CHAPTER SIX

Precedents

Babylonstoren - Food and architecture

Addition to the site of Le Corbusier’s Notre Dame du Haut, Renzo Piano - Introverted and paying homage

Intervention made at ruins to Szathmary Palace - Romantic Ruins

House in a tea garden, Rahul Mehrotra - Sense of place

Greenhouse Botanica, IDA - Integrating with surroundings
Food and architecture

Babylonstoren is one of the oldest Cape Dutch farms in the Western Cape. Along with producing wine, the farm is also well known for its food gardens, which span over eight acres, across a formal grid structure. There are 300 varieties of edible plants in the garden, which are used in the restaurant. The architecture stands as follies, waiting to be discovered within the garden, and placed along the historic axis drawn from the existing.

Architecture is light-weight and open to the elements, and stands as a vehicle for the showcasing of plants while allowing the visitor to enjoy the exquisite natural setting emphasised by a thin threshold between inside and out. There is a constant play between light and shade; that which is contained in a volume and that which opens to the sky.

The architecture of Babylonstoren influences the author’s scheme in that there is a continuous and close relationship with the beautiful setting it finds itself in (Nature 1) and with the food being grown in and around the interventions (Nature 3). Furthermore, a rich sensory experience and dialogue between plant and plate, and a well designed route through the gardens makes for an enjoyable experience.
Introverted and paying homage

Commissioned by the Association Oeuvre Notre Dame du Haut, Piano was asked to design a small visitors’ center and convent for the Poor Clare nuns who live on the grounds.

“Piano’s works have a certain air of sensitivity about them, a characteristic that would produce a work not to overshadow nor compete with, yet respectfully support, Corbusier’s masterpiece” (Archdaily 2011).

Although only 300 ft away from Le Corb’s church, Piano decided to cut into the slope of the hill so as to not intrude on the presence nor setting of the building. Mostly hidden underground, Piano’s small incisions offer a peaceful space as it opens on to the landscape and allows sunlight to flood the interiors.

“In typical Piano style, the material palette is simplistic and the forms elegant which create a functional and passively beautiful space” (Archdaily online: 2011).

The nuns cells are both one with their setting and the landscape surrounding them while respectful to the heritage and importance of the building above them.
This addition to the site sets a precedent for architecture additions to historically sensitive sites—using its topography as means for acting sensitively and appropriately, and burying itself within the earth, completely out of sight. Architecture is unobtrusive and purposefully subtle, so as not to overshadow the famous chapel.
The romantic ruin

The ruins are one of Hungary’s most valuable and protected monuments. Bishop György Szathmáry (1457-1524) built his own Renaissance style summer residence here at the very beginning of the 16th century and it was later invaded by the Persians, when it fell into ruin.

The reconstruction programme of the Tettye Park basically made it unavoidable to re-define the role of the palace ruin as an emphatic landscape element and architectural monument.
When defining the interventions, our main aim was to avoid overwriting the intellectual layers as well as the quality resulting from the ruin’s complexity. The starting point was to accept the existence of these even if the layers were developed either through centuries or just a few decades. At the same time, it was unavoidable to revise and ‘retune’ the quality and the meanings carried by the ruin (Archdaily online: 2012).

Coreten structures fill in what was lost by time and natural weathering, thus allowing the visitor to differentiate between old and new, and encouraging them to explore the ruin which previously sat alone in the landscape (Archdaily online: 2012).

The addition to the palace ruins sets a precedent for interventions to be added to ruins at an isolated site, also holding great meaning like it does at the No. 2 shaft compound. The intervention fills in missing walls that the palace has lost, with a new and lighter material, juxtaposing itself against the stereotomic and crumbling stone of the palace. The intervention makes an accessible public space of what is essentially a crumbling ruin.
Sense of place

Set in a tea plantation in Conoor, India, the house was designed to minimise the impact it has on the sensitive landscape around it. The house is covered in a cantilevered metal roof that floats above the veranda, framing the views of the plantations ahead. The rooms sit as three separate cabins underneath the single floating roof (Archdaily online, 2012).

The architecture establishes a quiet yet strong connection with the nature it is surrounded by. The materiality provides a subtle palette to reflect and blend with the tea gardens.

Figure 6.9. (Left) Use of materials reveal a sensitivity to the surrounding (Archdaily, 2012)
It is clear from the spaces created that Mehotra has a deep understanding and appreciation of the site in which the building exists. Views to the exterior are well considered, filling the building with light and a constant invitation to venture outside.

Figure 6.10. (Below) Views to the exterior (Archdaily, 2012)

Figure 6.11. (Below and above) Plan and section of the house (Archdaily, 2012)
Integrating with surroundings

The greenhouses take their form from the surrounding forest. “Both the formal vocabulary and the structural concept derive from nature, and are meant to harmonise and expand with the forest” (Archdaily, 2013).

The steel structure is formed from a Veroni tessellation, at about five meters, the trunks branch toward the treetop, forming a ‘natural’ and light roof, with a secondary glass construction enclosing the space.

The green house acts as an enchanted capsule of tropical plant life within the confines of an European forest.

Figure 6.12. The greenhouse in context | Archdaily, 2013|
Figure 7.1. Early Concept Sketch (May 2014)
"I think we should invent or encourage a new status within the profession of architecture, that of the poet/architect. Whose job it is to go further than the Vitruvian ideals of firmness, commodity and delight, further than an artist whose engagement with nature we experience vicariously, but towards an architecture that mediates between our incomprehension of the vast magnificence and complexity of the natural world and the actual spaces that we can physically touch and inhabit. A natural poetic architecture that creates spaces that takes us back into ourselves. Like attics, confessionals, the bed, the cloister or the study carrel. Small-scale containments validating, encouraging and prompting internal journeys. Spaces that are empowered by the vastness of nature and made habitable by the imagination offer a counterpoint to our increasing isolation from nature, from others and from our surroundings. This should be an architecture to help us connect more deeply with our inner selves and, consequently, more meaningfully engage with our environment and hopefully with each other.” – Jeffrey James, (2013: 144)
ISOLATION

DIFFERENTIATION

ANTICIPATION

LONGING

AWE

ANESTHESIA
The author of the document followed a mainly iterative approach of trial and error, combining a number of methods and mediums to achieve clarity in design intention. The theory read allowed for an understanding and an approach to what often seemed a large and daunting site. Conditions were compartmentalized and architecture would act as a vehicle that would unite and blur nature and memory. The visitor moving through the site would introduce and merge the different conditions to one another. From this, initial concept sketches kindled an understanding of the types of spaces that were anticipated. Gears were constantly changed between pragmatic requirements and an intuitive counterpart. A larger scaled plan was used to develop an initial parti around the movement of the different entities moving through the site. Physical models were used to understand the building spatially on site – “it feels as if the building should be higher here, respond to, act against, reach out towards…etc.” The architecture began to materialize and the author began to make use of digital modeling programs to be able to fully visualise changes made within the context.
Figure 7.2. Early concept sketch indicating movement across site and along the ha-ha, with building placement (June 2014)
Design Development

*How can nature be incorporated into an architecture that will allow a platform of silence in order for the contested landscape of Cullinan to speak?*

This chapter explores and understands the author’s process and intention when it comes to making space and relating an introduced architecture back to the genius loci of the site in terms of its natural setting and historical context. The spatial understanding and experience will focus on how architecture can facilitate a relationship between nature and existing structure, both defining and blurring the threshold between the two. Ruins are understood, as both carriers of memory and of nature.

As the ruins carry such heritage significance the guidance of the Icomos Burra charter is followed and, as such, the initial intentions dictate that ruins be treated as sensitively as possible.

**Relate the natures**

Some of the first conceptual diagrams speak of the longing and connection of Natures via architectural intervention. The Natures are more or less grouped within themselves, with some instances where the Natures are overlapping one another. The approach of the complex indicates that movement of the visitor will mostly occur from the north / northeast with a water channel running perpendicularly to the main roadway, directing foot traffic towards the agricultural research facility and restaurant. This water channel further acts as a divide between that which is reserved to remain Nature 1 and where the earth has been toiled over so as to become the productive Nature 3.

The intention of the scheme was to lead the visitor throughout the site; the new architectural intervention can be viewed from the approach across the entirety of the site and is placed within and around the controlled Nature 3.

An initial concept diagram indicates an idea that the architecture, which is introduced to the site, extend between all conditions, dipping down between the vertical divide that exists on site known as the ‘ha-ha’. The divide nestles and stores the most ‘untamed’ of Nature 1, like a capsule. The fact that the ruins have remained devoid of human contact for years means that this Nature 1 is the most absent, the most removed, and the extent on which it has acted upon the ruins is already visible.

A series of buildings stretching across and interacting with all three conditions.
Views and light

Views are important when creating silent space: an architecture that controls what is revealed and concealed.

Promenade architecturale (Circulation)

“Prior to actually passing into the interior of a building, we approach its entrance along a path” (Ching 2007:242).

“The path our movement can be conceived as the perpetual thread that links the spaces of the building, or any series of interior or exterior spaces, together.

Since we move in Time through a Sequence of Spaces we experience a space in relation to where we’ve been and where we anticipate going” (Ching 2007:240).

The visitor is ‘spurred’ on by the path, which is designed to ignite and encourage different feelings within the user: anticipation for what is to come, differentiation from other users of the site and isolation and introspection at places of silence. Along with the emotive matters of moving through space, there is also the pragmatic issue of moving visitors sequentially from point A to B, without the visitor feeling too controlled and being unable to enjoy the site on their own.

From the outset, it was realized that the movement and experience of the visitor exploring the site and the movements of the researchers and other employees would coincide at certain points but would still be separate. The output and input of fresh produce takes place along separate routes but not out of site of the visitor, allowing for an open viewing of production.

The circulation through the site became an overruling design informant.
Figure 7.3 Movement cutting through ha-ha (July 2014)
Isolation

Initial sketch plans indicate the entrance of visitors along narrow walls that prompt a feeling of isolation and introspection, which is commiserative of the miners that once stayed there and remains aware of what once stood before. The walkways are designed so that in most instances people walk in solitude or perhaps uncomfortably close to one another. The walls grow higher and eventually open to form the undercover exhibition space. The walkway into the exhibition space occurs from the original concrete slab that once belonged to the row of now demolished compound rooms. The rough texture of the slabs, crumbling at the corners, the way plants grow from any of the gaps, and the light way in which the new walls will touch the existing surface bed will indicate to the user what is old and what is new and beyond this, the very significance of the slab they now stand upon.
The human ha-ha

An influential aspect of the site is the retaining wall level difference that separated miners of different ethnicities from one another. As mentioned in chapter 3, this 3m level difference is referred to as ‘the human ha-ha’ and hides what occurs at the lower level from the beginning of the approach. The ha-ha allows the opportunity for design interaction and dialogue to form between the old and new condition. Evident in early design progress, walkways were drawn reaching out and across the level difference. When walking close along the level difference, one is able to see across the retained patch of untamed Nature 1 and into the roofless compound rooms at the lower level. There were three ways to react with the ha-ha –

- to allow for built form to be built next to and to ‘peak’ over
- to cantilever over
- to dip down into
- to dig further under and into

All four of these methods of interacting with the ha-ha break the inherent isolation experienced on the site and were all experimented with in the design process.

Forms of vertical movement also differentiate in language – walkways may span across, thin and alone, ramping down into the ha-ha encouraging a feeling of separation from the previous condition and submergence into the next. A more stereotomic stair condition was also considered, cutting into the historic fabric to represent the banishing of the condition entirely at that point.
Figure 7.5. Initial sketch response to the ha-ha (March 2014)

Figure 7.6. Diagramatic response to the ha-ha (Author, March 2014)
A cardboard model was built so as to come to terms with the vastness of the site and the topography, which slopes down gradually from the road towards the southwest. The industrial buildings to the south and southwest of the site lend themselves towards the development of an industrial aesthetic within the scheme; evident in the first few sections which were drawn, was the high and rounded roof. An initial intuition was for the insertion of a light structure into the mainly stereotomic and heavy-set compound rooms. With the development of the programme, this insertion translated itself into a greenhouse typology.

The model was an intuitive experiment in form-making, with pieces of cardboard stuck together and pulled apart until the site became comfortable for the author. Initial development hugs itself against the edge of the ha-ha. Lines stretch and encourage movement out and away from an initial nucleus. It was also felt that as the agricultural research facility is at the lowest point of the site, a focal point and height were required to counteract the otherwise flat landscape of the Highveld. It was unclear at this point as to what form and programme the taller entity would take on. Much emphasis was placed on the exhibition space being at the higher level, with research laboratories and the herbarium situated against the retaining wall. Movement is encouraged through the exhibition space, down to view greenhouses and then up again towards the restaurant. This movement sequence was however disjointed and impractical. The path of researcher/employee is not clear, as is that of the visitor. It required that the restaurant be in close proximity to the exhibition space but also form dialogue with the existing food preparation and wash up facility, spanning a distance of 20 meters, which may become problematic.
Figure 7.9. Conceptual section through exhibition and restaurant space (May 2014)

Figure 7.10. Conceptual section through ha-ha, sky bridge and green house (May 2014)
Greenhouses

Visitors are encouraged to explore and traverse the greenhouses and, as they are fully glazed, eyes are free to roam upward. The meeting of new and old material is clearly evident and the use of a transparent and light material highlights the ‘abuse’ that the compound rooms have received over the years. Greenhouses can either be inserted directly into the compound rooms, or they may contain the compound, equally there is the opportunity for them to do both. If the glazed greenhouse contains a controlled Nature 3, then it may act as a looking glass for that which happens when nature is left to its own devices as is presently found in the abandoned compound ruins.
Figure 7.12. Conceptual planning (Author, May 2014)
Exhibition space.

The spatial qualities of this space were developed through a series of explorative drawings. The exhibition space will require adequate lighting and specifically planned views to all Natures. The exhibition space will encourage movement via corridors that narrow and with columns, direct towards larger volume rooms that allow for the eye to roam to the exterior.

Figure 7.13. Conceptual drawing of exhibition space (May 2014)
Iteration 2- Axis shift

The existing grid (5 x 5m) was drawn and overlaid on top of the aerial photograph of the site. The plans of the new began to morph and respond to the grid, to the extent that the new building began to fit in 'too comfortably' with the existing fabric; the plan became so sympathetic to its current condition that it was not making a statement. It was felt that it needed to stand out in defiance of the strict order that was so effective in 'the ordering of human multiplicities.' At this point, the possibility of testing a slight shift in the axis of the plan was investigated in order to rebel against the existing compound's grid. However, this iteration proved to be unsuccessful as the axis change was too slight and uncomfortable. The issue of movement through the site still was not resolved.
Figure 7.15. Iterated Section through exhibition space, nursery and greenhouse (June 2014)

Figure 7.16. Iterated Section through restaurant, tower, and herbarium (June 2014)
Iteration 3

During design critique, it was suggested that people could walk down the water channel path and where the water falls over the edge of the ha-ha, visitors could be guided to a cantilevered view point where, for the first time, they would have a view right across the ruin in the garden. Movement then continues parallel to the edge of the ha-ha down a light ramp structure. The ramp forms part of a pergola structure, where creeper plant species are encouraged to grow up and upon the structure. The pergola seems to perch upon the edge of the retaining ha-ha wall. The visitor is encouraged to explore the greenhouses before moving up heavier stairs which are cut into the retaining wall. The visitor is prompted to directly compare Natures via movement through changing base planes. From thereon, the visitor is drawn to the visual landmark of the water tower and the smells of the restaurant that sits adjacent to what and under the tower.

The laboratories

During the iteration it was found that the scheme failed to fill a real world programmatic requirement. Who would care for and watch over the agricultural test plots and for what reason? Three laboratories were needed for different uses. The site did not justify a large institutional type building and it was decided that the laboratories could be separate, smaller buildings that had greater connection to the outside. The laboratories respond directly to the edge of the ha-ha and, to various extents, each one cantilevers over the edge. The laboratories are placed quite narrowly next to one another, facilitating access along the length of the laboratories, out of sight from public view between each building. Narrow views open up towards the agriculture in the distance.
Figure 7.18. Iterated plan showing 3 laboratories along side one another, cantilevering over the ha-ha (July 2014)
The Highveld typology

Pretoria Regionalism, the Third Vernacular, reflects a particular response to nature and landscape through the economical use of naturally available and industrially produced materials with an empirical response to climate, all of which tempered the emergent tenets of the Modern (Fischer 1998:123).

The pitched roof becomes a very important element in response to the climate of the Highveld, which requires heavy massing to maintain a temperate interior. Additionally, deep verandas cool air entering the building while the pitch of the roof protects the building from heavy downpours experienced in summer.

The spatial and formalistic qualities of the pitched roof were explored in a series of scaled maquettes and sketches.

As the laboratories respond to the historical grid and context they are placed in, they are unable to be orientated optimally. As such, the plan of the building
narrors and angles itself so that a large portion of the façade is able to respond to the north. The laboratory is formed via a repetition of identical portal frames, spaced equally apart; these frames continue past the angled wall and the roof covering lifts itself up to reveal the ‘bones’ of the structure. From here up they are covered with shade netting to allow for some permeability, while still shading the seedling tables underneath.

The laboratories are accommodated in a high volume space with natural lighting accommodated for from skylight strips and the inserted light-well that breaks the uniformed roof pitch. Office space for the botanists and researchers overlooks the main research space on a mezzanine floor above. The laboratories, although separated, encourage a network of exchange with relatively accessible and open spaces. Laboratory work spaces are separated from the reception, common area and ablutions but still maintain visual accessibility. The laboratories have direct access to sapling growth tables and test growing patches. The laboratory stores seeds and hazardous materials in an access controlled safe room.
Figure 7.20: Exploration into the access of light into the semi-basement exhibition space (August, 2014)
Iteration 4

With the development of the plan to embrace better public space and movement route, an exhibition space was designed as a complete hidden entity, parallel to the route into the lower base plane and cutting itself into the retaining wall of the ha-ha to form a semi basement which is the width of the compound rooms that once stood above it. The sensitive surface bed overhead will be kept and will be supported with steel columns and beams. Where existing foundations of gable walls exist in the earth and need to be removed, skylights will be inserted along these lines and also at the back wall, washing the wall in light from above.

Figure 7.21. Shadows cast into exhibition space from steel pergolas supporting creepers. (August, 2014)
Figure 7.22. (Left) Exploration sketches (August, 2014)

Figure 7.23. (Above) Design condition along ha-ha, with ramp entering into the space and pergola hanging from top of the wall (August, 2014)
Underlying concept

It is envisioned that the added built layer be inconspicuous to the eye when viewed from the entrance of the compound complex. The more significant and complete fabric will receive a lighter touch - this in terms of the light greenhouses inserted into standing ruins as well as various conditions experienced along the level change. The lighter condition of the laboratory edging over the ha-ha, is separated by a light well that allows for a visual connection through all the laboratories while at the same time separating the heavier laboratory condition by digging into the earth. The more insular and contained the programme is and the less architecture is in direct contact with sensitive fabric - such as at the herbarium - the more likely that built form will dig itself into and against the slope, away from the ha-ha.

Where the water trickles down from the historic bath
And over the edge of the ha-ha
Where people walk down through the shadows of the pergola
Foliage of creepers growing overhead
And where one is buried in the belly of the ha-ha
It is here that one hopes to encounter a silence
Both present and historic
The nature where man has control over and is replicating Nature 1 in order to produce food or for the aesthetic enjoyment of a garden.
THE CAPSULE-
nature 1 and 3
CUT INTO- AN EXHIBITION
ARK OF TASTE

The response to the compound capsule, contain or insert
RESEARCH LABORATORIES
INTO THE HA- HA
CHAPTER EIGHT

Techne

The technical investigation will allow for the integration of theory, design development and real-world tangibility to the design scheme.

The techne of the building should allow for the curation of light and shadow. It is through these mediums that one emphasizes the junction of old and new material.

Through tectonics architecture becomes a language.
Stereotomic: of nature 1

situate against slope, grow of the earth

-----------------------------------------------

Tectonic: of memory and heritage,
Aalto’s drawing tells us more about Aalto than it does about the plane. He is less concerned with the construction of the plane than with the image of light coming through the filter of the propeller. He is less concerned with the form of the airplane than with the form the rotating propeller implies. Aalto loved flying more than he loved airplanes and he loved machines not for their own sake but for what they made visible. Light was to Aalto more than illumination; it could destroy forms or create them, and could at times be inseparable from the objects defined (Ford 1996:117).

In a number of Aalto’s designs including the Paris Pavilion, “Aalto adapted a common vernacular device, board and batten siding, but by deepening, adding to and modeling the profile, he heightened the shadows cast by the battens...The only purpose of the batten was thus to make an opaque wall appear as a semi-transparent screen” (Ford 1996:129).

Aalto was obsessed with the dematerialization of objects through light; it seemed as if he would want to wish away aspects of the design such as the roof by washing it in light.

Seeing as the architecture seats itself within a reclaimed ‘green-fields’ site, it would have to ‘touch the earth lightly’ and be able to give regenerate and erase the footprint it creates. Therefore new architecture touches the earth and historic fabric as lightly as possible,

**Tectonic intention**

The tectonic intent develops from the relationship developed between natures. Where nature is most wild (Nature 1), is also where historic fabric is most sensitive and the completeintervention is light and as unobtrusive as possible. The junction between old (stereotomic) and new (tectonic) is emphasized. The new doesn’t simply slot in with the old but rather, new fabric hangs off, onto or from existing fabric, supporting and inviting vegetation to grow with it. New fabric becomes more stereotomically heavy and ‘of the earth’ as it moves away from the ha-ha and cuts into the slope.
Material Palette

A material palette is chosen to correlate with sensitive and textured existing fabric, and responding to the semi-industrial warehouses bordering the compound. New fabric would need to be distinguished from old but still not be jarring. Materials will be required to be as robust and hardy as possible and support an ecology surrounding the buildings.
Vertical Movement

Ramps
With the sites history formed on a basis of segregation and isolation, the design aims to provide inclusive access across the site, aligning itself with the access guidelines provided by SANS 10400-S:2011, where the minimum slope is 1:15, with a maximum vertical rise of 500mm between landings. The ramps have hand rails on both sides and are composed of pre-cast concrete units supported by a steel frame, allowing for a smooth transition between levels.

Stairs
Stairs are used throughout the design as a vertical connection of above and below of the ha-ha. Vertical movement into the ha-ha is encouraged with the ramp, down into the space via a slow progression, as apposed to making use of stairs. However, stairs cut into the slab and encourage movement on the way up towards the restaurant.

All stairs are compliant with SANS 10 400 where no step riser shall exceed 200mm, and no tread will be less than 250mm (Most stairs in the design have risers of 170mm, and treads of 300mm as they are in public environments)
Climbing and trailing plants

1. *Ancylobotrys capensis*  
   Rock Milk Apricot

2. *Aloe ciliaris*  
   Climbing Aloe

3. *Asparagus spp.*  
   Climbing asparagus

4. *Bauhinia galpinii*  
   Pride of the Cape

5. *Bowiera volubilis*  
   Climbing onion

6. *Clematis brachiata*  
   Traveller’s joy

7. *Combretum microphyllum*  
   Flame creeper

8. *Cucumis africanus*  
   Wild cucumber

9. *Jasminum Multiflorum*  
   Starry eyed jasmine

10. *Senecio tamoides*  
    Canary creeper

11. *Thunbergia alata*  
    Black-eyed susan
A plant palette was devised with the following pragmatic functions in mind - global climate regulation, air and water cleansing, pollination, waste decomposition and treatment, human health and well being benefits, erosion and sediment control and habitat functions. However, planting was also chosen for quality of space that they would add and for the emphasizing of the concept of the different natures.

A large area of the scheme would be left as reclaimed veld, as the purest form of Nature 1, including some areas below the ha-ha. Plants that would be allocated to the new scheme were divided into two entities, those that would grow along the horizontal and vertical to their own devices as creepers and grasses, and those grown for the purpose of agriculture.

Edible plants grown on site

1. *Lactuca Sativa*  
   Butter Lettuce
2. *Cucumbis sativus*  
   Cucumber
3. *Nasturtium officinale*  
   Watercress
4. *Petroselinum crispum*  
   Parsley
5. *Cucurbito pepo*  
   Gem squash
6. *Ipomoea betatas*  
   Sweet potato
7. *Allium satiuum*  
   Garlic
8. *Solanum melongena*  
   Brinjal
9. *Eruca sativa*  
   Roquette
10. *Beta Vulgaris*  
    Beetroot
11. *Solanum iycopersicum*  
    Tomato
Figure 8.6. Roof catchment for storage (Compound Group, 2014)
**WATER STRATEGY**

### Water strategy

A large demand exists for the amount of irrigation required for the 1000m² of agriculture on site, as well as the 4 greenhouses that would require varying amounts of irrigation as per plant species housed. The landscape architect has designed and made provision for storm water to run towards and be collected in existing storm water channels, which will then be collected and stored for the irrigation of the agriculture plots. However, for 1000m² of agriculture, this storm water reserve will not be enough. With the demand being the highest in March, a monthly volume of 177m³, water will have to be pumped from the nearby big hole and stored in the large tower on site. The tower would have to be pumped over the course of every night, therefore:

\[
\frac{177}{30.5} \text{ (day month average)} = 5.8 \text{ m}^3 \text{ (needed each day)} + 15\% \text{ back up} = 6.7 \text{ m}^3 \text{ tank size.}
\]

The tower will gravity feed irrigation processes each day.

The tower will carry 4x (2.44m x 1.22m) square Abeco tanks and will also be accessible as a viewing platform to the public.

Roof runoff will amount in the most amount of clean and with some effort, potable water that will be made use of in the laboratories and restaurant after it has run through a dirt and silt trap, and under a UV filter to be stored in tanks in service areas under the cantilevered areas of the research laboratories.
Figure 8.8. Water catchment strategy (Consulted Group, 2014)
Greenhouses – ‘Arks of taste’

Greenhouses were traditionally always built using sheet glass, which ended up being exceptionally heavy and open to possible cracks from hailstorms experienced the Highveld. As such, the use of clear polycarbonate composite sheets, would fare well in these conditions and will be easier and cheaper to replace.

As the greenhouse has been inserted into the existing compound gabled walls, it was of concern that some shading would occur, negating the value and use of the greenhouse, which is to gain as much internal heat as possible. After a sun study was undertaken, it was seen that the shadow cast by the gabled wall in summer was negotiable, but there was some concern for long shadows cast in mornings and afternoons in the winter which would mean that the green house would be unable to heat up as quickly as they should. It was decided that the polycarbonate greenhouses be pulled out 2m away from the gable so less shading would occur, nonetheless, these shaded areas would form as protection for storage of equipment and direct sun sensitive plants. Half the compound room would be made up of controlled greenhouse condition, and the other- original Nature 1. The greenhouses are accessible to one another via an original door reveal that connected the rooms to one another. There is also a raised walkway for visitors to be able to view both Nature conditions alongside one another. The walkway is composed of a galvanized steel structure with a Mentis Grating floor plate to ensure walkways remain as light as possible, so as to not allow for further shading to occur.

<table>
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<th>Covering</th>
<th>Number of layers</th>
<th>% Transmission</th>
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<td>Glass (double-strength float, 3.2mm)</td>
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</tr>
<tr>
<td>Acrylic panels</td>
<td>2</td>
<td>83</td>
</tr>
<tr>
<td>Polycarbonate panels</td>
<td>2</td>
<td>83</td>
</tr>
</tbody>
</table>
Figure 8.12. Long section through exhibition space and research laboratories (October, 2014)
Figure 8.13. Composition of greenhouses (September, 2014)
existing 'ha-ha' wall
existing compound rooms
existing bath
existing food preparation platform
existing industrial warehouses
Sustainability principles

Simple principles such as orientation would allow for the optimum internal climate to be achieved within the internal spaces. With the research laboratories, the roof and ceiling is angled so as to ensure natural ventilation occurs across the laboratory, with deep overhangs occurring where light and air would enter, and encouraging cross ventilation to transpire with warm air exiting the louvered clerestory windows at the higher ridge. Clerestory windows run along the entire length of the southern façade, filling the space below with a constant and soft light. The mezzanines for the offices are pierced with windows with a deep reveal so as to ensure afternoon western sun does not overheat these spaces. The balconies on the ha-ha end of the research labs are also protected with long angled timber louvers so as to protect the balcony from piercing western sun.
Figure 8.16. Long section through exhibition space and greenhouse (October, 2014)
Figure 8.17. Long section through exhibition space and research laboratories (nts) (September, 2014)
DETAIL 1- OF NATURE 2

- 204 ft. thick cast GF reinforced concrete
- 6 mm and 12 mm double glazed safety glass
- Insulated window
- 3/4" x 3/4" 16 gauge galvanised steel bar grids at 2" to channal water to floor
- Latex in filling
- Steel reinforcement
- Waterproofing
- Waterproofing
- Concrete
- Concrete at 300mm
cover to support concrete at upstands
- Wood diaphragm concrete
- Roofing wall cost in c/s
- 3/4" #8 bars laid to 6" from timber
- 6" reinforced below reinforced on pad
- Filtration material to be placed flush in joint over at the bottom to encircle at top

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DETAIL 2- OF NATURE 1
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