



VI_1.
*Conceptual technical
approach collage of
materiality disintegration
(Author 2014)*

CHAPTER VI

TECHNICAL SPECTACLE

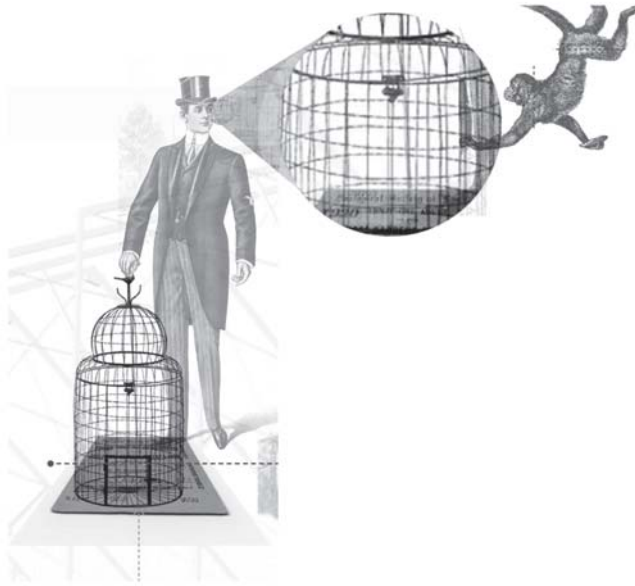
technical resolution

THE TECHNICAL SPECTACLE PRESENTED IN CHAPTER VI WILL SERVE AS THE INVESTIGATION OF THE TECHNICAL AND PROGRAMMATIC REQUIREMENTS OF THE ENCLOSURE DESIGN INTERVENTION.



6.1 *Introduction*

Technical strategies were developed to give expression to the palimpsest concept on-site. Special attention ought to be given to specific detailing elements when considering the overall concept of this dissertation. Materials were carefully selected throughout the enclosure to interpret the palimpsest and the character of the zoo.



*VI_2. Conceptual
representation of the
technical spectacle
(Author 2014).*

6.2 *Vervet monkey*

The vervet monkey was chosen as the primary client for the proposed enclosure. The pragmatic requirements and zoo husbandry is therefore an important consideration for the design enclosure intervention. The study has simplified the life history universe as described in Chapter III to fit the daily activities of the monkey in terms of their eating, sleeping, resting and nesting habits (refer to figure VI_2 on page 232). The selected species will therefore inform decisions, such as the planting pallet, moat wetland design, general material selection and the ecological approach of the enclosure design.

1.

Vervet monkey

Chlorocebus pygerythrus



Kingdom: Animalia
Phylum: Chordata
Class: Mammalia
Order: Primates
Family: Cercopithecidae
Genus: Chlorocebus
Species: *C. pygerythrus*

FEEDING



1. *Acacia erioloba* – seeds and pods
2. *Aloe spp* – nectar (flowers)
3. *Celtis africana* – fruit
4. *Colophospermum mopane* – s eeds
5. *Deinbollia oblongifolia* – fruit
6. *Euphorbia ingens* – fruit
7. *Euphorbia tirucalli* – fruit
8. *Ficus abutilifolia* – figs
9. *Ficus sur* – figs
10. *Ficus sycamorus* – fruit
11. *Grewia caffra* – fruit
12. *Harpephyllum caffrum* – fruit
13. *Hyphaene coriacea* – fruit
14. *Protobius longifolia* – fruit
15. *Searsia chirindensis* – fruit
16. *Sclerocarya birrea* – fruit
17. *Strelitzia nicolai* – soft parts of the flowers

weight
(m) 4.5kg
(f) 3.3kg

height
height: 46-66cm

habitat
Savannah and woodland edge, near water.

status
ST least concerned

RESTING



NESTING



TRAVELLING, FEEDING

FEEDING, RESTING, GROOMING

monkeyland

*The world's first free-roaming multi-species primate sanctuary,
Plettenberg Bay, Western Cape*

12 hectare forest

550 primates total

6m high fence + 1m of live wires



VI_3. Suspension bridge at Monkeyland, Plettenberg Bay (www.monkeyland.co.za 2011).



VI_4. Monkey at Monkeyland, Plettenberg Bay (www.monkeyland.co.za 2011).

primate kingdom

Singapore Zoo

Primate Kingdom is made of six large and two small man-made islands planted with tall trees, wild grasses, palms and bamboos. It boasts several collection of attractive primate species such as the lion-tailed macaques, patas monkeys, playful bunch of brown capuchins, docile-looking Celebes crested macaques, douc langurs, black spider monkeys and golden-lion tamarins.

Its landscape was carefully designed to ensure there are ample spaces for each animal, not to mention the need for the primates to feed themselves from the trees.



VI_5. Gorilla enclosure at the Primate Kingdom, Singapore (Graetz 2000).



VI_6. Gorilla enclosure at the Primate Kingdom, Singapore (Graetz 2000).

6.3 *Water strategy*

Water will form a critical part of the proposed enclosure. The use of water will influence the ecology and pragmatic requirements of the enclosure design. Water will form the barrier of the enclosure and become an essential component of habitat creation. The water body will consist of smaller components and will be discussed in the following paragraphs.

6.1.1 *Stream*

A proposed stream will serve as an important ecological component of the design. In order to apply the vision encapsulated in Marais's quote, the purification of the water therefore becomes an important aspect. The topography will also be manipulated by means of gravity in order for the stream to flow. Figure VI_11 on page 239 illustrates the process of purification and of the moat.

6.1.2 *Moat*

The proposed moat is not only to serve as a functional barrier but bleeds as an ecological filter into both the proposed and adjacent enclosures. The moat itself will induce habitat creation and will be inhabited by birds, antelope, insect and other aquatic life. Fig. x illustrates the water purification process of the moat and the pragmatic requirements of the moat as barrier.

6.4 Ecology

The proposed ecosystem will be supported by habitat functions. The enclosure will provide a refuge and habitat to plants and animals, thereby contributing to the conservation of biological and genetic diversity and evolutionary processes. The enclosure will replicate the vervet monkey's habitat, specifically in context of Pretoria vegetation typologies and the site selection adjacent to the Apies River. The existing *Celtis* trees on-site form the basis of a historical *Celtis* forest replication and connect to the habitat functions of the vervet monkeys as well as other species that will not be a threat to the monkeys. The habitat will contribute to the conservation of biological, genetic diversity and evolutionary processes. A selective choice of species was made to share the enclosure with the vervet monkeys. The species include the bat-eared fox, steenbok, klipspringer, brown rabbit, leopard tortoise, the South African hedgehog, grey reedbuck, the secretary bird, the blue crane and other bird and aquatic species. Figures VI_7 on page 237 shows similar species from the NZG Guide from 1960.



VI_7. Female Oribi (Chris Pisart in NZG Guide 1960).



VI_8. Crowned crane (Chris Pisart in NZG Guide 1960).

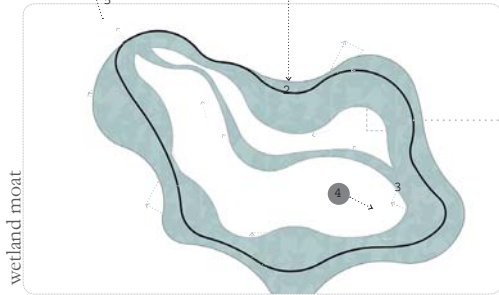


VI_9. Bushbuck (Chris Pisart in NZG Guide 1960).

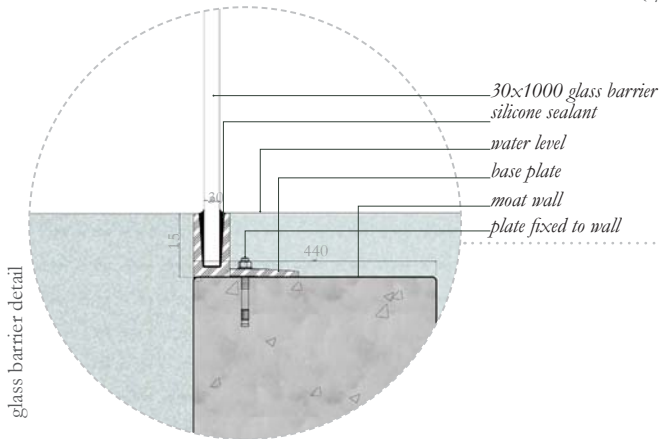
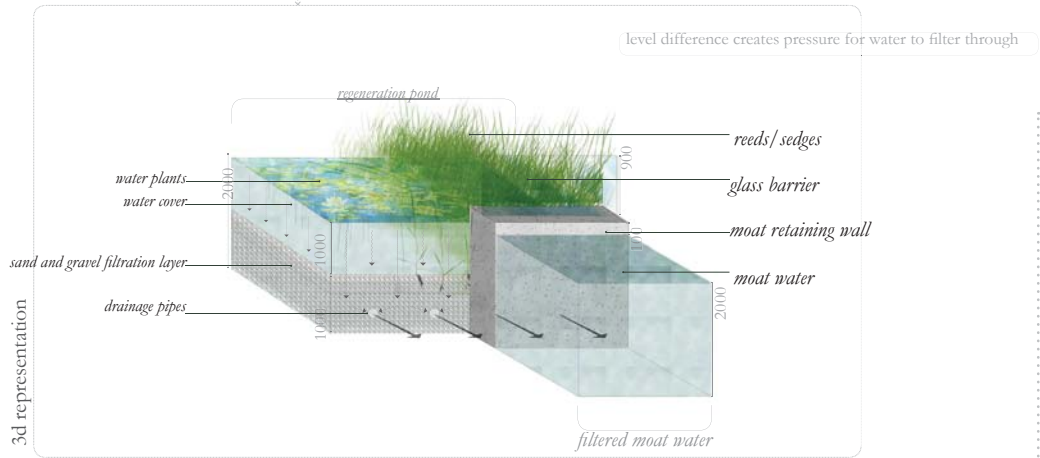
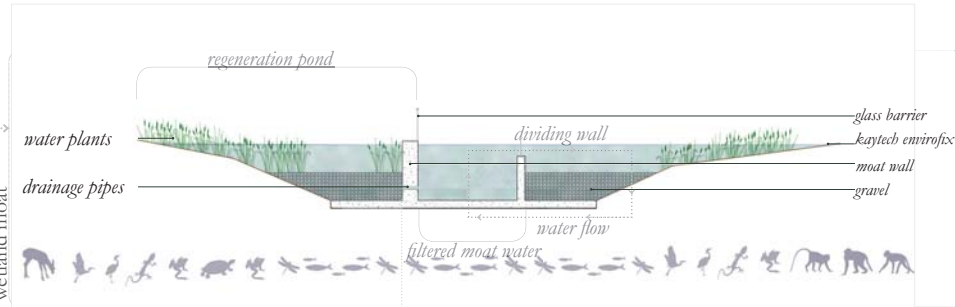


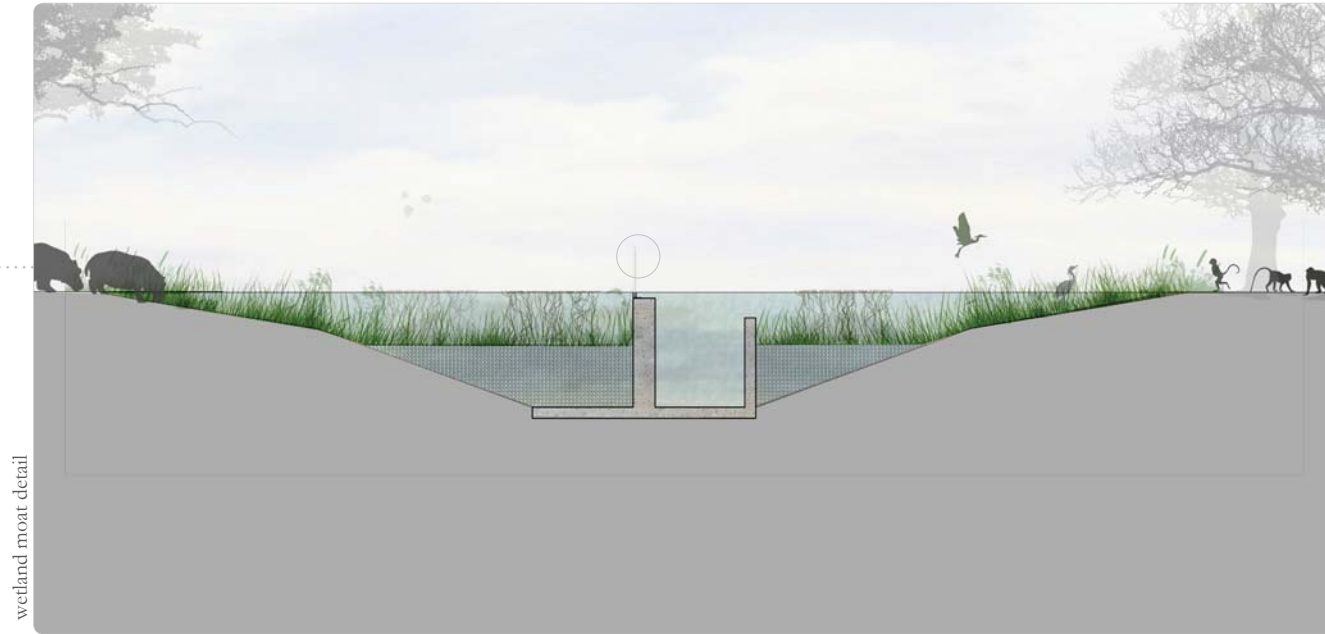
VI_10. Steenbuck ewe (Chris Pisart in NZG Guide 1960).

2 Wetland moat



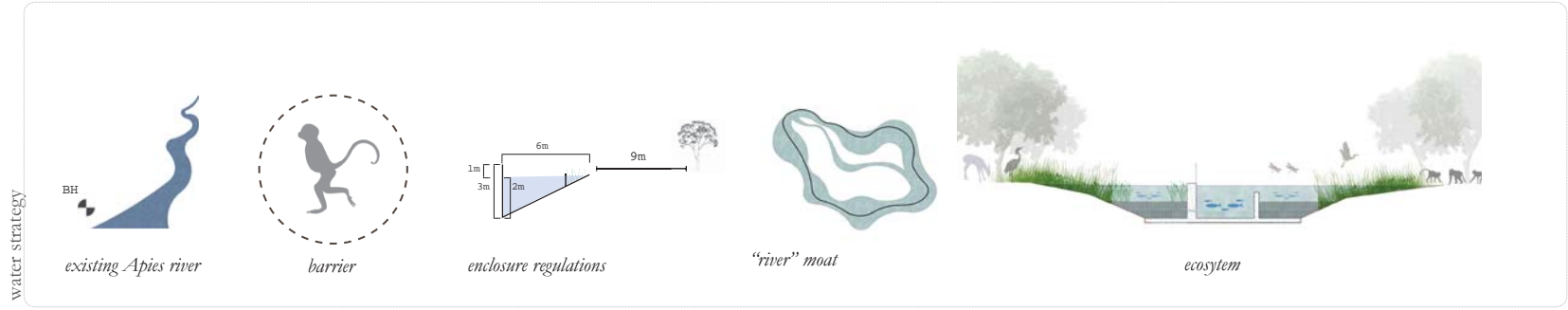
1. water supply from Apies river borehole
2. moat fills to indicated water level
3. water circulated/aerated with nozzles
4. emergency supply reservoir to provide for evaporation loss
5. overflow into river during flood event



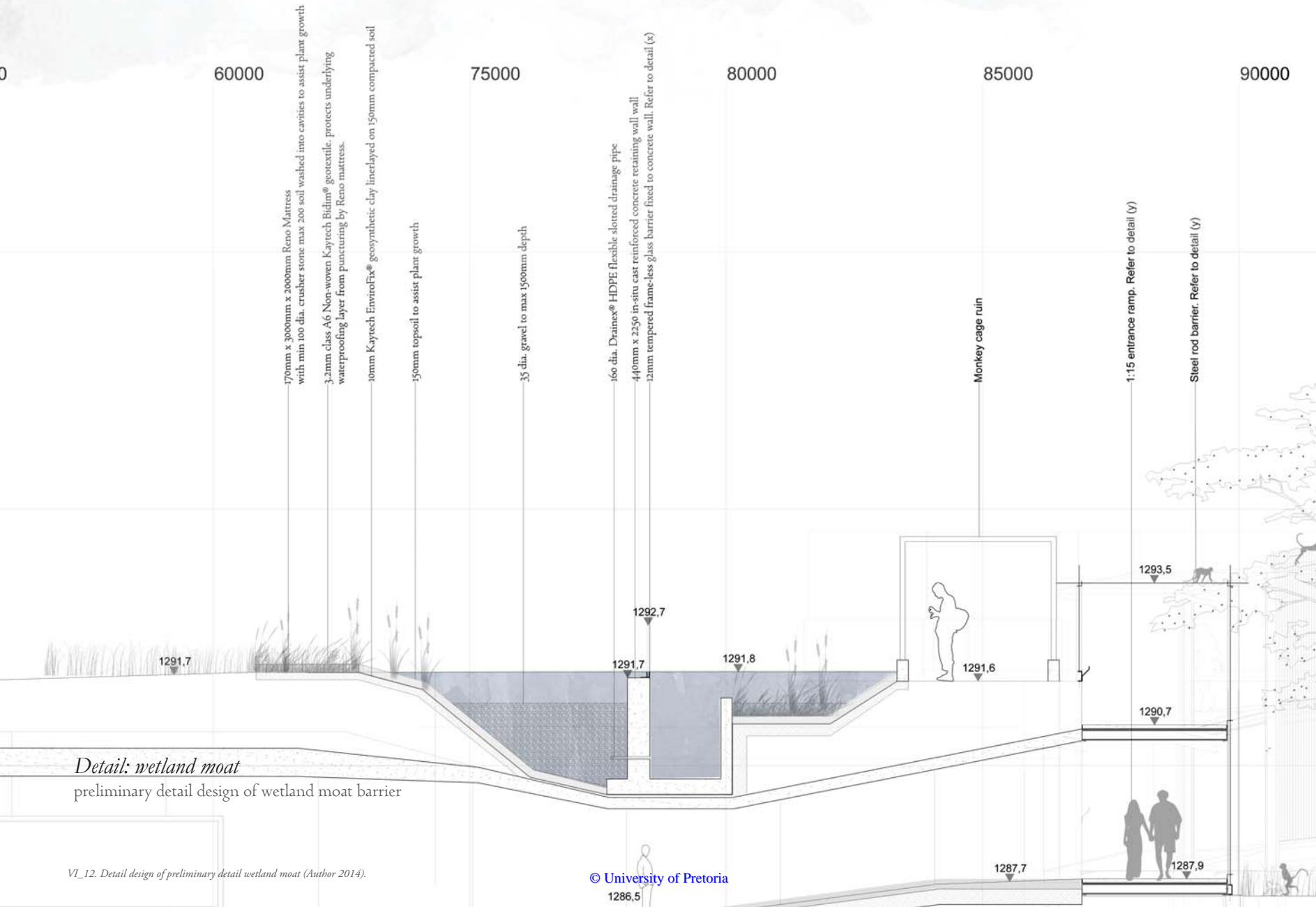


wetland moat detail

VI_11. Water strategy: wetland moat (Author 2014).



water strategy



Detail: wetland moat

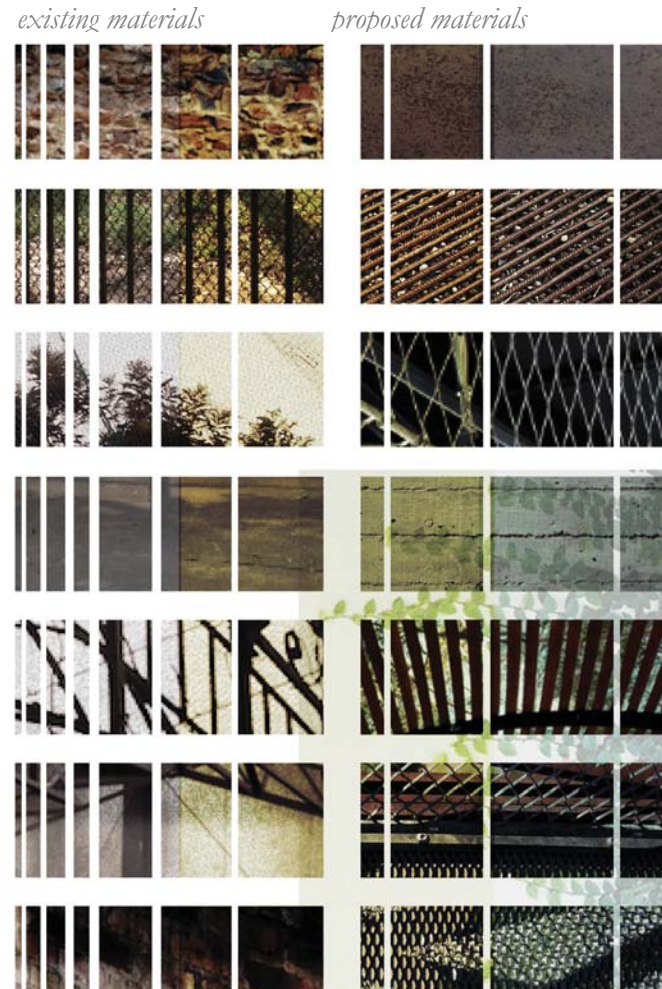
preliminary detail design of wetland moat barrier

6.5 *Materials*

The design experience aims to provide sensory and haptic qualities that will reconnect the zoo visitor with the animal and its habitat. The beauty, as described by Meyer, will be unveiled throughout the design to stimulate the user's senses. Materiality is therefore an important design consideration when building landscape experiences in subtle and unique ways.

The visitors rely on all their senses to identify opportunity for interaction with the animal. Hence the need exists for active comparative identification so that one can exploit conservation and cultural messages throughout the landscape design.

The material palette is carefully selected to celebrate the existing character of the historical cages by means of material choices on-site. The technical approach will induce an analogy with the proposed elements in relation to the old materials. The material choices will contribute to the narrative of the enclosure route and extend to properties, such as weathering and seasonality. The narrative will commence at a confined cage-like character, dissolving towards lighter materials and finally release into natural spaces. Mild steel plates, steel rods, reinforcement bars, concrete and timber will be typical materials used in different ways to strengthen the transition and haptic quality of the enclosure experience. The contemporary zoo materials will also be implemented where specific views must be acknowledged. A skywalk circulation tunnel and tower will attempt to serve as an extruded experience for both man and animal.



VI_13. Material selection: existing versus new.

6.1.3

Mild steel plates

The *dynamic beauty principle* requires a material that changes over time, just as the planting palette will differ with season changes. The proposed mild steel plates will be allowed to weather over time and adapt to the appearance of dynamic changes through time. The staining caused by corrosion will be channelled in such a way that it selectively allows for stains to occur on the concrete at certain points and complement the dynamic beauty intention.

6.1.4

Steel rods and reinforcement bars

Steel rods and reinforcement bars will be used as aesthetical and functional elements within the enclosure. The rods and reinforcement bars will strengthen the cage-like narrative within the enclosure and provide opportunity for a haptic and transitional experience.

6.1.5

Mesh

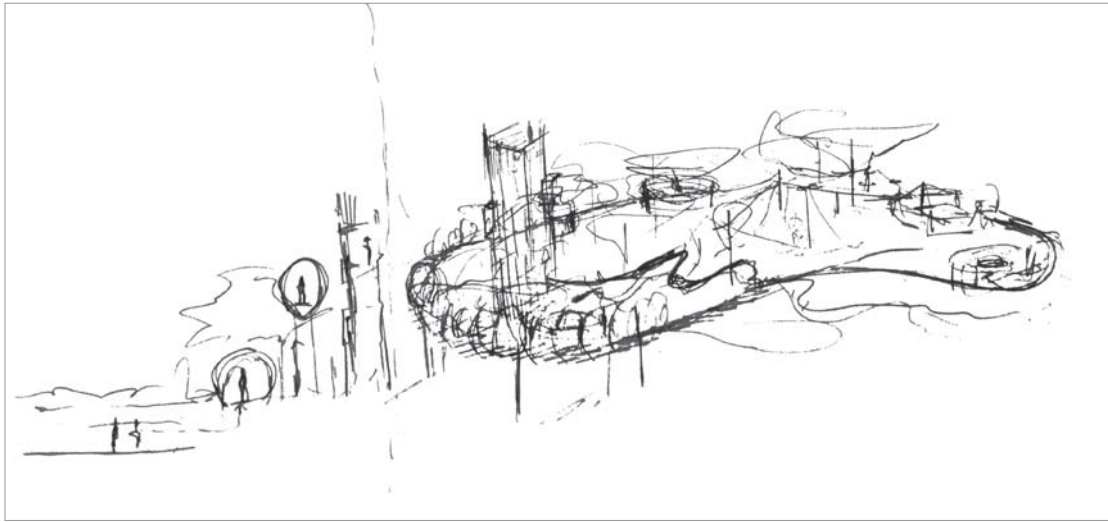
The proposed enclosure canopy will consist of a transparent grid structure made of stainless steel rope from Jakob® INOX LINE series. The Jakob® INOX LINE webnet has a skin-like appearance of a diaphragm. The mesh will form a simplistic surface but can also be tensioned into three-dimensional forms featuring funnel-type, cylindrical or spherical shapes. It is therefore an ideal material to use within the enclosure. The mesh has a translucent appearance and is weather-resistant and non-corrodible.

The mesh is 1mm thick and strung in a 30mm diamond pattern, the webnet mesh breaks down the visual barriers between inside and outside. Due to its transparency and flexibility, the mesh can cover large areas of the design. The mesh will be implemented over all walkways and the arrival space, and act as a barrier for the general communal areas.

6.1.6

Surface finishes

The surface finishes of the walkways on ground level will be constructed with steel reinforcement bar. The intention will be to expose the 'natural' surface underneath the walkways and contribute to the interface between the visitor and the landscape.



VI_14. Conceptual movement and strata intent of elements (Author 2014).

6.6 *Movement*

The experience through the enclosure is dependent on the intended stratification of the design. The general movement of the design therefore circulates the visitor from as many levels as possible. The visitor will experience the enclosure from below the ground right through to the tree canopy level.

The design aims to provide inclusive access across the entire site. The SANS 10400-S:2014 guidelines will therefore influence the walkway and ramp decisions. The design will therefore adapt a 1:15 gradient on all ramped areas with a minimum of 1200mm landing space.

6.1.7 *Planting strategy*

According to the Sustainable Sites Initiative (SSI) ecosystem processes involving the interaction of living elements, such as vegetation and soil organisms, and non-living elements, such as bedrock, water and air, have many direct and indirect benefits to humans (www.sustainablesites.org 2014).

The SSI suggests that a design should implement ecosystem processes in order for a sustainable site to thrive, protect or regenerate sustainable land development and management practices.

In order to sustain such practice, a site-specific planting palette was investigated to reinstate an appropriate endemic community. The planting palette includes the establishment of a woodland habitat relating to the local climate and site conditions. The chosen plant species will provide feeding opportunities and attract the maximum number of species.

Sufficient light, a suitable growing medium, nutrients, irrigation, survival ability, grazing, browsing and other animal impacts are some of the basics requirements for vegetation choices within the enclosure. Plants are selected to accentuate their natural appearance and be planted in mixed communities.

Nevertheless, this proposed strategy will require management practices to overcome the wear and tear generated by the animals within the habitat. An adequate period of time will be allowed (minimum 4 to 6 months) for plant species to ensure sufficient plant growth and establishment.

6.1.8 *Community*

The plant strategy for the proposed and existing vegetation is to duplicate the inventory of the communities; Marikana thornveld and the species of the Moot plains as they previously existed in this region.

These species shape the environment by virtue of sheer size and numbers. The design will therefore aim to recreate the plant community that was once established at the identified site by implementing most plant species from the chosen community structures.

6.1.9 *Habitat*

The community is divided into the three habitats that correlate with the habitat of the vervet monkey species and the existing Apies River habitat. The habitats include wetland, riparian and woodland ecologies. The plant strategy choices are therefore further categorised according to these three introduced habitats. These specified species occur mostly in the form of vegetated strips throughout the site and create spaces and places for ecological emergence. Biological processes, social interactions and recreational activities of both man and animal will still remain as important factors of the design.

The introduction of the stream, wetland and woodland typologies into the enclosure aims to improve the biodiversity. Wildflowers, grass, birds and insect species will inhabit the enclosure and form part of the ecological processes.

6.1.10 *Current conditions:*

Woodland Community

This Woodland Community habitat established by Grobler *et al.* (2002) generally occurs on gradual to moderate steep slopes and consists of aspects of hills, ridges and granite boulders. The Woodland Community is common to occur along rivers in lower lying areas in the Pretoria vicinity. The vegetation typology presented within the Woodland Community will be introduced to the enclosure to support the woodland ecology of the vervet monkey habitat.

6.1.11 *Vervet monkey feeding*

The vervet monkey is an omnivorous animal. Their diet consists of both plant matter and other smaller animal species in order to get the nutrition they need to survive. Leaves and young shoots make up the bulk of the vervet monkey's diet, along with tree bark, flowers and fruits that can be found in the trees surrounding them. The monkeys forage for food on the ground, such as roots, bulbs, seeds, grasses and small arthropods. The final addition to the plant strategy will provide a habitat for the dietary needs of the vervet monkey. The vegetation introduced to the enclosure will aim to sustain the vervet monkeys during most of the year, especially during the summer months.

3. Planting strategy



trees

tall trees:

- Celtis africana*
- Ficus sur (a) (r)*
- Harpephyllum caffrum (a)*
- Searsia chirindensis (a) (r)*
- Sclerocarya birrea*

shrubs:

- Asparagus cooperi (c)*
- Grewia occidentalis (a)*
- Buddleja saligna (c)*
- Searsia pyroides var. pyroides*

other:

- Strelitzia nicolai*
- Hyphaene coriacea*

riparian

mix 1:

- Asparagus laricinus*
- Scadoxus puniceus*
- Setaria megaphylla*
- Panicum maximum*

mix 2:

- Hibiscus calyphyllus*
- Hypoestes aristata*
- setaria megaphylla*
- Jasminum multipartitum*

trees

tall trees:

- Searsia lancea (c)*
- Acacia caffra (c)*
- Combretum molle (c)*
- Combretum erythrophyllum (w) (e)*
- Searsia leptodictya (w)*
- Zanthoxylum capense (w)*
- Ilex mitis (c)*
- Colobospermum mopane*

shrubs:

- Euclea crispa subsp. crispa (c)*
- Pavetta gardeniifolia*
- Olea europaea subsp. africana (c)*
- Rhamnus prinoides (a) (w)*
- Buddleja saligna (c)*

other:

- Melinis nerviglumis (g)*
- enneapogon scoparius (g)*
- themeda triandra (g)*
- Euphorbia ingens (a)*
- Euphorbia tirucalli (r) (a)*

riverine/woodland

mix 1

- Vernonia oligocephala*
- Clematis brachiata*
- Phyllanthus reticulatum*
- Zantedeschia aethiopica*
- Blechnum tabulare*

wetland

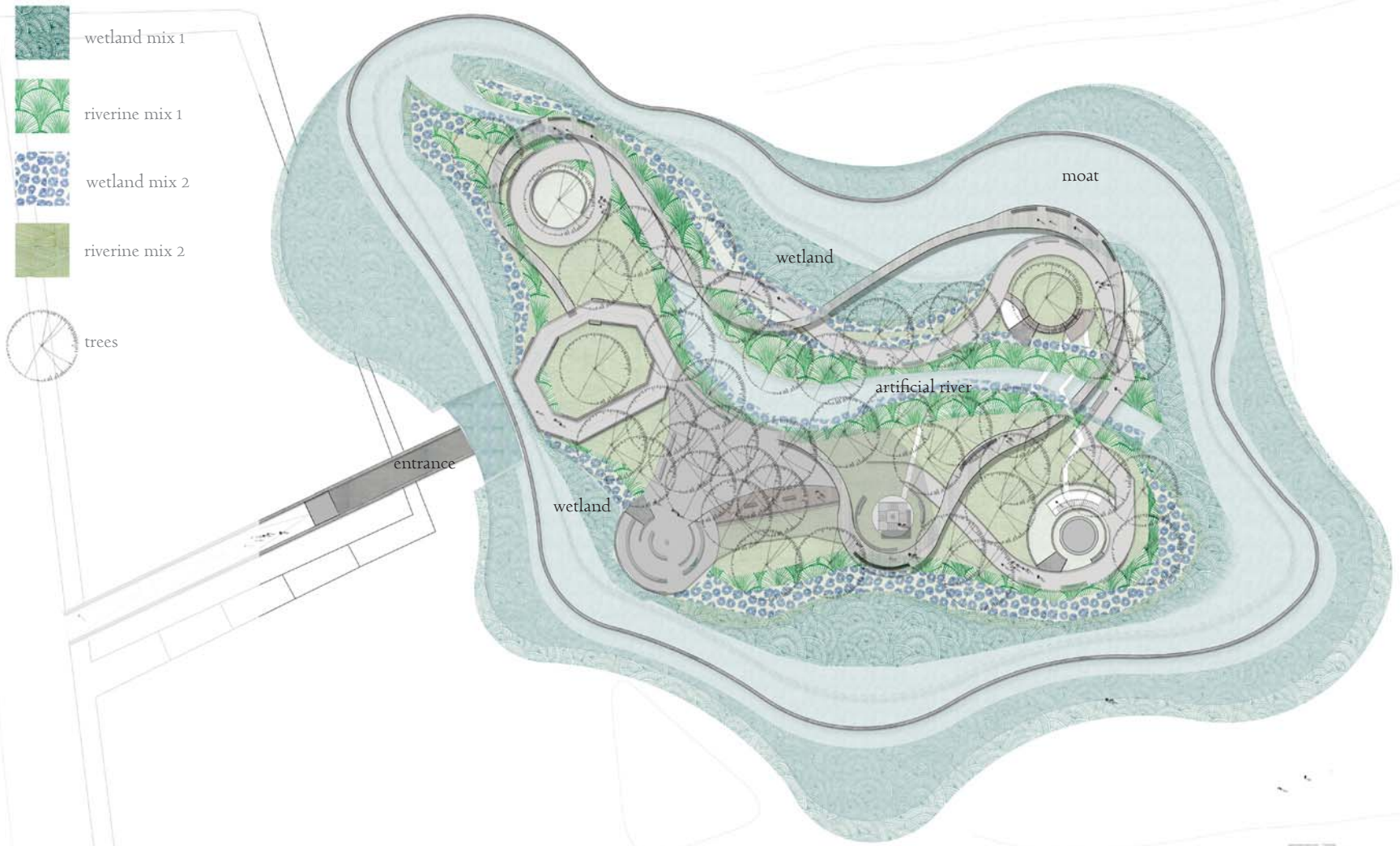
mix 1:

- Setaria megaphylla (s)*
- Juncus kraussii (s)*
- Cyperus prolifer (s)*
- Sium repandum (w)*
- Eragrostis plana (s)*

mix 2:

- Nymphoides thunbergiana (w)*
- Nymphaea nouchali (w)*
- Mentha aquatica (w)*





VI_16. Conceptual preliminary planting plan (Author 2014).

Resultant specie list:

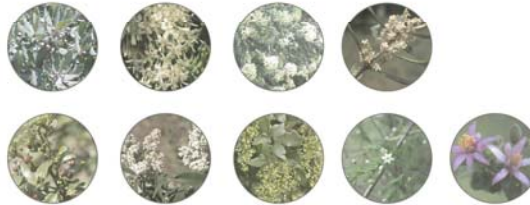
Trees

- Celtis africana* (c)
Searsia lancea (c)
Acacia caffra (c)
Combretum molle (c)
Combretum erythrophyllum (w) (e)
Searsia leptodictya (w)
Zanthoxylum capense (w)
Ilex mitis (e)
Calophospermum mopane (a)
Ficus sur (a) (r)
Harphephyllum caffrum (a)
Searsia chirindensis (a) (r)
Sclerocarya birrea (a)



Shrubs

- Euclea crispa* subsp. *crispa* (c)
Pavetta gardeniifolia var. *gardeniifolia* (c)
Buddleja saligna (c)
Olea europaea subsp. *africana* (c)
Rhamnus prinoides (a) (w)
Buddleja salviifolia (e)
Searsia pyroides var. *pyroides* (c)
Asparagus cooperi (c)
Grewia occidentalis (a)



Herb

- Hypoestes aristata*
Hibiscus calyphyllus (w)
Phyllanthus reticulatu (a) (r)
Vernonia oligocephala (g)
Clematis brachiata (g)



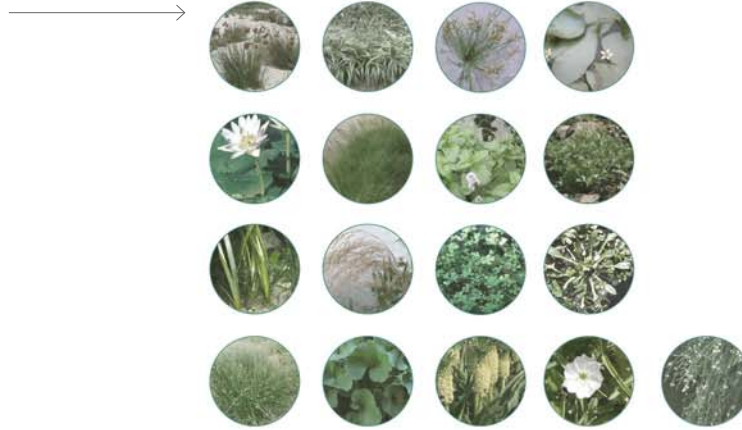
Graminoids

- Melinis nerviglumis* (g)
enneapogon scoparius (g)
themedra triandra (g)



Wetland

- Setaria megaphylla* (s)
Juncus kraussii (s)
Cyperus prolifer (s)
Nymphoides thunbergiana (wl)
Nymphaea nouchali (wl)
Eragrostis plana (s)
Mentha aquatica (wl)
Sium repandum (wl)
Vallisneria aethiopica (wl)
Phragmites australis (wl)
Gunnera perpensa (s)
Marsilea schelpiana (wl)
Limosella major (r)
Isolepis prolifer (s)
Eucomis autumnalis (wl)
Falkia oblongata (r)
Gomphostigma virgatum (s)



Succulents

- Euphorbia ingens* (a)
Euphorbia tirucalli (r) (a)



Other

- Hyphaene coriacea* (a)
Strelitzia nicolai (a)
Zantedeschia aethiopica (h)
Blechnum tabulare (h)



Key: (c)- community; (w)- woodland; (e)- existing; (r)- riverine; (a)- monkey feeding plant; (wl)- wetland ; (g)- grass; (s)-sedge; (h)- historical

4. Enclosure entrance



VI_19. Bell-lac winery. RCR Architects (Archdaily 2014)



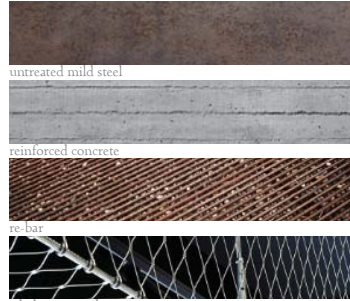
VI_20. Bell-lac winery. RCR Architects (Archdaily 2014)



VI_21. Bell-lac winery. RCR Architects (Archdaily 2014)



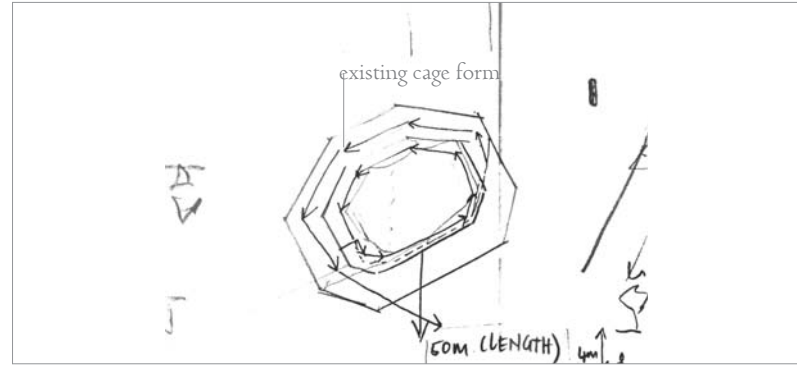
VI_22. Jakob's winery. Jakob's winery (Archdaily 2012)



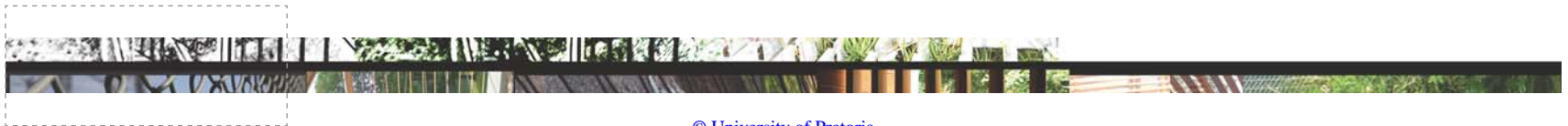
VI_25. Material palette of Entrance and ramp (Author 2014).



VI_23. Design development: entrance ramp and monkey space excavation (Author 2014).

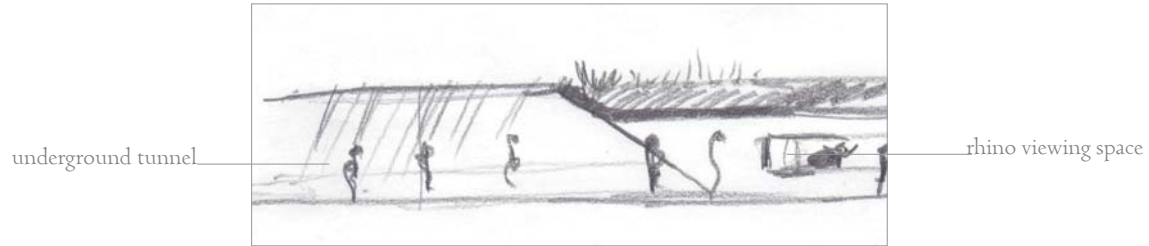


VI_24. Design development: entrance ramp circulation in old cage (Author 2014).

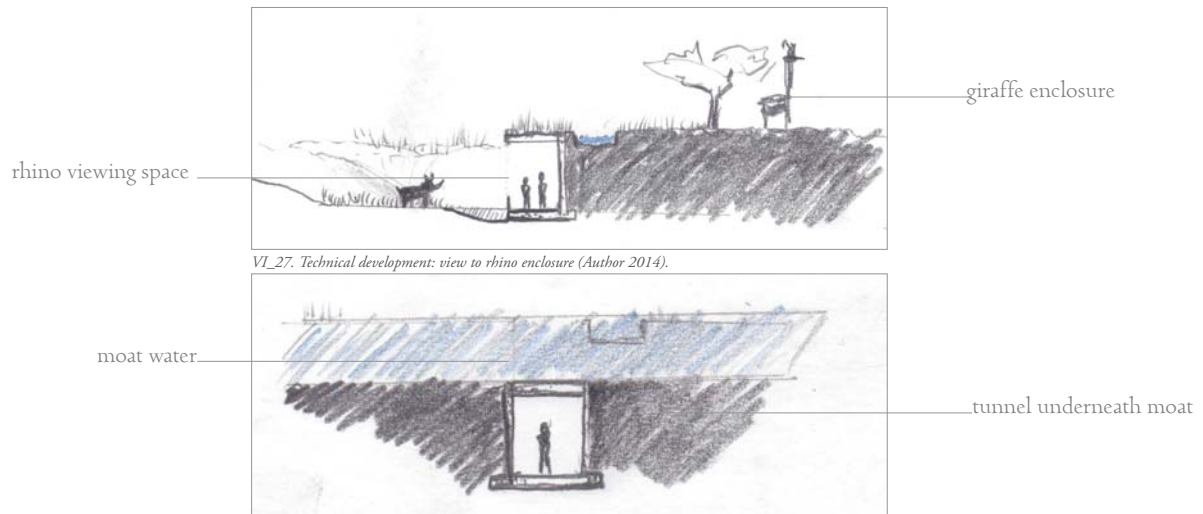




VI_26. Technical development: entrance (Author 2014).



VI_27. Technical development: view to rhino enclosure (Author 2014).

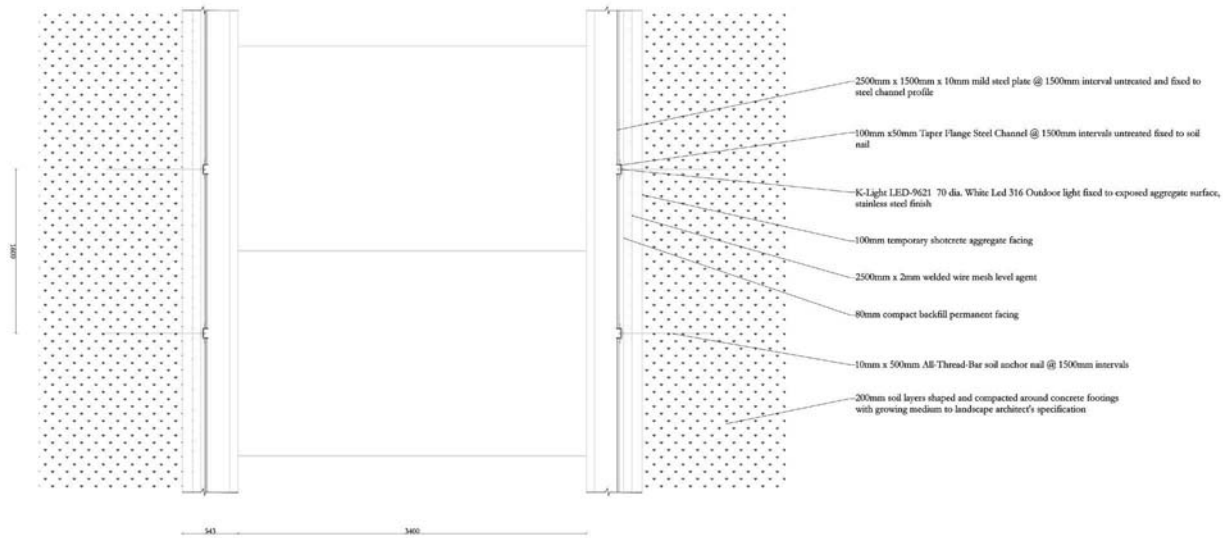


VI_28. Technical development: underground tunnel (Author 2014).



Detail: entrance tunnel

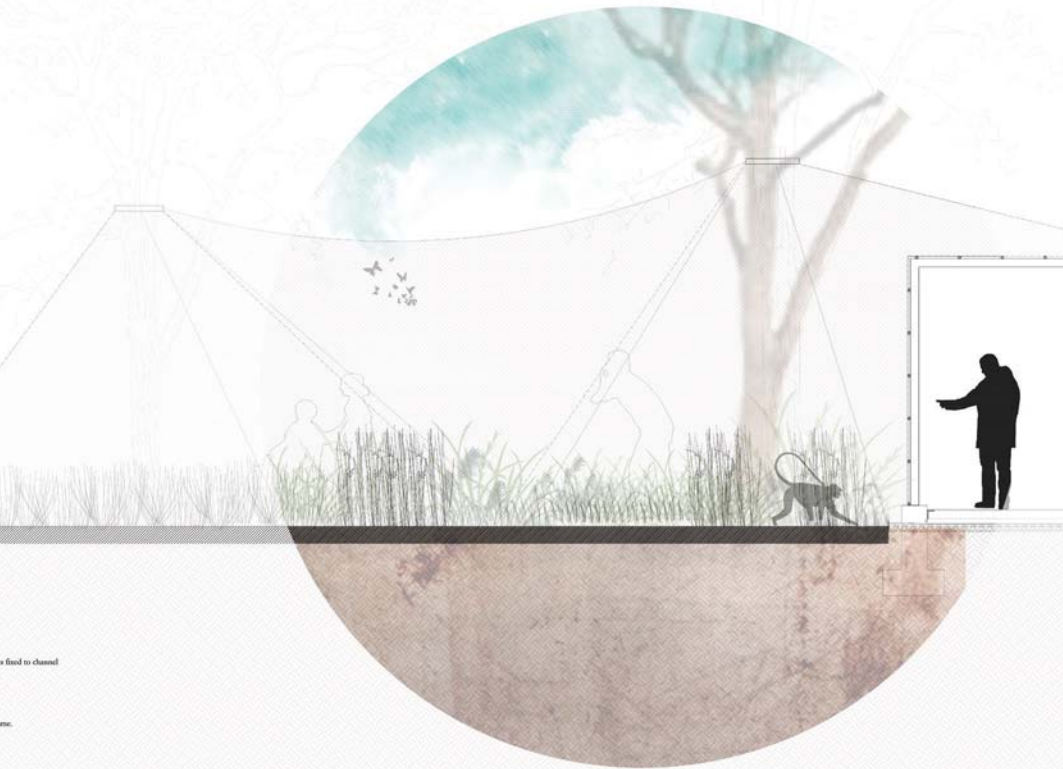
detail design of entrance tunnel into enclosure (not to scale)





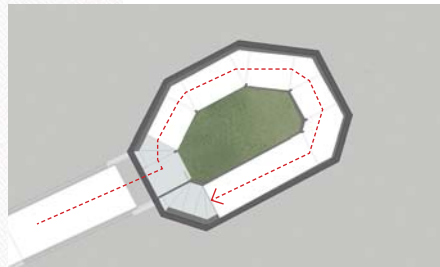
Detail: entrance ramp

detail design of entrance ramp into existing cage (not to scale)

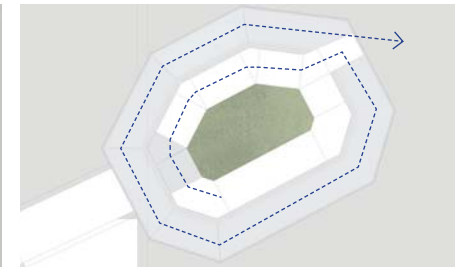


is fixed to channel
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loading of off-shutter finish to ENGINEERS' specification.

return to



VI_30. Entrance ramp circulation (Author 2014).



VI_31. Entrance ramp circulation: existing cage (Author 2014).

5. Ground level walkway



VI_32. Puffadder walkway, Babylonstoren, Patrice Taravella (Dezeen 2014).



VI_34. Puffadder walkway, Babylonstoren, Patrice Taravella (Dezeen 2014).



VI_33. Eggum Lofoten, Snobetta Architects (Archdaily 2007)



VI_36. Les fleurs maudites, Charlotte Trillaud (Domusweb 2014)



chain linked fence



reinforced concrete



re-bar



rhodesian teak timber

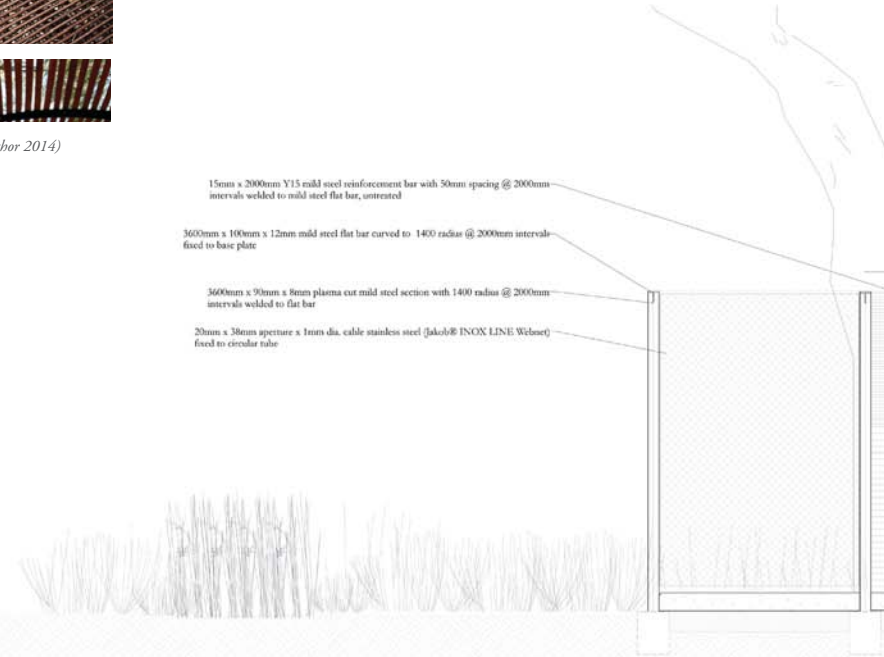
VI_35. Material pallet of walkway (Author 2014)

15mm x 2000mm Y15 mild steel reinforcement bar with 50mm spacing @ 2000mm intervals welded to mild steel flat bar, untreated

3600mm x 106mm x 12mm mild steel flat bar curved to 1400 radius @ 2000mm intervals fixed to base plate

3600mm x 90mm x 8mm plasma cut mild steel section with 1400 radius @ 2000mm intervals welded to flat bar

20mm x 38mm aperture x 1mm dia. cable stainless steel (Jako® INOX LINE Weibar) fixed to circular tube





Detail: ground level walkway
detail design of ground level walkway (not to scale)

6. Skywalk



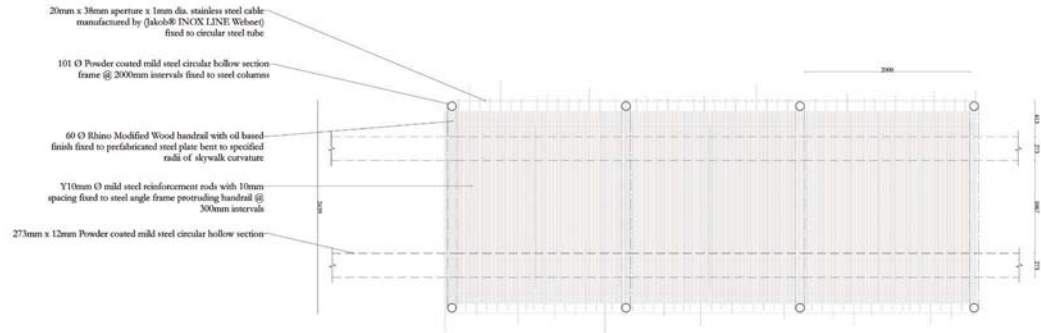
VI_37. Eggum Lofoten,
Snobetta Architects
(Archdaily 2007)



VI_38. Kirstenbosch
"boomslang" canopy
walkway Mark
Thomas Architects
(Archdaily 2007)



VI_39. The
Saxon Boutique
Hotel walkway
(Classicafrica 2010)

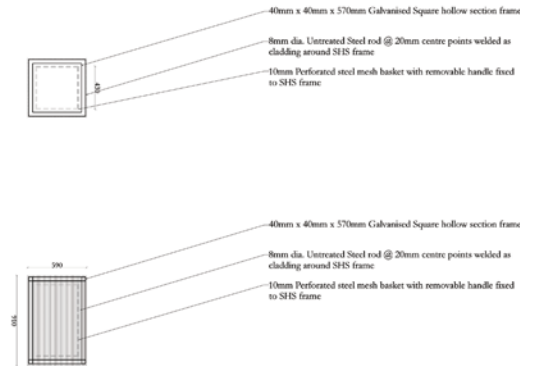
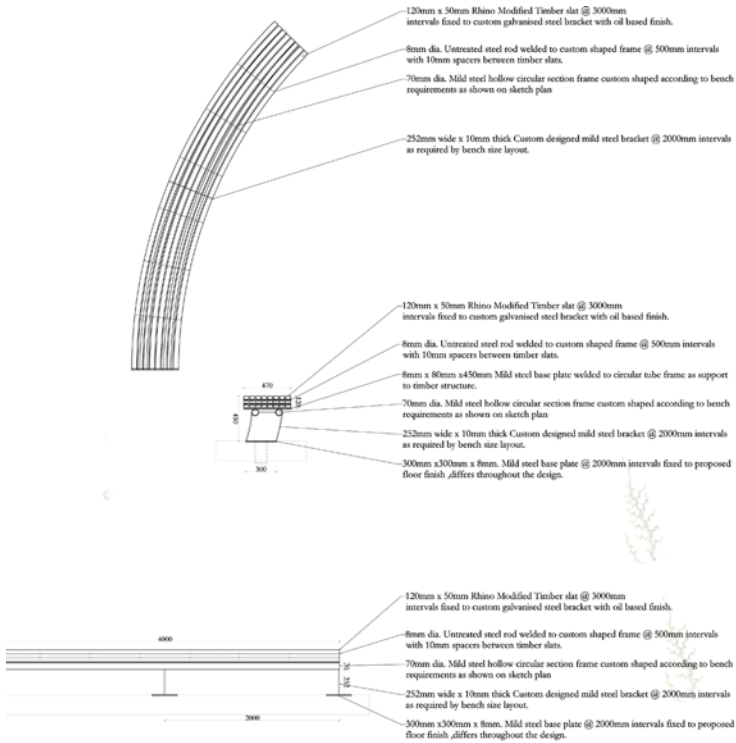




Detail: skywalk
detail design of skywalk (not to scale)

6. Furniture





Detail: bench and dustbin
detail design of bench and dustbin (not to scale)

6.1.12 *Zoo landscape sustainability*

According to Thayer (1994: 317), ‘the goal of sustainable landscapes is the transformation of culture – the taming of technology, the emergence of a new environmental ethics, a new measure of life quality and a substantially broadened sense of community, including not only humans but all life’.

With hundreds of people visiting the NZG, the NZG can influence visitors by example. The enclosure will therefore aim to design a landscape that encourages natural plant succession, the demonstration of wildlife conservation, and regional resource collaboration. The enclosure will produce oxygen, collect storm water and recycle waste, while creating a habitat for humans and animals. The enclosure will interpret sustainable design principles by responding to the local climate, culture, planting and animal requirements. This will result in a rich diversity of new design principles for the design enclosure.

The sustainable use of water is a global issue that zoos need to address. A well-designed exhibit can set an example for the public and designers of the zoological milieu. The plant selection and horticultural practices can reduce the requirements for ongoing irrigation. The design will therefore aim to include endemic vegetation and proper soil preparation. Composting programmes, such as collecting animal manure produced on a daily basis, must also be implemented.

In conclusion, the sustainable principles implemented within the enclosure will aim to reduce the water demand, act as a filter, reduce storm-water runoff, provide wildlife habitat, reduce energy consumption, improve air quality, improve human health and increase outdoor recreational opportunities (www.sustainablesites.org 2014).

6.1.13

Sustainability rating

The Sustainable Sites Initiative (SSI) tool was used to generate a sustainability rating for the proposed vervet monkey enclosure. The prerequisites and credits are organised into nine sections that are based on the process of site development. The vervet monkey enclosure achieved the following ratings:

Site context: 10/13

Pre-design assessment and planning: 3/3

Site design – water: 22/23

Site design – soil and vegetation: 40/40

Site design – Material selection: 33/42

Site design – human health and well-being: 28/30

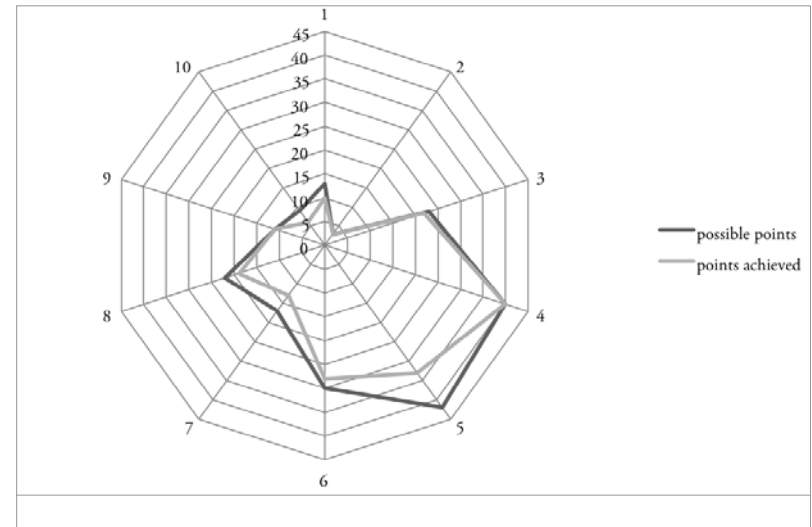
Construction: 13/17

Operations and maintenance: 19/22

Education and performance monitoring: 11/11

Innovation or exemplary performance: 6/9

The design achieved an overall rating of 185/200, which classifies it as a platinum-rated project.



VI_41. Graphic representation of SSI sustainability rating: possible points vs points scored (Author 2014).



VI_42.
Conceptual "Apies" habitat
vision (Author 2014)

CHAPTER VII

APPENDIX

The concluded enclosure

The concluded enclosure has multiplied, overlapped and implemented the difference design experience strata on various scales through different rhythms. The incremental moments of monkey and human interaction has revealed, enabled and regenerated a temporal and dynamic ecology. The enclosure revived the romantic Apies River described by Eugene Marais, while simultaneously creating habitat evoking visitor emotion. The final design response redefined the threshold between man and animal through reconfiguration and spatial manipulation. The study proved that a zoological enclosure can provide experience and beauty to the user without compromising the animal exhibited, the natural dignity of the habitat, or finally, the character of the zoological garden.

Figures

I_1.	Bruegel's two monkeys painting by Pieter Bruegel the Elder (Bibliokept 2012).	8	III_17.	Conceptualizing the life history volume of the animal. (Author 2014)	94
I_2.	Gilles Aillaud: Cage Vide-1971. Representation of man's mastery over nature	14	III_18.	Understanding the in situ life history of the animal (Author 2014)	95
I_3.	Gilles Aillaud: Cage Vide-1971. Representation of man's mastery over nature	16	III_19.	Displacement of the life history volume (Author 2014)	96
I_4.	NZG within the Tshwane metropolitan (Author 2014).	24	III_20.	Modification of an animal's life history universe to remove fitness depressing events (Author 2014)	97
I_5.	Location of NZG in context of CBD of Pretoria (Author 2014)	26	III_21.	Spatial compression of the life history universe (Author 2014)	98
I_6.	Aerial photograph of site location (Author 2014).	28	III_22.	Temporal expansion of a displaced life history universe (zoo exhibit) (Author 2014).	99
I_7.	Conceptual analogy of chapter overview (Author 2014).	33	III_23.	Unzoo versus Zoo , adapted from Jon Coe (Author 2014)	102
I_8.	Location of NZG in context of Pretoria, current and historical (Author 2014).	36	III_24.	Coercion to cooperation: The evolution in zoo design towards the Unzoo (Author 2014).	105
I_9.	Diagrammatic representation of methodological approach (Author 2014).	38	III_25.	Zoogeography in Parc Zoologique, Paris (parczooologiqueparis.fr 2014).	106
II_1.	The Lion-Trainers, 1985, by José Garcia y Más (Baratay 2002).	42	III_26.	Illustration of Landscape immersion aims to bring animals and guests within their natural environment habitat or landscape. Animals are separated by <u>sunken fences</u> and people move through <u>sky walks</u> thus allowing <u>as much space as possible for animals</u> and the <u>best views for people</u> .	108
II_2.	Timeline of history of zoological gardens compared to the history of landscape architecture (Author, 2014).	52	III_27.	Critique of artificial landscape: savannah enclosure (insert).	110
II_3.	Hamburg Zoological Garden; Carl Hagenbeck Zoo; Nordland Panorama (Zeno 1911).	53	III_28.	Stratagem II synopsis (Author 2014)	112
II_4.	Zoo as conservation centre (National Geographic, 2000).	54	III_29.	Disney's Animal Kingdom african safari (Land, 2012).	114
II_5.	Orang-utangs imitating children (Graetz, 1997).	56	III_30.	Disney Animal Kingdom african safari and artificial Boabab tree (Land, 2012).	114
II_6.	Historical map of NZG (NZG, 1920).	58	III_31.	Zoo de Vincennes proposal for Savannah exhibit (Kebence, 2012).	118
II_7.	Map Plan of Developed Zoological Gardens, north and south of the Apies river (department of public works 1967)	60	III_32.	Paris zoological garden implemented savannah exhibit (Archdaily 2014).	118
II_8.	Spatial manifestation of how we look at animals adapted from Joffé (1969) (Author 2014).	61	III_33.	Zootopia zoo, large central square (CDN, 2014).	120
II_9.	Cover of NZG guide book 1961 (NZG, 1961)	62	III_34.	Stratagem III synopsis (Author 2014)	122
II_10.	Dr. Jan Willem Boudewyn Gunning (NZG, 1920)	64	IV_1.	Gilles Aillaud: Cage Vide-1971. Representation of man's mastery over nature	124
II_11.	Max the gorilla sculpture, Johannesburg Zoo (Author 2014)	66	IV_2.	Diagrammatic representation of base condition: NZG (Author 2014).	130
II_12.	Collage of the threshold between man and animal influenced by the landscape (Author 2014).	68	IV_3.	Existing site component analysis: NZG (Author 2014)	131
III_1.	Composite Landscapes: Photomontage by John Stezaker (lands 2013)	70	IV_4.	Site analysis of topography, hydrology and climate (Author 2014).	132
III_2.	Theoretical development: 'Zoo' versus 'Experience' versus 'Design' (Author 2014).	76	IV_5.	Stratagem application for master plan response (Author 2014).	133
III_3.	Nelson Byrd Woltz's Biobabitats: weir system	78	IV_6.	Site analysis and implications of topography, hydrology and climate (Author 2014).	134
III_4.	Nelson Byrd Woltz's Biobabitat: water channel	78	IV_7.	Circulation strategies: Without Hierarchy - not efficient and quite often is an unpleasant experience. It is easy to be disoriented, one can become lost, and one can, as a result, miss many worthwhile animal exhibits (Author 2014, adapted from Harrison 2007).	136
III_5.	Nelson Byrd Woltz's Biobabitats: water inlet (Woltz, 2009)	80	IV_8.	Circulation strategies: With Hierarchy, central main loop- this is typical for zoos that have an icon in the middle, such as a lake or a heritage structure, or a space that provides a traditional activity (Author 2014, adapted from Harrison 2007).	136
III_6.	Patio de los Naranjos in Seville: irrigation as art (Treib 1999)	80	IV_9.	Circulation strategies: With Hierarchy, multiple loops- he visitors can select the zones they wish to visit and the sequence of visitation depending on the time and energy (Author 2014, adapted from Harrison 2007).	136
III_7.	Patio de los Naranjos in Seville: top view of courtyard and cathedral (Treib 1991)	83	IV_10.	Circulation strategies: With Hierarchy, central axis- allows for greater dispersion of visitors into the various exhibit zones (Author 2014, adapted from Harrison 2007).	136
III_8.	Human condition intertwined with the natural landscape. Adapted from Hargreaves landscapes' Crissy field park (Author 2014).	84	IV_11.	Analysis of existing enclosures on site: catalogue, biomes and funtions (Author 2014).	138
III_9.	Natural process in form of art. Interpretation of Hargreaves landscape (Author 2014).	84	IV_12.	Barrier analysis in the NZG (Author 2014)	140
III_10.	Hyper-nature, recognising art in the landscape. Aerial view of crop circles (Author 2014).	84	IV_13.	Barrier analysis in the NZG of the confined experience (Author 2014)	141
III_11.	Constructing landscapes that refine landscape and engage culture adapted from PWP Landscape architecture (Author 2014).	85			
III_12.	Creative ecology: James Corner, Taking measures across the American landscape collage: Hoover dam and the colonad (Corner 2008)	86			
III_13.	Crissy Field Park by Hargreaves associates integrates a diversity of recreational uses with a vigorous and dynamic environment. (Hargreaves 2001)	88			
III_14.	Stratagem I synopsis (Author 2014)	89			
III_15.	Photograph showing reflection of Author and primate cage (Author 2014).	90			
III_16.	Conceptualizing the life history composite of the animal. (Author 2014)	93			

IV_14.	Biozone proposal (Author 2014)	142	V_22.	Sketch plan: First draft design response of primate enclosure (Author 2014).	187
IV_15.	Proposed savannah biozone vision (Author 2014)	143	V_23.	Section: First draft design response of primate enclosure (Author 2014).	188
IV_16.	Photographic presentation of existing primate cages at the NZG (Author 2014)	144	V_24.	Exploration of 'extruded' experience in enclosure (Author 2014).	190
IV_17.	Zoo 360 at Philadelphia Zoo. big cat crossing and primate crossing (philadelphiapzoo.org 2014)	146	V_25.1	Illustration of principle application: visitor and primate elevation and immersion (Author 2014).	190
IV_18.	Johannesburg zoo Gibbon enclosure (Author 2014).	148	V_26.	Illustration of principle application: animal interaction with landscape elements implemented (Author 2014).	192
IV_19.	Johannesburg zoo Madagascar primate enclosures (Author 2014).	148	V_27.	Palimpsest collage of vision for enclosure (Author 2014).	193
IV_20.	Ecosystem creation: Animals attracted vs confined (Author 2014)	150	V_28.	Abstraction of old Apies River, adapted from Pierneef (Author 2014).	194
IV_21.	Deep fence exploration (Author 2014).	150	V_29.	Footbridge Crossing L'Areuse (Architizer 2014).	194
IV_22.	Mixed specie exhibition (Author 2014).	150	V_30.	Bell-lloc winery, RCR Arquitectes (Archdaily 2014)	194
IV_23.	Safari rides (Author 2014).	150	V_31.	Pedestrian bridge, Mirp Rivero Architects (Archdaily 2012).	194
IV_24.	Hidden barriers, landscape immersion (Author 2014).	150	V_32.	Bell-lloc winery, RCR Arquitectes (Archdaily 2014)	194
IV_25.	Use existing topography as design driver (Author 2014).	150	V_33.	Re-bar footpath, RCR Architects (Landezine 2014).	194
IV_26.	Proposed conceptual master plan of NZG and its components (Author 2014).	152	V_34.	Bell-lloc winery, RCR Arquitectes (Archdaily 2014)	194
IV_27.	Biozone proposal, primate 'elevation' and vervet monkey enclosure (Author 2014).	154	V_35.	Puffadder walkway, Babylonstoren, Patrice Taravella (Dezeen 2014).	194
IV_28.	Conceptual enclosure development (Author).	156	V_36.	Yad Vashem holocaust museum Safdie Architects (Archdaily 2011)	194
IV_29.	Gibbon cage in NZG (Author 2014).	158	V_37.	Re-bar walkway, Tussols basil sport-park, RCR Architects (Landezine 2014).	194
IV_30.	Primate cage threshold exploration (Author 2014).	159	V_38.	Eggum Lofoten, Snohetta Architects (Archdaily 2007)	195
V_1.	Conceptual collage of man and animal threshold (Author 2014).	160	V_39.	Eggum Lofoten, Snohetta Architects (Archdaily 2007)	195
V_2.	Stratagem application for sketch plan response (Author 2014).	165	V_40.	Observation Tower / ARHIS (Archdaily 2010)	195
V_3.	3d and plan view of sketch plan site location (Author 2014).	167	V_41.	Kirstenbosch "boomslang" canopy walkway Mark Thomas Architects (Archdaily 2007)	195
V_4.	Carrying capacity feasibility representation (Author 2014)	168	V_42.	Observation Tower / ARHIS (Archdaily 2010)	195
V_5.	View of site location showing existing Apies River, wooded area and existing primate cages (Author 2014)	170	V_43.	Kirstenbosch "boomslang" canopy walkway Mark Thomas Architects (Archdaily 2007)	195
V_6.	Approach to site location next to existing Apies River (Author 2014).	172	V_44.	Viewingtower at Vecht Riverbank / Ateliereen Architecten (Archdaily 2012)	195
V_7.	View towards existing aviary existing Apies River (Author 2014).	172	V_45.	Xtrata Treestop Walkway(Archdaily 2007)	195
V_8.	Approach to primate cages on site (Author 2014).	172	V_46.	Viewingtower at Vecht Riverbank / Ateliereen Architecten (Archdaily 2012)	195
V_9.	Existing primate cages on site (Author 2014).	173	V_47.	The Saxon Boutique Hotel walkway (Classicafrica 2010)	195
V_10.	'Brachiation' of Gibbons in confined enclosure (Author 2014).	173	V_48.	Hedge Building Germany : Rostock Architecture (e-architect 2003)	196
V_11.	Apies river, Transvaal by J.H Pierneef (Bolsmann 2001).	174	V_49.	Stratum of interaction infographic(Author 2014).	198
V_12.	Conceptual development and barrier exploration (Author 2014).	177	V_50.	Conceptual collage of skywalk (Author 2014).	198
V_13.	Zoo poster by Arnrud Banniza for Regent's Park Zoo 1920 (Christies).	178	V_51.	Conceptual development of moat (Author 2014).	198
V_14.	Pragmatic analysis of chosen site for enclosure: user vs. monkey vs functional (Author 2014).	181	V_52.	Conceptual development of moat (Author 2014).	199
V_15.	Conceptual development of entrance and moat design. Critique: sunken bridge becomes obstacle for monkeys to escape (Author 2014).	182	V_53.	Sketch plan: Draft design response of primate enclosure (Author 2014).	200
V_16.	Photographic study of existing primate cages on selected site (Author 2014).	184	V_54.	Sectional elevation a-a: Draft design response to stratum concept application showing moat barrier, tower and underground tunnel (Author 2014).	202
V_17.	Inverso principle applied to existing primate cages: Man becomes the spectacle (Author 2014).	185	V_55.	Sectional elevation b-b: Draft design response to stratum concept application showing moat barrier, and skywalk (Author 2014).	204
V_18.	Photographic study of existing primate cages on selected site (Author 2014).	185	V_56.	Response to moat critique: rethink moat ecology and influence on other enclosures (Author 2014).	204
V_19.	Design exploration: apies river, skywalk and existing cages (Author 2014).	186	V_57.	Sketch plan: components (Author 2014).	205
V_20.	Design exploration: moat, skywalk and stream introduction (Author 2014).	186	V_58.	Sketch plan: Draft design response of primate enclosure (Author 2014).	205
V_21.	Design exploration: moat, entrance (Author 2014).	186	V_59.S	Sectional elevation b-b: Draft design response iii to stratum concept application showing moat barrier, and skywalk (Author 2014).	206

V_60.	Conceptual intention: skywalk (Author 2014).	208	VI_27.	Technical development: view to rhino enclosure (Author 2014).	241
V_61.	Conceptual intention: entrance (Author 2014).	208	VI_28.	Technical development: underground tunnel (Author 2014).	241
V_62.	Conceptual intention: moat (Author 2014).	208	VI_29.	Detail design of preliminary detail of entrance ramp (Author 2014).	242
V_63.	Conceptual intention: skywalk (Author 2014).	208	VI_30.	Entrance ramp circulation (Author 2014).	243
V_64.	Conceptual intention: moat (Author 2014).	208	VI_31.	Entrance ramp circulation: existing cage (Author 2014).	243
V_65.	Seamless water body: moat (Author 2014).	208	VI_32.	Puffadder walkway, Babylonstoren, Patrice Taravella (Dezeen 2014).	244
V_66.	Pierrneef abstraction: stream (Author 2014).	209	VI_33.	Puffadder walkway, Babylonstoren, Patrice Taravella (Dezeen 2014).	244
V_67.	Reconfiguration of old cages (Author 2014).	209	VI_34.	Eggum Lofoten, Snohetta Architects (Archdaily 2007)	244
V_68.	Conceptual sketch plan development (Author 2014).	209	VI_35.	Les fleurs maudites, Charlotte Trillaud (Domusweb 2014)	244
V_69.	Conceptual intention: Skywalk (Author 2014).	209	VI_36.	Material pallet of walkway (Author 2014)	244
V_70.	Conceptual intention: Skywalk (Author 2014).	209	VI_37.	Observation Tower / ARHIS (Archdaily 2010)	246
V_71.	Conceptual development: moat edge (Author 2014).	210	VI_38.	Observation tower conceptual design (Author 2014).	246
V_72.	Conceptual development: connection (Author 2014).	210	VI_39.	Viewingtower at Vecht Riverbank / Ateliereen Architecten (Archdaily 2012)	246
V_73.	Conceptual development: Apies river palimpsest (Author 2014).	211	VI_40.	Material pallet of skywalk(Author 2014)	246
V_74.	Sketch plan: Technical drawing of design response of primate enclosure (Author 2014).	212	VI_41.	Eggum Lofoten, Snohetta Architects (Archdaily 2007)	248
V_75.	Sketch plan: final proposed design response of primate enclosure (Author 2014).	213	VI_42.	Kirstenbosch "boomslang" canopy walkway Mark Thomas Architects (Archdaily 2007)	248
V_76.	Sectional elevation a-a: proposed response of enclosure entrance (Author 2014).	214	VI_43.	The Saxon Boutique Hotel walkway (Classicafrica 2010)	248
VI_1.	Conceptual technical approach colloage of materiality disintegration (Author 2014)	216	VI_44.	Material pallet of skywalk (Author 2014)	248
VI_2.	Conceptual representation of the technical spectacle (Author 2014).	220	VI_45.	Graphic representation of SSI sustainability rating: possible points vs points scored (Author 2014).	251
VI_3.	Suspension bridge at Monkeyland,PlettenbergBay (www.monkeyland.co.za 2011).	223			
VI_4.	Monkey at Monkeyland,PlettenbergBay(www.monkeyland.co.za 2011).	223			
VI_5.	Gorilla enclosure at the Primate Kingdome, Singapore (Graetz 2000).	223			
VI_6.	Gorilla enclosure at the Primate Kingdome, Singapore (Graetz 2000).	223			
VI_7.	Female Oribi (Chris Pisart in NZG Guide 1960).	225			
VI_8.	Crowned crane (Chris Pisart in NZG Guide 1960).	225			
VI_9.	Bushbuck (Chris Pisart in NZG Guide 1960).	225			
VI_10.	Steenbuck ewe (Chris Pisart in NZG Guide 1960).	225			
VI_11.	Water strategy: wetland moat (Author 2014).	227			
VI_12.	Detail design of preliminary detail wetland moat (Author 2014).	228			
VI_13.	Material selection: existing versus new.	230			
VI_14.	Conceptual movement and strata intent of elements (Author 2014).	232			
VI_15.	Planting strategy habitat (Author 2014).	236			
VI_16.	Conceptual preliminary planting plan (Author 2014).	237			
VI_17.	Planting pallete. Image source (Plantzafrica 2014).	238			
VI_18.	Planting pallete. Image source (Plantzafrica 2014).	239			
VI_19.	Bell-lloc winery, RCR Arquitectes (Archdaily 2014)	240			
VI_20.	Degin development: entrance ramp and monkey space excavation (Author 2014).	240			
VI_21.	Bell-lloc winery, RCR Arquitectes (Archdaily 2014)	240			
VI_22.	Bell-lloc winery, RCR Arquitectes (Archdaily 2014)	240			
VI_23.	Jakob Inox mesh (Jacobinox 2012)	240			
VI_24.	Degin development: entrance ramp circulation in old cage (Author 2014).	240			
VI_25.	Material pallet of Entrance and ramp (Author 2014).	240			
VI_26.	Technical development: entrance (Author 2014).	241			

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