Appendix D: Specialist Reports

- “Proposed Activities at Kirstenbosch National Botanical Garden” (VMA Architects, 2014);
- “Stage 1 Report: Proposed Feasibility Study for a new Administration Building, Parking Facility and Refurbishments of the Fynbos Lodge at Kirstenbosch National Botanical Garden” (VMA Architects, 2014);
- “Botanical Assessment of the Proposed Development Area at Kirstenbosch Botanical Garden” (Nick Helme Botanical Surveys, 2014);
- “Comment on Scheme 2 layout, Kirstenbosch office rebuild, SANBI, Cape Town.” (Nick Helme Botanical Surveys, 2016);
- “Notification of Intent to Develop” (Asha Consulting, 2014);
- “Notification of Intent to Develop- Supporting Documents” (Asha Consulting, 2014);
- “Response to Notice of Intent to Develop” (Heritage Western Cape, 2014);
- “Kirstenbosch Administration Building: Revised project description and layout.” (Asha Consulting, 2016);
- “Visual Statement: SANBI New Buildings at the Kirstenbosch Botanical Garden, Cape Town” (Megan Anderson Landscape Architects, 2015);
- “SANBI New Buildings at the Kirstenbosch Botanical Garden, Cape Town: VIA Addendum to assess the new scheme (Scheme 2)” (Megan Anderson Landscape Architects, 2016);
- “Freshwater Ecological Assessment for the Proposed Establishment of a new Administration Building at Kirstenbosch National Botanical Garden” (Freshwater Consulting Group, 2014);

- “Annexures for the Freshwater Ecological Assessment” (Freshwater Consulting Group, 2014); and
- “Comments on potential impact of proposed changes to layout plan for a new administrative building at Kirstenbosch National Botanical Garden on freshwater ecosystems” (Freshwater Consulting Group, 2016).
- “Stormwater Management Plan” (Orrie, Welby & Associates, 2016)
- “Traffic Impact Assessment” (ITS Engineers, 2016)

KIRSTENBOSCH NATIONAL BOTANICAL GARDEN

VMA Architects

APPOINTMENT OF A MULTI -DISCIPLINARY TEAM WITH A PROFESSIONAL ARCHITECT AS THE PRINCIPAL AGENT FOR THE FEASIBILITY STUDY, DESIGN AND CONSTRUCTION MANAGEMENT OF A NEW ADMINISTRATION BUILDING AT KIRSTENBOSCH NATIONAL BOTANICAL GARDEN.

Bid Number: G174/2013

14th May 2014

66 Long Street, 6th Floor, Cape Town, 8001
Tel: 021 426 1930 Fax: 086 551 0156 E-mail: angelo@nm1994.com www.vernonmathewsarchitects.com
Reg Nr: 2007/190311/23

OBJECTIVE OF WORKSHOPS

VMA Architects

1. Confirm Accommodation Schedule and Brief for the Administration Building comprising of the HR Department , Finance and I.T Department.
2. Confirmation of Additional Activity viz . Upgrade of Fynbos Lodge
3. Confirmation of Parking Facility
4. Additional space required for EDRR program including marketing & communication staff
5. Confirmation of Additional Consultants.
6. Preferred Site

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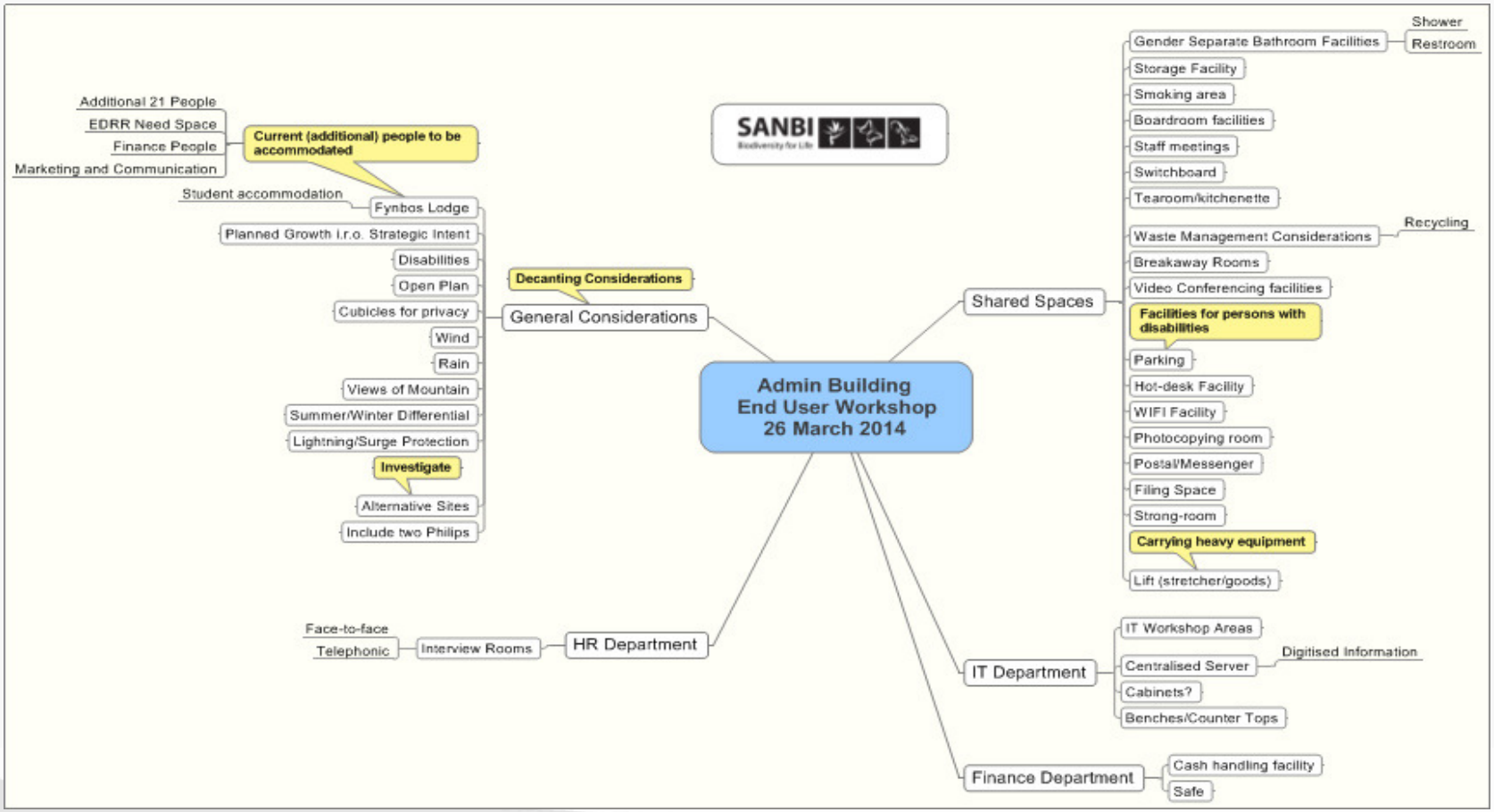
MIND MAP

VMA Architects



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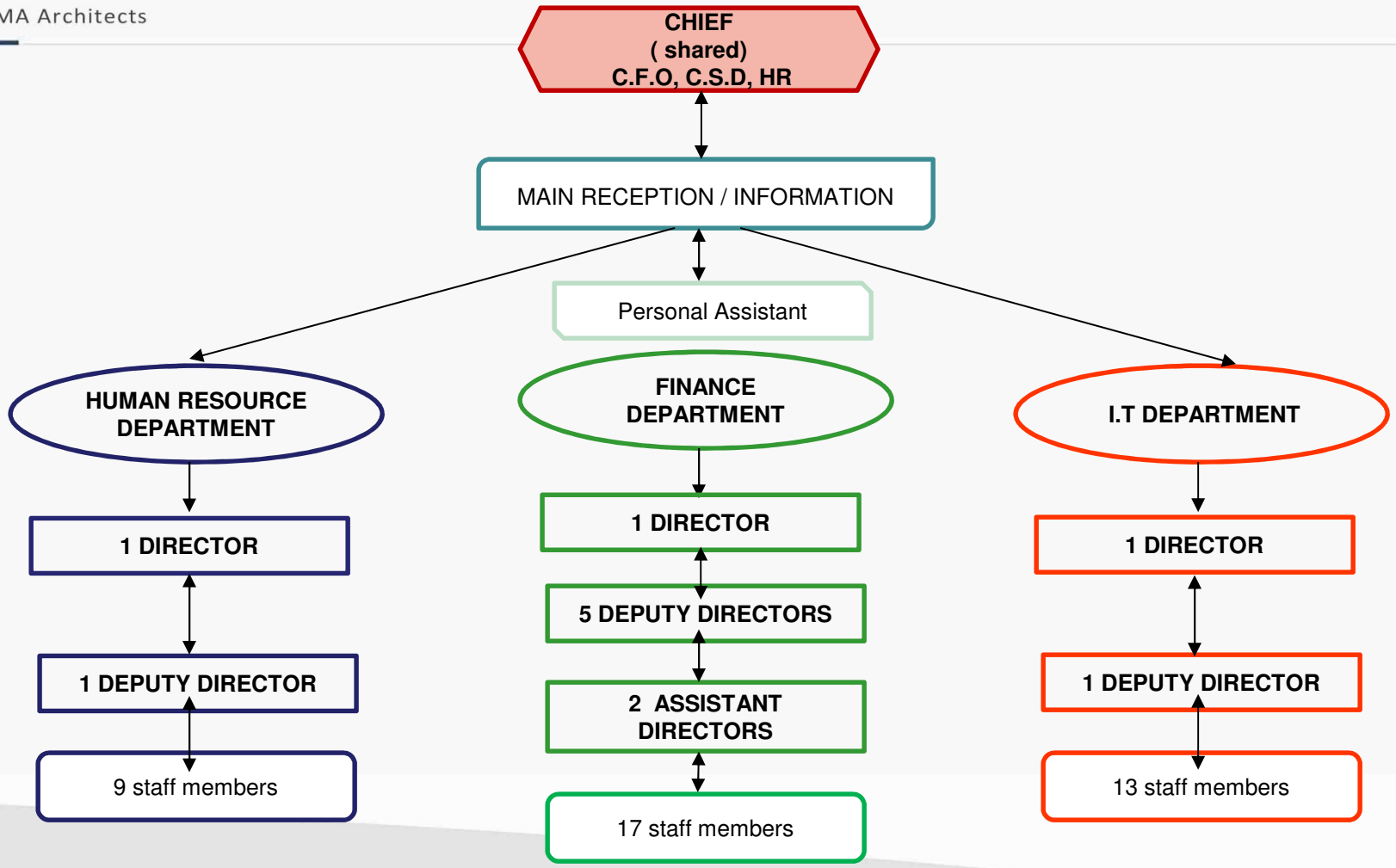
VMA Architects



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ACCOMMODATION SCHEDULE

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H.R DEPARTMENT

No.	Item	Assigned s.q.m	General Comment
	Department of HR		
1	Director of HR	25	Kaashiefa Bassier
2	Deputy Director of Training	20	Training Unit (Rene Du Toit)
3	HR/ Dedicated Printer Stations	6	One bulk Printer / 6 Desktop Printer
4	Archive / Store Room / Stationery room	12	Stationery + Equipment
5	1 meeting / Seminar room (5 people)	12	Small Meeting / Discussion Rooms
6	Open plan Office (8 staff members)	51	Open plan office Space
7	1 new staff member (To be Appointed)	10	New staff member post filled this financial year
8	Ablutions	10	Male / Female
9	Drinking Fountain	-	Spring Water to be supplied by Kirstenbosch Botanical
	Sub Total (excluding parking)	146	
	146 s.q.m x 1.2 s.q.m (Structure & Circulation)	175	
	Add 10 % Growth	18	Future projection
	TOTAL	193	

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FINANCE DEPARTMENT

SANBI Biodiversity for Life

VMA Architects

No.	Item	Assigned s.q.m	General Comment
	Finance Department		
1	Waiting Area	25	
2	Director of Finance	25	A. Smith (Office / Private)
3	Personal Assistant	12	Goelood
4	Deputy Director (Income)	20	Office / Private
5	Deputy Director (Finance)	20	Office / Private
6	Deputy Director (Payroll)	20	Office / Private
7	Deputy Director (Assets)	20	Office / Private
8	Deputy Director (Projects)	20	Office / Private
9	Offices ASD (Salaries)	15	Office Screened / Private
10	Offices ASD (Creditors)	15	Office Private
12	Printing Photocopy Area	10	Printing Station / Closest Staff does most of the Printing
13	3 Seminar Room @ 16 s.q.m	48	For Breakaway Meetings
15	1 Filing Room (Finance)	16	Records
16	1 Filing Room (Payroll)	10	Records
17	9 General Staff @ 7s.q.m in Open Plan	63	Open Plan Offices / Located close to natural ventilation
18	Temporary 3 year Projects / Staff	30	3 Staff Member on contract
19	1 Cleaning (payroll) Staff	10	
20	Ablutions	15	Male & Female
21	Drinking Fountain	-	Spring Water to be supplied by Kirstenbosch Botanical
	Sub Total (excluding parking)	394	
	394 s.q.m x 1.2 s.q.m (Structure & Circulation)	472	
	Add 10 % Growth	47	Future projection
	TOTAL	519	

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I.T DEPARTMENT

VMA Architects

No.	Item	Assigned s.q.m	General Comment
	I.T Department		
1	Director	25	Private Office
2	Deputy Director	20	Private Office
3	Office (open plan)	65	Staff located near natural light & ventilation
4	Office (Consultants)	15	Visiting / Outside Assistance
5	Helpdesk	30	Space for 3 Staff Members (Call Centre)
6	Video Conferencing Room	50	Also use for Training / Presentations
7	Workshop	50	Repairs
8	Store Room	10	General
9	Printing Facility	10	For 2 Copiers
10	Special Storage Facility (Steel Secure boxes)	38	New Computers / Distribution
11	Ablutions	15	Male & Female
12	Server Room	12	
13	Drinking Fountain	-	Spring Water to be supplied by Kirstenbosch Botanical
	Sub Total (excluding parking)	340	
	340 s.q.m x 1.2 s.q.m (Structure & Circulation)	408	
	Add 10 % Growth	40	
	TOTAL	448	

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SHARED FACILITIES

VMA Architects

No.	Item	Assigned s.q.m	General Comment
	Shared / Communal Facility		
1	Main Reception / Waiting Area	35	Central Reception with Switchboard
2	Information Desk	15	General Information & Reception
3	Entrance Foyer	50	Pre - Assembly Space
4	Canteen (65 people) / Recreation	130	Staff / Guest
5	Kitchen	30	Staff & General use
6	Refuse / Recycling Facility	15	Central Facility
7	Store Rooms	15	
8	Prayer Rooms / Cubicles	18	Staff / Guest
9	Seminar Rooms	25	
10	Strong Room	18	3 Cubicles
11	Sickbay	12	
12	Boardroom	100	Can be subdivided with partition to create two spaces at 50 s.q.m each
13	Stretcher Lift	6	
	Sub Total (excluding parking)	469	
	469 s.q.m x 1.2 s.q.m (Structure & Circulation)	562	
	Add 10 % Growth	56	
	TOTAL	618	

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SUMMARY

VMA Architects

No.	Item	Assigned s.q.m	General Comment
	Summary		
	HR Department Total Area	193	(excluding parking)
	Finance Department Total Area	519	(excluding parking)
	I.T Department Total Area	448	(excluding parking)
	Shared Facilities	618	
	TOTAL (excluding parking)	1778	
	Footprint of existing Administration building (Site Option 2)	850	
	Bulk Factor	2,2	

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ADDITIONAL ACTIVITIES

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1. Fynbos Lodge	- Upgrade & Removal Asbestos Roof & Provision of parking. Stabilization of River Bank with Gabions (Stones banks)
2. Parking	- 50 cars , 3 Mini buses & 1 Loading Zone.
3. Additional Space	- E.D.R.R (Marketing and Communication) – 21 staff members

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LOCALITY

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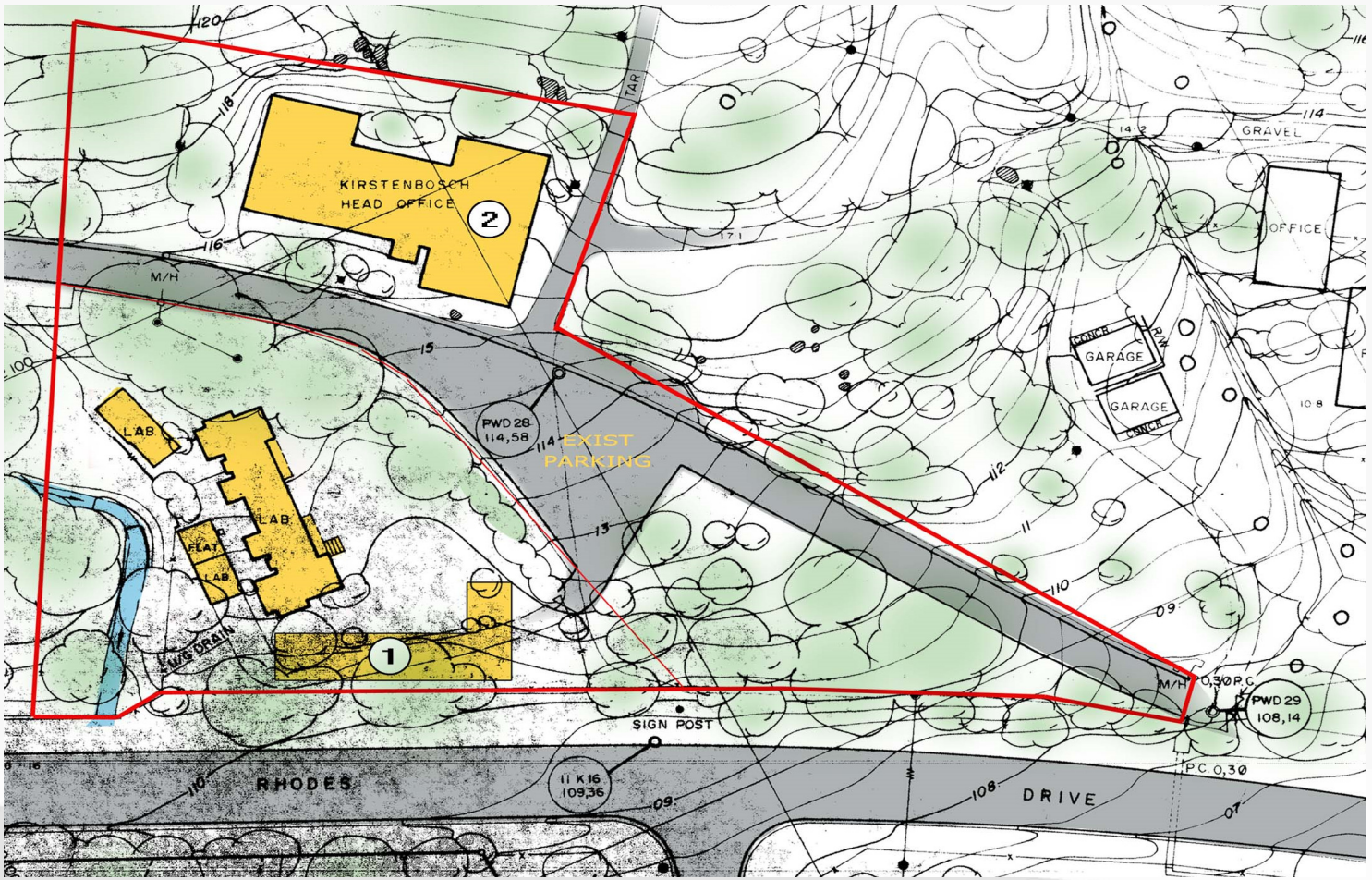
WHOLE AREA OF STUDY

VMA Architects



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SITE OPTION 1

VMA Architects

- Footprint too small
- Within 32m of river
- Site too noisy – proximity to roads
- Awkward shape of site
- Too close to Fynbos Lodge

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SITE 1 PHOTO'S

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SITE OPTION 2

VMA Architects

- Existing footprint of 850m s.q.m ideal
- The site is quiet, serene and beautiful
- More than 32m from river
- Building has a better presence due to elevation
- Building can make a positive reference to Fynbos lodge
- Shape of site is better suited
- Excavations and foundations less costly

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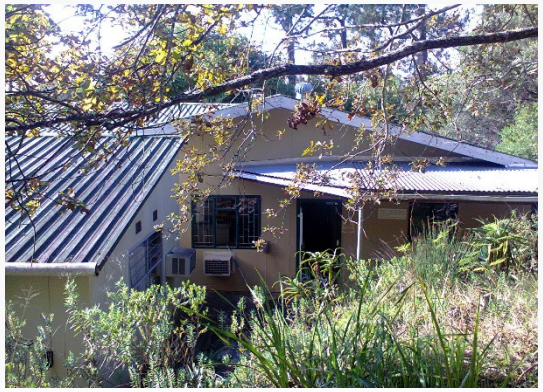
SITE 2 PHOTO'S

VMA Architects





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ADDITIONAL REQUIRED CONSULTANTS

VMA Architects

- GEO - TECHNICAL ENGINEER
- SUSTAINABLE CONSULTANT
- ENVIRONMENTAL CONSULTANT
- LIGHTNING CONSULTANT
- LANDSCAPING
- INTERIOR DESIGNER
- FIRE CONSULTANT

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THANK YOU / DANKIE / ENKOSI

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DISCUSSION

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Stage 1 Report

PROPOSED FEASIBILITY STUDY
FOR A NEW ADMINISTRATION BUILDING, PARKING FACILITY AND
REFURBISHMENT OF THE FYNBOS LODGE
AT KIRSTENBOSCH NATIONAL BOTANICAL GARDEN

Project Number: G174/2013

SANBI
Biodiversity for Life

aurecon

VMA
ARCHITECTS

FRONTLINE

AMPS

IFINDO

sillitò

ARVIND N BHAWAN
Professional Land Surveyors
Land Surveyor
Technical Nature Practitioner
Engineering & Topographical Surveyor

Contents

1. Introduction:

A tender was advertised by SANBI requiring a multi-disciplinary team with a professional architect as the lead consultant for the feasibility study, design & construction management of a new administration building at the Kirstenbosch National Botanical Garden (KNBG): On Farm 875, a portion of the precinct. ie. KNBG.

The tender was advertised during November 2013. A clarification meeting was held on the 28th November 2013, with a closing date being 6th December 2013. VMA Architects (VMA) was awarded the tender on the 12th February 2014 and duly accepted the award on the 14th February 2014.

VMA recognises the status of KNBG as a world class destination at the foot of Table Mountain National Park, a World Heritage Site and recently declared one of the seven natural wonders in the world. The site is also situated closer to the origins of the Liesbeek River. VMA recognises that the design of the building will incorporate State of the Art Technology, complete with Wi-Fi, Access Control, and CCTV surveillance cameras, completely embracing green and sustainable principles in the design.

2. Executive Summary:

VMA embarked on an intensive consultation process with the End-Users of the Administration Department of KNBG. This process took the form of workshops, meetings and *in loco* inspections.

The first objective was to develop a brief in the form of an accommodation schedule with assignable square meters that incorporated future growth of approximately 10%.

The second objective was to identify a suitable site that could accommodate a building with a footprint of 2500m² within a double storeyed structure. A decision was taken by the client to utilise one of the two existing building sites viz. Information Technology building site or the Human Resources/Finance building site. VMA also took into account a further guiding principle that no trees would be removed in the precinct and subsequently recommend the following:

1. The site of the existing Finance/HR building, referred to later in the document as site option 2, is the preferred site for the New Administration Building.
2. The site of the old Information & Technology building & its surroundings is recommended as the preferred site for the parking facility.
3. Fynbos Lodge will be restored & modified as per heritage guidelines, as a student accommodation facility.
4. Banks to the south of Fynbos Lodge on the Liesbeek River will be stabilized using gabions.

The outcome of the workshop / consultation process regarding the assignable square meters is as follows:

Item	m²
Human Resources Division (HR)	172.92
Finance Division (F)	520
Information & Technology Directorate (IT)	465
Shared Facility	654
Early Detection and Rapid Response Programme (EDRR) Unit	657
Marketing & Communication Directorate will be absorbed in the total 10% accommodation growth.	

VMA will essentially undertake and provide the documentation and statutory approval process in Year 1; the construction of the Administration Building in Year 2 and the refurbishment and modification of Fynbos Lodge in Year 3. The construction of the Administration Building will result in the decanting of the HR Division & Finance staff to alternative accommodation (either on or off site) for a period of approximately 10 -12 months. The scheduling & timing of the parking facility will commence once the IT Directorate has successfully been relocated & setup in the new building. Care and diligence will be exercised to ensure that the IT Directorate's operations will not be interrupted.

The banks of the Liesbeek River to the south of Fynbos Lodge, a building with significant heritage status, must be stabilised with gabions, utilizing Table Mountain sandstone as a material.

A parking facility will accommodate 50 cars and a shelter at the bus terminus will also be provided for the employees of SANBI.

VMA confirms that upon approval of the Stage 1 report and in particular the Identification of the Site and Accommodation Schedule, the Professional Team will proceed to stage 2 viz. Conceptual Design and Development and Cost Estimates.

The following persons were consulted:

Christopher Willis
Rory Baker
Dirk Linde
Alan Smith
Kasshiefa Bassier
Beryl-Lynne Pekeur
Rene Du Toit
Philip le Roux
Philip Ivy

VMA wishes to expresses its sincere gratitude and appreciation for the valuable inputs and insights received. A special thank you to Amjad Hendricks from Aurecon, for his professional engagement on this project.

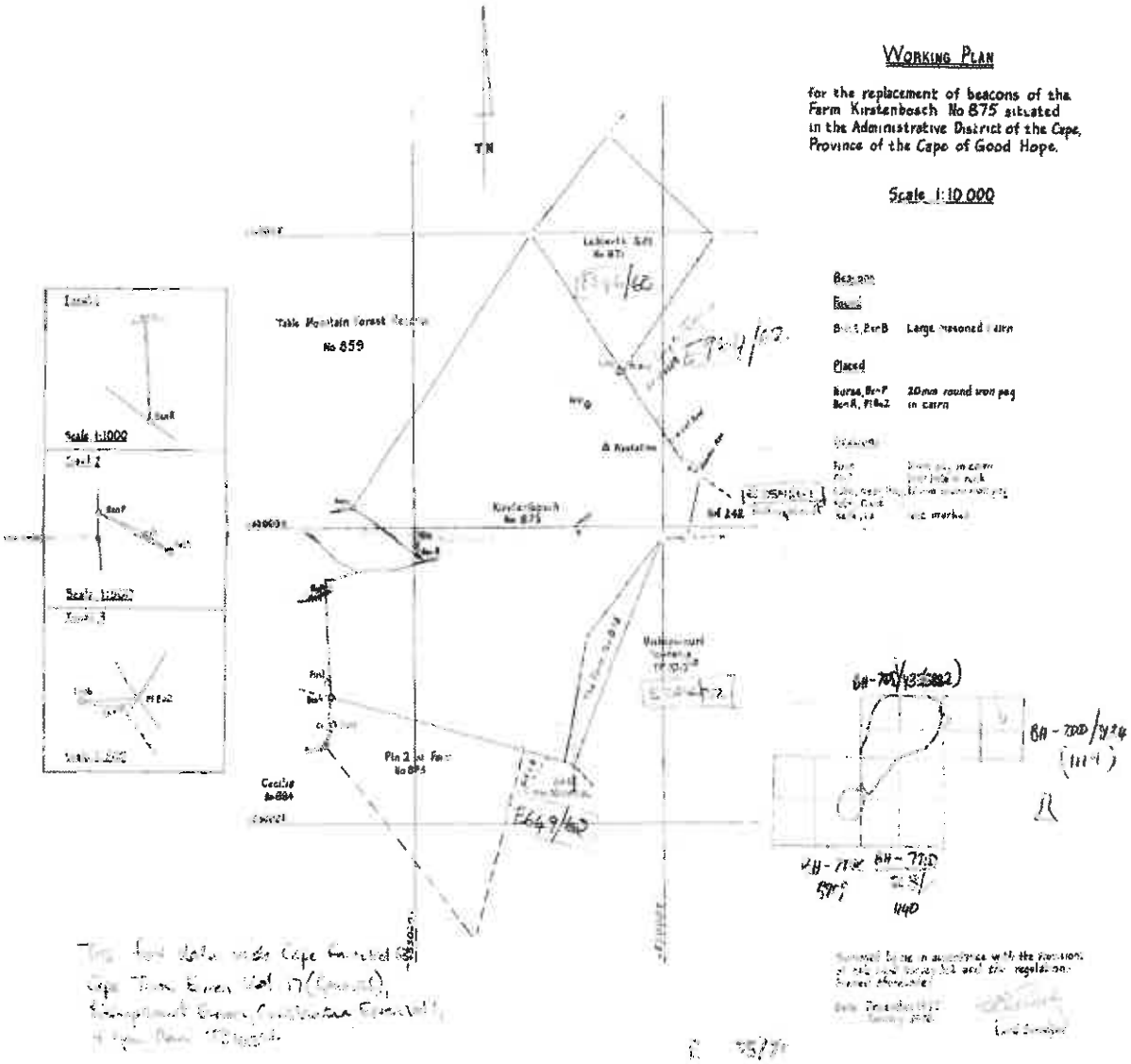
3. Site Information / Context:

3.1 Aerial Photo / Locality Map

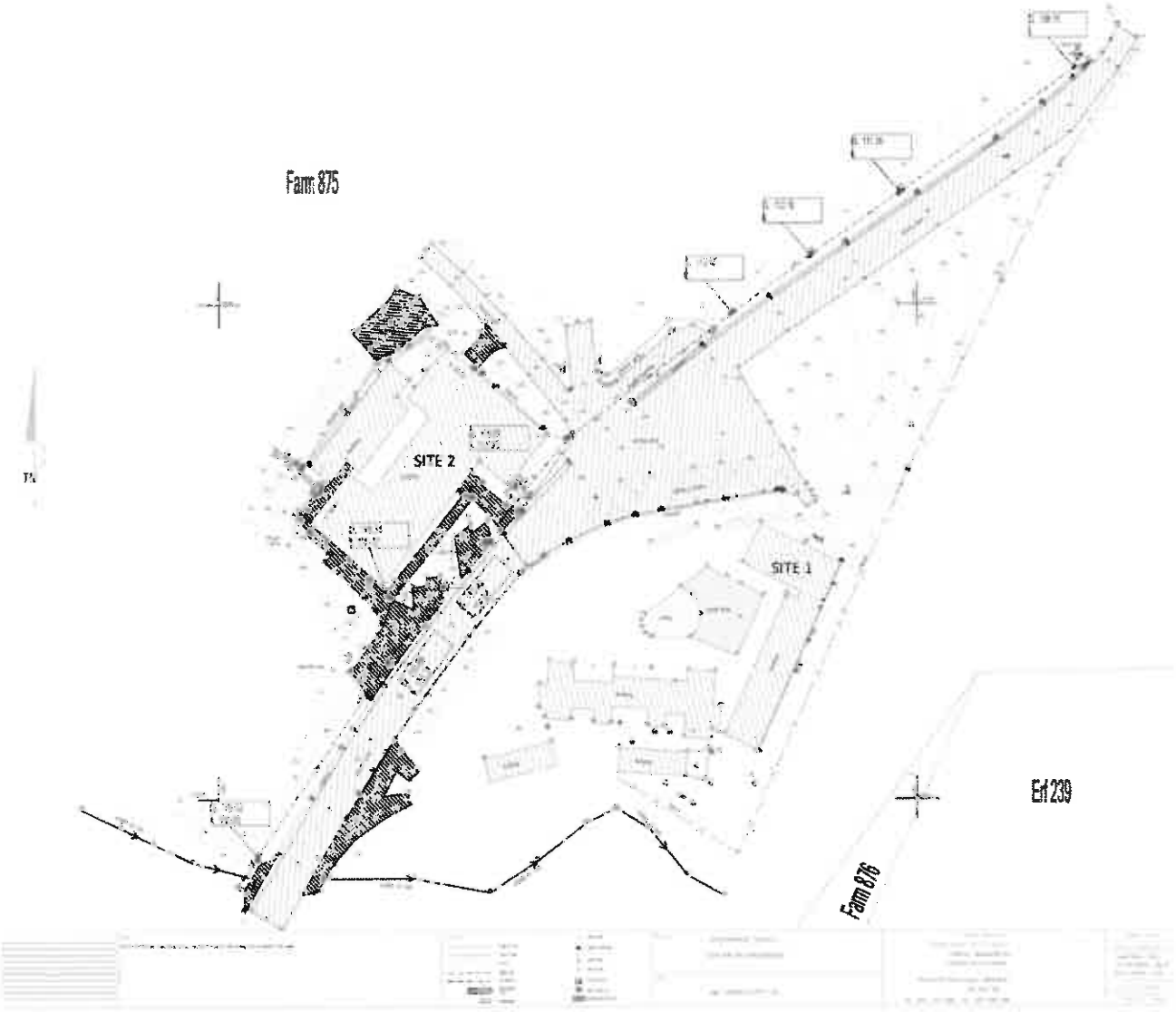
GPS Co-ordinates: 33°59'12.07" S 18° 26'07.78" E by: Google Earth

3.2 Site Cadastral Extent:

Over Farm Erf 875 (Kirstenbosch) (T12630/1961)



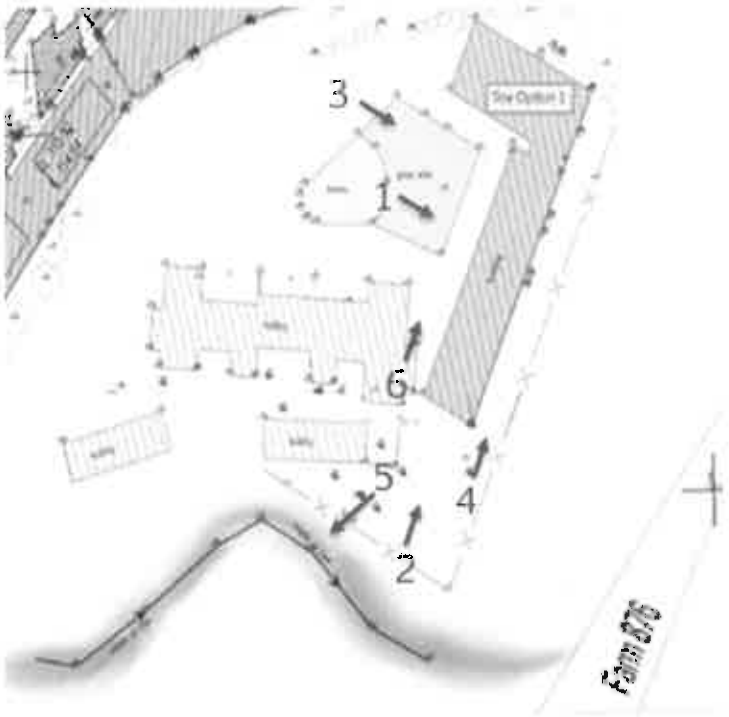
3.3 Survey Drawing



Survey Drawing: Prepared by Arvind Bhawan .29/05/2014

3.4 Photographic Study of Site Option 1 & 2

Site Option 1



Site Option 2

3.5 Tabular Comparison of Site Options / Identification

Site Option 1	Site Option 2
1. Site shape awkward.	1. Site shape more geometrically regular
2. Too close to the Liesbeek River and within the 32m building development line	2. More than 32m from the centre line of the Liesbeek River
3. Too close to Rhodes Drive & too noisy	3. Site is situated in a quieter location
4. Existing footprint (ca 274 m^2) too small for the proposed new Administration Building (incorporating EDRR, IT Directorate , Marketing & Communications Directorate, Shared Facilities)	4. Existing footprint of the Finance/HR Building is 850 m^2
5. Existing Building Site more suitable as parking facility.	5. It is more suitable as Corner Building and has a better orientation.
6. Building Site too close to the Fynbos Lodge	6. Existing building site allows for minimal impact on the existing Fynbos Lodge

VMA is engaging with Mr Ben Mars of Land Affairs to determine if any land claims have been registered against the relevant portions of Kirstenbosch. A report will be submitted to VMA in due course.

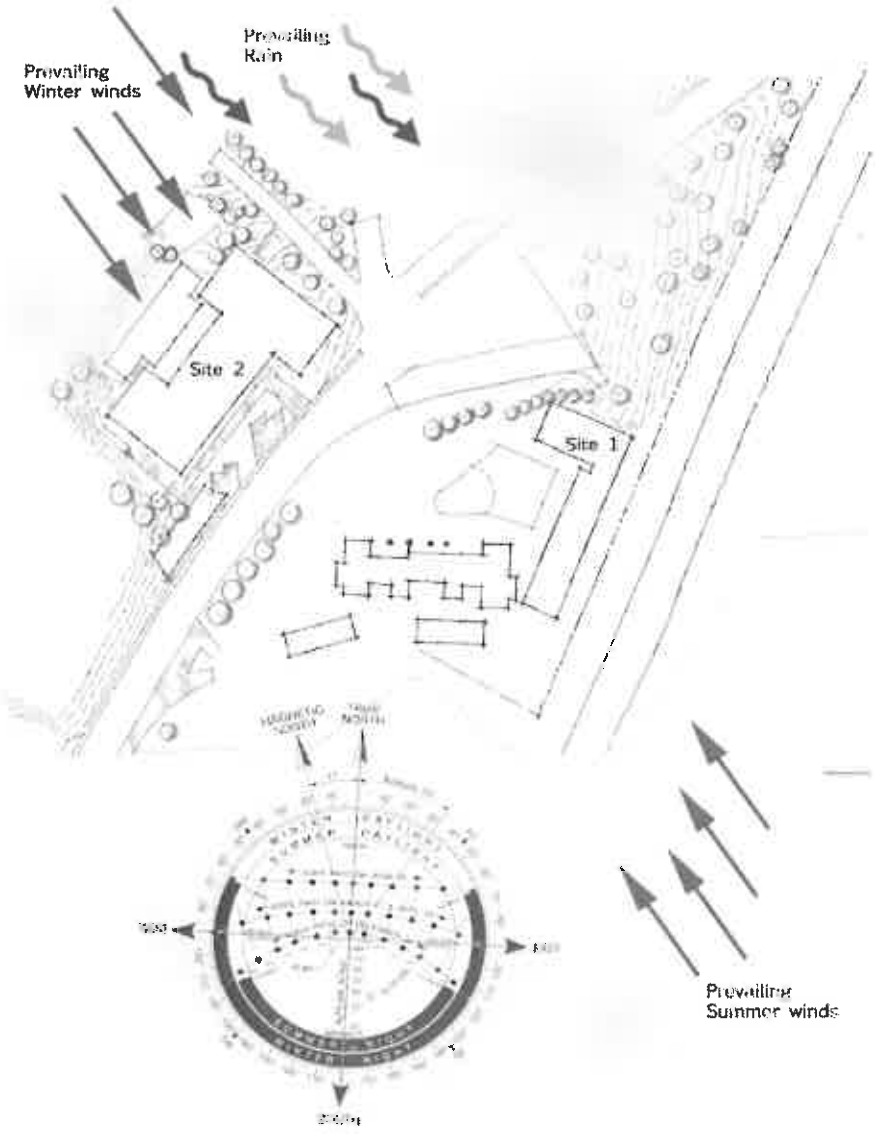
VMA recommends Site Option 2 over Site Option 1 as the preferred site for the new Administration Building and a bulk of 2.2 will apply with a maximum height of 12m. The Building will consist of approximately two and a half storeys. It is endeavoured that no trees will be removed. Site Option 1 will be utilized as the parking site, with the Fynbos Lodge being modified and redesigned as a student lodge. The river bank will be stabilized with gabions.

4. Climatic Data / Geographical Characteristics:

4.1 Introduction

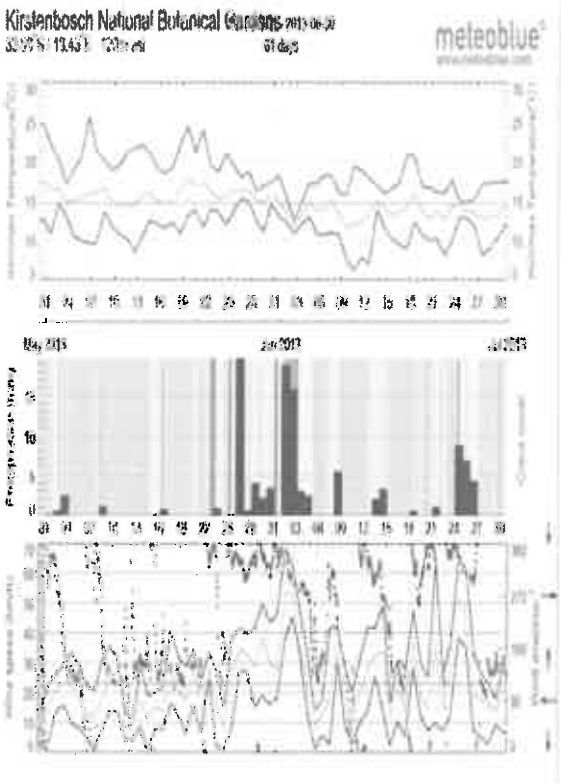
Kirstenbosch is situated at the foot of Table Mountain and this falls within the Mediterranean Climatic Belt.

The proximity of the mountain has a major impact on the microclimate, resulting in hot summers, cold and very wet winters. It is a known fact that Kirstenbosch/Newlands have recorded the highest rainfall in South Africa. Furthermore, very high wind speeds have been recorded, registering up to 45km/h during winter (north-westerly).

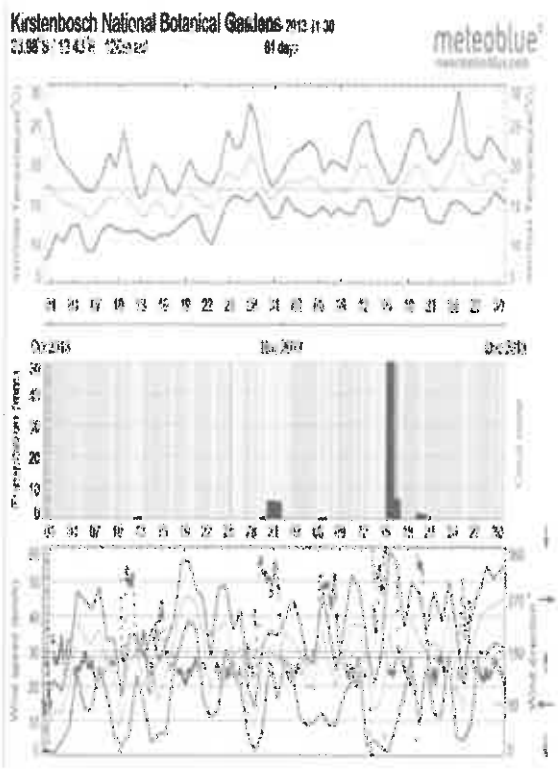


4.2 Climatic Data: June 2013 – June 2014

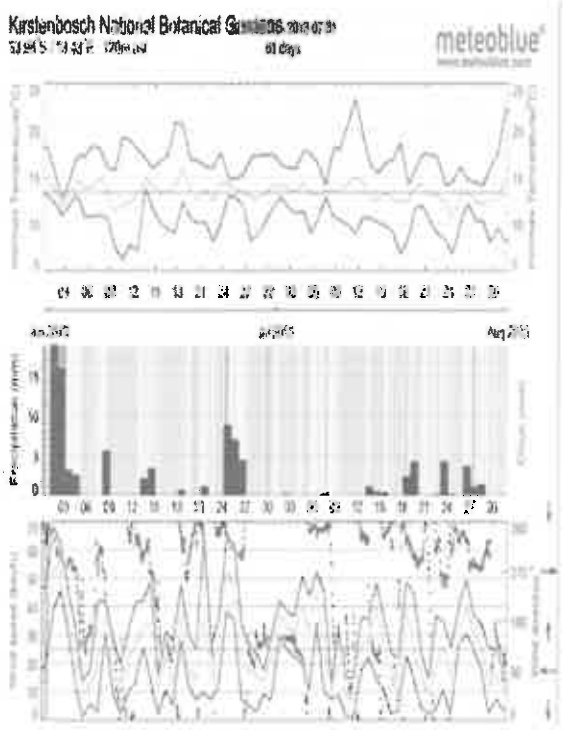
June 2013



August 2013



July 2013



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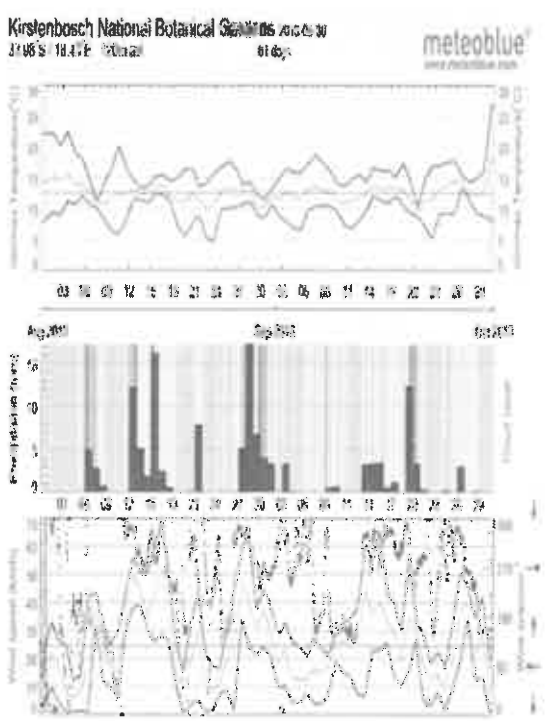

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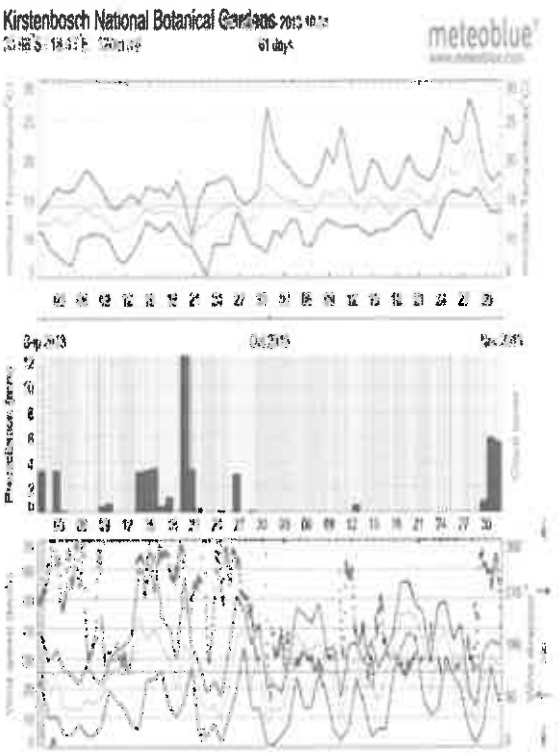
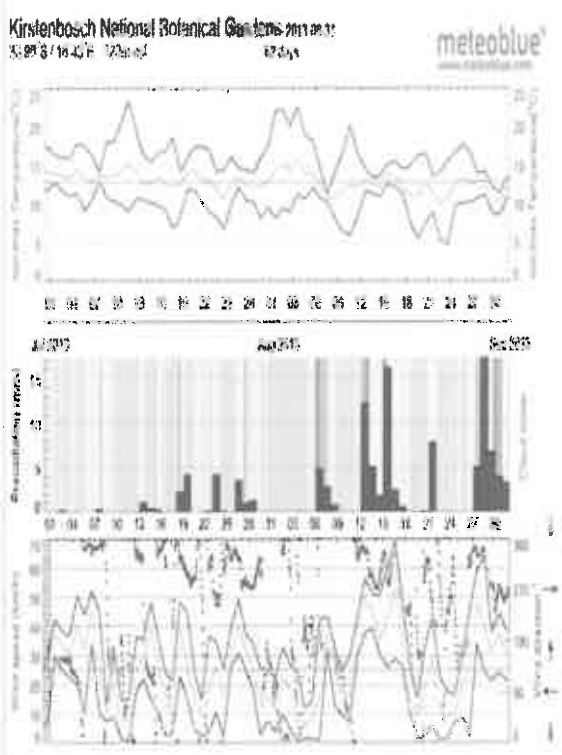
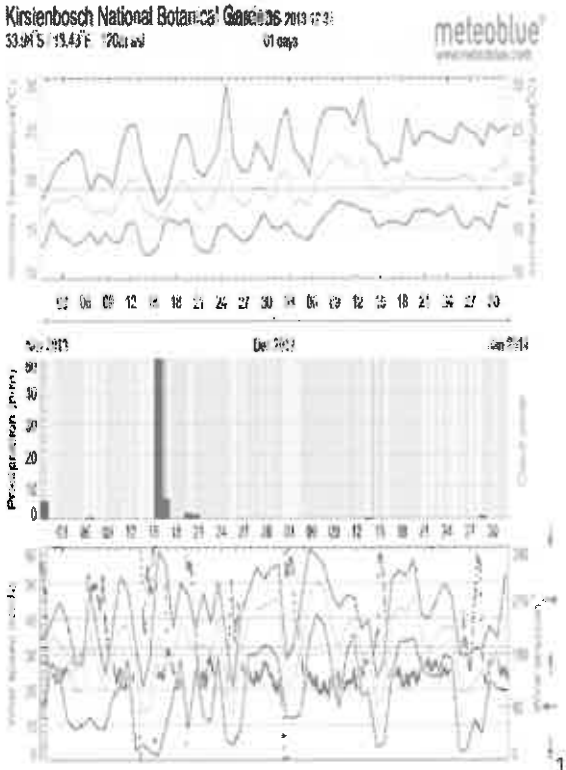


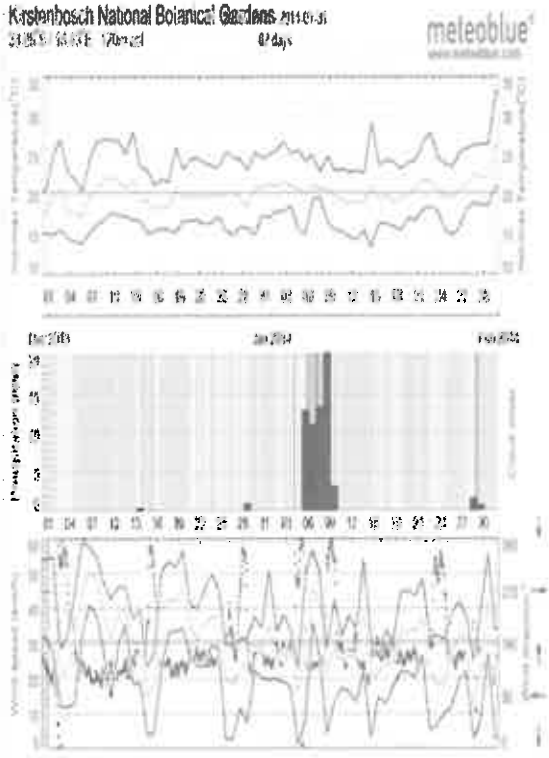
November 2013



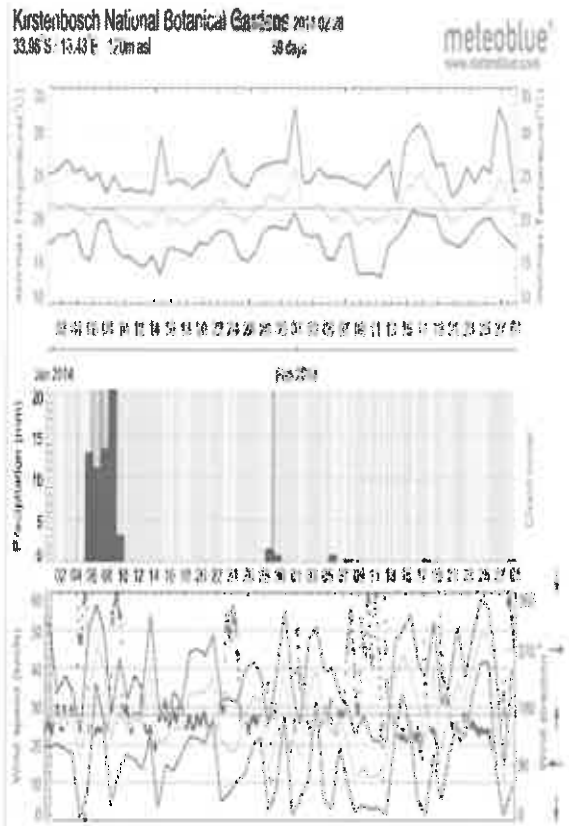
December 2013



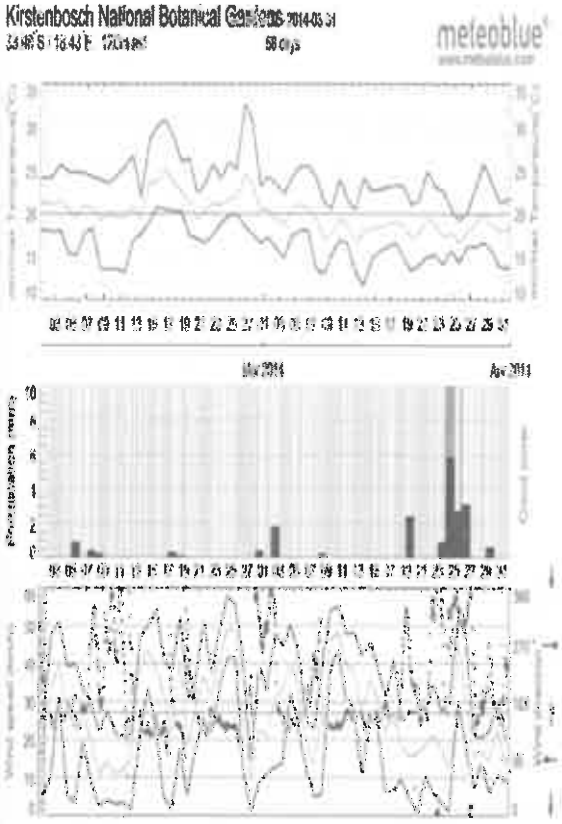
January 2014



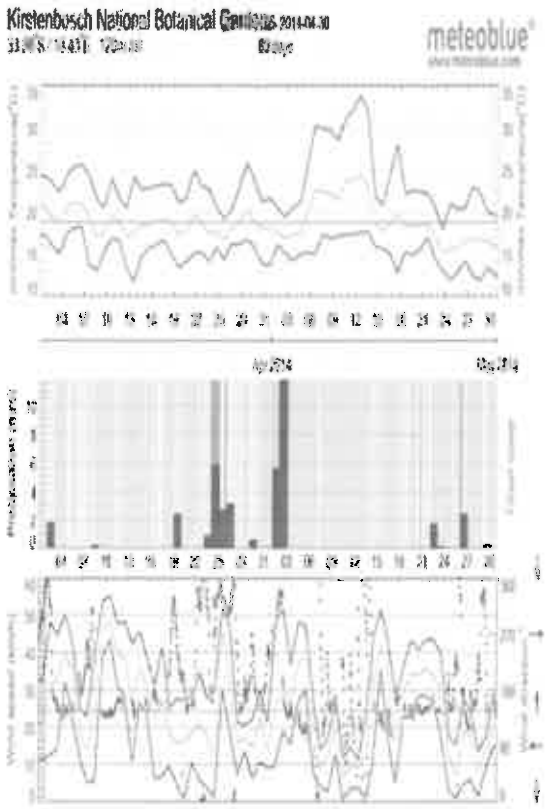
February 2014



March 2014



April 2014



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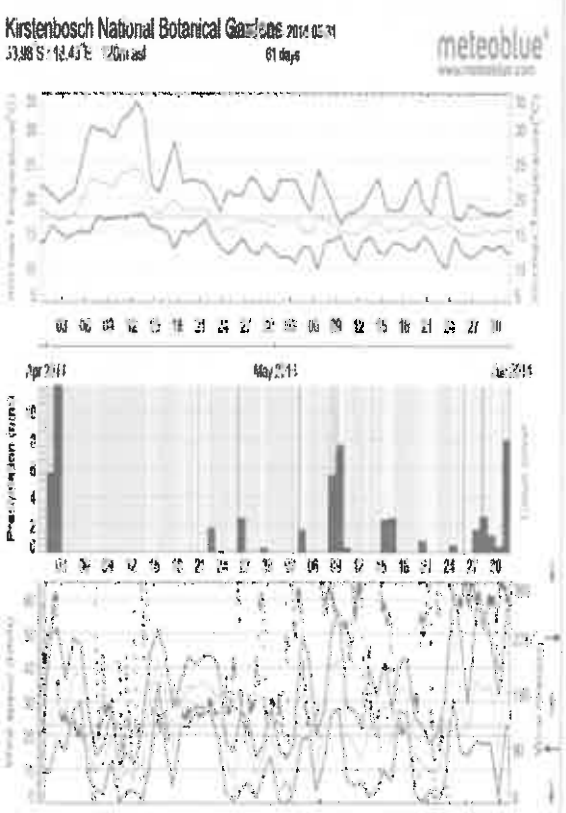

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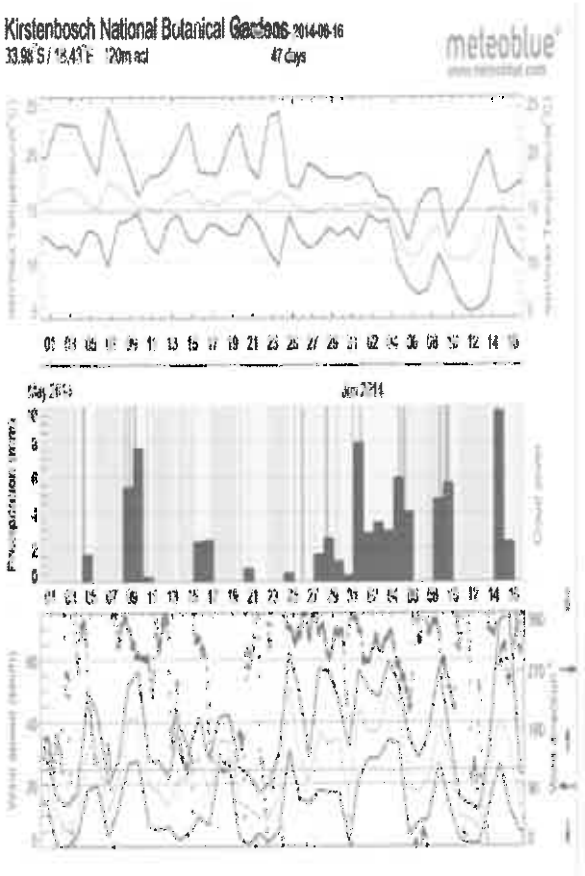


Climatic Data sourced from: meteoblue

5. Accommodation Schedule

Workshops were held with various Divisional/Directorate Heads & Project Managers, with the objective to draw up a detailed brief and accommodation schedule. Refer to Table 1 below.

The New Administration Building will accommodate the following departments:

- Finance (F)
- Human Resources (HR)
- Information and Technology (IT)
- Early Detection and Rapid Response Programme (EDRR)
- Marketing & Communications (M&C)

5.1 Building Classification: G1 SANS 10400 Edition 3

SANS 10400-A:2010
Edition 3

Table 1 (*concluded*)

1	2
Class of occupancy of building	**Occupancy**
E4	**Health care** Occupancy which is a common place of long term or transient living for a number of unrelated persons consisting of a single unit on its own site who, due to varying degrees of incapacity, are provided with personal care services or are undergoing medical treatment.
F1	**Large shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area exceeds 250 m^2.
F2	**Small shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area does not exceed 250 m^2.
F3	**Wholesalers' store** Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time.
G1	**Offices** Occupancy comprising offices, banks, consulting rooms and other similar usage.
H1	**Hotel** Occupancy where persons rent furnished rooms, not being dwelling units.
H2	**Dormitory** Occupancy where groups of people are accommodated in one room.
H3	**Domestic residence** Occupancy consisting of two or more dwelling units on a single site.
H4	**Dwelling house** Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuildings, if any.
H5	**Hospitality** Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons within a dwelling unit.
J1	**High risk storage** Occupancy where material is stored and where the stored material is liable, in the event of fire, to cause combustion with extreme rapidity or give rise to poisonous fumes, or cause explosions.
J2	**Moderate risk storage** Occupancy where material is stored and where the stored material is liable, in the event of fire, to cause combustion with moderate rapidity but is not likely to give rise to poisonous fumes, or cause explosions.
J3	**Low risk storage** Occupancy where the material stored does not fall into the high or moderate risk category.
J4	**Parking garage** Occupancy used for storing or parking of more than 10 motor vehicles.

Table 2 — Design Population

1	2
Class of occupancy of room or storey or portion thereof	**Population**
A1, A2, A4, A5	Number of fixed seats or 1 person per m^2 if there are no fixed seats
E1, E3, H1, H3, H4	2 persons per bedroom
E4	16 persons provided that the total number of persons per room is not more than 4
H5	16 persons per dwelling unit provided that the total number of persons per room is not more than 4
G1	1 person per 15 m^2
J1, J2, J3, J4	1 person per 50 m^2
C1, E2, F1, F2	1 person per 10 m^2
B1, B2, B3, D1, D2, D3	1 person per 15 m^2
C2, F3	1 person per 20 m^2
A3, H2	1 person per 5 m^2

Table 5 — Provision of sanitary fixtures in residential accommodation

1	2	3	4	5	6	7	8
Population	**Number of sanitary fixtures to be installed**						
	Males				**Females**		
number of people	**Toilet pans**	**Urinals**	**Wash-hand basins**	**Baths**	**Toilet pans**	**Wash-hand basins**	**Baths**
≤ 8	1	1	1	1	2	1	1
≤ 20	1	2	2	2	3	2	2
≤ 40	2	3	3	3	4	3	3
≤ 60	3	4	4	4	6	4	4
≤ 80	4	6	5	5	9	5	5
≤ 100	4	8	6	6	12	6	6
≤ 120	5	9	6	6	14	7	7
≤ 140	5	10	7	7	15	8	8
≤ 180	5	11	8	8	16	8	8
> 180	Add 1 sanitary fixture to the above for every 50 persons						

Table 6 — Provision of sanitary fixtures for personnel

1	2	3	4	5	6
Population[1]	**Number of sanitary fixtures to be installed**				
	Males			**Females**	
number of people	**Toilet pans**	**Urinals**	**Wash-hand basins**	**Toilet pans**	**Wash-hand basins**
≤ 15	1	1	1	2	1
≤ 30	1	2	2	3	2
≤ 60	2	3	3	5	3
≤ 90	3	5	4	7	4
≤ 120	3	6	5	9	5
> 120	Add 1 sanitary fixture to the above for every 100 persons			Add 1 sanitary fixture to the above for every 60 persons	Add 1 sanitary fixture to the above for every 100 persons

NOTE — If the facilities provided in a shopping complex can be conveniently situated so that they are available to the personnel and the public and visitors, it might not be necessary to provide separate facilities for the personnel in individual shops. The minimum number of facilities provided should then be the total required in accordance with this table for the total number of personnel in the shops within the complex who make use of these facilities.

[1] Population is the number of personnel only of a particular sex in an occupancy. The total number of personnel will, in some cases, be the total population obtained from Regulation A21, the public and visitors being very few in number. In other cases the proportion of personnel to the public and visitors will have to be established. The total number of personnel in a shopping complex, or in any particular shop, may be taken as 10 % of the total population for such complex or shop calculated in terms of Regulation A21.

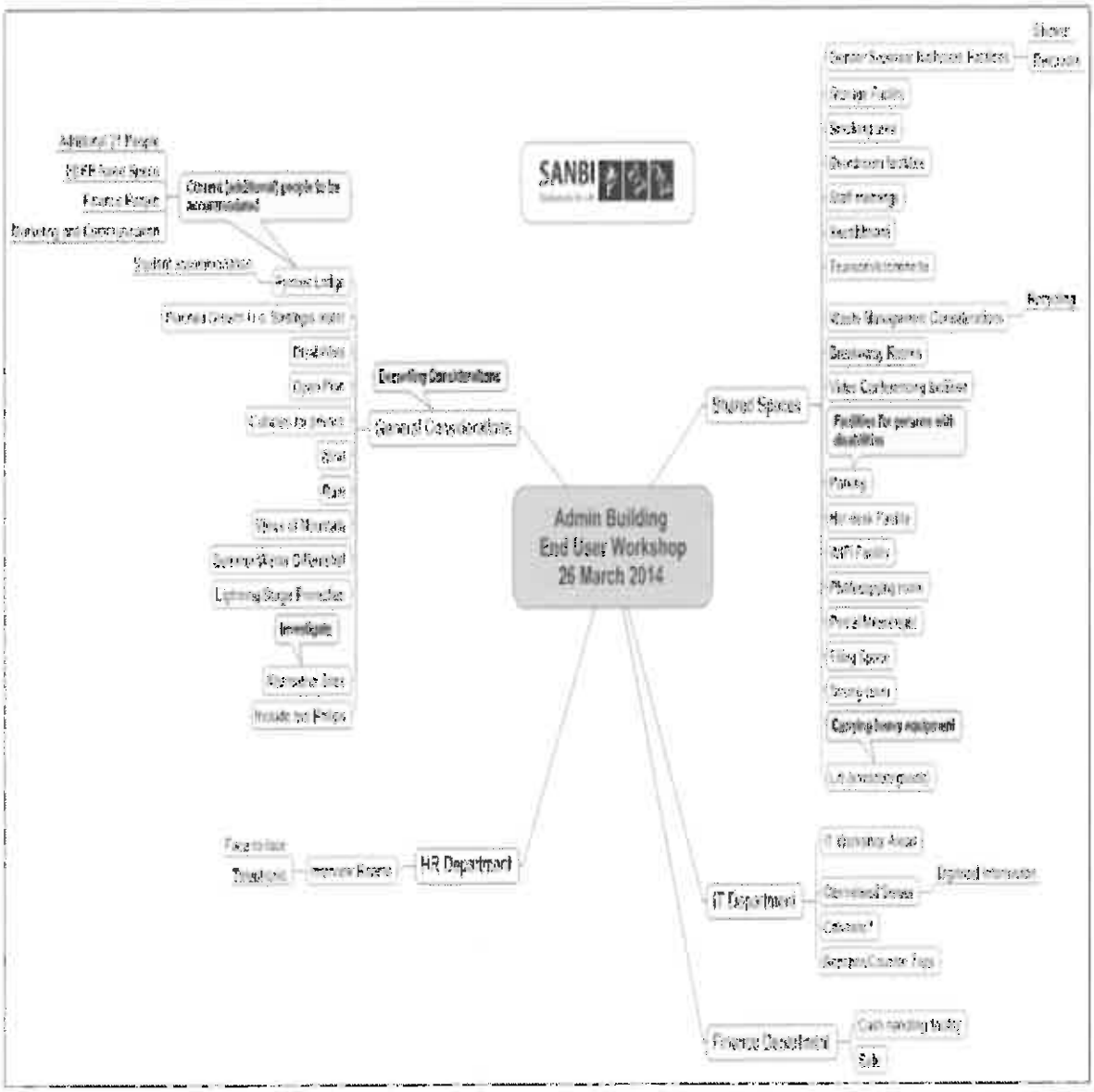
5.2 Table 1 – Consultation Workshop with End Users

Table 1

Process with End User Workshop

DATE	ACTIVITY
6 March 2014	Briefing session was held with the Aurecon Project Manager & Client Representative (SANBI Building Works Director).
26 March 2014	End User Workshop was held with the SANBI Team, Aurecon and principles to refine accommodation schedule & brief.
14 April 2014	Site Meeting was held with Aurecon, Land Surveyor, EIA Consultant, Kirstenbosch Garden Curator, SANBI Building Works Director.
23 April 2014	Meeting held with DEA & Aurecon
14 May 2014	End User Workshop was held with SANBI Team, Aurecon and principles to refine accommodation schedule.
Next Steps	
Accommodation schedule and Site confirmation meeting with SANBI end users & approval of Stage 1.	
Development of a Concept Sketch Design/Stage 2 with cost estimates.	

5.3 Mind map: by Rory Baker aurecon



5.4 Outcomes & Final Accommodation Schedule

Human Resources Division

No.	Item	Assigned m^2	General comment
	HR Division		
1	Deputy Director	20	Kaashiefa Bassier
2	Deputy Director of Training	20	Training Unit (Rene du Toit)
3	HR/Dedicated Printer Stations	6	One bulk Printer/6 Desktop Printers
4	Archive/Store Room/Stationery Room	12	Stationery + Equipment
5	1 meeting/Seminar Room (5 people)	12	Small Meeting / Discussion Rooms
6	Open plan Office (8 staff members)	51	Open plan office space
7	Ablutions	10	Male/Female
8	Drinking Fountain	-	Spring Water to be supplied by Kirstenbosch National Botanical Garden
	Sub Total (excluding parking)	**131**	
	131 m^2 x 1.2 m^2 (Structure &Circulation)	**157.20**	
	Add 10 % Growth	**15.72**	**Future projection**
	TOTAL	**172.92**	

Finance Division

No.	Item	Assigned m^2	General Comment
	Finance Division		
1	Waiting Area	25	
2	Director of Finance	25	A. Smith (Office / Private)
3	Personal Assistant	12	Goelood
4	Deputy Director (Income)	20	Office / Private
5	Deputy Director (Finance)	20	Office / Private
6	Deputy Director (Payroll)	20	Office / Private
7	Deputy Director (Assets)	20	Office / Private
8	Deputy Director (Projects)	20	Office / Private
9	Offices ASD (Salaries)	15	Office Screened / Private
10	Offices ASD (Creditors)	15	Office Private
12	Printing Photocopy Area	10	Printing Station / Closest Staff does most of the Printing
13	3 Seminar Room @ 16 m^2	48	For Breakaway Meetings
15	1 Filing Room (Finance)	16	Records
16	1 Filing Room (Payroll)	10	Records
17	9 General Staff @ 7 m^2 in Open Plan	63	Open Plan Offices / Located close to natural ventilation
18	Temporary 3 year Projects / Staff	30	3 Staff Member on contract
19	1 Cleaning (payroll) Staff	10	
20	Ablutions	15	Male & Female
21	Drinking Fountain	-	Spring Water to be supplied by Kirstenbosch Botanical
	Sub Total (excluding parking)	**394**	
	394 m^2 x 1 2 m^2 (Structure & Circulation)	**472**	
	Add 10 % Growth	**48**	**Future projection**
	TOTAL	**520**	

Information & Technology Directorate

No.	Item	Assigned m^2	General Comment
	IT Directorate		
1	Director	25	Private Office
2	Deputy Director	20	Private Office
3	Office (open plan)	65	Staff located near natural light & ventilation
4	Office (Consultants)	15	Visiting / Outside Assistance
5	Helpdesk	30	Space for 3 Staff Members (Call Centre)
6	Workshop	50	Repairs
7	Store Room	10	General
8	Printing Facility	10	For 2 Copiers
9	Special Storage Facility (Steel Secure boxes)	38	New Computers / Distribution
10	Ablutions	15	Male & Female
11	Server Room	63	
12	Office (Web Designer)	12	
13	Drinking Fountain	-	Spring Water to be supplied by Kirstenbosch National Botanical Garden
	Sub Total (excluding parking)	**353**	
	353 m^2 x 1.2 m^2 (Structure & Circulation)	**423**	
	Add 10% Growth	**42**	**Future projection**
	TOTAL	**465**	

Shared / Communal Facilities

No.	Item	Assigned m^2	General Comment
	Shared / Communal Facility		
1	Main Reception / Waiting Area	35	Central Reception with Switchboard
2	Information Desk	15	General Information & Reception
3	Entrance Foyer	50	Pre - Assembly Space
4	Canteen (65 people) / Recreation)	130	Staff / Guest
5	Kitchen	30	Staff & General use
6	Refuse / Recycling Facility	15	Central Facility
7	Store Rooms	15	
8	Rest Room	18	Staff / Guest
9	Seminar Rooms	70	Can be subdivided with partition to create two spaces
10	Strong Room	10	3 Cubicles
11	Pause Area	12	
12	Records Store	40	
13	Stretcher Lift	6	
14	Video Conferencing Room	50	Also use for Training / Presentations
	Sub Total (excluding parking)	**496**	
	496 m^2 x 1.2 m^2 (Structure & Circulation)	**595.20**	
	Add 10% Growth	**59**	
	TOTAL	**654**	

Early Detection and Rapid Response (EDRR) Unit

No.	Item	Assigned m^2	General Comment
	EDDR Unit		
1	Director (Program Leader)	25	
2	Assistant (Support Staff)	12	
3	Leader: Financial Management (Support Staff)	12	
4	Financial Clerk (Support Staff)	10	
5	Financial Assistant (Support Staff)	10	
6	Administrator (Support Staff)	10	
7	Assistant Administrator	10	
8	Leader: Policy & Communication (Deputy Director)	20	
9	Manager: Communications (Assistant Director)	15	
10	Assistant: Communications (Support Staff)	10	
11	Leader: Risk Assessment (Deputy Director)	20	
12	Manager: Risk Assessment	28	
13	Leader: Data Management (Deputy Director)	20	
14	Manager: Data Management (Support Staff)	28	
15	Leader: Coastal Provinces	20	
16	Regional Coordinators (Assistant Directors)	30	
17	Species Coordinators (Assistant Directors)	45	
18	Contract Managers (Managers)	24	
19	Contract Assistants (Support Staff)	20	
20	Deputy Coordinators (Support Staff)	35	
21	Meeting Room	70	
22	Ablutions (G1 Category)	25	Male – 1urinal + 1 wc + 2whb / Female 2 wc + 2 whb
	Sub Total (excluding parking)	**499**	
	499 m^2 x 1 2 m^2 (Structure & Circulation)	**598**	
	Add 10% Growth	**60**	**Future projection**
	TOTAL	**658**	

Summary of All Departments

No.	Item	Assigned m^2	General Comment
	Summary		
	HR Division Total Area	172 92	(excluding parking)
	Finance Division Total Area	520	(excluding parking)
	IT Directorate Total Area	465	(excluding parking)
	Shared Facilities	654	
	EDDR Unit	658	(excluding parking)
	TOTAL (excluding parking)	**2469 92**	**(excluding parking)**
	Footprint of existing Administration Building (Site Option 2)	850	
	Bulk Factor	2 2	

Summary of All Divisions/Directorates 10% Growth Expectation

No.	Item	10% Growth m^2	General Comment
	Summary		
	HR Division Total Area	16	(excluding parking)
	Finance Division Total Area	48	(excluding parking)
	IT Directorate Total Area	42	(excluding parking)
	Shared Facilities	59	
	EDDR Unit	60	(excluding parking)
	TOTAL Growth	**225**	**(excluding parking)**

No specific space provisioning has been allocated to the Marketing & Communications Directorate. However, should this Directorate require space in the building, it can be accommodated by total growth allowance.

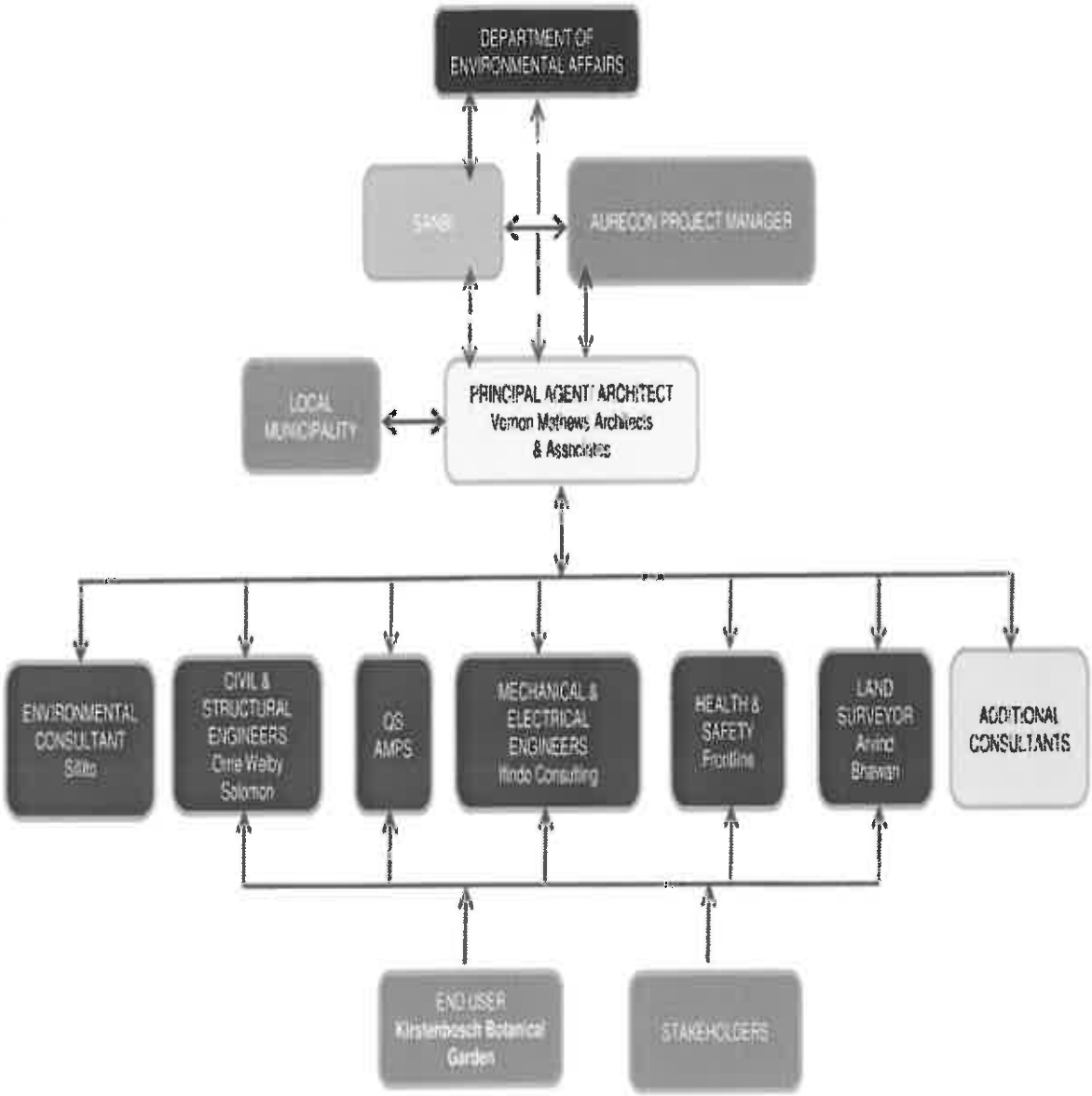
A provision for 50 cars has been allowed for in the parking area

5.5 Designation of Building in terms of SANS 10400 Edition 3:

Plan Approval Process

	Project Manager	Aurecon (Amjad Hendricks)
	Consultants	
1	Principal Agent	VMA
2	Architect	VMA
3	Quantity Surveyor	AMPS
4	Structural Engineer	OWS
5	Civil Engineer	OWS
6	Electrical Engineer	IFINDO CONSULTING ELECTRICAL & MECHANICAL ENGINEERS
7	Mechanical Engineer	IFINDO CONSULTING ELECTRICAL & MECHANICAL ENGINEERS
8	Environmental Consultant	Sillito environmental consulting
9	Land Surveyor	Arvind N Bhawan Professional Land Surveyor
10	Health & Safety	Frontline
	Additional Consultants	
11	Geotechnical Engineer	T.B.C
12	Sustainable Consultants	T.B.C
13	Lighting Consultants	T.B.C
14	Landscaping	T.B.C
15	Interior Designer	T.B.C
16	Fire Engineer	T.B.C

5.6 Organogram – Lines of reporting



5.7 Contractual Matters

1. Professionals will be guided by their different codes of practice & conduct as prescribed by the professional bodies, as well as the government act and SANBI DEA Standards & Policy.

2. Procurement procedure & processes to be in line with PFMA and the affirmative action policy guidelines.

3. The Form of contract during the construction phase of the project will be the JBCC Principle Building Contract with Quantities Version 4.1

4. Indemnity Insurance / Consultants.

5. All Guarantees, all risk insurance & public liability insurance to be in place at the commencement of construction.

6. World Heritage Site Development Guidelines to be incorporated & adhered to.

7. Additional Scope of Work and items to be included as an addendum to signed contract.

Angelo Manzoni	Christopher Willis
VMA Architects	SANBI
Date: 14 July 2014	Date: 23 July 2014

NICK HELME BOTANICAL SURVEYS
PO Box 22652 Scarborough 7975
Ph: 021 780 1420 cell: 082 82 38350 email: botaneek@iafrica.com
Pri.Sci.Nat # 400045/08

BOTANICAL ASSESSMENT OF PROPOSED DEVELOPMENT AREA AT KIRSTENBOSCH NATIONAL BOTANICAL GARDEN.

Compiled for: Sillito Environmental Consultants, Tokai

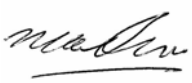
Client: South African National Biodiversity Institute

5 June 2014

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.



NA Helme

ABRIDGED CV:

Contact details as per letterhead.

Surname : HELME

First names : NICHOLAS ALEXANDER

Date of birth : 29 January 1969

University of Cape Town, South Africa. BSc (Honours) – Botany (Ecology & Systematics), 1990.

Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been the Sole Proprietor of Nick Helme Botanical Surveys, and have undertaken over 1300 site assessments in this period.

Peninsula and Cape Flats botanical surveys include: Mitchells Plain & Brentwood Park scans (TEP 2014); Wolwerivier scan, Vissershok (TEP 2014); CoCT BioSolids Beneficiation IA, Vissershok (RMS; 2013); De Grendel 24G study (De Grendel; 2013); Koeberg Visitors Centre constraints study (Stauch Vorster; 2013); Protea Ridge IA, Kommetjie (Doug Jeffery; 2013); Delft Sand Mine (EnviroSci Africa; 2012); Atlantic Beach study (Kantey & Templer; 2012); Ocean View Erf 5144 updated baseline (GNEC; 2011); Ocean View infill housing BA (I. Terblanche & Associates; 2010), Oakhurst farm, Hout Bay (SEC 2010); Protea Ridge Corridor study (Doug Jeffery; 2009); Oudekraal botanical constraints study (Doug Jeffery 2009); Mitchells Plain hospital site (Doug Jeffery; 2006, 2008); Eerste River Erf 5540 (CCA 2008);

Eerste River Erf 5541 (EnviroDinamik 2008); Kommetjie Riverside IA (Doug Jeffery 2008); Strandfontein Road widening (CoCT 2008); Pelikan Park IA (CoCT 2008); Blue Downs Erf 1897 (Environmental Partnership 2008); Driftsands NR Sensitivity Study (CapeNature 2006); Assessment of Driftsands South (Environmental Partnership 2006); Woodgreen housing Mitchell's Plain (CCA; 2006); Assessment of new Eskom Briers Substation and new 66kV overhead powerline (Eskom 2006); Muizenberg erf 108161 (CndeV; 2005); Muizenberg erf 159848 (Headland; 2005); Muizenberg erf 159850 (Headland; 2005); Kommetjie Riverside Ext 2. (Headland; 2005); Ocean View Mountain View extension IA (Ecosense; 2005); Imhoffs farm (Headland; 2005); Rocklands, Simonstown (CCA; 2005); Erf 35069 and Ptn. Erf 3418, Kuils River (SEC; 2005); Erf 550 & 552, Phillippi (Amathemba Environmental; 2005); proposed Grand Prix site next to CT International, Belhar (EnviroDinamik; 2005; Environmental Partnership 2007); Dreamworld film studio survey and Impact Assessment (Environmental Partnership; 2004 & 2005); Kompanjiestuin survey and Impact Assessment (Ecosense; 2004); Scarborough Erf 766 IA (ERM; 2004), Erf 11825, Fish Hoek (private client, 2004); R300 Cape Flats Ring Road surveys (Ecosense and Ecosense/Chand jv; 2003-2007); survey of remaining areas of natural vegetation in the eastern portion of the Cape Flats (Botanical Society of SA; 1999 - 2000).

CONDITIONS RELATING TO THIS REPORT:

The methodology, findings, results, conclusions and recommendations in this report are based on the author's best scientific and professional knowledge, and on referenced material and available knowledge. Nick Helme Botanical Surveys and its staff reserve the right to modify aspects of the report, including the recommendations and conclusions, if and when additional relevant information becomes available.

This report may not be altered or added to without the prior written consent of the author, and this also applies to electronic copies of this report, which are supplied for purposes of inclusion in other reports, including in the report of EAPs. Any recommendations, statements or conclusions drawn from or based on this report must cite this report, and should not be taken out of context, and may not change, alter or distort the intended meaning of the original in any way. If these extracts or summaries form part of a main report relating to this study or investigation this report must be included in its entirety as an appendix or separate section to the main report.

TABLE OF CONTENTS

1. INTRODUCTION

This botanical assessment was commissioned in order to help inform the planning and environmental authorisation process being followed for a proposed development in the vicinity of the laboratory and administration offices (head office) of Kirstenbosch National Botanical Gardens, Newlands (see Figure 1).

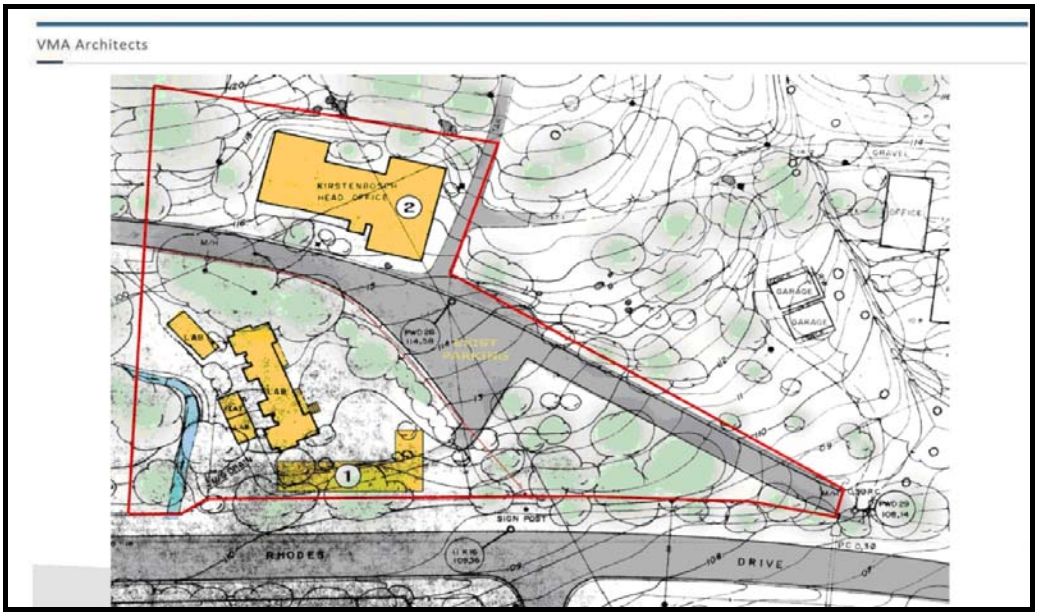


Figure 1: Map (provided) showing the study area (red outline).

2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Undertake a site visit in order to assess the vegetation in the study area.
- Compile a report which identifies any plant Species of Conservation Concern, and any threatened ecosystems present.
- Map the extent and location of areas of botanical significance that should be taken into account by the proposed development.
- Provide an overview of the botanical conservation significance of the vegetation in the study area, making reference to the available conservation planning products.
- Compile a report, including identification of key development constraints and opportunities.
- Identify and assess the likely botanical impacts associated with the proposed development.
- Make recommendations to avoid or minimise the likely botanical impacts.

3. LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

The site was visited on 26 May 2014. This is early in the optimal winter - spring flowering season in this primarily winter rainfall region, and consequently I was not able to either record or identify a few of the species that were either confirmed or likely to be present, notably some of the herbs and bulbs. Some of these potential species could be Species of Conservation Concern (SCC), although the likelihood of there being viable populations of undetected SCC in the study area is deemed to be low, as few such SCC are herbs or bulbs in this particular area. Particular attention was paid to the presence and abundance of SCC, and no attempt was made to identify or enumerate the many species (many not native to the Kirstenbosch area) that have been planted within the formal gardens in the study area. I was able to identify most perennial species on site, with the exception of various extra-limital (non native) species that have been planted in the area, and the overall confidence level in the accuracy of the botanical findings is high. The author has undertaken extensive work within the region, which facilitates the making of local and regional comparisons and inferences of habitat quality and conservation value.

The study area is assumed to be as indicated in Figure 1. The study area was walked, and plant species were noted in the field, and various references noted in the text were consulted and referred to. Conclusions were drawn based on this documentation and professional experience in the area. No attempt was made to describe, map or assess the wetland environments on site, as it was understood that a separate freshwater assessment had been commissioned.

The botanical conservation value of a site is a product of plant species diversity, plant community composition, rarity of habitat, degree of habitat degradation, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats.

It is understood that the proposed development is as follows:

Area 1

- The existing prefabricated building will be removed.
- The site will be converted in to a small parking area.
- The proposed parking area is within 32m of the Liesbeek River.
- Some of the existing garden located directly in front of the prefabricated building will have to be removed to accommodate the parking area. The

architects have stated that they want to retain as much of this existing garden section as possible.

Area 2

- The existing administration building (marked “Kirstenbosch Head Office” on the attached site plans) will be demolished.
- A new administration building will be constructed in its place.
- The administration building will be within the existing development footprint and will not encroach on the existing vegetation currently surrounding the existing building.
- The administration building will have an additional storey to accommodate more people.

Fynbos Lodge

- The yellow building titled “lab” on the attached site plans is the Fynbos Lodge
- The asbestos roof will be removed.
- There will be small interior renovations to the building- painting, replacing of counter tops, etc.
- No structural changes will occur to the building.

4. REGIONAL CONTEXT OF THE VEGETATION

The study area is considered to be part of the Southwest Fynbos bioregion (Mucina & Rutherford 2006), and is part of the Fynbos biome, located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR; Manning & Goldblatt 2012). The GCFR is one of only six Floristic Regions in the world, and is the only one largely confined to a single country (the Succulent Karoo component extends into southern Namibia). It is also by far the smallest floristic region, occupying only 0.2% of the world’s land surface, and supporting about 11500 plant species, over half of all the plant species in South Africa (on 12% of the land area). At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Many of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. Data from the nationwide plant Red Listing project indicate that 67% of the threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo *et al* 2009)! It should thus be clear that the southwestern Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species.

The Southwestern bioregion is characterised by relatively high winter rainfall and rich to poor lowland soils, with intensive agriculture and large urban areas. Due to this combination of factors the loss of natural vegetation in this bioregion has been severe (>80% of original extent lost within the lowland regions), and the bioregion has the highest number of threatened plant species of any bioregion in the country (Raimondo *et al* 2009).

The City of Cape Town regularly updates and revises its Biodiversity Network as sites are lost and new information becomes available (Holmes *et al* 2008), and the latest map (dated 2013) indicates that the entire study area lies within a designated Protected Area, namely the Table Mountain National Park. I am not sure how accurate this classification really is, but shall assume that it is accurate. No copy of the Biodiversity Network map is provided given that the entire area falls within the Protected Area.

5. THE VEGETATION ON SITE

According to the SA Vegetation Map (Mucina & Rutherford 2006) the original natural vegetation throughout the study area is Peninsula Granite Fynbos, with Southern Afrotemperate Forest patches higher up the mountain, about 600m to the west.

Peninsula Granite Fynbos has been classified as Critically Endangered on a national basis (DEA 2011). This unit has lost about 55% of its total original extent, and some 38% is formally conserved (entirely within the TMNP), well over the national target of 30% (Rouget *et al* 2004). These statistics do however, significantly overestimate the remaining area, as many patches have converted to Southern Afrotemperate Forest and forest precursor in the persistent absence of fire, as on this site.

Southern Afrotemperate Forest is technically not present on site, though in reality there are elements present. This unit is regarded as Least Threatened on a national basis (DEA 2011), with about 97% of its original total extent still remaining, some 59% formally protected, and a national conservation target of 34% (Rouget et al 2004).

Plate 1: View of the road to the main offices, looking northeast from close to the southern edge of the study area. The green roof of the laboratory area is just visible on the right hand side.

Plate 2: View of forest precursor vegetation south of the admin building, with the spiny shrub *Gymnosporia buxifolia* (pendoring) prominent.

The vegetation on site is a mix of locally indigenous, natural vegetation, and a smorgasbord of planted species, many of which are extralimital and not locally indigenous. There are even very large specimens of what are presumably stone pines (*Pinus pinea*; trunks and lower branches prominent in Plate 1) along the road, and these trees are of course exotic, although only mildly invasive. There are in fact many alien invasive species present, including *Acacia elata, Hypochaeris radicata*

(dandelion), *Commelina* sp*., Pennisetum clandestinum* (kikuyu grass), *Plantago lanceolata* (ribwort), *Vinca major* (periwinkle) and *Hedera* sp. (ivy).

Planted, non-locally indigenous species include *Ficus* sp., *Strelitzia* sp., *Searsia lancea* (karee), *Cussonia* sp. (cabbage tree), *Plectranthus* spp., *Dietes* sp., *Aloe arborescens*, *Asparagus* spp., *Crassula* sp., *Rhoicissus digitata* (wild grape), *Portulacaria afra* (spekboom), *Hypoestes aristata* (ribbon flower), *Barleria* sp., *Tecomaria* sp., *Quercus robur* (oak), *Eragrostis curvula, Senecio triqueter, Pelargonium* sp., *Psychotria* sp. and *Coleonema pulchellum*.

Locally indigenous species noted include *Celtis africana* (white stinkwood), *Kiggelaria africana* (wild peach), *Brabejum stellatifolium* (wild almond), *Oxalis pes-caprae, Searsia lucida* (blink taaibos), *S. tomentosa, Virgilia oroboides* (keurboom), *Myrsine africana, Chasmanthe aethiopica* (cobraflower), *Stenotaphrum secundatum* (buffalo grass), *Cassine peragua* (saffronwood), *Euryops pectinatus, Salvia africana-caerulea, Cotyledon orbiculata*, *Diospyros whyteana* (bladder nut), *Olea europaea* ssp. *africana* (wild olive), *Polygala myrtifolia, Clutia pulchella, Gymnosporia buxifolia* (pendoring), *Podalyria calyptrata* (keurtjie), *Apodytes dimidiata* (white pear), *Asparagus scandens, Canthium inerme, Knowltonia vesicatoria, Passerina corymbosa* (gonna) and *Aristea major*. These are all widespread and common species.

No plant Species of Conservation Concern were recorded, and none are likely to occur in viable or significant populations in the study area.

6. BOTANICAL CONSERVATION VALUE

The areas that are currently developed (roads, parking areas, buildings, pathways) and that are currently planted gardens or lawns are all of Low botanical conservation value. These areas are shown in Figure 2 and make up about 80% of the study area. No areas are deemed to be of High botanical sensitivity, as none of the species are Species of Conservation Concern, and the plant communities are well represented in the area.

Two patches of Medium botanical sensitivity were mapped on site (Figure 2). These together cover about 20% of the site and support the least modified natural vegetation on site, and the patch closest to Rhodes Drive is bisected by the Liesbeek River, but is more disturbed than the patch next to the head office.

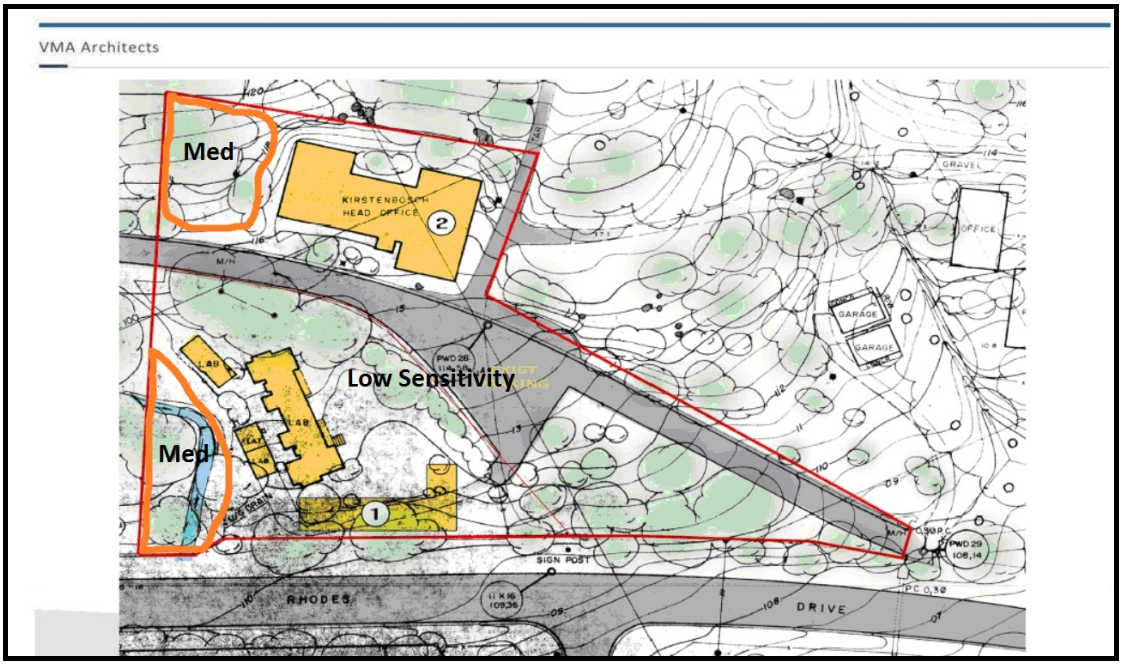


Figure 2: Botanical sensitivity drawn onto the layout map. All areas are of Low sensitivity, other than the two patches of Medium sensitivity.

7. IMPACT ASSESSMENT

7.1 Identification of Likely Impacts

Based on the information provided it appears that all development will take place within the area of Low botanical sensitivity (Figure 2). Any negative botanical impacts are likely to occur only at the Construction Phase, with no significant negative impacts at the Operational Phase. Some minor positive impacts may occur at the operational phase, in the form of rehabilitation.

Construction Phase impacts are likely to be mainly the disturbance of the soil and loss and damage to the vegetation bordering on the development areas, including some of the current gardens and lawns.

Operational Phase impacts may include planting of suitable locally indigenous species, and rehabilitation of disturbed areas.

7.2 Construction Phase Impacts

The extent of likely disturbance or loss of natural or partly natural vegetation (the latter including gardens) is likely to amount to less than 0.2ha. About 75% of the construction will take place in areas that are currently built or hardened, or is lawn.

The remainder will probably take place in areas that are currently gardened or only partly natural. No plant Species of Conservation Concern are likely to be impacted by the proposed development.

On balance the overall construction phase botanical impacts are thus likely to be Low negative before mitigation, and Neutral after mitigation.

Alternative	**Extent of impact**	**Duration of impact**	**Intensity**	**Probability of occurrence**	**Degree of confidence**	**Significance before mitigation**	**Significance after mitigation**
Proposed development	Site	Temporary to Permanent	Low	Definite	High	Low	Neutral
No Go	None	None	None	NA	High	Neutral	Neutral

Table 1: Construction Phase Impact table for the proposed project.

7.3 Operational Phase Impacts

Operational Phase impacts may include some minor alien plant invasion. Soil disturbance is a well known facilitator of alien plant invasion, but this can be effectively mitigated, which will reduce the impact to negligible.

The previously mentioned rehabilitation of disturbed areas and planting with suitable locally indigenous species is a form of mitigation, but it could also be viewed as a positive operational phase impact.

On balance the overall operational phase botanical impacts are likely to be Very Low negative before mitigation, and Low positive after mitigation.

Alternative	**Extent of impact**	**Duration of impact**	**Intensity**	**Probability of occurrence**	**Degree of confidence**	**Significance before mitigation**	**Significance after mitigation**
Proposed Development	Site	Mostly Medium term (1 - 5yrs)	Very Low	Moderate to High	Moderate - High	Very Low negative	Low positive
No Go	None	None	None	NA	High	Neutral	Neutral

Table 2: Operational Phase Impact table for the proposed project.

7.4 The No Go alternative

The No Go alternative is usually considered to be the continuation of the status quo. There would thus not be any construction phase impacts, and the only relevant impacts would be very low level alien invasive plant invasion, currently having negligible botanical impact in the remaining natural vegetation in the study area. Overall botanical impact of the No Go is thus deemed to be Neutral.

8. MITIGATION RECOMMENDATIONS

The following mitigation is considered to be feasible, reasonable and essential, and is factored in to the assessment:

- All alien invasive vegetation (excluding the only mildly invasive stone pines *Pinus pinea*, which are a feature of the area) within the study area should be felled and/or removed during the construction phase, and the area should be monitored for alien invasive vegetation for one year after construction.
- Suitable locally indigenous plant species should be planted in all areas requiring rehabilitation after construction is over.
- The Medium sensitivity areas indicated in Figure should not be disturbed during construction.

9. CONCLUSIONS AND RECOMMENDATIONS

- About 75% of the study area is of Low botanical sensitivity, with no plant Species of Conservation Concern observed or likely, and consisting mostly of developed or hardened areas, or planted gardens. Two patches of Medium sensitivity have been identified, which are likely to be outside the proposed development footprint.
- The proposed project is not likely to have more than a Low negative botanical impact overall (before mitigation) and a Neutral impact after mitigation, and the site does not present any notable constraints to the proposed development.
- The tall stone pines (*Pinus pinea*, shown in Plate 1) on site can be retained (if desired) as they are not particularly invasive and are a major feature of the area.

10. REFERENCES

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Holmes, P., J. Wood and C. Dorse. 2008. Updated (2013) and groundtruthed CoCT Biodiversity Network on GIS (cd), together with City of Cape Town – Biodiversity Report. Environmental Management Branch, City of Cape Town. Available from: www.iclei.org/lab

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Mucina, L. and M. Rutherford. *Eds.* 2006. Vegetation map of South Africa, Lesotho, and Swaziland. *Strelitzia 19*. South African National Biodiversity Institute, Pretoria.

Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A., and Manyama, P.A. (eds.) 2009. Red List of South African Plants 2009. *Strelitzia 25*. South African National Biodiversity Institute, Pretoria.

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. *South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 1: Terrestrial Component.* Pretoria: South African National Biodiversity Institute.

NICK HELME BOTANICAL SURVEYS

PO Box 22652 Scarborough 7975
Ph: 021 780 1420 cell: 082 82 38350 email: botaneek@iafrica.com
Pri.Sci.Nat # 400045/08

3 Feb 2016

SEC
Tokai
ATT: Lauren le Roux

Dear Lauren

Comment on Scheme 2 layout, Kirstenbosch office rebuild, SANBI, Cape Town.

My botanical IA report for this site, dated 5 June 2014, referred to a single development alternative, and a second alternative has recently been proposed. This second alternative (Scheme 2) is very similar, is two storeys, and has a smaller floor area, but virtually the same footprint, although it has moved 3m west and 1m north relative to the Scheme 1 footprint, to conserve existing trees along the road.

It is my opinion that there will be no significant differences in terms of botanical impacts between Scheme 1 and Scheme 2, and that both will have a Low negative botanical impact overall (before mitigation). There is no strongly preferred development alternative from a botanical perspective.

Yours sincerely

Nick Helme

iLifa leMveli leNtshona Koloni
Erfenis Wes-Kaap
Heritage Western Cape

NOTIFICATION OF INTENT TO DEVELOP

Completion of this form is required by Heritage Western Cape for the initiation of all impact assessment processes under Section 38(1) & (8) of the National Heritage Resources Act.

Whilst it is not a requirement, it may expedite processes and in particular avoid calls for additional information if certain of the information required in this form is provided by a heritage specialist/s with the necessary qualifications, skills and experience.

A. BASIC DETAILS

PROPERTY DETAILS:

Name of property: Kirstenbosch National Botanical Gardens	
Street address or location (eg: off R44): Off M63, Rhodes Drive	
Erf or farm number/s: Remainder of Farm 857	Coordinates: 33° 59' 12"S 18° 26' 09"E (A logical centre point. Format based on WGS84.)
Town or District: Cape Town	Responsible Municipality: City of Cape Town
Extent of property: 149.8941 ha	Current use: administrative area for the National Botanical Garden
Predominant land use/s of surrounding properties: Residential to the east, Table Mountain National Park to the west	

REGISTERED OWNER OF PROPERTY:

Name		
Address		
Telephone	Cell	E-mail

By the submission of this form and all material submitted in support of this notification (ie: 'the material'), all applicant parties acknowledge that they are aware that the material and/or parts thereof will be put to the following uses and consent to such use being made: filing as a public record; presentations to committees, etc; inclusion in databases; inclusion on and downloading from websites; distribution to committee members and other stakeholders and any other use required in terms of powers, functions, duties and responsibilities allocated to Heritage Western Cape under the terms of the National Heritage Resources Act. Should restrictions on such use apply or if it is not possible to copy or lift information from any part of the digital version of the material, the material will be returned unprocessed.

I confirm that I enclose with this form four hardcopies of all material submitted together with a CD ROM containing digital versions of all of the same.

Signature of owner or authorised agent Date / / 20
(Agents must attach copy of power of attorney to this form.)

DEVELOPMENT DETAILS:

Please indicate below which of the following Sections of the National Heritage Resources Act, or other legislation has triggered the need for notification of intent to develop.

☐ S38(1)(a) Construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier over 300m in length.	S38(1)(c) Any development or activity that will change the character of a site -
☐ S38(1)(b) Construction of a bridge or similar structure exceeding 50m in length.	☒ (i) exceeding 5 000m^2 in extent;
☐ S38(1)(d) Rezoning of a site exceeding 10 000m^2 in extent.	☐ (ii) involving three or more existing erven or subdivisions thereof;
☐ Other triggers, eg: in terms of other legislation, (ie: National Environment Management Act, etc.) Please set out details:	☐ (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years.
	If you have checked any of the three boxes above, describe how the proposed development will change the character of the site: Two single storey buildings will be demolished. One will be replaced by a double storey structure on the same (or almost identical) footprint, the other will be replaced by a car park. Minor rennovation and alteration of an adjacent structure (referred to as Fynbos Lodge; greater than 60 years old) will also take place.

If an impact assessment process has also been / will be initiated in terms of other legislation please provide the following information:

Authority / government department (ie: consenting authority) to which information has been /will be submitted for final decision:

Present phase at which the process with that authority stands:

Provide a full description of the nature and extent of the proposed development or activity including its potential impacts (eg: changes in land use, envisaged timeframes, provision of additional bulk services, excavations, landscaping, total floor area, height of development, etc. etc.):

Area 1

- The existing prefabricated building will be removed.
- The site will be converted into a small parking area.
- The proposed parking area is within 32m of the Liesbeek River.
- Some of the existing garden located directly in front of the prefabricated building will have to be removed to accommodate the parking area. The architects have stated that they want to retain as much of this existing garden section as possible.

Area 2

- The existing administration building (marked “Kirstenbosch Head Office” on the attached site plans) will be demolished. This building is c. 30 years old.
- A new administration building will be constructed in its place.

- The administration building will be within the existing development footprint and will not encroach on the existing vegetation currently surrounding the existing building. No new bulk services will be required as the site is already serviced.
- The administration building will have an additional storey to accommodate more people into the building.

Fynbos Lodge
- The building titled "lab" on the attached site plan is the Fynbos Lodge
- The current roof will be removed and replaced with something that will have a similar appearance, probably a Nu-Tec product (fibre cement).
- There will be small interior renovations to the building- painting, replacing of counter tops etc.
- No structural changes will occur to the building.

B. HERITAGE RESOURCES AND IMPACTS THEREUPON

Section 3 of the National Heritage Resources Act sets out the following categories of heritage resource as forming part of the national estate. Please indicate the known presence of any of these by checking the box alongside and then providing a description of each occurrence, including nature, location, size, type

Failure to provide sufficient detail or to anticipate the likely presence of heritage resources on the site may lead to a request for more detailed specialist information.

(The assistance of relevant heritage professionals is particularly relevant in completing this section.)

Provide a short history of the site and its environs (Include sources where available): On 27 October 1657 land including Kirstenbosch was granted to Leendert Cornelissen. He was to protect the forest and see that the Colony had a secure supply of wood. Van Riebeeck planted the Wild Almond Hedge, part of which survives on the southern edge of the Gardens, as a defensive mechanism against the locals. The name Kirstenbosch appears to have originated around the time that the VOC possessions at the Cape were handed over to British rule. The property changed hands many times during the 1800s and a farm house was built. The land was farmed in the 19th century and then purchased by Cecil John Rhodes in 1895. The well-known camphor tree avenue was planted by Rhodes (Rhodes Drive used to run through the avenue) but the farm soon fell into disrepair. On Rhodes' death he bequeathed the farm to the Government who developed the forestry. In 1913 the Government set the estate aside for development of a Botanical Garden. Harold Pearson was instrumental in getting it off the ground but he died in 1916 and is buried in the Garden. Development of the Garden continued over the years. (Source http://www.sanbi.org/gardens/kirstenbosch/history-kirstenbosch-nbg)

Please indicate which heritage resources exist on the site and in its environs, describe them and indicate the nature of any impact upon them:

☒	**Places, buildings, structures and equipment of cultural significance** Description of resource: There is a structure of greater than 60 years located immediately adjacent to the prefabricated structure. Description of impact on heritage resource: This older structure will be rennovated/altered as part of the project but a built environment application will be made at the time.
☐	**Places to which oral traditions are attached or which are associated with living heritage** Description of resource: Description of impact on heritage resource:

☐	**Historical settlements and townscapes** Description of resource: Description of impact on heritage resource:
☒	**Landscapes and natural features of cultural significance** Description of resource: The Kirstenbosch National Botanical Graden is part of the Cape Floral Region World Heritage Site. In addition, many of the main features of the garden (rockeries, paths, pools, etc) were constructed more than 60 years ago making the whole landscape of heritage significance. Description of impact on heritage resource: There will be no impact on the Garden landscape since the work to be carried out is solely within the administrative area of the property which is well screened from the Garden and surrounds by trees.
☐	**Geological resources of scientific or cultural importance** Description of resource: Description of impact on heritage resource:
☐	**Archaeological resources** (Including archaeological sites and material, rock art, battlefields & wrecks)**:** Description of resource: Description of impact on heritage resource:
☐	**Palaeontological resources** (ie: fossils)**:** Description of resource: Description of impact on heritage resource:
☒	**Graves and burial grounds** (eg: ancestral graves, graves of victims of conflict, historical graves & cemeteries)**:** Description of Resource: The grave of Harold Pearson lies on the property but it is far from the proposed interventions. Likewise, a historical graveyard lies adjacent to the small church to the east of Rhodes Drive and will not be impacted in any way. Description of Impact on Heritage Resource: No impacts.
☐	**Other human remains:** Description of resource: Description of impact on heritage resource:
☐	**Sites of significance relating to the history of slavery in South Africa:** Description of resource: Description of impact on heritage resource:
☐	**Other heritage resources:** Description of resource: Description of impact on heritage resource:

Describe elements in the environs of the site that could be deemed to be heritage resources: as above

Description of impacts on heritage resources in the environs of the site: as above

Summary of anticipated impacts on heritage resources: The only heritage resource that will be impacted is a structure greater than 60 years of age. A built environment application will be made for the purposes of alterations to that structure.

ILLUSTRATIVE MATERIAL (This form will not be processed unless the following are included):

Attach to this form a minimum A4 sized locality plan showing the boundaries of the area affected by the proposed development, its environs, property boundaries and a scale. The plan must be of a scale and size that is appropriate to creating a clear understanding of the development.
Attach also other relevant graphic material such as maps, site plans, satellite photographs and photographs of the site and the heritage resources on it and in its environs. These are essential to the processing of this notification.
Please provide all graphic material on paper of appropriate size and on CD ROM in JPEG format. It is essential that graphic material be annotated via titles on the photographs, map names and numbers, names of files and/or provision of a numbered list describing what is visible in each image.

C. RECOMMENDATION

In your opinion do you believe that a heritage impact assessment is required? ☐ Yes ☒ No

Recommendation made by:

Name Jayson Orton

Capacity Heritage Practitioner

PLEASE NOTE: No Heritage Impact Assessment should be submitted with this form or conducted until Heritage Western Cape has expressed its opinion on the need for such and the nature thereof.

D. INFORMATION TO BE PROVIDED AND STUDIES TO BE CONDUCTED AS PART OF THE HERITAGE IMPACT ASSESSMENT (HIA)

If it is recommended that an HIA is required please complete this section of the form.

DETAILS OF HERITAGE PRACTITIONERS AND SPECIALISTS INTENDING TO CONDUCT THE HIA:

1.	Name of individual: Name of Practice: Area of specialisation: Qualifications: Experience: Standing in heritage resource management: E-mail Address: Telephone: Cell:
2.	Name of individual: Name of Practice: Area of specialisation: Qualifications: Experience: Standing in heritage resource management: E-mail Address: Telephone: Cell:

3.	Name of individual: Name of Practice: Area of specialisation: Qualifications: Experience: Standing in heritage resource management: E-mail Address: Telephone: Cell:
4.	Name of individual: Name of Practice: Area of specialisation: Qualifications: Experience: Standing in heritage resource management: E-mail Address: Telephone: Cell:
5.	Name of individual: Name of Practice: Area of specialisation: Qualifications: Experience: Standing in heritage resource management: E-mail Address: Telephone: Cell:

If this submission is made in terms of Section 38(8) of the National Heritage Resources Act indicate below the particulars of the principle environmental consultant on the project.

Name of individual: Name of Practice: Area of specialisation:

E-mail Address: Telephone: Cell:

Postal Address:

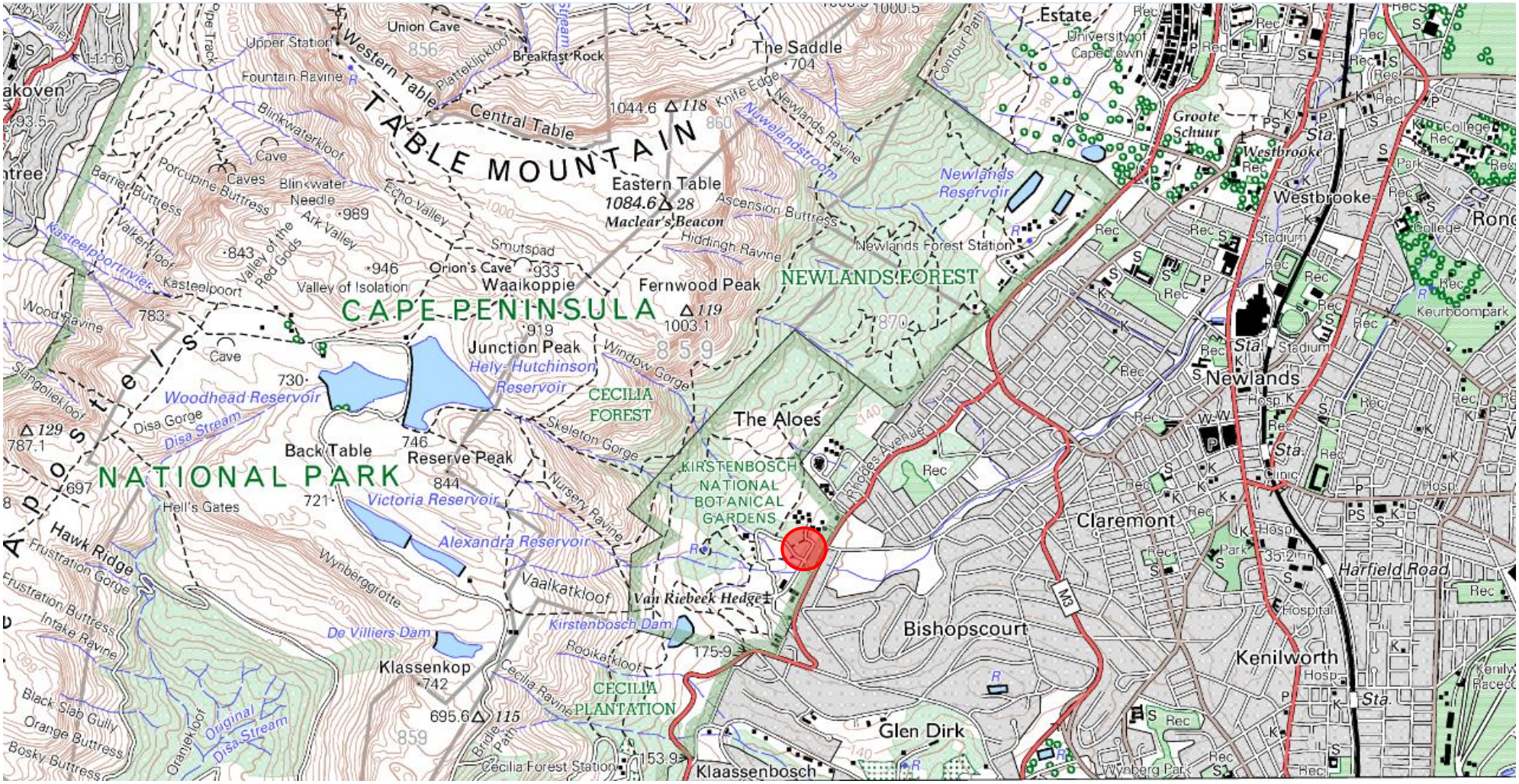
DETAILS OF STUDIES TO BE CONDUCTED IN THE INTENDED HIA

In addition to the requirements set out in Section 38(3) of the NHRA, indicate envisaged studies:	
☐	Heritage resource-related guidelines and policies.
☐	Local authority planning and other laws and policies.
☐	Details of parties, communities, etc. to be consulted.
☐	Specialist studies, eg: archaeology, palaeontology, architecture, townscape, visual impact, etc. Provide details:
☐	Other. Provide details:

PLEASE NOTE: Any further studies which Heritage Western Cape may resolve should be submitted must be in the form of a single, consolidated report with a single set of recommendations. Specialist studies must be incorporated in full, either as chapters of the report, or as annexures thereto.

NID SUPPORTING MATERIAL

SITE LOCATION

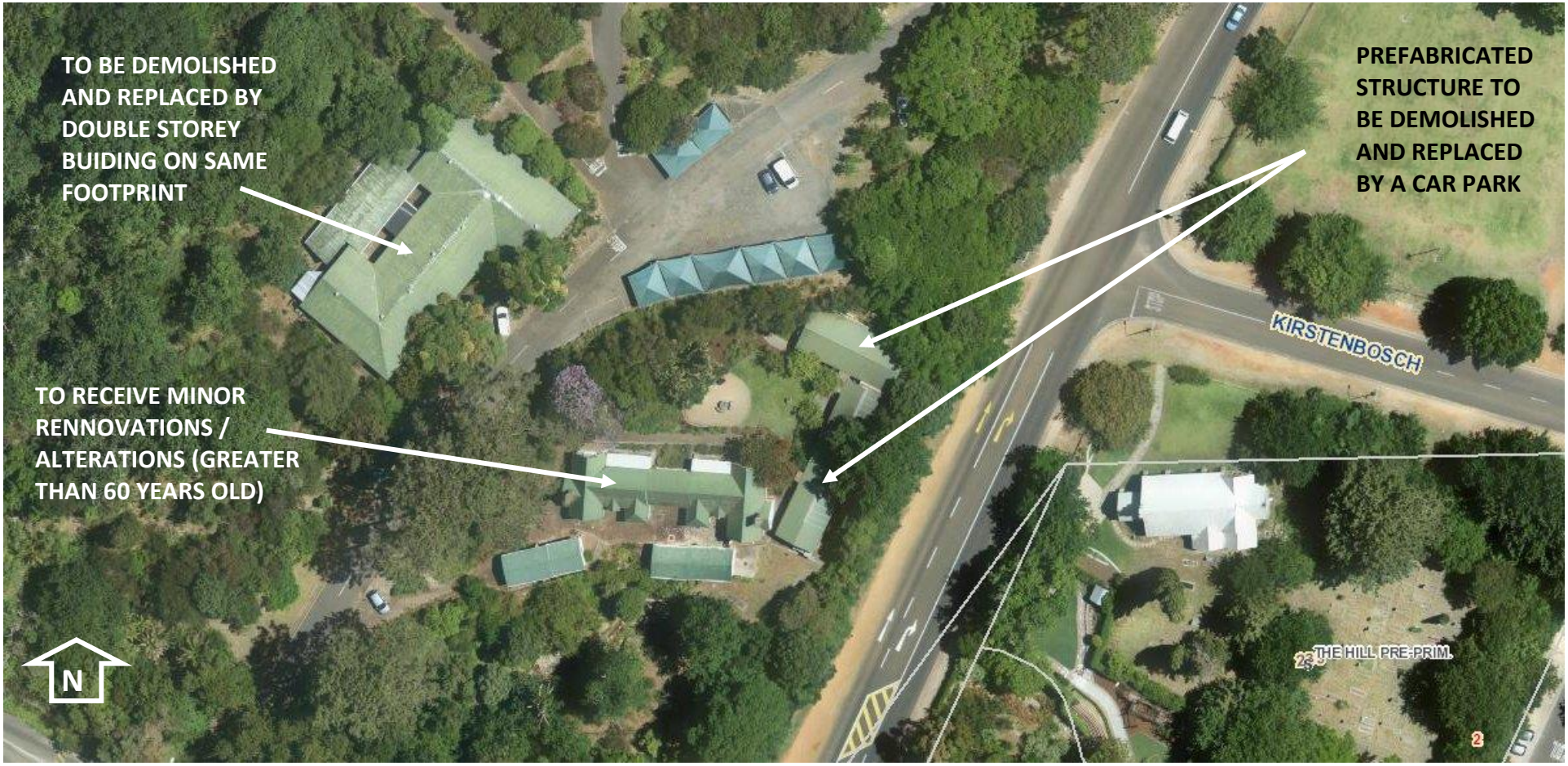


Extract from 3318CD showing the site (red circle).

SITE PLAN

Building marked (1) is to be demolished and replaced with a car park. Building marked (2) is to be replaced by a double storey building.

SITE AERIAL VIEW



Rhodes Drive runs from top right to bottom centre and the main entrance to Kirstenbosch off Rhodes Drive is just out of picture to the south.

PHOTOGRAPHS

Existing structure greater than 60 years of age (Fynbos Lodge) to be renovated / altered.

Prefabricated structures to be demolished.

Existing modern landscaping in the centre of the site to the north of Fynbos Lodge.

The southern end of the prefabricated structure and the relationship between the site and Rhodes Drive – Rhodes rive can just be seen through the vegetation and fence on the right hand side of the photograph. The corner of Fynbos Lodge can be seen on the left in the background (with stone rustication) and another modern outbuilding (to be retained) is on the left in the foreground.

Comparative modern (left) and 1944 (right) aerial views showing the site. The Fynbos Lodge is circled and the old alignment of Rhodes Drive is marked in yellow.

Our Ref: HM\CAPE TOWN METROPOLITAN\NEWLANDS\KIRSTENBOSCH NATIONAL BOTANICAL GARDENS FARM 857

iLifa leMveli leNtshona Kolony
Erfenis Wes Kaap
Heritage Western Cape

Enquiries Andrew September
Tel: 021 483 9543
Email: troy.smuts@westerncape.gov.za

Date: 02 October 2014
Case No: 14091706AS0919E
Auto IDs: 2809 - 3316

RESPONSE TO NOTIFICATION OF INTENT TO DEVELOP
In terms of section 38 of the National Heritage Resources Act (Act 25 of 1999)
and the Western Cape Provincial Gazette 6061, Notice 298 of 2003

Attention: Ms Kirsty Robinson
PO Box 303134
Tokai
Cape Town
7966

CASE NUMBER: 14091706AS0919E
NID: PROPOSED ADDITIONAL INFRASTRUCTURE AND FACILITY UPGRADE OON REMAINDER OF FARM 857, KIRSTENBOSCH NATIONAL BOTANICAL GARDENS, NEWLANDS.

The matter above has reference.

Your NID dated 26 September 2014 was tabled and the following was discussed:

1. HWC discussed the proposed development and infrastructure upgrade on Remainder of Farm 857, Kirstenbosch Botanical Gardens, Newlands.
2. No heritage resources will be effected by the proposed development.
3. No further studies is required.

Decision:

1. You are hereby notified that, since there is no reason to believe that the proposed development will impact on heritage resources, further processes under Section 38 of the National Heritage Resources Act (Act 25 of 1999) do not apply.

Terms and Conditions:

1. This approval does not exonerate the applicant from obtaining local authority approval or any other necessary approval for the proposed work.
2. If any heritage resources, including archaeological material, palaeontological material, graves or human remains, are encountered work must cease and they must be reported to Heritage Western Cape immediately.
3. Heritage Western Cape reserves the right to request additional information as required.

Should you have any further queries, please contact the official above and quote the case number above.

Yours faithfully

A. B. Hall

Andrew B Hall
Chief Executive Officer
Heritage Western Cape

www.capegateway.gov.za/culture_sport

Street Address: Protea Assurance Building, Green Market Square, Cape Town, 8000 • **Postal Address:** Private Bag X9067, Cape Town, 8001 • **Fax:** +27 (0)21 483 9842 • **E-mail:** hwc@pgwc.gov.za

Straatadres: Protea Assuransie-gebou, Groentemarkplein, Kaapstad, 8000 • **Posadres:** Privaatsak X9067 Kaapstad, 8001 • **Fax:** +27 (0)21 483 9842 • **E-pos:** hwc@pgwc.gov.za

ASHA Consulting (Pty) Ltd
6A Scarborough Road
Muizenberg
7945

01 February 2016

Lauren le Roux
SEC
By email: lauren@environmentalconsultants.co.za

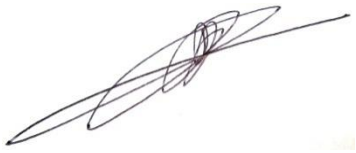
Dear Lauren

KIRSTENBOSCH ADMINISTRATIVE BUILDING: REVISED PROJECT DESCRIPTION AND LAYOUT

Thank you for sending the new project description and layout for the proposed Kirstenbosch administrative building. I agree that the new proposal will have less impact on heritage resources. In particular, the reduced height will reduce visibility with the result that the scenic drive passing the site will be less impacted. The site is quite well screened by trees in any case. It should be noted that upon receipt of the original Notification of Intent to Develop (NID). Heritage Western Cape (HWC), in their comment dated 02 October 2014) did not request any further studies because the potential impacts did not warrant such action. The South African Heritage Resources Agency (SAHRA), who were consulted because the site was within the Fynbos World Heritage Site, issued a comment on 02 February 2015 stating that they had no objections but that the height of the proposed structure was a concern. The new proposal (2 stories instead of 3) addresses this concern.

In my professional opinion, I therefore do not consider that there will be any new impacts to heritage resources as a result of the proposed changes and that in fact there is a benefit from the reduced building height.

Yours sincerely



Jayson Orton

VISUAL STATEMENT

Draft Report v1.2

SANBI New Buildings at the
Kirstenbosch National Botanical Gardens
Cape Town

10 February 2015

Prepared for:
Sillito Environmental Consulting
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EXECUTIVE SUMMARY

SANBI propose to upgrade the Administration Facilities at Kirstenbosch NBG in Cape Town. This will include the demolition of two existing prefab buildings, replacing one thereof with a 2.5 storey administration building, making improvements to the existing Fynbos Lodge, a small building with heritage significance, re-arranging and extending the parking area and stabilizing a section of an adjacent stream.

The location of this site is in the developed area of Kirstenbosch, immediately adjacent to Rhodes Drive. While built, the setting is still in a wooded, forest setting close to mountain streams. The Zone of Visual Influence is limited to the immediate site due to the surrounding trees.

While there will be a change to the visual environment through a new 2.5 storey building being built, on the footprint of the existing prefabricated building, this could be a positive improvement to the visual scene at the site, depending on the building materials and external finishes which at time of writing this report were not available, and the retention of all the trees.

The proposed parking area could be a negative visual impact as this entails the relocation of some existing trees, the removal of lawn and greenery and new paving. Plans at this stage do not reflect paving details nor any tree planting and as such this new parking area, which is also the forecourt to the Fynbos Lodge, is a large paved parking area and as such of visual concern.

Mitigation measures should include retention of wooded area around new Admin Building and appropriate hard and soft landscaping of the proposed parking development, which must play a dual role as the forecourt to the Fynbos, lodge building.

1. Introduction

1.1 Background and Approach to the study

SANBI propose infrastructure developments in Kirstenbosch National Botanical Gardens (NBG) in Cape Town in the Western Cape. These improvements will be to the existing buildings and a new Administration Building.

Sillito Environmental Consulting has been appointed to obtain the required authorization in terms of the NEMA regulations and have commenced the process.

Megan Anderson Landscape Architects (MALA) has been appointed to undertake the Visual Statement with respect to the possible visual impacts that the proposed development may have.

1.2 Terms of Reference

The following terms of reference have been proposed

- Identify issues raised in scoping phase, and site visit;
- Describe the receiving environment and the proposed project;
- Establish the view catchment area and receptors;
- Briefly indicate potential visual impacts, and possible mitigation measures

1.3 Methodology

A site visit and a photographic survey of the site and surrounds were undertaken. Receptors and the Viewshed were identified during the site visit.

A desktop mapping study was undertaken to map the viewshed and receptors

The findings of the above have been captured in this report and potential visual impacts identified with mitigation proposals.

1.4 Assumptions and Limitations

It is assumed that the information provided to MALA is correct.

2. Proposed Development

2.1 Site location

The proposed development is located within the Kirstenbosch National Botanical Gardens, which is located off Rhodes Drive in Cape Town, Western Cape.

Kirstenbosch is situated adjacent to the Table Mountain National Park and both form part of the Cape Floristic Region Protected Area, which was proclaimed a UNESCO World Heritage Site in 2004.

The entire Kirstenbosch National Botanical Garden falls outside of the City of Cape Town's zoning sphere and as such is not formally zoned as part of the City of Cape Town's zoning scheme,

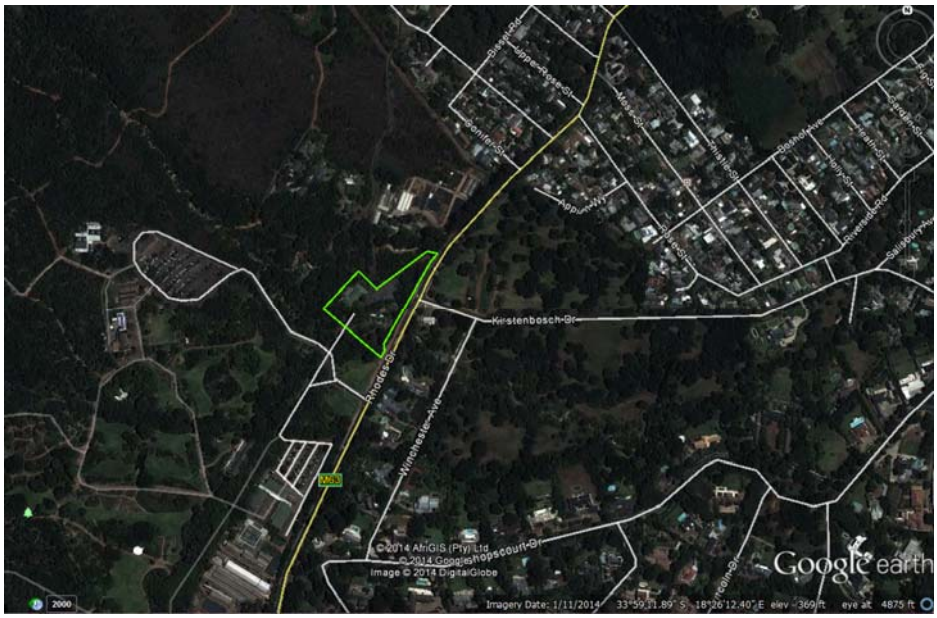

Figure 1 Location of site of proposed development in Kirstenbosch, Cape Town

The proposed development and upgrades is to take place in the small developed area (Erf 3040) of the cultivated section of the NBG.

Figure 2 Location of the development areas in the Harold Porter NBG (Source: VMA Architects)

2.2 Development Description

The development proposal is for the redevelopment of a 2500m^2 area of the cultivated gardens, including buildings. These buildings include Fynbos Lodge, which is over 60 years old, as well as the current Kirstenbosch Head Office as well as a small prefabricated building. The landscaping and parking areas associated with these existing buildings will also be altered in the redevelopment.

Due to the potential heritage value of Fynbos Lodge, no structural changes will occur to the building. The existing asbestos roofing will be replaced with a visually similar material, and maintenance-type renovations will take place in the interior of the building. The prefabricated building as well as the head office building will be demolished and redeveloped.

The upper catchment of the Liesbeck River is located in very close proximity to the area which is proposed to be redeveloped. The river is currently undercutting and weakening the north bank closest to the existing buildings and infrastructure. Therefore the development proposal includes the construction of gabions along the riverbank to reinforce this area. The gabions will run for approximately 20- 30metres within the existing curvature of the river. The total volume of material within the Liesbeck River to be excavated to put the gabions in place will be approximately 135m^3

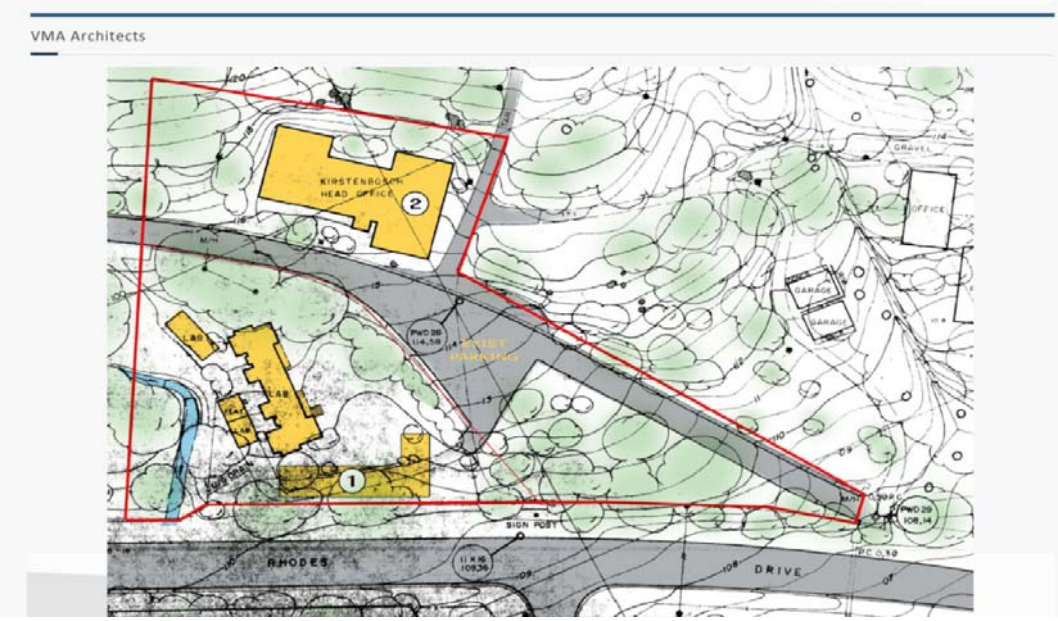

Figure 3 Site Plan of the location of the new proposed Administration Building (2) and Fynbos Lodge et al at the Kirstenbosch NBG

The new administration building facility will be situated in the position of the current Kirstenbosch Head Office and will accommodate the HR, Finance and IT departments and shared facilities for these departments. The total required area is 1778 m^2. The footprint of the current building is 850m2 so a multiple storey building will be required.

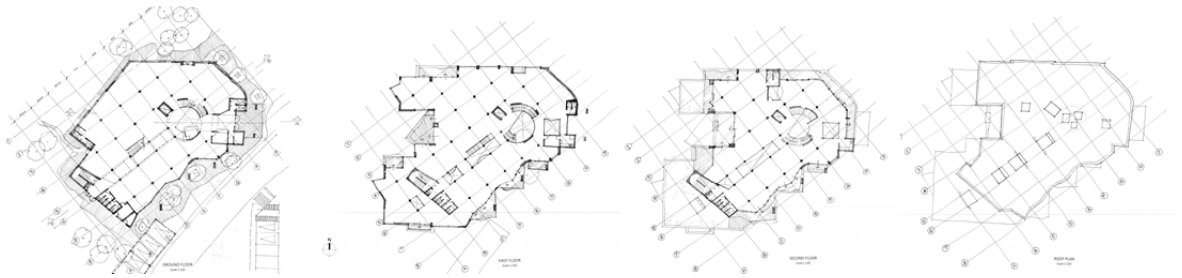

Figure 4 Proposed Ground Floor, First Floor, Second Floor and Roof Plan of proposed new building (Source: VMA Architects)

- Building will be within the existing development footprint and 2.5 storey's high;
- Ground level exterior will have a suspended timber deck to define the space which will soften the building and allow for an easier transition from the surrounding vegetated area to the building itself;
- 1st floor will cantilever over the ground floor to allow for the additional footprint required, avoid disturbing the surrounding vegetation and have a minimal structure as well as reducing the visual impact to adjacent residents through reducing the height of the building; and
- Roof of the Second Floor will be a garden space.

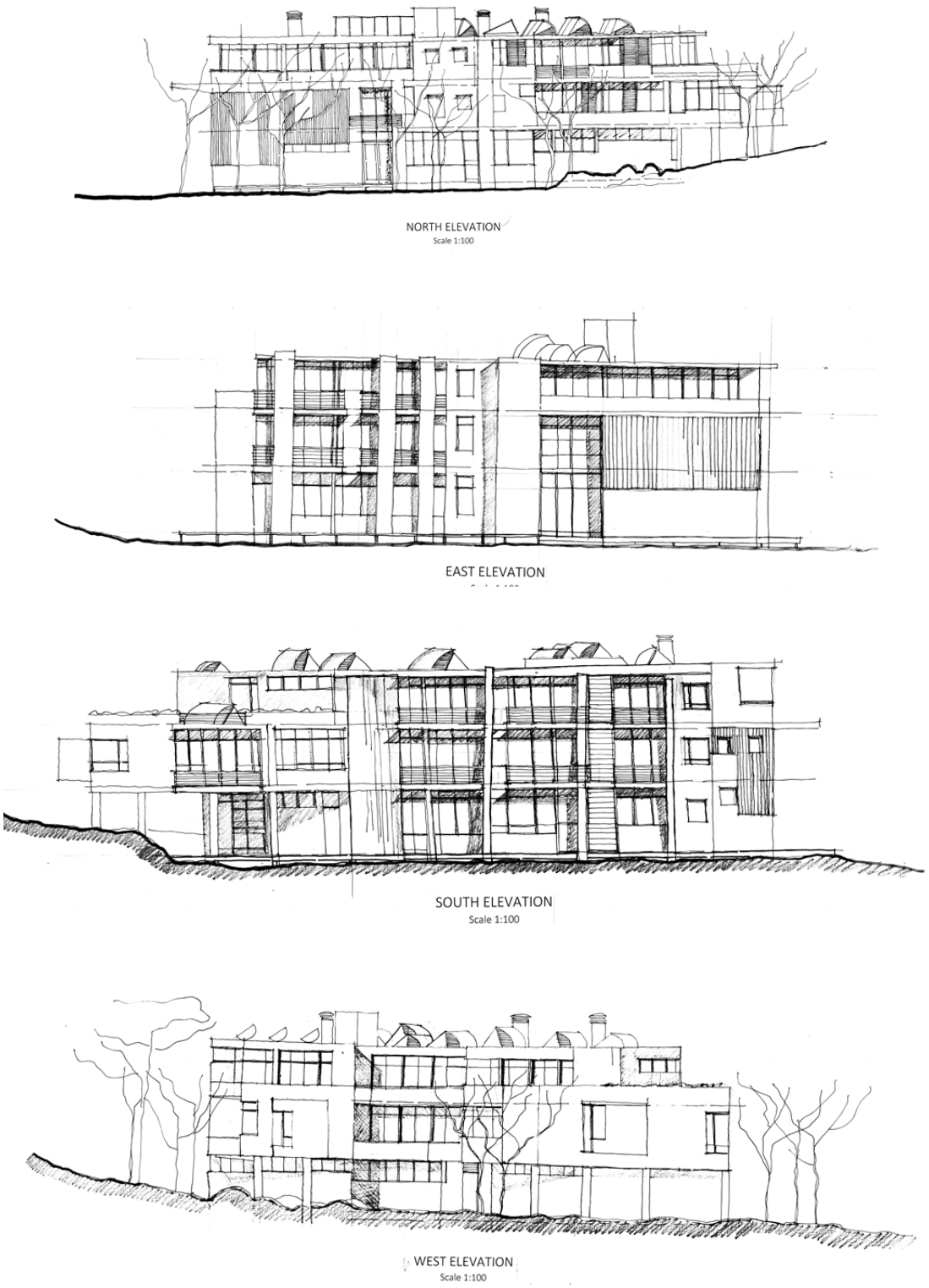

Figure 5 Proposed North, East, South and West Elevations of the proposed Administration Building (Source: VMA Architects)

In addition to the proposed Administration Building the following will be done:

1. Fynbos Lodge	- Upgrade & Removal Asbestos Roof & Provision of parking. Stabilization of River Bank with Gabions (Stones banks)
2. Parking	- 50 cars , 3 Mini buses & 1 Loading Zone.
3. Additional Space	- E.D.R.R (Marketing and Communication) – 21 staff members

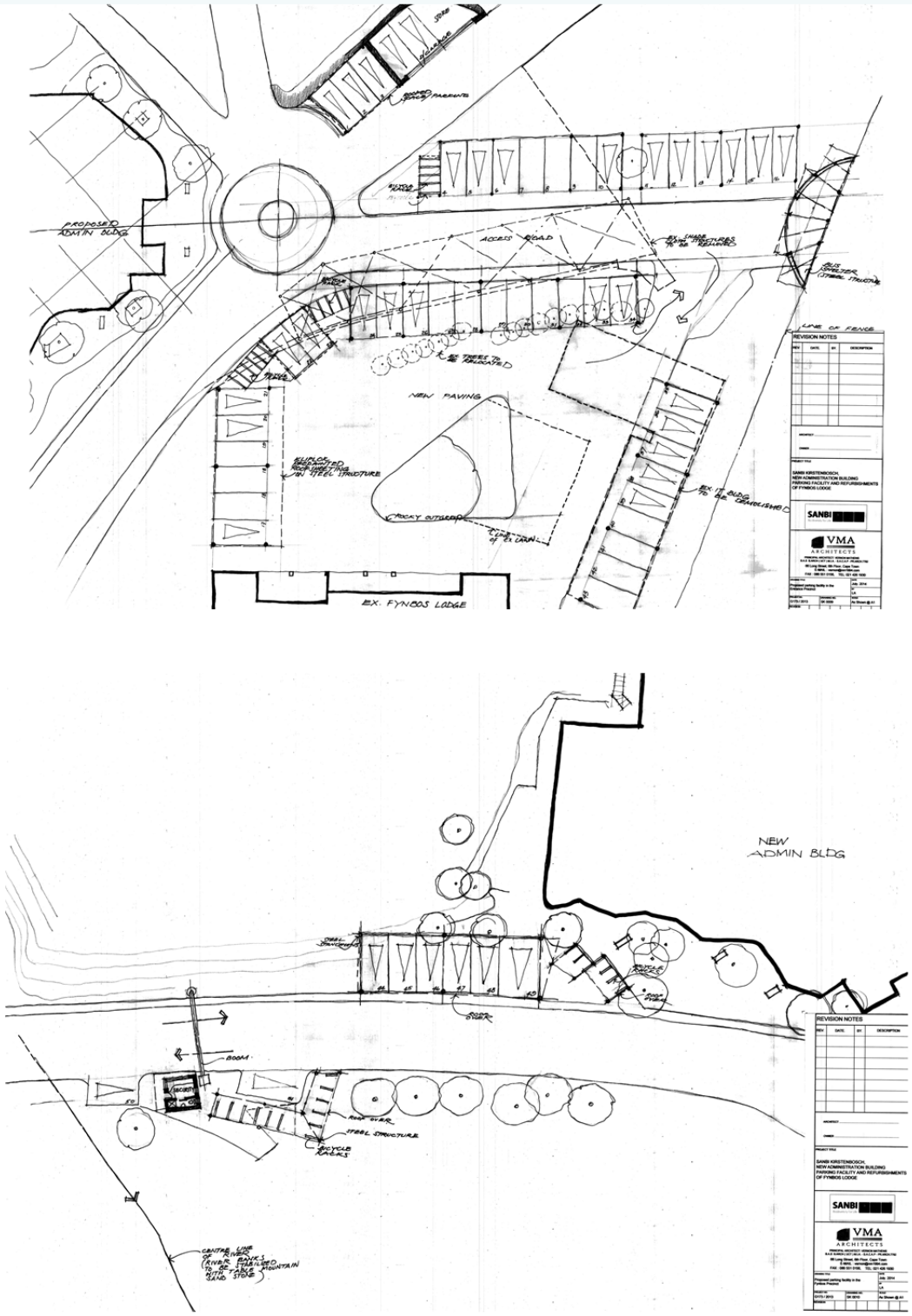

Figure 6 Proposed parking facility arrangement of the proposed Administration Building environs (Source: VMA Architects)

3. Visual Assessment of the Site and Proposed Development

3.1 Description of the affected area and scenic resources

The Kirstenbosch NBG, is located within The Cape Metro Area, described by Oberholzer and Winter as follows:

> The Cape Metro District, centred on Cape Town, is dominated by Table Mountain and the Cape Peninsula Mountain Chain, which is a National Park, World Heritage Site and area of major scenic and historic importance. Being an area of early colonial settlement, the city and its surroundings have a wide range of heritage sites too numerous to cover in the provincial inventory, but already well documented elsewhere. Robben Island is another World Heritage Site, famed for its political history.
>
> The quartzitic sandstone mountains of the Peninsula are a relic outlier of the Cape Fold Mountains, which include the Hottentots Holland Mountains to the east. These peaks and ranges are not only of scenic and tourism importance, but also for their biodiversity, water catchment and recreational value.
>
> Given the juxtaposition of mountain and sea, the Peninsula offers numerous scenic routes and passes including Chapman's Peak Drive, Ou Kaapse Weg and Redhill, as well as Sir Lowry's Pass leading to the Overberg. Near to Sir Lowry's Pass is the abandoned Gantouw Pass, an old wagon route over the mountains.

Besides the scenically dominant sandstone formations, the Malmesbury Group shales (Signal Hill, Blouberg and Tygerberg), the Cape Granites (Clifton, Hout Bay and Boulders in Simonstown), and the limestones (Macassar cliffs) all contribute to the varied landscapes and shorelines of the Cape Metro.

Important cultural landscapes, containing historical settlements and cultivation (mainly viticulture), include the Constantia Valley, Durbanville Hills, Bottleray Hills and the Lourens River Valley, as well as the Phillipi horticultural area (market gardens). Philadelphia is one of the old church towns of the Western Cape, and Mamre nearby is an historic mission village.

An old battle site occurs at Blouberg, and numerous World War II remains (mainly derelict radar stations) are found throughout the Cape Metro area, mainly on sites overlooking the coast.

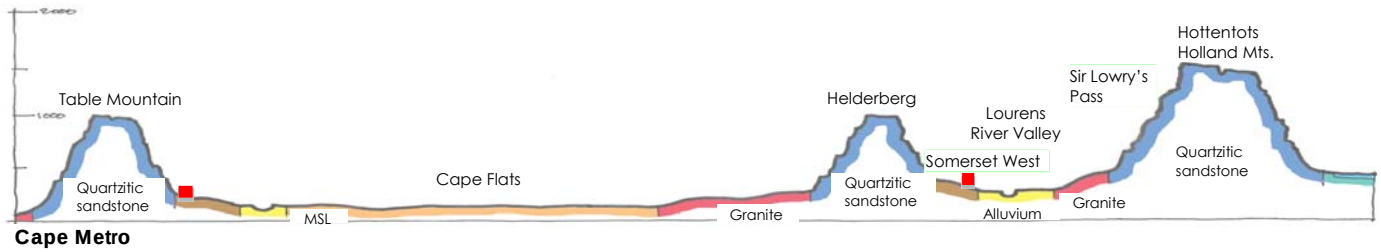

Figure 6 – Section through Cape Metro Area (source Oberholzer and Winter))

The Kirstenbosch estate is on the eastern face and foothills of the Cape Peninsula Mountain Chain and back of Table Mountain. It sweeps down from the steep scree slopes of the sandstone mountains onto the across rocky scree slopes and rolling shale hills. Tree-lined, fast-flowing mountain streams flow across the gardens.

Photo Plate 1 – The eastern mountain slopes above the Kirstenbosch Botanical gardens

Photo Plate 2 – Typical mountain stream which flows across the gardens and large boulders and forest.

Kirstenbosch NBG is classified as a nature reserve and covers 528 ha in total. The bulk of the area remains natural forest and fynbos and is classified as a protected area. 36 hectares have been cultivated, including restaurants, information and education centres, and buildings and infrastructure associated with SANBI operations and with the upkeep of the botanical garden.

The proposed site of development is within the built developed area of the garden, on the lower eastern border of the site. The Cape Town residential areas of Bishopscourt and Newlands are adjacent to the Kirstenbosch Gardens. These areas are low density wooded suburbs.

Photo Plate 3 – Existing parking area with the proposed new site in the background

Photo Plate 4 – Existing prefab building, which will be replaced by a 2.5 storey Administration building

The site of the proposed Administration building currently contains a prefabricated single storey building in a wooded area.

The Fynbos Lodge area comprises the Fynbos lodge and out buildings, the former of heritage significance and other prefab buildings, which will be demolished. These are arranged around a green courtyard of lawns and trees.

Photo Plate 5 – The existing Prefab office building within a wooded area

The Fynbos Lodge and additional building are existing buildings around a lawned and garden area. Parking facilities are between and adjacent to the buildings.

Local rock has been used extensively in the landscape, as retaining walls, bridge headwalls, steps and paving.

Photo Plate 6 – local rocks have been used extensively in the landscaping

Photo Plate 7 – The existing Fynbos lodge building, left, which has heritage significance and the outbuildings, all of which will be retained.

Photo Plate 8– The Fynbos lodge, right, overlooks a lawned courtyard with trees

The scenic resources of the surrounding area can be described as natural and wilderness area adjacent to parkland residential area.

The immediate area surrounding the proposed development can be described as a wooded built area.

The scenic and visual resources of the overall area are rated as high. The scenic and visual resources of area of the proposed development area are rated as moderate – high due to prefabricated buildings in wooded area.

3.2 Visibility of the Proposed Development

3.2.1 View Catchment

The geographical area from which the project will theoretically be visible, or view catchment area, is dictated primarily by topography.

Situated on the east facing mountain slopes, the greater view catchment of the site is defined by the surrounding ridges and peaks which form the Viewshed of the site. Maclear's Beacon and Reserve Peak in the west and Wynberg hill in the south-east. This is approximately 2kms from the site.

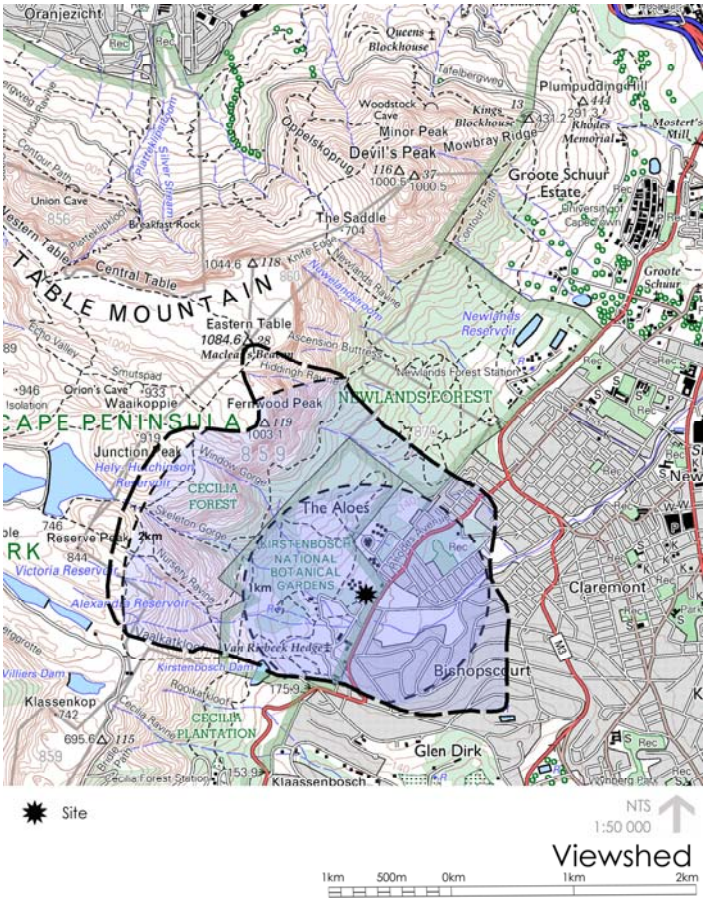

Figure 3 – Viewshed of the proposed Harold Porter NBG.

3.2.2 Zone of Visual Influence

Local features such as trees, landforms and buildings determine the Zone of Visual Influence (ZVI) of the site, i.e. the more relevant areas from which the proposed development will be seen.

The Zone of Visual Influence of the proposed Administration building is reduced to the immediately surrounding area by the wooded forest setting, an area of approximately 50 m from the proposed building.

The visibility of the proposed developments are therefore restricted to the site and local areas.

3.2.3 Receptors

The level of visual impact considered acceptable is dependent on the type of receptors.

- *High sensitivity – e.g. residential areas, nature reserves and scenic routes or trails;*
- *Moderate sensitivity – e.g. sporting or recreational areas, or places of work;*
- *Low sensitivity – e.g. industrial, or degraded areas.*

As indicated the text box above, the 'type' of receptors adds to the visual sensitivity of the site.

High sensitivity receptors will be:

- Tourists visiting the NBG; and
- Users of the scenic Rhodes Drive, which may get a glimpse of the proposed building and parking area when driving by, through vegetation.

Photo Plate 9 – Rhodes Drive runs past the proposed site of development mainly screened by vegetation

Moderate sensitivity receptors will be:

- workers in the NBG

There are no low sensitivity receptors.

4. Potential Visual Impacts

The following visual impacts can be expected:

4.1 Change in the visual character of the site from garden to building

The current site of the proposed development and upgrade is a built area in a wooded setting, Except for the Fynbos Lodge, the buildings are prefab, suggesting a temporary situation. These buildings are not of any visual significance. Some tarred roads and parking facilities exist around the buildings.

The proposed development of a new multi-storey admin building and re-arranged and larger parking area will result in a new building, which is a potentially positive visual impact (albeit it relatively large in scale) and more hardened surface for parking and circulation, which could be a negative visual impact as existing trees and lawn are being relocated and removed respectively. This parking area becomes the forecourt to the Fynbos lodge, which changes from a garden setting to a parking area, a negative visual impact.

This proposed visual impact would be:

- **Extent** - the spatial/geographical area of influence of the visual impact will be **local**, i.e. limited to the immediate surroundings;
- **Duration** - the predicted lifespan of the visual impact will be **long term**, i.e. the lifespan of the project;
- **Intensity** - the magnitude of the impact on visual, scenic and cultural resources will be **medium**, i.e. for the greater area these resources will not be affected but for the immediate area these resources will be affected to a limited extent;
- **Probability** - the degree of possibilty of the visual impact occurring to the immediate area will be **highly probable**;
- **Significance** - the significance of the impact occurring to the immediate area will be **medium** - the impact will result in moderate alteration of the environment and can be reduced by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated
- **Status** - the status of the visual impact will be positive and negative – the proposed building could enhance the scenic resources of the site while the expanded parking area with the removal of trees and lawn could provide for a visually harsh area.

Mitigation measures should include retention of wooded area around new Admin Building and appropriate hard and soft landscaping of the proposed parking development, which must play a dual role as the forecourt to the Fynbos, lodge building,

4.2 Additional night lighting

The larger Admin building will require additional night lighting but being a mainly day use building should not result in much night use and light requirement. There new parking area with removal of existing build opens up this area to Rhodes Drive and any additional lighting provided here may spill onto Rhodes Drive. Little information is available at present to assess this sufficiently.

This proposed visual impact would be:

- **Extent** – the spatial/geographical area of influence of the visual impact will be **local**, i.e. limited to the immediate surroundings;
- **Duration** - the predicted lifespan of the visual impact will be **long term**, i.e. the lifespan of the project;

- **Intensity** - the magnitude of the visual impact will be **low – high**, i.e. could be a notable alteration;
- **Probability** - the degree of possibilty of the visual impact occurring will be **possible**, where it is likely that the impact will occur;
- **Significance** - the significance of the impact occurring will be **medium** - the impact will result in a moderate alteration of the environment and can be reduced by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated;
- **Status** - the status of the intensity (severity) thereof will be Medium, i.e. notable alteration of night time scenic resources,

Mitigation should include:

- No - limited street/parking lighting;
- Keeping street/parking lighting to low level lighting; and
- Limiting external lighting on the buildings.

5. Conclusions

The Administration building is proposed within the existing built and developed section of the NBG, on a site that has an existing prefab building on it.

The proposed new building will result in a change of visual character from single story to 2.5 story building, but will remain on the same footprint, retaining existing trees. This visual change could be positive and enhance the visual resource of the area depending on the finer details of the building – building materials etc.

The proposed parking arrangement will result in a greater paved area with less greenery in the form of trees and lawns and as such is a potential negative impact. A landscape architect should be appointed to ensure the area retains its natural qualities and that the paving and planting interventions are appropriate.

While the developments will result in a change in the visual landscape, the scenic resources of the greater area will be minimally affected, but at the local scale will be moderately affected. If mitigation measures are implemented, the visual impact will be low.

Other visual impacts will be possible additional night lighting and light spill onto Rhodes Drive. These too can be mitigated to reduce the visual impacts.

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megan anderson
landscape
architects

Attention: Lauren Le Roux

9 February 2016

Dear Lauren,

SANBI NEW BUILDINGS AT THE KIRSTENBOSCH NATIONAL BOTANICAL GARDENS CAPE TOWN: VIA ADDENDUM TO ASSESS THE NEW SCHEME (SCHEME 2)

Purpose of addendum: to determine if and how the new scheme (Scheme 2) would alter the impacts and/or recommendations made by the Visual Impact Assessment specialist report (VIA ver 1.2 February 2015).

Scheme changes: this assessment addresses the following scheme changes:

	Scheme 1 (Old design)	Scheme 2 (Amended design)
Gross Floor Area	2999sq.m (excl. balconies)	1717sq.m (excl. balconies)
Building height	11640mm (3 storey)	8850mm (2 storey)
Bulk	2.5	2
Location	-	Scheme 1 and Scheme 2 are located in exactly the same position, except in scheme 2 the building position has moved 3m to the West and 1m to the North. Scheme 2 is more sympathetic to the site.
Appearance	-	The new design/scheme 2 has the same look and feel of scheme 1 except that a stone wall (Table Mountain sandstone) will be introduced at the entrance to the building. Scheme 1 has a flat concrete roof and scheme 2 has a lightweight sheet metal roof with a minimum pitch that visually appears to be flat. The external finish of the building is the same as scheme 1 where aluminium windows are utilised for fenestration and the wall finish is "UCT" or Luytens Plaster.

(Table source: Sillito Environmental Consulting, 2016)

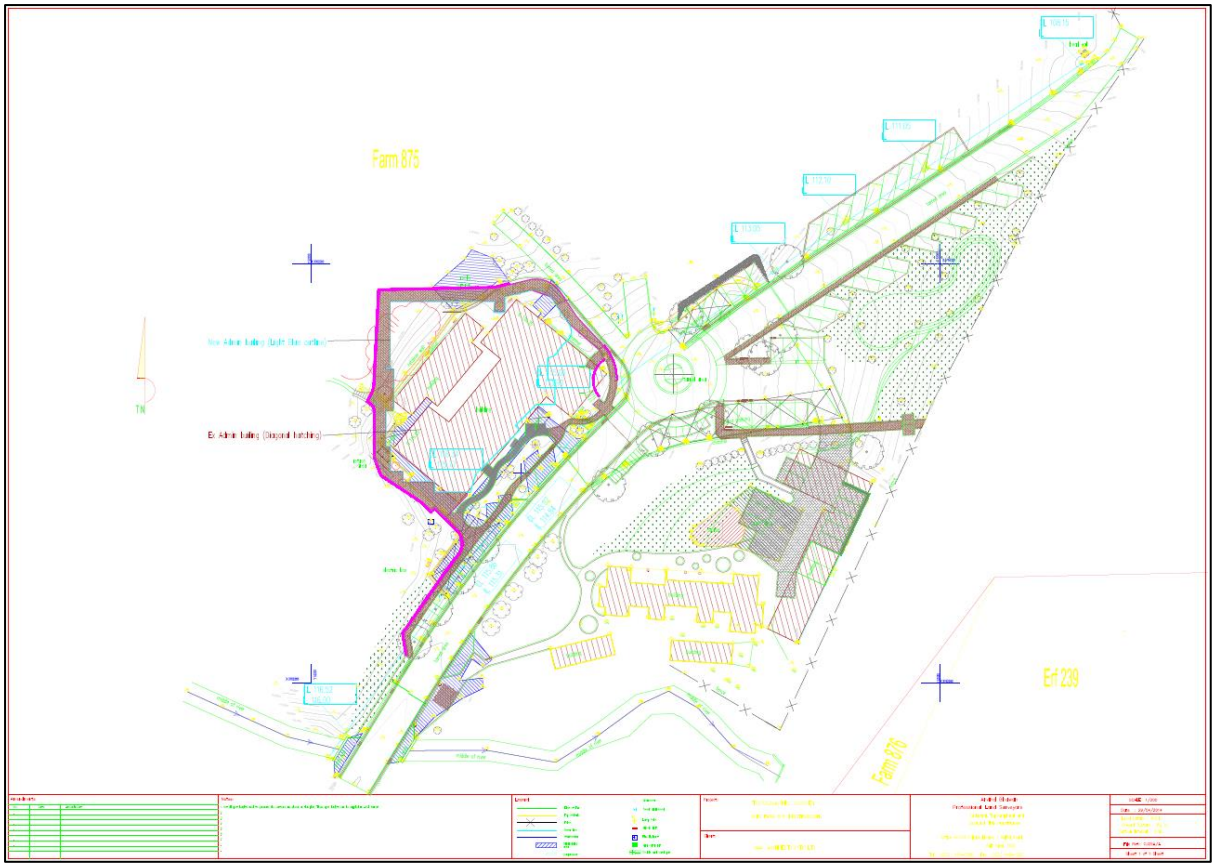

Figure 1: Plan of proposed Scheme 2, indicating new position of building which is more sympathetic to the site. The building has been moved 3m west and 1m north. Existing prefab buildings are indicated by brown diagonal hatch. Proposed new building is outlined in turquoise. (Source VMA Architects)

Assumption and limitations: a design of the Table Mountain Sandstone wall introduced to the entrance of the building in Scheme 2 was not available at the time of this assessment. It is assumed this feature will be appropriate in scale and location and would enhance the aesthetics of the new building.

Significance ratings of potential visual impacts of Scheme 2

1. CHANGE IN THE VISUAL CHARACTER OF THE SITE FROM GARDEN TO BUILDING	
Nature of impact:	The building of scheme 2 is lower in height, has 2 storeys (as opposed to 2.5 storeys), has smaller Gross Floor Area and in appearance is very similar to scheme 1 (with the exception of the Table Mountain Sandstone wall introduced at the building entrance). The proposed upgrade to the parking area is the same for both schemes. The potentially positive visual impact of the building is enhanced by scheme 2 as the building is smaller in scale. The potentially negative visual impact of the parking area remains the same for Scheme 2 as it would be for Scheme 1.
Extent and duration of impact:	Local; long-term
Intensity of impact:	Medium
Probability of occurrence:	Highly probable
Significance rating of impact prior to mitigation	**MEDIUM**- the impact will result in moderate alteration of the environment and can be reduced by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated
Status	Positive and negative – the proposed building could enhance the scenic resources of the site while the expanded parking area with the removal of trees and lawn could provide for a visually harsh area.
Proposed mitigation:	The same mitigation measures recommended for Scheme 1 apply to Scheme 2: • Retention of wooded area around new Admin Building; • Appropriate hard and soft landscaping of the proposed parking development, which must play a dual role as the forecourt to the Fynbos, lodge building. In addition, should the repositioning of the building (3 m to the west and 1 m to the north) impact indigenous trees and shrubs, these trees and shrubs should be relocated near to/around the new building and/or parking area.

2. ADDITIONAL NIGHT LIGHTING	
Nature of impact:	As the scale of the building in Scheme 2 is smaller than Scheme 1, the potential negative visual impact of night lighting would remain the same if not be marginally reduced. As the proposed design of the parking area for Scheme 1 and 2 are the same, potential negative visual impact of night lighting would remain the same.
Extent and duration of impact:	Local; long-term
Intensity of impact:	low – high, i.e. could be a notable alteration
Probability of occurrence:	Possible, where it is likely that the impact will occur
Significance rating of impact prior to mitigation	**MEDIUM**- the impact will result in a moderate alteration of the environment and can be reduced by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated
Status	Medium (negative), i.e. notable alteration of night time scenic resources,
Proposed mitigation:	The same mitigation measures recommended for Scheme 1 apply to Scheme 2: • No - limited street/parking lighting; • Keeping street/parking lighting to low level lighting; and • Limiting external lighting on the buildings.

Conclusion

The potential positive visual impact, in the form of improved scenic resources as a result of the building, would be enhanced by Scheme 2 as the building is similar in appearance but smaller in scale in Scheme 2 than in Scheme 1.

The potential negative visual impact of night lighting would be marginally reduced by Scheme 2 due to the reduction in building scale, however the potential negative impact of the parking area (removal of trees and lawn) would remain the same for Scheme 2 as for Scheme 1 as the design for the parking area remains the same for both schemes.

This being said, the changes in impacts resulting from Scheme 2, as described above, are not significant enough to change the actual significance ratings which consequently remain the same for Scheme 2 as they are for Scheme 1.

However, despite impact significant ratings remaining the same for Scheme 2 as for Scheme 1, Scheme 2 is preferred from a visual impact assessment perspective for the reduction of a negative impact and enhancement of a positive impact it would result in.

The same mitigation measures recommended for Scheme 1 apply to Scheme 2. In addition, should the repositioning of the building in Scheme 2 (3 m to the west and 1 m to the north) impact indigenous trees and shrubs, these trees and shrubs should be relocated near to/around the new building and/or parking area.

We trust you find the above in order. Please do not hesitate to contact me with any queries.

Yours sincerely

M. Anderson

Megan Anderson
PrLArch

FRESHWATER ECOLOGICAL ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF A NEW ADMINISTRATION BUILDING AT KIRSTENBOSCH NATIONAL BOTANICAL GARDEN

The Freshwater Consulting Group

December 2014

Report prepared for:

Sillito Environmental Consulting
Suite 105, Block B2
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Tokai, Cape Town, 7966

Freshwater Consulting Group

Document title	:	Freshwater ecological assessment for the proposed establishment of a new administration building at Kirstenbosch National Botanical Garden
Author/s :		Bruce Paxton, *PhD*
Reviewer :		Dean Ollis *Pr.Sci.Nat.*
Status of report :		Revised Final Report
Report date :		17 December 2014

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1. BACKGROUND AND TERMS OF REFERENCE

The South African National Biodiversity Institute (SANBI) has been allocated funds for the period 2013-2016 for the refurbishment, upgrading and maintenance of existing infrastructure as well as construction of new infrastructure at the National Botanical Gardens. One of the proposed projects is the establishment of a new administration building and parking area at Kirstenbosch National Botanical Garden (NBG), Cape Town, which will replace the existing prefabricated buildings currently located along Rhodes Drive to the north east of the main entrance to the Garden. The prefabricated buildings will be demolished and minor alterations are intended for other buildings on the site. It is intended that the new administration building be a brick-and-mortar double-storey building, but that it will remain within the development footprint (approximately 500 m^2 in extent) of the existing buildings.

The proposed parking area will be within 32 m of the upper reaches of the Liesbeek River, which drains the south-western slopes of Table Mountain. Furthermore, the development proposal includes the construction of gabions along the undercutting north bank of the section of river adjacent to the site for the new administration building (20 to 30 m in length), to stabilise and reinforce this area so as to protect the buildings and infrastructure. As such, a Basic Assessment is required in terms of the EIA Regulations of the National Environmental Management Act (NEMA, Act No. 107 of 1998) to mitigate any potential impacts stemming either from construction activities or directly from the development itself. This report documents the results of a freshwater ecological assessment undertaken by the Freshwater Consulting Group (FCG) on behalf Sillito Environmental Consulting. It describes and assesses the potential impacts of the proposed development on the affected tributary of the Liesbeek River and its associated freshwater ecosystems.

1.1 Terms of Reference

The terms of reference was to provide specialist freshwater ecological input to the Basic Assessment, to evaluate the impacts of the proposed development activities associated with the establishment of new administration buildings at Kirstenbosch NBG. More specifically, the scope of work for FCG's input was as follows:

- Provide a description of the potentially affected freshwater ecosystems and assess their ecological importance and sensitivity;
- Assess the significance of any impacts to freshwater ecosystems that could stem directly from the development or from construction-related activities; and
- Recommend mitigation measures to limit potential impacts to freshwater ecosystems.

2. APPROACH TO THE STUDY

The following tasks were undertaken by FCG:

- Review of all available documentation and plans for the proposed decommissioning and construction activities;
- Examination of potentially relevant conservation/biodiversity plans (including the National Freshwater Ecosystem Priority Areas project and the City of Cape Town's Wetlands Map) to note whether any rivers or wetlands of regional or local conservation importance have been identified in close proximity to the site;
- Examination of relevant maps, as well as aerial and satellite imagery of the study area to identify potentially affected aquatic ecosystems;
- Completion of a site visit to visually assess the Present Ecological State (PES) of the section of river that flows past the existing buildings (using the assessment method described in **Appendix A**), and to scan the area around the buildings for visible signs of wetland presence;
- Collection of pH and electrical conductivity (EC) measurements from the potentially affected river reach at the site, and of aquatic invertebrate data using the sampling method known as the South African Scoring System Version 5 (SASS5) (after Dickens & Graham 2002, as described in **Appendix B**);
- Compilation of a GIS map showing the location of the delineated watercourse(s) in relation to the footprint of the proposed construction area;
- Determination of the conservation importance of the potentially affected watercourse(s), using the Ecological Importance and Sensitivity (EIS) assessment method for rivers (as described in **Appendix C**);
- Identification and assessment of the significance of potential impacts of the proposed activities on freshwater ecosystems, using the significance rating method and assessment criteria described in **Appendix D**;
- Preparation of an impact assessment report (i.e. the current report); and
- Specialist input will be provided into an application for "water use" authorisation to the Department of Water & Sanitation (DWS) in terms of the National Water Act (Act No. 36 of 1998).

3. DESCRIPTION OF FRESHWATER ECOSYSTEMS ON AND ADJACENT TO THE SITE

The proposed development is located alongside the upper reaches of the Liesbeek River, roughly two kilometres from its source where it flows past the entrance to the Kirstenbosch NBG (Figure 1). Upstream of this point the river rises as two first-order tributaries – Skeleton and Nursery streams – at an elevation of roughly 700 m on the eastern slopes of Table Mountain – the 'Back Table'. Topographic maps show these two tributaries converging at a point just upstream of the proposed development in Kirstenbosch NBG. However, the confluence could not be located during the course of field work and it is likely that the Nursery stream has subsequently been diverted and that it either fails to confluence with Nursery Stream, or does so at a point further downstream via stormwater drains. Where the river flows past the existing Administration buildings at the entrance to the NBG, it passes beneath two culverts which are separated by a distance of *c.* 90 m (Figure 2). The first culvert (Figure 3 – A(i)) diverts the river beneath the entrance road to the existing Administration buildings, while the second diverts it beneath Rhodes Drive (Figure 3 – C(i)).

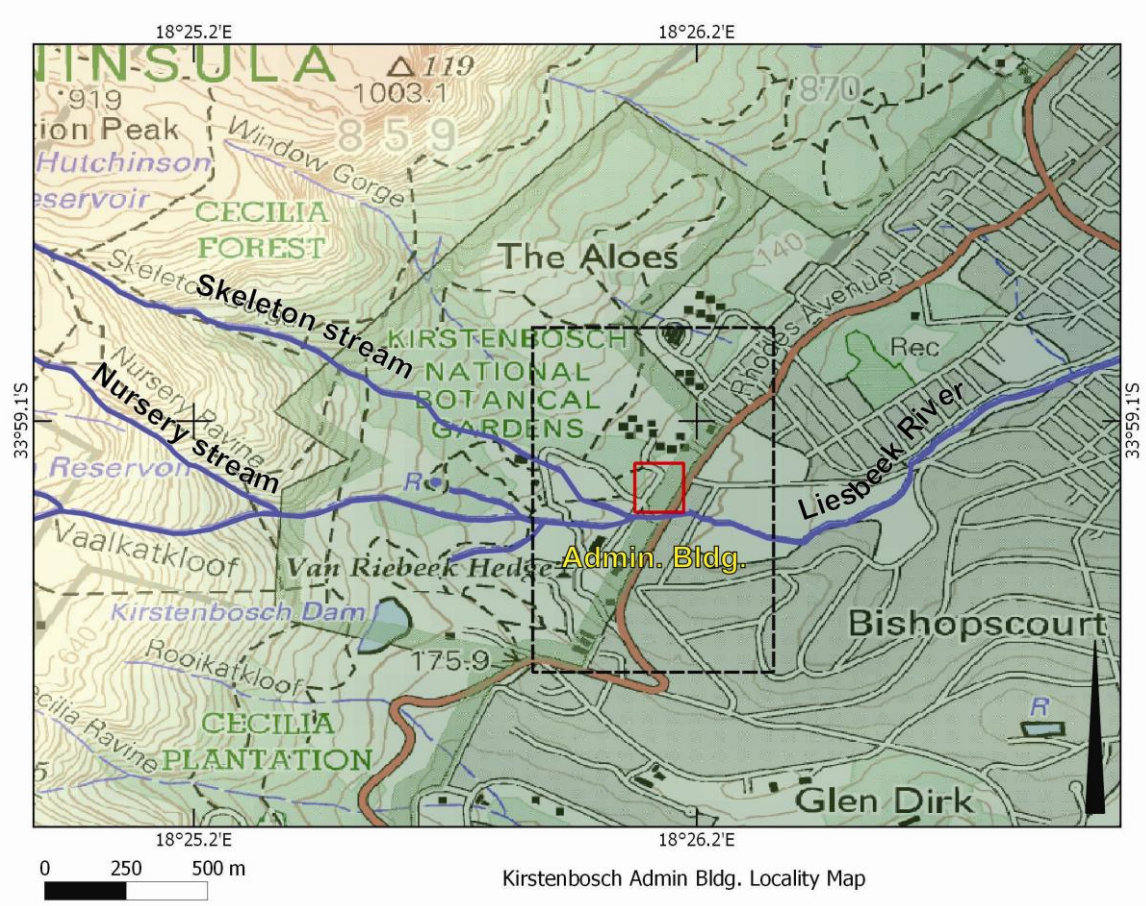

Figure 1 Locality map of proposed Administration buildings (bounded in red). The Liesbeek River is highlighted in blue showing its source on the slopes of the eastern slopes of Table Mountain. Skeleton and Nursery streams are shown to confluence just upstream.

Figure 2 Site Plan showing the existing parking lot, together with: (1) the existing IT building, (2) the administration building and (3) the 'Fynbos Lodge'. The Liesbeek River flows to the south of the proposed development through two culverts between the entrance road to the administration buildings (Culvert A) and beneath Rhodes Drive (Culvert B). The white dot indicates where SASS aquatic invertebrate samples were collected.

The existing administration and IT buildings are located between these two culverts on the northern bank of the river. The nearest existing built structure is *c*. 10 m from the river banks (Figure 2). The reaches of both Skeleton and Nursery streams upstream of the proposed development are relatively pristine and rise as typical Cape Floristic Region (CFR) mountain streams in Afromontane and riparian forest against the slopes Table Mountain. Further downstream in the vicinity of the existing administration building, however, the riparian zone has been colonized by a mix of alien species including oak, pine, poplar and palms. Downstream of the first culvert (Culvert A, Figure 3 – A(ii)), the channel banks are severely incised (down-cut). This is due to the fact that the channel cross-section of Culvert A is inadequate to cope with the volume of flows routed through it and no consideration has been given to reinforcing the banks immediately downstream. As a result, the increased velocities and erosive capacity of the water channelled through the culvert has led to gully erosion, washouts and disturbances to the riparian belt between Culvert A and B (Figure 3 – B (i), (ii) and C (ii)). Despite this erosion, the bed of the river itself has stabilised and instream habitat conditions are relatively good. During high flows, however, it is likely that large amounts of sediment are mobilized from the banks causing sedimentation downstream.

Figure 3 The upper reaches of the Liesbeek River where it passes adjacent the Administration buildings: A(i) upstream of Culvert A looking downstream (yellow box) that runs beneath the entrance road to the Administration buildings, A (ii) looking upstream from Culvert A, B(i) looking upstream towards Culvert A, B(ii) severe erosion immediately downstream of Culvert A, C(i) looking downstream towards Culvert B passing beneath Rhodes Drive, C(ii) bank erosion between the two culverts. Blue arrows indicate flow direction.

3.1 Present Ecological State (PES)

The assessment of the PES of the potentially affected river reach at the site was undertaken following the procedures outlined in the Index of Habitat Integrity (IHI) assessment method developed by the Department of Water Affairs (Kleynhans 1999) and described in Appendix A.

As noted above, the riparian zone upstream of Culvert A is geomorphologically stable, but dominated by alien tree species, whereas the riparian zone immediately adjacent to the proposed parking area (between Culvert A and B) is severely degraded by both alien plant species, as well as by down-cutting and gully erosion as a result of elevated water velocities through Culvert A, exacerbated by the absence of erosion mitigation measures. Despite these changes, the bed of the river itself has stabilised and instream habitat conditions are relatively good, both upstream and downstream of Culvert A. These conditions are reflected in the IHI scores (Table 1), which show the instream habitat conditions being relatively good (PES Category B – Largely natural) upstream of Culvert A, whereas riparian habitat conditions here are moderately modified (PES Category B/C). Downstream of Culvert A (between Culvert A and B) instream habitat conditions are largely natural (PES Category B), whereas the riparian zone is largely modified (PES Category D) – this low score being largely attributable to bank erosion and incision.

Table 1 IHI Scores and overall PES results for the river upstream and downstream of Culvert A.

CRITERIA	Upstream Culvert A		Downstream Culvert A	
	Score	Confidence	Score	Confidence
INSTREAM				
Water abstraction	5	H	5	H
Extent of inundation	0	H	0	H
Water quality	8	H	8	H
Flow modifications	0	H	0	H
Bed modification	5	M	5	M
Channel modification	5	H	8	M
Presence of exotic macrophytes	0	H	0	H
Presence of exotic fauna	0	H	0	H
Presence of solid waste	2	H	2	H
RIPARIAN				
Water abstraction	5	H	5	H
Extent of inundation	0	H	0	H
Water quality	8	H	8	H
Flow modifications	0	H	8	H
Channel modification	8	H	23	H
Decrease of indigenous vegetation	5	H	10	H
Exotic vegetation encroachment	10	H	10	H
Bank erosion	5	H	23	H
FINAL PES SCORES & CATEGORIES	**Upstream Culvert A**		**Downstream Culvert A**	
Instream	87.0		85.5	
	PES Category B		**PES Category B**	
Riparian	79.2		57.1	
	PES Category B/C		**PES Category D**	

The water quality in the potentially affected river reach, both upstream and downstream of Culvert A, is considered to be slightly to moderately impacted (IHI score of 8), mainly due to the use of organic material and fertilizer in the Kirstenbosch Garden. Runoff of nutrient-enriched water is likely to elevate the nutrient concentrations in the river and possibly the concentration of Total Dissolved Solids (as reflected by electrical conductivity measurements), relative to the presumed natural state. At the time of the site visit (April 2014), the electrical conductivity recorded in the river at the aquatic invertebrate sampling point (see map in Figure 2) was 6.1 mS/m (i.e. relatively low and reflective of near-natural conditions) and a pH of 5.1 was recorded (indicative of acidic conditions, as would be expected under natural conditions for a fynbos-dominated catchment). This suggests that, at the time of site visit, the water quality in the sampling reach was relatively good.

3.2 Aquatic invertebrates (and indigenous fish)

A total of 13 aquatic invertebrate families were recorded instream at the site just upstream of Culvert A (see sampling point on map in Figure 2). Five of these taxa have a high SASS5 sensitivity score (10 and above), including notonemourid stoneflies and teloganodid mayflies (Table 2), suggesting that habitat and water quality conditions were relatively good.

Table 2 List of aquatic invertebrate taxa present in the river adjacent to the proposed development.

Order	Family	Sensitivity Score
Annelida	Oligochaeta (Earthworms)	1
Crustacea	Potamonautidae* (Crabs)	3
Plecoptera (Stoneflies)	Notonemouridae	14
Ephemeroptera (Mayflies)	Baetidae (2 species)	6
	Teloganodidae	12
Odonata (Dragonflies & Damselflies)	Aeshnidae (Hawkers & Emperors)	8
	Corduliidae (Cruisers)	8
Trichoptera (Caddisflies)	Philopotamidae	10
Cased caddis:	Sericostomatidae	13
Coleoptera (Beetles)	Elmidae/Dryopidae (Riffle beetles)	8
	Gyrinidae (Whirligig beetles)	5
Diptera (Flies)	Athericidae	10
	Simuliidae (Blackflies)	5

The total SASS5 Score was calculated as 96 and the Average Score Per Taxon (ASPT) was 7.3[1]. Figure 4 plots the SASS5 Score and ASPT obtained at the site against the Biological Bands assigned to the upper reaches of rivers in the Southern Folded Mountains Ecoregion (based on the SASS interpretation guidelines of Dallas 2007). This figure shows that the site falls along the boundary between the bands for Ecological Categories B and C, i.e. it is considered to be in a Fair/Good ecological condition (largely natural to moderately modified). This rating is consistent with the expectation that the river is moderately impacted by development in and around Kirstenbosch NBG, and is in agreement with the instream PES results based on the river IHI (see Table 1).

[1] These results are based on the assumption that an unconfirmed taxon was Leptoceridae and not Sericostimatidae, which would have given a SASS5 Score of 103 and ASPT of 7.9.

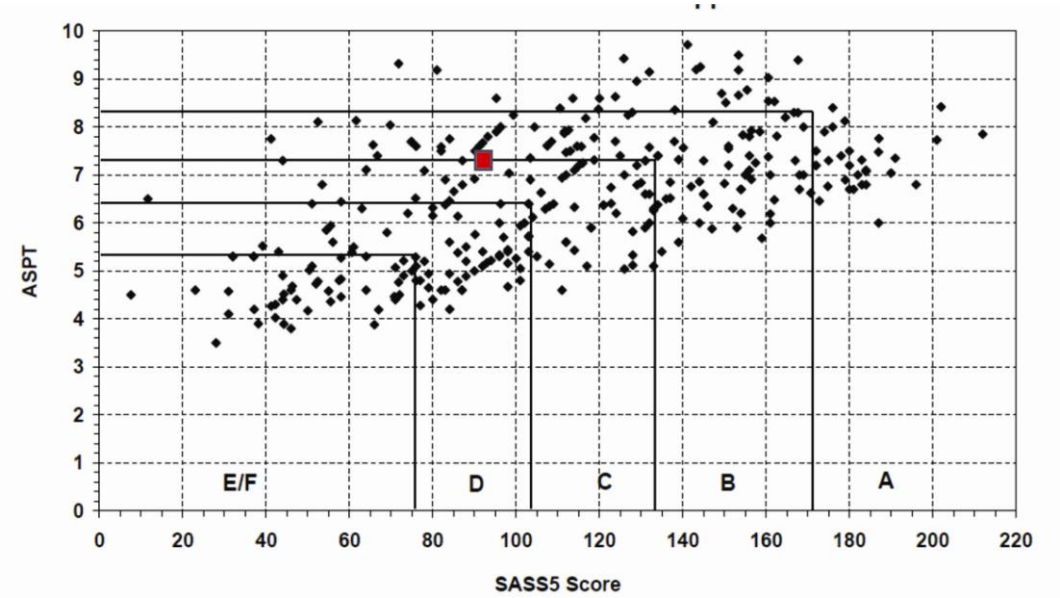

Figure 4 SASS5 Score and ASPT for the site sampled at Kirstenbosch (red square) plotted in relation to the SASS Biological Bands for the upper reaches of rivers in the Southern Folded Mountains Ecoregion .

Note on freshwater fish—Cape galaxias (*Galaxias zebratus*) is a small paleao-endemic freshwater fish species, which was observed to be present at the site. The taxonomic and conservation status of this fish species is currently uncertain. Recent phylogeographic studies show that *G. zebratus* is a species complex with up to ten unique isolated lineages represented in the Cape Floristic Region (Waters and Cambray 1997, Wishart et al. 2006, Chakona et al. 2013). Table Mountain populations (i.e. those in the Liesbeek and Disa Rivers) share genetic affinities with Eerste River populations, but are separate from populations on the Cape Peninsula further south (i.e. the Schusters, Klaasjagers and Els Rivers, and populations in the wider Western Cape region). Pending species descriptions and range distribution studies, the populations in the Liesbeek River adjacent to the proposed development should be considered of moderate to high conservation importance at a regional/provincial scale.

3.3 Ecological Importance and Sensitivity (EIS)

The EIS of the aquatic ecosystems associated with the Liesbeek River at the site affected by the proposed development was assessed according to the procedures recommended for rivers by the Department of Water Affairs and described in Kleynhans (1999) (Appendix B). The biotic importance and sensitivity of the aquatic ecosystem (i.e. the presence/absence of rare, unique or endangered biota, species sensitivity and richness) was considered to be low overall (median EIS score = 1) but moderate to high for the instream component of the river (median EIS score = 2) (see Table 3), mainly due to the confirmed occurrence of Cape Galaxius fish species. The importance and sensitivity of the habitat (abiotic) ecosystem components was rated as moderate overall (median EIS score >1 but <2) and high for the instream component

(EIS score >2). The biotic rating was primarily due to the presence of unique and sensitive biota rather than rare or endangered species – although, as noted above, the conservation status of the Cape galaxias on site is currently unclear.

The high rating accorded the habitat (abiotic) component of the ecosystem on site was primarily attributable to the presence of aquatic habitat types that are deemed to be sensitive to flow change. Also, the location of the site in a sensitive conservation area – the Table Mountain National Park – contributed to this high score.

Table 3 EIS results for the potentially affected section of the Liesbeek River.

Criteria	Liesbeek River @ Kirstenbosch	
	instream	riparian
BIOTIC		
Rare & endangered biota	0	0
Unique biota	3	0
Intolerant (i.e. sensitive) biota	3	0
Species/taxon richness	1	0
median scores	**2**	**0**
	1	
HABITAT		
Diversity of aquatic habitat types	1.5	0
Refuge value of habitat types	1.5	0
Sensitivity of habitat to flow changes	3	0
Sensitivity of habitat to WQ changes	3	0
Migration route/corridor	1	0
Protected/natural areas	4	0
median scores	**2.3**	**0**
	1.1	

In terms of the National Freshwater Ecosystem Priority Areas (NFEPA) project, the Liesbeek River and its tributaries are listed as a Fish Support Area (Figure 5). Fish Support Areas are Fish Sanctuaries where the ecological condition of rivers flowing through the FEPA sub-catchment is lower than an A or B. The recommendation is that no activities be undertaken in the catchment that could further degrade the ecological integrity of these river reaches and that, ideally, the ecological condition of these Fish Support Areas be improved.

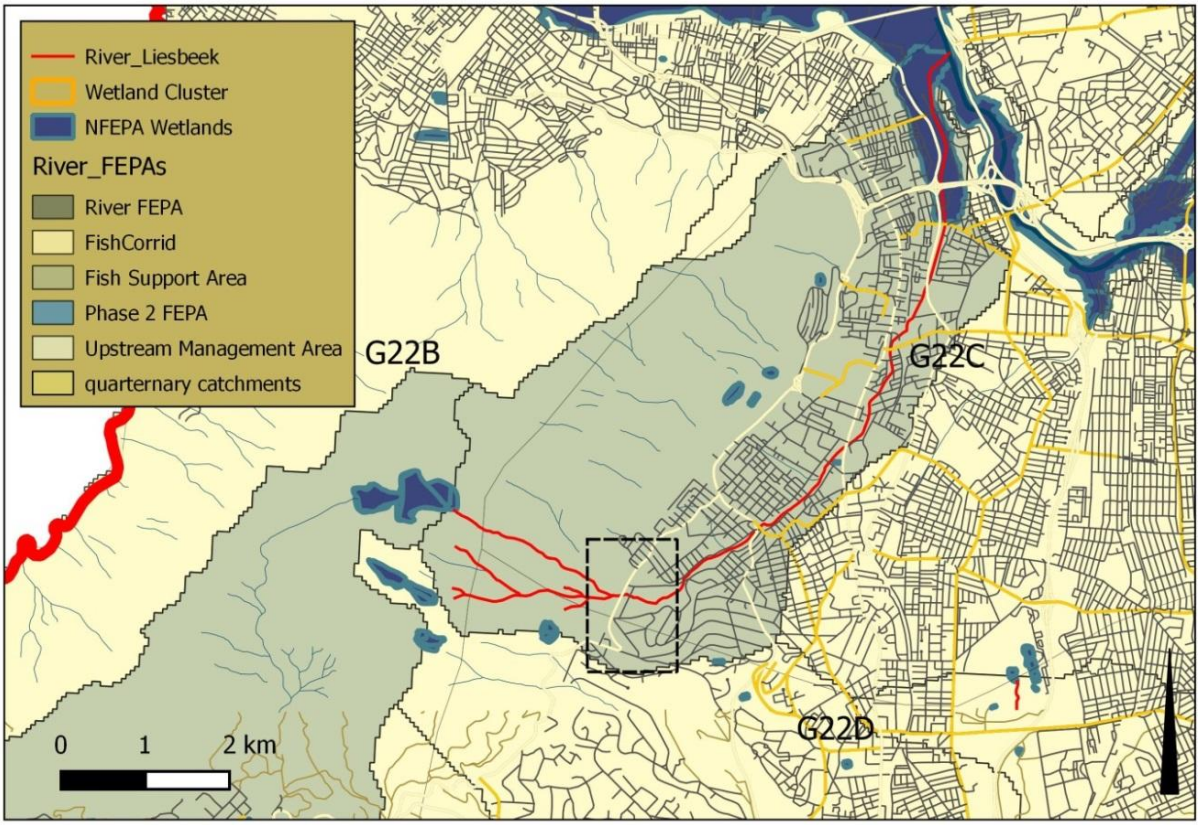

Figure 5 The Liesbeek River showing the location of wetlands, Fish Support Areas and FEPA sub-catchments mapped by the National Freshwater Ecosystems Priority Areas (NFEPA) project within Quaternary Catchments G22B, G22C and G22D. The Liesbeek River (shown in red) flowing through Kirstenbosch NBG is shaded as a Fish Support Area.

4. PROPOSED ACTIVITIES

The proposed works would entail the decommissioning of existing administrative infrastructure as well as the construction and refurbishment of new infrastructure adjacent the entrance to Kirstenbosch NGB along its boundary with Rhodes Drive. In addition, a section of the river bank adjacent to the proposed infrastructure upgrades would be stabilised with gabions. A summary of the proposed activities in each area follows (refer to Figure 2, Figure 6 and Figure 7).

IT Building (*Building 1*, Figure 2; block #1 in Figure 6; and Figure 7(1)) — The existing prefabricated IT building (Building 1) would be demolished and the site would be converted into a parking area. This parking area would be within 32 m of the river channel. Part of the existing garden in front of the building (Figure 7) would be removed to accommodate the parking area.

Administration Building (*Building 2*, Figure 2; block #2 in Figure 6; and Figure 7(2)) — The existing administration building (Building 2) would be demolished and a new double-storey administration building would be constructed in its place, within the bounds of the existing development footprint.

'Fynbos Lodge' (*Building 3*, Figure 2; 'LAB' in Figure 6; and Figure 7(3)) — The asbestos roof of the 'Fynbos Lodge' (Building 3) would be removed and replaced. Minor interior renovations, including painting and replacing counter tops would also be undertaken. No structural changes are proposed for the building.

River bank stabilisation (purple line in Figure 2; photo B(ii) in Figure 3) — Gabions and a reno mattress would be installed along a section of the northern bank of the river reach adjacent to the site, to stabilise and reinforce this eroded area. The gabions would run for approximately 20-30 metres within the existing curvature of the river. The total volume of material to be excavated from the bed and bank of the river to put the gabions and reno mattress in place would be approximately 135 m^3.

Stormwater management — The proposed approach to the management of stormwater runoff from the areas to be developed is to retain and treat stormwater through the use of permeable paving in the parking area and access road. According to the Stormwater Management Report (OWSA 2014), the 2 400 m^2 of permeable paving that is proposed would be adequate to meet the attenuation and water quality requirements of the City of Cape Town's (2009) stormwater management policy.

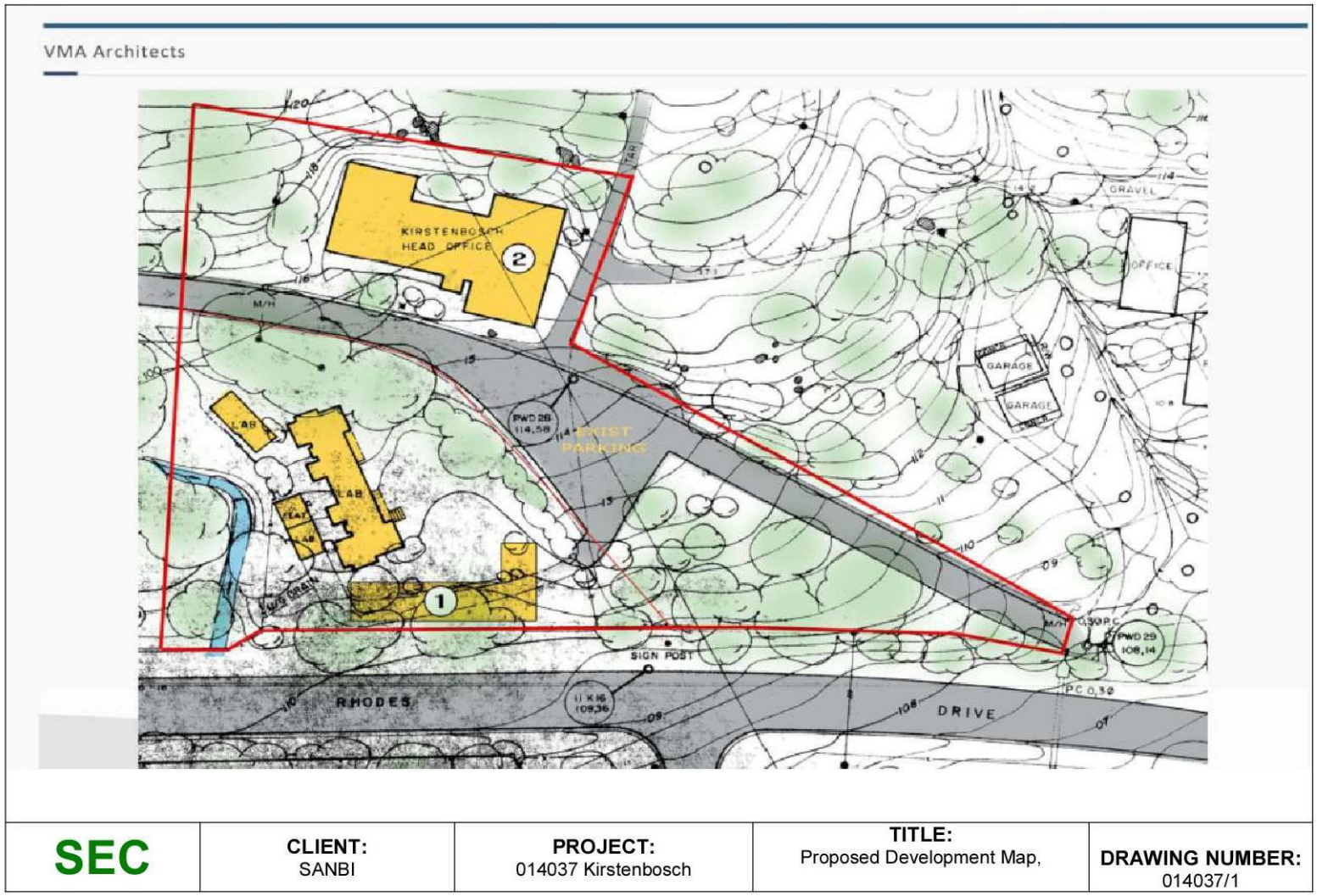

Figure 6 Proposed development plan (block number 1 is the proposed parking area, where the existing IT building is located, and block number 2 is the existing admin building that would be reconstructed)

Figure 7 Existing administrative infrastructure in Kirstenbosch NBG: (1) IT Building, (2) Administration Building showing the existing parking lot and (3) the 'Fynbos Lodge'

5. ASSESSMENT OF POTENTIAL IMPACTS OF PROPOSED ACTIVITIES ON FRESHWATER ECOSYSTEMS

The rating method used to assess the significance of the potential impacts of the proposed infrastructure upgrades at Kirstenbosch NBG on the adjacent river ecosystem is described in Appendix D.

5.1 Construction Phase Impacts

5.1.1 Site access, materials and equipment storage, and construction-related disturbance

Description: Disturbance to and loss of terrestrial and riparian vegetation, and compaction of soils due to excavations, trampling by construction personnel, and movement and storage of materials and machinery on site.

Assessment: Disturbance to and loss of vegetation on the site, and along the riparian corridor of the Liesbeek River, will lead to mobilisation of sediments in the river channel and increased sediment loads downstream. The risks of erosion and sedimentation will be greater during the high flow (winter) season.

Mitigation:

- No construction activities should be undertaken within 10 m of the outer edge of the river channel (i.e. south of buildings (a) and (b) in Figure 2), except when the river stabilisation work is done (see Section 5.1.4).
- Danger tape should be used to demarcate no-go areas within the recommended 10 m buffer.
- All equipment and materials storage areas should be located at a minimum distance of 10 m from the riparian edge of the Liesbeek River.

Table 4: Impact Significance Rating: Degradation of aquatic ecosystems as a result of site access, materials and equipment storage, and construction-related disturbance

	WITHOUT MITIGATION		WITH MITIGATION	
Category	**Rating**	**Description**	**Rating**	**Description**
Extent	Med	Impact beyond site boundary: sediment transport into the Liesbeek River	Low	Impacts unlikely beyond site boundary
Duration	Low	Short term: sediments re-mobilised during the following flood season	Low	Short term, easily reversible
Intensity	Low	Minor change in habitat diversity and ecosystem structure and function	Low	Little to no change
Confidence	High	-	Med	-
Probability	Med	Low to Medium probability of impact without mitigation	Low	Low likelihood with mitigation
Status	**(-)**	**Negative**	**(-)**	**Negative**
Significance	**Low**	Some loss of ecosystem structure and function	**Low**	Little to no loss of ecosystem structure and function

5.1.2 Waste materials generated by construction activities and work camps

Description: Waste materials and rubble generated by earth-moving and excavation, and waste materials produced by work camps may end up in the river or along the riparian corridor.

Assessment: Inadequate management of waste materials and rubble generated by construction activities or work camps will degrade aquatic habitat and pollute the Liesbeek River.

Mitigation:

- All rubble and other waste generated on the construction site should be removed from site and disposed of at a recognised waste management facility.
- The river corridor (including the recommended 10 m buffer area) must be inspected by the site manager and cleared of all waste on a daily basis.
- The ECO must check whether there is any waste along the river corridor during every site inspection.

Table 5: Impact Significance Rating: Degradation of Liesbeek River as a result of waste materials generated by construction activities and work camps

	WITHOUT MITIGATION		WITH MITIGATION	
Category	**Rating**	**Description**	**Rating**	**Description**
Extent	Low	Impact restricted to riparian corridor and river immediately adjacent to site	Low	Short section of river adjacent to site
Duration	High	Long term: Builders rubble won't be mobilised in all but the largest floods	Low	Short-term (duration of construction phase)
Intensity	Med	Change in habitat diversity and ecosystem structure and function	Low	Very little change
Probability	High	Likely without mitigation	Low	Low probability of impact with mitigation
Confidence	High	-	High	-
Status	**(-)**	**Negative**	**(-)**	**Negative**
Significance	**Low**	Some loss of ecosystem structure and function in the immediate vicinity	**Low**	Little to no loss of ecosystem structure and function

5.1.3 Contamination of river and riparian corridor by bitumen, fuels, oils or cement slurry

Description: Bitumen, fuels, oils, cement slurry and other construction materials pose an environmental risk to the river and riparian corridor during the construction phase. Proper management of these materials is essential to minimise this risk.

Assessment: Construction materials including bitumen, cement slurry, or oil or fuels for construction machinery will degrade water quality in the Liesbeek River and pose an ecological hazard to aquatic communities downstream.

Mitigation:

- All environmentally hazardous materials, including bitumen, fuels, oils and cement slurry should managed in such a way that they are not able to contaminate the river through direct spills or stormwater runoff.
- No bitumen, fuels, oils, cement, cement slurry, or any other environmentally hazardous materials should be stored within 10 m of the riparian edge.
- Operators must manage and contain cement slurry, and remove and dispose of excess materials from the vicinity of the riparian corridor.
- All spills should be reported immediately and workers should be instructed to store, transport and use hazardous materials in ways that minimise the risk of spills.

Table 6: Impact Significance Rating: Contamination of Liesbeek River and riparian corridor by bitumen, fuels, oils or cement slurry

	WITHOUT MITIGATION		WITH MITIGATION	
Category	**Rating**	**Description**	**Rating**	**Description**
Extent	Med	Impact beyond site boundary: possible transport of spills into the Liesbeek River and downstream	Low	Impacts unlikely beyond site boundary
Duration	Low	Short term: waste materials will be flushed from the river relatively quickly (within days)	Low	Short term, easily reversible
Intensity	Med	Intensity depends on the type and severity of the spill	Low	Little to no change if there is no spillage or runoff of contaminants into the Liesbeek River corridor
Probability	Med	Likely without mitigation	Low	Low probability of impact with mitigation
Confidence	Med	-	Med	-
Status	**(-)**	**Negative**	**(-)**	**Negative**
Significance	**Med**	Minor loss of ecosystem structure and function	**Low**	Little to no loss of ecosystem structure and function

5.1.4 Impacts associated with installation of gabions and reno mattress along river bank

Description: The following negative construction-phase impacts on the Liesbeek River ecosystem could occur when the gabions and reno mattress are installed along the river bank:

- Sedimentation of river and knock-on effects to aquatic biota, especially when the initial excavation work is carried out along the base of the river bank.
- Disruption of spawning by Cape Galaxius in the Liesbeek River downstream of the construction site (the spawning period for this fish species complex is typically from spring to mid-summer).
- Localised alteration of flows and sediment loads in the river at and immediately downstream of the construction site, due to the presumed temporary isolation of an instream work area within the river when the initial work in the river is conducted and the pumping of water from this area back into the river.
- Physical disturbance to instream and riparian habitat, as a result of construction activities taking place in the river.
- Physical damage to river embankments and riparian vegetation through the storage of construction materials (including rocks) and/or equipment in these areas.
- Damage to riparian areas through the dumping of excavated material and spoil.
- Pollution of the river through leakage of fuels, oils, etc. from construction machinery, or through the runoff of cement and cement slurry from the construction area.
- Generation of litter and other waste material (e.g. wire off-cuts from the construction of the proposed gabion baskets) in the river channel itself and along the river banks.
- Increased disturbance of aquatic and semi-aquatic fauna, due to noise and the presence of a construction team with their machinery in and adjacent to the river.

Assessment: The potential construction-phase impacts associated with the installation of the proposed gabions and reno mattress were evaluated, overall, to be of low significance with the recommended mitigation measures assumed to be in place (see Table 7). Without mitigation, however, it was predicted that the sedimentation of the river that could occur during the initial excavation work and the related impact of possibly disrupting the spawning of Cape Galaxius fish species downstream of the construction site (as a result of the smothering of spawning habitat) would result in an overall negative impact of medium-to-high significance on the river ecosystem. The most important recommended mitigation measures for these impacts are to conduct the proposed activities in the low-flow season and outside of the typical spawning period for Cape Galaxius – this would be from early January to late March – and to create an isolated instream work area that is kept as dry as possible while the initial excavation activities are being carried out.

Mitigation:

- When the initial work is undertaken (i.e. excavation of the river bed and bank, and placement of the reno mattresses), the work area should be isolated from the rest of the stream for the duration of this phase of work (e.g. using sandbags) and the isolated work area should be kept as dry as

possible by pumping water out of this area. The sediment-laden water that is pumped from the isolated work area must not be discharged directly back into the river, but rather over land adjacent to the river where there can be some infiltration and settlement. This will reduce the sediment load in the water and the velocity at which the water enters the river. In addition, as a final line of defence against sedimentation of downstream areas, a temporary permeable barrier to trap sediments should be placed across the river immediately downstream of the work area (and downstream of the point at which the water that is pumped from the work area re-enters the river). This temporary barrier can be constructed using sand bags and/or gabion baskets, wrapped with geotextile fabric.

- The work that is to be carried out in the river itself (e.g. the installation of the reno mattresses) should be undertaken between the beginning of January and the end of March, during the low-flow season and when the spawning period for the Cape Galaxius fish species (spring to mid-summer) should be over. If any work is to be carried out in the river during spring or early summer, when Cape Galaxius are potentially spawning downstream of the site, then more stringent sediment control measures and more frequent monitoring by an ECO will be required.
- No construction material (e.g. rocks) or excavated spoil material should be stockpiled in the river channel, on the river banks or in the riparian zone of the river.
- All litter and other waste generated during installation (including wire off-cuts from the construction of the gabion baskets) should be immediately removed from the river channel and banks.
- Avoid the use of noisy machinery (as far as possible), minimise the amount of time spent working in the river, and only allow workers into the river when they need to be in there to complete specific tasks.
- All the recommended mitigation measures for the general construction work on the site (as outlined in Sections 5.1.1 to 5.1.3, above) should be properly implemented.
- The construction area and the section of the stream adjacent to and downstream of this should be inspected on a regular (at least weekly) basis by the ECO for signs of disturbance, sedimentation and pollution when the gabion installation work is being undertaken. If signs of disturbance, sedimentation or pollution are noted, immediate action should be taken to remedy the situation and, if necessary, a freshwater ecologist should be consulted for advice on the most suitable remediation measures.
- If the ECO observes any incident while the gabions are being installed that results in a visually significant negative impact on the ecological condition of the river (or is informed of such an incident), a stop-works instruction should be issued, and the incident should be immediately reported to the Department of Water & Sanitation (DWS) (Compliance and Enforcement Unit) and to the City of Cape Town (Environmental Compliance Unit, Environmental Resource Management Department).

Table 7: Impact Significance Rating: Impacts on Liesbeek River during installation of proposed gabions and reno mattress along eroded section of the northern bank of the river

	WITHOUT MITIGATION		WITH MITIGATION	
Category	**Rating**	**Description**	**Rating**	**Description**
Extent	Med-High	Impact beyond site boundary: sedimentation of Liesbeek River and disruption of spawning by Cape Galaxius fish populations	Med	Impact less likely but could still affect regionally important Cape Galaxius
Duration	Low	Short term: sediments re-mobilised during the following flood season	Low	Short term, easily reversible
Intensity	Med	Moderate change in habitat quality and ecosystem structure and function	Low	Minor, localised deterioration of habitat quality
Confidence	Med	-	Med	-
Probability	Med	Distinct possibility without mitigation	Low	Low probability of impact with mitigation
Status	**(-)**	**Negative**	**(-)**	**Negative**
Significance	**Med-High**	Potentially major loss of ecosystem structure and function	**Low**	Little to no loss of ecosystem structure and function

5.2 Operational Phase Impacts

5.2.1 Hydrological and water quality impacts of stormwater runoff as a result of catchment hardening

Description: There will be an increase in the extent of hardened surfaces and in the number of cars that will need to be accommodated in the new parking area. This will increase the amount of runoff during rainfall events and the risk of pollutants entering aquatic systems.

Assessment: It was estimated by the stormwater planning engineers for the project that the post-development runoff from the site will be 46% more than the pre-development runoff for the 1 in 10 year recurrence interval storm. The storage requirement for a 24 hour storm with a 1 in 10 year recurrence interval (which was used as the design objective to comply with the attenuation requirements of the City's stormwater policy) were calculated to be $50m^3$ (OWSA 2014). The stormwater planning engineers have calculated that this volume can be retained within the proposed permeable paving structure for the parking area and access road (the area required for the treatment of water for a 24 hour storm with a recurrence interval of 10 yrs is $1200m^2$ and the extent of permeable paving proposed for the development is $2400m^2$). The stormwater planning engineers have also indicated that the proposed permeable paving will ensure compliance with the City's (2009) water quality criteria for stormwater runoff from new developments.

Mitigation:

- Ensure that the permeable paving is regularly brushed and vacuumed (at least twice a year) to ensure that it retains its permeability, and immediately replace any paving blocks that are cracked or broken (these

maintenance requirements should be written into the operational-phase component of the EMP).

- Include a litter trap and a sediment trap (sump) at the outlet of all stormwater drainage systems, and maintain these regularly.

Table 8: Impact Significance Rating: Hydrological and water quality impacts of stormwater runoff as a result of catchment hardening

	WITHOUT MITIGATION		WITH MITIGATION	
Category	**Rating**	**Description**	**Rating**	**Description**
Extent	Low-Med	Localised impact beyond site	Low-Med	Localised impact beyond site
Duration	Med	Long-term but reversible	Med	Long-term but reversible
Intensity	Med	Moderate increase in runoff and pollutants likely over time if permeable paving is not properly maintained	Low	Very little change to hydrology and water quality likely with proper maintenance of permeable paving and installation of sediment traps
Probability	Med	Distinct possibility of impacts over time	Low	Impacts unlikely with proper maintenance of permeable paving
Confidence	Med-High	-	Med-High	-
Status	**(-)**	**Negative**	**(-)**	**Negative**
Significance	**Med**	Moderate changes could occur to ecosystem functioning	**Low**	Low significance. Impacts are minor and largely mitigated

5.2.2 Reduced erosion of river banks and improved dissipation of high flows

Description: The stabilisation of a section of the river bank will reduce ongoing erosion of the bank, and will allow for better dissipation and absorption of high flows. The improved dissipation and absorption of high flows would result from the permeable nature of the reno mattress and gabion baskets that are to be installed.

Assessment: The proposed stabilisation of the eroding section of river bank with gabions is likely to have a largely positive impact on the river during the operational phase. There is a minor risk that the bank stabilisation structures could lead to a localised increase in flow rates and/or water depths in the river. It was, however, determined by the Engineers that the introduction of the gabion structure will have a negligible increased effect on the flow rates and water depths (in the order of 1% - 2%), as the Manning n-value (a factor related to the frictional resistance of the river surface) for gabion boxes is similar to that of the natural river bed (pers. comm., Adeeb Abrahams: Orrie, Welby-Solomon & Associates).

Mitigation:

- Ensure that the mesh size of the baskets is small enough in relation to the size of the stones to be used in the baskets, so that stones do not wash out of the baskets and compromise the structural integrity of the stabilisation measures.
- Ensure that there is good supervision and quality control during the construction and installation of the gabion baskets and reno mattress.
- Conduct regular inspections and ongoing maintenance of the reno mattress and gabion baskets (this requirement should be written into the operational-phase component of the EMP).

Table 9: Impact Significance Rating: Reduced erosion of river banks and improved dissipation of high flows

	WITHOUT MITIGATION		WITH MITIGATION	
Category	**Rating**	**Description**	**Rating**	**Description**
Extent	Low-Med	Positive impact would extend downstream of site	Low-Med	Positive impact would extend downstream of site
Duration	Low-Med	Effectiveness would diminish over time without maintenance	Med	Long-term but not permanent
Intensity	Low-Med	Minor to moderate improvement likely	Med	Moderate improvement likely
Probability	High	Definite	High	Definite
Confidence	Med	-	Med	-
Status	**(+)**	**Positive**	**(+)**	**Positive**
Significance	**Low-Med**	Positive impact of low to medium significance anticipated.	**Med**	Positive impact of medium significance anticipated

5.3 Cumulative Impacts

Some additional hardening of the catchment area for the Liesbeek River will occur. This is considered to be a cumulative impact of very low to negligible significance, due to the extremely small size of the property that is to be developed relative to the total size of the catchment area for the river.

5.4 "Water use" authorisation

The bulk of the proposed activities, excluding the installation of bank stabilisation measures, would take place outside of the current-day riparian zone of the Liesbeek River but the 1:100 year flood line has not been determined for the relevant section of the river. As such, it is unclear whether the proposed activities would be considered to be a Section 21(i) "water use" in terms of the National Water Act (Act No. 36 of 1998) (NWA) – i.e. altering the bed, banks, course or characteristics of a watercourse – because this particular "water use" is defined in the relevant General Authorisation (Government Notice No. 1199 of December 2009) as "any change affecting the resource quality within the riparian habitat or 1:100 year floodline, whichever is the greater distance ...". The proposed installation of gabions along a section of the northern bank of the river does, however, trigger the legal requirement for "water use" authorisation in terms of Section 21 (c) – impeding or diverting the flow of water in a watercourse – and Section 21 (i) of the NWA. This was confirmed by the Department of Water & Sanitation (DWS), in a letter dated 19/11/2014 and an application should thus be submitted to the Western Cape office of DWS. It is likely that the applicable "water uses" fall under the ambit of the relevant General Authorisation.

6. SUMMARY AND CONCLUSIONS

The Liesbeek River and its tributaries flowing through the Kirstenbosch NBG are considered to be of moderate to high ecological importance and sensitivity due to the presence of sensitive aquatic invertebrate taxa, unique fish species and its location within the Table Mountain National Park. The PES of the potentially affected section of river ranges from largely natural to largely modified, mainly due to the impacts of existing infrastructure (road culverts, landscaping, upstream parking areas).

The proposed upgrade of existing infrastructure at the Kirstenbosch NBG is not considered to pose any highly significant additional risks to adjacent aquatic ecosystems, aside from those already present. The existing infrastructure, including culverts, gardens and landscaping have degraded the river, and contributed to channel erosion and incision along the potentially affected river reach. It is not expected that the upgrades will contribute to further significant degradation of the river ecosystem. Indeed, it is anticipated that the proposed installation of gabions to stabilise the eroding section of river bank adjacent to the site will result in a positive impact on the ecological integrity of the river reach. Care should, however, be taken with regards to environmental considerations during the construction phase and attention should be paid to the maintenance of the proposed permeable paving in the parking area and the proposed gabions along river bank during the operational phase. The recommended mitigation measures presented in the current report for the construction and operational phases should be written into the Environmental Management Programme (EMP) for the proposed upgrading project.

It is recommended that the relevant official(s) from the Western Cape Regional Office of DWS be contacted to establish which application forms must be filled in and what information must be provided to the Department for the “water use” authorisations that are required for the proposed activities in terms of Sections 21(c) and (i) of the NWA.

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Appendix A:

Present Ecological State (PES) assessment method for riverine habitat integrity

Present Ecological State (PES) assessment method for riverine habitat integrity

The DWAF (1999) Habitat Integrity assessment method for determining the Present Ecological State (PES) of a riverine ecosystem, also known as the Index of Habitat Integrity (IHI, after Kleynhans 1996), aims to assess the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict on the habitat integrity of the system. These disturbances include abiotic factors (such as water abstraction, weirs, dams, pollution and dumping of rubble) and biotic factors (such as the presence of alien plants and aquatic animals which modify habitat). The assessment method is a largely field-based site assessment, supplemented with information gleaned from other sources including relevant reports, strategic plans, maps, aerial photographs, land cover databases, together with local knowledge.

Aspects considered in the assessment comprise those instream and riparian zone perturbations regarded by the developers of the method as the primary causes of the degradation of river ecosystems. The severity of each impact is assessed, using a score between zero and 25 as a measure of impact (Table A1).

Table A1: Description of the Impact Classes used in the River PES assessment and the range of scores for each Class

Impact Class	Description	Score
None	No discernible impact or the modification is located in such a way that it has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size and variability is limited.	1 - 5
Moderate	The modifications are present at a small number of localities and the impact on habitat quality, diversity, size and variability are fairly limited.	6 - 10
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size and variability. Large areas are, however, not affected.	11 - 15
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area are affected. Only small areas are not influenced.	16 - 20
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	21 - 25

The assessor must assign a confidence level (high, medium or low) to each criterion based on his/her knowledge of the site and catchment. High confidence would be based on the assessor having a thorough knowledge and understanding of the site and surrounding area. Low confidence would be based on the assessor having knowledge based on the site visit only and some supplementary information (e.g. land cover). Whilst it is near-impossible to remove all subjectivity involved in making PES assessments, descriptions of each criterion are provided to assist with the assessment (Table A2).

Table A2: Descriptions of criteria used in the IHI assessment (after Kleynhans 1996)

Criterion	Description
Water abstraction	Direct abstraction from within the specified river/river reach as well as upstream (including tributaries) must be considered (excludes indirect abstraction by for example exotic vegetation). The presence of any of the following can be used as an indication of abstraction: cultivated lands, water pumps, canals, pipelines, cities, towns, settlements, mines, impoundments, weirs, industries. Water abstraction has a direct impact on habitat type, abundance and size; is implicated in flow, bed, channel and water quality characteristics; and riparian vegetation may be influenced by a decrease in water quantity.
Extent of inundation	Destruction of instream habitat (e.g. riffle, rapid) and riparian zone habitat through submerging with water by, for example, construction of an in-channel impoundment such as a dam or weir. Leads to a reduction in habitat available to aquatic fauna and may obstruct movement of aquatic fauna; influences water quality and sediment transport.
Water quality	The following aspects should be considered; untreated sewage, urban and industrial runoff, agricultural runoff, mining effluent, effects of impoundments. Ranking may be based on direct measurements or indirectly via observation of agricultural activities, human settlements and industrial activities in the area. Water quality is aggravated by a decrease in the volume of water during low or no flow conditions.
Flow modification	This relates to the consequence of abstraction or regulation by impoundments. Changes in temporal and spatial characteristics of flow such as an increase in duration of low flow season can have an impact on habitat attributes, resulting in low availability of certain habitat types or water at the start of the breeding, flowering or growing season.
Bed modification	This is regarded as the result of increased input of sediment from the catchment or a decrease in the ability of the river to transport sediment. The effect is a reduction in the quality of habitat for biota. Indirect indications of sedimentation are stream bank and catchment erosion. Purposeful alteration of the stream bed, e.g. the removal of rapids for navigation is also included. Extensive algal growth is also considered to be bed medication.
Channel modification	This may be the result of a change in flow which alters channel characteristics causing a change in instream and riparian habitat. Purposeful channel modification to improve drainage is also included.
Presence of exotic aquatic fauna	The disturbance of the stream bottom during exotic fish feeding may influence, for example, the water quality and lead to increased turbidity. This leads to a change in habitat quality.
Presence of exotic macrophytes	Exotic macrophytes may alter habitat by obstruction of flow and may influence water quality. Consider the extent of infestation over instream area by exotic macrophytes, the species involved and its invasive abilities.
Solid waste disposal	The amount and type of waste present in and on the banks of a river (e.g. litter, building rubble) is an obvious indicator of external influences on stream and a general indication of the misuse and mismanagement of the river.
Decrease of indigenous vegetation from the riparian zone	This refers to physical removal of indigenous vegetation for farming, firewood and overgrazing. Impairment of the riparian buffer zone may lead to movement of sediment and other catchment runoff products (e.g. nutrients) into the river.
Exotic vegetation encroachment	This excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Encroachment of exotic vegetation leads to changes in the quality and proportion of natural allochthonous organic matter input and diversity of the riparian zone habitat is reduced.
Bank erosion	A decrease in bank stability will cause sedimentation and possible collapse of the river bank resulting in a loss or modification of both instream and riparian habitats. Increased erosion can be the result of natural vegetation removal, overgrazing or encroachment of exotic vegetation.

Weightings and calculation of instream and riparian status

Once a score has been allocated to an impact, it is moderated by a weighting system (devised by Kleynhans (1996). Assignment of weights is based on the perceived relative threat of the impact to the habitat integrity of a riverine ecosystem. The total score for each impact is equal to the assigned score multiplied by the weight of that impact (Table A3).

Table A3: Instream and riparian criteria used to derive IHI scores, with their respective weightings (after Kleynhans 1996)

Instream Criteria	Wgt	Riparian Zone Criteria	Wgt
Water abstraction	14	Water abstraction	13
Extent of inundation	10	Extent of inundation	11
Water quality	14	Water quality	13
Flow modification	7	Flow modification	7
Bed modification	13		
Channel modification	13	Channel modification	12
Presence of exotic macrophytes	9		
Presence of exotic fauna	8		
Solid waste disposal	6		
		Decrease of indigenous vegetation from the riparian zone	13
		Exotic vegetation encroachment	12
		Bank erosion	14

Based on the relative weights of the criteria, the impacts of each criterion are estimated as follows:
Rating for the criterion /maximum value (25) x the weight (percent).

The impact scores for all criteria calculated in this way are summed, expressed as a percentage and subtracted from 100 to arrive at a PES score for the instream and riparian components, respectively. The PES or IHI scores (%) for the instream and riparian zone components are then used to place these two components into a specific Habitat Integrity or PES Class (Table A4), also known as an Ecological Category.

Table A4: Habitat Integrity classes (from DWAF 1999)

Class	Description	Score (% Of Total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place, but the assumption is that ecosystem functioning is essentially unchanged.	80 - 89
C	Moderately modified. A loss or change in natural habitat and biota has occurred, but basic ecosystem functioning appears predominately unchanged.	60 - 79
D	Largely modified. A loss of natural habitat and biota and a reduction in basic ecosystem functioning is assumed to have occurred.	40 - 59
E	Seriously modified. The loss of natural habitat, biota and ecosystem functioning is extensive.	20 - 39
F	Modifications have reached a critical level and there has been an almost complete loss of natural habitat and biota. In the worst cases, the basic ecosystem functioning has been destroyed.	0 - 19

Appendix B:

South African Scoring System Version 5 (SASS5) aquatic invertebrate assessment method

South African Scoring System Version 5 (SASS5) aquatic invertebrate assessment method

The SASS5 macroinvertebrate-based assessment method (see Dickens & Graham 2002) is specifically designed for the assessment of the ecological integrity of perennial river systems. It involves kick- and sweep-sampling of aquatic macroinvertebrates from three "biotope groups", using a hand-held 950 µm-mesh net. The three biotope groups are Stones (including stones in and out of current), Vegetation (including marginal and aquatic vegetation, both in and out of current), and Gravel, Sand and Mud (GSM). The sample from each of the three biotope groups is placed in a basin and all the taxa identified, at the level of invertebrate family. Each invertebrate taxon has a pre-assigned SASS5 "sensitivity score" based on its general susceptibility to or tolerance of pollution, on a scale of 1 to 15, with sensitive taxa being assigned higher scores. Interpretation of the sample results is based on two values: the SASS5 Score, which is the summed sensitivity scores of all taxa present, and the average score per taxon (ASPT), which is the SASS5 Score divided by the number of taxa.

Data were analysed using the SASS5 interpretation guidelines developed by Dallas (2007), which assign an Ecological Category (ranging from A to E/F) to a site on the basis of the SASS5 Score and ASPT. The SASS5 data interpretation guidelines provide Ecoregion-specific ranges of SASS5 Scores and ASPT values for deriving an Ecological Category, with different ranges given for upper-river and lower-river zones for those Ecoregions in which sufficient data were available to generate separate guidelines.

Appendix C:

Ecological Importance & Sensitivity (EIS) assessment method for river ecosystems

Ecological Importance and Sensitivity Assessment Method for River Ecosystems
(taken from Appendix R.7 of DWAF 1999)

The ecological importance of an aquatic ecosystem is an expression of its importance to the maintenance of ecological diversity and functioning, while ecological sensitivity refers to the ability of a river and its biota to resist disturbance and its capability to recover from disturbance once it has occurred (resilience). The Ecological Importance and Sensitivity (EIS) assessment method of DWAF (1999) for river ecosystems takes into account both biotic and abiotic components of a river reach.

Biotic components included in the assessment are:
(1) the presence of rare and endangered biota;
(2) the uniqueness of the biota;
(3) species/taxon richness; and
(4) the presence of biota with an intolerance to flow and/or water quality changes (i.e. sensitive biota).

Abiotic (habitat) components included in the assessment are:
(1) the diversity of aquatic habitat types or features;
(2) the refuge value of habitat types;
(3) sensitivity of available habitat to flow changes;
(4) sensitivity to flow-related water quality changes;
(5) importance as a migration route/corridor for instream and riparian biota; and
(6) proximity to national parks, wilderness areas, nature reserves, natural heritage sites or natural areas.

A score of 0 or 1 (low rating) to 4 (very high rating) is assigned to each of the biotic and abiotic criteria listed above, together with confidence ratings, and the median score is calculated to derive the overall EIS category for the two components. A description of the EIS scoring categories is provided in Table C1 (below), together with an indication of the range of median EIS scores for each category.

Table C1: Ecological Importance and Sensitivity (EIS) categories

EIS Categories (and ranges of median EIS scores)	General Description
Very high (>3 but ≤4)	Quaternaries/delineations that are considered to be unique on a national or even international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.
High (>2 but ≤3)	Quaternaries/delineations that are considered to be unique on a national scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases, may have a substantial capacity for use.
Moderate (>1 but ≤2)	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually not very sensitive to flow modifications and often have a substantial capacity for use.
Low/marginal (>0 but ≤1)	Quaternaries/delineations that are not unique at any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have a substantial capacity for use.

Appendix D:

Impact significance rating method

Impact significance rating method

The evaluation method is adapted from Hacking, AATS – Envirolink, 1998: An innovative approach to structuring environmental impact assessment reports. In: IAIA SA 1998 Conference Papers and Notes.

Definitions of or criteria for environmental impact parameters

The significance of environmental impacts is a function of the environmental aspects that are present and to be impacted on, the probability of an impact occurring and the consequence of such an impact occurring before and after implementation of proposed mitigation measures.

(a) Extent (spatial scale)

L	M	H
Impact is localized within site boundary	Widespread impact beyond site boundary; Local	Impact widespread far beyond site boundary; Regional/national

Take into consideration:

- Access to resources; amenity
- Threats to lifestyles, traditions and values
- Cumulative impacts, including possible changes to land uses at and around the site

(b) Duration

L	M	H
Quickly reversible, less than project life, short term (0-5 yrs)	Reversible over time; medium term to life of project (5-15 yrs)	Long term; beyond closure; permanent

Take into consideration:

- Cost – benefit economically and socially (e.g. long or short term costs/benefits)

(c) Intensity (severity)

Type of Criteria	Negative		
	H-	M-	L-
Qualitative	Substantial deterioration, death, illness or injury, loss of habitat/diversity or resource, severe alteration or disturbance of important processes.	Moderate deterioration, discomfort, Partial loss of habitat/biodiversity/resou rce or slight or alteration	Minor deterioration, nuisance or irritation, minor change in species/habitat/diversity or resource, no or very little quality deterioration.
Quantitative	Measurable deterioration Recommended level will often be violated (e.g. pollution)	Measurable deterioration Recommended level will occasionally be violated	No measurable change; Recommended level will never be violated
Community response	Vigorous	Widespread complaints	Sporadic complaints

Type of Criteria	Positive		
	L+	M+	H+
Qualitative	Minor improvement, restoration, improved management	Moderate improvement, restoration, improved management, substitution	Substantial improvement, substitution
Quantitative	No measurable change; Within or better than recommended level.	Measurable improvement	Measurable improvement
Community response	No observed reaction	Some support	Favourable publicity

Take into consideration:

- Cost – benefit economically and socially (e.g. high nett cost = substantial deterioration)
- Impacts on human-induced climate change
- Impacts on future management (e.g. easy/practical to manage with change or recommendation)

(d) Probability of occurrence

L	M	H
Unlikely; low likelihood; Seldom	Possible, distinct possibility, frequent	Definite (regardless of prevention measures), highly likely, continuous

The specialist study must attempt to quantify the magnitude of impacts and outline the rationale used. Where appropriate, international standards are to be used as a measure of the level of impact.

(e) Status of the impact

Describe whether the impact is positive, negative or neutral for each parameter. The ranking criteria are described in negative terms. Where positive impacts are identified, use the opposite, positive descriptions for criteria.

Determination of impact significance

Based on a synthesis of the information contained in (a) to (e) above, the specialist will be required to assess the significance of potential impacts in terms of the following criteria:

Significance: (Duration X Extent X Intensity)

Intensity = L				
Duration	H	Medium	Medium	Medium
	M	Low	Low	Medium
	L	Low	Low	Medium
Intensity = M				
Duration	H	Medium	High	High
	M	Medium	Medium	High
	L	Low	Medium	High
Intensity = H				
Duration	H	High	High	High
	M	Medium	Medium	High
	L	Medium	Medium	High
		L	M	H
		Extent		

Positive impacts would be ranked in the same way as negative impacts, but result in high, medium or low positive consequence.

Degree of confidence in predictions:

State the degree of confidence in the predictions, based on the availability of information and specialist knowledge.

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18 February 2016

Lauren Le Roux
Sillito Environmental Consulting
By email: lauren@environmentalconsultants.co.za

Dear Lauren

Comments on potential impact of proposed changes to layout plan for a new administrative building at Kirstenbosch National Botanical Garden on freshwater ecosystems

Background and terms of reference

In December 2014, the Freshwater Consulting Group (FCG) completed a freshwater ecological assessment for the proposed establishment of a new administration building at Kirstenbosch National Botanical Garden (NBG). The proposed development area is located alongside the upper reaches of the Liesbeek River, where the river flows past the entrance to the Kirstenbosch NBG. The layout plan that was considered in our original assessment is now being referred to as "Scheme 1".

A number of changes have been made to the design of the proposed buildings, and the revised proposal is being referred to as "Scheme 2". The primary differences between the two proposals are that the main building would only be two storeys high in Scheme 2, compared to three storeys in Scheme 1, and the building would be shifted 3 m to the west and 1 m to the north in Scheme 2 relative to the originally proposed position. The main reasons for these changes are, apparently, to make the proposed administration building less obtrusive and more sympathetic to the site, and to allow for the retention of existing trees along the road to the east of the building.

I was appointed by Sillito Environmental Consulting (SEC) to provide a professional opinion as to whether the potential impacts on freshwater ecosystems associated with the proposed development would be different for Scheme 2, compared to those for Scheme 1 as presented in the original impact assessment report by FCG. I was also asked to indicate whether the recommendations made in our previous specialist report would need to be altered for the newly proposed scheme.

Assumptions

The comments provided in this letter are based on the assumption that the parking area for the new administration building is to be located in the same position as previously proposed and that stormwater runoff (from the parking area and from the buildings) will be managed as previously proposed. Furthermore, it is assumed that the bank stabilisation measures for the section of the Liesbeek River adjacent to the development area will be implemented as previously proposed.

Comments and conclusions

The overall conclusion of the previous assessment for the proposed administration building at Kirstenbosch NBG by FCG was that the proposed infrastructure upgrades would not pose any highly significant additional risks to adjacent freshwater ecosystems, aside from those already present. On the contrary, it was predicted that the proposed installation of gabions to stabilise the

eroding section of river bank adjacent to the site is likely to result in a positive impact on the ecological integrity of the river reach.

The total footprint area of the proposed administration building is to remain the same as previously proposed, with the position of the building to be moved slightly westward and northward for Scheme 2 in relation to Scheme 1. The shifting of the building will not result in the encroachment of the building or any of the associated infrastructure into any freshwater ecosystems that were mapped during the previous assessment by FCG and, if anything, the building will be marginally further from the river than previously proposed. At the same time, the proposed parking area will remain in the same position as previously proposed, stormwater runoff will be managed as previously proposed, and the river bank stabilisation measures will be implemented as previously proposed. As such, I am of the professional opinion that the proposed revisions to the layout plan and designs for the new administration building at Kirstenbosch NBG will not change the findings of the assessment presented in the previous report by FCG or the recommendations that we made in that report.

I hope this letter provides the input required from FCG at this stage. Please do not hesitate to contact me if you have any queries or require any further assistance from us.

Yours sincerely

Dean Justin Ollis *Pr.Sci.Nat.*

STORMWATER MANAGEMENT PLAN

SANBI KIRSTENBOSCH

NEW ADMINISTRATION BUILDING,

PARKING FACILITY AND REFURBISHMENT OF FYNBOS LODGE

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NOVEMBER 2014

Contents

1 Introduction

This report is the stormwater management plan for the proposed new administration building, provision of parking facilities and the refurbishment of the existing Fynbos Lodge for SANBI in Kirstenbosch.

The work falls under *Contract SANBI: G174/2013 for the provision of professional services for the design of a new administration building for the South African National Biodiversity Institute in Kirstenbosch.*

1.1 Existing Stormwater Services

There are 6 buildings with a total floor area of 1003m^2 located on the site earmarked for the construction of the new Administration building. The area is serviced with an existing access road with shaded and unshaded parking areas. The buildings are accessed by walkways.

The access road has a half round channel along the south eastern edge which terminates at a catchpit. The catchpit is drained with a 300mm ∅ concrete pipe which in turn discharges onto the apron garden area located north east of the catchpit. A second Stormwater system is located along the north western side of the rest of the access road which in turn terminates at a catchpit.

Figure 1: Typical Example of existing stormwater infrastructure.

The catchpit is connected to a stormwater system which in turn discharges into a stormwater pipe system on Rhodes Drive.

The Stormwater from the roads of the buildings is managed by a system of open surface channels which discharge directly into the Liesbeek River located west of the development.

The existing system appears to function satisfactorily with no visual evidence of scouring or erosion at the discharge points.

Signs of scouring of the existing river bed was observed. The proposed development does not discharge water directly into the river. However the scouring of the river banks may result in the foundations, of the buildings adjacent to the river bank, becoming unstable.

2 Background

2.1 Stormwater Policy Requirements

The City of Cape Town Catchment Management Policy (2009) indicates the recurrence and duration of design storm event for a site, according to the following criteria:

- Size of the catchment.
- Nature of the site with respect to it being a greenfield (new development) or brownfield (existing development) project.

The new SANBI Administrative Building complex in Kirstenbosch will be considered as a greenfield development with a land area of approximately 1.0 hectares (ha). Therefore, in accordance with the City of Cape Town Catchment Management Policy (2009), the following requirements need to be complied with for the **control of quantity and rate of runoff:**

- The protection of stability in downstream channels requires a 24 hour extended detention of stormwater runoff for a 1 year recurrence interval, 24hr storm event.
- The protection of downstream properties from fairly frequent nuisance floods requires the reduction of a 10 year recurrence interval post-development peak flow to a pre-development peak flow level.
- The protection of floodplain developments and floodplains from adverse impacts of extreme floods requires the reduction of a 50 year recurrence interval post-development peak flow to existing pre- development peak flow levels and the evaluation of the effects of the 100 year recurrence interval storm event on the stormwater management system, adjacent properties and downstream facilities and downstream properties. The impacts need to be managed through detention controls and or flood plain management.

In terms of **water quality**, the City of Cape Town Catchment Management Policy (2009) has criteria for achieving sustainable urban drainage system objectives in various development scenarios.

The water quality target for the SANBI Administrative Building complex, being a greenfield site, is the removal of **80% of Suspended Solids (SS) and 45% of Total Phosphates (TP)** produced on site as a result of post development stormwater runoff or to reduce to undeveloped catchment levels whichever requires a higher level or treatment. In addition all litter, grease and oil need to be trapped at the source.

2.2 The Site

The ± 1.0 ha site is located in the existing Kirstenbosch Botanical Gardens. (Co-ordinates South 33˚ 59' 12", East 18˚26' 09")

Access to the botanical gardens is off M63 - Rhodes Drive along the south eastern boundary. A secondary access is located off the M63 - Rhodes Drive in the north western corner of the botanical gardens. Access to the construction site is via the main entrance.

The following figure illustrates the locality of the site.

Figure 2: Site Locality

2.3 Existing Stormwater Services

The area is serviced with an existing ± 6m wide access road ± 200m long, starting at the main gate and terminating at the entrance to the nursery.

There are 4 buildings with a total floor area of ± 580 m^2 located on the south eastern side of the access road and 2 buildings with a total floor area of ± 720 m^2 on the north western side of the access road on the site, earmarked for the construction of the new Administration Building. There are 22 shaded and 15 unshaded off street parking bays. The buildings are accessed by walkways.

The access road has a half round channel along the south eastern edge which terminates at a catchpit. The catchpit is drained with a 300 mm ∅ concrete pipe which in turn discharges onto the open garden area located north east of the catchpit. A second Stormwater system is located along the north western side of the rest of the access road winch in turn terminates at a catchpit at the end of the road. The catchpit is connected to a stormwater system which in turn discharges into a stormwater pipe system located on Rhodes Drive.

The Stormwater from the roofs of the buildings, on the south eastern side of the access road, is managed by a system of open surface channels which terminates at a headwall. The headwall discharges directly into the Liesbeek River, located west of the development, via a 300 mm Ø pipe.

The existing system appears to function satisfactorily with no visual evidence of scouring or erosion at the discharge points.

Signs of scouring of the existing river bed was observed.

2.4 Geohydrology

The geology underlining the site for the proposed new SANBI building at Kirstenbosch Botanical Gardens is expected to comprise Quaternary age scree gravels and coarse sands of colluvial origin and variable thickness at ground surface, underlain by coarse porphyritic granites of the Cape Granite Suite, together with their associated residual granite soils. Variable weathering can be expected in the granites, ranging from relatively deep residual granite soils to granite bedrock and core-stones exposed across the area.

A perched water table can develop seasonally in the coarse colluvials screes and gravels. The permanent water table lies at depth in the fractures granite rock aquifer.

2.5 Climate

Kirstenbosch receives around 951 mm of rain per year and receives most of its rainfall during the winter months (SA Explorer, 2014). Figure 6 shows the average rainfall values for Kirstenbosch per month. It receives the lowest rainfall (19 mm) in February and the highest (166 mm) in June. (Note: for the simulated Rainfall Grid the MAP is estimated as 1200mm)

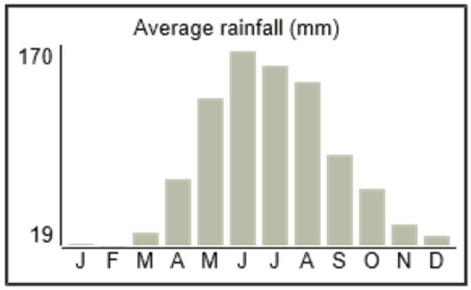

Figure 2.5.1: Average Rainfall (mm) for Kirstenbosch (SA Explorer, 2014)

The monthly distribution of average daily maximum temperatures (Figure 7) shows that the average midday temperatures for Kirstenbosch ranges from 15.4°C in July to 23.7°C in February. The region is the coldest during July when the mercury drops to 7.3°C; on average during the night (SA Explorer, 2014).

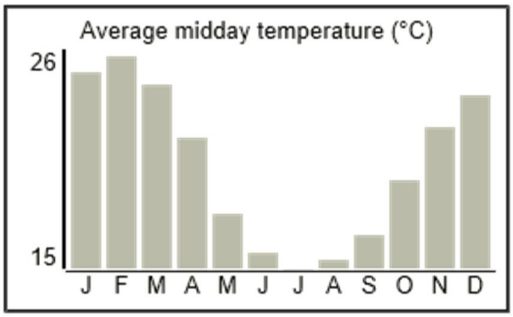

Figure 2.5.2: Average Midday Temperature (˚C) for Kirstenbosch (SA Explorer, 2014)

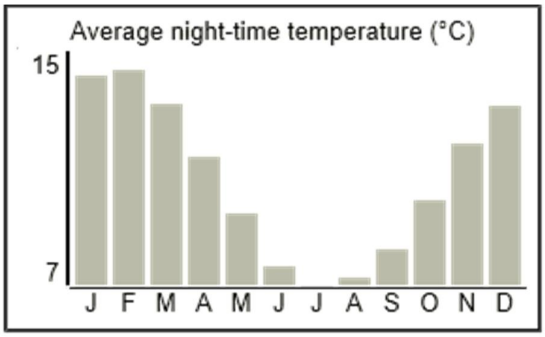

Figure 2.5.3: Average Night-Time Temperature (˚C) for Kirstenbosch (SA Explorer, 2014)

3 Methodology

3.1 Flood Calculation Design Methodology

The stormwater runoff for the storm events as prescribed in the City of Cape Town Catchment Management Policy (2009) were calculated using the Rational Method, Standard Design Flood Method, Hydrograph Method and the Empirical Flood Estimation Method as set out in the *Introduction to Flood Hydrology* by Haarhoff and Cassa, 2007. In additional computer based stormwater discharges simulations based on the Modified Chicago Method were run.

3.2 Rational Method

The Rational Method is one of the methods recommended for small catchments by the Stormwater Management Plan Guidelines for New Developments (2009). The method is based on the assumption that the discharge is the product of a runoff coefficient, storm intensity and area of the catchment.

$$Q = \frac{ciA}{3.6}$$

Where:

Q	Discharge in m^3/s
c	Runoff coefficient a factor dependent on surface roughness and permeability ranging from 0 to 1
i	Storm or rainfall Intensity in mm/hr
A	Area of the catchment in km^2

The rainfall intensity is independent of the development on the site whilst the area and runoff coefficient are dependent on site ground characteristics such as vegetation, sub-catchment delineations etc. It is for this reason that the intensity is discussed here whilst the area and runoff coefficients are discussed in section 3.2.2.

3.2.1 Intensity

The data for intensity of rainfall and rainfall volumes can be obtained from weather station data. The nearest weather station to the Kirstenbosch Botanical Garden is Cecelia (Latitude 33˚ 59’ 00”, Longitude18˚26’ 00”) which is 2.7 km south east of the site.

Using the City of Cape Town 2010 Rainfall Grid the nearest data point (X-50 821.85; Y-3 761 949.08) is located 450 m from the site.

Map 3.1: Proximity of weather station to Kirstenbosch Botanical Garden site

Storm rainfall depths for the 24 hour storm duration and different recurrence intervals (RI) were obtained from the City of Cape Town 2010 Rainfall Grid.

Table 3.1: Rainfall depths for different storm recurrence intervals at nearest Data Point

Recurrence Interval (yrs)	2	5	10	20	50	100	200
Rainfall Depth (mm)	81.5	107.2	124.1	140.2	161	176.5	191.9

Source: City of Cape Town 2010 Rainfall Grid

The 1 year RI storm needs to be retained for a further 24 hours after the storm i.e. 48 hours after the commencement of the storm event.

The 10 year and 50 year RI storm event storm duration must be determined as the storm duration which requires the greatest pond storage volume. The 100 year RI storm duration is the storm duration that creates the largest peak flow.

Long storm durations such as 24 hour storm events have greater rainfall depths than a storm event of 45 minutes (0.75 hour) duration but have a lower intensity and therefore requires greater detention volumes whilst shorter duration events like a 0.75 hour storm event have greater intensity and hence greater peak flows. Therefore the 1, 10 and 50 year RI will be calculated for 24 hour storm duration. The 100 year flood will be calculated for the shortest possible storm duration which is assumed to be 0.75 hour because shorter duration storms produce greater intensity rainfalls and thus greater peak flows.

The rainfall intensity can be calculated as the depth of rainfall falling over the time of concentration. The 24 hour storm can be assumed to have a triangular distribution with the peak rainfall intensity occurring at 12 hours.

3.2.2 Site Catchment Areas and Runoff Coefficient

3.2.2.1 Pre-development Area

The topography of the site slopes down from the south west towards the north east. The stormwater draining through the site is therefore both a combination of onsite stormwater runoff and stormwater from the mountain to the north west of the site. The area under concern for this study is going to be limited to the area to be developed. (i.e. 1.0 ha)

Table 3.2.1: Pre-development catchment characteristics

Sub-catchment	Area (m^2)	Runoff Length (m)	%Urban	Slope	Description	Runoff Coefficient
1	10 000	200	0	4.2	Mild slope, thick bush and grass, impermeable sand	0.65

The area of the site is approximately 1.0 ha.

3.2.2.2 Post-development

The sub-catchments remain the same as pre-development with the exception of the percentage of impervious area which has increased to 70%. The post-development site consists of roads, office buildings, parking and open-spaces. A general slope of 4.2% was assumed across the site.

Table 3.2.2: Post development sub-catchment characteristics

Sub-catchment	Area (m2)	Runoff Length (m)	%Urban	Slope	Description	Runoff Coefficient
1	10 000	200	0	4.2	Buildings, roads, parking areas and open spaces with mild slope, thick bush and grass, impermeable sand	0.95

4 Findings and Discussion

4.1 Peak Runoff

The following peak flows were determined and are tabulated as follows.

Table 4.1: Pre and Post-development Runoff Comparison

RI	Pre-Development Runoff (m^3/s)	Post Development Runoff (m^3/s)	Difference (m^3/s)
2	0.56	0.82	0.26
5	0.90	1.31	0.41
10	1.13	1.65	0.52
20	1.40	2.05	0.65
50	1.78	2.60	0.82
100	2.15	3.14	0.99

The post development runoff is 46% more than the pre-development runoff for the 1 in 10 year recurrence interval storm.

4.2 Storage Requirements

An initial analysis was performed to determine the storage requirements. The storage requirements were calculated using a triangular distribution for the 24 hour storm for a 1 in 10 year recurrence interval (which was determined to be a design objective in section 2.1).

The difference between the Pre and Post development volume is calculated as $50m^3$. This volume can be retained within the Permeable paving structure detailed in Figure 4.4.

4.3 Water Quality

In terms of **water quality**, the City of Cape Town Catchment Management Policy (2009) has criteria for achieving sustainable urban drainage system objectives in various development scenarios.

The water quality target for the SANBI Administrative Building complex, being a greenfield site, is the removal of **80% of Suspended Solids (SS) and 45% of Total Phosphates (TP)** produced on site as a result of post development stormwater runoff or to reduce to undeveloped catchment levels; whichever requires a higher level or treatment. In addition all litter, grease and oil need to be trapped at the source.

Because of the existing topography and unavailability of any suitable open space the water quality will be controlled using permeable paving only.

4.4 Permeable Paving

Permeable paving serves both structural and stormwater management functions by being able to handle heavy loads from vehicles and by reducing stormwater runoff. Permeable paving has a very high initial infiltration rate of 4500 mm/hr and can treat and store stormwater (EPA, 2014b) Permeable paving consists of a paver usually 80mm thick, a geotextile and layers of finer stone to increase infiltration and treatment of the stormwater (Figure 4.4.2). The stormwater is then released via a 110 mm diameter underdrain into a stormwater network. Permeable paving can reduce TSS between 71% and 99% and total phosphorus between 42% and 65% (EPA, 2014b).

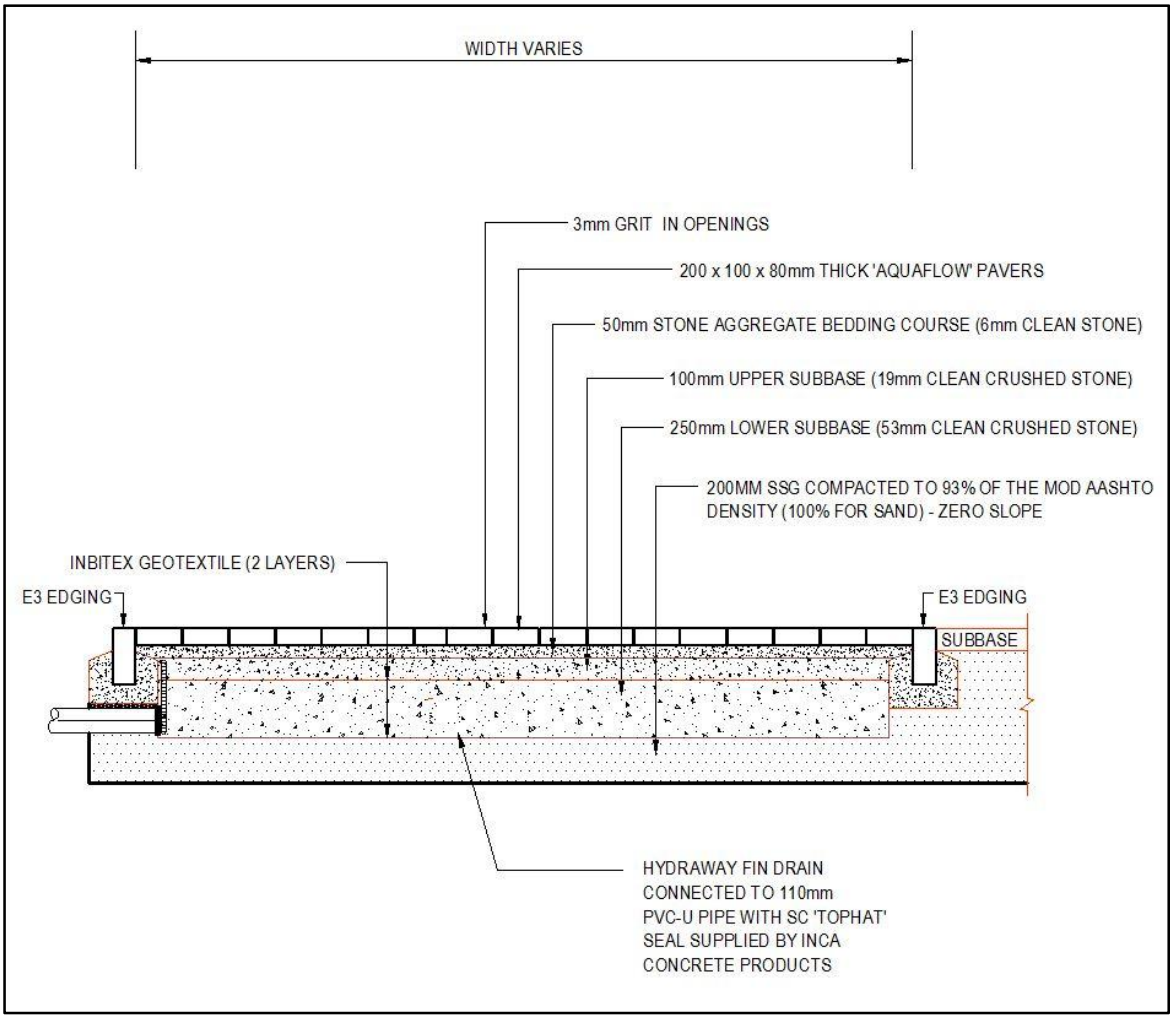

Figure 4.4.2: Detail of Proposed Permeable Paving Layer Works

Permeable paving is most effective in a parking lot when situated at the lowest drainage point of the site or in roads when stormwater is drained along the length of the road. Since the natural drainage path is towards the north-east, the proposed layout can accommodate the detention requirements.

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The parking and road is approximately 2400m^2 and therefore has the potential to treat and retain 850m^3 (which is adequate for the storage of a 1 in 10 year storm event). The area required for the treatment of water for a RI 10yr 24 hour storm is 1200m^2; the 2400m^2 of Permeable Paving which is proposed for this development is adequate. Therefore the treatment of the stormwater on site will be adequately met using permeable paving only.

5. Stabilisation of the River Bank

5.1 Location

Figure 5.1 indicates the position of the river and its proximity to the existing buildings.

Figure 5.1: River Proximity to Existing Buildings

5.2 Catchment

Figure 5.2 indicates the catchment area of the River under study.

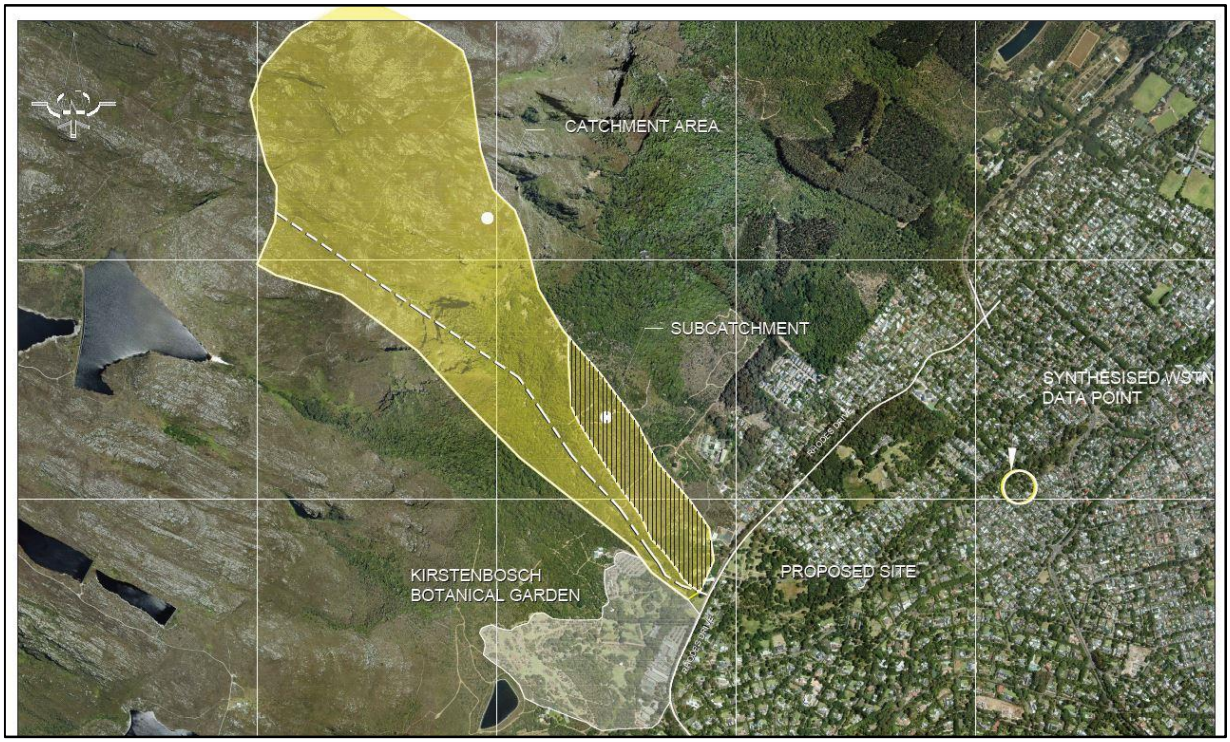


Figure 5.2: Study Area Catchment

The following catchment characteristics were assumed.

- Area: 1.76km^2
- Length of Longest Water Course: 2.7km
- Maximum Catchment Elevation: 1070m
- Minimum Catchment Elevation: 120m
- Slope (85/10 Method): 34%
- Catchment Centroid: X: -53195.9794 Y: -3761011.8185

5.3 Determination of Peak Flows

The peak flows for the different Recurrence Intervals are tabled in Table 5.3

Table 5.3: Peak Flows for Recurrence Intervals

RI	PEAK FLOW (m^3/s)	MANUAL CALCULATIONS				PC SWMM
		Rational Rural	SDF Method	Hydrograph Method	Empirical Flood Estimation	Modified Chicago Method
2	Q_n	8.94	4.47	26.08	8.30	9.82
5	Q_n	12.53	10.25	35.52	19.27	14.18
10	Q_n	15.42	15.27	44.95	27.57	15.83
20	Q_n	18.47	20.74	55.49	41.24	18.66
50	Q_n	22.40	28.65	72.14	59.30	22.40
100	Q_n	25.86	35.13	88.79	72.97	27.77

5.4 Depth of Flow

Figure 5.4.1, Figure 5.4.2 and Figure 5.4.3, indicate the depth of flow for the 1 in 50 year recurrence interval for the three cross-sections 1, 2 and 3 as indicated in Figure 5.1.

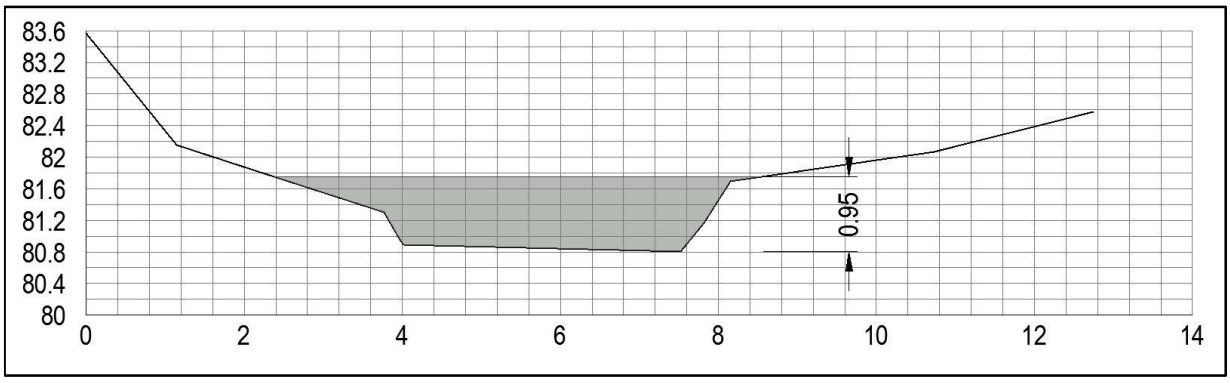


Figure 5.4.1: Section 1-1 RI 50yr Peak Flow Water Depth

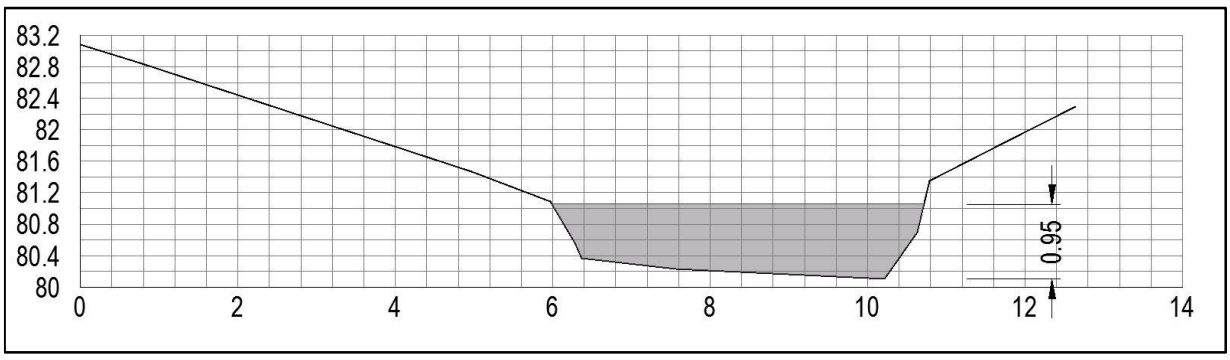


Figure 5.4.2: Section 2-2 RI 50yr Peak Flow Water Depth

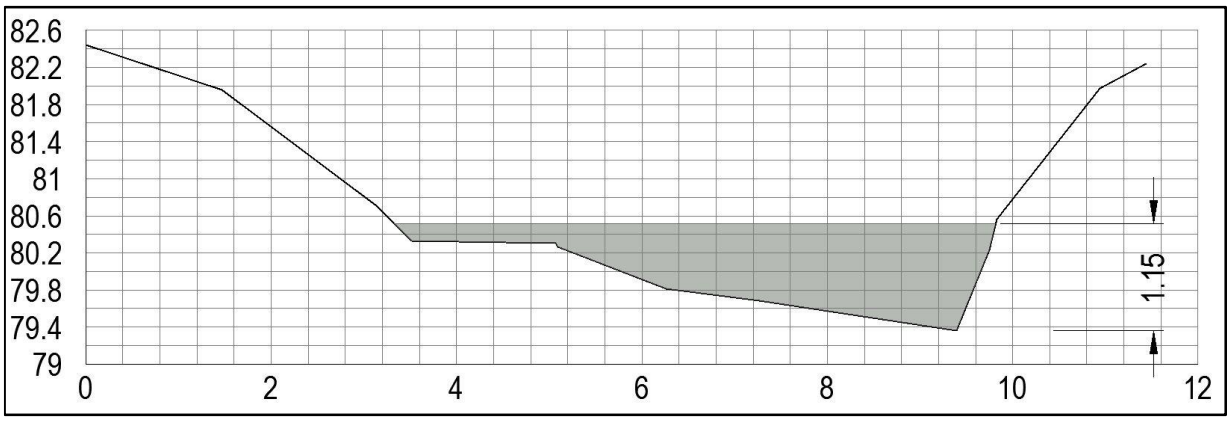


Figure 5.4.3: Section 3-3 RI 50yr Peak Flow Water Depth

Table 5.4.3 tabulates the calculated heights for the different recurrence intervals.

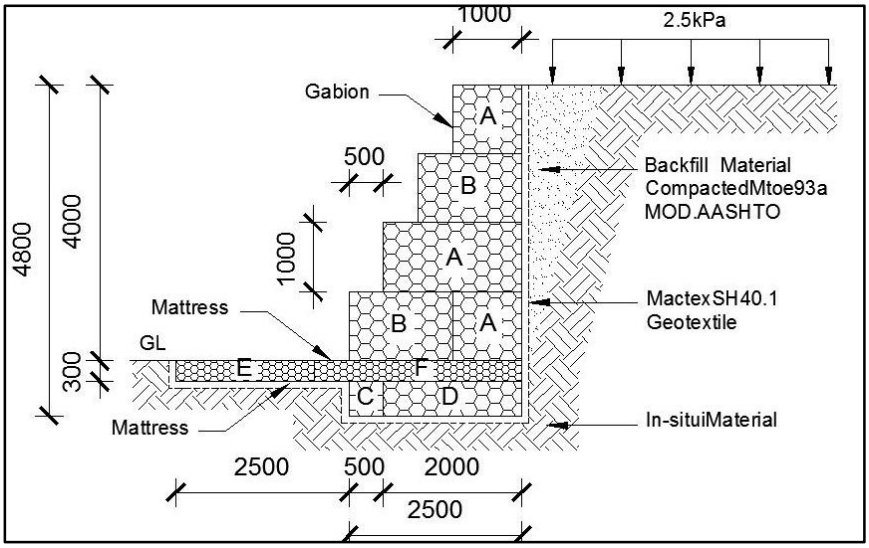
Table 5.4.3 : Peak Flows for Recurrence Intervals

d (m)	A (m^2)	P (m)	R (m)	s	n	Q (m^3/s)
0.50	1.74	4.61	0.38	0.07	0.03	8.24
0.60	2.17	5.06	0.43	0.07	0.03	11.21
0.70	2.65	5.51	0.48	0.07	0.03	14.73
0.80	3.16	5.96	0.53	0.07	0.03	18.75
0.90	3.69	6.47	0.57	0.07	0.03	23.03
1.00	4.33	7.50	0.58	0.07	0.03	27.19
1.10	5.05	8.52	0.59	0.07	0.03	32.28

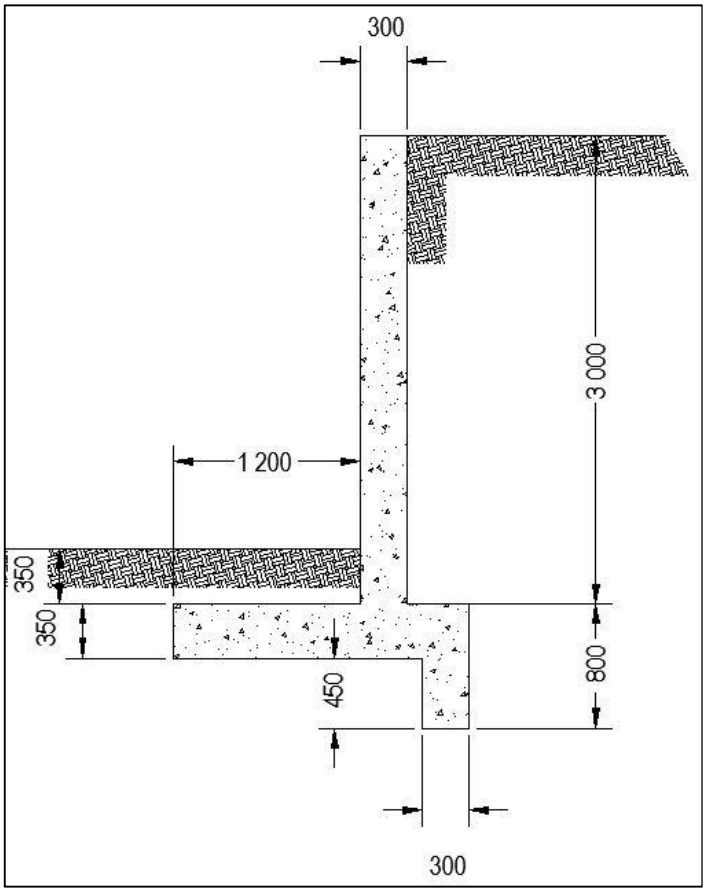
5.5 Stabilisation Options

Two **(2)** options to stabilise the existing embankment were investigated viz.

Option 1: Stabilisation using Gabions



Option 2: Stabilisation using Concrete Retaining Walls.



5.6 Discussion

The stabilisation of the embankment utilising gabions is considered to be less evasive than the construction of a concrete retaining structure. The construction of gabions will not necessarily require any excavation for trimming of the existing riverbed. The construction of the gabion will not pose a pollution problem. It is therefore recommended that the gabions be used in lieu of the concrete structure.

6. Conclusion

The site is part of the sub-catchment which originates 950m north west of the site. The stormwater discharge is currently managed by a system of natural watercourses and sheetflow discharges augmented with surface channels, catchpits and a pipe system for the existing development. The attenuation of a 10 year RI 24 hour storm (± 50m^3) will be accommodated in the permeable paving of the roads and parking area.

The proposed development has a negligible increase in the 1 in 100 year RI peak discharge and is therefore assumed to be managed downstream.

The stormwater quality treatment targets, as set by the City of Cape Town Catchment Managment Policy (2009), can be achieved using the permeable paving only.

Calculations indicate that the 1 in a 100 year RI peak discharge of the Liesbeek River tributory is contained within the existing watercourse, however, the embankment of the river is to be protected against erosion; for the section of embankment in close proximity to the existing building.

The utilisation of gabions is recommended to be used for the stabilisation of the embankment.

7. Recommendations

The following recommendations are made for the adequate stormwater management for the development of SANBI Kirstenbosch Administrative Building Complex:-

1. The stromwater discharge volume up to a 1 in 10 year RI to be detained in the permeable paving of the roads and parking area.

2. The permeable paving will serve as the stormwater quality treatment of the runoff.

3. Gabions to be used to stabilise the existing embankment of the river; for the section in close proximity to the existing building.

Traffic Impact Assessment

SANBI, Kirstenbosch

Cape town, Western Cape Western Cape

January 2016

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Summary Sheet

Report Type	Traffic Impact Assessment
Title	SANBI, Kirstenbosch
Location	Cape town, Western Cape
Client	Orrie, Welby-Solomon and Associates cc
Reference Number	ITS 3588
Project Team	Christoff Krogscheepers Pieter Arangie Tarshia Williams
Contact Details	Tel: 021 914 6211 & Fax: 021 914 7403
Date	January 2016
Report Status	Final
File Name:	G:\3588 TIA Sanbi Kirstenbosch\12 Reports\Issued\3588 TIA Sanbi Kirstenbosch_Final Report_TW_2016-01-25.docx

This transport impact assessment has been prepared in accordance with the National Department of Transport's 'Guidelines for Traffic Impact Studies' PR93/635 (1995) by a suitably qualified and registered professional traffic engineer. Details of any of the calculations on which the results in this report are based will be made available on request.

This transport impact assessment is reported only in a summary table instead of a lengthy report to assist review and interpretation of the results. This summary table includes all the relevant information that is normally contained in a report. It should be sufficient for review and interpretation of the expected transport impacts as well as the comprehension of the required measures to mitigate the transport impact. If any more detail is required please contact the authors.

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TABLE OF CONTENTS

Abbreviations

CM – Critical Movement

DR – Divisional Road

GLA – Gross Leasable Floor Area

HCM – Highway Capacity Manual

LOS – Level of Service

MOE – Measures of Efficiency

MR – Provincial Main Road

N/A – Not Applicable

N1 – National Route 001

OP – Provincial Minor Road (Ondergeskikte Pad)

RAP&G – Road Access Policy and Guidelines

SARTSM – South African Roads Traffic Signs Manual

SATGR – South African Trip Generation Rates

SDF – Spatial Development Framework

SDP – Sight Development Plan

SSD – Shoulder Sight Distance

V/C – Volume to Capacity Ratio

NMT – Non-motorist Transport

ITE - Institute of Transportation Engineers.

Traffic Impact Study SANBI, Kirstenbosch, Cape town, Western Cape	
1. Purpose of Study	This report investigates the expected transport related impacts of the proposed development in Kirstenbosch on the surrounding road network and to recommend appropriate mitigation measures if and where necessary.
2. Locality	Erf Number: CA875RE, Kirstenbosch Gardens in Newlands Description: The SANBI Building is situated along Rhodes Drive, to the north of the Kirstenbosch Garden Entrance / Rhodes Drive Intersection in Newlands. Locality Map: **Figure 1** (Appendix A)
3. Land Use	Existing use: Offices Proposed use: • Administrative Building (Offices) 973m² Site Development Plan: **Figure 2** (Appendix A).
4. Existing Access	The site currently has access off Rhodes Drive (MR134) via Kirstenbosch Gardens Entrance spaced approximately 175 metres to the south of Kirstenbosch Drive. Refer to **Figure 1** (Appendix A).
5. Existing Roadways in Site Vicinity	Rhodes Drive: Provincial Main Road (MR134), Class 3 Secondary Arterial Road, One lane per direction with no median, 60km/h, no parking. Paved shoulders and no sidewalks in the site vicinity. See **Photo 1** & **2** (Appendix C). Kirstenbosch Gardens Entrance Road: A single lane per direction, entrance into Kirstenbosch Gardens. No sidewalks. See **Photo 3** & **4** (Appendix C). Refer to Locality Map, **Figure 1** (Appendix A).
6. Analyses Hours	Weekday a.m. (07:30 to 08:30), Weekday p.m. (16:00 to 17:00)
7. Scenarios Analysed	2016 Existing conditions 2021 Background traffic conditions 2021 Total traffic conditions
8. Study Intersection (existing control)	#1: Rhodes Drive / Kirstenbosch Gardens Entrance Road (Stop Controlled) **Figure 3** (Appendix A) illustrates the Lane Configuration and Traffic Control Devices.
9. Existing Intersection Operations	The existing traffic operations are based on existing traffic volumes and existing intersection geometry / control. Based on the analyses results, the study intersection currently operates at acceptable levels-of-service. The existing demand does not exceed the capacity of the study intersection and no upgrades are required to improve the intersection. Refer to **Figure 3**(Appendix A) for a summary of the MOE's. The results of the intersection analysis are also summarised in **Table 1.**

10. 2021 Background Traffic Conditions	The existing traffic counts were increased by three percent per year over the next five years to obtain the expected 2021 Background Traffic Conditions. Based on the analyses results, the study intersection will continue to operate at acceptable levels-of-service. The worst level-of-service is during the a.m. peak hour with a LOS=D, average delay per vehicle of 31.5 seconds and a volume to capacity ratio of 0.12. The transport network can accommodate the transport demand and no upgrades are required at the intersection. Refer to **Figure 3** (Appendix A) for a summary of the MOE's. The results of the intersection analysis are also summarised in **Table 2** (Appendix B).
11. Trip Generation Rates	Administrative Building (Office): • AM 1.48 Trips/100m² GLA, 93/7 Split. (Reference ITE714) • PM 1.40 Trips/100m² GLA, 10/90 Split. (Reference ITE714)
12. Trip Distribution	• 70% North Rhodes Drive to / From Cape Town • 30% South Rhodes Drive to / from Hout Bay The Trip Distribution is also graphically illustrated in **Figure 3** (Appendix A).
13. Development Trips	AM Peak Hour Total Trips: 29 Trips (27 In /2 Out) PM Peak Hour Total Trips: 28 Trips (3 In /25 Out) Refer to **Figure 3** (Appendix A) for a summary of the MOE's. The results of the intersection analysis are also summarised in **Table 4** (Appendix B).
14. Access to Site	Main access will remain off Rhodes Drive (M63) spaced approximately 180metres to the south of Kirstenbosch Drive, at Kirstenbosch Gardens Entrance.
15. 2021 Total Traffic Conditions	The analysis of the 2021 total traffic conditions is based on the existing lane configuration. The 2021 total traffic volumes was determined by adjusting the existing volumes with a growth rate of 3% per annum over 5 years and adding the expected development trips to the adjusted volumes. Based on the analyses results, the study intersection will continue to operate at acceptable levels-of-service. The worst level-of-service is during the a.m. peak hour with a LOS=D, average delay per vehicle of 34.4 seconds and a volume to capacity ratio of 0.13. The transport network can accommodate the transport demand and no upgrades are required at the intersection. Refer to **Figure 3** for a summary of the MOE's. The results of the intersection analysis are also summarised in **Table 5**.
16. Non-Motorised Transport	It is not expected that there will be a significant NMT demand along Rhodes Drive to / from the proposed development and no dedicated NMT facilities are recommended
17 Public Transport	Rhodes Drive and Kirstenbosch Drive serves as a public transport routes and there are facilities on-site for public transport, no dedicated public transport facilities are recommended along Rhodes Drive.

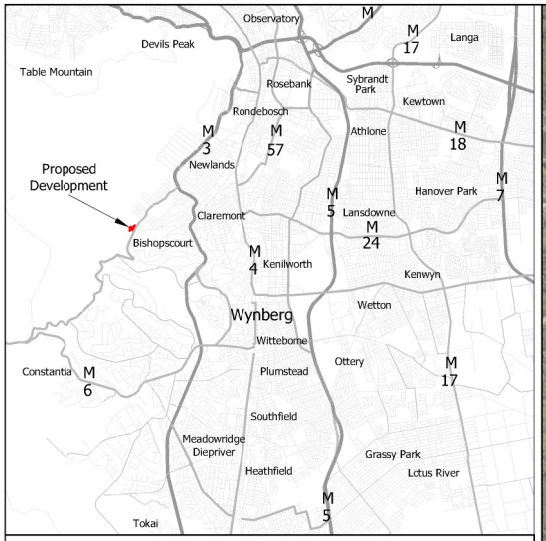
18. Parking	Based on the Department of Transport's guidelines the following parking rates apply to the proposed development: • Administration Building - 4 bays per 100m² GLA Based on the DoT parking rate a total of 39 parking bays are required. The development provides 42 parking bays, which is sufficient. These rates should be confirmed with the local authority in terms of the specific local zoning requirements. The SDP shows a roundabout at the entrance to the parking area. The roundabout creates a possible conflict situation with the two internal access roads to the north of the intersection and it is recommended that an alternative stop controlled layout should be considered at this intersection as illustrated in Figure AL01 in Appendix C.
19. Conclusion & Recommendations	This report investigates the expected transport related impacts on the surrounding road network of the proposed development on erf number CA875RE, Kirstenbosch Gardens. **Existing Traffic:** The study intersection is currently operating at acceptable Levels-Of-Service (LOS) and no road upgrades are proposed from an intersection capacity point of view. **Background Traffic:** The study intersection will continue operating at acceptable Levels-Of-Service (LOS). **Development Trips:** The development is expected to generate 29 weekday a.m. peak hour trips (27/2, in-/outbound) and 28 weekday p.m. peak hour trips (3/25, in/outbound). **Total Traffic:** The study intersection will continue to operate at acceptable LOS during all peak periods. The traffic demand does not does not exceed the capacity of the study intersection and no upgrades are required. **Access:** The existing access configuration will be retained with the proposed development. The access to the proposed site is via Kirstenbosch Gardens Entrance, along Rhodes Drive. **Parking:** Based on the information received a total of 42 parking bays will be provided for the proposed development which is sufficient. **Public Transport and NMT:** No public transport or pedestrian/cyclist facilities are proposed as part of the proposed development. It is expected that NMT and Public Transport volumes generated by the development will be very low. The expected public transport and NMT demand associated with the proposed development can be accommodated within the proposed parking area. Based on the results of the analyses in this report, it is evident that the impact of the proposed development is relatively low and the existing road network can accommodate the additional traffic volumes generated by the proposed development. A proposed two-way stop controlled layout is recommended as a possible alternative at the entrance of the proposed development. Refer to Figure AL01 in Appendix C for the proposed layout.

REFERENCES

- Provincial Administration: Western Cape, Department of Economic Affairs, Agriculture and Tourism: Transport Branch, Road Access Guidelines and Policies, 2002.
- Department of Transport, Guidelines for Traffic Impact Studies, Report No. PR 93/645, Pretoria, 1995.
- Department of Transport, Off-Street Parking Indices, N DoT PG 3/85, November 1985
- Institute of Transportation Engineers. Trip Generation, 6th Edition. 1997.

Appendix A

Figures



REGIONAL MAP (N.T.S.)

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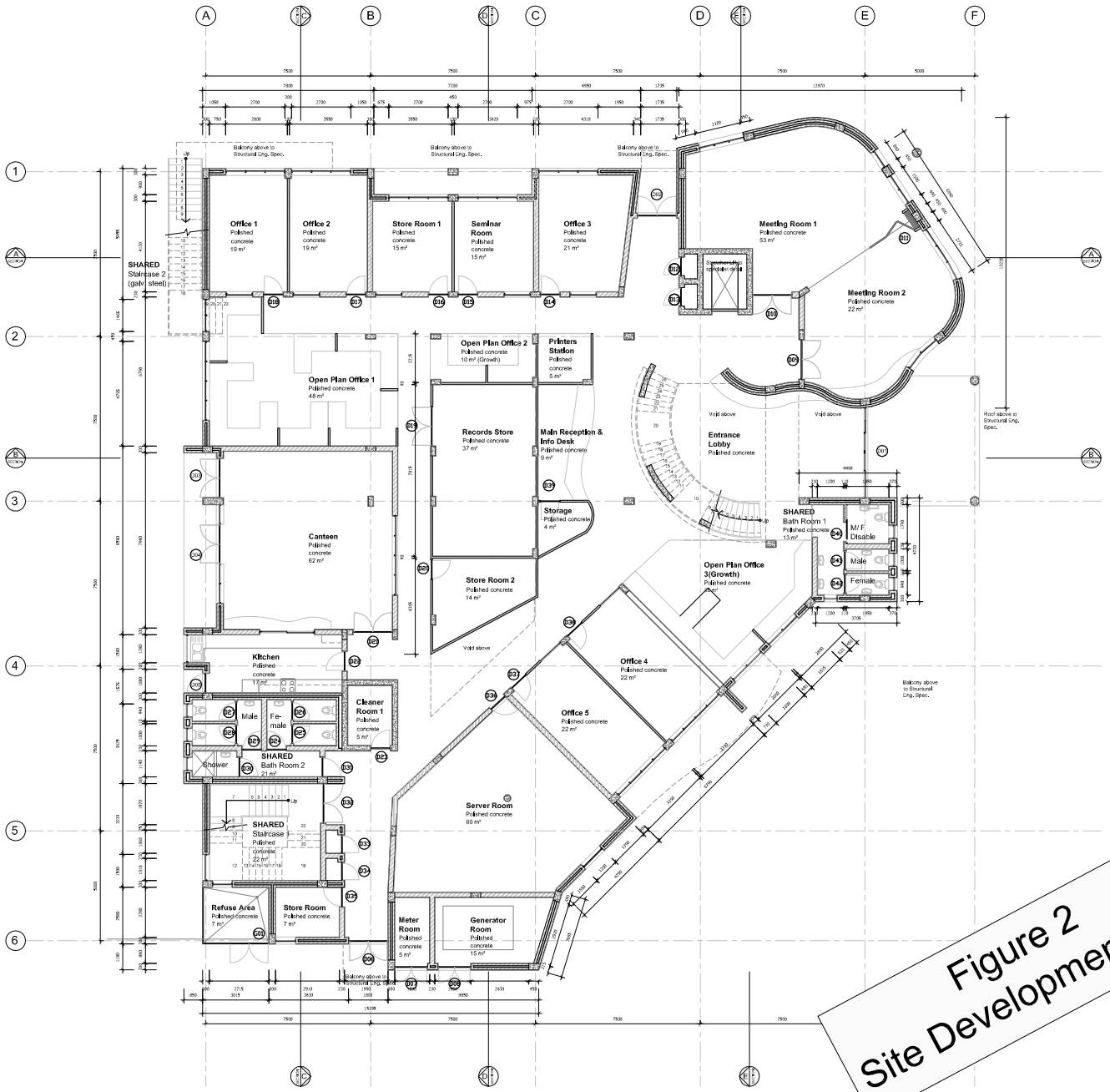
PROJECT:	FIGURE:	NUMBER:
TIA SANBI Kirstenbosch	Locality Plan	1



GROUND FLOOR STOREY PLAN

Figure 2
Site Development Plan

N

FOR TENDER DOCUMENTATION ONLY

GENERAL NOTES

NOTES & SPECIFICATIONS
GENERAL
1.) All Building, Electrical and Drainage work to be in strict accordance with **Local Council Authorities** requirements **(SANS 10400-A:2010 , Edition 3)** .
2.) All Dimensions and Levels to be checked on site before commencement of any construction.
3.) All openings less than **3000mm** to have **PC IDE Lintols** over and min. of **Four courses of Brick force** laid above lintols to manufacturers specifications.
4.) All structural timber to be **Grade 4 -8 S.A. Pine .**
5.) **All Damp Proof Membranes** (375Micron) to be stepped with weep holes at **1200 cts.** positioned 1 **50mm** above paving or **Natural Ground Level .**
6.) Excavate to a depth to provide a **Solid and Uniform** surface for **all** Foundations. **No concrete footing to project beyond any site boundary.**
7.) **All External Openings** to have **Vertical Damp Proof Courses** (250Micron) around openings.
8.) **All Glazing** greater than 1m² and less than **300mm** above Floor Level to be fitted with **SABS Safety Glazing** (min. 6mm) as per SANS 10400-N:2010 (edition 3), Part N Regulation
9.) **Light Areas** to be min. **10% of Floor Area** (SANS 10400-O:2011 edition 3, Part O Regulation) .
10.) **Ventilation Areas** are min. **5% of Floor area** (SANS 10400-O:2011,edition 3, Part O Regulation) .
11.) All Windows and Doors finishes and specifications as per **Window and Door Schedule** documentation.

GENERAL
ALL DIMENSIONS & LEVELS TO BE VERIFIED ON SITE PRIOR TO COMMENCEMENT OF ANY WORK AND ANY DISCREPANCIES/CHANGES TO BE REPORTED IMMEDIATELY TO THE ARCHITECTURAL CONSULTANTS.

ENGINEER REQUIREMENTS
ALL EXCAVATIONS, ENGINEERED FILL, FOUNDATIONS,RC BASES, RC BEAMS, RC COLUMNS, RC FLOOR SLABS,RC FRAME STRUCTURES, ROOF STRUCTURES AND RELATED DETAILS REFER TO STRUCTURAL ENGINEERS DRAWINGS & SPECIFICATIONS.
NOTE : THIS DRAWING TO BE READ IN CONJUNCTION WITH ENGINEER'S DOCUMENTATION

FIRE EXTINGUISHERS \ HOSE REELS
ALL FIRE EMERGENCY EQUIPMENT SHALL BE CLEARLY INDICATED WITH SABS APPROVED SIGNAGE & CONFORM TO THE SANS 10400-T: 2011 edition 3 PART : T REGULATION

EMERGENCY ROUTES
ALL EMERGENCY ROUTES SHALL BE CLEARLY INDICATED WITH SIGNAGE & CONFORM TO THE SANS 10400-T: 2011 edition 3 PART : T REGULATION

DIFFERENTLY-ABLED FACILITIES
FACILITIES OF DIFFERENTLY-ABLED PERSONS MUST BE CONSTRUCTED IN ACCORDANCE WITH THE SANS CODE 10400-S:2011 edition 3 PART :S REGULATION (ACCESSIBILITY OF BUILDINGS TO PERSONS) AS INDICATED ON PLAN

REFUSE ROOM
TO BE RENDERED RODENT PROOF IN ACCORDANCE WITH GOVERMENT RODENT PROOFING REGULATIONS.

REVISION NOTES

REV.	DATE.	BY.	DESCRIPTION

ARCHITECT .....

OWNER .....

PROJECT TITLE

SANBI KIRSTENBOSCH:
PROPOSED NEW ADMINISTRATION BUILDING, PARKING FACILITY AND REFURBISHMENT OF FYNBOS LODGE

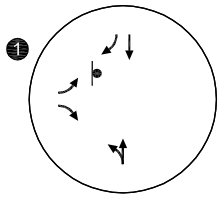
PRINCIPAL ARCHITECT: VERNON MATHEWS
B.A.S B.ARCH (UCT) M.I.A - S.A.C.A.P - PR.ARC-17782
66 Long Street, 6th Floor, Cape Town
E-MAIL : vernon@nm1994.com
FAX : 086 551 0156, TEL: 021 428 1930

DRAWING TITLE	DATE
GROUND FLOOR STOREY	XX-XX-2015
	BY
	MFD

PROJECT NO.	DRAWING NO.	SCALE
G174/ 2013	WD 002	1:100 on A1

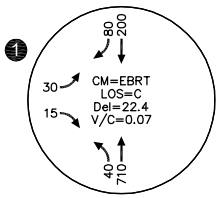
REVISION

EXISTING LANE CONFIGURATION



EXISTING TRAFFIC CONDITIONS

AM PEAK



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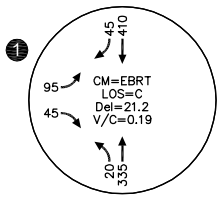
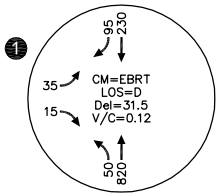


2020 BACKGROUND TRAFFIC CONDITIONS

AM PEAK



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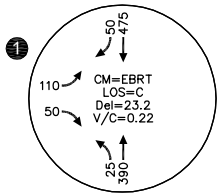
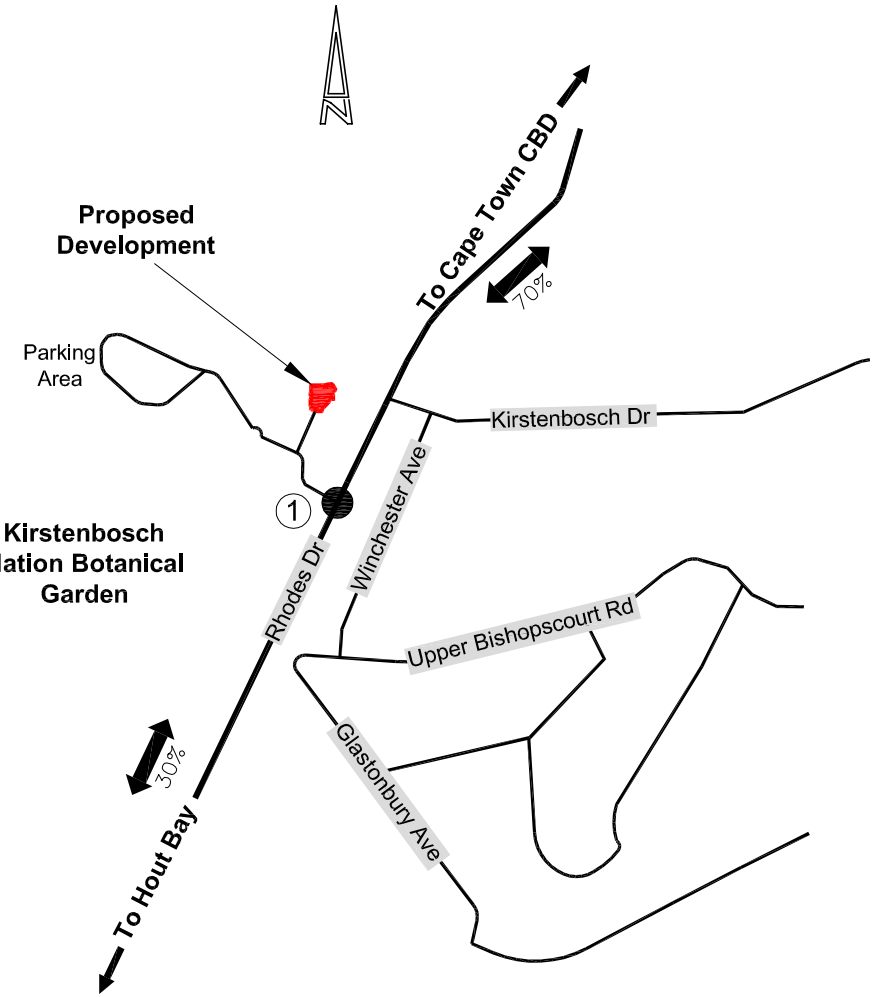
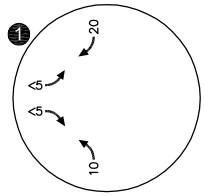




2020 EXPECTED DEVELOPMENT TRIPS

AM PEAK



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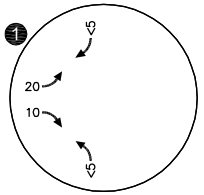
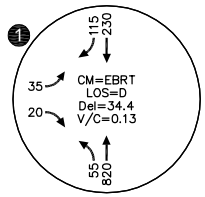


TRIP GENERATION

PEAK HOUR	IN	OUT	TOTAL
AM PEAK	27	2	29
PM PEAK	3	25	28

2020 TOTAL TRAFFIC CONDITIONS

AM PEAK



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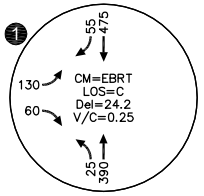

LEGEND
STOP/ YIELD CONTROL
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE SIGNALISED / CRITICAL MOVEMENT LEVEL OF SERVICE UNSIGNALISED
Del = INTERSECTION AVERAGE DELAY SIGNALISED / CRITICAL MOVEMENT DELAY UNSIGNALISED
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

NOTE:
CAPACITY ANALYSIS BASED ON LANE CONFIGURATION AS SHOWN IN FIGURE 3.

SCHEMATIC

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PROJECT:	FIGURE:	NUMBER:
PAARL MEDICLINI ADDITIONS AND ALTERATIONS	TRAFFIC FIGURES	3

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PROJECT:	FIGURE:	NUMBER:
TIA SANBI Kirstenbosch	Proposed Aceess Layout	AL01

Appendix B

Tables

Table 1: Existing Traffic Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	CM	LOS	Delay	V/C	CM	LOS	Delay	V/C
Rhodes Drive / Kirstenbosch Entrance	EBRT	C	22.4	0.07	EBRT	C	21.2	0.19

Table 2: 2021 Background Traffic Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	CM	LOS	Delay	V/C	CM	LOS	Delay	V/C
Rhodes Drive / Kirstenbosch Entrance	EBRT	D	31.5	0.12	EBRT	C	23.2	0.22

Table 3: Proposed Trip Generation Rates

Land Use	Units	Source	AM Peak Hour			PM Peak Hour		
			Rate	In	Out	Rate	In	Out
Admin Building	100m²	ITE714	1.49	93%	7%	1.40	10%	90%

Table 4: 2021 Estimated Peak Hour Trips

Land Use	Units	Size/ Volume	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Administration Building	m²	876	27	2	**29**	3	25	**28**
		Total	**27**	**2**	**29**	**3**	**25**	**28**

Table 5: 2021 Total Traffic Conditions

Intersection	AM Peak Hour				PM Peak Hour			
	CM	LOS	Delay	V/C	CM	LOS	Delay	V/C
Rhodes Drive / Kirstenbosch Entrance	EBRT	D	34.4	0.13	EBRT	C	24.2	0.25

Appendix C

Photographs

Photo 1: Northbound view along Rhodes Drive

Photo 2 Southbound view along Rhodes Drive towards Kirstenbosch.

Photo 3: Eastbound view along Kirstenbosch Access Road

Photo 4: Northbound view along Access Road towards the Site