional walk-in fridge for overflows or in case there is a breakdown so that samples are not destroyed. They would also need small generators that kick in immediately while waiting for the main generator in case of power failures, again so that the research would not be lost. The most important thing is that the samples have to be protected because if you lose samples that you have worked a year to collect, all the work is gone and that will cost a couple of hundred thousand rand, notwithstanding how far it would put the research back. The researchers need laboratories with high density light but they would also need a space to work that is not over lit and bad for their eyes. A way of solving that would be to have controls on the lights to turn them from fluorescent down to more subdued low intensity lighting. Samples, with a few exceptions would be kept in the laboratories and storage areas and not taken to the office area. No food is allowed in the laboratory area although a separate room to make beverages, off the laboratories, would be welcomed by the researchers.



Space behind the machines is needed for access, as well as lots of storage and refrigerators for samples.

CASE STUDY: Kenilworth Racecourse

Cape Flats

A case study of the Kenilworth Racecourse in the Cape Flats area in Cape Town found that Fynbos was not protected due to ignorance. The area of the Cape Flats is the only area in the world where Cape Flats Sand Fynbos naturally occurs and during the development of the area, this specific type of Fynbos was almost eradicated. The Cape Flats Sand Fynbos is now at a vulnerable status and conservation is crucial to its survival. The only remaining specimens can be found in the centre of the Kenilworth Racecourse.

In 1882 the race track was implemented and zoned as a conservation area having been identified as one of 35 core botanical sites in the country. This was not adhered to and wide development occurred eradicating much of the natural Fynbos and veld including the extinction of Erica Turgida, a type of Fynbos found only in this region, due to a development adjacent to Kenilworth Racecourse obliterating the remaining population.

Between 1991 and 2005, Cape Nature took over the management of the conservation area. In 2006 an agreement was established between the City of Cape Town Biodiversity Management Branch, Gold Circle and Cape Nature; a conservation management team was put in place and Kenilworth Racecourse Conservation Area (KRCA) was formed. Since the establishment of the KRCA in 2006, much of the area in the centre of the track has been rehabilitated, and this is continuing at present with scheduled fires being set and controlled when necessary and if possible.

The KRCA is an area of 52 hectare, forming one of the largest stretches of natural

Fig 25

vegetation remaining in Cape Town's southern suburbs. KRCA's Fynbos is of great historic and cultural significance and is regarded as one of the only examples of Cape Flats Sand Fynbos remaining on the Cape Peninsula. It is home to at least 300 different plant species including 34 on the Red Data List, as well as amphibian species such as micro frog pans, paint beck tortoises, as well as lizards and snakes all indigenous to the area. Alien monitoring and clearing is critical to this habitat with early detection and rapid response crucial to its elimination.

The centre of the racecourse, due to management problems was not previously under a fire regime but now, under the KRCA, it follows a strict 10 to 15 year protocol making sure the Fynbos is burnt and controlled with the help and presence of the fire department as well as many volunteers.

The KRCA is managed by Rob Slater who spoke about the issues facing the organisation. The first was a lack of staff, there are three permanent office workers who help with tours and research, three volunteers, a supervisor, four workers and then students sent from Cape Nature, so the team is fairly small for such a large area of land. There are a few programmes running on conservation which invite the public to come and learn more about the KRCA. The tours include frog and wetland walks to try and promote community conservation. The walks take children and adults on guided tours through the conservation and help to create awareness. There is no environment centre, just a small field office adjacent to the parking lot which makes it difficult for visitors, especially with small children as the tours have to use Kenilworth Racecourse facilities which are far and out of the way. The walks aid in the monitoring and management of the conservation. There are external bodies who come to the KRCA for research, both for population studies, botanical research and to collect samples to research and study.

The micro climate is very important to the conservation of the KRCA as the area must remain pure and uncontaminated, with no cross breeding. With the frogs, instant DNA testing is done to see if they are interbreeding, in which case they will be removed from the conservation area.

The endangered Fynbos is being conserved with the habitat closely surveyed as well as by rehabilitating certain types of Fynbos in the nursery which is close to their offices. Once these plants have grown to a particular size they are then replanted into the conservation area.

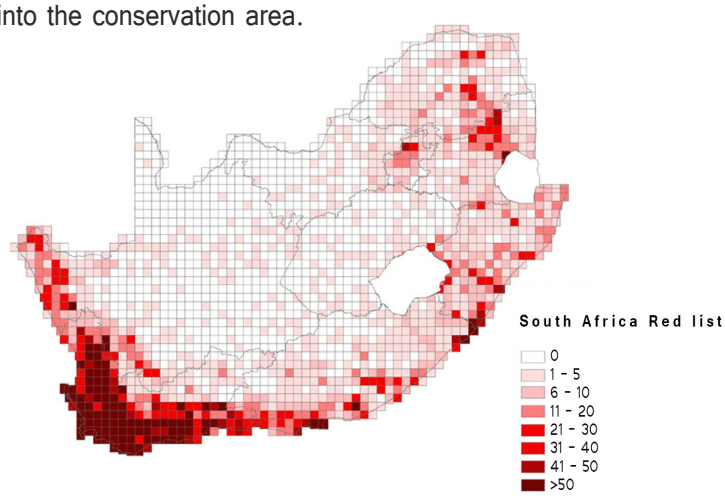


Fig 26

AUTUMN

01_Concept

02_Design Development

- Programme: Funding & Structure
  Accommodation Schedule

- Design Process: Design Development
  Design Process
  Site Informants

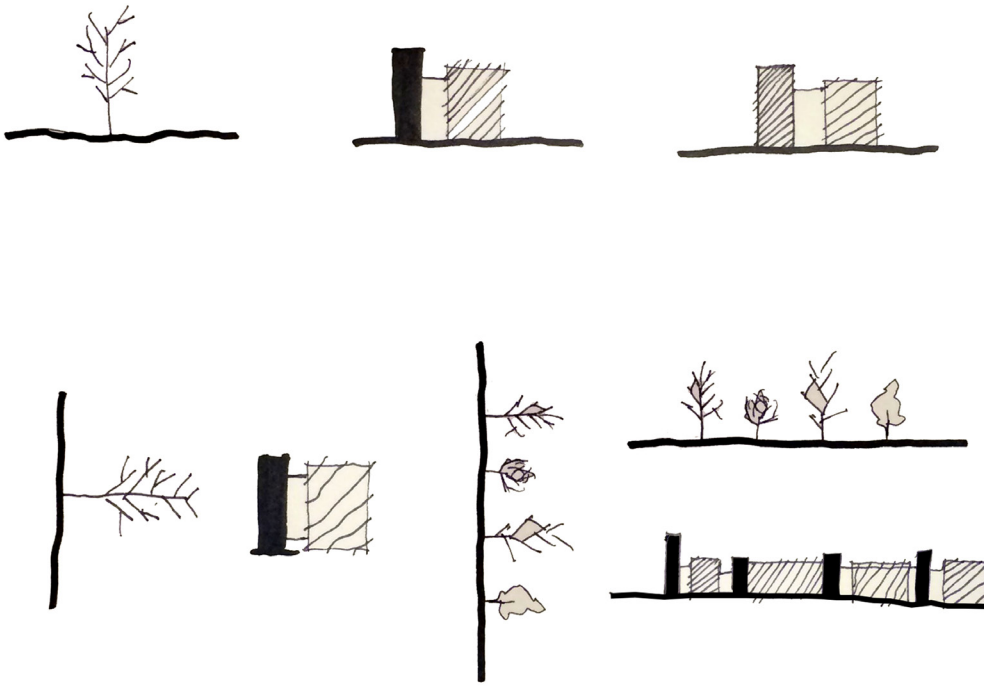
- Detail: Materiality
  Light and Shadow
  Water
  Fire

03_Precedents

- The Arc
- Jianamai Visitor Centre
- Essay: A Response To Landscape
- Steinkopf Community Centre

04_Sustainability

- Design
- The Garden

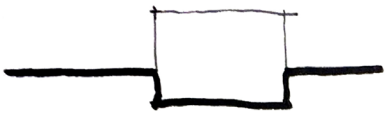


c o n c e p t

The building is a proposal for rethinking the local identity of the Cederberg, but most importantly the Fynbos and the landscape. Fynbos which is becoming extinct and landscape which is being exploited of its natural resources and beauty. Research into different methods of growing, harvesting and conserving will change the way the land is being depleted.
This building needs to shed light on the landscape and history of its geology and flora as an exhibition of itself. The structure aims not to be a piece of the land but rather a showcase of the geology and local environment inspired by the biodiversity and topography of Clanwilliam. The building grows organically, spreading out onto the site without overthrowing the natural balance. The rammed earth walls anchor the building to the landscape and show the type of geological formations below the sand.

The main concept for the building was the idea of the mighty sandstone rock formations that form the Cederberg region, from which these delicate and beautiful Fynbos flowers emerge once a year. The great rammed earth walls will be made from the soils of the area with light buildings clipped onto the sides. Taking design elements from the Fynbos and the harsh environment it survives, has greatly influenced the design. Looking specifically at water, fire, climate and Fynbos survival mechanisms has formed the placement and influencing factors of the building.

_Fynbos Survival Mechanisms



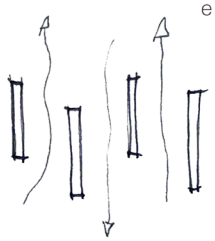
_Partially submerged

_Hairy to reduce water-loss

_Tall and narrow, face direction of the sun

_Air can easily flow

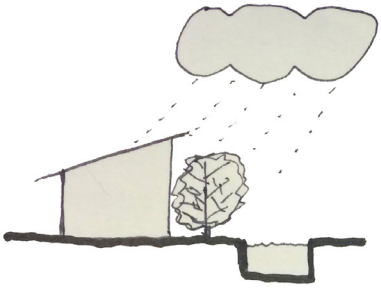
_Small and close to the ground



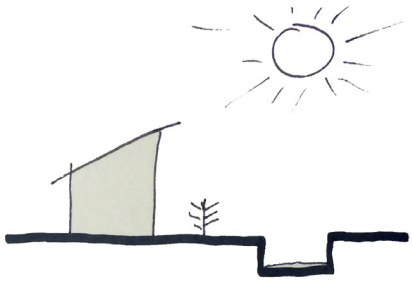
_Reflective

Inspired by the Fynbos plant, the buildings will be submerged into the ground to help with fire as well as insulation and protection from the extreme climate. Like Fynbos, the buildings are a collection of smaller structures close to the ground as a defence against the environment and fire, with light, linking spaces along the rammed earth walls.

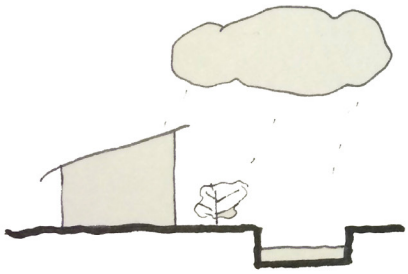
_Seasonal Considerations



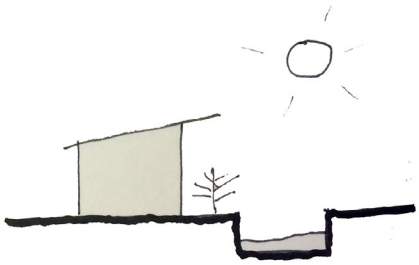
_Winter



_Summer

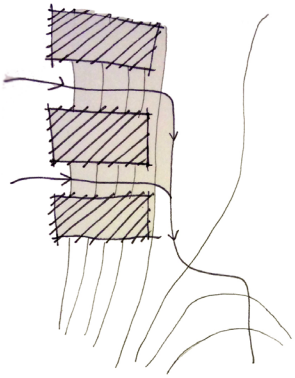


_Autumn

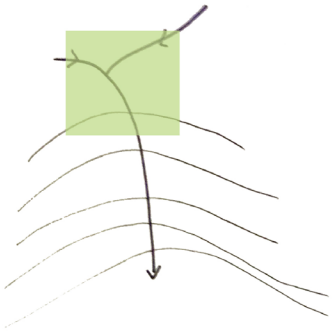


_Spring

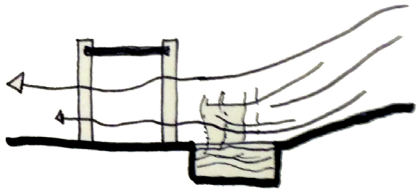
As this building is submerged into the landscape, the seasonal changes will certainly be felt and exploited within the design of the building,



_Water harvesting



_Building placement

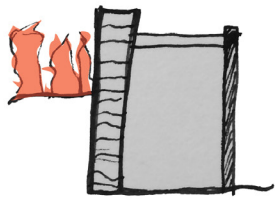


_Evaporative cooling

Water is life for the Fynbos and in such a harsh environment it becomes very valuable. For this reason the building has been placed in alignment with the contours of the land and at the top of a valley so as to be able to collect and use the natural water within the design, making visitors acutely aware of its presence or lack thereof.

_Submerged fire breaks

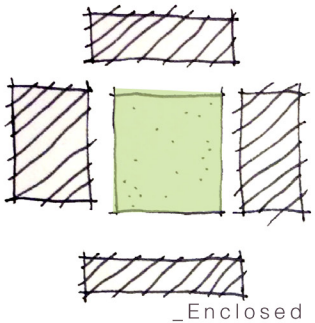
_Vegetation grading



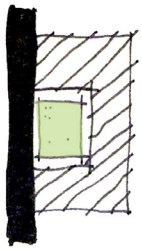
_Fireproof rammed earth walls

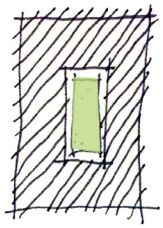
Fire brings life to the Fynbos plant but does not have the same effect on the built form. Fire ignites a regrowth in the species and helps the spread and replant of seeds and so is an important part of the Nature Reserve. Adding fire breaks around the building and using the sand that forms the soil of the Cederberg to create solid rammed earth walls, will protect the building from fire. The fire breaks will also be used as roads and walkways for visitors to the centre.

_Outdoor Spaces

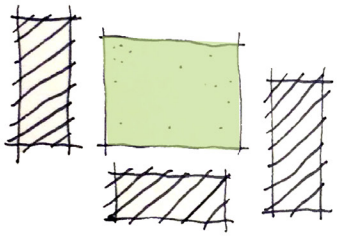


_Enclosed spaces

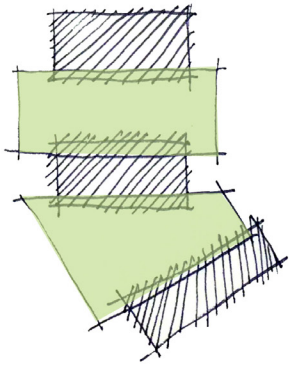




_Courtyard

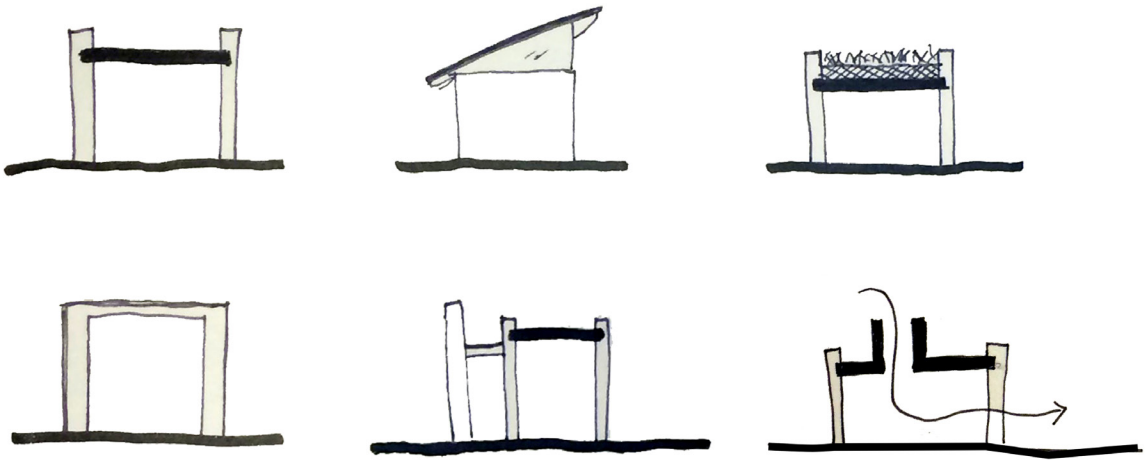


_Implied spaces

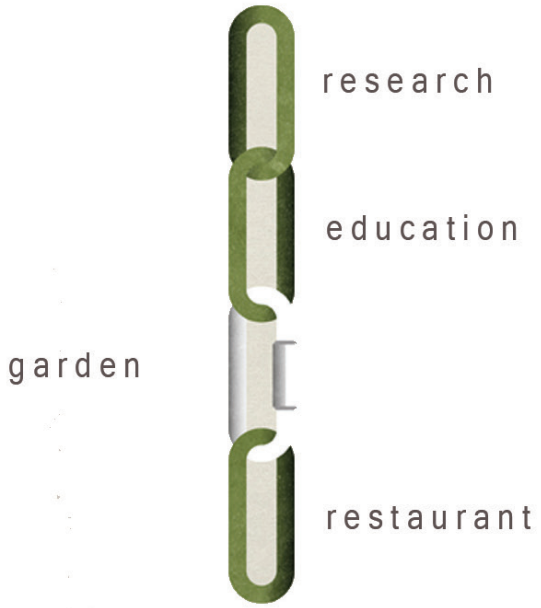


_In between spaces

Creating the open spaces in between the buildings and how the buildings are placed to form these protected areas is an important aspect of the design.



As this is a landscape project, the roof scape is very important and green roofs have been used so that the building can give the impression of falling into the landscape, creating an extension of the natural formations by allowing visitors to walk over them even if the building is closed.

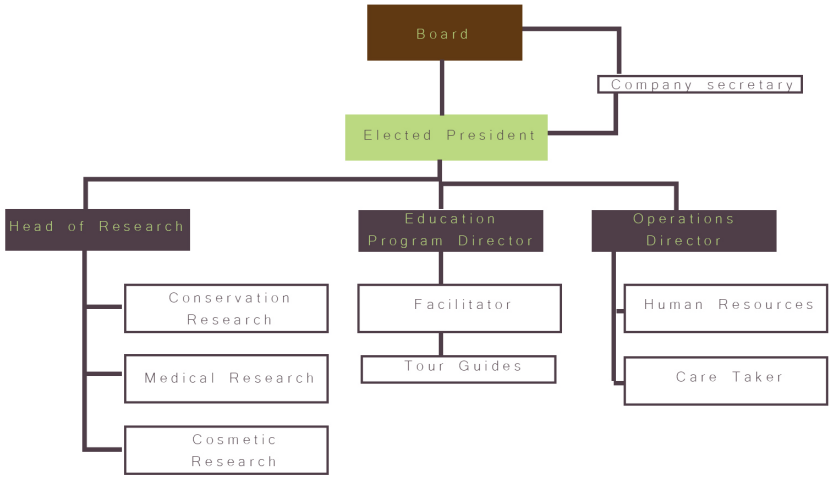

research
education
garden
restaurant

p r o g r a m m e

Conservation is an vitally important aspect in terms of Fynbos and the best way to save it is through education and the spread of knowledge about it. Through the discovery of certain types of Fynbos such as Rooibos, diverse uses have been uncovered for the plant, bringing economic value as well as the aesthetic. Since the discovery of Rooibos there have been many claims on its health and cosmetic values stating to its impact on cancer and diabetes. The involvement of a research centre intertwined with an education centre will help to inform visitors of its immense value. The Fynbos Research and Education Centre will help draw more visitors to Clanwilliam, which survives mainly on agriculture and the tourism the Fynbos already attracts. The centre would provide education for the community, teaching them about Fynbos and its many possibilities, providing jobs for guides who will conduct tours through the reserve, as well jobs involving maintenance and in the restaurant. One of the main purposes of the Research and Education Centre will be to bring people to the reserve throughout the year. With permanent research facilities it should be occupied all year, and the introduction of the education facilities will bring schools and tours to the reserve for seminars, lectures and guided walks through the Fynbos.

F u n d i n g & s t r u c t u r e

As this is a project which will endeavour to help educate people on Fynbos, protect and conserve the environment and conduct research into an endangered species, a non-profit company will be formed to benefit the public and not the private sector. The income and property may not be distributed to the incorporators, members, directors or officers of the non-profit company, except as reasonable compensation for services rendered by them. All of a non-profit organisation's assets and income must be used to advance its stated objectives, as set out in its Memorandum of Incorporation (MOI). As a minimum of three incorporators must complete and sign the MOI, each main client will nominate a director to head the board. If one of them steps down for some reason and needs to be replaced, another director will be found from within the institution that they resigned from. This will keep each client and the institution that they work for equally represented so that no one issue becomes the dominant force behind the centre.



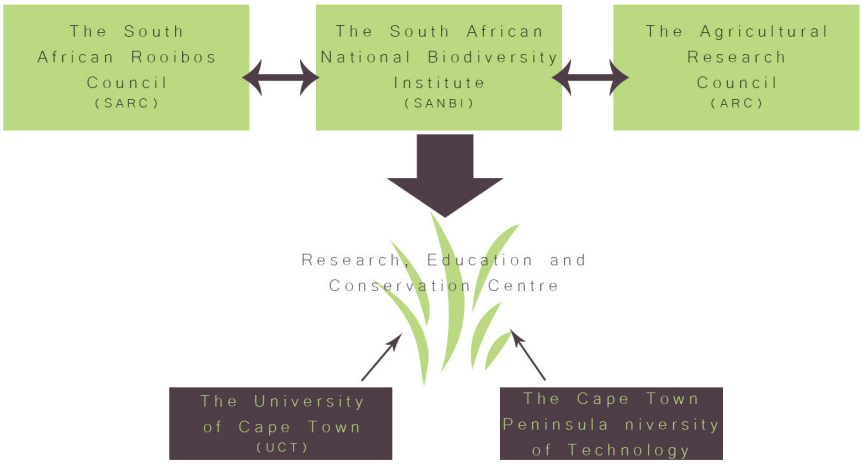
Proposed clients are the South African National Biodiversity Institute (SANBI), the South African Rooibos Council (SARC) and the Agricultural Research Council (ARC). The University of Cape Town (UCT) and the Cape Town Peninsula University of Technology (CTPU) would also make use of the institution but would not be the initial clients.

The SANBI, the SARC and the ARC would set up a non-profit organisation that could then enter into a partnership with other funders with an agreement in place. An example of this could be UCT and CTPU who could then each make an annual donation which would enable them to make use of the facilities.

SANBI is currently involved in leading and coordinating research in South Africa. The institute is presently monitoring the state of biodiversity in the country and helps with policy advice and information. They would be one of the main clients as although they would not work at the centre at all, the information and research

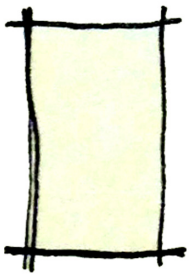
would be of great value to them. The SANBI looks after the Botanical Gardens in Cape Town as a way of educating and exposing biodiversity for enjoyment and education and the centre outside Clanwilliam would be an additional 'window' for people to view the Cederberg's rare biome.

The SARC was established as a non-profit company to promote the interests of the South African Rooibos industry locally and internationally. It acts as a representative for its members who consist of producers, processors, manufacturers, as well as local marketers and exporters. The SARC will be a willing client in this project as one of the focusses of the centre will be on research into Rooibos which will ultimately help inform the members of the Council. Researching methods of better conservation and growing techniques for Rooibos will help farmers and producers of the tea become more sustainable in their farming and harvesting methods. The research into medical and cosmetic uses for Rooibos and other Fynbos will increase their membership from the scientific community enabling the research to aid in new uses for the species.The



ARC is the principal agricultural research institution in South Africa. Its job is to conduct and drive research and development, technology development and the transfer of information in order to promote agriculture and related industries and ensure natural resource conservation. The ARC is currently involved in the research of Rooibos, Buchu and Honey Bush which are all types of Fynbos. Their facilities are in Stellenbosch however and locating a specifically Fynbos targeted branch in the Cederberg region would be useful to all involved. The specimens needed for the research would be on their doorstep and it would also be beneficial for the community of Clanwilliam who would then gain from the presence of the research laboratories.

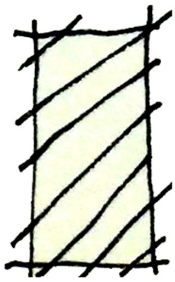
UCT and CTPU will use the facilities on a non-permanent basis as students will visit on internships or daily field trips. They will use the centre with an agreement that they will contribute an annual donation for the use of the facilities as well as for exposure to the staff. The research carried out while the students are visiting will remain the property of the centre.



Public

p u b l i c

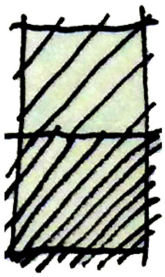
_Exhibition space
_Lobby space
_Information centre
_Restaurant
_Bathrooms



Semi Public

e d u c a t i o n

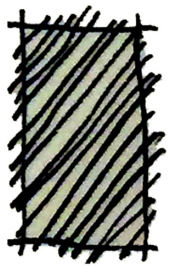
_Auditorium
_Seminar rooms
_Lobby space
_Kitchen
_Bathrooms



Semi Private

r e s e a r c h

_Offices
_Laboratories
_Kitchen/kitchenette
_Bathrooms



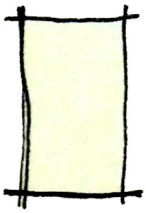
Private

a d m i n i s t r a t i v e

_Offices
_Kitchen
_Meeting rooms
_Bathrooms

A c c o m a d a t i o n . s c h e d u l e

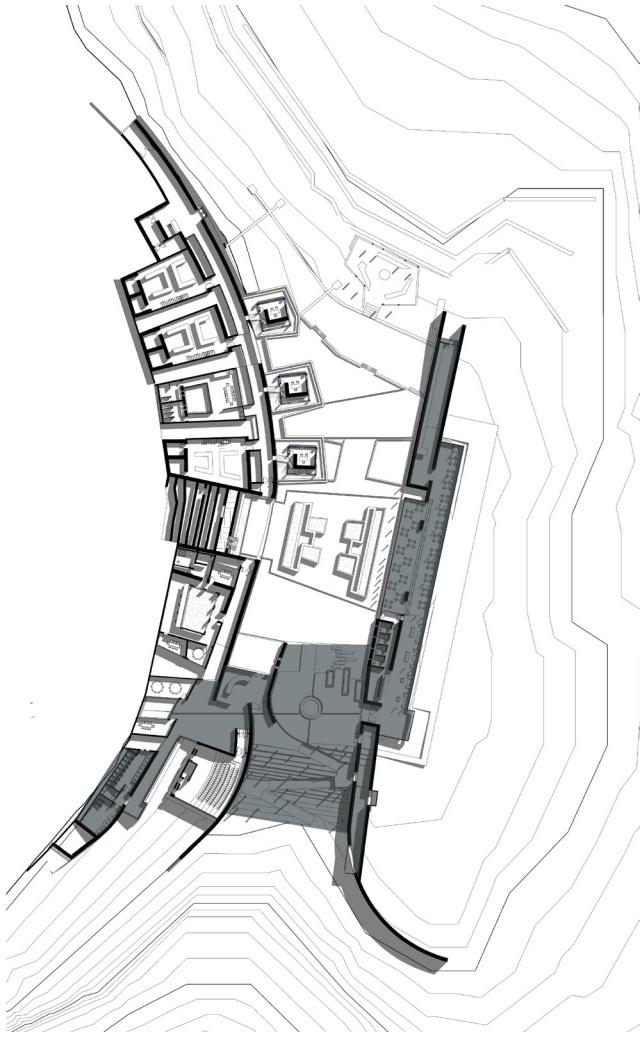
Programme		Aprox Sqm		Total Sqm
Research facilities	Reception	25	x1	25
	Medical research laboratories	200	x1	200
	Medical offices	30	x3	90
	Cosmetic research laboratories	200	x1	200
	Cosmetic offices	30	x3	90
	Conservation research laboratories	200	x1	200
	Conservation offices	30	x3	90
	Staff room	120	x1	120
	Bathroom facilities	16	x2	32
Educational facilities	Auditorium (120 people)	200	x1	200
	Seminar rooms	30	x2	60
	Bathroom facilities	50	x2	100
Administration	Offices	100	x1	100
	Meeting room	16	x2	32
	Storage	10	x1	10
	Bathroom facilities	14	x2	28
	Kitchen	30	x2	60
Restaurant	Restaurant space	300	x1	300
	Bar	120	x1	120
	Bathroom facilities	7	x4	28
	Kitchen	150	x1	150
	Lobby	150	x1	150
	Information centre	80	x1	80
	Gift shop	75	x1	75
	Open exhibition space/nursery	800	x1	800
		Total		3340M2

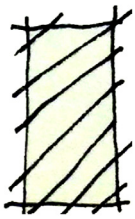


Public

P u b l i c

The public programme consists of an outdoor covered exhibition space which then opens up into the information centre looking over the views to the north of the Cederberg Mountains and the dam to the south. This then leads onto the restaurant which has open views to the east over the reserve as well as a more protected space in the garden.

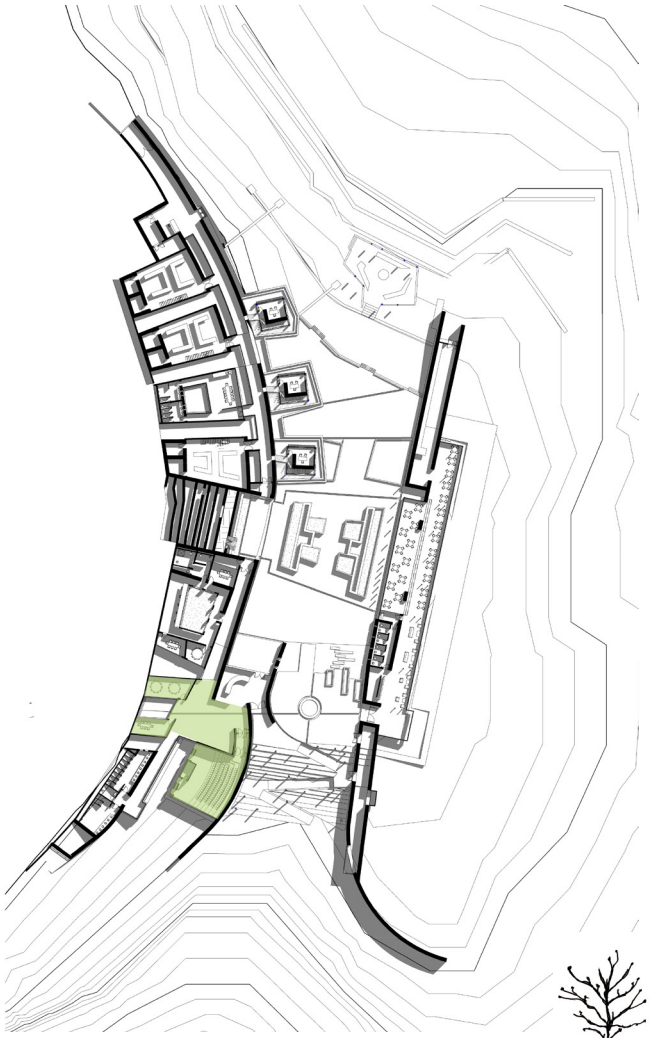


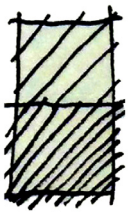


Semi
Public

S e m i . p u b l i c

The semi public programme consists of the education facilities which houses an auditorium for talks and presentations about Fynbos as well as seminar rooms and a lobby.

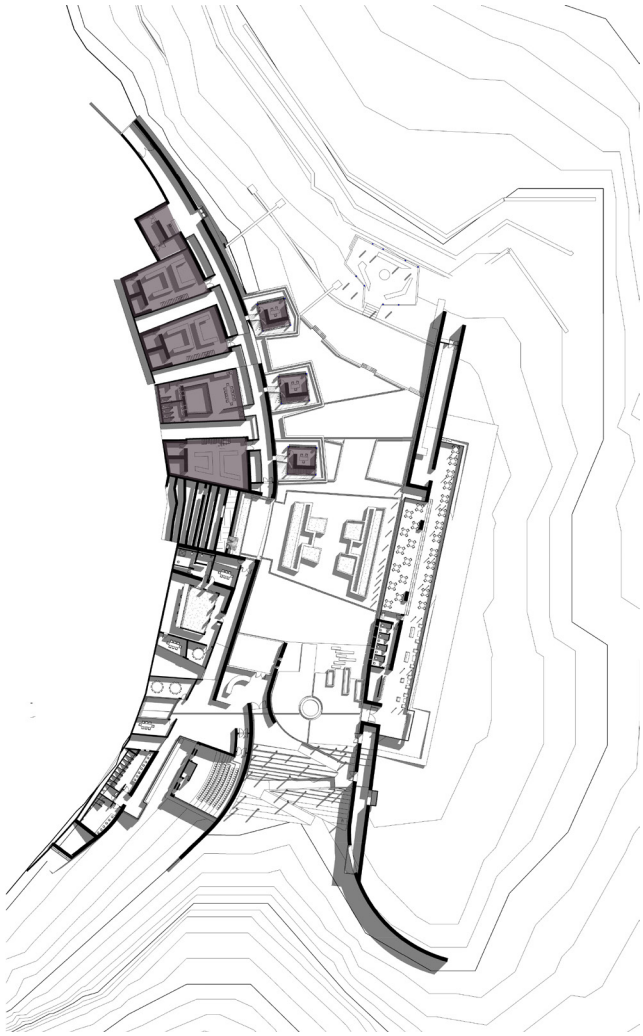




Semi
Private

S e m i . p r i v a t e

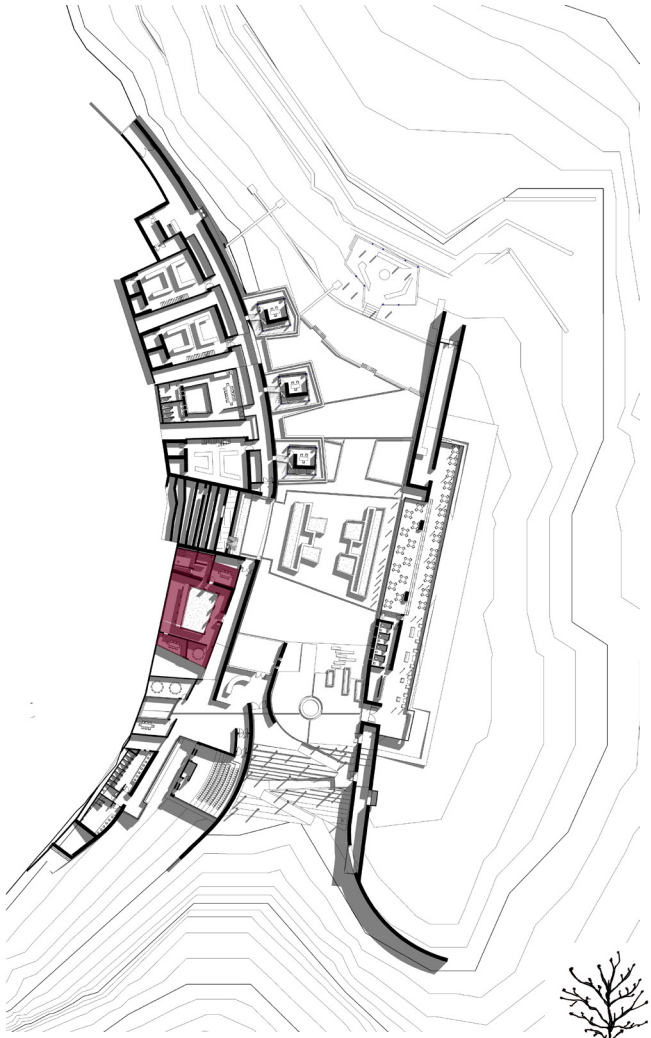
The semi private programme consists of the research facilities. This is made up of three wings: conservation, medical and cosmetic. Each wing has laboratories on the west, submerged into the ground for insulation and controlled lighting, and offices for the researchers on the east.

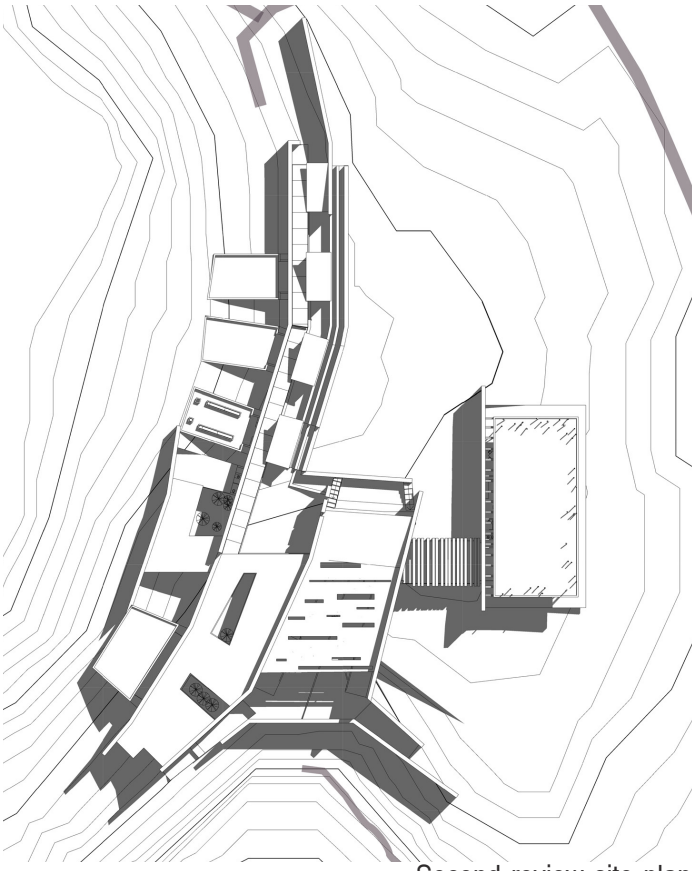


Private

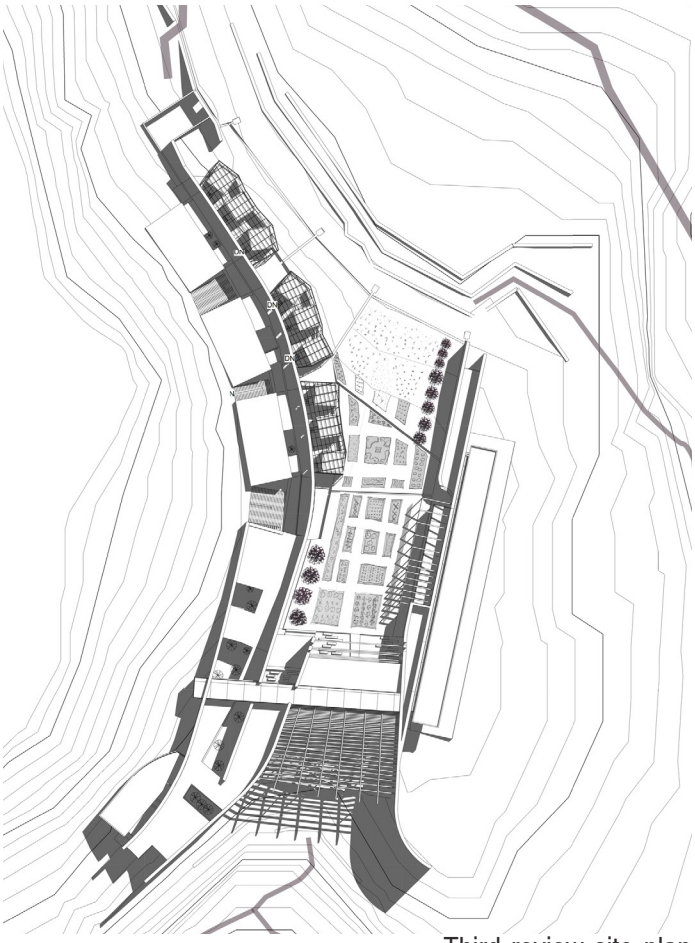
P r i v a t e

The private programme consists of the centre's administration offices with meeting rooms as well as kitchens for each programme and storerooms.

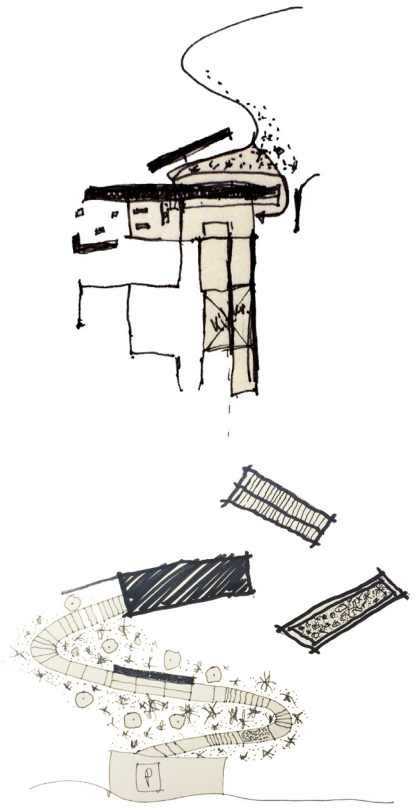


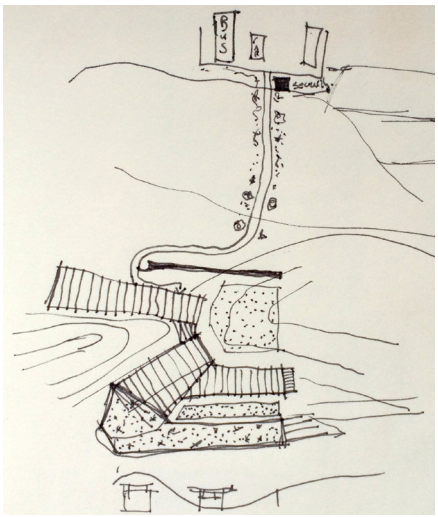


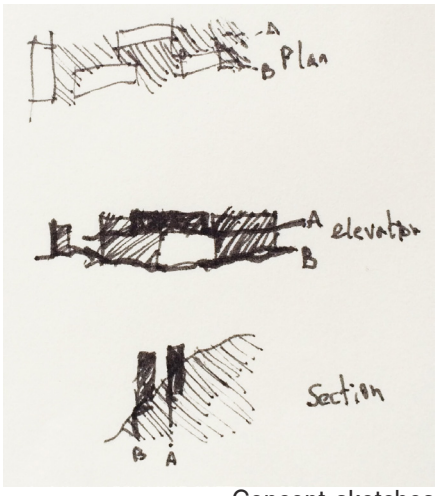
Second review site plan



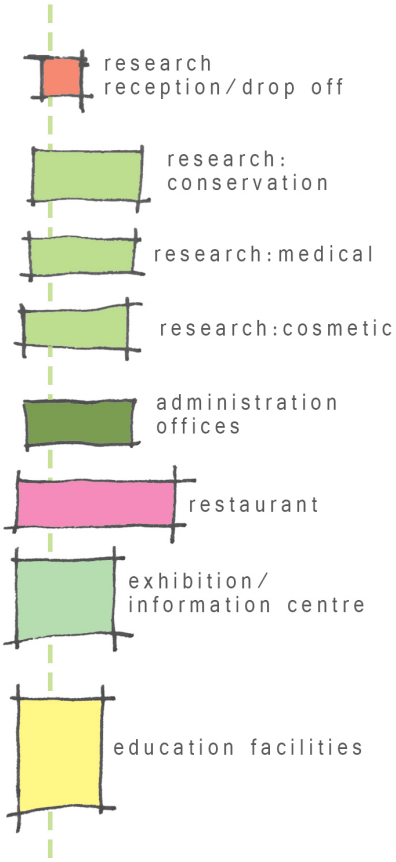
Third review site plan

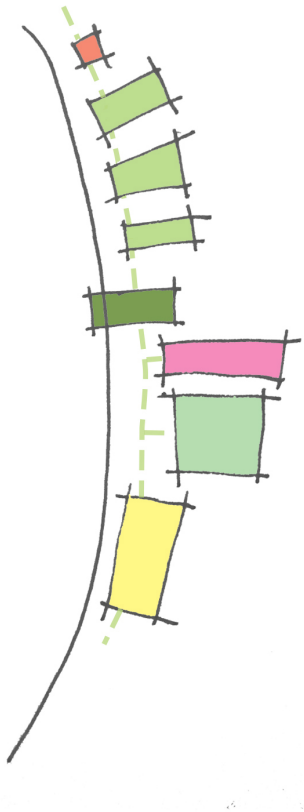


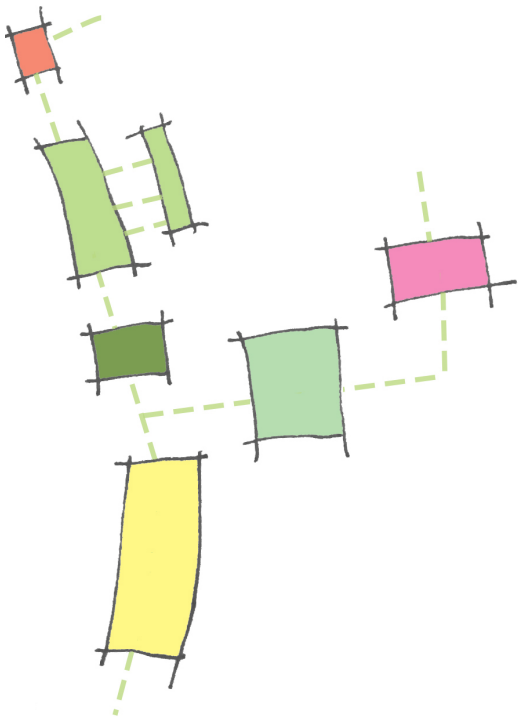


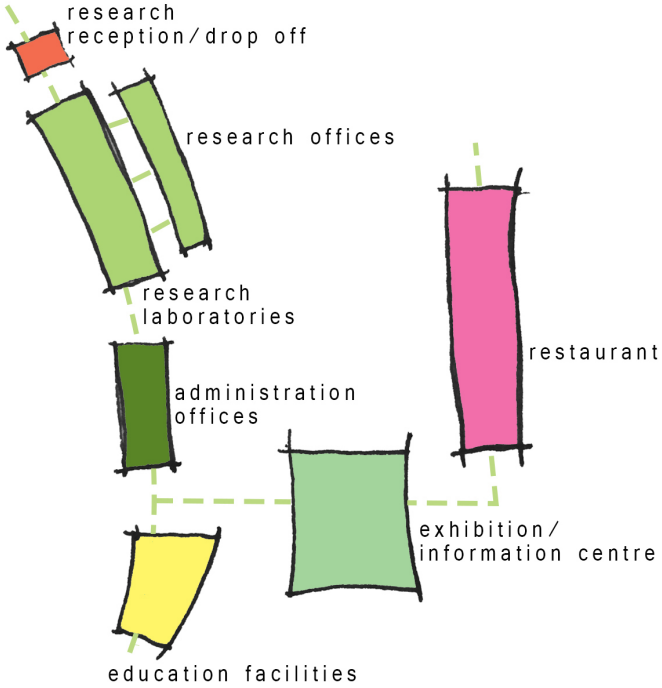


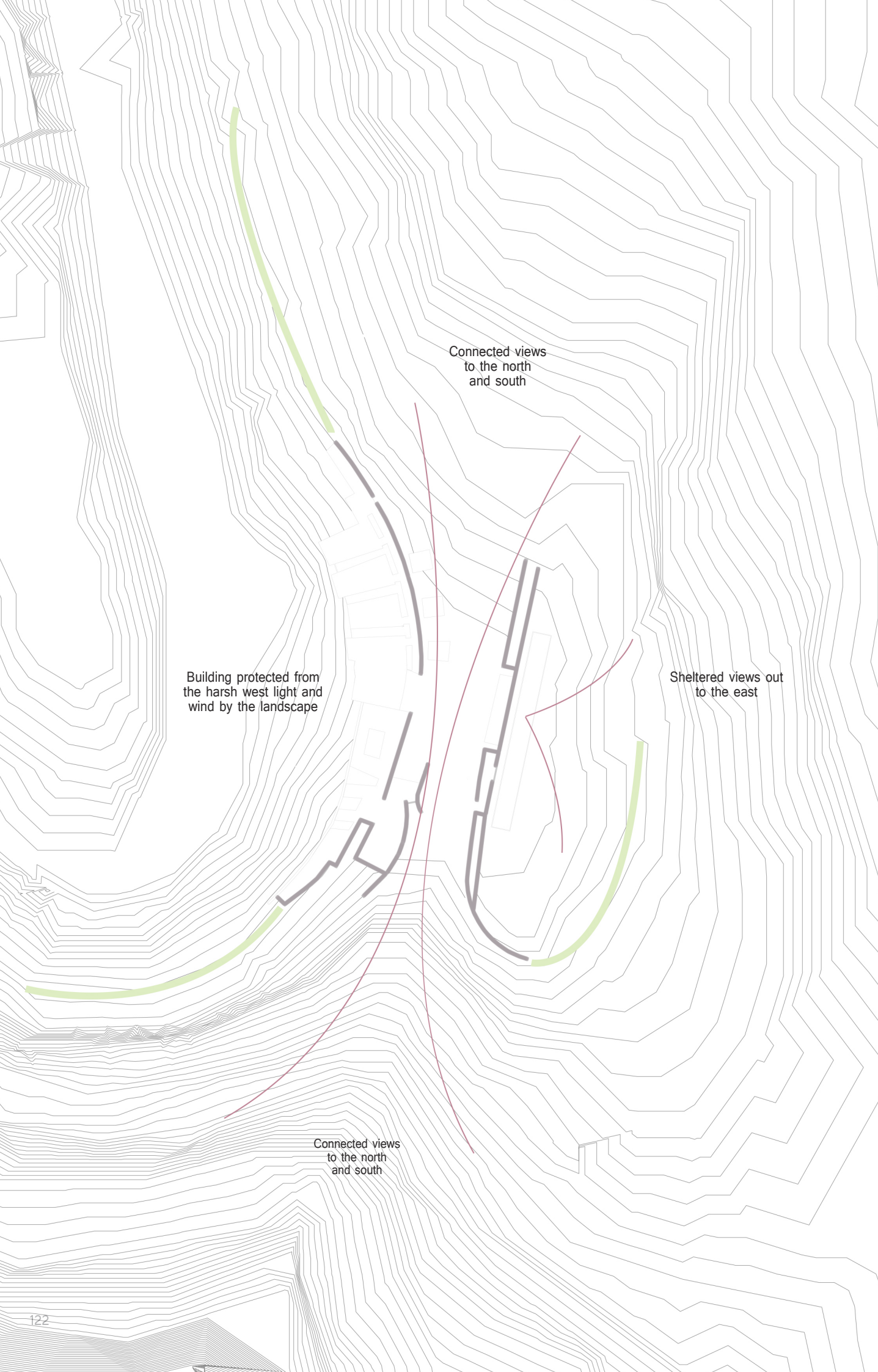
Concept sketches


research
reception/drop off
research:
conservation
research:medical
research:cosmetic
administration
offices
restaurant
exhibition/
information centre
education facilities

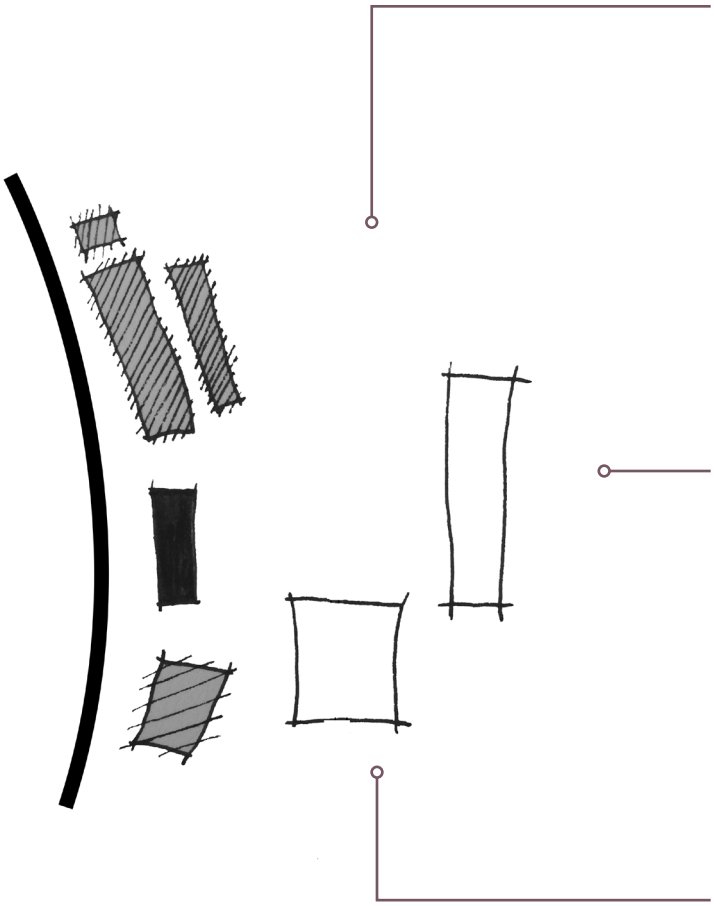


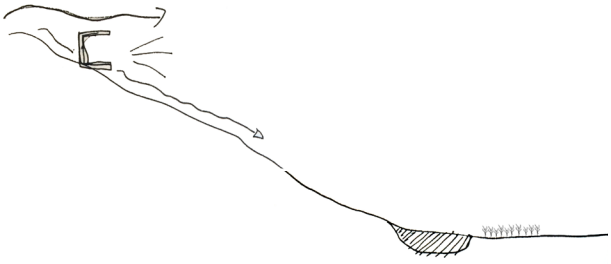


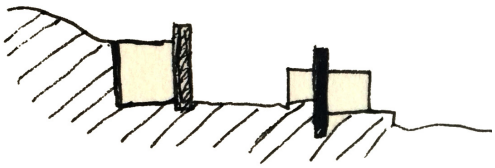

research
reception/drop off
research offices
research
laboratories
administration
offices
restaurant
exhibition/
information centre
education facilities

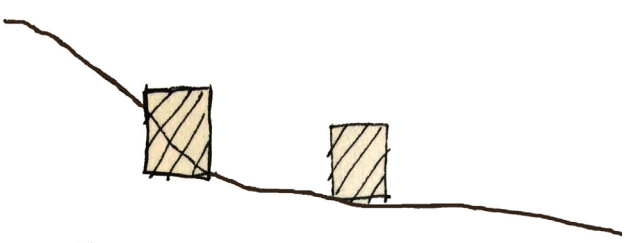

Connected views
to the north
and south
Building protected from
the harsh west light and
wind by the landscape
Sheltered views out
to the east
Connected views
to the north
and south

_Site informants









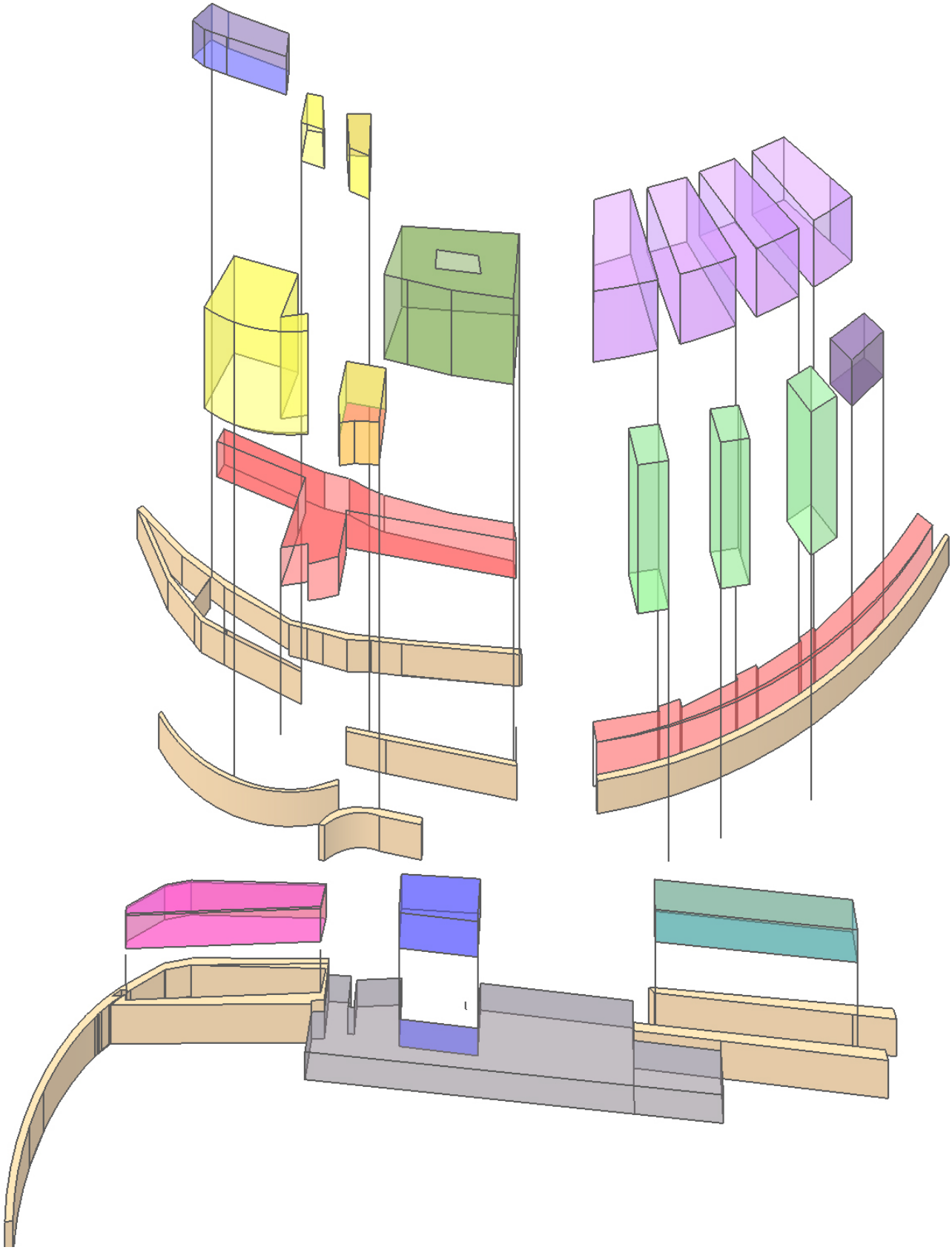
Protected from climate and access to views.

Place of erosion and caves.

Fertility and place of harvest.

Creating possibilities for a different dialogue between architecture and nature.

By cutting into the earth, the landscape is extended by the architecture and echoing the built form creates a protected space for nature to inhabit.



Rammed earth walls
Circulation
Education facilities
Education bathroom facilities
Administration
Restaurant kitchen
Restaurant bathroom facilities
Restaurant
Gift shop
Research reception
Research offices towers
Research laboratories

E d u c a t i o n

Education forms a crucial part of the centre providing a platform for visitors to better know the Fynbos plant and the environment in which it survives. The information centre will provide basic facts about Fynbos as well as educate people on the centre itself and how it is a showcase for the species. The facilities will then aim to further educate visitors on the Fynbos with talks from the on-site researchers as well as by guest speakers. There will be walking tours around the nature reserve to familiarise visitors with the local flora. School tours will be encouraged and talks geared towards children as they will eventually become the custodians of the Fynbos of the future

R e s e a r c h

The research programme performs a vital task in looking into different aspects of the Fynbos plant. The programme is divided into three separate divisions; conservation, medical and cosmetic research. Each of these aspects is already being researched but combining them under one roof and within the home of the Fynbos will provide better access and understanding of the environment. Research into conservation is vital to find new methods to ensure survival but medical and cosmetic research will bring economic dividends which is almost as important.

R e s t a u r a n t

The restaurant will be a platform for people to come and experience different types of dishes made from Fynbos plants as enjoyed by the Khoisan, an example of which would include casseroles flavoured by roots or Rooibos infused cake. It will open people's eyes to the immense and different uses for the Fynbos. There is also a separate bar area where tea and wine tasting, using the products of the area, can be enjoyed.

G a r d e n

The garden is the oasis within the centre's architecture, providing a safe haven from the harsh conditions of the landscape, with the building forming a natural barrier. The garden will allow visitors to explore and see some of the more endangered Fynbos species up close, as well as other varieties from the area. As time moves on the garden will eventually reclaim the structure and slowly make it its own.

The form of aestheticisation that has developed in modern society has meant that nothing that is not actually felt has happened. With the image being the most important of all cultures in this present world, it has reduced today's lives to pictures seen on television wars and interspersed with advertisements, royal babies and architecture, making the importance and relevance of each just a mundane blur, bringing the viewer's reaction to one of mute content, reducing the depth and meaning of the images. Baudrillard speaks of how desensitised the viewing of the Gulf War was, viewed in the same way as a baseball match, 'in a culture of simulation... we Have lost our capacity to grasp the reality of war' (Leach, 1999:23). People have become numb and removed from issues of importance, in this case the destruction of Fynbos, so it is therefore necessary to remove people from behind the aestheticised image and into a one on one relationship with the plants to create a spatial awareness so as to be able to explore and use ones senses to bring people back to the essence and importance of life by experiencing it.

'You walk through the forest and as you move you create a path. This path is formed by your temperament, it lies where you have chosen to walk. Then you gather some stones and line them up in an area you find pleasant. In other words you form a space in a place that you like along this path. Architecture is an orchestration, which appeals to your movement, your temperament'

(Architect Sverre Fehn, 1997)

The movement through the building and the site is very important, as how one experiences a building is through the series of spaces the architect creates. With this project, how one moves through the landscape is equally important as it will allow the visitor to interact with the Fynbos that fills the site. A series of paths with pause spaces for visitors to stop, sit, feel, listen and interact with their natural surroundings, will be the introduction to their Fynbos experience. Crossing between the landscape and the architecture is a critical threshold to deal with, as this project needs to be able to bring the architecture showcasing Fynbos together with the landscape that holds it, flawlessly creating the almost imperceptible transition between inside and out (Zumthor, 2012). Within the architecture there needs to be constant reminders, pockets of the outside within, creating the landscape from outside into the world inside. It is the opportunity for Fynbos, which has not been able to have its voice heard, to make a statement and to be realised. It needs to be an idea, a mood, an atmosphere and a promise to visitors that they can come and explore and thereby express their own relationships with Fynbos.

d e t a i l

A building consists of a multitude of single parts which must be joined together but how the joins are realised determines the success of the finished building. As in the architecture, so too are joints important in the Fynbos plant. From the very harsh environment, the species has evolved a plant strategy known as sclerophylly. Plants develop long-living, tough, low-nutrient leaves capable of resisting desiccation. This results in carbon-rich, woody foliage that lacks sufficient nitrogen to make it viable for animal utilisation. This renders the usual defences against grazing animals - such as thorns, spikes and leaf chemicals, unnecessary (The Vegetation of South Africa, Lesotho and Swaziland 2010 Vol I, p. 86) and allows the plants to focus on surviving. Each type of Fynbos is varied in its appearance but this is not an issue of huge biodiversity and specialisation, but rather of the architecture or structure of the different plants. Proteas have distinctive pared-down stem and branch structures; they seem like mythical, miniature trees-symbols. Restios have the wispy frail elegance of reeds or bamboo without the threat of dominance and impenetrability, and the Ericas are smaller, denser, often ground-hugging masses of vegetation.

As with architecture, each joint and structure emphasises the order and reinforces the idea of architecture, built or plant. Our overall view of the flora is influenced by each essential detail that makes up its whole. In architecture the same attention to detail is needed, how to form a whole from innumerable details. Looking at shape, form, materiality, light, as one would a painting, they all make up the composition that brings an atmosphere to a space. The choices of details 'determine the sensitive transitions within the largest proportions of the building' (Zumthor, 1998:15) Each detail adds to an understanding of the whole of which they are an integral part.

M a t e r i a l i t y

Rural landscape buildings have the opportunity for penetrating the beauty, 'unadorned architecture that is deeply rooted in the landscape and constructed out of local materials' (Zumthor, 2012:9). They can be the motif of wonder with the architecture representing a poetic quality that only those experiencing the space feel, and the outer focusing on proportion and material, creating an atmosphere with a natural presence.

'We perceive atmosphere through our emotional sensibility' (Zumthor, 2012:13) so once one views a piece of architecture there is a spontaneous emotional reaction and then an immediate appreciation compared to a thought out, more linear reaction. The architecture is created from a series of different experiences to form the anatomy of a building, without this the architecture ceases to exist and becomes merely a structure, it is the atmosphere that brings the magic, creating a piece of architecture. 'Material composition gives rise to something unique' (Zumthor, 2012:33). Combining one material with another creates an effect, but choosing a specific material and playing with a multitude of different finishes, still keeping one familiar touchstone, will retain the connection an observer will have with the space. It can create a poetic quality too, if placed in exactly the right situation.

'Architecture has its own realm. It has a special physical relationship with life'
(Zumthor, 1998:12)

The building is the background for life which happens in and around it and the structure is what will remain after the people have left and nature is allowed to take it back. It is the possibility for something which has not been able to have its voice heard before, to make a statement and for it to be realised. The idea of the building, once drawn up takes the architect's vision from paper to reality. The drawings need to be an illustration of an idea, a mood, an atmosphere and a promise to which we can come and unload our imagination, similar to sitting in a field of Fynbos, the building has to be able to move us and interact with each of our senses.

Objects consist of a multitude of single parts which must be joined together and how the joints are realised determines the success of the finished object. This is vital in many mediums such as sculpture, furniture design, or in the case of this thesis, Fynbos. The characteristics of Fynbos are more at a plant level than a cellular one, in particular, small leaves are part of a strategy to survive the dry summers. They allow a gaseous exchange with few stomata hence less water loss. Leaves are also often orientated upwards, so reducing heating by the sun. Plants of this biome that have larger leaves, like some of the Protea family, have hairs on the leaves - like the silver tree or waxy coverings that reflect heat or otherwise stop water loss. Plants have adapted to fire, with woody roots buried deep underground from which they can re-sprout.
Each joint and structure emphasises the order and reinforces the idea of the Fynbos. Our overall view of the plant is influenced by each essential detail that makes up its whole. What footprint is left behind for nature to take over is determined by the materiality of the architecture overtime, to become a ruin, however how it decays can be foreseen from the materials used.

In architecture the same attention to detail is needed, how to form a whole from the innumerable details. Looking at shape, form, materiality and even more to joints, edges and light, all need to form a composition that brings the same feeling as when accessing a piece of Fynbos. These choices of detail 'determine the sensitive transitions within the larger proportions of the building' (Zumthor, 1998:15) Each detail adds to the better understanding of the whole of which they are an integral part.

Fig 27

Fig 28

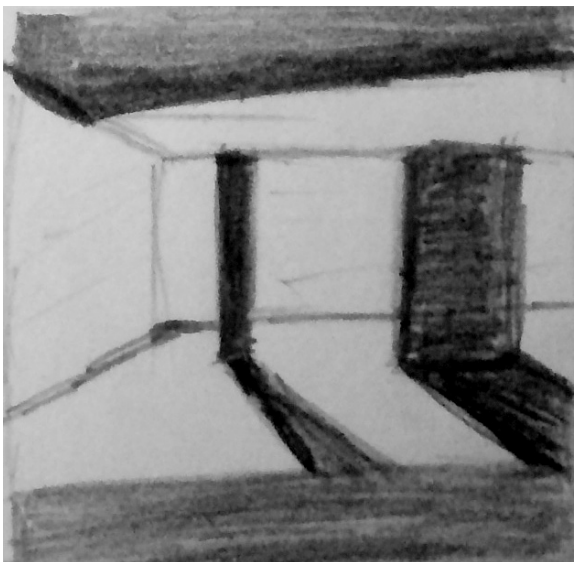
PRECEDENT: Jianamani Visitor Centre

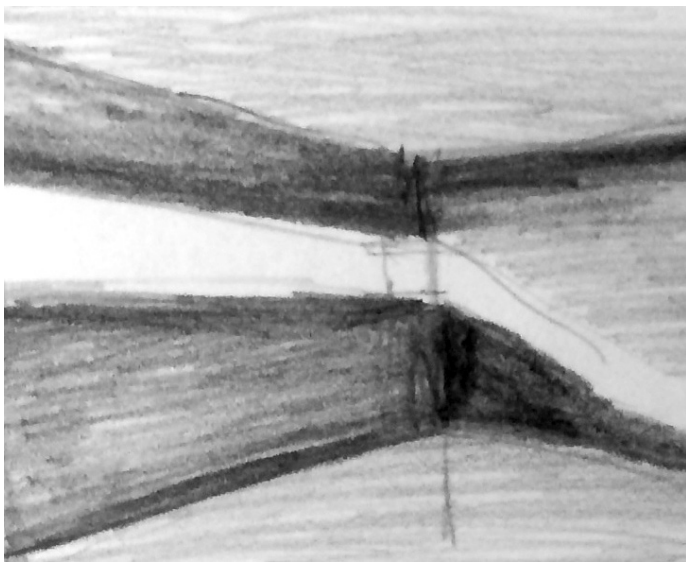
Architect: TeamMinus

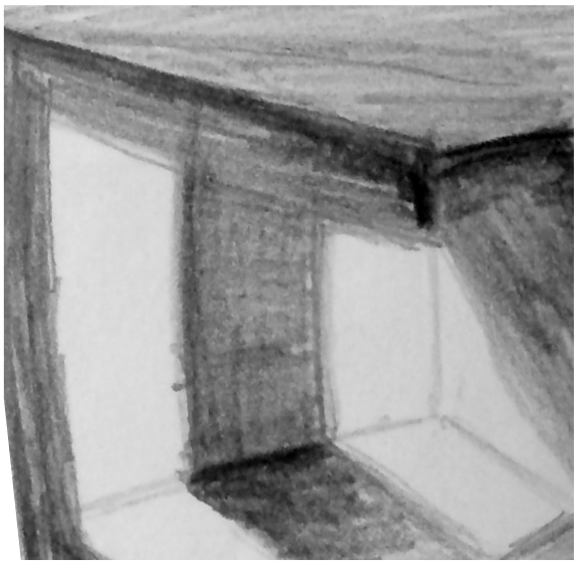
This is a visitor centre for an ancient Buddhist memorial in Tibet which is used by tourists and pilgrims and provides information about Jianamani as well as affording the visitor a panoramic view of the area, Yushu. The programme consists of a post office, clinic and small research archive as well as information space and facilities. The area of Yushu has the world's largest pile of Mani stones which are fragments of rocks inscribed with Buddhist prayers. Forty percent of the population of Yushu, largely Tibetans, make a living from carving Mani stones. This area is deeply symbolic and religious and the cultural landscape has shaped the community's identity. The centre is a two story building with tapered pre-cast concrete walls clad in stone using age old building traditions. There are also prayers endemic to the region carved into the walls. The rooftop forms a space from which to view the area and is made from wood recycled from the debris caused by an earthquake in 2010. There are two cantilevered observation decks which are orientated towards Jianamani and other places of interest. The roof and deck space could become an elevated public space if not controlled by the information desk which prohibits free movement.

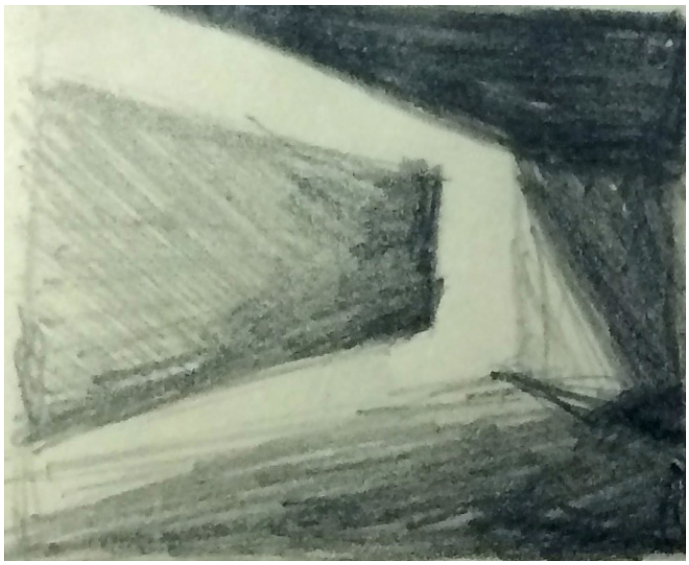
This centre remains respectful of the local traditions and identity and has managed to use indigenous material and building practices but with a modern spin so that it fits very comfortably with the surrounding structures and landscape. It uses a collective memory from the reuse of timber as a sign of respect and homage to those lost in the earthquake and a reinterpretation of tradition, again respecting local identity and culture.

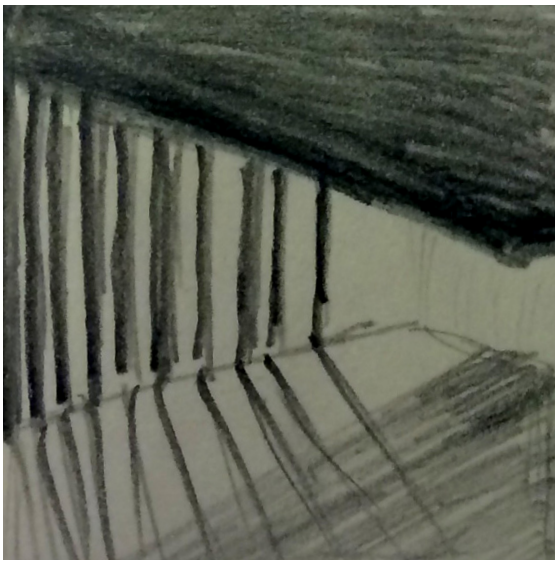
The Fynbos Centre can learn much from this precedent of how understanding an environment and site and using local materials and crafts can make a piece of new architecture fit so easily into its surroundings. This building, flat for the purposes of the viewing deck, has still been able to follow the vertical element within its design, connecting the building to the mountainous surroundings.

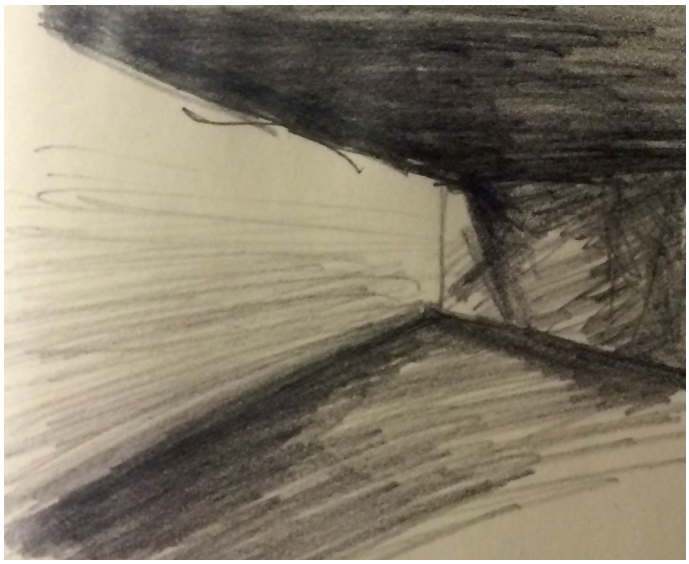












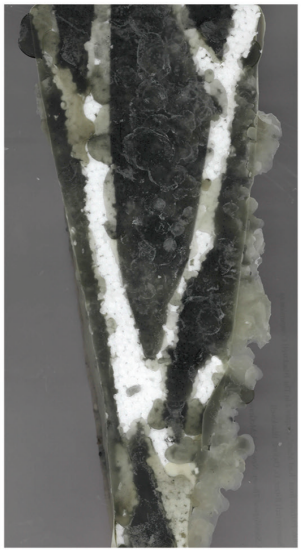
L i g h t & s h a d o w

'When we see a color we are actually seeing a play with light, in through, and on a body – refracting, reflecting and absorbing light'

(Steven Holl, 2012:19)

Colour is made of a composition of light within the anatomy of the brain which then processes it and creates the pigments of the imagination that we can use to colour the world around us. Colour should be used to highlight and accentuate architecture, as with art it can conceal or order spaces and change and affect the composition. Using colour within architecture should not merely be about painting a wall or inserting a piece of stain-glass window but as Steven Holl does, exploring it as an element that composes the perception of the space. It cannot be a superficial application that could be done away with but must form part of the experience of the space. By merging colour with light Holl 'generates a new ethereal effect on light' (Holl, 2012:23).

In Jordi Safont-Tria's essay The Autonomy of Colour she speaks to Steven Holls 'colour palette' made up of purely pencil shades from white, grey to black. This allowed Holl to explore spaces with shadow and light and to create for them. The light and shadow show time within a building measured by the falling light as well as showing a multitude of juxtapositions within the architecture: dark verses light, hard verses soft, solid verses void.















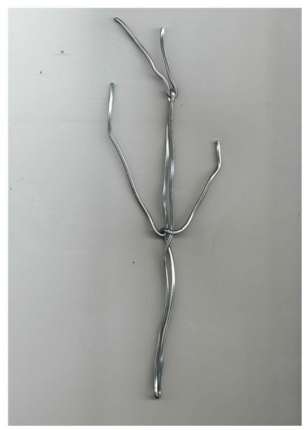



Fig 29

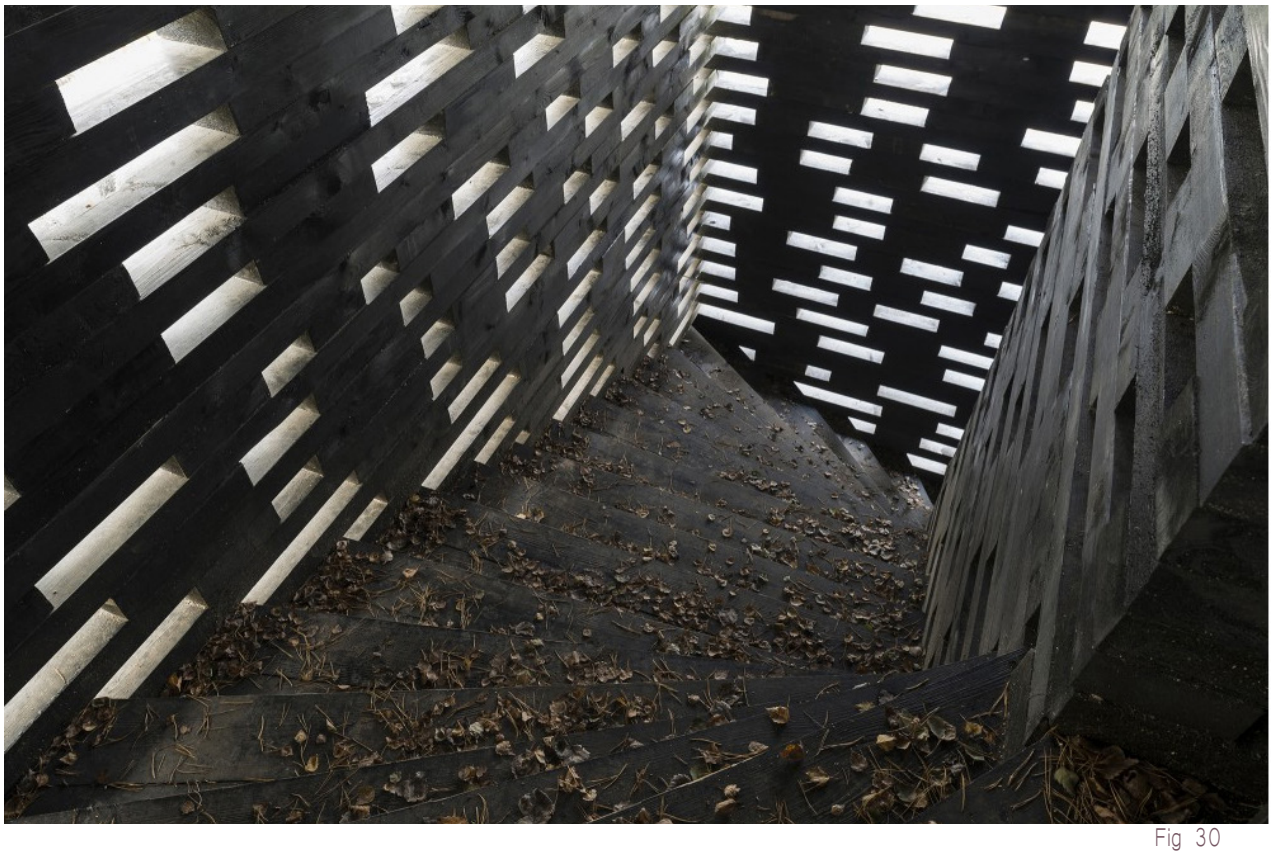


Fig 30

PRECEDENT: The Arc

Architect: Boris Bernaskoni

This precedent looks at the Arc which was part of the Archstoyanie Annual Land-arc and Architecture Festival held in Russia. The Arc was, according to the architect, Boris Bernaskoni, 'a symbol of conquest... the conquest of nature by the city' (Mpotokwane, 30:2013) Though the urbanisation of nature, if suddenly a dense city appeared here, the architecture of the Arc would still remain relevant. At the rate cities are urbanising this is important to consider when looking at rural landscape architecture, but even so, one of the Arc's greatest properties is in the way it is designed for nature to incrementally take over and vanquish. The Arc, although an exhibition, was made a permanent feature within the landscape and so is able to truly change with time.

This is mainly because of its 'organic, laissez-fair construction' using locally sourced materials and building techniques, constructing at the contractor and material's discretion rather than to a precise detail. The Arc is made up of pine planks and metal connecting rods which from the outside form a 'dense, linear, simple and solid' façade but in contrast, from within the structure it is 'transparent, non-linear, complex and functional'. The contradiction of the two façades helps to give the Arc its chameleon type features. 'During the day sunlight streams through the voids in the pavilion's façade, producing an ethereal quality. At night, its blackened wood disappears into the darkness, creating the illusion of a solid mass. During winter, snow softens the pavilion's orthogonal lines, adding delicacy and texture to the construction' (Mpotokwane, 30:2013) The Arc's ability to morph and evolve with the seasons and times of day is a remarkable achievement and as the pavilion is made from wood, time will make its mark and once decayed and aged it will be taken down and used as firewood. This perfectly completes the circle of the Arc's life, as it ends back in the earth from which it came.

The Arc is interesting in how it deals with its surroundings, being able to blend and change over time and with each season. At night, disguised by the dark, but in winter being reshaped into a softer silhouette.

Fig 31

W a t e r

'We might consider water a phenomenological lens with the powers of reflection, spacial reversal, refraction, and transformation of rays of light'

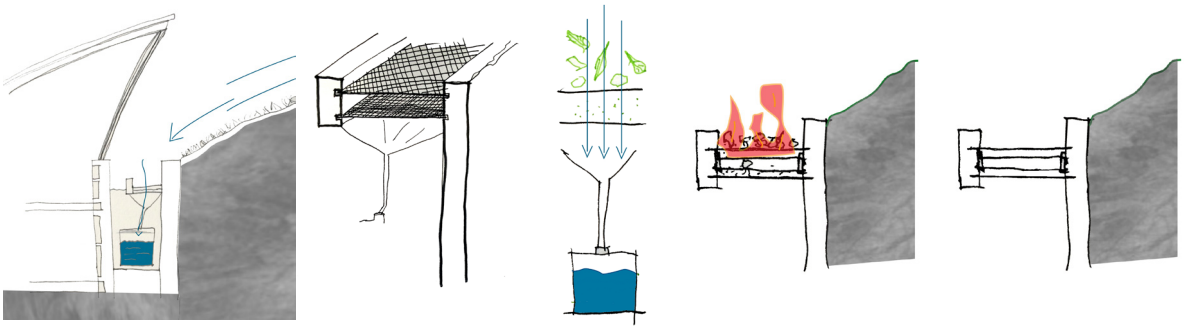
(Steven Holl, 2012:30)

Water, without which there would be no life, human or plant has always been incorporated into architecture and in designing this centre it will be an important influence, used both inside and out. Water is extremely valuable in this hot and harsh setting, and will be showcased through the seasons with water troughs and collection pools designed into the landscape and architecture showing different images in the water as they form a reflective pool of colours and forms, changing with the slightest of breezes. During the summer months when all the water has dried up, the pits will reflect no spatial symmetry or colourful reflections of their surroundings but at the end of winter and spring, the troughs will fill once more with rain water and when the flowers blossom, a colourful carpet like pattern will reflect the flowers, continuing the colours. The water inside the buildings will create a new spatial depth to the volumes bringing a scene of life and moment within the walls, 'introducing water as a phenomenal lens to reflect hues and shades of the environment or façades' (Holl, 2012:30).

_Water diagram

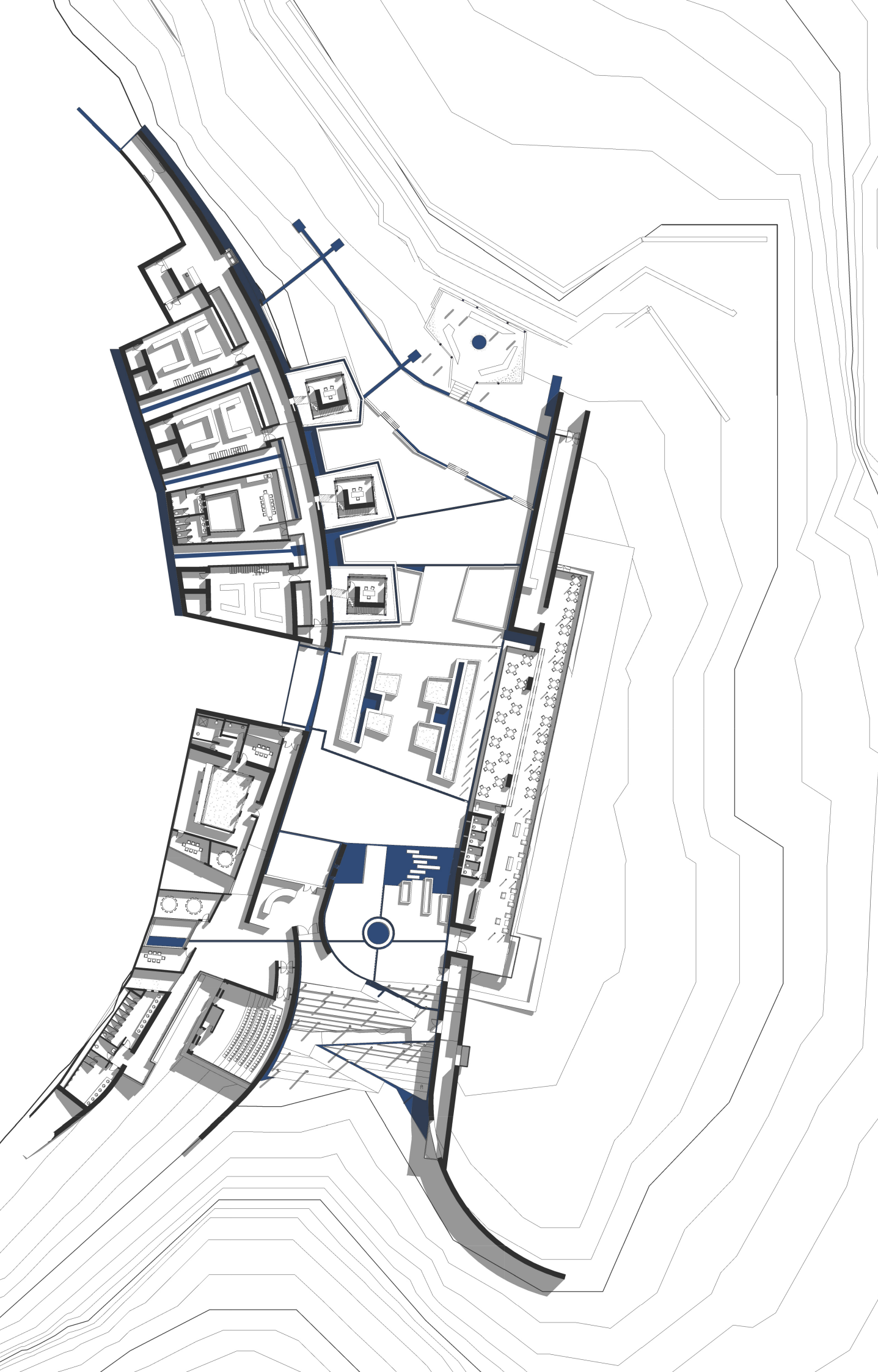
The Fynbos Centre uses water throughout the building as a tranquil reminder of how precious it is. The water, however is not just for show as it has many functions throughout the centre.

Water collection and storage of rain and runoff occurs behind the laboratories. Water goes through two fine sieves which filter it before it is collected and stored in water drums. The debri in the sieves will be burnt in a controlled fire. This water will then be used throughout the centre during the year.



The water is used for heating in winter through the hydronic duct heater which runs through the cavities of the rammed earth walls, and cooling in summer through a mist system.

The garden uses the water from the troughs which run through the garden for irrigation as well as to extinguish the seasonal, controlled fires occur within the garden. This water can also be used to aid in fighting any wild fires that might occur.



F i r e

Fynbos must burn, but fires in the wrong season (such as in spring, instead of late summer) or too frequently (so that plants do not have time to set seed) eliminate species (Vegetation of South Africa, Lesotho and Swaziland, 1996). Plants do not simply fuel fire but can in fact influence the fire in many other ways. Depending on the vegetation type they can behave quite differently as fuels. 'even within the same climate vegetation types of quite different flammability can occur adjacent to one another' (Schwilk, 2003:23). Patches of non-flammable forest break the Fynbos which is very flammable as the species depends on the fire to reignite the dormant seeds which lie beneath the surface soil. Therefore grading the vegetation around the architecture for the Fynbos Centre will aid in providing a barrier between the fire and the building. Different types of Fynbos, such as succulents will act as a bad fuel and will slow the fire down as it approaches the structure.

The Fynbos Centre uses a number of systems to protect the structure from burning down. The vegetation is graded, as previously discussed, with succulents dispersed with the natural vegetation. Fire breaks are used in the form of paths to get to the centre from the parking lots as well as using the small service roads to the centre.

The planted roofs have water troughs which will act like moats and have hosepipe access points if needed so that the roofs can be flooded if threatened by a fire. The laboratories have a trench separating the building from the landscape which houses water tanks, creating a defensive space.

By celebrating fire and making it a spectacle to draw more people to the centre with seasonal burnings within the garden to help the reseeding and growth of the plants, it will help people better understand the plant and feel involved in the concervation of the Fynbos species.

F i r e . m a t e r i a l i t y

As this centre is going to be built in an area with a high risk of fire, some even set by the centre itself, it is important to look at the materials used within the architecture as although fires will be controlled by the fire department and volunteers, it is vital that the materials used should also play their part in restricting it.

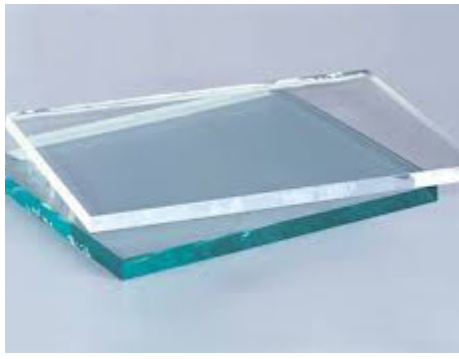
b r i c k s

As bricks are made in a fire kiln, they are already highly resistant to fire. A brick wall can achieve a 1-hour to 4-hour fire-resistance rating.

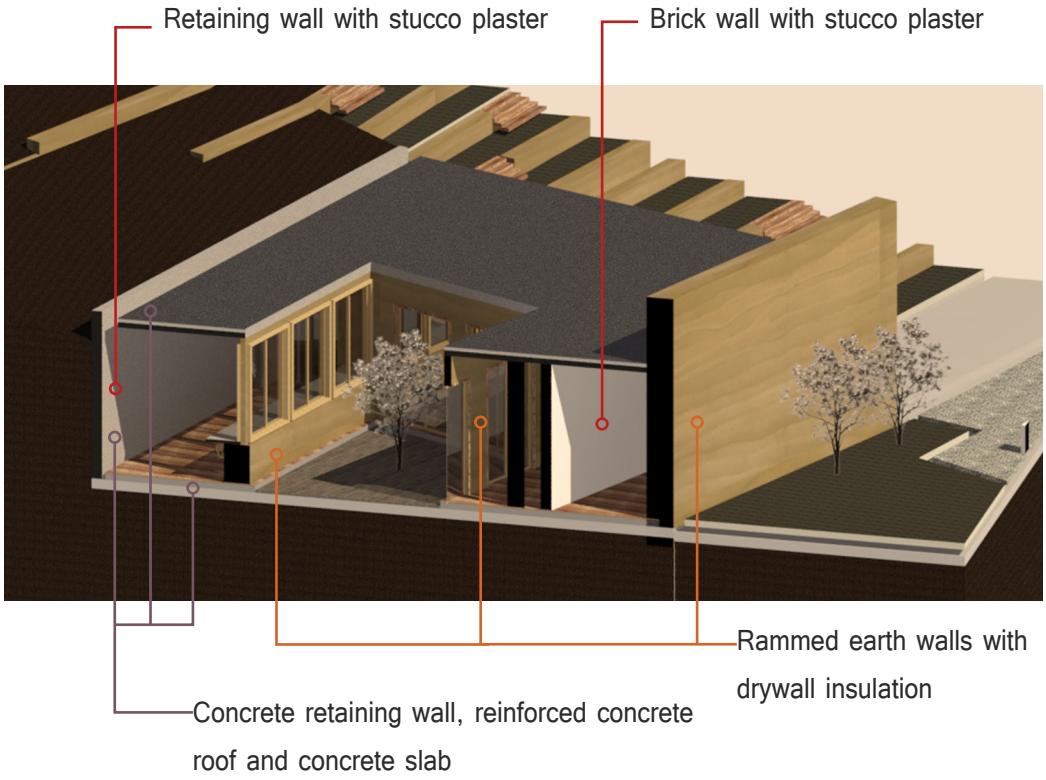
d r y w a l l

Gypsum board, also known as drywall consists of a layer of gypsum sandwiched between two sheets of paper. Type X gypsum board is specially treated with additives to further improve its fire-resistant qualities. The paper on the exterior of this board burns slowly and doesn't contribute to fire spread. In addition, the material has a non-combustible core that contains water that has been chemically combined with calcium sulphate. When affected by fire, the first thing that happens is that this water escapes as steam. This effectively impedes the transfer of heat through the gypsum board. Even after the water is gone, the gypsum core continues to resist fire penetration for a time. Builders often use multiple layers of this board to increase the fire-resistance rating.

g l a s s w i n d o w s



Dual-paned glass windows will be used, this is because, in addition to providing energy efficiency, they also double the time it would take for fire to break the glass. The outer layer will break first then the inner layer, further protecting the inside of the building. Tempered glass, which is heat-treated to make it almost four times stronger than regular glass, is also effective. It is also wise to note the importance of window framing. Steel framing offers the best fire protection.



concrete floors and roofs

Concrete, one of the most common building materials, also has excellent fire-resistant qualities. It is non-combustible and has low thermal conductivity, meaning that it takes a long time for the heat to affect its structural, load-bearing ability and that it stops the spread of fire. It is actually significantly more fire-resistant than steel, and is often used to reinforce and protect this material from fire. Concrete is also frequently cited as one of the best fire-resistant roofing materials which is extremely important as the roof is particularly vulnerable to sparks from wild fires.

plastering

Stucco is a plaster that has been used for centuries for both artistic and structural purposes. Modern stucco is made of Portland cement, sand and lime, and serves as an excellent and durable fire-resistant finish material for buildings. A 2.54-centimeter layer of stucco can easily lend a 1-hour fire rating to a wall [source: Nazarro].

Roof eaves (overhangs) are a fire hazard, but they can be protected with an encasement of fire-resistant material. Stucco is often recommended as one of the best materials for boxing in hazardous eaves.

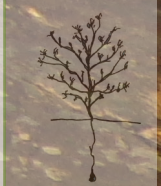
A.response.to.landscape

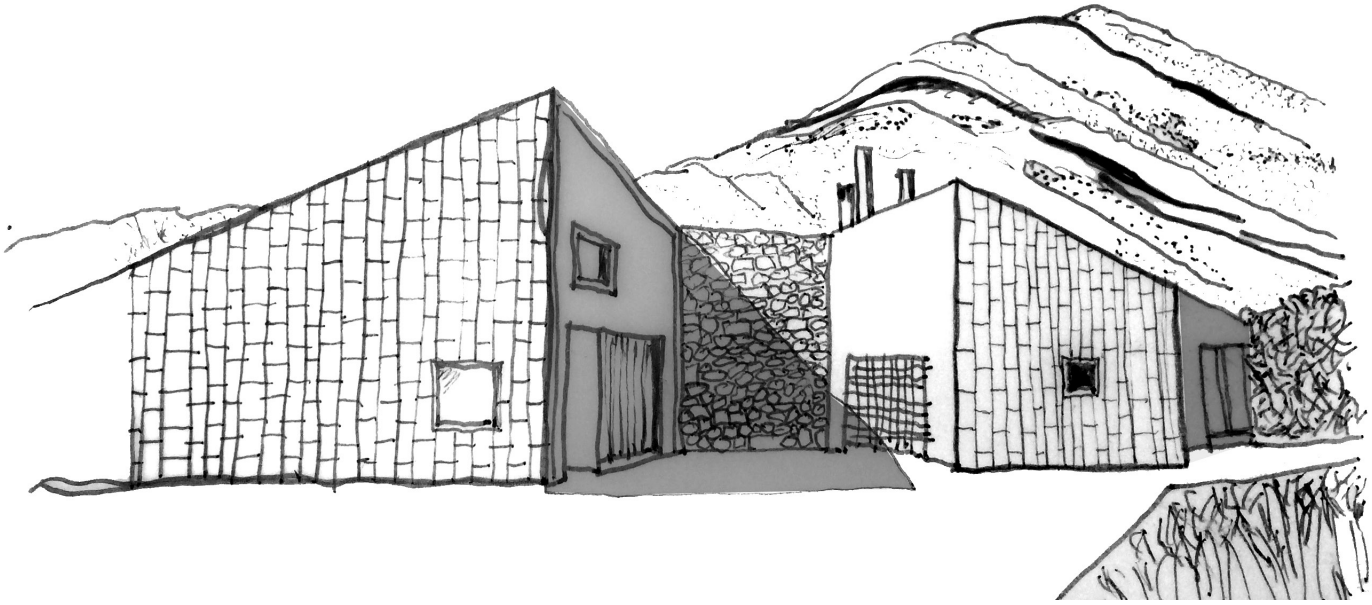
Architecture is 'interpreting the world as a meaningful order in which the individual can find his place in the midst of nature and in the midst of a community' (Harries 1993, p. 51). Philosopher Karsten Harries speaks about architecture that arrives at a point with little thought of context or site. Shigeru Ban also notes that architecture today sometimes uses weirdly shaped forms that are computer generated with little thought given to structure or context (Boon Design, 2007) suggesting that soon there will be cities made up of alien pods that have no relation to either site or culture. We need rather to be designing non-arbitrary architecture that rises from real life situations and the needs of particular people, places and landscapes, architecture that listens and responds to nature and culture. Alvar Aalto had a profound respect for craftsmanship and a sensitivity to natural materials which he used in all his buildings, Aalto tried to frame the landscape with his architecture by merging the metaphysical with nature.

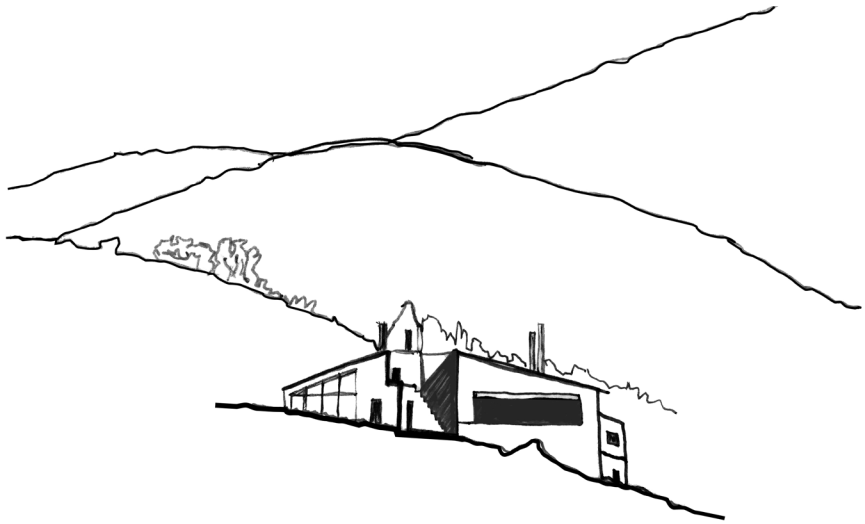
> 'The ultimate goal of architecture is to create a paradise... every house, every product of architecture...should be a fruit of our endeavour to build an earthly paradise for people.'
>
> (Aalto ,2007)

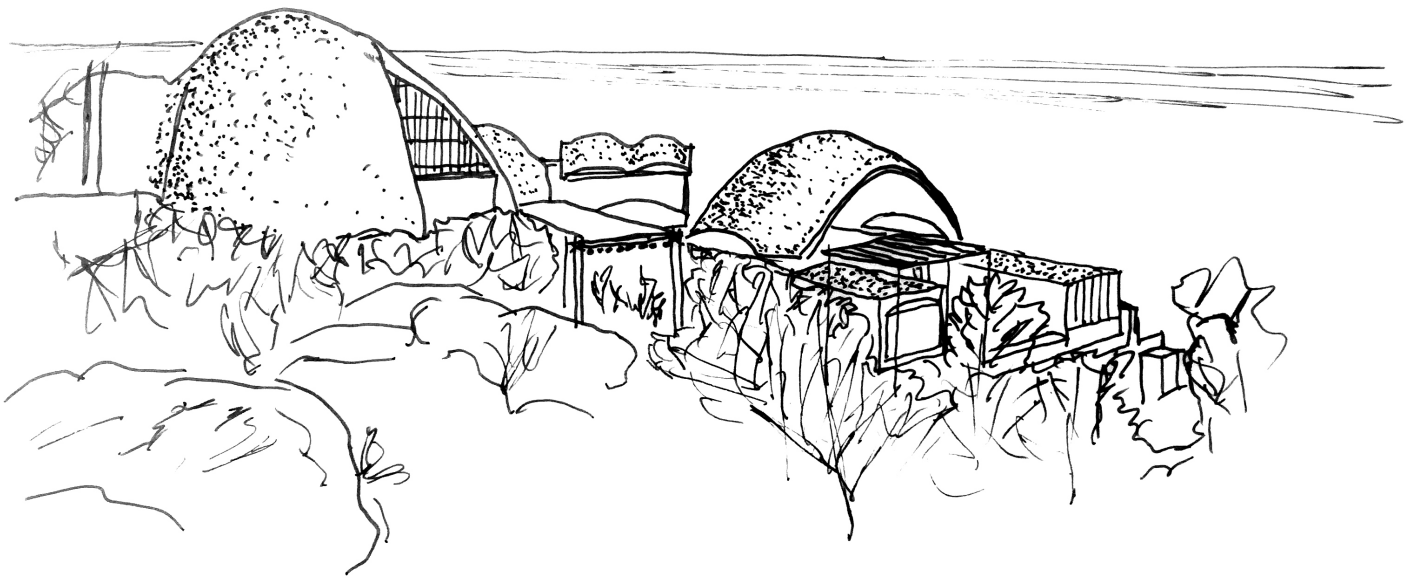
Drawing from nature and the landscape, either by embracing or contrasting it, the site and influences can act as a generator from which the architecture can draw. It then becomes a very important link between the inside/outside spaces, a threshold that needs to take from the site to bridge the divide. Creating spaces of 'in between' and by using local materials one can create a feeling of inside/outside, one space where the same language and feeling of openness is felt through the continuity of materiality implied. In the case of the thesis building, the sand outside which forms the Cederberg soil has been used inside in the construction of the rammed earth walls so the familiarity of the area is already a feature of the space, connecting inside and outside and linking the form with the function.

By using the natural environmental conditions metaphorically in the architecture, one is bringing the outside in. Echoing features of the natural landscape such as the contours, rocks or hill slopes, makes one aware of the outside even when remaining inside.









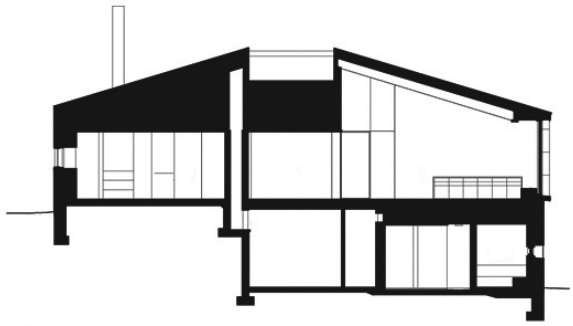


Fig 33

The Valley Sun House is a perfect example of using the landscape to create its form, as the building mimics the landscape forming a dialogue between the roof angles and the sloped land formation, blending the architecture into the natural environment. Using fallen rocks from the site within the architecture, outside and within the house, brings the landscape into the space blurring the barriers of inside/outside.

Peter Rich's Mapungubwe Interpretation Centre is another example of the roof following the curved nature of the fallen boulders which are scattered around the site. The building is camouflaged by using the naturally occurring rocks as the façade, blurring it into the landscape, and then learning from local building practices to reinterpret the local dwelling. The centre is not only a showcase for the surrounding landscape but a nudge to the visitor to awaken an understanding of the vulnerability of the local ecology of the area.

'Aalto describes architecture as an organism that grows and develops over time and applies architecture to an organic dimension'

(urbentekstur, 2013).

The Fynbos Centre was also created from its surroundings, using the contours of the landscape to position its main axis and create a dialogue with the existing land formations. The building also uses the local sandstone soil of the Cederberg to create its rammed earth walls which form the anchor of its architecture.

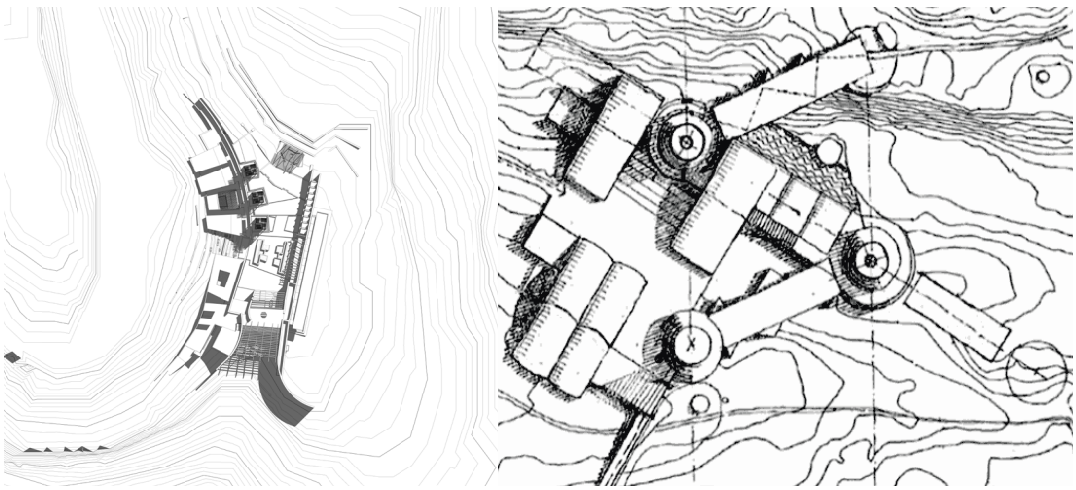
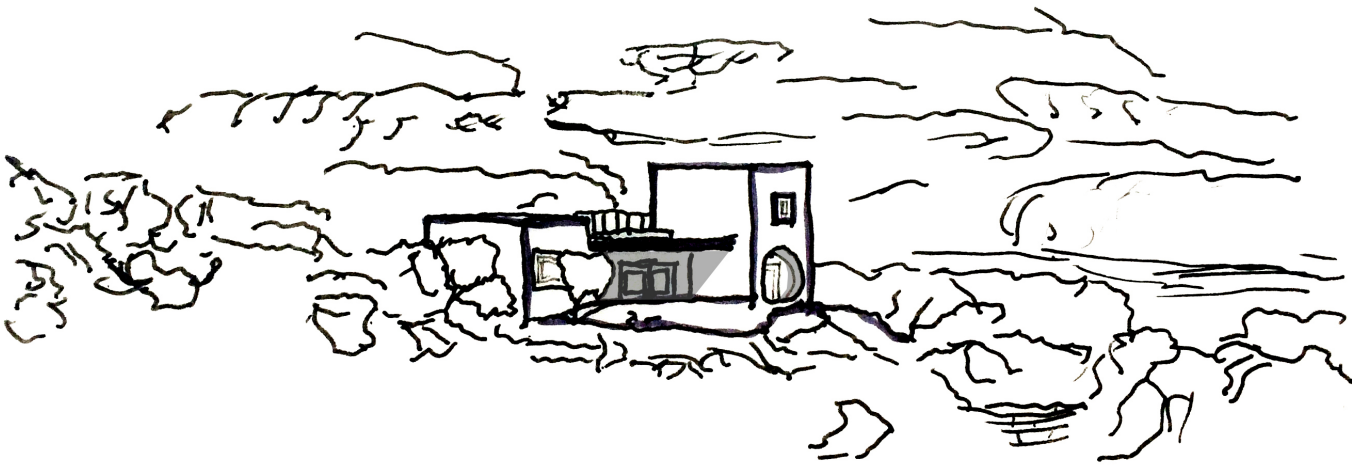
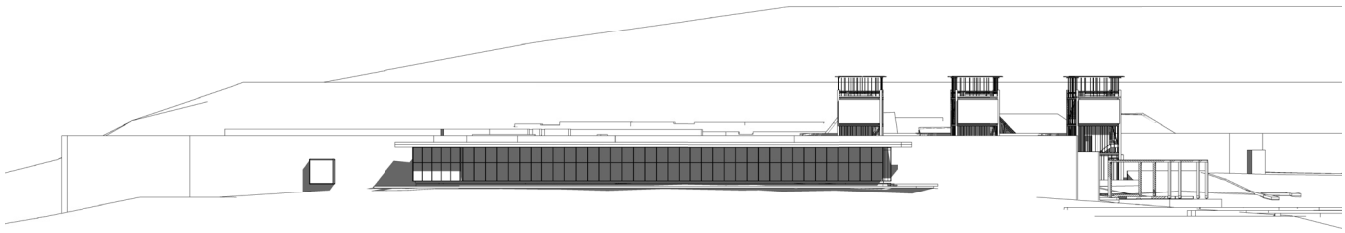
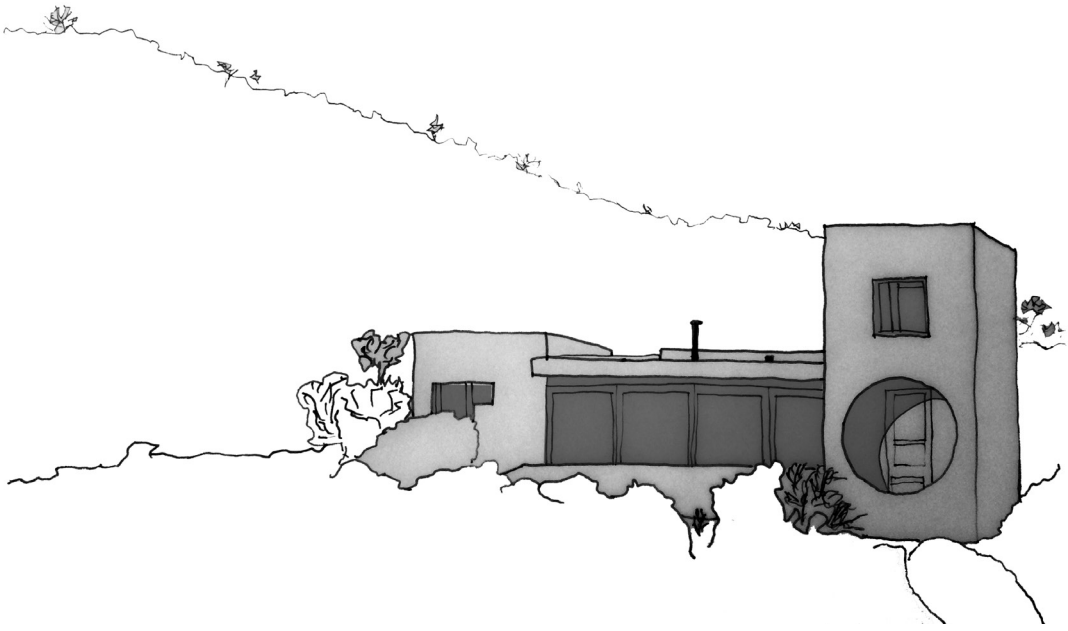
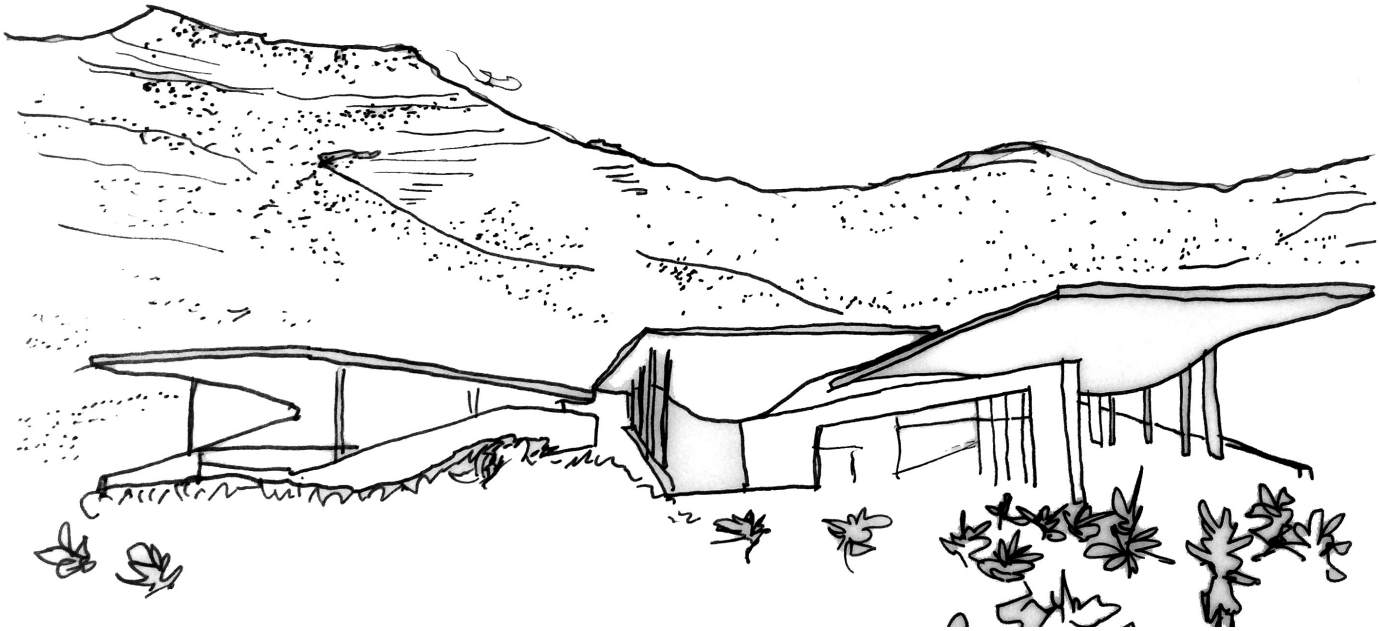


Fig 34









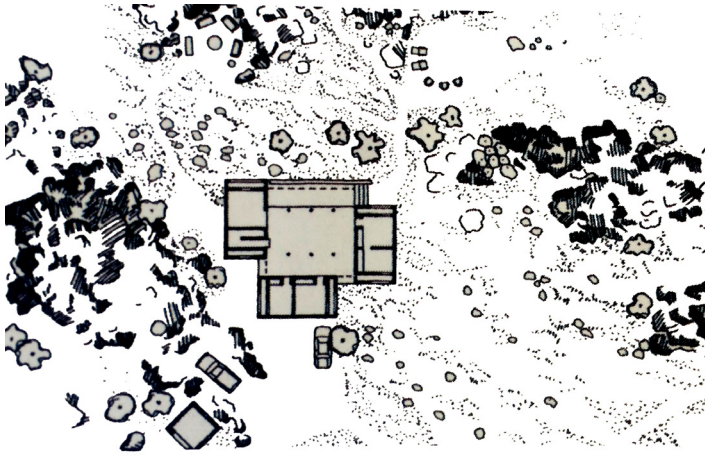


Fig 35

Another possible way is to be inspired by nature but rather than memorising the landscape, extract and emphasise the details that come from the slopes and crevices. By looking at architecture as a building that can supplement nature rather than an imitation, the architecture can embrace and respect the past and the present of a site and landscape.

In contrast, if we now look at the Wolff House in the Cederberg, in both plan and in perspective, the house in no way echoes the landscape but opposes the natural slopes of the hills with its box like appearance, but nevertheless it still fits completely within its context as careful consideration has been taken of the lines of the building and gestures towards the landscape as well as the detail for the materiality. From within the structure the landscape is framed and a rocky ridge is used to ground the building.

The Karoo Wildness Centre by Field Architecture aims to create a dialogue with the mountains that form the backdrop to this centre with its thin straight roofs reaching out into the Karoo landscape. The building looks to the detailing, using the immediate materials around the site so that it creates an intimate relationship with user and context, with the roof mimicking a leaf to collect water emphasising its importance in the arid Karoo climate.

We need to aim to create an architecture that involves the architect, user and nature to find an understanding between all three.

'I find counterpoint to be vastly more interesting than harmony'

(Architect Sverre Fehn , 1997)

The Fynbos Centre's elevation, in contrast to its plan which echos the landscape, opposes the curved smooth mountain ridge with straight horizontal lines and then three vertical towers bringing a verticality to the long rammed earth walls.

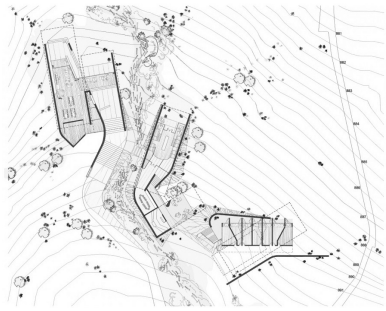
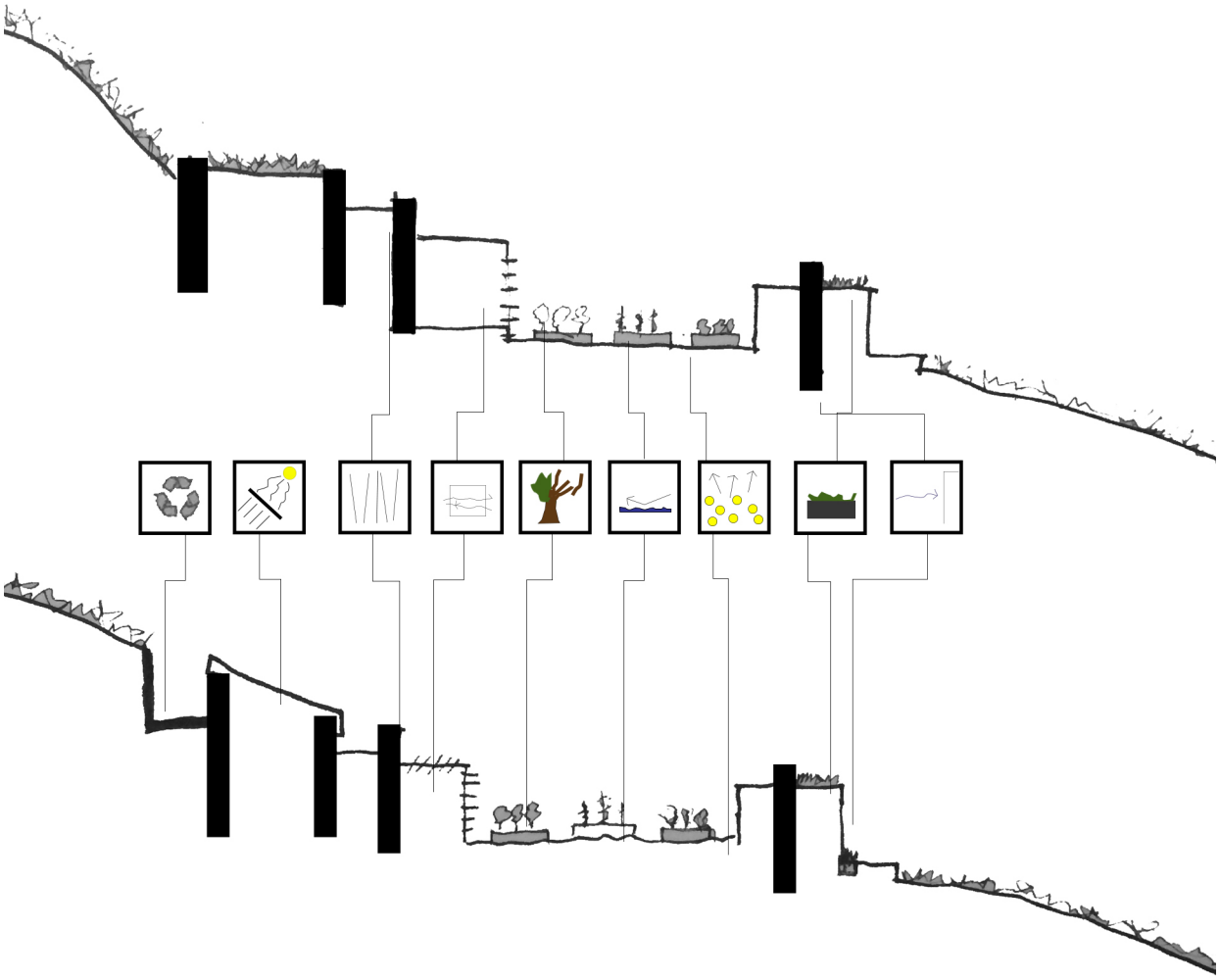


Fig 36



Solar panels

Seasonal vegetation:
summer sunlight

Diffusing sunlight material

Water collections

reservoir/evaporation/pond/
sunlight/refractive surface/
watering source for garden

Planted green roof

Wind protection

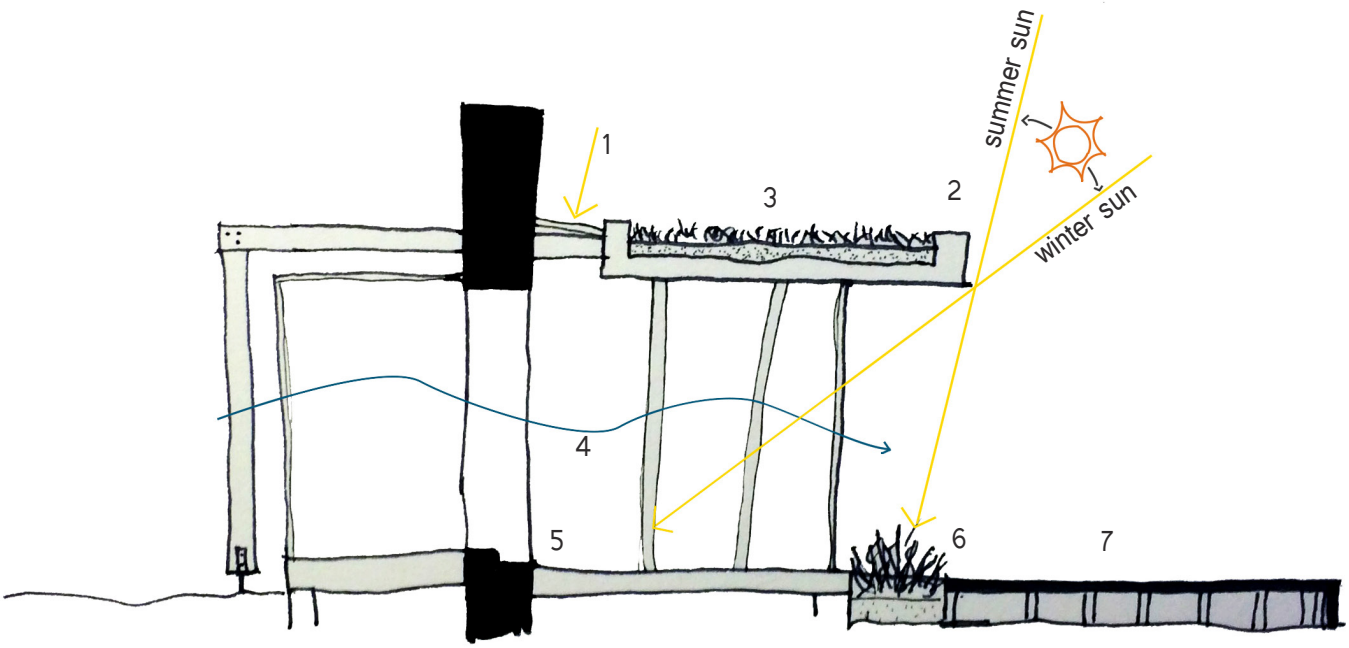
Natural light

Cross ventilation

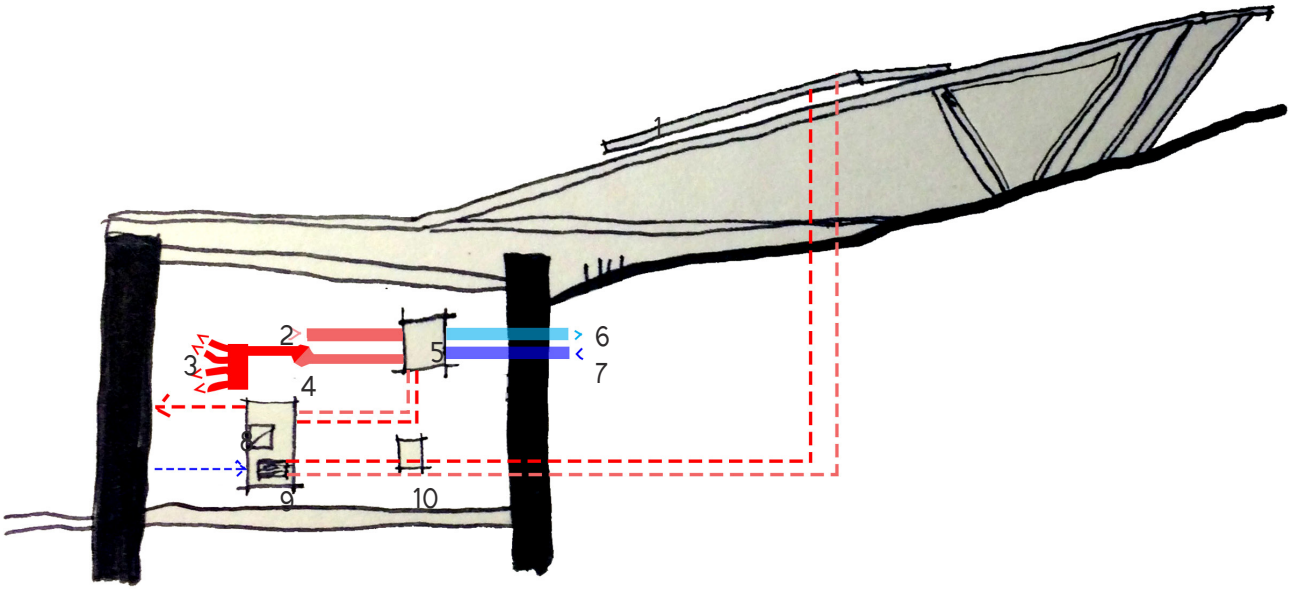
s u s t a i n a b i l i t y

In order to have a sustainable world it is important that we reinvestigate how we see 'sustainable', as a true understanding of ecology looking at how we practice our present forms of agriculture, production, building and landscapes and how, vitally, design comes into each of these areas. 'We must mirror nature's deep interconnections in our own epistemology of design' (Van der Ryn & Cowan, 1996: x)

In spite of our ever growing need and the lack of care for the source of our existence, the sustainable movement is one with hope for the future, one that aims to create connections between culture, nature and technology to ensure there remains an inhabitable and even beautiful world. Sustainability cannot have a single pronged approach but needs to be addressed by both the people in power as well as the people trying to preserve traditional practices and helping local communities. Environment educator David Orr speaks to these issues explaining the grassroots approach as 'ecological sustainability' where it 'is the task of finding alternatives to the practices that have gotten us into trouble in the first place: it is necessary to rethink agriculture, shelter, energy use... community patterns, forestry, the importance of wilderness and our central values' (Cite David Orr, Van der Ryn & Cowan, 1996: pg. 5). Presently, technological sustainability sees the environmental crisis as that 'every problem has either a technological answer or market solution'(Cite David Orr, Van der Ryn & Cowan, 1996: pg.4). Where the two different points of thinking collide is awareness but they ultimately have very different areas of focus for a sustainable world. Technological sustainability often forgets or ignores the details of culture and community to better manage the earth's resources using 'sustainability' as the driver for development and cost benefit analysis and data as a defence, but never finds out how people actually respond. Whereas ecological sustainability restrains itself and looks to rather limit use and exploitation of the earth as a means of looking to other options which will not deplete the biosphere.



1- Large roof overhangs to lock the sun in, in summer and allow light in, in winter.
2- Photovoltaic panels integrated into the skylight panels. The direct sunlight filters through the PV skylights which have a 90% opacity and allow diffused light to enter the building.
3- A roof garden moderates the temperature and helps cool the building by acting as insulation. Planted with Fynbos succulents that are drought tolerant.
4- Large sliding panels on both sides of the restaurant open to allow for cross ventilation, which aids in cooling the space during summer.
5- Concrete floors and rammed earth walls capture heat in the winter and slowly release during the day helping to heat the centre.
6- Planted Fynbos with water channel to help stop fire.
7- Cedar wood deck which can be burnt away if fires reach the centre.



1- Solar collector
2- From exhaust air manifold (wc/labs)
3- Flexible plastic supply duct to rammed earth walls for distribution (heating only as excess water from winter rain)
4- Hydronic duct heater
5- Heat recovery ventilator
6- Exhaust to outside
7- Outdoor air supply
8- Gas supply
9- Gas-backup Solar tank
10- Drain back tank

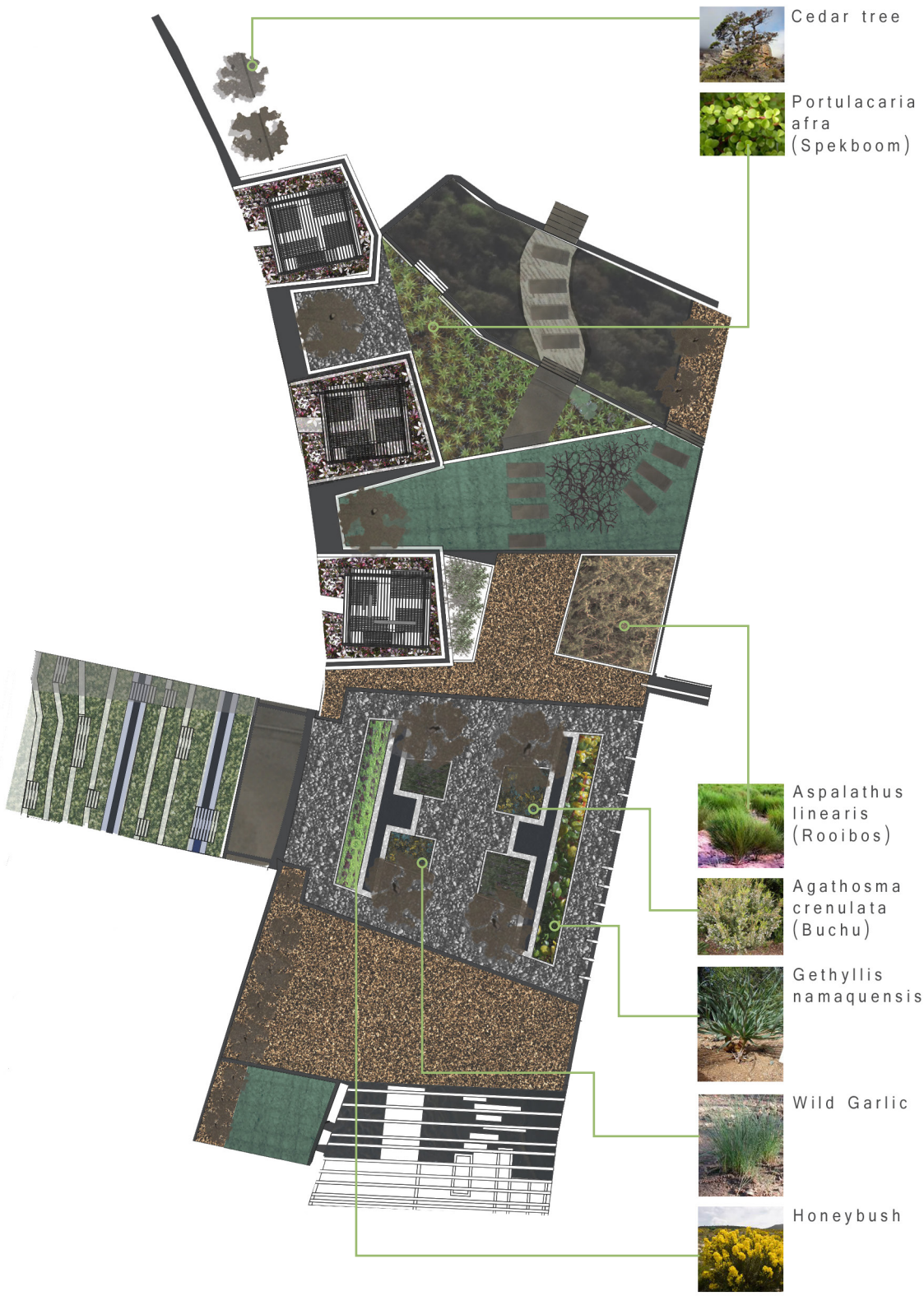
Design is the way forward within the ecologically sustainable way of thinking. Designing from the bottom up, using local traditional knowledge and looking to nature for inspiration will assist with the details of the design in a long term approach to sustainable development and to the point where nature takes over once the balance has been restored. 'Design is a hinge that inevitably connects culture and nature' (Van der Ryn & Cowan, 1996: pg 8) We sometimes use design in a very narrow way that leads to fulfilling human interests but have neglected the impact it could have on nature if we were to design to create a dialogue.

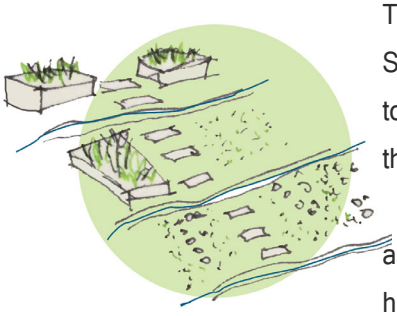
This Fynbos centre strives to do just that, to design to allow for nature to occur and then to become self-reliant in order to facilitate a redesign of the problem. An example of this is how the restaurant deck is separated from the dining area to allow the Fynbos to be in direct conversation with the visitor but also to create a fire break so that if a fire occurs the deck can be burnt away but the architecture will remain. Cedar trees will be planted and will eventually be able to be sustainably harvested without being cut down so as to replenish the deck.

Planted roofs will help to insulate the building as well as continue the natural landscape, however when the fires spread to the roofs, the water which was naturally collected will be used to flood them, quenching the flames. This will allow the fire to still have done its job in ensuring the continuation of the species while the flood of water will save the building from being burnt down. The garden which will be planted with a variety of Fynbos will also be burnt seasonally using the water from the troughs to extinguish the flames, as well as to irrigate the Fynbos during the rest of the year.

Between the laboratory buildings which have been buried into the mountainside small habitats have been created between the architecture forming smaller micro-climates for types of Fynbos that need a darker, wetter environment. These rarer species can also be studied by the conservation research programme.

The rammed earth walls, which will house a number of functions including spaces for birds to nest will help to increase the spread of seed. The amount of seeds distributed by birds in the Fynbos Biome is fairly low, being spread mainly by ants, compared to the Karoo Biome where birds spread most of the seed. Creating a habitat for birds to nest will perhaps bring more of them to the Nature Reserve and help to distribute the seed.

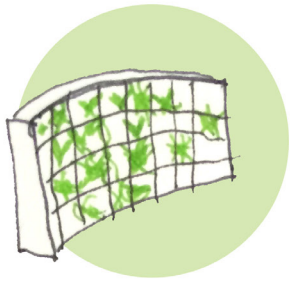

Cedar tree
Portulacaria afra (Spekboom)
Aspalathus linearis (Rooibos)
Agathosma crenulata (Buchu)
Gethyllis namaquensis
Wild Garlic
Honeybush



Terraces

Subtle terracing of the topography helps to keep the soil on the slope and treat storm-water as well as creating micro-habitats within the garden.

_Earthwork



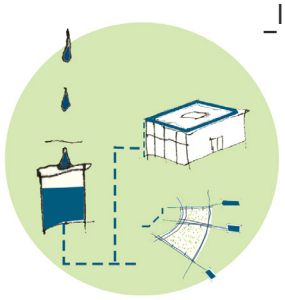
Living walls

The walls for the building can act as another substrate for vertical gardens promoting sustainable gardening.

Water collection

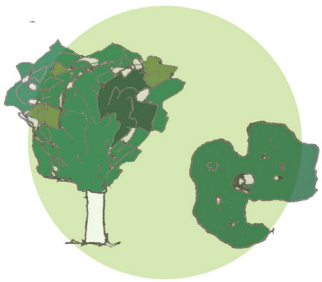
The most important source of water for the oasis is rain, a precious and limited resource, so clever release technologies are needed.

_Irrigation



Reclaiming water

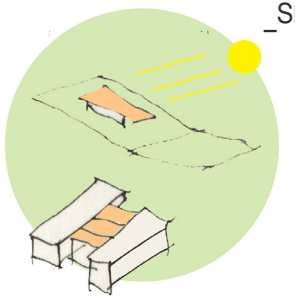
Collection of rain and run off water to be reused around the centre for fire prevention or irrigation.



Shade

Using the shade of the Cedar trees will create an inviting oasis for people to enjoy.

_Shade/sun



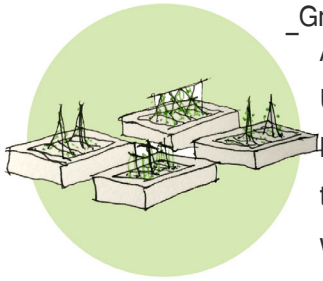
Sun

Taking advantage of the hot sun by using solar and photovoltaic panels on the roof and skylights.

Designed experiments

Using the spaces between the laboratories to create new micro-climates for different Fynbos types and new growing methods can be explored.

_Growth



Agriculture

Using the garden to grow local produce and different types of edible Fynbos will promote the species further.

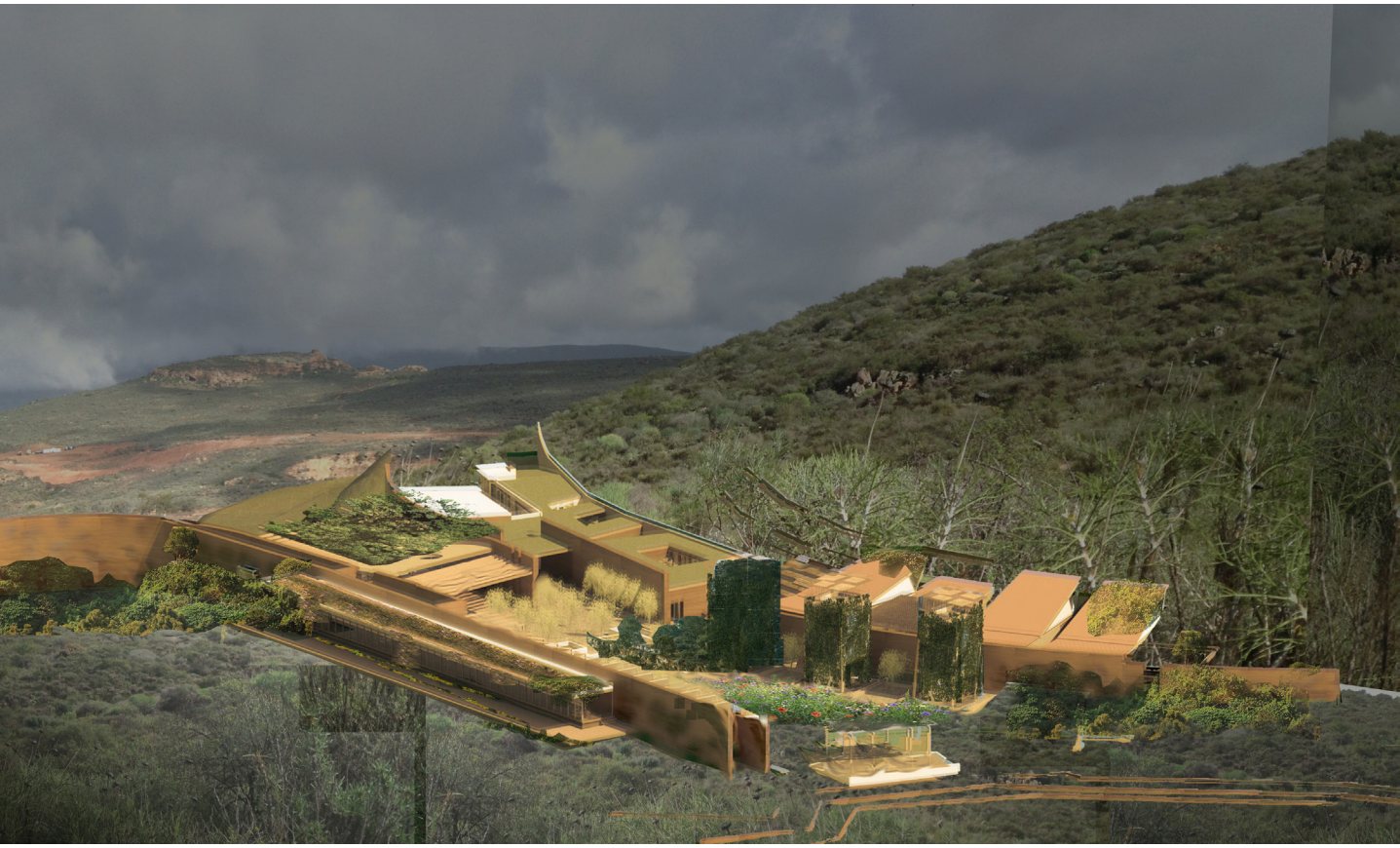
Walkways

A network of trails for discovering the Fynbos before reaching the centre.

_Celebration

Pause Spaces

Along the routes there will be pause spaces to admire the view and acknowledge the surroundings.



PRECEDENT: Steinkopf Community Centre

Architect: Roelof Uytenbogaardt

Steinkopf Community Centre in the Northern Cape was a community project that was only partly completed due to lack of funding. Only the hall was ever finished but the building had been a grand scheme to uplift the community of Steinkopf which never came to fruition. The roof which spans a large area is stretched out to create shade beyond the building and make a street edge barrier. The structure uses this long spine to link open and closed as well as public and private spaces. The stepped roof creates a clerestory lighting system allowing light to penetrate into the vast space.

As this building was abandoned and has since been slowly taken apart for materials, it has fallen into ruin being enveloped by the hot arid landscape, leaving behind only the bones of the architecture and what was implied but never realised.

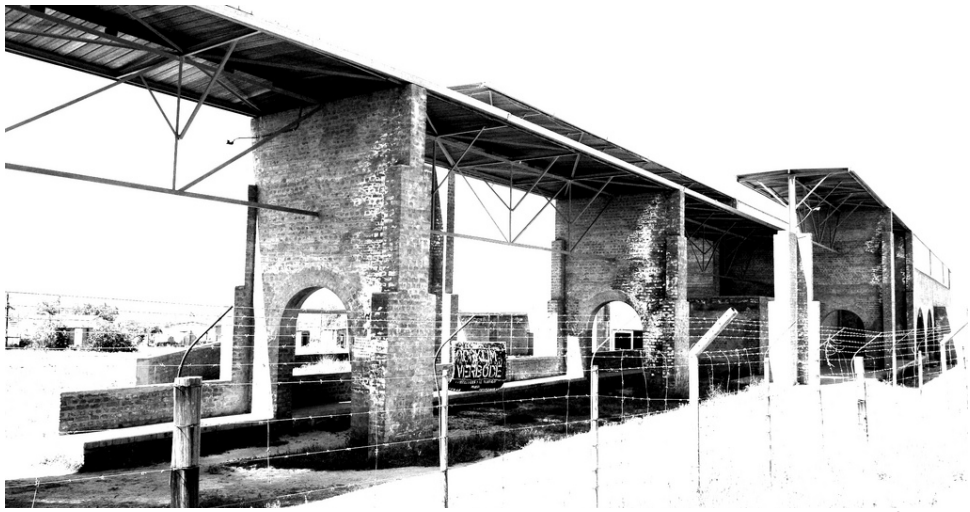


Fig 37

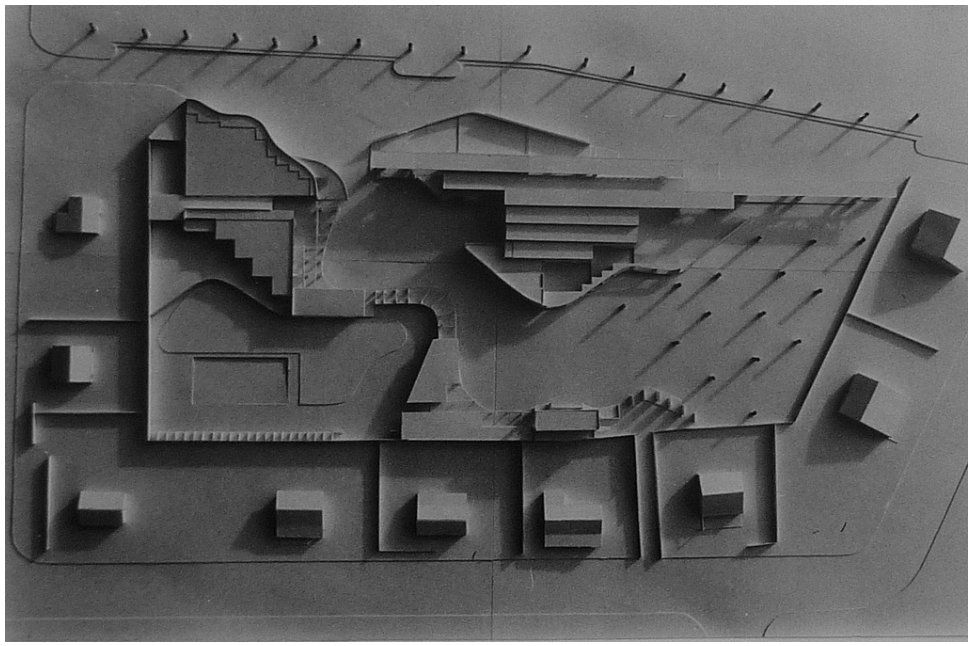


Fig 38

WINTER

01_Technical Study

- Rammed Earth Walls
- Precedent: Oaxaca School of Plastic Arts
  NK'Mip Desert Cultural Centre
- Details

02_Final Design

- Design Drawings

Fig 39

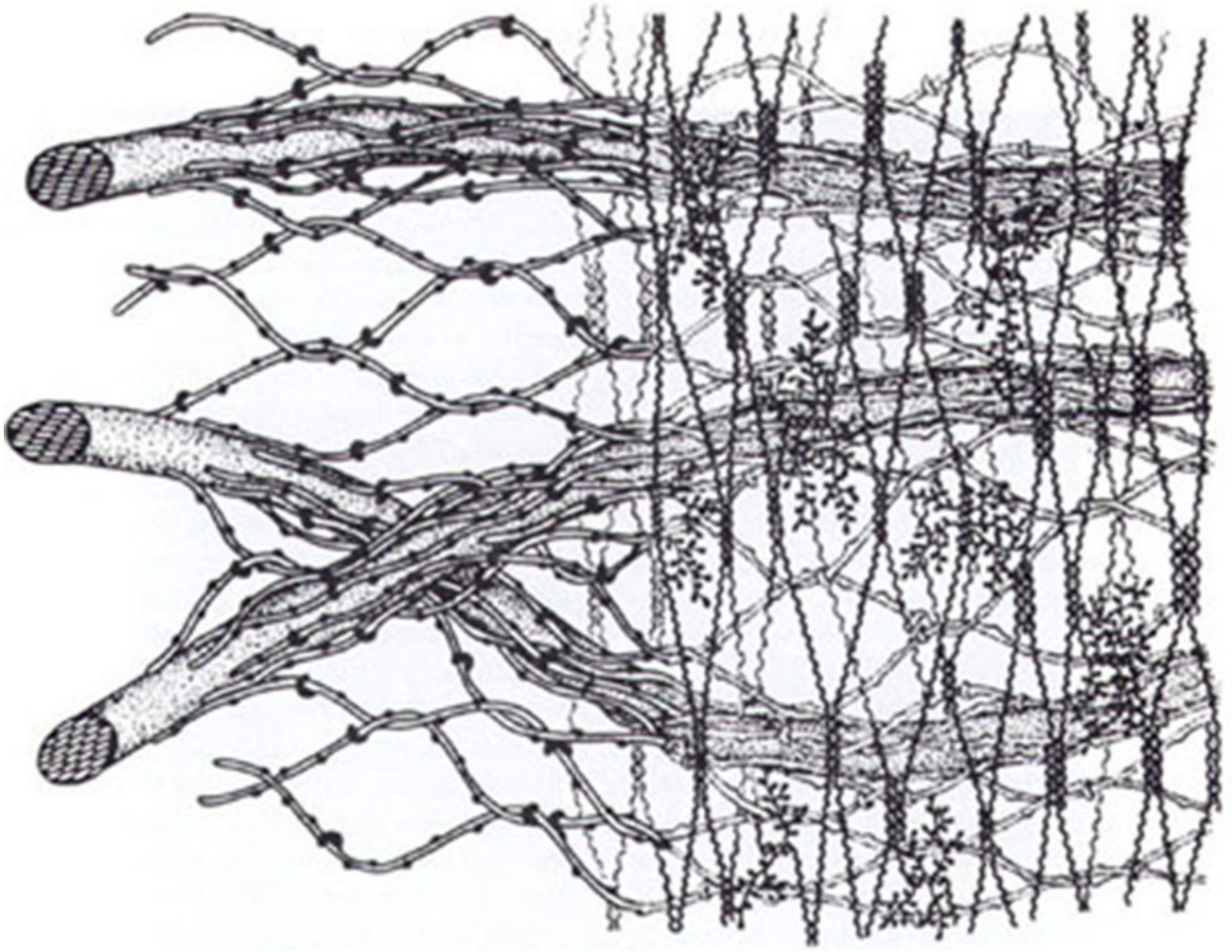


Fig 40

t e c h n i c a l . s t u d y

The plant cell wall is a highly organised composite'

(Carpita, 2001:1)

Fynbos plants are made up of cells which are in essence the building blocks which define them. The 'skin' of a plant consists of a covering called the cell membrane and cell wall, which differs from other living things, for instance an animal has only a cell membrane. This cell wall is important as it provides protection and support for the plant, much like a brick wall in a building, and also provides shape. It has many different functions and is vital to the survival of the plant, so it will be important to look at the wall as an architectural term and see how it too can function beyond holding up the roof.

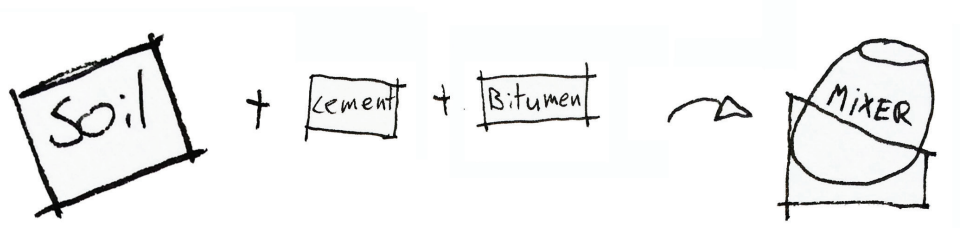
As was discussed previously, the building has rammed earth walls rising out of the sandstone soil of the area, which will also be the material used in the construction of the walls, which is a locally sourced building material. The rammed earth walls are especially useful as they can be shaped to whatever meets the demands of the building. The structure of the Fynbos plant will influence how these walls are used as building blocks for other activities, creating storage, shelves, seating and nesting places for birds, but in an architectural sense these walls are the perfect vehicle for passive heating and cooling systems, creating insulation for both weather and sound as well as for structure.

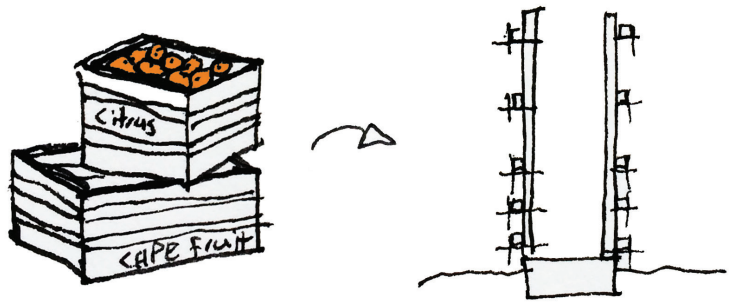
R a m m e d . e a r t h

Rammed earth walls have been used since ancient times, a section of the Great Wall of China was even made using this method. These walls are easily constructed and as most of the material is found on site, it makes it very accessible and keeps the carbon footprint of the building low.

The earth walls have excellent thermal storage qualities at very little cost. If they are constructed properly they are incredibly durable against even fire, rot, and termites. The earth walls regulate the air moisture for indoor climates as well as sound proofing the spaces and expelling polluted air.

The construction process uses three percent of the energy expended in similar concrete buildings so the rammed earth walls are also very efficient. As the soil in Clanwilliam is prominently sand, cement and bitumen will be added to the soil mixture. The process is labour intensive; however, it must be noted that labour is ecologically neutral and does not harm the environment where machines and other processes add to a building's embedded cost.



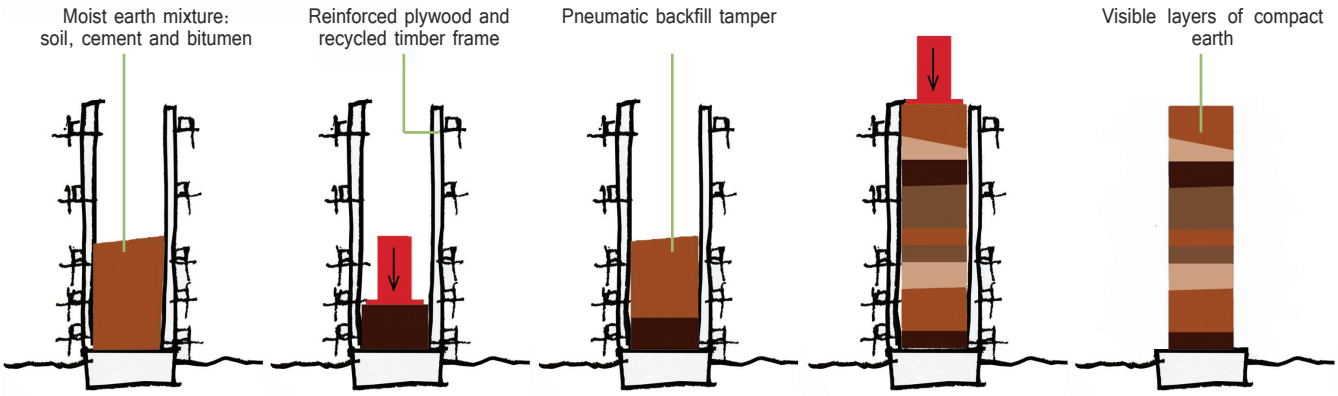


There is large scale citrus production very close to Clanwilliam which uses wooden crates, these can be recycled and used to form the wooden framing structure for the rammed earth walls. Once the structure is set up, the mixture must be blended on site and placed into the wooden forms immediately so that the damp earth does not dry out. Concrete plinths of about 35cm are placed at the base of the walls, with a sheet of bitumen so that ground water does not cause erosion or damp.

The earth is then tamped down until it is completely compacted creating an

engineered earthquake-safe wall that has similar durability to that of concrete. These walls can be reinforced with steel and embedded with a core of insulation. They vary in thickness, according to their heights and loadings, from 30cm to 80cm with a 10cm insulation cavity. Conceptually the walls are similar to unreinforced load-bearing masonry cavity walls.

The process creates a stratified effect which can be thought of as primal or even give the idea of new construction within existing ruins. Variations in strata colour can be created by mixing different sands and gravels together. Due to the special structure and colour of the rammed earth, erosion and partial damage will not become quickly obvious or critical. These walls ideally undergo a natural aging process, especially because of the UV resistance of the earth pigments and because of the fundamental dryness and the hygroscopic activity of the silt material, micro-organisms and fungus cannot develop. Even over decades, the façades will show hardly any colour changes, in fact the intensity becomes stronger as time passes. With a technically flawless building process of edges and surfaces, maintenance should not be needed for many years.



Step 1: framework is built and a layer of moist earth is filled in

Step 2: the layer of moist earth is compressed

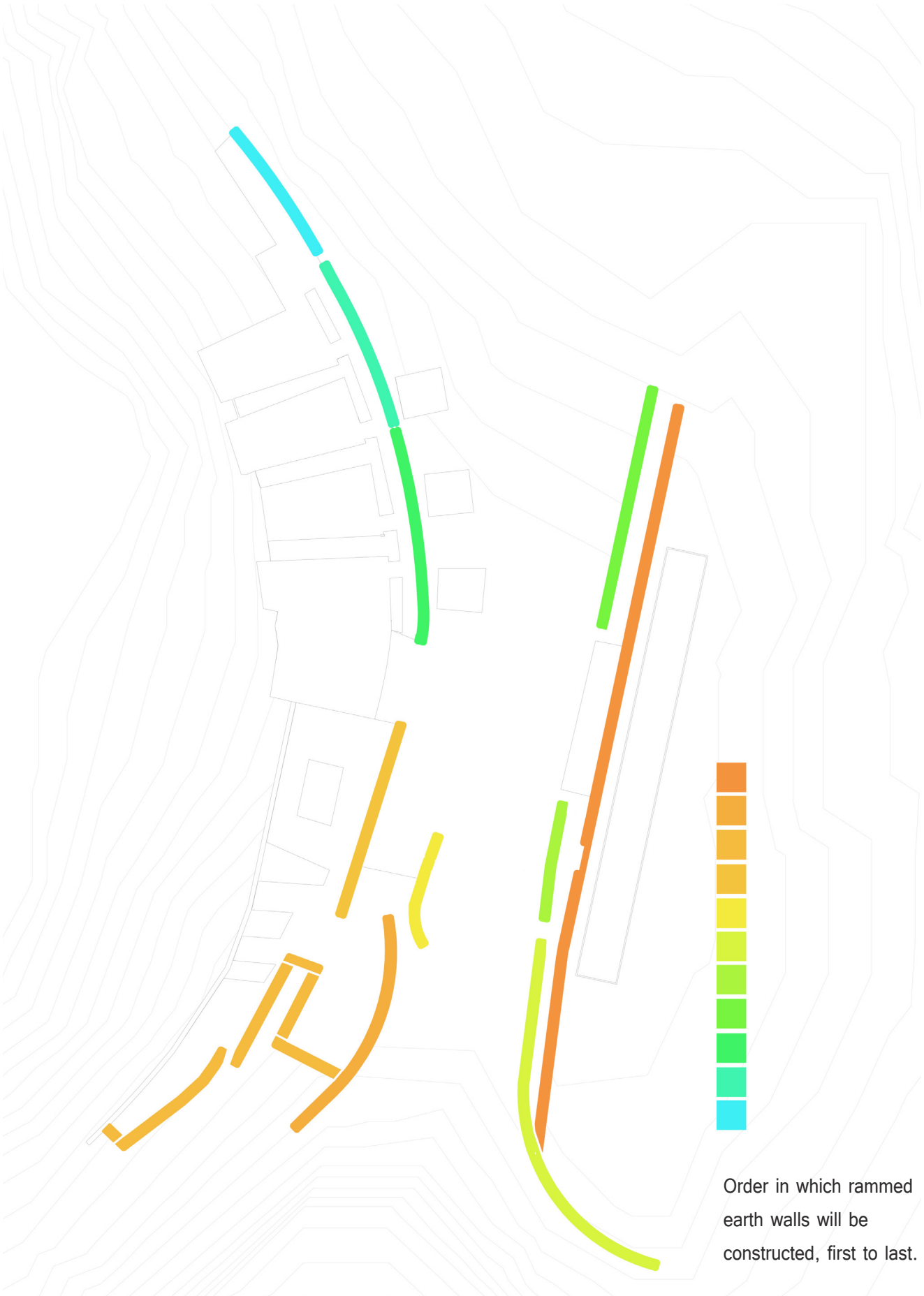
Step 3: the next layer of moist earth is added

Step 4: successive layers of moist earth are added and compressed

Step 5: framework is removed leaving the rammed earth wall

Even if erosion eventually causes damage, the earth walls can be rehabilitated with the same raw material so that the repair is hardly visible.
Rammed earth buildings can be situated in wet, temperate regions and they can be built in very cold regions if adequately insulated which makes this an ideal material to use in a climate that is both hot and dry, and cold and rainy. In the summer, when temperatures can reach above 50 degrees the earth walls can absorb solar radiation by day and release the heat by night and the thermal mass can absorb excess heat during the day keeping the inside cool. (Rose, 2001)

Rammed earth building schedule



Order in which rammed earth walls will be constructed, first to last.

PRECEDENT: Oaxaca School of Plastic Arts

Architect: Mauricio Rocha

The Oaxaca School of Plastic Arts was designed by architect Mauricio Rocha in collaboration with the Benito Juárez University in Oaxaca, Mexico. The area has a similar climate to that of Clanwilliam. As there were a lot of other construction projects in progress, there was an excess of loose earth available so the architect decided to use rammed earth walls to build the school. The walls help with insulation from the heat and sound as well as creating enjoyable courtyard spaces between the buildings with a good materiality provided by the walls.

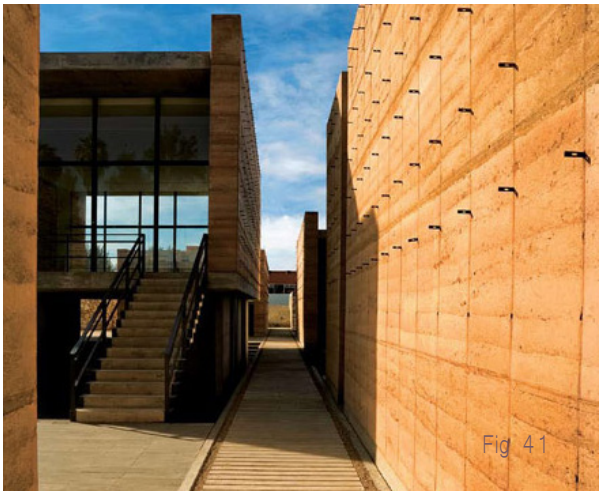


Fig 41

Fig 42

PRECEDENT: NK'Mip Desert Cultural Centre

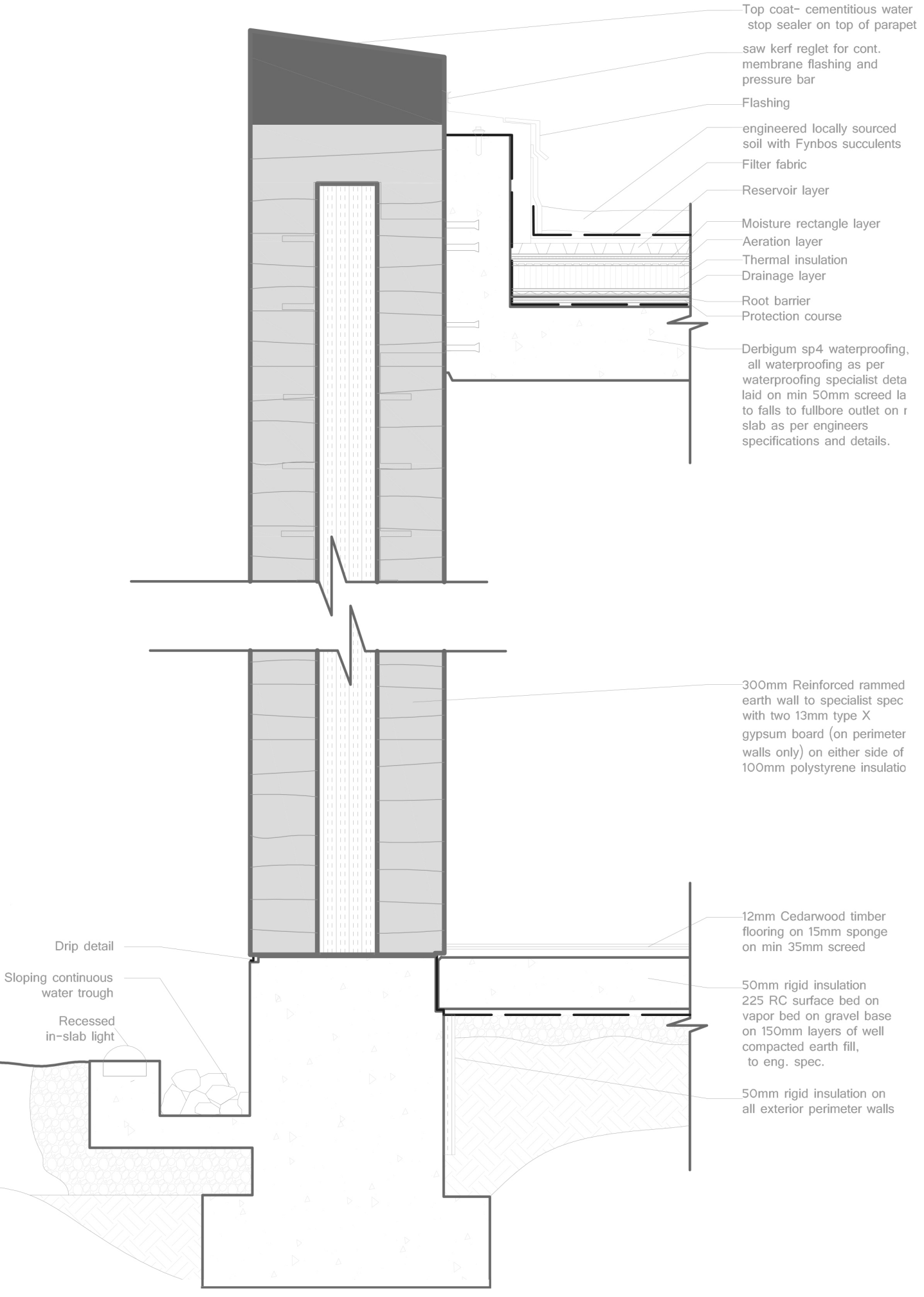
Architect: HBBH Architects

The Nk'Mip Desert Cultural Centre is a perfect example of how rammed earth can be used in a cultural and ecological environment. The centre can be found in the Canadian desert, within the South Okanagan Valley in Osoyoos. British Columbia has a complex political climate and the cultural centre was built to forge better relations with the native aboriginal people as well as to celebrate the rich past and culture of the area. This building blends into the landscape and speaks to the visitor about the natural environment, similar to the Fynbos Research and Education Centre.

Fig 43

Fig 44

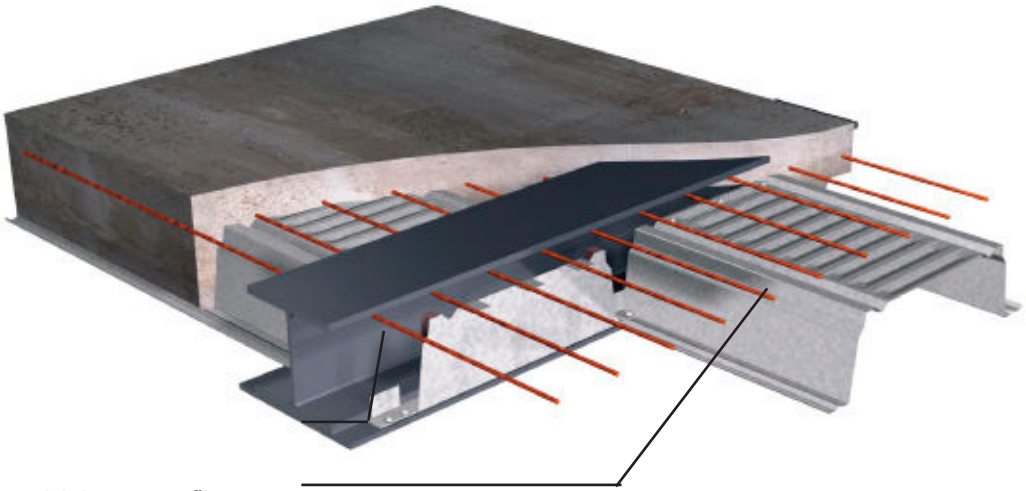
Rammed earth detail



Experimenting with different grades of rammed earth with different mixtures of clay cement and sand.

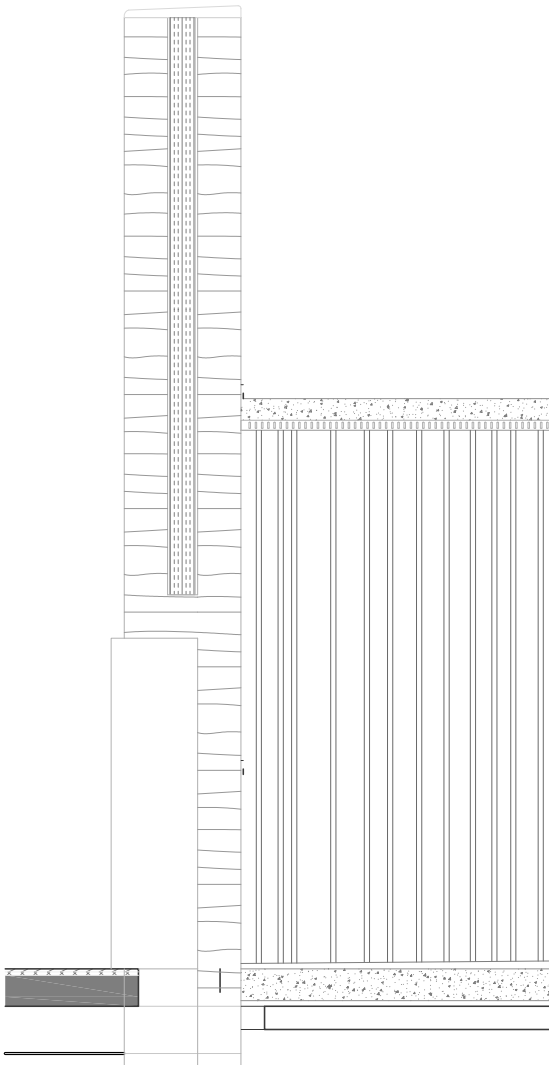
Composite floor detail for steel tower

Slim-floor application in combination with an asymmetric beam

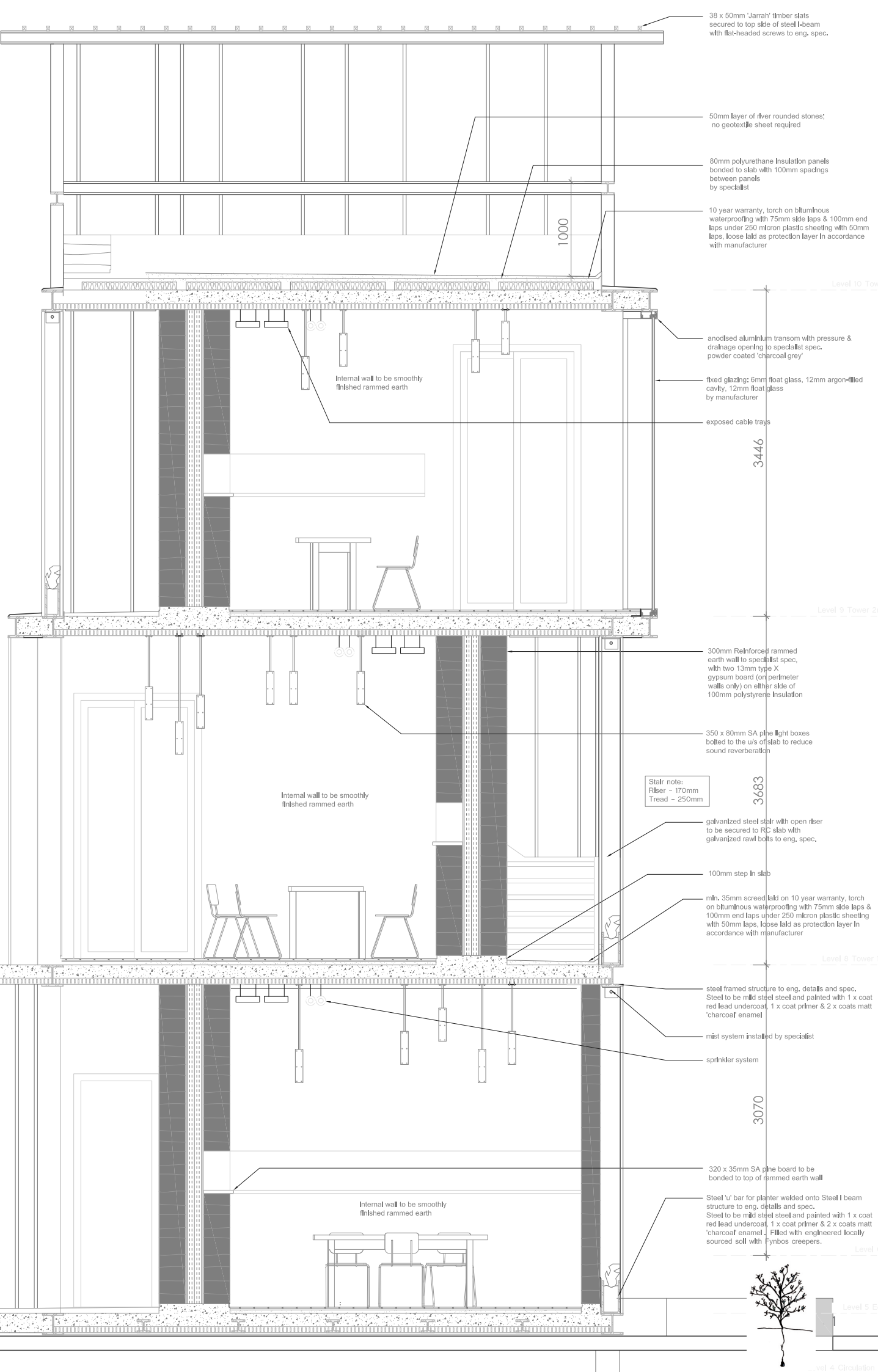


Patented steel I-beam profile

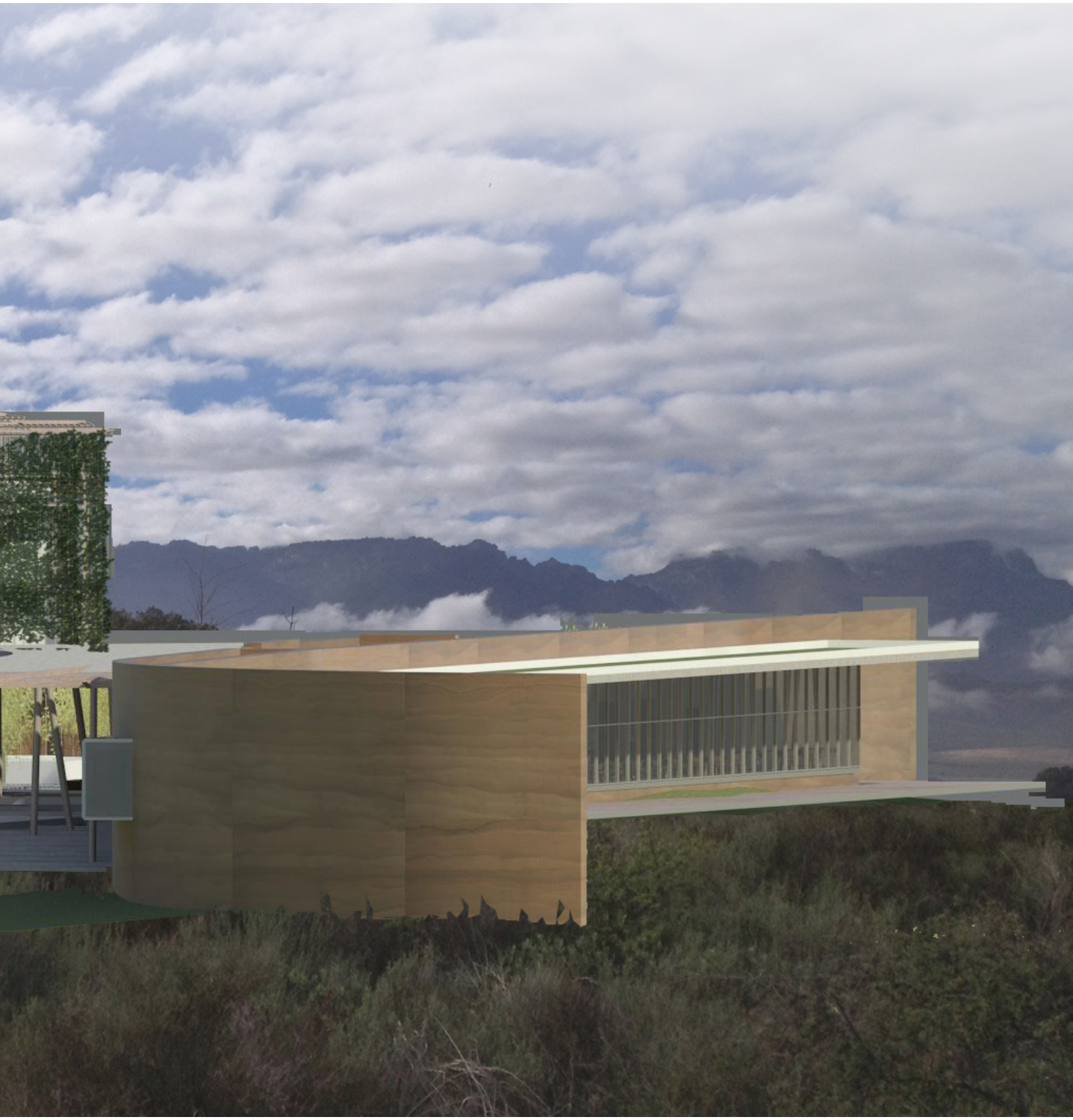
Ribbed reinforced concrete slab

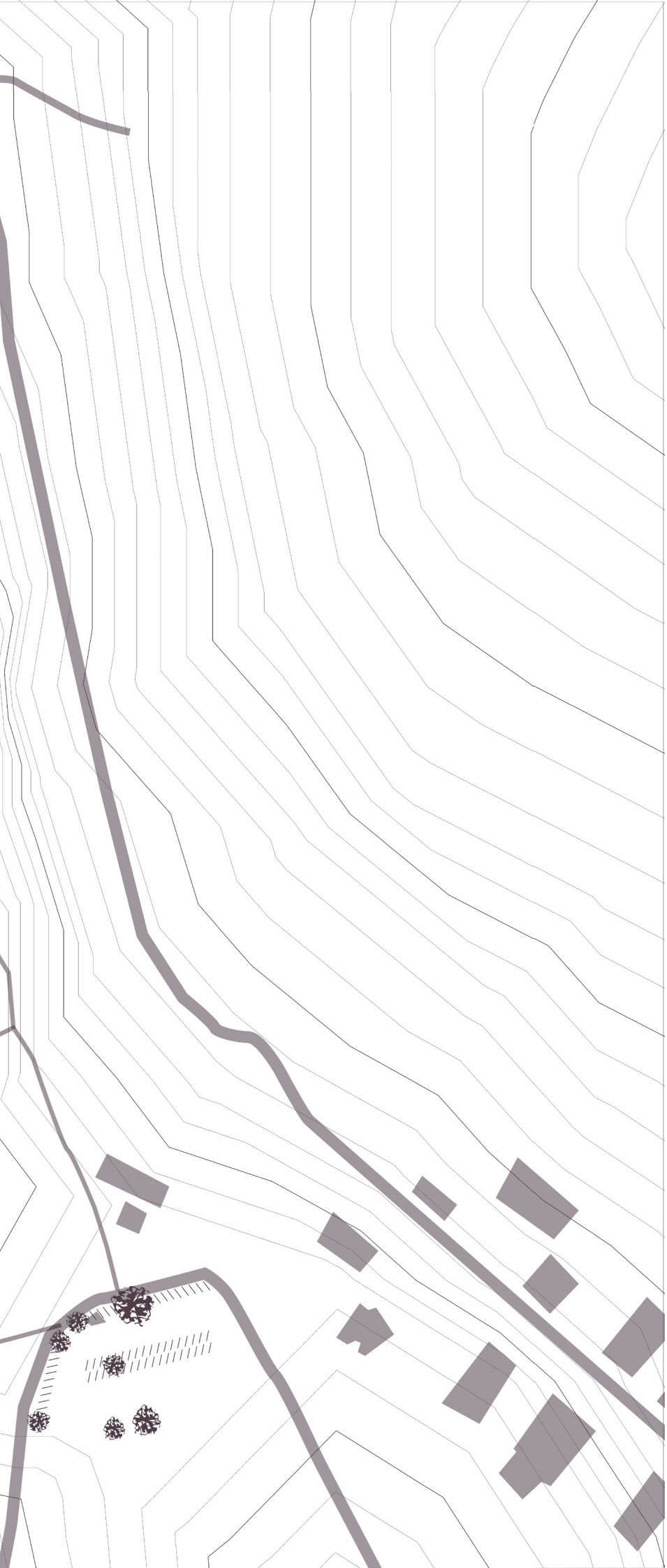


Steel tower office detail


38 x 50mm 'Jarrah' timber slats secured to top side of steel I-beam with flat-headed screws to eng. spec.
50mm layer of river rounded stones; no geotextile sheet required
80mm polyurethane insulation panels bonded to slab with 100mm spacings between panels by specialist
10 year warranty, torch on bituminous waterproofing with 75mm side laps & 100mm end laps under 250 micron plastic sheeting with 50mm laps, loose laid as protection layer in accordance with manufacturer
1000
Level 10 Tow
anodised aluminium transom with pressure & drainage opening to specialist spec. powder coated 'charcoal grey'
fixed glazing: 6mm float glass, 12mm argon-filled cavity, 12mm float glass by manufacturer
Internal wall to be smoothly finished rammed earth
exposed cable trays
3446
Level 9 Tower 2
300mm Reinforced rammed earth wall to specialist spec, with two 13mm type X gypsum board (on perimeter walls only) on either side of 100mm polystyrene insulation
350 x 80mm SA pine light boxes bolted to the u/s of slab to reduce sound reverberation
Stair note:
Riser - 170mm
Tread - 250mm
3683
Internal wall to be smoothly finished rammed earth
galvanized steel stair with open riser to be secured to RC slab with galvanized rawl bolts to eng. spec.
100mm step in slab
min. 35mm screed laid on 10 year warranty, torch on bituminous waterproofing with 75mm side laps & 100mm end laps under 250 micron plastic sheeting with 50mm laps, loose laid as protection layer in accordance with manufacturer
Level 8 Tower
steel framed structure to eng. details and spec. Steel to be mild steel steel and painted with 1 x coat red lead undercoat, 1 x coat primer & 2 x coats matt 'charcoal' enamel
mist system installed by specialist
sprinkler system
3070
320 x 35mm SA pine board to be bonded to top of rammed earth wall
Internal wall to be smoothly finished rammed earth
Steel 'u' bar for planter welded onto Steel I beam structure to eng. details and spec. Steel to be mild steel steel and painted with 1 x coat red lead undercoat, 1 x coat primer & 2 x coats matt 'charcoal' enamel . Filled with engineered locally sourced soil with Fynbos creepers.
Level
Level 5 E
vel 4 Circulation

f i n a l . d e s i g n

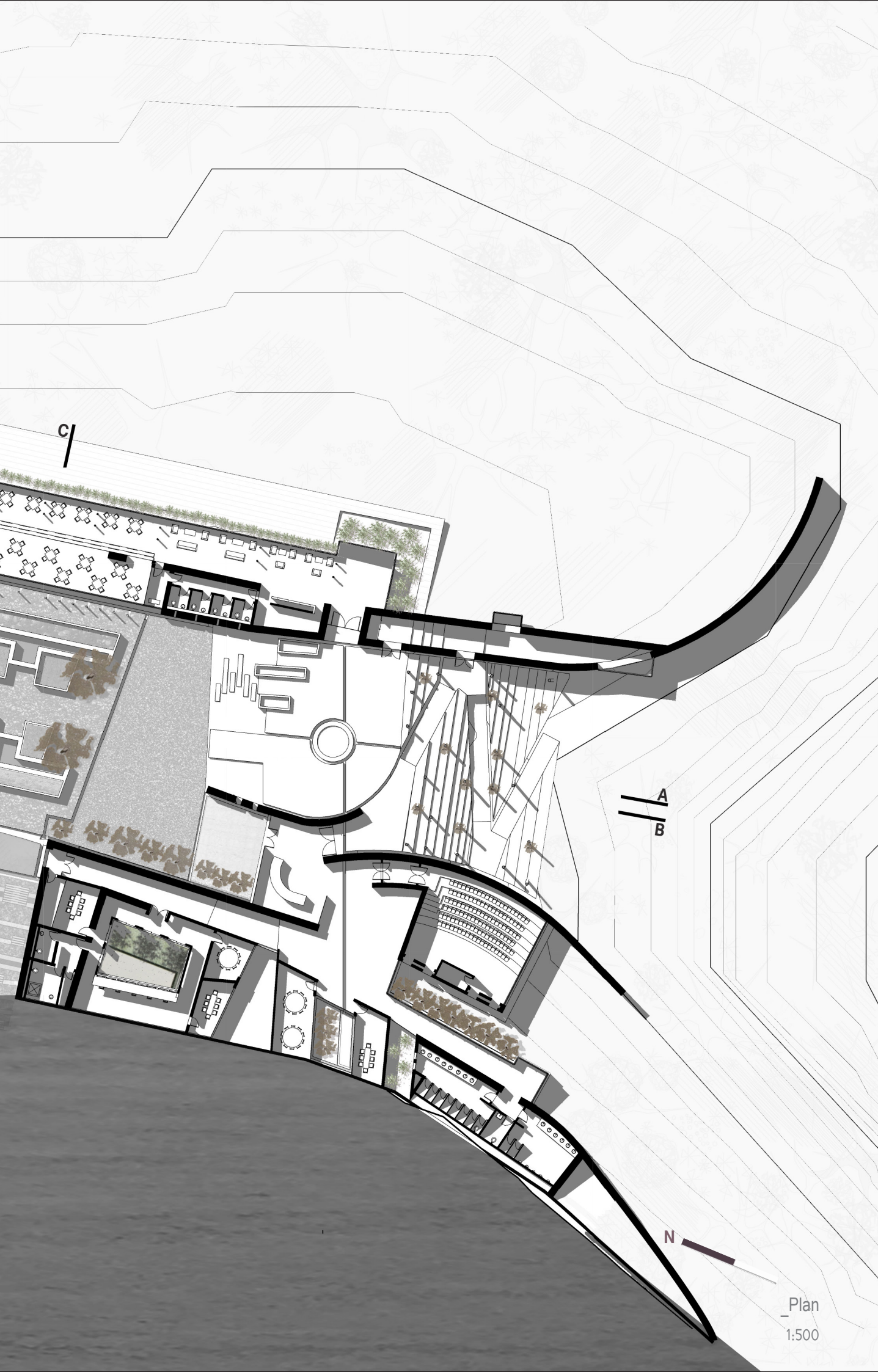




N

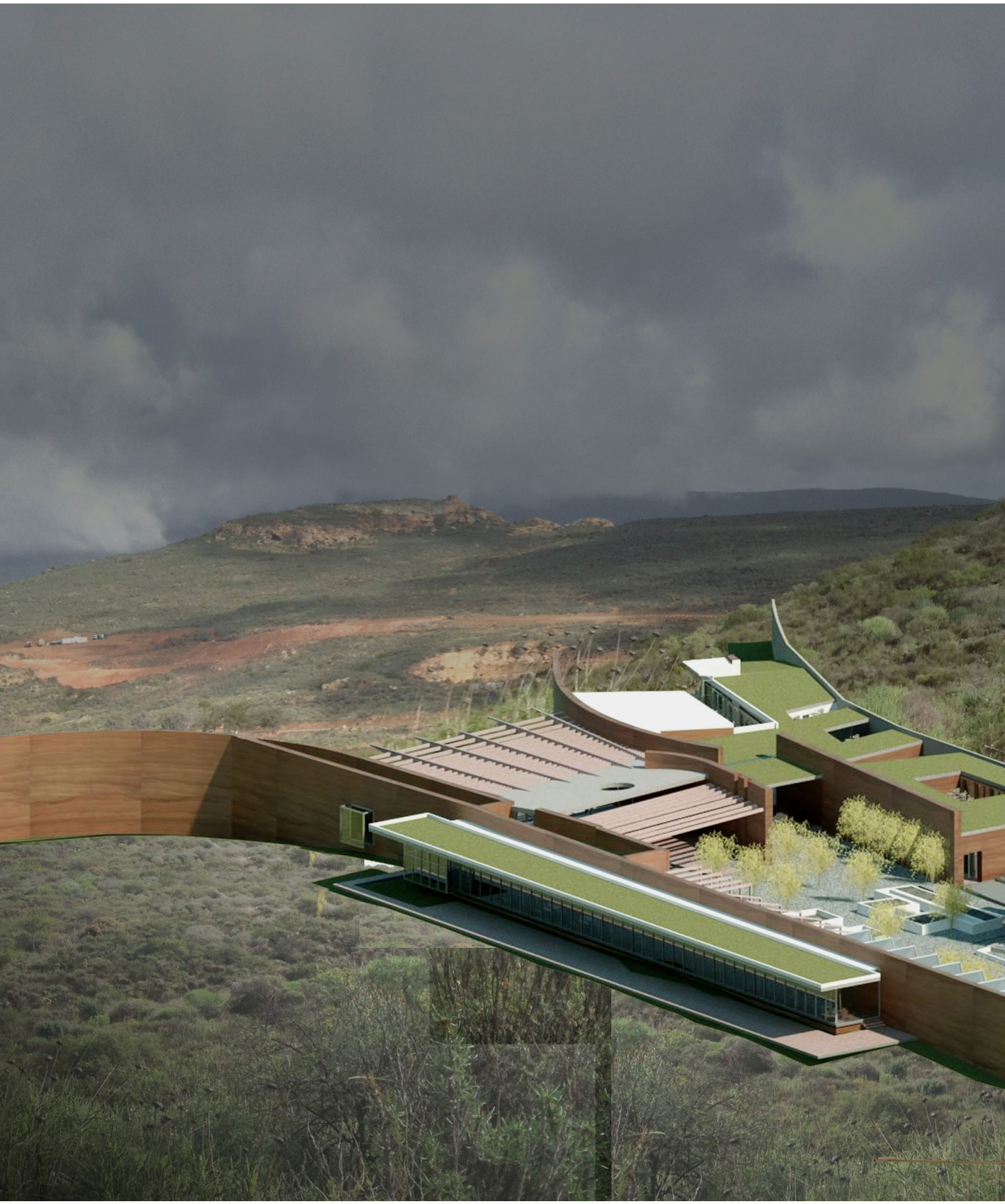
Site Plan
NTS


A
B
D
C
D

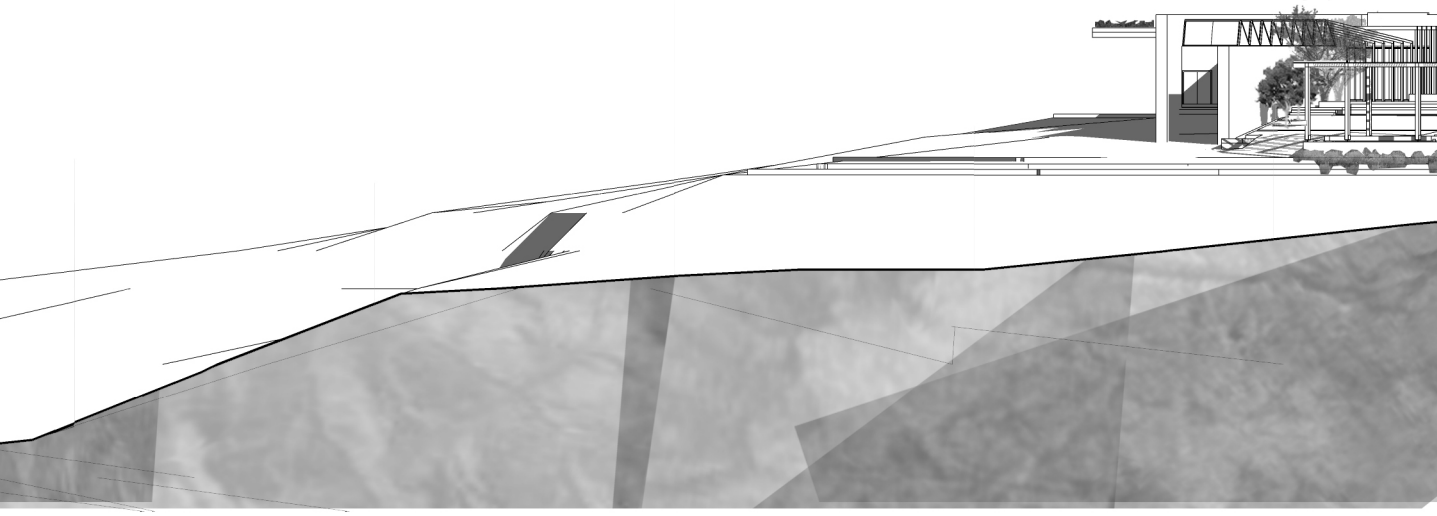


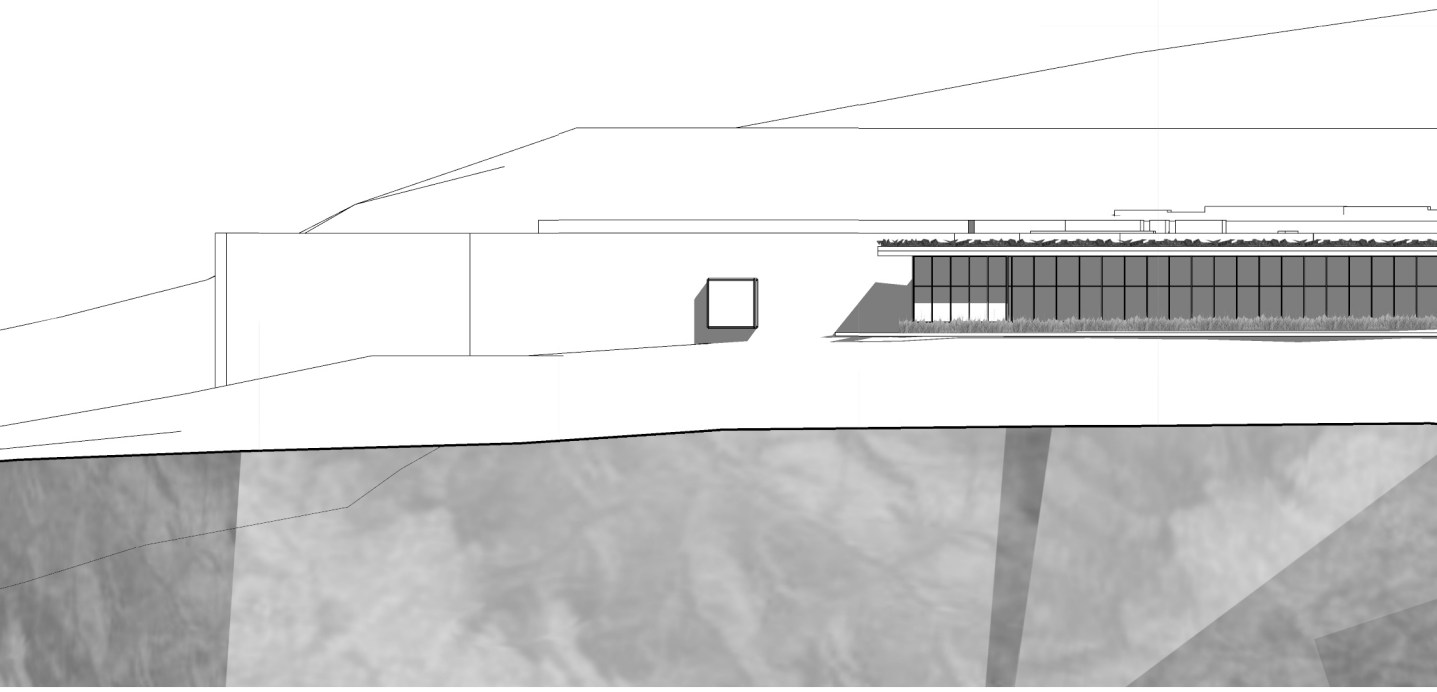
_Plan

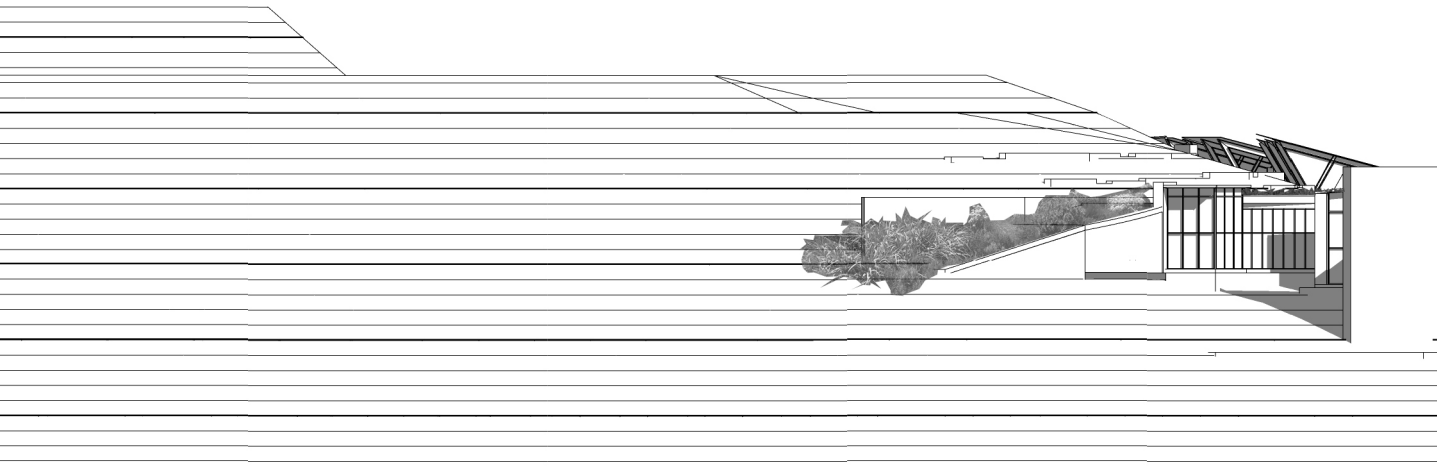
1:500

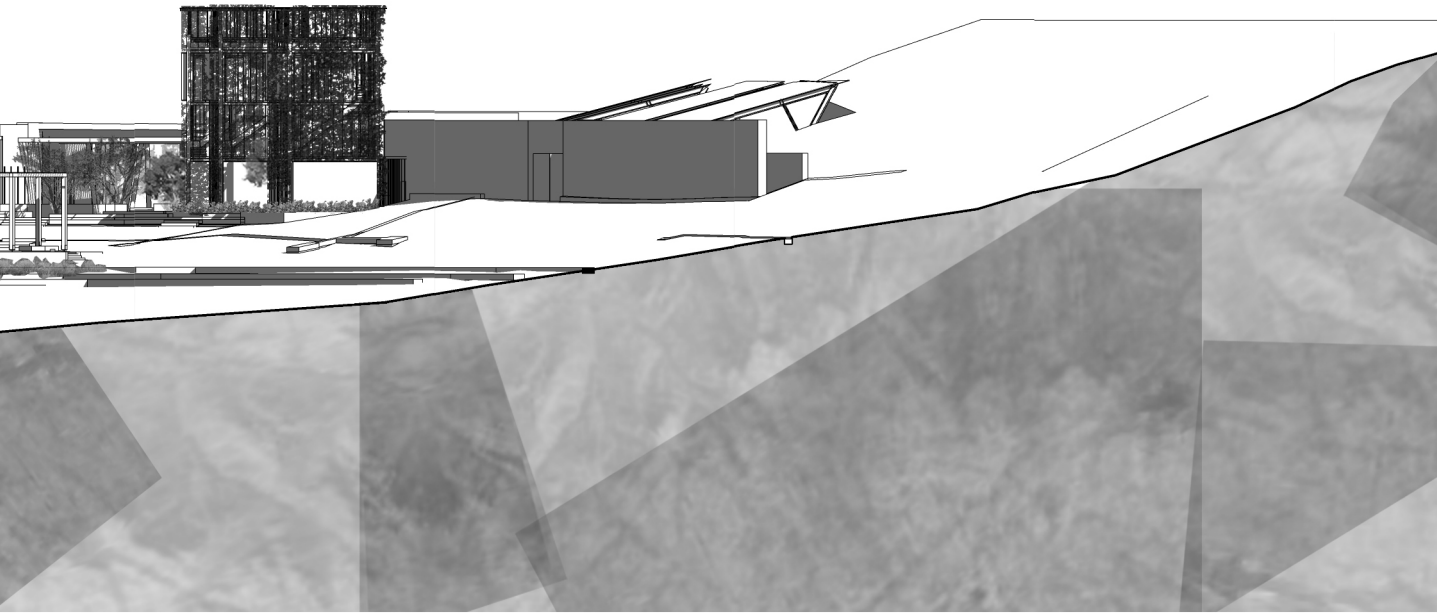


_View south towards the dam



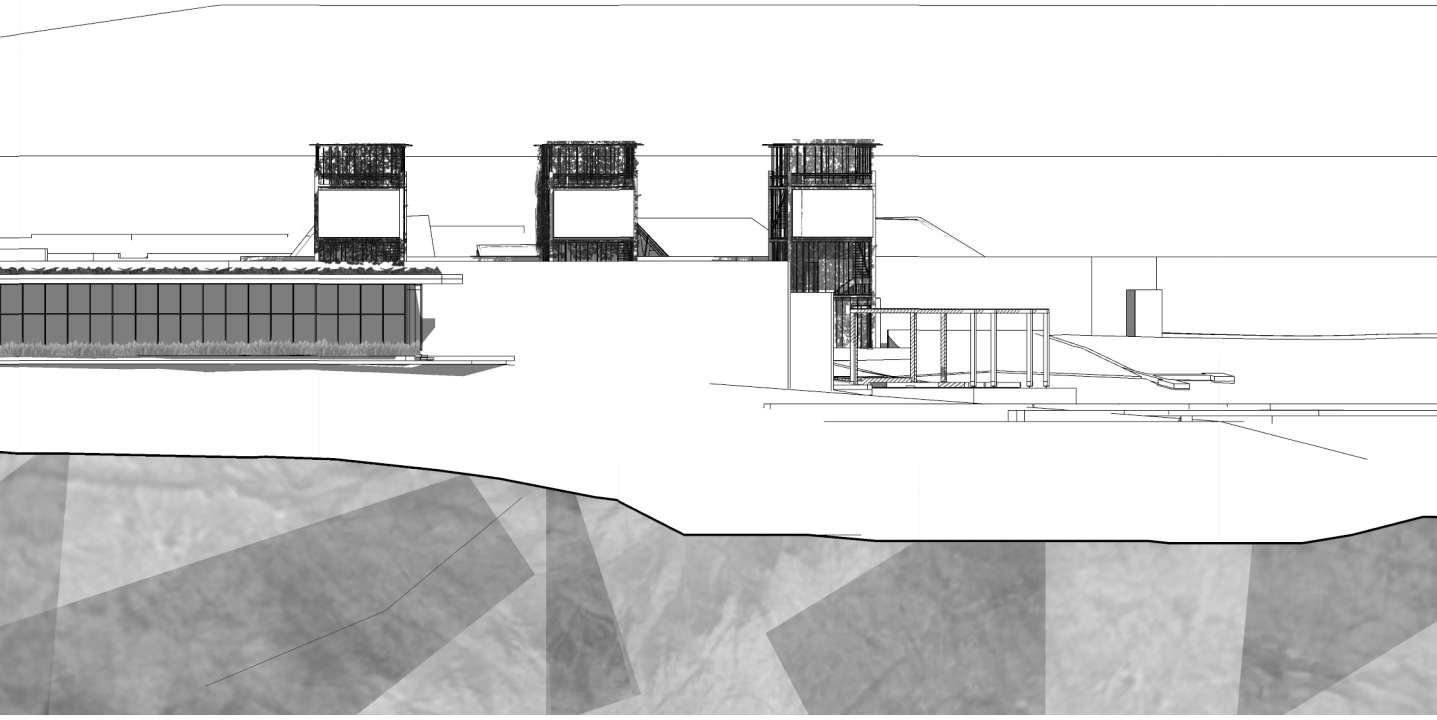






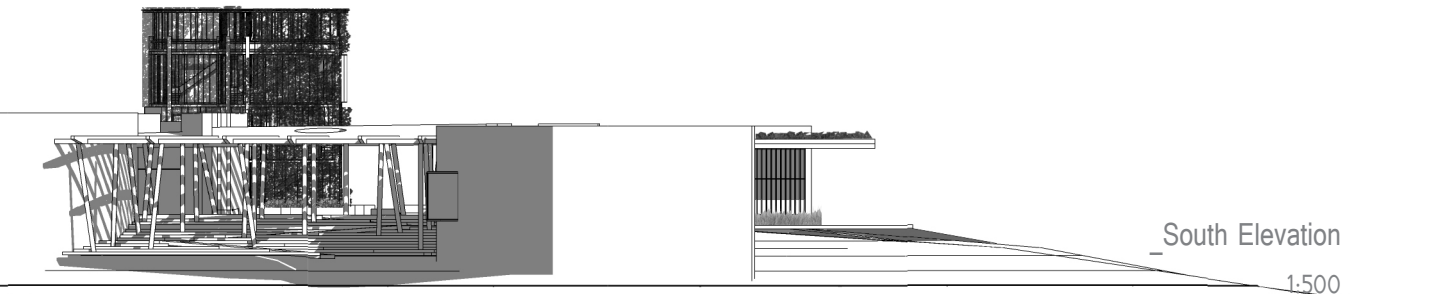
_North Elevation

1:500



_East Elevation

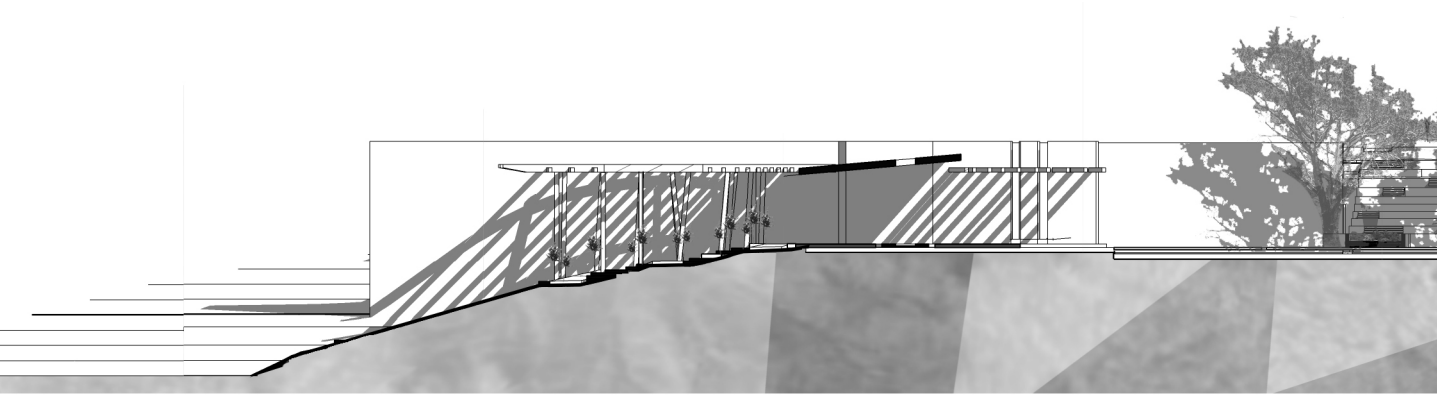
1:500

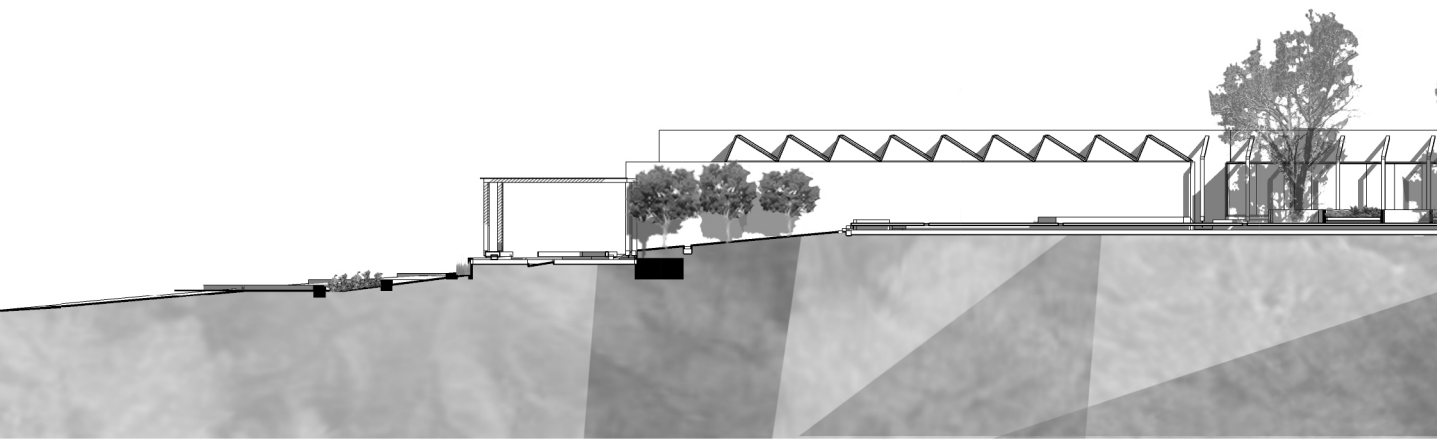


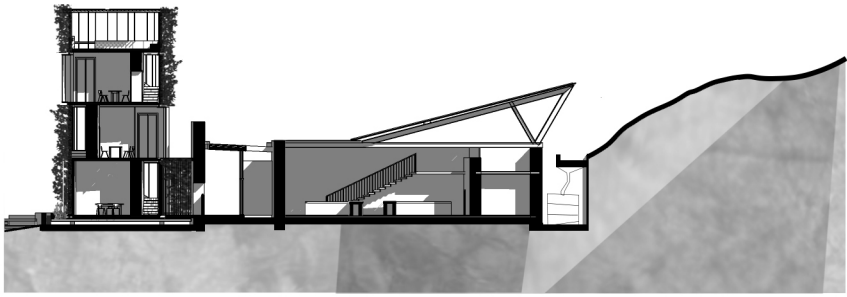
_South Elevation

1:500

_View north through the garden

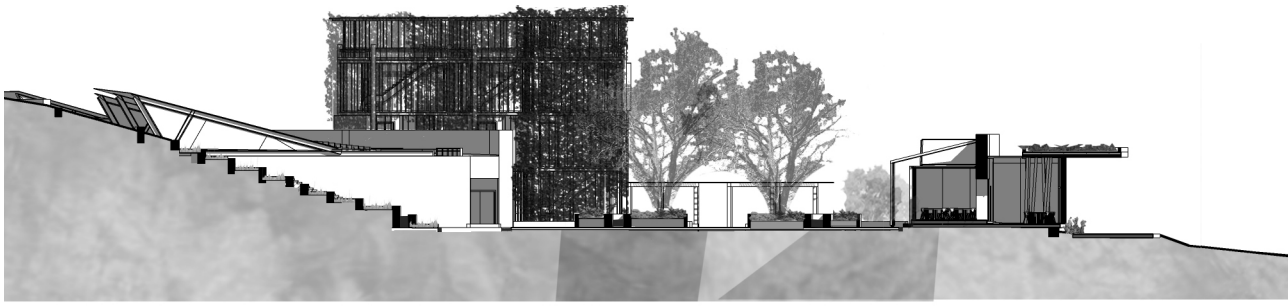






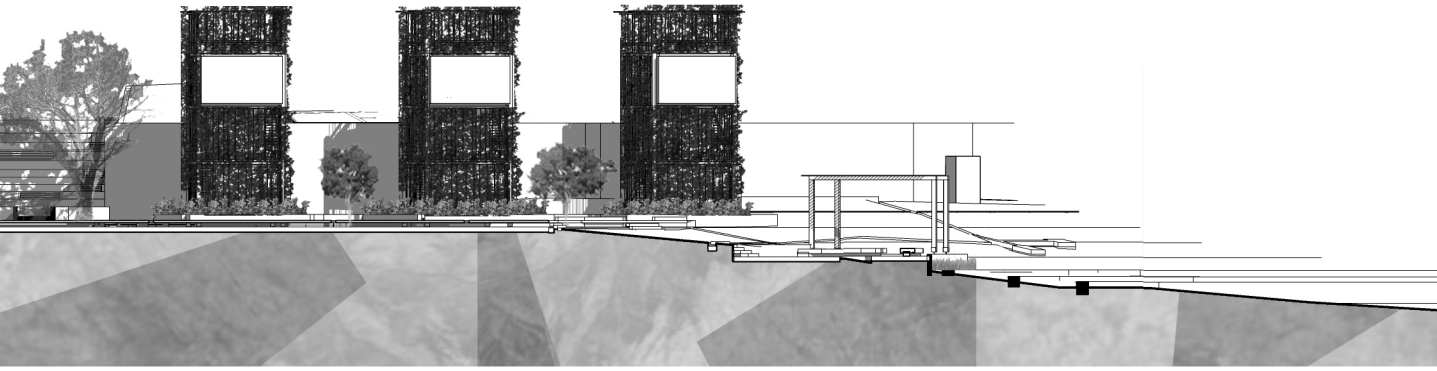
_Section DD through office tower and labs

1:500



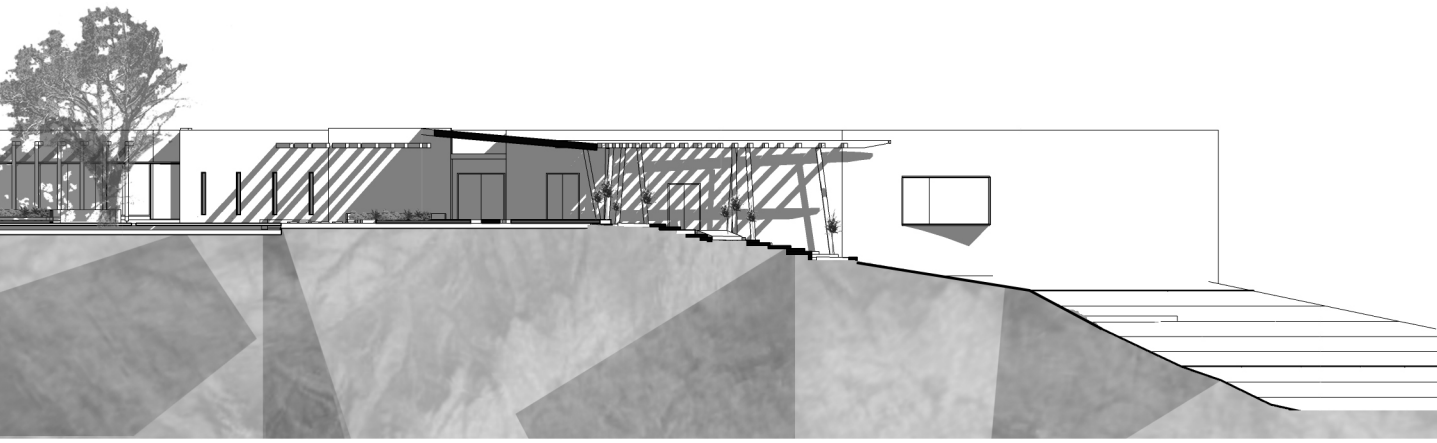
_Section CC through garden and restaurant

1:500



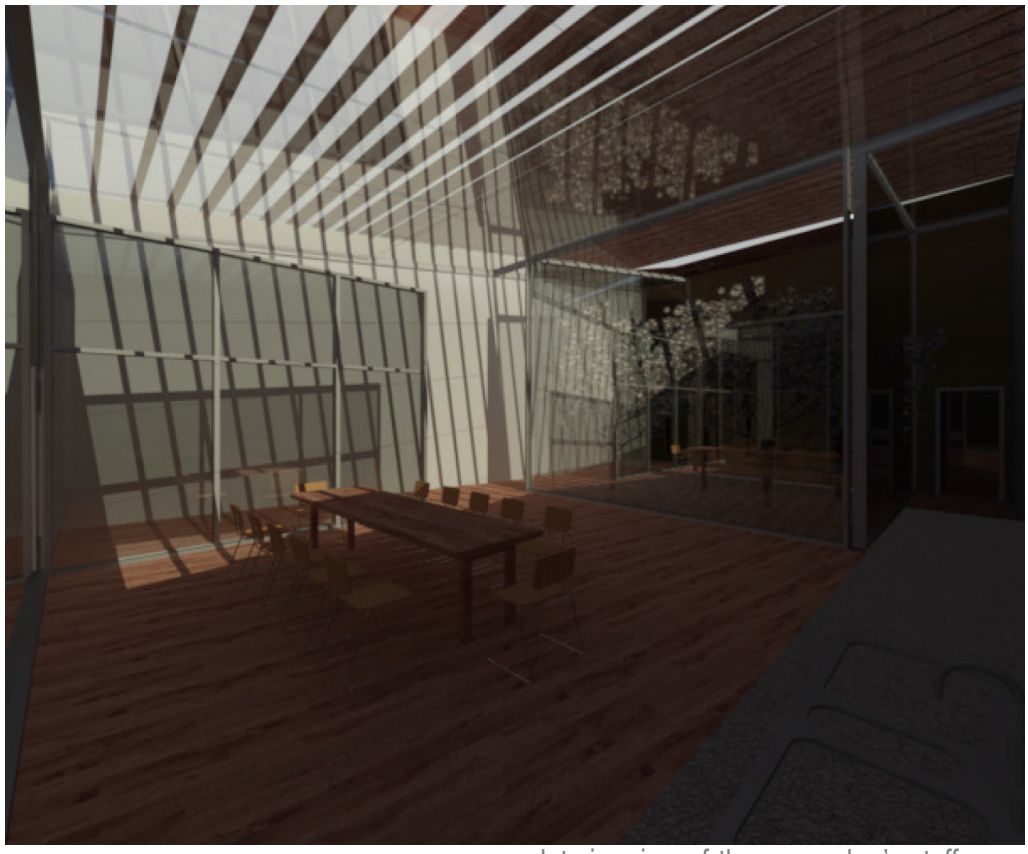
_Section BB through the garden, south – north

1:500



_Section AA through the garden, north – south

1:500



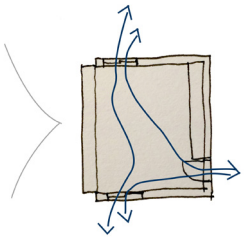
_Interior view of the researcher's staff room

_Interior view of the restaurant

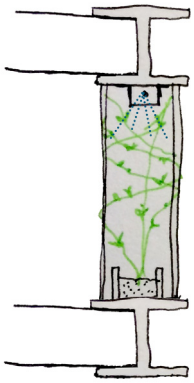
_Interior view of the auditorium

_Towers

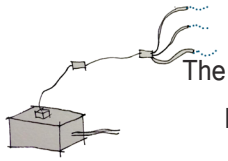
Concept to bring a vertical element to the architecture.



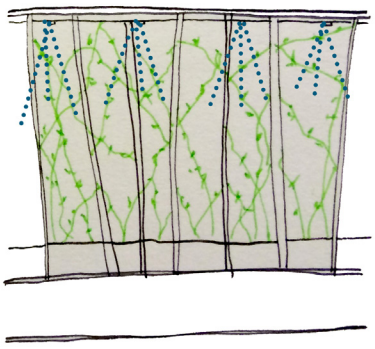
Height brings views and taking advantage of height and wind direction of passive cooling.

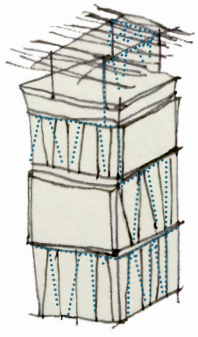


The green creeper facade will be kept watered throughout the hot summer months using a mist system which is very economical in its water usage and will use the water collected in the water tanks behind the labs.



The mist system will also keep the towers cool.





_View from the edge of the south end of the garden

_View from the east of the restaurants deck

_View north of the entrance and auditorium

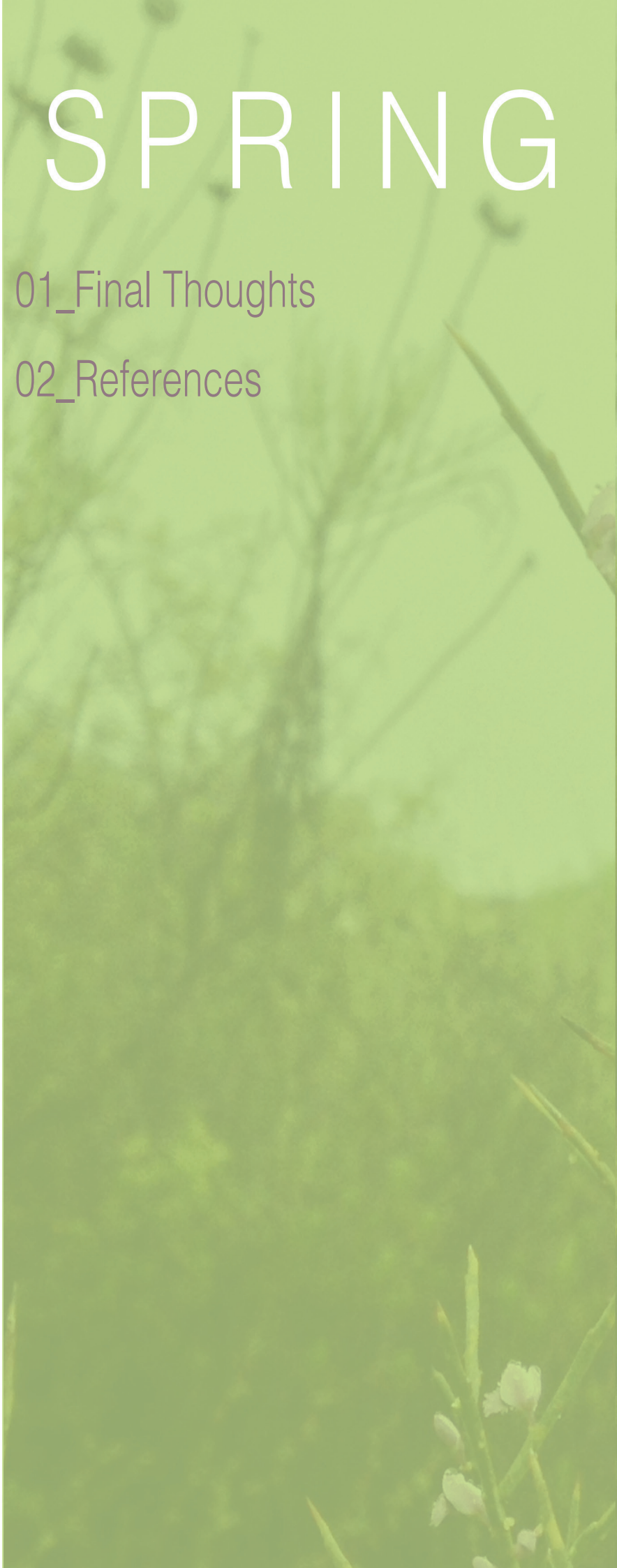
_View west through the garden

_View south to the Clanwilliam Dam

_View from the edge of the south end of the garden

_Arrival view from the end of the tour back to the centre

SPRING



f i n a l . t h o u g h t s

Through the investigation carried out by the thesis, a better understanding of the landscape in the Cederburg region and its natural influences has helped to evolve the architecture to one of a response to the narrative of nature. There needs to be care and an understanding between the built form and the landscape so that the Fynbos can exist in harmony between the two. This building is not a closed structure but communicates with its environment and where people can roam freely with architecture framing the landscape. The external façade is restrained and modest so as not to detract from the Fynbos and views.

An investigation into local craft and regionalism suggests the importance of materiality in response to local climate as well as a regional responsiveness and understanding. This is much like the Fynbos, which with its inherent qualities can communicate across cultures and once explained and better understood, and with the facilitation of architecture, a relationship is formed and a bond forged. The research component of this thesis has been successful in aiding a type of architecture to facilitate the survival of Fynbos as well as educating and uplifting the local community.

The architecture highlights a concern for tectonics and atmosphere and how it too has an important role to play within the citing of the building and how the spaces are created to take the visitor on a journey through an architectural narrative.

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Image references

Fig 1 **Flower field**
du Plessis, R. (2006) 5, photograph, in possession of the author, Cederberg.

Fig 2 **Ruin in flower field**
du Plessis, R. (2006) IMG_0937, photograph, In possession of the author, Cederberg.

Fig 3 **Industry picture**
Unknown Author. (n.d.) Original, drawing, viewed 15th September 2014, http://zurb.com/word/product-design

Fig 4 **Production line**
Unknown Author (n.d.) _70401484, drawing, viewed 15th September 2014, rougeplant_fordmuseum, photograph, viewed 15th September 2014, http://www.bbc.com/news/magazine-23990211

Fig 5 **Villa Savoy**
Levin,M. (n.d.) f10-arch2-480, photograph, viewed 15th September 2014, http://www.wsws.org/en/articles/2009/02/lett-f10.html

Fig 6 **Rock painting**

Fig 7 **Greek column**
Disdero, M, (19/20/2007) Jerash, Photograph, viewed 15th September 2014, http://commons.wikimedia.org/wiki/File:JerashCorinthian.jpg

Fig 8 **Garlis**
Unknown Author (n.d.) garlis500, photograph, viewed 17th October 2014, http://www.ontarioarchitecture.com/garland.html

Fig 9 **Paris metro**
Cadman,S. (n,d.) Abesses_entrance_1 photograph, viewed 17 October 2014, http://en.wikipedia.org/wiki/File:Abesses_entrance_1.jpg

Fig 10 **Stuttgard airport terminal 3**
Schmidt,J. (2004) xlarge_1849_905_a , photograph, viewed 17th October 2014, http://www.sbp.de/en/build/sheet/905-Airport_Stuttgart_Terminal_3.pdf

Fig 11 **Pink wild flowers**
du Plessis, R. (2007) 25, photograph, in possession of the author, Cederberg.

Fig 12 **Child in front of shack**
Masondo,S. (n.d.) BLOG_1005, photograph, viewed 15th September 2014, http://explorer.timeslive.co.za/2010/05/13/from-the-road-2/

Fig 13 **Church flower exhibition**
Unknown Author (n.d.) phpThumb_generated_thumbnailjpg, photograph, viewed 15th September 2014, http://tourismcapetown.co.za/leisure-travel/town/clanwilliam

Fig 14 **Six floral kingdom map**

Fig 15 **South Africa's Biomes map**

Fig 16 **South Africa's solar radiation map**
Unknown Author. (n.d.) Original, Map, viewed 20th October 2014, http://www.abb.com/cawp/seitp202/3a55c11b32a716dfc1257aca00323e1d.aspx

Fig 17 **Barron fire landscape**
du Plessis, R. (2013) IMG_0924, photograph, in possession of the author, Cederberg.

Fig 18 **Rock painting**
Margison, E. (2013) IMG_3835, photograph, in possession of the author, Cederberg.

Fig 19 **Central Park**
Sourced from: Crowe, N. (1995) Nature and the Idea of a Man Made World. London: MIT Press.

Fig 20 **Vaux-Le-Vicomte**
Sourced from: Crowe, N. (1995) Nature and the Idea of a Man Made World. London: MIT Press.

Fig 21 **Japanese Kare-Sansui (Dry Garden)**
Sourced from: Crowe, N. (1995) Nature and the Idea of a Man Made World. London: MIT Press.

Fig 22 **Map of South Africa relief system**

Fig 23 **Map of South Africa Karoo Supergroup**

Fig 24 **Flower being crushed by industry**

Fig 25 **KRCA arial**

Unknown Author (n.d.) Arial_KRCA, Photograph, viewed 14th October 2014, http://www.krca.co.za/

Fig 26 **South Africa's red list data**

Unknown Author (n.d.) red data list, Map, viewed 20th October, http://redlist.sanbi.org/stats.php

Fig 27 **Jianamani Visitor Centre Arial**

Atelier (2013) Jianamani-Visitor-Centre-by-Atelier-TeamMinus_dezeen_12, photograph, viewed 20th March 2014, http://www.dezeen.com/2013/10/29/jianamani-visitor-centre-by-atelier-teamminus/

Fig 28 **Jianamani Visitor Centre building**

TeamMinus (2013) Jianamani-Visitor-Centre-by-Atelier-TeamMinus_dezeen_ss_1, photograph, viewed 20th March 2014, http://www.dezeen.com/2013/10/29/jianamani-visitor-centre-by-atelier-teamminus/

Fig 29 **Arc by Bernaskoni**

Unknown Author (n.d.) 3, photograph, viewed 5th March 2014, http://www.archdaily.com/492900/arc-bernaskoni/

Fig 30 **Arc interior by Bernaskoni**

Unknown Author (n.d.) 6, photograph, viewed 5th March 2014, http://www.archdaily.com/492900/arc-bernaskoni/

Fig 31 **Pond water reflection**

Sourced from: Holl, S. (2012) Color Light Time. Germany: Muller Publishers.

Fig 32 **Fire landscape with tortoise**

du Plessis, R. (2013) IMG_1189, photograph, in possession of the author, Cederberg.

Fig 33 **Sun Valley House: section**

Rick Joy Architects (n.d.) 1404-Sun-Valley-House-Rick-Joy-Architects-12, Image, viewed 12 September 2014, http://archrecord.construction.com/residential/recordHouses/2014/1404-Sun-Valley-House-Rick-Joy-Architects-slideshow.asp?slide=12

Fig 34 **Peter Rich: plan**

Rich, P. (2010) Site Plan, photograph, viewed 12th September 2014, http://www.designboom.com/architecture/peter-rich-architects-mapungubwe-interpretation-center-south-africa/

Fig 35 **Wolff House: Plan**
Mike Bell. (n.d.) Steinkopf Community Centre, photograph, viewed 23rd August 2014, http://www.artefacts.co.za/main/Buildings/image_slide.php?type=2&bldgid=9194&rank=0

Fig 36 **Field Architecture: Plan**
Field Architecture. (2011) FieldArchitecture_500_Karoo-017, photograph, viewed 18th September 2014, http://fieldarchitecture.com/public-commercial/karoo-wilderness-center/attachment/fieldarchitecture_500_karoo-017/

Fig 37 **Steinkpf community centre**
Parker,W. (2007), Steinkopf Community Centre, Photograph, viewed 25th October 2014**,** https://www.flickr.com/photos/thnktank/4084585999/

Fig 38 **Steinkop plan**
Harris,S. (2011). Steinkopf Model, Photograph, viewed 25th October 201, https://www.flickr.com/photos/myskygarden/6061714212/

Fig 39 **Protea**
Reid,M. (2014) DSC01182, Photograph, in possession of the author, Cederberg.

Fig 40 **Plant cell wall structure**
Carpita & Gibeaut. (1993) Fig9-15, Drawing, viewed 16th October 2014, http://www.uky.edu/~dhild/biochem/11B/lect11B.html

Fig 41 **Oaxaca School of Plastic Arts front building**
Unknown Author (n.d.) tema_08_01, photograph, viewed 18th October 2014, http://www.eartharchitecture.org/index.php?/archives/1039-Oaxaca-School-of-Plastic-Arts-by-Mauricio-Rocha.html

Fig 42 **Oaxaca School of Plastic Arts side view**
Unknown Author (n.d.) tema_08_04, photograph, viewed 18th October 2014, http://www.eartharchitecture.org/index.php?/archives/1039-Oaxaca-School-of-Plastic-Arts-by-Mauricio-Rocha.html

Fig 43 **Nk'Mip Desert Cultural Centre interior entrance**
Nic Lehoux Photography. (n,d.) 170203032_278d009, photograph, viewed 18th October 2014, http://ad009cdnb.archdaily.net/wp-content/uploads/2008/12/170203032_278d009.jpg

Fig 44 **Nk'Mip Desert Cultural Centre main entrance**
Nic Lehoux Photography. (n,d.) 533509684_278d032-528x351, photograph, viewed 18th October 2014, http://www.archdaily.com/10629/nkmip-desert-cultural-centre-hbbh-architects/

_Nylandtia spinosa Herba

Tortoise Berry

The Tortiose Berry is a widespread variety commonly found on sandy flats and rocky slopes. It produces fruit in the summer which can only be propagated by being eaten by the tortoise. Chewing on small amounts of fermented leaves can help with sleeplessness.

_Salvia Chameleagnea Herba

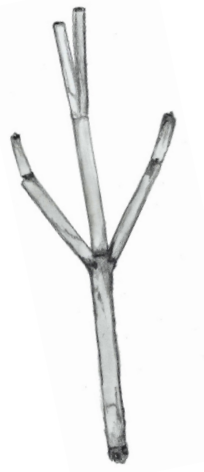
Purple Sage

Purple Sage is found widely in fynbos vegetation on sandy slopes, roadsides and flatlands, along watercourses or amongst rocks. It poduces beautiful purple flowers. This herb is considered an effective remedy for coughs – including whooping cough – bronchitis, colds and diarrhoea.

_Euphorbia Mauritanica Herba

Spurges

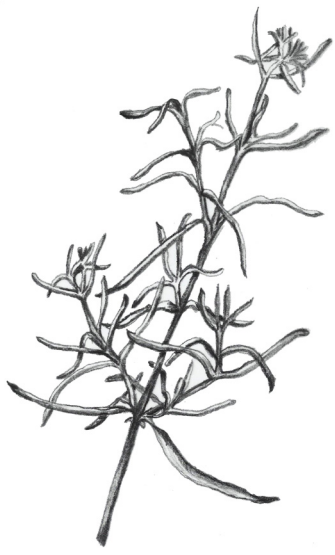
This succulent is found mostly in dry areas of the Cape, especially in more rocky terrains. It contains a milky residue which is poisonous.



_Galenia Africana Herba

Kraalbos

Kraalbos is found in areas with very bad soil quality usually caused by overgrazing or over working the land. It has a faint aroma but is not known for its scent. It is used for its antiseptic qualities to cure wounds and skin infections but is usually mixed with other plants.



* This thesis deals with the Fynbos species and is inherently trying to create a space in architecture to raise awareness about the plant. This glossary introduces the reader to a few of the more well known Fynbos varieties, helping to increase knowledge and make this a more personal journey for the reader during this thesis.

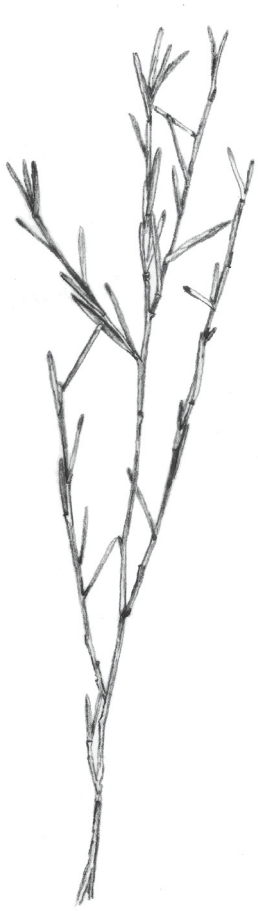
g l o s s a r y

_Aspalathus linearis Herba

Rooibos

Rooibos tea is made from a specific Fynbos species found only on the slopes of the Cederberg Mountains. It is cultivated in sandy soils. Its young branches are often reddish. The leaves are green and needle-like, 15-60 mm long and up to about 1 mm thick. They are without stalks and and may be densely clustered.

Aspalathus linearis is of great economic value. It was first used by the indigenous people of the Cederberg area and is currently a very popular tea.



_Agathosma Betulina Herba

Buchu

Buchu is commonly found on the sandy mountain slopes of the Western Cape Province. It is well known for the beautiful aroma it releases when the small leaves have been bruised. It has just started being produced for tea consumption and research has recently began into its varied properties.

The Khoisan people have been using it as a medicine, tea and perfume for many years.

It is exported to France to aid in the process of making perfume.