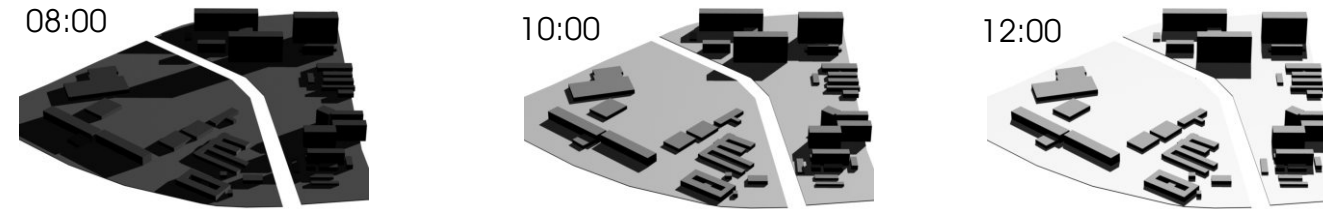


21 December Summer Solstice



21 June Winter Solstice

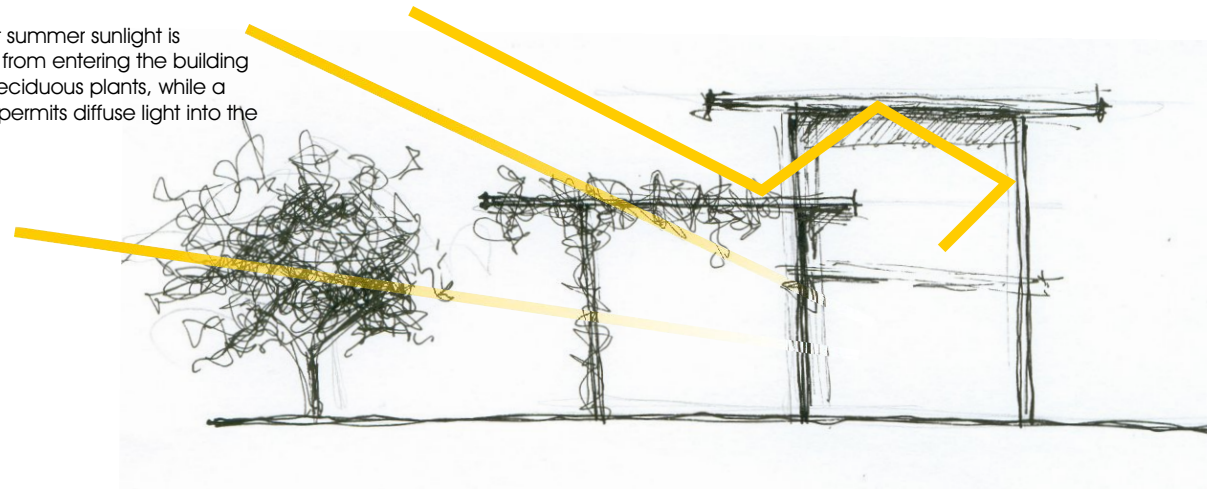
### 2.5 Sunshine

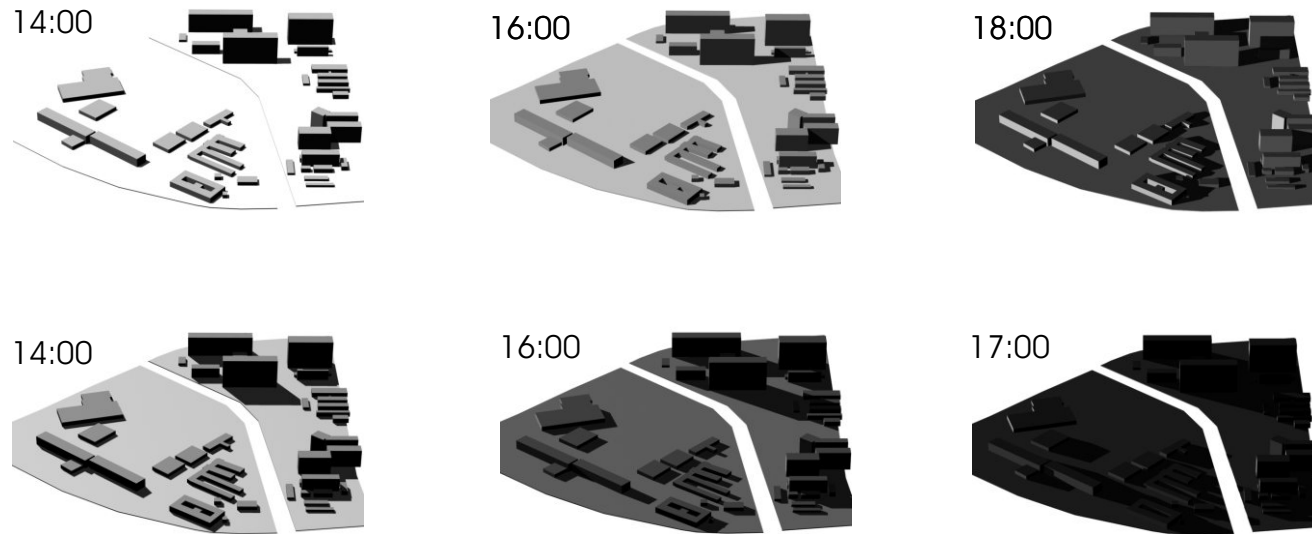
The Pretoria area receives a very high sunshine percentage with an annual maximum of 80% and a minimum of 67%. This reads as 4.5Whr/m<sup>2</sup>/day in mid-winter and 8Whr/m<sup>2</sup>/day in mid-summer. Although these figures are high, much of this

sunlight is diffuse radiation (AAL 310, 2002, p19).

Due to scattered cloud and pollution, more diffuse radiation is experienced in the afternoon than in the morning. This needs to be considered if solar collectors are to be used, as solar reflectors only absorb direct radiation while flat plate

2.15 Direct summer sunlight is prevented from entering the building by using deciduous plants, while a light plate permits diffuse light into the building.



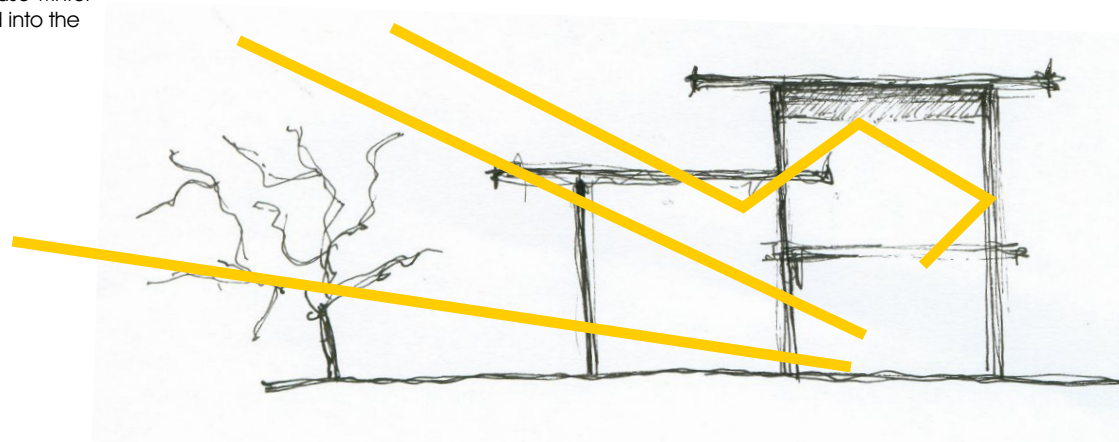


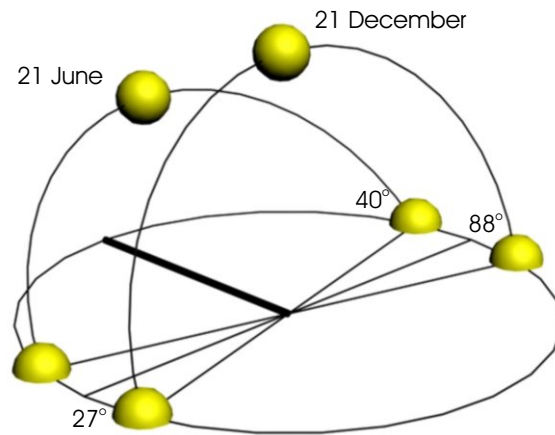
2.17 Shadow paths across the site

collectors can absorb direct and diffuse radiation (AAL 310, 2002, p18). It should also be noted that in summer the south elevation experiences more radiation than the north elevation due to the wide morning and evening azimuth, however the this radiation not very intense (Schultze, 1986, p20).

Fig.2.17 shows the shadow path across the site through 21 December and 21 June. The buildings on the site are all low profile and cast a very small overall shadow. The largest shadow is cast by the old College of Nursing on the east side of the river. The new building should not lie in this shadow

2.16 Direct and diffuse winter sunlight is permitted into the building





2.18 Sun movement path

path as in winter the maximum amount of direct morning sunlight is desired. It is also favourable for no shadows to fall on the terrariums.

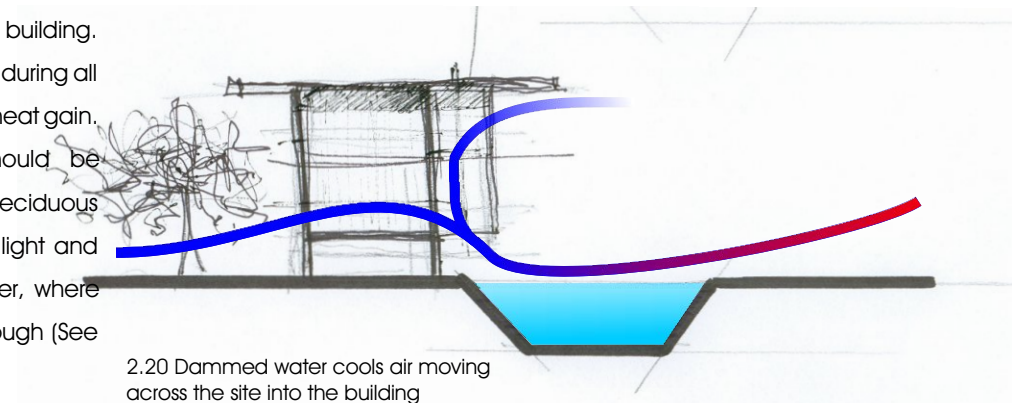
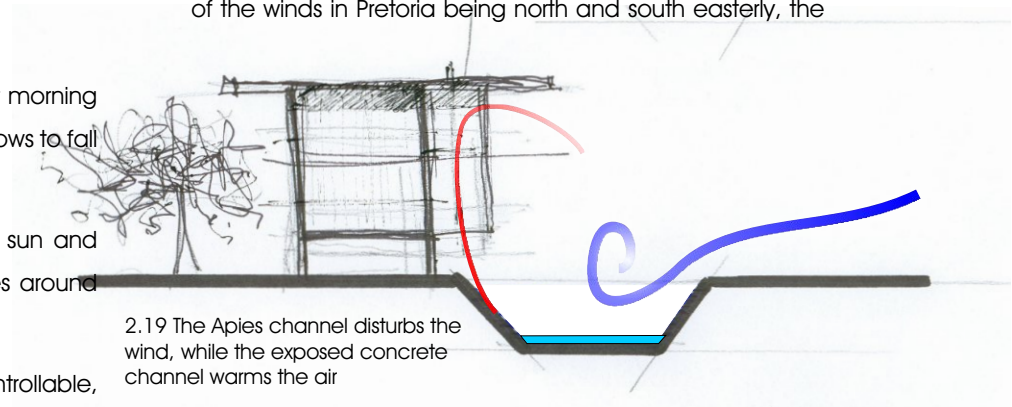
The building form must provide the appropriate sun and shade combinations for the diverse plant species around the building.

The low sun angle in the evenings are almost uncontrollable, using vegetation and large overhangs are a solution, but lessen the amount of natural lighting into the building. Ambient light should get reflected into the building during all seasons by using a light plate, reducing glare and heat gain. In summer, large, permeable overhangs should be overgrown with deciduous vines. Along with deciduous plants around the building, these prevent direct light and heat gain into the building (See fig.2.15). In winter, where heat gain is desired, the plants allow the light through (See fig.2.16).

## 2.6 Wind

In summer the wind direction ranges from east-north-easterly to east-south-easterly and in the winter months it is mainly south-easterly (Holm, 1996, p69). Wind as a major energy source is not viable in Pretoria as an annual average wind speed of 13km/h is required to economically generate electricity (AAL 310, 2002, p26), however wind could be a supplementary energy source if used only in times of high wind speeds.

In such a built up city, the buildings form wind channels that increase the velocity of the wind, however with the majority of the winds in Pretoria being north and south easterly, the



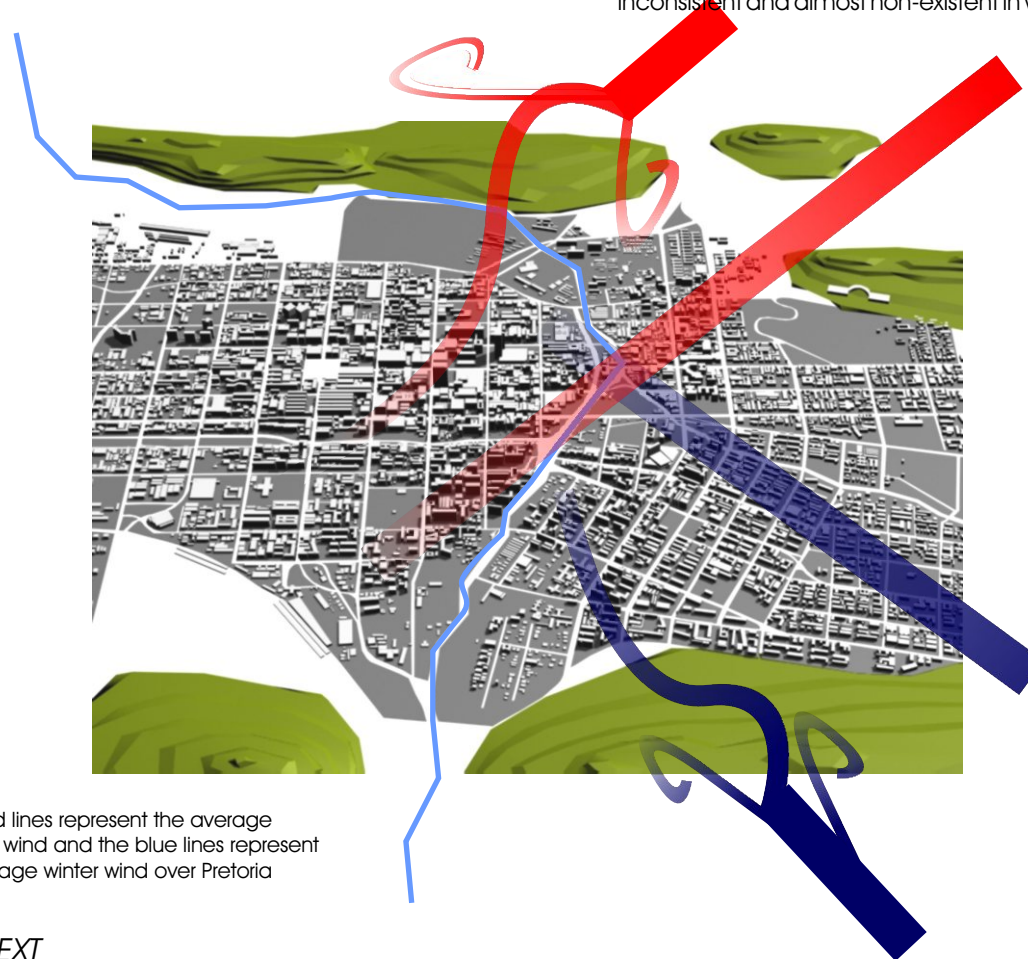
wind hits the buildings diagonally reducing the chance of these winds to be channelled. The ridges to the north and south of the city also divert some of the winds, but can channel winds along the base of the ridges into the city.

With the EBRC being on the Apies River, there is an opportunity to employ the wind in conjunction with the river as a cooling system for the building. Maximum utilisation of this system could take place if the river was dammed and the water level controlled. In summer the water level should be raised as high as possible with openings at the base of the building, wind passing over the river will lose some of its

heat before moving through the building and in the process cooling the building down (See fig.2.20).

In winter, the water level should be dropped, exposing the concrete channel and minimising the surface area of the water. Wind moving over the river will be disrupted and warmed by the channel preventing cool air from moving through the building (See fig.2.19).

With further investigation, it became apparent that utilising the River for cooling was not a viable option. Firstly the wind in Pretoria is minimal and secondly the water level in the river is inconsistent and almost non-existent in winter.



2.21 Red lines represent the average summer wind and the blue lines represent the average winter wind over Pretoria

## 2.7 Apies River

The source of the Apies River is from springs in the Fountains valley that delivers around 26million litres of water a day. The river was canalised with concrete embankments to help drain storm water. This prevents water from being absorbed into the ground ,thus increasing the flow volumes of the river. Another problem is that soil erosion takes place at the end of the concrete channel. In the proposed area, there is an un-located sewer leak into the river, further polluting it (ARUDF, 1999, p18).

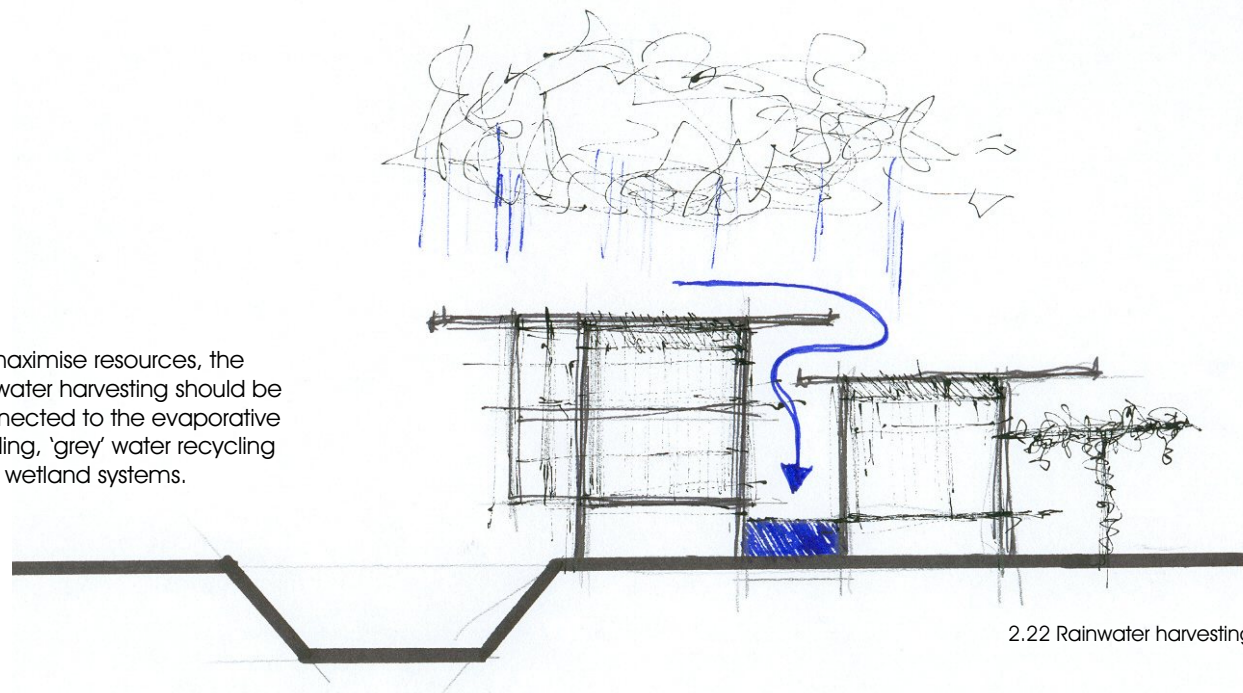
On the site there are 50 year flood-lines 15m from the river, these spaces could be utilised as urban green spaces, these are however currently lost, hostile,

dangerous spaces. These spaces can be utilised to their maximum if they are used as strong movement corridors and with careful engineering the buildings can pass over the flood-lines.

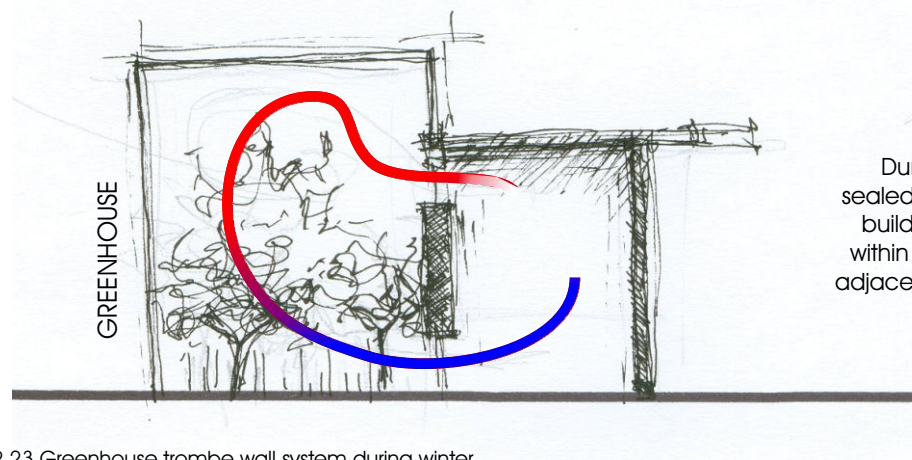
## 2.8 Temperature

The temperature averages for the months of November to March fall within the thermal comfort zone that ranges from 16°C to 32°C, with an optimum temperature being around 22°C (Holm, 1996, p69). During certain days however, the temperature falls outside of the comfort zone. For example maximum temperatures have been recorded of 38°C in January and minimum temperatures of below zero in winter months. Air temperatures can be manipulated by using the greenhouses as a trombe wall system (See fig.2.23).

To maximise resources, the rainwater harvesting should be connected to the evaporative cooling, 'grey' water recycling and wetland systems.

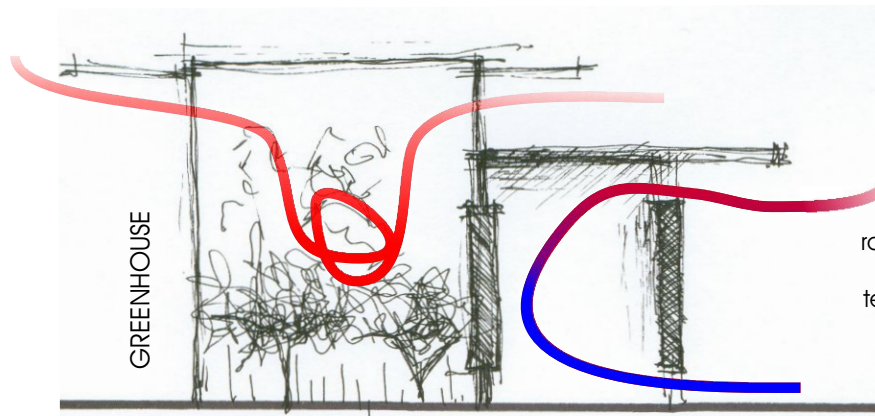


2.22 Rainwater harvesting



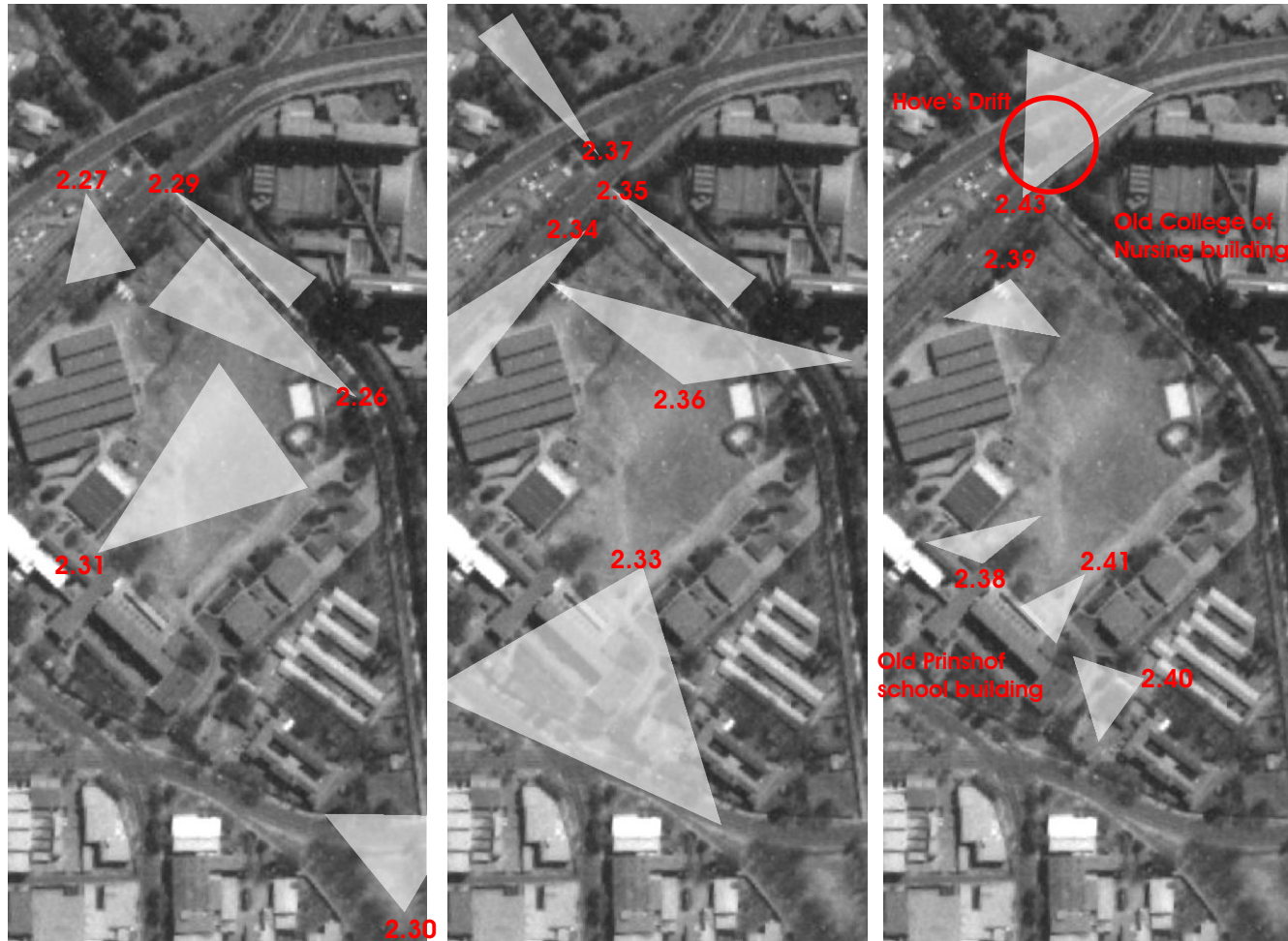
During winter, the greenhouses should be sealed to the outdoors but open to the main building. The high temperatures generated within the greenhouse will move through the adjacent buildings, pushing the cold air back into the greenhouse to heat-up.

2.23 Greenhouse trombe wall system during winter



During summer, the greenhouse must be sealed to the main building with openings at roof level to allow excess heat to escape. With the greenhouse fully ventilated at night, temperatures inside it will drop rapidly at night, drawing heat from the main buildings walls and expelling it.

2.24 Greenhouse trombe wall system during summer



2.25 Photograph references

## 2.9 Imageability

Pretoria city is made up of a number of different precincts as shown in fig.3.5. The site lies within the Hospital precinct which is mostly made up of medical and educational institutions with a few residential nodes and light commercial facilities bordering the precinct to the south. The Apies River flows through the middle of the precinct tying it to the rest of the city. However the precinct lacks a specific identity of its own and also ignores the potential asset of the river. This is the result of a number of factors:

-The buildings along the river have their backs turned to the river preventing indoor activities flowing out onto the river, blocking views onto the river and closing the river off to pedestrian access.

-Many of the institutions are surrounded by high walls or fencing, preventing visual access, so one's eye is drawn to the auto shops, derelict buildings, vacant land and informal taxi-ranks that surround the precinct, creating a negative image of the area (See fig. 2.27)

-These walls also prevent outward views of surrounding areas, separating it from the city, both visually and physically (See fig. 2.26).

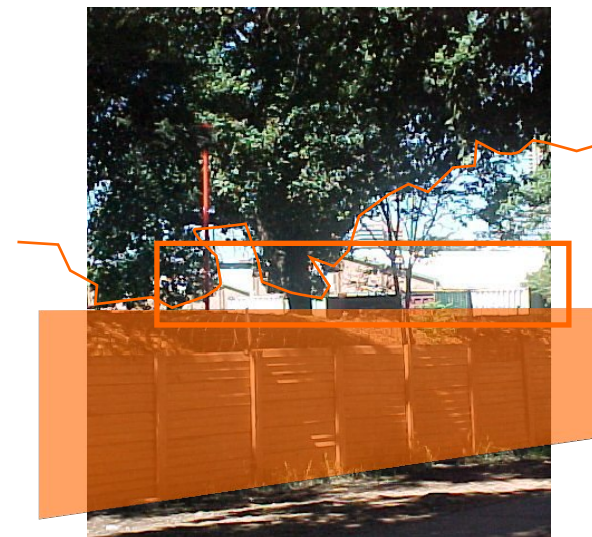
-The institutions take-up large parcels of land that become quite monotonous and leave a number of small, lost spaces. These contribute to a feeling of desolation in the area.

-The sterile atmosphere created by the precinct prevents the natural/cultural image of the zoo from spreading southwards

2.26 Inside PTA Tech. boundary wall with Apies River behind



2.27 Boundary wall on Dr Savage Street with light industrial looking buildings behind





along the river.

-There is a lack of interaction with the natural environments. This leaves them with an un-maintained, hostile feel that contributes further to the negative image of the precinct (See fig. 2.29).

### 2.10 Social

-The area has the potential of being highly active with the numerous student related installations. The lack of permeability between them and absence of entertainment facilities and social spaces prevent this activity. This potential could be enhanced by the river.

-To the north of the precinct, there is an informal taxi rank that is very littered and neglected, creating a hostile environment towards pedestrians (See fig. 2.34).

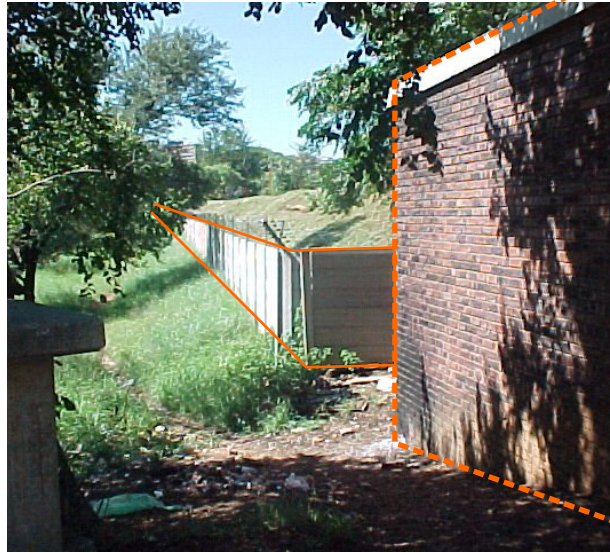
-The Apies river creates a link through the site, at Dr Savage Street. Unfortunately this link is littered, overgrown and along with an un-maintained ablution block, this area has become inhospitable. The river and adjacent spaces are enclosed with walls on each side with no visibility onto it, thus the area has become a dangerous area to walk through, especially at night (See fig. 2.29).

-The Hospital precinct forms part of the boundary to the CBD. Here the grain of the city becomes coarser, this causes the strong flow of energy from the east and south east to become saturated and doesn't move through or past the precinct, resulting in a loss of urban life (See fig. 2.28).

### 2.11 Movement

-The construction of Nelson Mandela Drive created a number of linear open spaces between itself and the river.





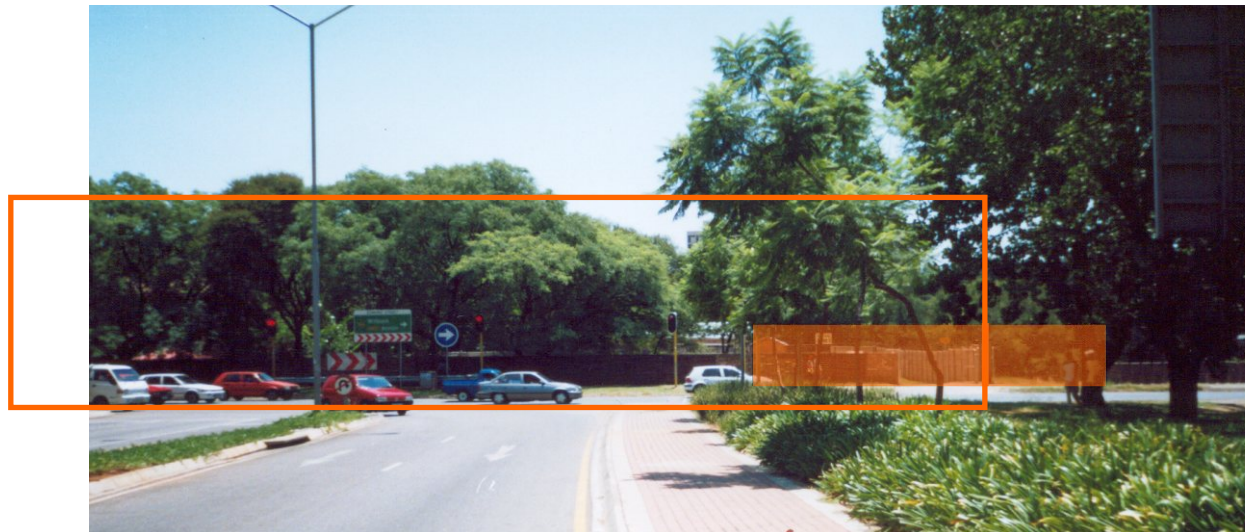
2.29 Pedestrian link at Dr Savage Street

Unfortunately these spaces have become disconnected because of east/west traffic, while the traffic volume makes it hard to cross Nelson Mandela Drive. Nelson Mandela Drive terminates abruptly at Struben Street and leaves one with no sense of direction. There is no identity here with only the concrete Technikon wall. There are some interesting buildings that lie just behind the wall, but are not visible. There is no indication that the Union Buildings and Zoo are a few hundred metres east and west respectively (See fig.2.30).

-The road capacity is good and carries a large amount of taxis and cars, unfortunately there is very little access for buses and there are no bicycle paths so public transport in the area is limited. These need to be improved since there is no potential for rail transport, resulting in a great pressure being placed on the roads (ARUDF, 1999, p78).

-Along Nelson Mandela Drive there are pedestrian paths, but there are no drop-off areas for vehicles, which further limits the use of public transport. This pedestrian path is linked to

2.30 No identity at the termination of Nelson Mandela drive. The river is obscured by the PTA Tech. walls



the Taxi-rank, but the lack of crossings on Dr Savage street and uninviting environment along the river prevent the use of the path. High speed traffic along Dr Savage also prevents drivers from taking note of their surrounding environment adding to the lack of awareness and neglect of the precinct.

### 2.12 Pollution

-Pollution is visible within the river in the form of litter and leaking sewage. Due to the large enclosed land parcels, the precinct is generally unpolluted.

### 2.13 Environmental

-Much of the vegetation along the Apies River in this area is ground cover of veld grasses with scattered Sweet Thorn (*Acacia Karroo*) trees. There are very few exotic plant species occurring in the area. Although the river is canalised, the soils on banks are still very rich and the potential for vegetation to grow is high (ARUDF, 1999, p77).

-The walls along the river separate a thin line of indigenous vegetation from cultivated lawns. These lawns mostly serve as parking areas for the Technikon and Nursing college (See fig.2.31). Exotic species are also more abundant within the boundary of the campus. The large island created by Soutpansberg Road and Dr Savage street create a wide barrier to the natural environment, preventing the spread of vegetation from the north into the city .

-At Hoves Drift, the river changes from concrete to natural, the high water velocity causes erosion of the banks here, especially in times of flooding. There is a greater number of bird species here and fish begin to occur.



2.31 Green open spaces used for parking areas

2.5.12 Road proposals

Currently there is a proposal for a new road system within the precinct (ARUDF, 1999, p78). This will extend Nelson Mandela Drive to connect to Boom Street and Soutpansberg Road and will line the river with roads on both sides. The idea is to create continuity of movement, however this proposal will lead to a number of problems, namely:

- Pedestrian access to the river will be further limited.
- Traffic speeds in the area will be increased.
- Unusable left-over spaces will increase.

-Many historical elements will be destroyed.

This area is highly sensitive as it forms a boundary between the urban environment of the CBD and the biophysical environment of the Zoological gardens and Witwatersberg ridges to the north. It is in this area along the Apies River that the Biophysical environment moves into the city. The extension of Nelson Mandela Drive will only weaken this link, and further isolate the River.

2.32 New road proposals on the site



University of Pretoria Ltd - Butcher, A (2003)

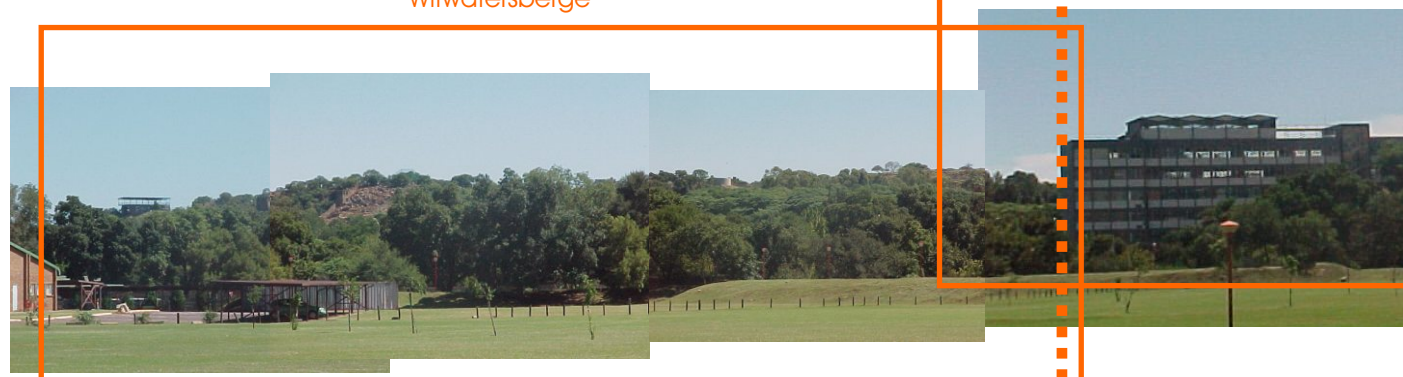


2.33 The view to the south west of the Pretoria skyline



2.34 Dr Savage Street with the adjacent taxi terminus

Witwatersberge





2.35 Apies River southwards

2.36 North west view shows the abrupt change of context, from the natural environment of the Zoological gardens, to the urban environment of the College of Nursing.

2.37 Apies River northwards, indicating the change to the biophysical environment

College of Nursing



## 2.14 Buildings

There are a number of historical elements/buildings within the precinct that are rarely noticed. These need to be celebrated to unlock the potential richness of the site and would serve as orientation devices and social activators. These include the old College of Nursing, the old Prinshof School and Hove's Drift.

The old Prinshof school lies on the western edge of the Pretoria Technikon campus and on the east bank of the Apies River lies the old College of Nursing. Both these buildings have been identified to having cultural / architectural importance (see appendix A). These buildings are not to be removed or disrupted and sightlines to these buildings are not to be disrupted.

The other existing buildings on the Pretoria Technikon campus, are mostly light industrial type warehouses and prefabricated structures. The warehouses are used as studios for the sculpture, glasswork, ballet etc. while the old school buildings are used mostly for staff offices. Most of the warehouses have been made more personal to their function through painting (Fig.2.62), but some have not and create the image of an office park (Fig.2.62). The older industrial buildings have more character with their cooling stacks, strip windows etc. than the newer ones.



2.38 Graffiti on sculpture dept. wall



2.39 Glasswork studios



2.40 Older industrial buildings



2.41 Old school buildings

### 2.15 Hove's Drift

When Pretoria was established, the land that the chosen site sits on was a property called Prinshof, named after Joggem 'Tweeduim' Prinsloo and in the early 20th century the area served as the Prinshof Experimental Station where the cultivation of different types of grass species took place. Property on the west bank was owned by Theodore Hove (1834-1906)(VD Vaal, 1999). A linocut work by Hendrik Pierneef called *Uniegebou Vanaf Prinshof, Pretoria*, show what the area looked like in 1925 (Fig.2.46).

Hove's drift provided access across the Apies River from central Pretoria to the north and in 1932 a bridge was built here by Bain & Proudfoot. In 1935, Dr Savage street, was built across the bridge. The road was named after Dr SR Savage who was Mayor of Pretoria in 1907-1908 (VD Vaal, 1999).

Dr Savage Street carries relatively fast moving traffic, because of this commuters don't see the bridge. The pavements across the bridge are very narrow, and the surrounding environment is uninviting, no opportunity is therefore given to pedestrians to interact with this historical element.



2.42 *Uniegebou Vanaf Prinshof, Pretoria*, 1925 by Hendrik Pierneef

2.43 Bain and Proudfoot's 1932 bridge across the Apies River with Dr Savage street across it

