HARTENBOS
Garden Estate
Natuur-Landgoed

STORMWATER MANAGEMENT PLAN

FOR

HARTENBOS GARDEN ESTATE RESIDENTIAL DEVELOPMENT ERF 3122 HARTENBOS

PROJECT No: 1704062

Compiled By:

LJR Civil Consultants cc
DESIGN & DRAUGHTING ENGINEERING CONSULTANTS
2000/007738/23

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JUNE 2021

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INTRODUCTION

1.1 GENERAL

LJR Civil Consultants CC has been appointed by the Hartenbos Hills Propco (Pty) Ltd, to compile a Stormwater Management Plan, for the proposed Hartenbos Heuwels residential development.

1.2 LOCALITY

The site is situated in Hartenbos. Locality plan is attached as Annexure A.

1.3 DEVELOPER

Hartenbos Garden Estate

Postal Address		:	252 Val de Vie Paarl 7646
Contact person		:	Dr. Kotie Kruger
Contact number	Cell.	:	082 375 9679
	E-mail	:	ajkruger@vodamail.co.za

1.4 CONSULTING ENGINEERS

LJR Civil Consultants CC

Company Registration No.	:	2000/007738/23
Physical address	:	55 Louis Trichardt Street Parktown Estate Pretoria 0184
Postal address	:	(Same as physical address)

Contact person : Louis Roets
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2. DESCRIPTION OF SITE

2.1 LAYOUT AND PROPOSED DEVELOPMENT PARAMETERS

A site layout plan is attached in Annexure B. The proposed development parameters are as follows:

Total site Area 60.519ha
The developable area will consist of:

Ptn Nos	No of Units	Extent (ha)	Zoning	Land Use
1-279	279	10,9151	Single Residential I	Dwelling House
280-282	3	0,8394	General Reidential Zone III	Terrace Apartments (Flats)
283-290	8	12,0308	Open Space Zone II	Private Open Space with tearooms, telecom station
291	1	23,9230	Open Space Zone III	Nature conservation area with tearoom and utility
292	1	0,1884	Open Space Zone II	Sport facilities, clunhouse, restaurant, bar, office utility
293	1	0,3720	Open Space Zone II	Maintenance Shed/Store, utility
294	1	2,4333	General Reidential Zone III	Village precinct, flats, clubhouse, frailcare and recreation*
295	1	8,8884	Transport Zone III	Private Road
296	1	0,9286	Utility Zone	Municipal Reservoir
TOTAL	**296**	**60,5190ha**		

2.2 TOPOGRAPHY

The property is roughly between 102 and 135 metres above sea level. The slope of the site is mostly to the eastern side. The developed area has a moderate slope and the undeveloped area has a steep slope.

2.3 GEOTECHNICAL CONDITION

A detailed Geotechnical Investigation of the site was done in November 1984 by Schwartz Tromp and Associates. An extract from the report is attached in Annexure C, indicate a summary of engineering properties of on-site materials. (Table 7.2).

3. PROPOSED STORMWATER METHODOLOGY

3.1 DESIGN METHODOLOGY

Stormwater system will be designed according to design standard as per “Guidelines for human settlements planning and design “Red Book”, and proposals as per this report. It is proposed that stormwater on the developable area will be handled as follows:

- Major storm 1 in 25 years to be handled by the road system, with a maximum flow depth of 150mm.
- All roads will be designed with a cross fall or camber of 3%.
- All pipe systems to be designed for the 1 in 5 year storm, minimum size 450 with kerb inlets.
- To ensure that the out flows of the increased post development does not put the downstream development at risk and that erosion does not take place, detention structures will be constructed at all outlets. Furthermore it is proposed to implement the SUDS (Sustainable Urban Drainage System).
  In short it means to get surface run-off as quickly as possible back into the natural ground by using of well vegetated buffer strips, unlined grass channels with rock/subsoil drains (retention channels), and energy dissipaters.
- Rain harvesting systems to be implemented.

Also taking into account the key stormwater management objectives from the Baseline Assessment of wetlands prepared by Freshwater Consulting for this project. Below a summary of their objectives;

Stormwater management objectives

1 **Minimise the Threat of Flooding –** by designing a system that mimics pre-development responses to storms, reduces the volume of runoff by promoting infiltration, reducing the peak flows and time-to-peak by detention and slow release of flood runoff.

2 **Protect receiving water bodies – this should be achieved by:**

a) Preventing the deterioration of water quality,

b) Maintaining the natural flow regime and seasonality of these systems, this means low flows too;

c) Preventing erosion or sedimentation of wetlands and streams, and

d) Preservation of Natural River channels, wetlands and vegetation.

3 **Promote Multifunctional use of stormwater Management systems –** to maximise the use of resource and thereby minimise costs and the pressure on land for public land use, conservation etc.

4 **Develop sustainable Environments –** through minimising the need for intensive maintenance intervention.

3.2 STORMWATER CATCHMENTS

Attached in Annexure D is the Stormwater Management Plan, which indicates the catchment areas and water sheds.

The biggest portion of the development is on the western side of the development, with a water shed that runs on the western side. Therefore most of the catchments will drain east towards Road A. Road A between points A and B runs with the contours. To ensure that stormwater can drain towards the Kerb inlet, it is proposed to construct Road A in a saw tooth manner with high points indicated with dots on the plan and lower points at the kerb inlet. This defines the catchment areas as indicated on the stormwater management plan.

The 5 in 1 and 1 in 25 year pre- and post-development are indicated in the table below:

Catchment	Pre-development		Post-development	
	1 in 5 years (m^3 /s)	1 in 25 years (m^3 /s)	1 in 5 years (m^3 /s)	1 in 25 years (m^3 /s)
A	0.010	0.018	0.035	0.063
B	0.019	0.035	0.066	0.120
C	0.012	0.022	0.014	0.026
D	0.006	0.012	0.018	0.032
E	0.023	0.042	0.041	0.074
F	0.021	0.038	0.026	0.047
G	0.016	0.028	0.077	0.139
H	0.006	0.011	0.030	0.059
I	0.053	0.096	0.290	0.530
J	0.021	0.038	0.074	0.135
K1	0.020	0.037	0.085	0.155
K2	0.040	0.074	0.147	0.267
L1	0.009	0.016	0.034	0.062
L2	0.011	0.020	0.054	0.099
L3	0.002	0.004	0.007	0.012
M	0.026	0.048	0.082	0.150
N	0.040	0.072	0.132	0.241
O1	0.032	0.058	0.093	0.170
O2	0.005	0.010	0.037	0.067
P1	0.013	0.024	0.084	0.153
P2	0.023	0.043	0.065	0.118
P3	0.017	0.032	0.062	0.112
P4	0.009	0.016	0.024	0.044
P5	0.007	0.012	0.019	0.035
Q	0.012	0.022	0.022	0.040
R1	0.002	0.005	0.009	0.016
R2	0.012	0.023	0.051	0.093
S	0.014	0.025	0.060	0.110
T1	0.006	0.011	0.022	0.041
T2	0.011	0.020	0.040	0.073
V	0.009	0.016	0.033	0.059
X	0.006	0.011	0.022	0.039
Y	0.010	0.019	0.038	0.069

3.3 RAIN HARVESTING

Rain harvesting can be achieved by installing rainwater tank at each house/building and rainwater collection tanks at some outlets. This water can then be used for irrigation of the green areas and/or to supplement the water for the sewer system, filling of swimming pool, etc.

Typical tank that is used at houses/building to collect rainwater is uPVC tanks (Jo-Jo tanks). Example of these tanks is attached in Annexure E. Different tanks are available on the market, above ground tanks are normally chosen to tie into the architects theme of the development. The tanks can be installed above ground or underground. The collected water can be utilized for irrigation or for supplementing the water for the sewer via a pump system.

The tank that will be installed at the outlets (wing walls) of the stormwater pipe system will be the typical horizontal and will be installed underground. It is proposed that a silt trap be installed before the inlet of the tank to minimize silt flow into the tank. This harvested water can be utilized for irrigation via a pipe and pump system.

3.4 STORMWATER EROSION CONTROL

Stormwater erosion is one of the most challenging factors of stormwater management as it happens quickly and destructively. With the slopes in the study area being fairly steep, surface runoff on bare soil could have negative impacts on the receiving environment due to transportation of silt to the storage (attenuation close) ponds. Should erosion occur, the eroded soil may need to be replaced to reinstate the integrity of the slopes and banks. In doing so, awareness will be necessary to prevent the use of unsuitable soil in replacing the eroded soil.

It is possible to make use of sand bags/straw bales to prevent erosion during the construction phase of the development, before stabilizing vegetation is established. Following the construction phase, it is recommended that rapidly growing grasses be planted on site as this will serve to stabilize disturbed soil as well as retard sheet flow.

3.5 STORMWATER POLLUTION CONTROL

Sewer reticulation within the development must be designed in such a way as to

obviate blockages and possible overtopping of manholes. The blockage or leakage of any sewer may pose considerable pollution threats to both surface and groundwater resources.

3.6 STORMWATER MANAGEMENT RECOMMENDATION

It is recommended that the stormwater system as indicated on the stormwater management plan be constructed. Detail design must be done to determine pipe size, kerb inlet lengths and detention structure sizes. It is recommended that detention structures are constructed with Gabions and with geo-fabric. That rainwater harvesting tanks at outlets, as shown on the plan, be installed and the rainwater harvested used for irrigation of green areas. Furthermore it is recommended to install flow retention channels at green area as indicated on the plan. Buildings to be fitted with rain harvesting tanks, where practical. A Stormwater Maintenance Plan must be implemented to ensure that the stormwater system function over long term.

It is therefore recommended that the proposals as indicated in the report are implemented. Designs must be done by Professional Engineers/Tegnologist. Constructions drawings to be handed in at the Council for approval before construction commences.

Your comments/approval is appreciated, in order for this project to proceed as planned.

For more information please contact Louis Roets at 083 283 7540.

J. L. Roets Pr. Tech (Eng)

ANNEXURE A

LOCALITY PLAN

ANNEXURE B

SITE LAYOUT PLAN

ANNEXURE C

GEOTECHNICAL REPORT

ANNEXURE D

STORMWATER MANAGEMENT PLAN (CATCHMENT)

ANNEXURE E

TYPICAL RAIN HARVESTING TANKS