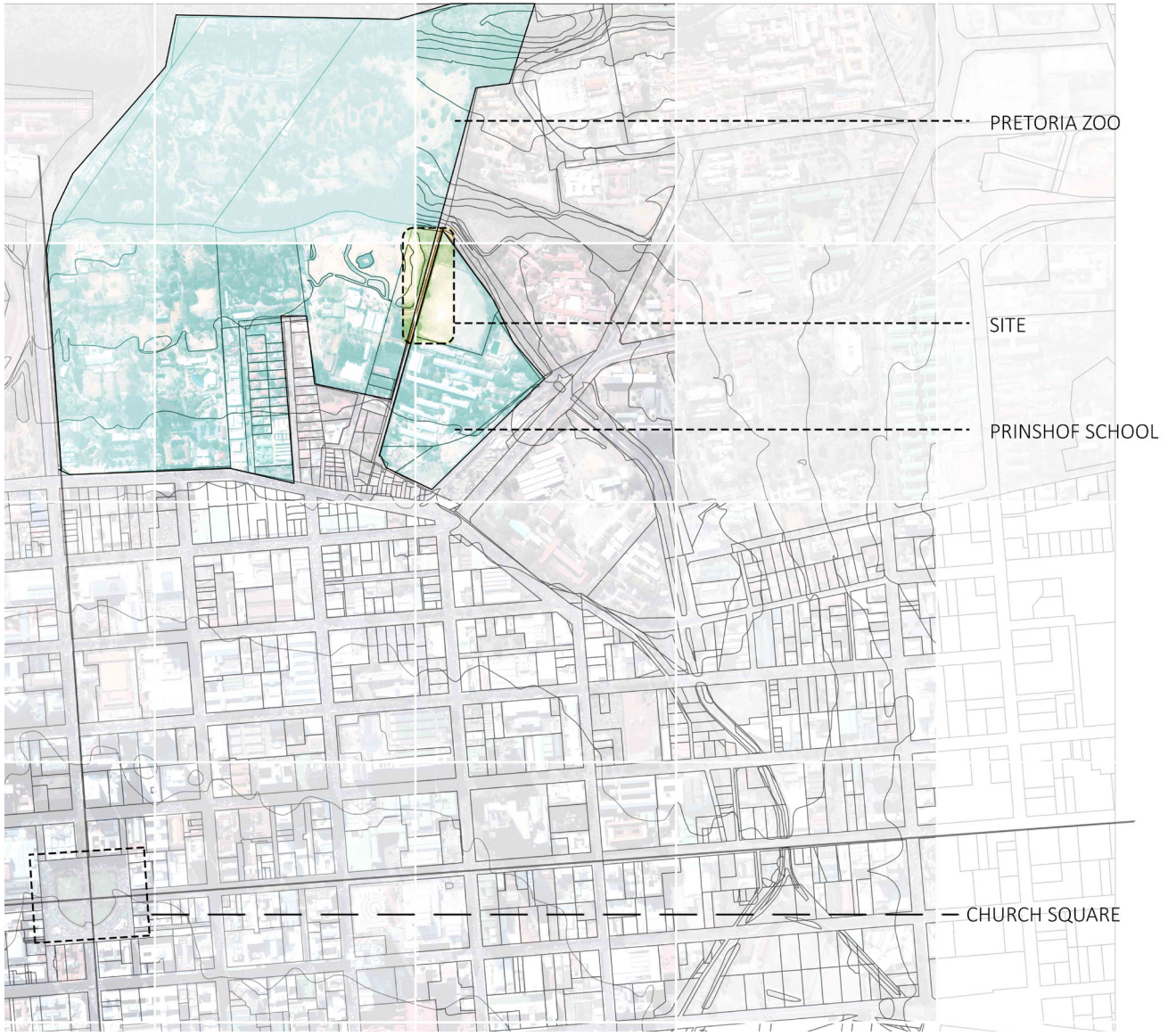
5 / SITE CONTEXT

5.1 / SITE SPECIFICS

The site of interest is on the boundary between two properties; the Pretoria National Zoo on the west and the Prinshof School on the east (refer to Figure 00). It holds a great deal of potential in terms of both its placement and connection between the inner city and the Apies River. The river, which is to the north of the proposed site, is currently seen as a dead space or a 'no-go' area. As seen in Figure 00, waste and storm water run-off discharge into the canalized Apies River, resulting in unpleasant smells and views of polluted water. Some parts of the Apies River, obscured from public view, are occupied by the homeless and street dwellers, making it unsafe to walk next to the river.

The site is chosen because of its hidden potential. Natural resources can be utilized and programs informed by the existing functions in the area. In the group framework, the Apies River is activated as a green park; fashioned as wetlands that filter and clean the water. Public walkways are created to reconnect people to nature. There is a 6-meter-high hill on site, which is the backdrop for the zoo's animal camps, refer to Figure 5.4 on page 52. Behind the hill is the zoo's dump site; filled with waste gathered within the zoo area. The site also maintains a plantation and nursery structures where trees and plants are cared for, but these structures are in a state of physical deterioration. The Prinshof School sport ground forms the eastern boundary of the site. Figure 5.3 shows the sport grounds' current condition, ascribable to a



5.1_ Location of proposed site (https://www.google.com/earth/ edited by author, 2015).

lack of activity from the school. The grounds are used by the students, but not to full capacity. The site gradually slopes downwards to the north and into the Apies River and in the past fed the river with water run-off. This set in motion all the necessary requirements in the natural cycle flow of the biosphere. Excessive land development over the years has, however, caused the connection to the river to be lost; natural ecosystems that once thrived on that site have then also been lost. Therefore, the project aims to reconnect water run-off and the river and, by doing so, to reclaim the natural flow of ecosystems.

5.2_ Zoning: Prinshof School, Zonong of existing site (https://www.google.com/earth/ edited by author, 2015).

5.3 _ View of site from the school sports ground (Author, 2015).

5.4 _ View of site from Pretoria Zoological gardens, Eland camp (Author, 2015).

5.5 _ Site photo, dumping site (Author, 2015).

5.6 _ Site photo, walkway next to hill (Author, 2015).

5.7 _ Site photo, entrance to site showing contrast between hill and damaged ecosystems (Author, 2015).

5.10 _ Aerial view of site (https://www.google.com/earth/ edited by author, 2015).

5.8 _ Site photo, view of dumping next to walkway (Author, 2015).

5.9 _ Site photo, Insect habitats on site (Author, 2015).

5.2 / MICRO-CLIMATE ANALYSIS

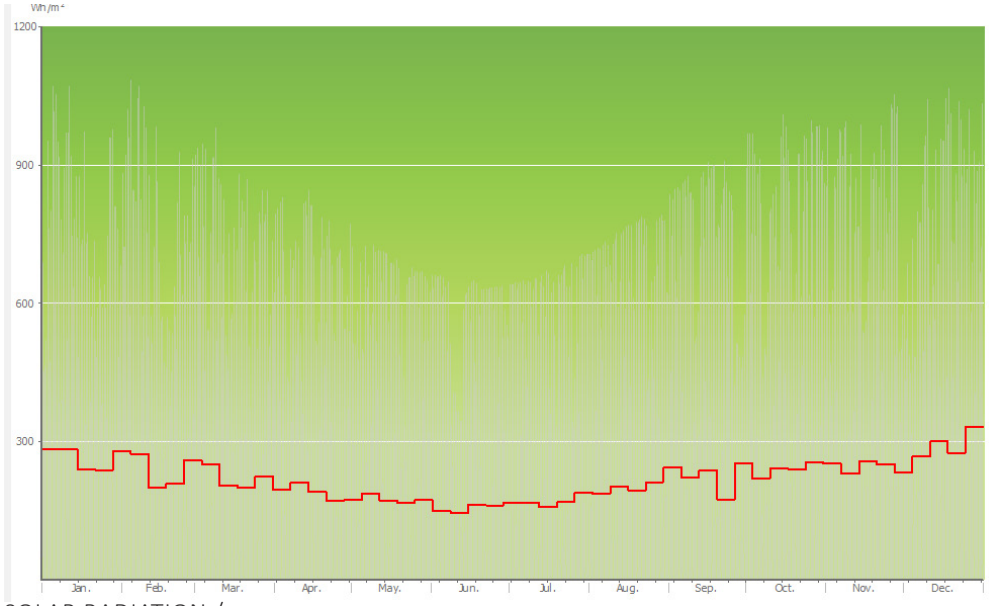
Micro-climate is the analysis of the general climate on a specific site. It is influenced by topography; the ground surface and plant cover, as well as man-made forms.

Micro-climate analysis is continued in the Eco-Mapping section. An overview of the proposed site is given here, in terms of the existing factors that influence the climate of the site.

5.2.1
CLIMATE DATA

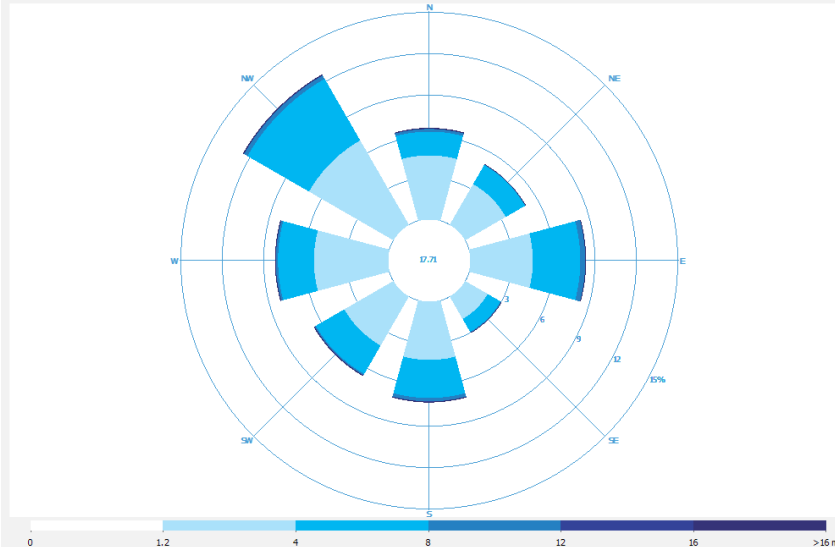
The climatic data was analyzed using the Eco-design Star tool from Archicad. Within this tool, climatic data was sourced from ZAF_Johannesburg.683680_IWEC.epw which gives the exact climatic measurements of a specific area. The proposed site's coordinates were used to pin point the exact climatic data and analysis, refer to figure 5.11- 5.14:

1. Solar radiation
2. Air temperature
3. Relative humidity
4. Wind direction and speed

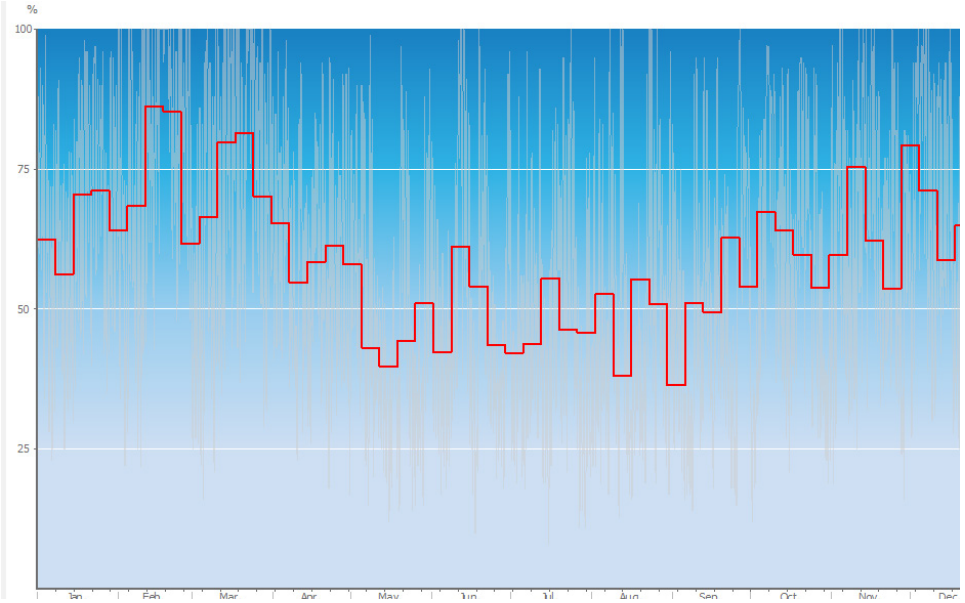


SOLAR RADIATION /
Measured on a weekly basis
Max: 1130 Wh/m²
Average: 225.45 Wh/m²
Min: 0.0 Wh/m²

5.11_ Solar radiation measurements for proposed site sourced from Archicad's Eco-design tool(Author, 2015).

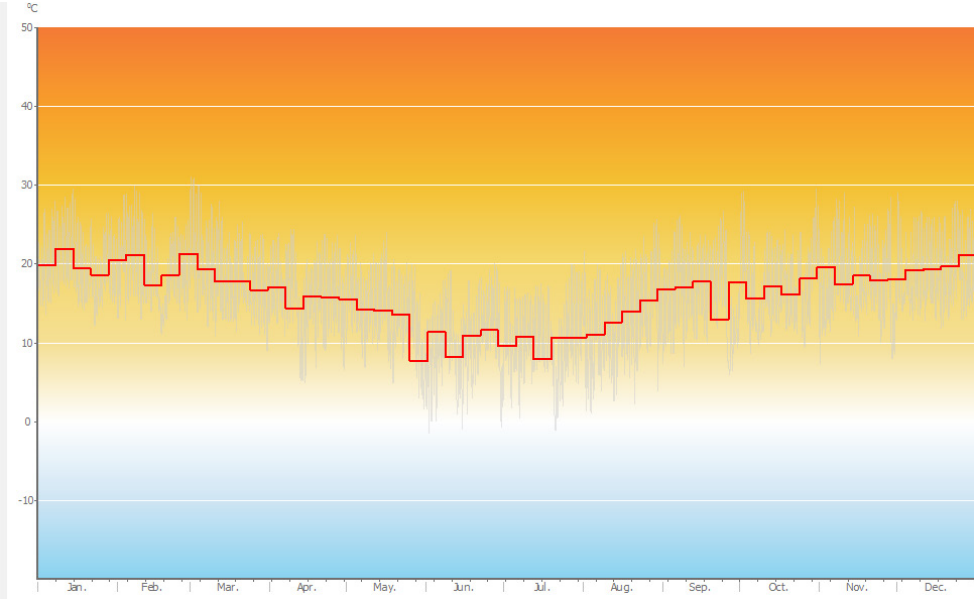


5.12_ Wind direction and speed for proposed site sourced from Archicad's Eco-design tool(Author, 2015).



RELATIVE HUMIDITY /
Measured on a weekly basis
Max: 100 %
Average: 58.77 %
Min: 8 %

5.14_ Relative humidity for proposed site sourced from Archicad's Eco-design tool(Author, 2015).

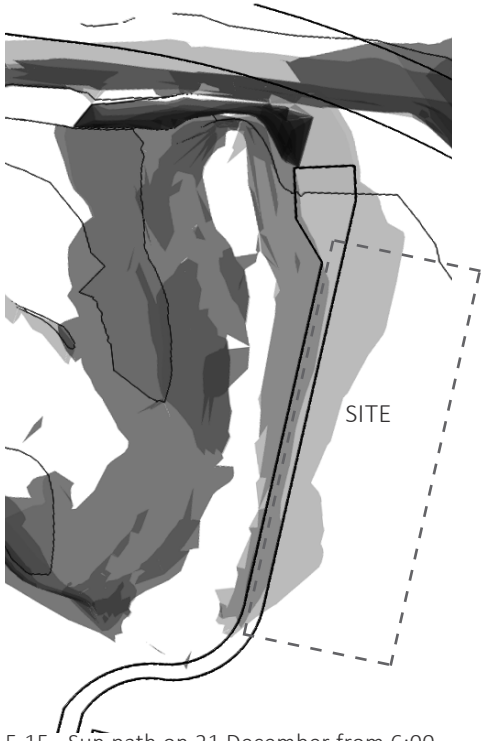


AIR TEMPERATURE /
Measured on a weekly basis
Max: 31.10 C^0
Average: 15.84 C^0
Min: -1.50 C^0

5.13_ Air temperature measurements for proposed site sourced from Archicad's Eco-design tool(Author, 2015).

5.2.2
SUN STUDY

The sun's movement through the day and year is a crucial environmental factor to consider. When designing a building to be dependent on passive systems, it is critical to study the sun path. It can reveal where natural daylight can be utilized or where to place the PV panels. The proposed site's sun path was studied in summer, autumn, winter and spring.

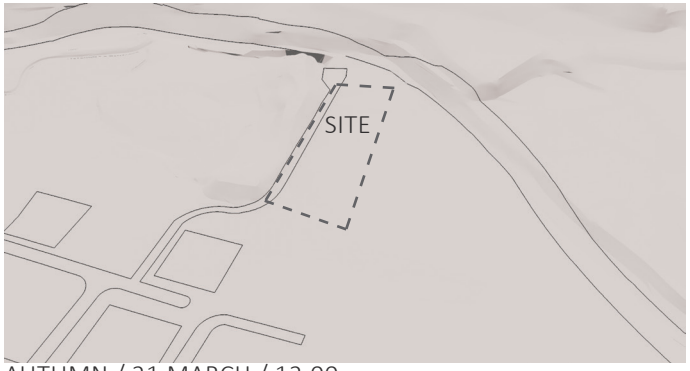


5.15_ Sun path on 21 December from 6:00 to 18:00 (Author, 2015).

SUMMER / 22 DECEMBER / 8:00

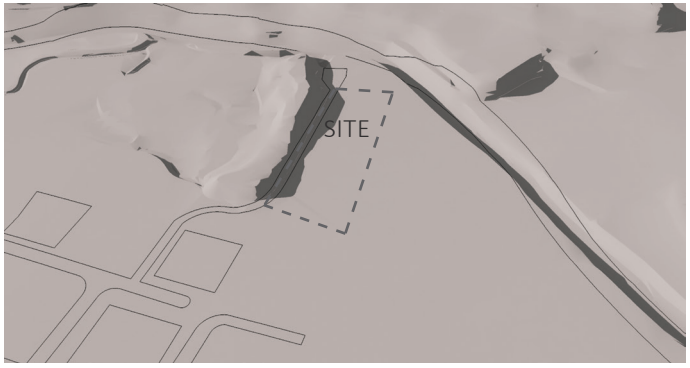
AUTUMN / 21 MARCH / 8:00

SUMMER / 22 DECEMBER / 12:00



AUTUMN / 21 MARCH / 12:00

SUMMER / 22 DECEMBER / 17:00

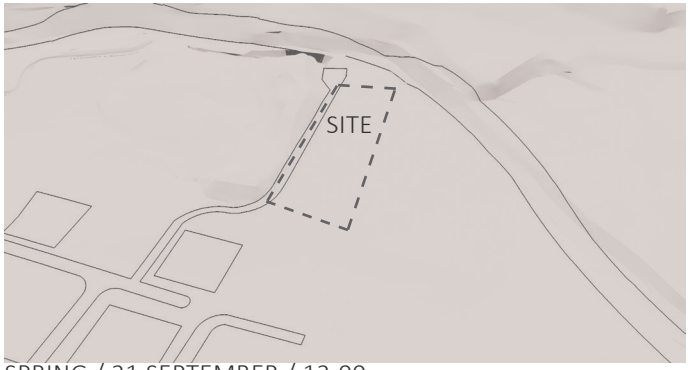


AUTUMN / 21 MARCH / 17:00

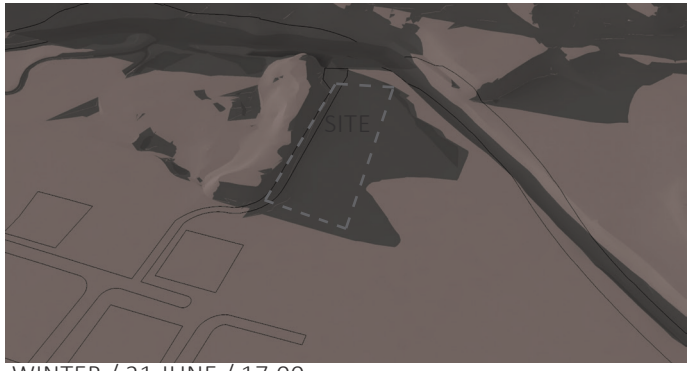
WINTER / 21 JUNE / 8:00

SPRING / 21 SEPTEMBER / 8:00

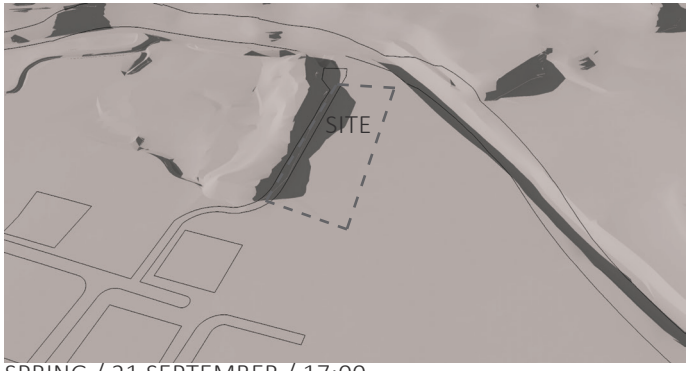
WINTER / 21 JUNE / 12:00



SPRING / 21 SEPTEMBER / 12:00



WINTER / 21 JUNE / 17:00



SPRING / 21 SEPTEMBER / 17:00

OUTCOME /
The outcome of the sun study reveals the site to be very exposed to the sun, with limited natural shading. The existing trees on the site do not provide sufficient shading. Therefore alternative means to create shading on the site are necessary. Planting trees, creating screens on the building and constructing objects to create shading for the building are options to consider.

5.16_ The sun study analyzed through the year focused between 8:00 the morning, 12:00 noon and 17:00 in the afternoon, and varied from summer on the 21st of December, Autumn 21 March, winter 21 June and spring 21 September (Author, 2015).

5.3 / ECO-MAPPING

Ecological mapping was done using the 'Ecomasterplanning' methods conceived by Ken Yeang[8] . Habitat mapping can increase insight into the character of that place[9] and enables the assessment of the ecological value and structures of the existing environment. It facilitates the restoration of destroyed habitats or the conservation of healthy habitats (Freeman, C. 2010: 100). Ecomasterplanning is the continuous integration of the environment and four infrastructures (Yeang, K. 2008: 128):

1- **Green infrastructure;** connecting greenways and habitats
2- **Gray infrastructure;** the engineering systems.
3- **Blue infrastructure;** sustainable urban drainage system
4- **Red infrastructure;** the human infrastructure consisting of built systems and hardscapes

The difference between ecomasterplanning and conventional master planning is the addition of the green infrastructure or 'eco-infrastructure'. The green infrastructure integrates the functionality of green spaces (that benefit from ecosystems) with the built infrastructure, resource management and land development (Yeang, K. 2008: 131). It is critical to have a green infrastructure in place in any master plan.

5.3.1
GREEN INFRASTRUCTURE

All natural areas are interconnected by green ways or wetlands that conserve the functions of natural ecosystems. The natural characteristics of the place are therefore preserved. The existing ecosystems are also enhanced, resulting in positive outcomes (Yeang, K. 2008: 128):

1- Cleaner water and enhanced water supply
2- Cleaner air
3- Reduction of the heat island effect
4- Moderation in the impact on climate change
5- Protection of sourced water.

The environmental benefits and positive values of green infrastructure are a critical framework for the functioning of natural systems. It is ecologically critical for the growth and care of plant and animal habitats, such as, healthy soil, water and air (Yeang, K. 2008: 128).

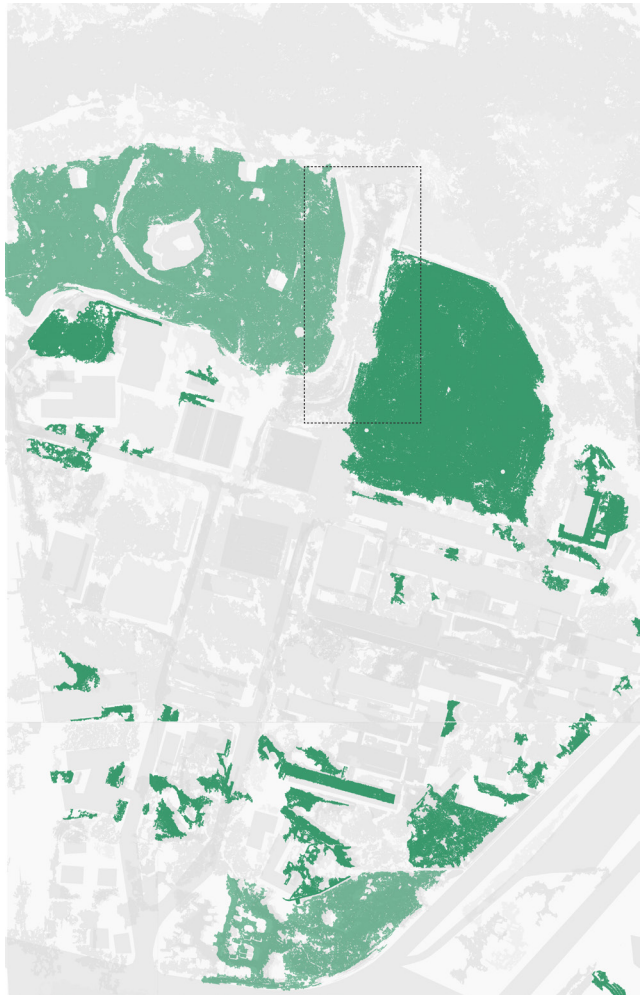
OUTCOME / The green infrastructure on site is to some extent overpowered by grasslands, formed by the school sports ground in the east and the zoo camps in the west. Bushes and trees form clusters of overgrown vegetation that create shade and habitat for some wild species. The site also consists of bare and patchy ground cover originating from human activities that negatively affected the site.

[8] Ken Yeang is a director of Llewelyn Davies Yeang in London and TR Hamzah & Yeang, Its sister company, in Kuala Lumpur, Malaysia. He is the author of many articles and books on sustainable design, including Ecodesign: A Manual for Ecological Design(Wiley-Academy 2006)
[9] As described in the theory chapter 3

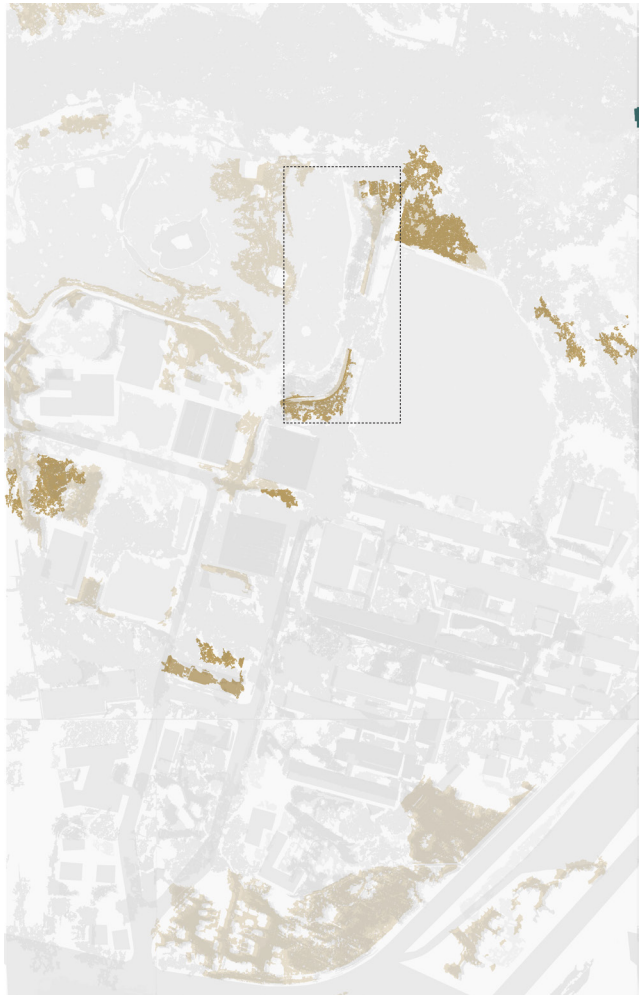
GRASSLAND HABITATS /
- Open-space grass lands
- Rough Grassland irregular managed and grazed grassland

BARE AND PATCHY HABITATS /
- Bare ground
- Dump / landfill

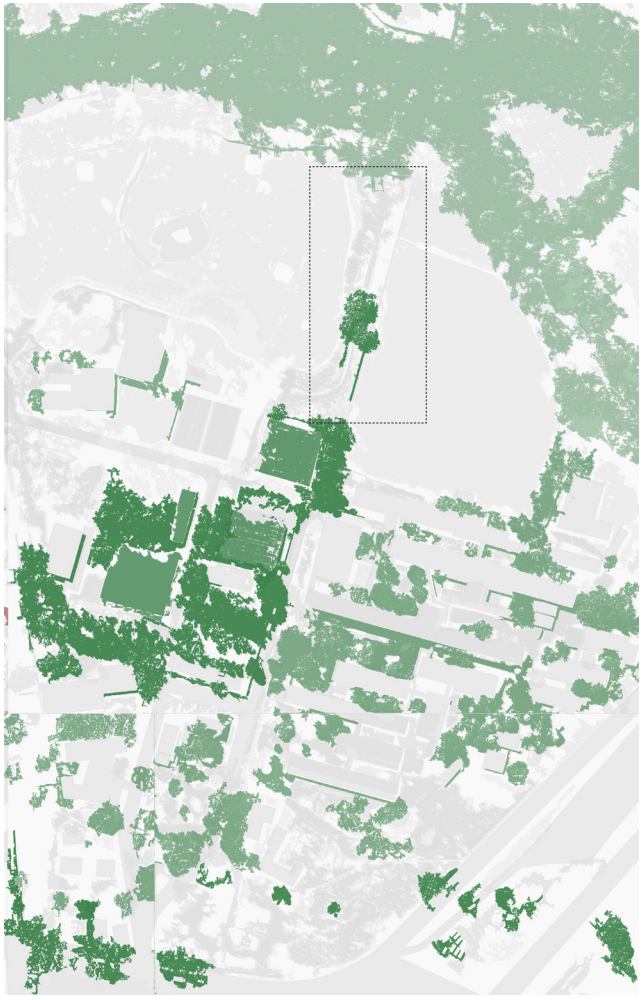
BUSH AND TREE HABITATS /
- Bush and forest / close canopies
- Woodlands / scattered trees
- Plantation
- Tree groups / isolated group of trees.



5.17_ Grassland habitat analysis of proposed site (Author, 2015).



5.18_ Bare and patchy ground surfaces analysis of proposed site (Author, 2015).



5.19_ Bush and tree habitats analysis of proposed site (Author, 2015).

5.3.2
BLUE INFRASTRUCTURE /

Blue infrastructure can be seen as surface water infrastructure. Through the use of filtration beds, built surfaces, retention ponds and bio-swales rainwater can be retained on the surface of the site and used to replenish the ground water (Yeang, K. 2008: 131). When identifying the character of a place in ecomasterplanning, the site's natural drainage patterns and contour slope play a part (Yeang, K. 2008: 131); as seen in Figure 5.20. After the water pattern has been considered, the surface water must be managed properly, so that surface water can be most beneficially utilized before it disappears through drainage or evaporation. The blue infrastructure in ecomasterplanning must conclude with the creation of a system that sustains urban drainage. It must be able to function as a wetland habitat and create a buffer strip that alleviates flooding and offers habitats for wildlife and other species (Yeang, K. 2008: 131).

OUTCOME / The site is significant because of its natural downward slope to the Apies River. The Apies River is the only natural water landmark on site and has been collecting run-off surface water from the surrounding area.

CONTOUR MAPPING /

5.20_ Contours sloping down to Apies River (Author, 2015).

AQUATIC HABITATS /
- River and stream
- Standing water

5.21_ Aquatic analysis of proposed site (Author, 2015).

RED INFRASTRUCTURE /
- Buildings
- Tarred Roads
- Gravel roads

5.22_ Built up infrastructure analysis of proposed site (Author, 2015).

5.3.3
RED INFRASTRUCTURE /

Red infrastructure can be seen as the human community; the buildings from the built environment (Yeang, K. 2008: 131).

OUTCOME / The buildings in the surrounding area are situated on the southern side of the site. These consist of school buildings and restaurant buildings in the Zoo area.

5.4 / PRETORIA ZOO

Dr J.W.B. Gunning established the National Zoological Gardens (NZG) of South Africa as a branch of the Staatsmuseum der Zuid-Afrikaansche Republiek (Engelbrecht, 2014: 63). The small collection of animals was moved to the site Rus in Urbe, which is the current site for the NZG, in 1899 when Dr Gunning received permission. This was followed by the construction of Lion House in 1902 and the main entrance in 1903 (Engelbrecht, 2014: 63).

Additional land was granted to the northern side of the Apies River in 1909 and in 1935 funding was received to enlarge the zoo by the addition of Prinshof farm No. 628. The NZG is the largest zoo with national status in the country. It currently occupies 85 hectares and houses over 8000 animals; which include reptiles, fish and birds (Engelbrecht, 2014: 67).

Today, the Zoo's arrangement of enclosures and exhibits is according to various rationales based on the animals' environment, region and climatological characteristics. Awareness is increasingly focused on the role of environment (Engelbrecht, 2014: 57). As a result, enclosures are grouped in terms of conservation, with an emphasis on habitats; thus conveying their importance to the public. The intention is to raise the public's understanding of the importance of biodiversity preservation through imitating the species' habitats.

5.23_ Existing plantation area in the Zoo (Author, 2015).

5.24_ Abandoned buildings in the zoo used for storage (Author, 2015).

5.25_ Dump sites in the Zoo area (Author, 2015).

5.26_ Aerial view of the site area (https://www.google.com/earth/ edited by author, 2015).

5.27_ Photos framed in the Prinshof school about the inauguration of the school, Mev. Betsie Verwoerd revealing the plaque of the school in 1967(Author, 2015).

5.28_ Photos framed in the Prinshof school about the inauguration of the school, the new building being introduced (Author, 2015).

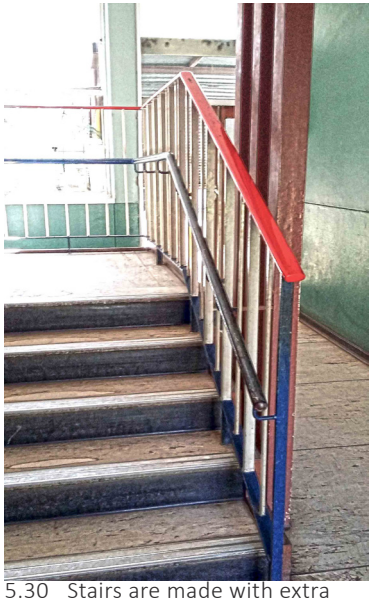
5.5 / PRINSHOF SCHOOL

HISTORICAL HIGHLIGHTS

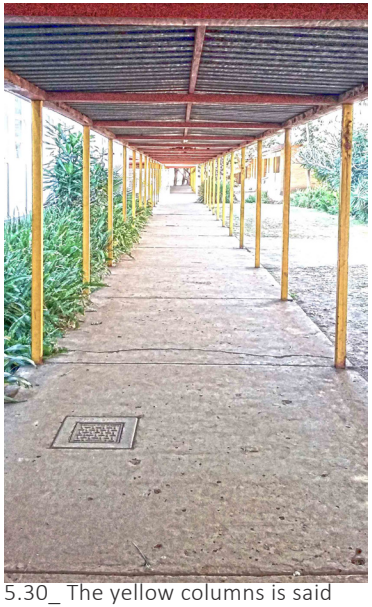
In 1954 the parents of Pretoria requested that the Department of Education found a school for visually handicapped pupils of the Arts and Science. A committee was nominated to investigate educational facilities for the partially sighted in South Africa, and in 1962 the Department approved the establishment of such a school.

A year later the Prinshof School for the partially sighted was established. It was officially opened by Mrs. Betsie Verwoerd on 23 November 1963.

5.29_ Photos framed in the Prinshof school about the inauguration of the school, northern aerial photo of the school building in 1970 (Author, 2015).



5.30_ Stairs are made with extra handrail for the visually impaired school children (Author, 2015).



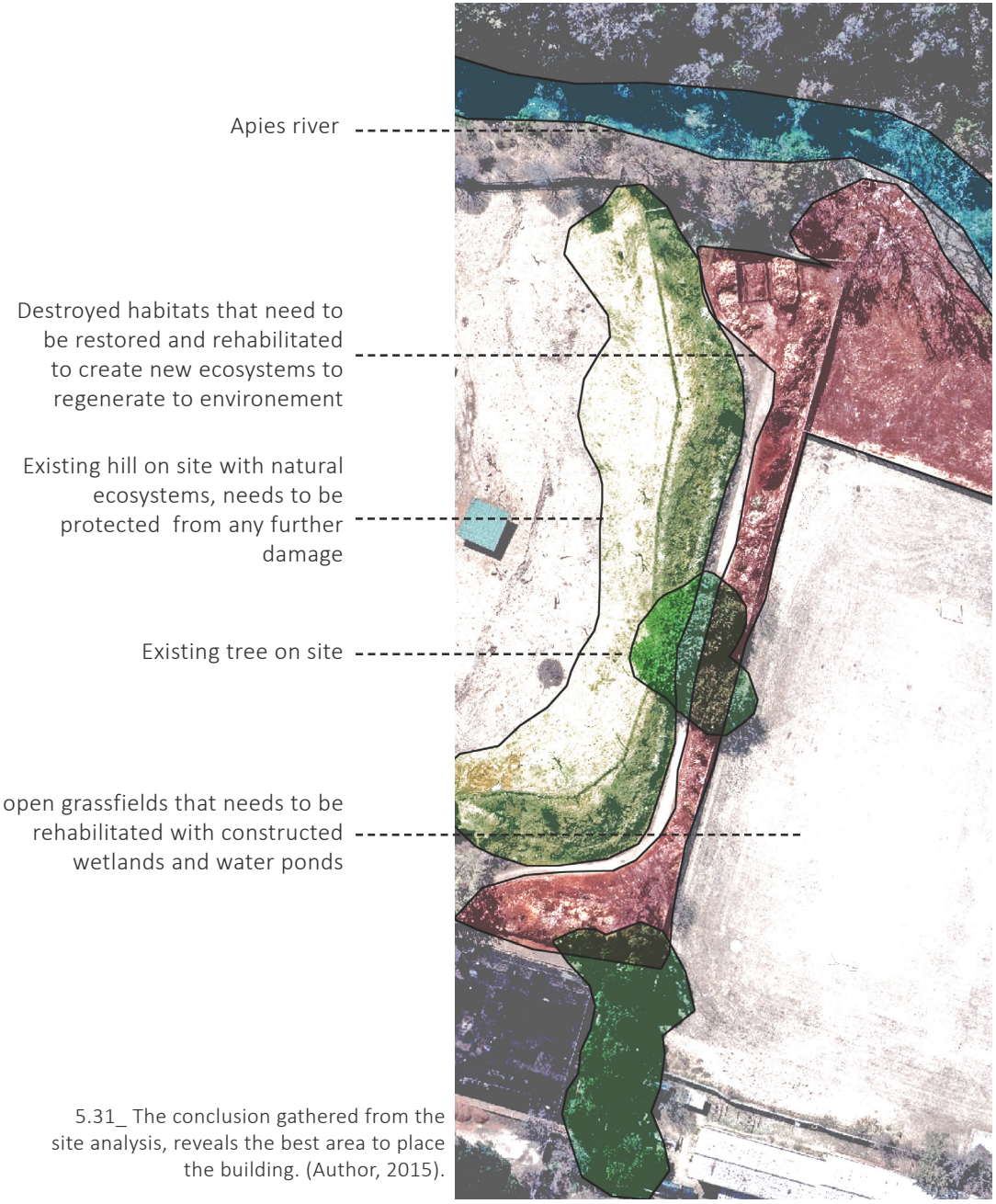
5.30_ The yellow columns is said to be visually stimulating for the visually impaired (Author, 2015).

5.6 / OUTCOME OF SITE ANALYSIS

The position of the building was identified based on conclusions drawn through eco-mapping (refer to Figure 5.31). The following conclusions were drawn: The existing ecosystems on site hold potential but are limited by the activities of man and the positioning of red infrastructure. The placement of roads and buildings disconnects the city from the Apies River. The water flow towards the river is interrupted by buildings and cannot flow naturally.

Areas that hold the most potential to enhance the natural ecosystems were identified. Areas that had already been disturbed by human activities were identified as potentially well-suited foundation sites for the building. The main purpose of this study was to better understand the character of the place, in order to allow its ecosystems to continue naturally. Although minimum excavation will take place to insert a building, the building should be designed to enhance the natural ecosystems and aid in the longevity of the ecosystem services.

To fashion a resilient and regenerative city, urban greening must seek a more integrated balanced solution that incorporates ecosystems. It must go beyond the minor introduction of soft gardens in and around buildings and rather create an urban area that incorporates living habitats with functioning ecosystems (Wells et al, 2010: 130).



5.31_ The conclusion gathered from the site analysis, reveals the best area to place the building. (Author, 2015).