

GARDEN ROUTE GATEWAY PLAZA (PTY) LTD

DRAFT SERVICES REPORT FOR CIVIL ENGINEERING SERVICES FOR THE DEVELOPMENT OF PORTIONS 278 AND 282 OF THE FARM KRAAIBOSCH 195

**HESRIV-479 Rev 1
Revision 0.0**

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ABBREVIATIONS

AADD	:	Annual Average Daily Demand (water)
AADWF	:	Annual Average Dry Weather Flow (sewer)
PWWF	:	Peak Wet Weather Flow (sewer)
CES	:	Community Engineering Services
GLS	:	GSL Consulting Engineers
GM	:	George Municipality
ha	:	hectare
HCE	:	Hessequa Consulting Engineers CC
kℓ	:	kilolitre
kℓ/d	:	kilolitre per day
ℓ/c/d	:	kilolitre per capita per day
m	:	metres
masl	:	metres above mean sea level
Mℓ	:	mega litre
m ³	:	cubic metre, i.e. one kilolitre
mm	:	millimetre
TWL	:	Top of Water Level
VAT	:	Value added tax
WTW	:	Water Treatment Works
WWTW	:	Waste Water Treatment Works

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INTRODUCTION

Hessequa Consulting Engineers have been appointed by Mr A Calitz for the planning and design of civil engineering services for the development proposal on Portions 278 & 282 of the Farm Kraaibosch 195 between George and Wilderness in the Western Cape. This report is based on a desk top study which was compiled after discussions with the Client and George Municipality.

The report will discuss the design criteria and specifications which will be applied to civil engineering services required for the development.

The area of the proposed development is situated to the northern side of the N2 National Road between the N2/Knysna Road junction and the turn-off to Victoria Bay.

EXTEND OF THE DEVELOPMENT

The proposed development consists of the following:

Block A:

Nursery : 300m²

Block B (Ground floor):

Tourist Centre (Mixed use) : 2,000m²

Block C:

Outdoor function area : 300m²

Block D (Ground floor):

Club House/guest rooms : 1,350m²

Block E:

Chapel : 250m²

Block F:

General storage : 150m²

Block G:

Stables : 1,000m²

Block H:

Storage : 150m²

CIVIL ENGINEERING SERVICES

Proposed designs are based on the design standards of the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* as published by the CSIR as well as the minimum requirements of George Municipality.

All materials and workmanship shall comply with the specifications as set out in the South African National Standards for Civil Engineering (SANS).

1.1 MASS EARTHWORKS

Mass earthworks will be required to level out sites for the development of individual Blocks and open spaces and to ensure slopes for the free draining of storm water.

Localised depressions will be filled with G7 material from commercial sources and compacted to 93% MAASTO.

1.2 ROADS

Peter Gray (Traffic Engineers) was contracted by the Client for an independent Traffic Impact Study. The outcome of the TIA will be documented in a separate report.

Access to the development area will be from the existing filling station development. No new access from the N2 will be required. One-way access will be to the northern side of the filling station. Access and exit will be available from the southern side of the filling station.

All new road surfacing will consist of permeable surfaces (ie. Grass blocks/ loose stone/wood chips). Road widths vary between 5m and 9.0m and surfaces will be contained in an orderly manner with barrier kerbs. Bellmouth's will be constructed with 8m radiuses. All upper selected and sub-base materials will be imported from commercial sources.

The basis of the road and pavement design for the proposed development is set out in the table below:

Table 1 Road Design Criteria	
Parameter	Specification
Surface Treatment	Grass blocks/loose stone/wood chips
Upper Selected and Sub-base from commercial sources	150mm G5 (95% MAASHTO) on 150mm G7 (93% MAASHTO) on 150mm Roadbed prep in-situ Material (90% MAASHTO)

Sub-grade	(No geotechnical have been conducted at this stage.
Carriage Way Width	5-9m
Design Speed	30 km/h
Maximum Gradient	16% over 30m max
Minimum Gradient	0.45%
Cross Fall	3%
Bellmouths	8m Radius

1.3 STORM WATER

1.3.1 Major Systems

The stormwater system forms an integral part of the site development plan. The system rests on three legs namely the minor system, the major system and an emergency system. Storm water infrastructure will be constructed in accordance with the standard requirements and specifications as agreed with the George Municipality.

This proposed development is not affected by any floodline and no major storm water system is envisaged.

The minor storm water control system will be affected through a sustainable drainage system (SUDS) i.e. wetlands, balancing ponds, drainage areas and open diversion channels will be implemented where practical. The proposed drainage system will in addition to the ecological and aesthetical purposes function as filters that will obviate pollution from / onto surrounding areas. The existing topography and water features will be utilized and minimal earthworks and disturbance of natural areas are anticipated.

1.3.2 Minor Systems and Storm water Design

The emergency system recognizes failure of the minor/major system by storms greater than provided for in major system or in the event of malfunction of the minor system by providing continuous overland flow routes to minimize flooding of developed areas.

The following measures are proposed to mitigate the impact of post development storm water runoff from the proposed development:

- a) Installation of 24 x 5,000 kℓ and 10 x 10,000 kℓ water tanks scattered through-out the development site collecting rain water from the different roofs.

- b) Open Spaces will be utilised as recreation areas as well as stormwater detention areas where the concentration of stormwater runoff will be minimised through the application of landscaping techniques, i.e. by creating grass lined swales, undulations and depressions.
- c) Post development runoffs will be attenuated by constructing stilling basins and energy dissipaters at outlet structures.

1.4 WATER

1.4.1 WATER SOURCE

Water, for the proposed development, will be available from the existing water reticulation.

1.4.2 WATER DEMAND

In accordance with the design standards of the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* the total water demand will be as follows:

Area:

Block A (Nursery) : 300m ² @ 400 l/100m ² /d	=	1,2 kℓ/d
Block B (Tourist Centre) : 2,000m ² @ 400 l/100m ² /d	=	8,0 kℓ/d
Block C (Outdoor function area) : 300m ² @ 400 l/100m ² /d	=	1,2 kℓ/d
Block D (Club house/overnight rooms) : 100 people @ 250 l/p/d	=	12,5 kℓ/d
Block E (Chapel) : 250m ² @ 400 l/100m ² /d	=	1,0 kℓ/d
Block F (General store) : 150m ² @ 400 l/100m ² /d	=	0,6 kℓ/d
Block G (Stables) : 1,000m ² @ 400 l/100m ² /d	=	4,0 kℓ/d
Block H (Storage) : 150m ² @ 400 l/100m ² /d	=	0,6 kℓ/d

Total **37,59 kℓ/d**

TOTAL (Annual Average Daily Demand) **41,6 kℓ/d**

0,5 ℓ/s

The proposed development falls in the Low Risk Group 1.

Fire flow criteria (Low risk) = 15 ℓ/s @ 7 m for 2 hours.

The required storage capacity for Fire Flow is 108m³

1.4.3 STORAGE CAPACITY

George Municipality confirms that the development area will be serviced from the Kraaibosch water tower. The required storage volume, for the development, is as follows:

$$\begin{aligned} \text{Storage Volume} &: 2 \times 41,6 \text{ m}^3 \text{ plus } 108\text{m}^3 &= & 191 \text{ m}^3 \\ \text{Say} &&& 0,2 \text{ M}\ell \end{aligned}$$

1.4.4 BULK WATER DISTRIBUTION

Details of the interconnecting pipework required will be finalised in conjunction with George Municipality and Community Engineers Services (CES) the appointed water and sewer master plan consultant. An existing 200 AC water main is located on the southern side of the N2. It is at this stage envisaged that a new 110mm water main will cross the N2 (directional drilling) to supply water to the proposed development. Where possible, water saving methods e.g. rainwater harvesting, stormwater harvesting, rainwater tanks, low flow shower heads etc., will be implemented.

1.4.5 INTERNAL WATER RETICULATION

New 90/75 mm class 12 MPVC water mains complete with isolating valves, fire hydrants and Block connections will be provided. A 90mm Bulk Water Meter will be installed at the connection to the municipal main. Block connections will be made with HDPE PE80 PN12,5 pipes. Typical details are shown on drawing HESRIV-479/W01.

The basis of the water reticulation design for the proposed development is summarised in the table below:

Table 2 Water Reticulation Design Criteria	
PARAMETER	GUIDELINE
Pipe materials for erf connections	HDPE PE80 PN12,5
Pipe materials for reticulation mains	MPVC (Class 12)
Minimum diameter for reticulation mains	75mm
Minimum diameter for Block connections	25mm
Valves	90/75mm AVK (open clockwise)
Fire Hydrants	90mm AVK London V
Water meter	90mm Elster Kent

1.5 SEWAGE TREATMENT AND SEWER MAINS

1.5.1 WWTW

No municipal waste water system is available to accommodate the waste water generated from the proposed development. The expected annual average dry weather flow (AADWF) equals 80% of 41,6 kℓ/d = 33,3 kℓ/d = 0,38 ℓ/s. (Fully developed)

Waterborne sewerage will be provided in the development. Sewerage will gravitate to a proposed new BIOROCK/ECOROCK Sewage Package Plant (or similar) to be located on the southern side of the proposed development. The plant will be installed in phases as required and will be able to treat up to 30m³ of waste per day. The treated water will be suitable for irrigation on the surrounding grass/paddock areas where public access will be restricted.

1.5.2 WASTE WATER FLOW

In accordance with the *Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development* it is expected that 80% of the Average annual water daily demand will end up in the wastewater system.

The annual average dry weather flow (AADWF) equals 80% of 41,6 kℓ/d = 33,3 kℓ/d = 0,38 ℓ/s.

To determine the Peak Wet Weather Flow (PWWF) a peak factor of 4,2 were taken in consideration with an expected stormwater infiltration of 15%. The PWWF equals 1,89 ℓ/s.

1.5.3 SEWER RETICULATION

A waterborne sewer reticulation system comprising of 160mm class 34 PVC sewer mains with solid shaft fibre cement manholes complete with ductile iron double lipped manhole covers is proposed.

The connection to each Block will be done with a 110mm Ø Class 34 uPVC connection pipe work.

1.5.4 DESIGN CRITERIA

The following minimum design criteria shall be applicable to sewer pipework:

- Design parameters: Average daily flow as per Red Book for the different housing categories
Peak factor – Harmon formula : Extraneous flow – 15% : Minimum velocity – 0.7m
- Minimum cover to pipes: 0.80m
- Minimum pipe size : 110mm diameter for Block connections: 160mm diameter for internal sewer mains.

- Minimum gradients : 110mm diameter Block connection at 1:60 and 160mm diameter main lines at 1:100.
- Maximum manhole spacing of 80m and rodding eyes will be constructed at all directional deviations.

1.6 ELECTRICAL SLEEVES

The position of electrical sleeves (110/160mm Class 34 PVC) will be determined in consultation with the Electrical Engineer.

1.7 SOLID WASTE

Solid waste of the George Municipality is currently discharged at the Gwaing solid waste dump site. The site is nearing full capacity but George Municipality is in process of the development of a new regional Solid waste site.

Solid waste for commercial purposes is based on an estimated 0,12 kg/m²/day. The estimated solid waste generated per day is as follows:

$$5,800 \times 0,12 \text{ kg/m}^2/\text{d} = 0,696 \text{ ton/day} = 0,522 \text{ m}^3/\text{day} \text{ (volume)}.$$



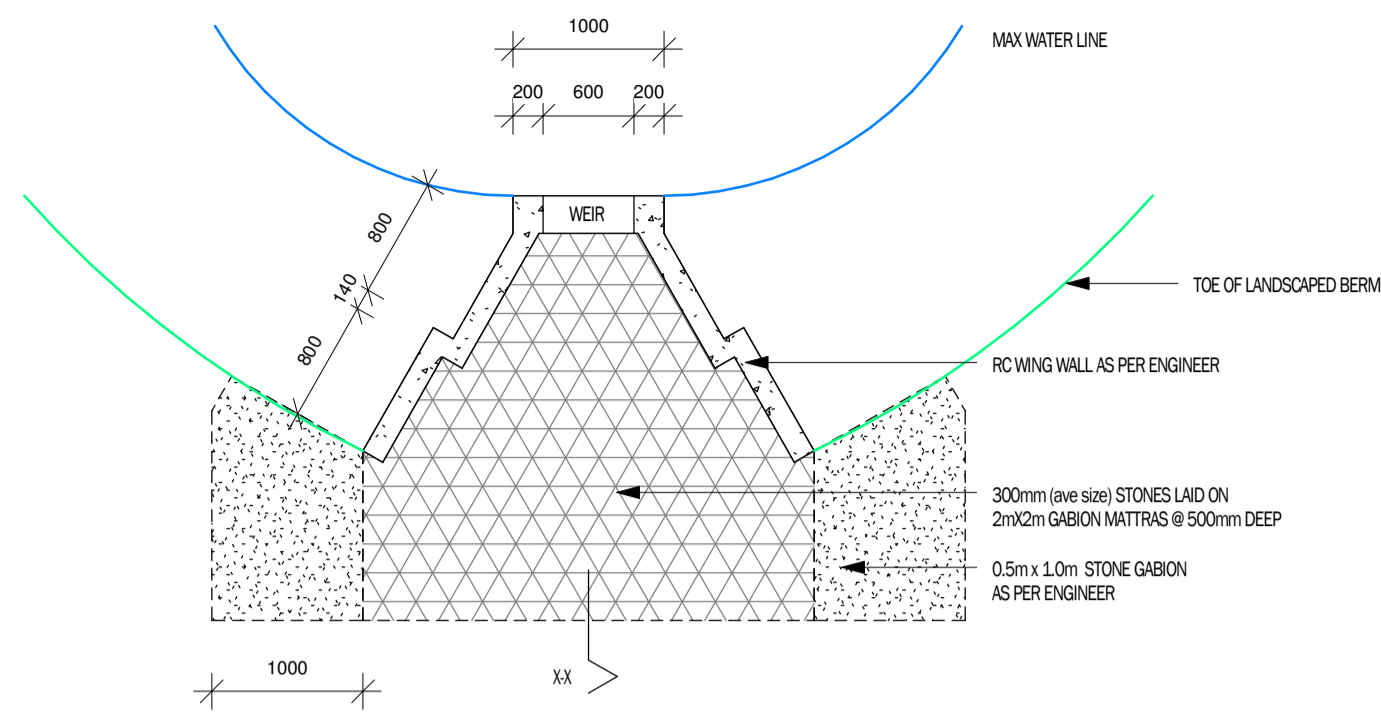
GIDEON PEPLER Pr Tech Eng
HESSEQUA CONSULTING ENGINEERS

12 September 2022

ANNEXURE A : DRAWINGS

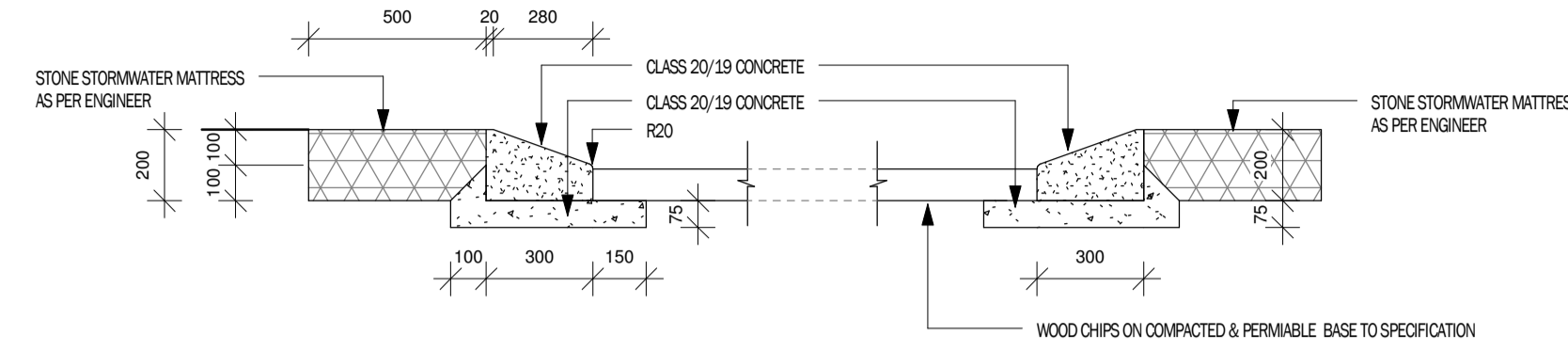
HESRIV-479-W01 : WATER RETICULATION TYPICAL DETAILS

HESRIV-479-S01 : SEWER RETICULATION TYPICAL DETAILS



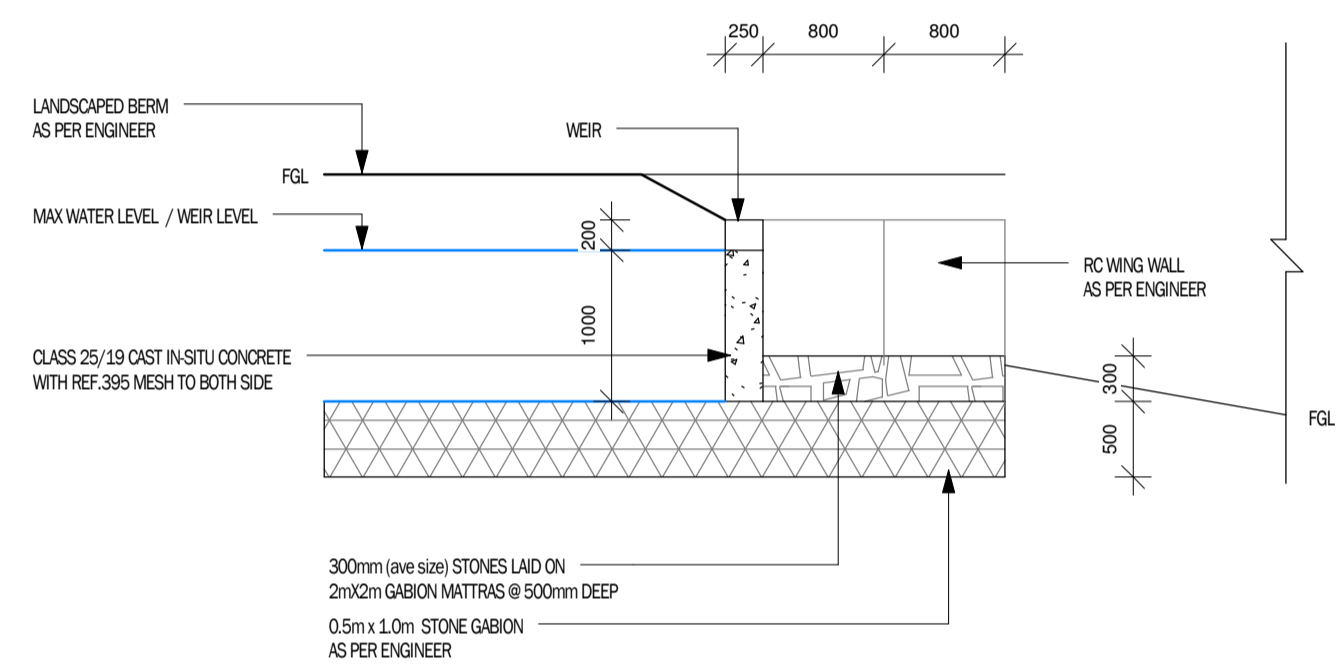
SW OUTLET LAYOUT

1 : 50



TYPICAL ROAD/ PARKING SECTION

1 : 20



SW OUTLET DETAIL SECTION

1 : 50

Retention Pond 1		
Item	Unit	Quantity
Catchment area (A)	ha	1.9
Slope of catchment area (S)	%	2
Runoff coefficient ©		0.25
Design returne period (50yr)	yr	50
Rainfall intensity (I)	mm/hr	55
Peak flow (Qmax. input)	l/s	73
Time of concentration (Tc - estimated)	min	30
Pond retention capacity required (V)	kl	131

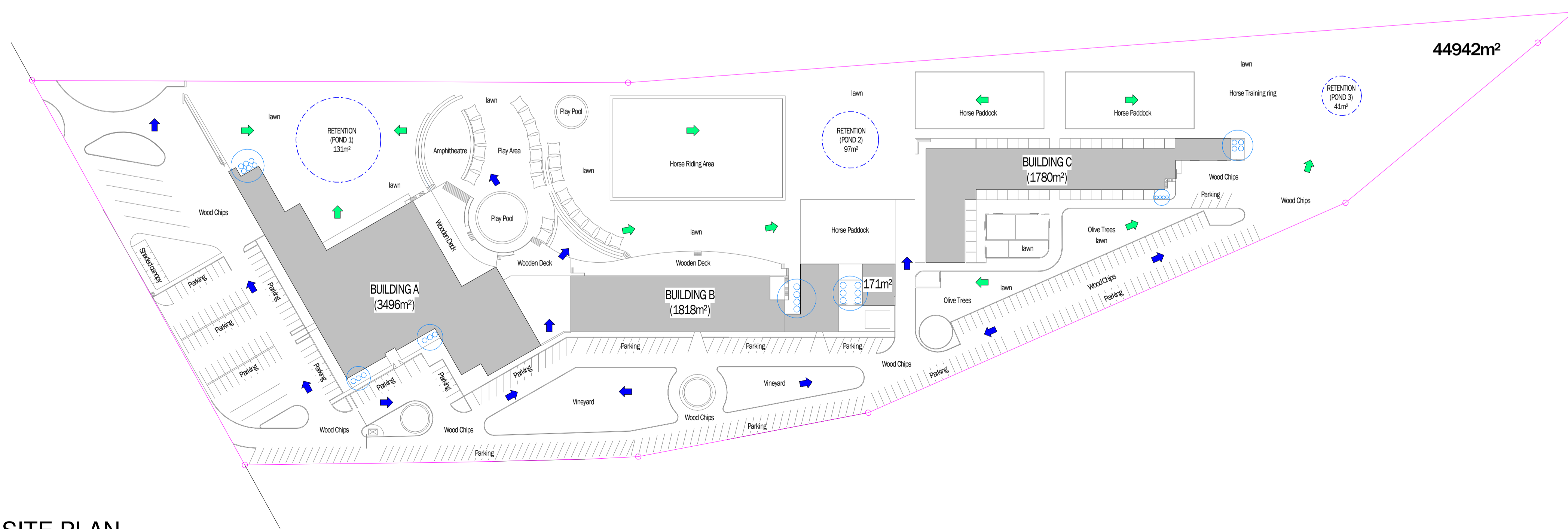
Retention Pond 2		
Item	Unit	Quantity
Catchment area (A)	ha	1.7
Slope of catchment area (S)	%	2
Runoff coefficient ©		0.25
Design returne period (50yr)	yr	50
Rainfall intensity (I)	mm/hr	55
Peak flow (Qmax. input)	l/s	65
Time of concentration (Tc - estimated)	min	25
Pond retention capacity required (V)	kl	97

Retention Pond 3		
Item	Unit	Quantity
Catchment area (A)	ha	0.9
Slope of catchment area (S)	%	2
Runoff coefficient ©		0.25
Design returne period (50yr)	yr	50
Rainfall intensity (I)	mm/hr	55
Peak flow (Qmax. input)	l/s	34
Time of concentration (Tc - estimated)	min	20
Pond retention capacity required (V)	kl	41

Storage tanks - Building A		
Item	Unit	Quantity
Roof area (A)	sqm	3496
Slope of roof area (S)	%	5
Runoff coefficient ©		0.9
Design returne period (50yr)	yr	50
Rainfall intensity (I)	mm/hr	55
Peak flow (Qmax. input)	l/s	48
Time of concentration (Tc - estimated)	min	20
Storage tanks required (5kl/unit)	5kl	12

Storage tanks - Building B		
Item	Unit	Quantity
Roof area (A)	sqm	1818
Slope of roof area (S)	%	5
Runoff coefficient ©		0.9
Design returne period (50yr)	yr	50
Rainfall intensity (I)	mm/hr	55
Peak flow (Qmax. input)	l/s	25
Time of concentration (Tc - estimated)	min	20
Storage tanks required (5kl/unit)	5kl	6

Storage tanks - Building C		
Item	Unit	Quantity
Roof area (A)	sqm	1780
Slope of roof area (S)	%	5
Runoff coefficient ©		0.9
Design returne period (50yr)	yr	50
Rainfall intensity (I)	mm/hr	55
Peak flow (Qmax. input)	l/s	24
Time of concentration (Tc - estimated)	min	20
Storage tanks required (5kl/unit)	5kl	6



SITE PLAN.

1 : 1000

STORMWATER LEGEND	
	STORMWATER SURFACE FLOW ON ROAD AREA DRAINAGE FLOW DIRECTION @ 1:200 FALL
	STORMWATER SURFACE FLOW ON GARDEN AREA DRAINAGE FLOW DIRECTION @ 1:50 FALL
	RAINWATER TANKS FOR ROOF WATER
	30m³ RETENTION PONDS
	WOOD CHIPS ON COMPACTED & PERMEABLE BASE TO SPECIFICATION
	SITE BOUNDARY / CATCHMENT AREA

LEVEL NOTES:
 * ALL UNFINISHED RESIDENTIAL FLOOR LEVELS TO BE CONFIRMED ON SITE
 * ALL FINAL STORMWATER SURFACE DRAINAGE FLOW DIRECTION LEVELS TO BE CONFIRMED ON SITE
 * ANY AND ALL LEVEL CHANGES AND CONFIRMATIONS TO BE APPROVED BY ENGINEER.

2.5% MINIMUM CROSS FALL ON ALL ROADS AND 0.5% AVERAGE LONGITUDINAL FALL APPLICABLE TO ALL ROADS

ALL LAYER WORKS TO BE LABORATORY - COOP & CORP TESTED BEFORE PAVING COMMENCEMENT. PROVIDE ENGINEER WITH QUALITY CONTROL TEST RESULTS OF APPLICABLE MATERIALS PRIOR TO CONSTRUCTION COMMENCEMENT.

- NOTES:
- THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH ALL ARCHITECTS DRAWINGS AND OTHER RELEVANT DRAWINGS BEFORE CONSTRUCTION COMMENCES.
 - ALL DIMENSIONS MUST BE CHECKED AND ANY DISCREPANCIES MUST BE REFERRED TO THE ENGINEER FOR ATTENTION.
 - DRAWINGS NOT TO BE SCALED.
 - ALL DIMENSIONS AND LEVELS MUST BE CHECKED ON SITE.
 - ALL WORKS MUST COMPLY WITH SANS 1200.
 - ENGINEER TO APPROVE ALL WORKS PRIOR TO CONSTRUCTION.
 - 48hour INSPECTION NOTICE PERIOD REQUIRED IN WRITING.

ROOF:
 * CORRUGATED ROOF SHEETS WITH 5° SLOPE TO OUTLETS AS PER ENGINEER.
 * ALL SW FROM GUTTERS TO FLOW INTO STORAGE TANKS AND OVERFLOW INTO SW MATTRAS AS PER ENGINEER.



client GARDEN ROUTE GATEWAY PLAZA PTY LTD	
project Proposed new tourist facility on Ptn 400 of Farm Kraaibosch 195.	
date 27.06.2023	sheet A1-01
sheet SW MANAGEMENT PLAN	
reference no 2023/GATEWAY	Preliminary Plan

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