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Appendix G7: Revised Stormwater Management Plan

POISE

STRUCTURAL & CIVIL ENGINEERING DESIGN CONSULTANTS

PROPOSED NEW SECTIONAL TITLE DEVELOPMENT: ERF 2074 PLETTENBERG BAY

CIVIL ENGINEERING INFRASTRUCTURE REPORT

Project No 24G64

REZONING

Version 1 July 2024

CONSULTING ENGINEER:
Poise Consulting Engineers
12 Boston Light Drive
Plettenberg Bay
6600

PROPOSED NEW SECTIONAL TITLE DEVELOPMENT: ERF 2074 PLETTENBERG BAY

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REZONING

1. INTRODUCTION

Erf 2074 Plettenberg Bay is to be developed for Sectional Title Group Housing

The total area of the site is approximately 5.95 hectares. The development will comprise 228 two and three bedroom Residential Apartment Units of average 130 square meters.

The Developer has appointed Poise Consulting Engineers to attend to the design of the civil engineering services for the development.

This report addresses the sewer and water connection requirements and capacities for the new development and summarizes the proposed road access and stormwater management principals to be adopted.

This report is issued for re-zoning approval purposes.

2 SITE LOCALITY AND TOPOGRAPHY

The site is situated on the southern side of Marine Drive, on the eastern boundary of Thulana Hill residential development.

The approximate coordinate of the centre of the site is 34° 03' 12" S and 23° 21' 37" E.

The site has a long narrow aspect with average north to south length and east to west width approximately 640 meters and 93 meters. A watershed ridge crosses the site approximately 270 meters south of the north east corner.

North of the watershed the site slope is initially from east to west, then turning to a northerly/north easterly direction, with the lowest point at the north east corner. The average slope of this area is approximately 8 percent.

South of the watershed the site slope is predominantly from east to west, turning slightly to south west, with the lowest point of the developable area in the south west. The average slope of this area is approximately 6 percent.

The southern end of the site steepens severely. In this area approximately 1 hectare will be undevelopable due to extreme slope.

3. DESIGN STANDARDS

The following design standards will be applicable:

- Guidelines for Human Settlement Planning and Design, compiled for the Department of Housing by the CSIR (Red Book)
- SANRAL Drainage Manual
- Relevant specific specifications of the Bitou Engineering Services Department
- CoCT 2009 Mangement of Urban Stormwater Impacts Policy (SUDS)

4. WATER RETICULATION

Water Connection

The water connection for the development off the existing 160mm reticulation watermain which is located in a servitude running north south, along the eastern boundary of the site, at the north eastern corner of the site.

Water Demand

The water demand is based on average daily demand of 500 litres per housing unit.

Average Daily Demand : 114 kl 228 Units
Based on a peak factor of 4 the maximum peak flow demand will be 5.3 litres per second.
The fire flow criteria is Moderate Risk which requires provision for a fire flow 1500 litres per minute per hydrant within 270 meters, with a minimum residual head 15 meters.

Impact on Capacity

The impact on capacity will be addressed in a separate Bulk Services capacity analysis report to be undertaken by GLS Consulting Engineers, in which any bulk water upgrades required to service the Development, will be identified. Such upgrades will be defined in the Services Level Agreement to be concluded with Bitou as a prerequisite for the Development to proceed.

Internal Reticulation

The internal water pipes will remain the property of the development and will not be taken over by Bitou Municipality.

It is proposed that, due to fire boosting requirements, a separate fire and domestic supply reticulation be provided.

The domestic reticulation system will be designed to provide for a minimum residual head of 24m under peak flow conditions. The domestic reticulation will be of Class 12 UPVC pipes of 75mm and 110mm diameter. Connection leaders to apartment blocks will be of minimum 63mm Class 10 HDPE.

The fire system will be of 110mm and 160mm diameter Class 12 UPVC pipes. Fire Hydrants will be provided at maximum 180m intervals. The system will be designed to provide a minimum head of 15m under fire flow conditions.

Construction of all watermains and connections will be in accordance with Bitou Municipality and SABS 1200 specifications.

The conceptual internal water layout is indicated on Drawing 24G64 S01.

5. SEWER RETICULATION

Sewer Connection

The sewer connection for the Development will be to the existing municipal sewer manhole located at the northern corner of Erf 2733, close to the north eastern corner of the site.

Sewerage Discharge

The sewerage discharge demand is based on average daily discharge of 400 litres per unit.

Average Daily Discharge: 91,2 kl 228 Units
Based on a peak factor of 2.5 the maximum peak discharge will be 2,6 litres per second.

Impact on Capacity

The impact on capacity will be addressed in a separate Bulk Services capacity analysis report to be undertaken by GLS Consulting Engineers, in which any bulk sewerage upgrades required to service the Development, will be identified. Such upgrades will be defined in the Services Level Agreement to be concluded with Bitou as a prerequisite for the Development to proceed.

Internal Reticulation
The internal sewer pipes will be the property of the development and will not be taken over by Bitou Municipality.

The internal sewer reticulation system will be of 160mm Class 400 UPVC sewer pipes. Manholes will be of precast concrete ring structures, in accordance with SABS 1200D standards. Manholes will be provided at a maximum of 80 meter intervals.

Minimum cover to sewers will be 1000mm under roadways and 700mm elsewhere.

Construction of all sewers, connections and manholes will be in accordance with SABS 1200 specifications

Two internal pump stations will be required, one at the south- western lowest point of the developable area, which will pump to a point from which it will discharge to a gravity main leading to the second pump station at the north east corner of the site. Sewerage will be pumped from this pump station southwards to a manhole to be positioned on the site boundary, to enable a gravity link to the connection point manhole. This gravity link sewer will be 160mm diameter and will be over municipal land for a distance of 36 meters.

The conceptual sewerage layout is indicated on Drawing 24G64 S01.

6. ACCESS

Access

The primary access will be off Marine Drive directly from the existing circle which is situated approximately 450 meters east of the N2 National Road.

The access will comprise two incoming lanes of total width 6.5 meters and an exit lane of width 3.5meters.

A secondary access will be provided from Arial Drive on the eastern boundary.

Internal Roads
Internal roads will be private roads and will not be taken over by Council

Pavement and Geometric Standards

The development internal roads which will be classed as follows:

Description	Width	Category/Class
Internal Access Roads	5.0/5,50m	UC/ES0,3

Parking modules will be to the standard 12,5 or 17.5m configuration.

The following pavement structure will be utilised for internal roads:

80mm Interlocking Block paving on 20mm sand bedding
125mm C4 Subbase compacted to 95% Mod AASHTO

150mm Imported G7 subgrade compacted 95% Mod AASHTO
150mm Insitu treatment compacted to 90% Mod AASHTO

Parking:
60mm Interlocking Block paving on 20mm sand bedding
100mm C4 Subbase compacted to 95% Mod AASHTO
150mm Imported G7 subgrade compacted 95% Mod AASHTO
150mm Insitu treatment compacted to 90% Mod AASHTO

Parking: Permeable Paving
60mm Permeable pavers on 50mm thick 6mm crushed stone
100mm Base layer of 19mm crushed stone
300mm Subbase layer of 37mm crushed stone
150mm Insitu treatment compacted to 90% Mod AASHTO
110mm slotted HDPE Class 400 subsurface drains with 19mm stone bedding, bidum wrapped

Kerbs
The internal roads will have standard SABS figure MK10 semi mountable kerbs on the high side with CK1 semi mountable kerb and channel on the low side of the crossfall.

7. STORMWATER MANAGEMENT

7.1 Pre-Development:

As described in Paragraph 2 above the site has a long narrow aspect with average north to south length and east to west width approximately 640 meters and 93 meters. A watershed ridge crosses the site approximately 270 meters south of the north east corner.

Approximately 66% of the area of the site to be developed, lies to the north of the watershed. This area currently drains to the stormwater drainage system of Marine Drive.

The remaining 34% lies to the south of the water shed. Approximately 90% of this area drains over the western boundary to the drainage system of the adjacent Thulana Hills Sectional Title development on Erf 9829. The The Thulana Hills drainage system discharges at the south western corner of Erf 9829 to a natural watercourse which leads to the Piesang Valley River . The remaining 10% drains in a south westerly direction down the steep slope across Erf 9828 to ultimately discharge to the Piesang Valley River

7.2 Post Development:

In the developed condition stormwater runoff from roofs will be partially discharged to road and parking surfaces and partially to landscaped garden areas.

The discharge to the road surfaces will be routed to permeable paved areas.

The discharge to landscaped garden areas will be partially routed to road surfaces and partially to grass lined swales.

The swales and permeable paving areas will be designed to detain the runoff the pre=development flow rates.

In the Northern Catchment an underground piped system will collect the runoff from the swales and permeable paved areas and convey it to the discharge position at the north-eastern corner of the site, where it will be connected to the existing Municipal stormwater system in Marine Drive.

In the Southern Catchment an underground piped system will collect the runoff from the permeable paved areas and convey it to the swales positioned along the western boundary.

From the swales the discharge will be released on surface in a manner engineered to simulate the existing spread of surface flow across the full area of discharge. Therefore the detained runoff will be distributed on surface without concentration.

7.3 Sustainable Drainage Systems (SUDS)

The City of Cape Town norms for SUDS are adopted for projects located in the Western Cape:

The detention criteria is that stormwater be detained to reduce the post-development runoff rates to not exceed the pre-development rates for the 1 in 10 year and 1 in 50 year return storm intervals.

However in the case of the southern catchment due to the sensitivity of the discharge release area, detention will be provided to reduce the post-development runoff rates to not exceed the pre-development rates for the 1 in 10 year and 1 in 100 year return storm intervals.

The target reductions of total suspended solids (TSS) and total phosphates (TP) are 80% and 45% respectively.

The reduction of the post- development runoff to the pre-development rates and the targeting of the required SUDS TSS and TP reductions will be achieved by the detention of post development runoff in the swales and permeable paving to be provided.

The swales and permeable paving areas indicated on Drawing 24G64 S01 are preliminary. Finalization of permeable paving and swale details will be undertaken in the Detailed Design Phase

7.4 Stormwater Modelling

The runoff and retention calculations have been done utilising the CBA Hydrograph Generation Reservoir Routing program of Chris Brooker and Associates.
The average annual precipitation is 650mm.

Pre-development:

In calculating the run-off coefficient C the following factors were used, adapted from SADM Table 3.7:

- Slope C_S 0.08
- Permeability C_P 0.16
- Vegetation C_V 0.11

Using adjustment factors of 0.73 and 0.89 and 1.0 (Table 3.8 adapted for mild slope and semi-permeable conditions) for the 10, 50, and 100 year Return Interval (RI) storms respectively, the following run-off coefficients were obtained:

- 1:10 RI 0.25
- 1:50 RI 0.31
- 1:100 RI 0.35

Northern Catchment: Area: Area 3.201 ha.

The Pre development time of concentration Tc is calculated using the Kirby Formula for overland flow as follows:

Hydraulic Length of Runoff	347m
Average Slope	8,1%
Roughness Coefficient	0.3
Tc	23 minutes

The generated Pre-Development runoff rates are:

1: 10 Year RI	0,12 m3/s
1: 50 Year RI	0,15m3/s

Southern Catchment: Area: Area 1.643 ha.

The Pre development time of concentration Tc is calculated using the Kirby Formula for overland flow as follows:

Hydraulic Length of Runoff	98m
Average Slope	5,5%
Roughness Coefficient	0.3
Tc	14 minutes

The generated Pre-Development runoff rates are:

1: 10 Year RI	0,08 m3/s
1: 100 Year RI	0,22 m3/s

Post-development:

Detailed modelling and finalization of permeable paving and swale areas will be undertaken in the Detailed Design Phase. Preliminary modeling has been undertaken on the basis of the following:

The post development runoff factors are calculated adopting 100% for roof and road areas and 30% for unsurfaced landscaped areas.

Northern Catchment:

Roof and Road Area	21400 m2
Swale and Landscaped Area	10610 m2
Total Area	32010 m2
Runoff Factor Cd:	0.77

Area Permeable Paving: 2500m2 Area Swales: 270m2

The generated Post-Development runoff rates and detention volumes are:

!: 10 Year RI	0,112 m3/s	Detention Volume	314m3
1: 100 Year RI	0,148 m3/2	Detention Volume	554m3

Southern Catchment:

Roof and Road Area	12260 m2
Swale and Landscaped Area	4170 m2

Total Area	16430 m2
Runoff Factor Cd:	0.83

Area Permeable Paving: 1500m2 Area Swales: 530m2

The generated Post-Development runoff rates are:

1: 10 Year RI	0,078	Detention Volume	134m3
1: 100 Year RI	0,205	Detention Volume	276m3

8. STORMWATER MANAGEMENT DURING CONSTRUCTION

Permanent detention channel swales which are specified on the western and northern boundaries of the site will be constructed on commencement of construction. Elsewhere along the southern, western and northern boundaries of the site a grass lined stormwater containment berm will be constructed. The detention channel swales and berms will contain all concentrated and silt contaminated stormwater flow from running off to the underlying property during the construction period.

The desilting maintenance of these facilities will be undertaken on a regular basis.

9. REFUSE MANAGEMENT

Removal:
The solid waste from the development will be collected by the Bitou refuse removal trucks from a waste storage area which will be provided at the main access to the site.

Arrangement will be made by the Development Body Corporate for the transport of refuse from the individual units to the storage area. At the storage area the refuse will be stored in bins for the weekly Bitou collection.

Quantity:
Based on the South African middle income average of 0.74 kilograms per person day, and an average of 3 people per unit, an average of 2.4 kilograms per unit is adopted. On this basis the estimated total weekly quantity for the 250 units will be 4,2 tons.

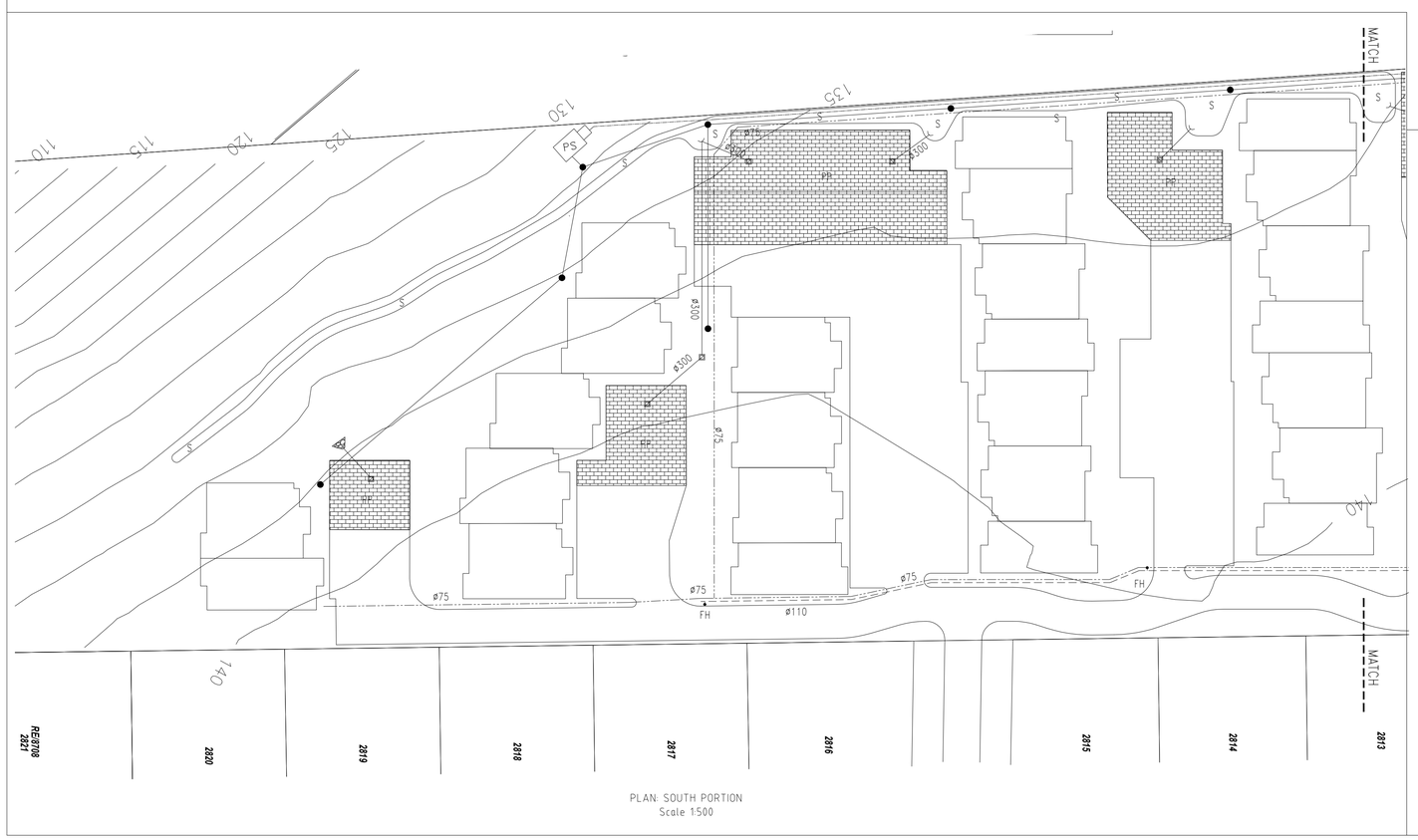
10. ATTACHMENTS

DWG No: 24G64 S01
General Layout: Roads, Stormwater, Sewer and Water Reticulation

Prepared By: Date: 09 July 2024

D Botes Pr.T Eng.

PLAN: NORTH PORTION
Scale 1:500



PLAN: SOUTH PORTION
Scale 1:500

LEGEND

- UPVC DOMESTIC WATER
- UPVC FIRE MAIN
- EXISTING RETIC.WATER
- EXISTING BULK.WATER
- FH — FIRE HYDRANT
- GATE VALVE
- ø160 UPVC SEWER CLASS 34 AND MANHOLE
- PS — SEWER PUMP STATION
- SEWER RISING MAIN
- STORMWATER PIPE & MANHOLE
- S — STORMWATER DETENTION SWALE
- PP — STORMWATER DETENTION PERMEABLE PAVING

REV	DESCRIPTION	DATE
B	REVISED FOR NEW LAYOUT	08 07 24
A	ISSUED FOR INFORMATION/APPROVAL	11 04 24

DRAWN BY: PB CELL:

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Project

ERF 2074, PLETTENBERG BAY

Description

SEWER AND WATER RETICULATION, ROADS AND STORMWATER LAYOUT

JOB No	DRW No	REV	DATE
24/G64	S01	B	08 07 2024