

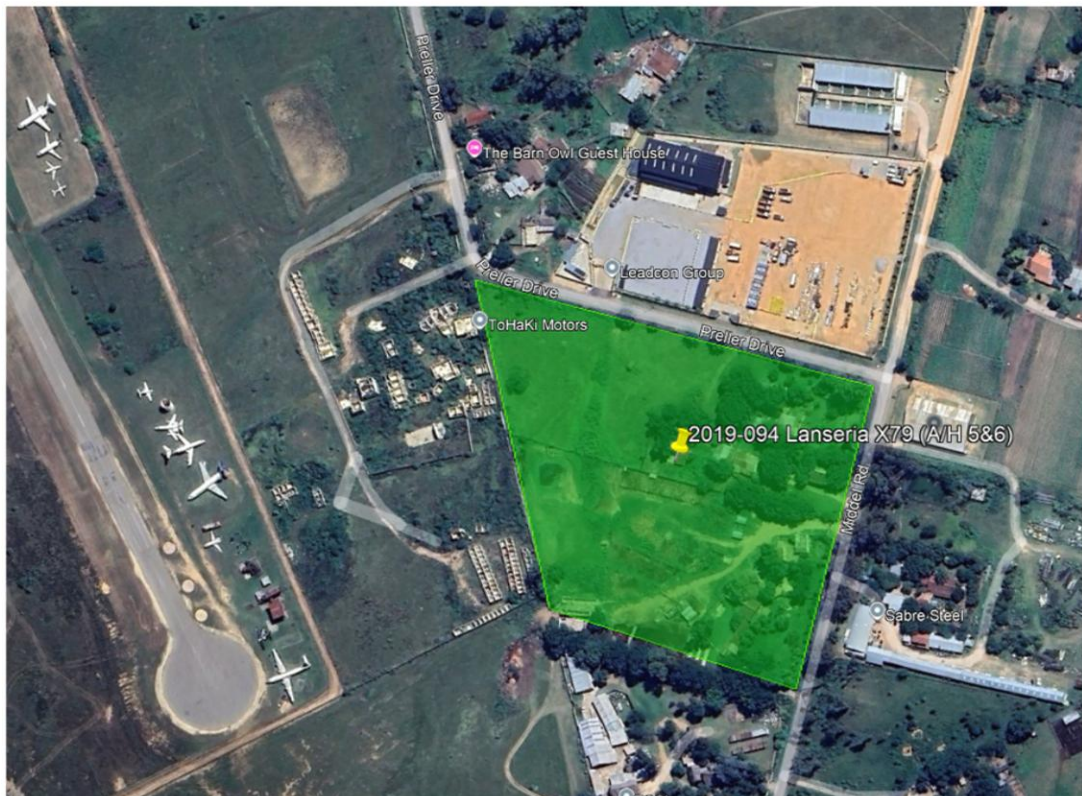
TOWNSHIP ESTABLISHMENT APPLICATION OF PORTION 5 & 6 OF THE FARM SUNRELLA AGRICULTURAL HOLDINGS

STORMWATER MANAGEMENT REPORT

REPORT 2019-094-23 Rev-1

JUNE 2025

CLIENT: GROWTHPOINT & APETURE PROPERTIES



EDS Engineering Design Services (Pty) Ltd Reg. No: 2006/021564/07 VAT No: 4190230971

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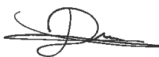


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Outline Scheme Report Information Sheet

Report number : 2019-094-23-Rev-1
Local authority : City of Johannesburg Metropolitan Municipality
Proposed change : Township Establishment Application
Development type : Industrial 3, Warehouses
Property description : Portion 5 and Portion 6 of the farm Sunrella Agricultural Holdings (Lanseria Ext 79, erf 976 and erf 977)

Report undertaken by:

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Signature : 
Qualifications : B.Eng (Civil)
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Report reviewed by:

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**PORTION 5 AND 6 OF THE FARM SUNRELLA
AGRICULTURAL HOLDING
OUTLINE SCHEME REPORT
STORMWATER MANAGEMENT REPORT**

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1 INTRODUCTION

EDS Engineering Design Services (Pty) Ltd (EDS Engineers) was appointed to compile an Stormwater Management Report for the township application of Erf 976 and Erf 977, Lanseria Extension 79 on Portion 5 and Portion 6 of the farm Sunrella Agricultural Holdings Township.

The application site is located in Lanseria and falls in the area of jurisdiction of the City of Johannesburg Metropolitan Municipality.

This report describes the existing civil engineering stormwater management in proximity to the application site, the expected demands as a result of the change of the zoning rights and evaluates the capacity of the existing networks to accommodate the expected demands.

2 DETAILS OF THE APPLICANT

The details of the applicant:

Company Name:	GROWTHPOINT PROPERTIES
Physical Address:	The place 1 Sandton Drive Sandton Gauteng 2196
Contact Person:	Polla Scholtz
Telephone Number:	(011) 944 6050

Company Name:	APERTURE PROPERTIES
Physical Address:	89 Bute Lane, Sandown Sandton South Africa
Contact Person:	Hilton Carty
Telephone Number:	(079) 916 3982

The details of the town planner:

Company Name:	The Town Planning Hub cc
Physical Address:	Lombardy Corporate Park Block B, Unit M, Cole Rd, Shere Pretoria
Contact Person:	Adele Coertze
Telephone Number:	(012) 809 2229

3 SITE INFORMATION

3.1 SITE LOCATION

The site is located within the municipal boundaries of the City of Johannesburg.

The site details are as follows:

Site		Portions 5 and 6 of the farm Sunrella Agricultural Holdings
Size		3.879 ha
Boundaries	North	Side Road
	East	Main Road (Proposed K215)
	West	Lanseria Airport Extension 1

The location of the proposed township is shown in **Annexure A**.

3.2 PROPERTY DESCRIPTION

The application site is on portions 5 and 6 of the farm Sunrella Agricultural Holdings.

The physical combined size of portions 5 and 6 of the farm Sunrella Agricultural Holdings is 3.879 ha. A request to the city of Johannesburg Metropolitan Municipality for the approval of the township establishment of Lanseria Extension 79 of Erf 976 with Erven 977 measuring 3.879 ha in extent has been submitted.

Erf 976 and Erf 977 of Lanseria Extension 79 will be consolidated. For the purposes of this report, the site will hereafter be referred to as Lanseria Extension 79.

The proposed subdivision layout is included in **Annexure B**.

4 DEVELOPMENT INFORMATION

4.1 EXISTING LAND-USE RIGHTS

Portion 5 and Portion 6 of the farm Sunrella A/H are currently zoned “Agriculture” permitting land and building use for any bona fide farming activity. A copy of the zoning certificates is included in **Annexure C**.

The existing land use rights are summarised in **Table 4.1.1** below.

Table 4.1.1: Existing land use rights

Erf nr	Existing zoning	Size (ha)	Density	Coverage	FAR	Height (m)
Portion 5 and 6	Agriculture	3.879	N/A	N/A	N/A	N/A

4.2 PROPOSED LAND-USE RIGHTS

The zoning of the application site will change to “Industrial 3”.

The schedule of rights as well as an extract of the motivation memorandum as submitted by the town planner, indicating the proposed development controls, are included in **Annexure D**.

The proposed land use rights are summarised in **Table 4.2.1** below.

Table 4.2.1: Proposed land use rights

Erf nr	Proposed zoning	Size (ha)	Density	Coverage	FAR	Height (m)
Lanseria Extension 79	Industrial 3	3.879	N/A	60%	0.6	25

5 OBJECTIVES OF THE STORMWATER MANAGEMENT PLAN

The objectives of the stormwater management plan are as follows:

- To determine the stormwater runoff for the pre-development site conditions.
- To determine the stormwater runoff for the post-development conditions.
- To ensure that the stormwater runoff for a 100-year storm can discharge through a flood escape route to ensure that no flooding on site occurs.
- To ensure that the quantity and the rate of stormwater runoff from the site is controlled as per the requirements of the Johannesburg Roads Agency (JRA).
- Calculate and allow for external stormwater management as no external system is available in the facility of the proposed development.

6 PLANNING AND DESIGN CONSIDERATIONS

6.1 REQUIREMENTS OF THE JOHANNESBURG ROADS AGENCY (JRA)

The Stormwater Management Report and design considerations are based on the requirements of the following policies and design guidelines:

- The City of Johannesburg Metropolitan Municipality – *Stormwater Management By-Law*.
- Johannesburg Roads Agency SOC Limited (JRA) – *Roads & Stormwater Manual – Volume 1 Code of Procedure*.
- The South African National Roads Agency SOC Limited – *Drainage Manual*
- Stormwater design manual for the City of Johannesburg 2019.

7 CURRENT STORMWATER SYSTEM

The existing stormwater reticulation consists of the following:

- There are no existing stormwater infrastructure networks in the surrounding area of the application site.

The existing stormwater information was received from the Johannesburg Roads Agency and is included in **Annexure E**.

8 PROPOSED STORMWATER MANAGEMENT SYSTEM

8.1.1 Background

A fragmented and degraded unchannelled valley bottom wetland occurs on site. The wetland is clearly impacted by anthropogenic activities including housing, alteration of flow paths and historical use of the site for intensive livestock rearing. The Lanseria Airport has also altered the hydrology of the aquatic ecosystems within 500m of the site. The affected wetland system is currently in an Ecological Category E, representing a seriously modified state. This classification reflects a high level of disturbance, with substantial alteration of natural ecosystem processes, and a significant loss of indigenous biota and habitat integrity across most components assessed — particularly in vegetation, hydrology, and water quality. The ecological importance and sensitivity of the system is also *low*, representing an aquatic ecosystem that is not ecologically important and sensitive at any scale.

EDS Engineers and Galago Environmental worked together to encompass sections of the unchannelled valley bottom wetland, with a single attenuation pond in the northern corner of the site. The *mitigative aspect* of the loss of the wetlands, due to the proposed development, will be the *improvement of the wetland ecological services in the artificial wetland (AW) and attenuation structure*. Galago Environmental recommends that the principles of emulating current wetland ecological goods and services are incorporated into the core design (flood attenuation, stream flow, sediment trapping, erosion control, etc) to ensure *functionality remains and is improved*.

8.1.2 Stormwater Management Principles

The stormwater system is based on Sustainable Urban Drainage Systems (SUDS), focusing on reducing flow velocity, protecting against erosion, and promoting groundwater recharge. Stormwater attenuation is provided in line with Johannesburg Roads Agency (JRA) requirements. The design respects common law obligations to accommodate upstream runoff across lower-lying land. A new wetland system is proposed to support ecological function and downstream wetland connectivity.

8.1.3 Internal Stormwater Infrastructure

The internal stormwater infrastructure includes a combined attenuation dam and wetland to manage runoff and support infiltration. Surface drainage from parking areas and hardstands will be collected via a piped system. Subsurface drains will capture and direct groundwater and seepage to the wetland.

8.1.4 On-Site Stormwater Runoff

Runoff from Lanseria x 79 will be attenuated to pre-development levels using the proposed attenuation structure. Low-frequency storm discharges will be routed through the wetland to enhance infiltration before entering the downstream system.

8.1.5 JRA Stormwater Requirements

The stormwater Management Policy of the Johannesburg Roads Agency (JRA) applies to all new developments and specifies that all developments on land exceeding 4000m² are subject to stormwater attenuation on site. The stormwater runoff for the application site should be attenuated to the satisfaction of the stormwater department of the Johannesburg Metropolitan Municipality.

The site will be shaped to direct 1:100-year storm runoff via surface flow to the stream on the north-western boundary. In the absence of municipal stormwater infrastructure, runoff will be conveyed by new municipal pipes to the nearby northern watercourse.

The proposed combined stormwater and wetland attenuation ponds with all internal stormwater infrastructure will be constructed on the consolidated site Extension 79. The proposed attenuation pond is indicated in **Annexure F**.

9 DESIGN CALCULATIONS

The area of the application site for the stormwater calculation is 3.879 ha.

9.1 ESTIMATED PRE-DEVELOPMENT STORMWATER RUNOFF

The simplified rational method was used to determine the estimated pre-development runoff for the application site. The design data for determining the stormwater runoff for the 2- to 50-year recurrence interval design storm events for the pre-development conditions are summarised in **Table 9.1.1**.

Table 9.1.1: Pre-development runoff data

		Portion 5 and 6 of the Farm Sunrella A/H	
Catchment Area (A)		38 790	m ²
MAP		750	mm/year
Runoff Factor (C)		0.3	
Time of Concentration (Tc)		30	minutes
Rainfall Intensity (I)	1-2 year	50	mm/hr
	1-5 year	71	mm/hr
	1-10 year	86	mm/hr
	1-20 year	104	mm/hr
	1-25 year	108	mm/hr
	1-50 year	130	mm/hr

PORTION 5&6 – SUNRELLA AGRICULTURAL HOLDINGS

The following formula applies:

$$Q = CIA/3.6$$

Where,

- Q = Peak flow (m³/s)
- C = run-off coefficient
- I = Average rainfall intensity over the catchment (mm/hr)
- A = Catchment area (m²)

The estimated pre-development stormwater runoff for the 2- to 50-year recurrence interval design storm events is summarised in **Table 9.1.2**.

Table 9.1.2 Estimated pre-development stormwater runoff

		Portion 5 and 6 of the Farm Sunrella A/H	
Peak Flow (Q)	1-2 year	0.162	m ³ /s
	1-5 year	0.230	m ³ /s
	1-10 year	0.278	m ³ /s
	1-20 year	0.336	m ³ /s
	1-25 year	0.349	m ³ /s
	1-50 year	0.421	m ³ /s

The pre-development stormwater calculations are included in **Annexure G**.

9.2 ESTIMATED POST-DEVELOPMENT STORMWATER RUNOFF

The simplified rational method was used to determine the estimated post-development runoff for the application site. The design data for determining the stormwater runoff for the 2- to 50-year recurrence interval design storm events for the post-development conditions are summarised in **Table 9.2.1**.

Table 9.2.1: Post-development runoff data

		Erf 976 & 977 (Lanseria Extension 79)	
Catchment Area (A)		38 790	m ²
MAP		750	mm/year
Runoff Factor (C)		0.9	
Time of Concentration (Tc)		15	minutes
Rainfall Intensity (I)	1-2 year	80	mm/hr
	1-5 year	107	mm/hr
	1-10 year	129	mm/hr
	1-20 year	152	mm/hr
	1-25 year	157	mm/hr
	1-50 year	183	mm/hr

PORTION 5&6 – SUNRELLA AGRICULTURAL HOLDINGS

The following formula applies:

$$Q = CIA/3.6$$

Where,

- Q = Peak flow (m³/s)
- C = run-off coefficient
- I = Average rainfall intensity over the catchment (mm/hr)
- A = Catchment area (m²)

The estimated post-development stormwater runoff for the 2- to 50-year recurrence interval design storm events are summarised in **Table 9.2.2**.

Table 9.2.2 Estimated post-development stormwater runoff

		Erf 976 & 977 (Lanseria Extension 79)	
Peak Flow (Q)	1-2 year	0.776	m ³ /s
	1-5 year	1.038	m ³ /s
	1-10 year	1.252	m ³ /s
	1-20 year	1.475	m ³ /s
	1-25 year	1.524	m ³ /s
	1-50 year	1.776	m ³ /s

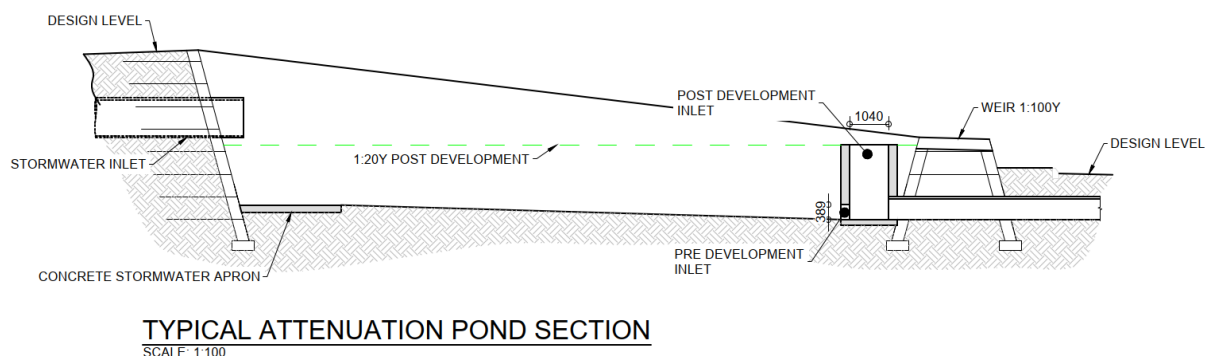
The post-development stormwater calculations are included in **Annexure G**.

9.3 ATTENUATION PONDS

From Tables 9.1.2 and 9.2.2 above, there would be an increase in the stormwater runoff for the pre-development conditions of the application site.

The runoff associated with the development is to be attenuated such that the pre-development flow for the 5- to 25-year storm events is not exceeded. The attenuation facility must also be capable of withstanding the 50-year storm event.

The proposed typical attenuation pond detail is shown below, the final drawings will be submitted with the Site Development application for approval to local authorities.



9.3.1 SIMPLIFIED HYDROGRAPH METHOD

The simplified hydrograph method, as stipulated in the *SANRAL Drainage Manual* was used to calculate the estimated required stormwater attenuation volume for the application site and is summarised in Tables 9.3.1

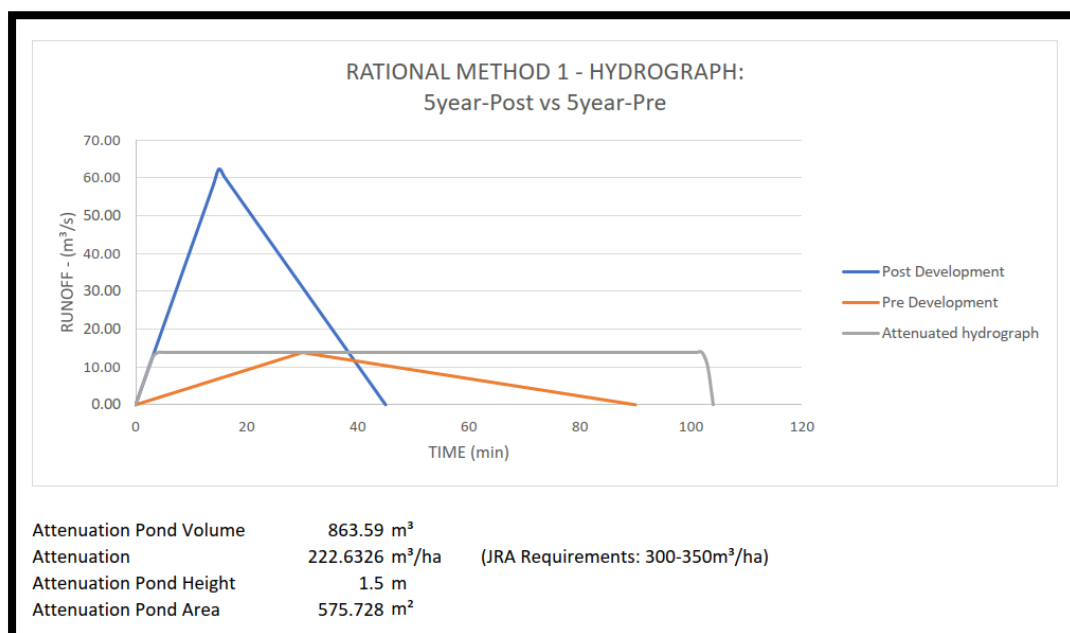


Figure 3: 5y-Pre vs 5y-Post Hydrograph

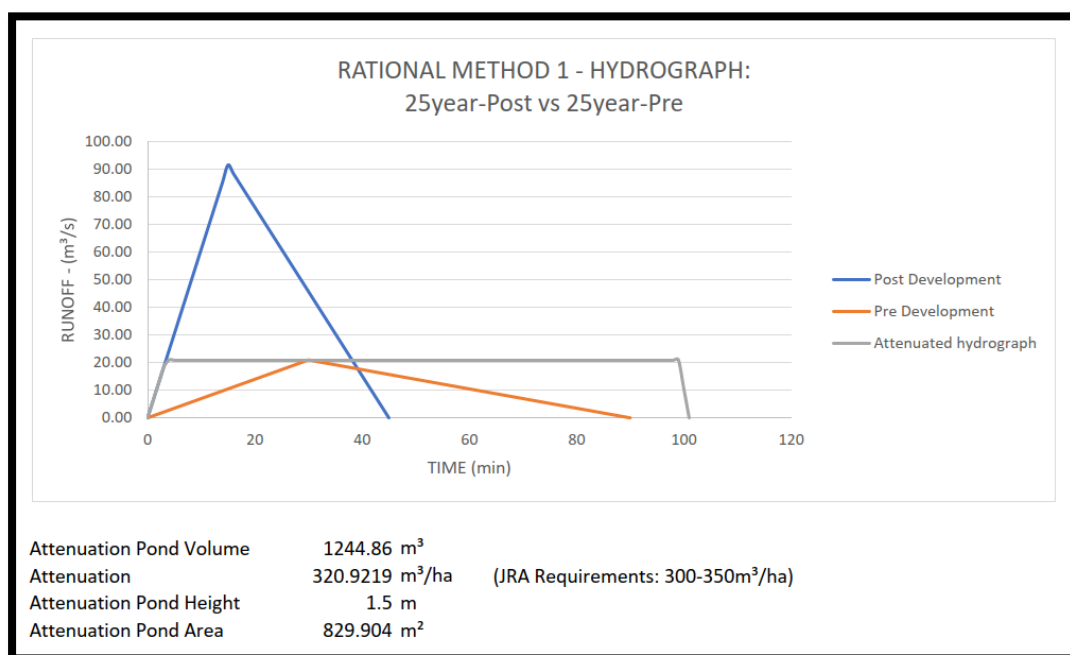


Figure 4: 25y-Pre vs 25y-Post Hydrograph

Table 9.3.1 Estimated stormwater attenuation volumes – Simplified Hydrograph

		Pre-development (m ³)	Post-development (m ³)	Attenuation Pond Volume (m ³)
Lanseria Extension 79	1:5 year	621	1401.3	863.6
	1:25 year	942.3	2057.4	1244.9

* Simplified Hydrograph – 3TC

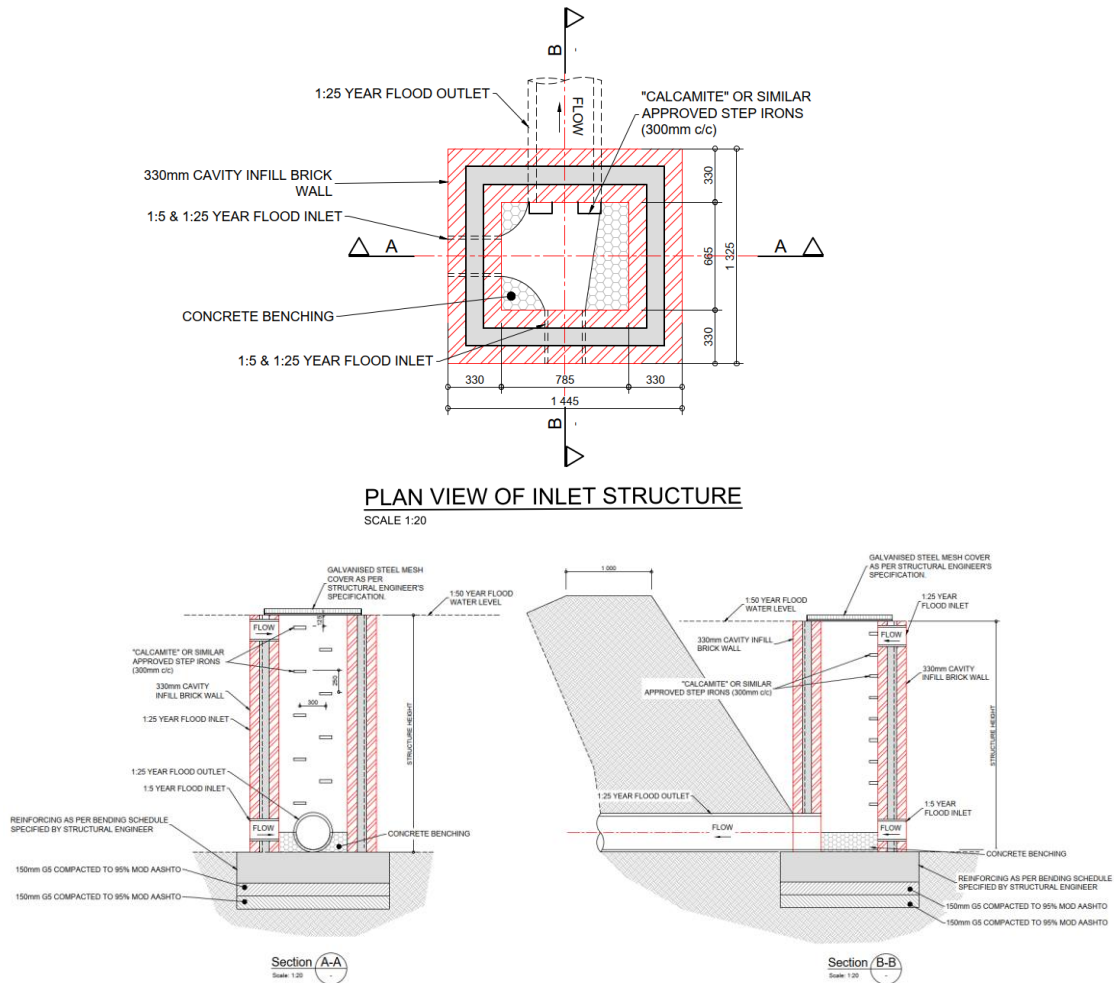
The estimated design summary is included in **Annexure G**.

The designs of the attenuation facilities were done to size the pond for optimum storage volume. The proposed approximate positions of the attenuation facilities are located in the north-eastern corner of the application site and are indicated on the layout in **Annexure F**.

9.3.2 ATTENUATION POND OUTLET CONTROL STRUCTURE

The post-development stormwater will be managed and discharged in accordance with pre-development conditions through the attenuation pond outlet structure. This system will effectively control flood events with return periods of 1 in 5 years, and 1 in 25 years and a pond overflow weir structure will control the 1 in 100 years storm event.

PORTION 5&6 – SUNRELLA AGRICULTURAL HOLDINGS



9.3.3 STORMWATER OUTLET CONTROL STRUCTURE

The attenuation pond outlet will include an erosion and energy dissipation structure as approved by the JRA and designed in accordance with the NTC Road Drainage Manual. This will ensure that the concentrated flow at the road culvert will be dissipated and hence have no detrimental effect on the downstream watercourse. A typical example is shown below, the design and final drawings will be submitted for approval with the external road design to the local authorities.

9.4 UPSTREAM CATCHMENT AREA REQUIREMENTS

The estimated stormwater runoff from the upstream catchment area, originating from Lanseria, will be conveyed through an underground culvert system located on Erf 977.

The stormwater will then be discharged into the external stormwater system constructed as part of the Lanseria Extension 11 development external road upgrades. The culvert outlet will be equipped with an erosion and energy dissipation structure, which must be approved by the Johannesburg Roads Agency (JRA) and designed in accordance with the **NTC Road Drainage Manual** and the **NHI Hydraulic Design of Energy Dissipators for Culverts and Channels**. This structure will ensure that the concentrated flow at the culvert outlet is effectively dissipated, thereby preventing any adverse impact on the downstream watercourse.

Table 9.4.1: Upstream Catchment runoff data

Catchment Area (A)	644 330	m ²
MAP	750	mm/year
Runoff Factor (C)	0.4	
Time of Concentration (Tc)	94	minutes

Table 9.4.2: Estimated stormwater runoff for upstream flow

Method	1:25 year peak flow (m ³ /s)	1:50 year peak flow (m ³ /s)
Rational Method	2.23	3.15
Alternative Rational	3.66	4.51
Adopted	3.66	4.51

The culvert has been designed to accommodate the **1:50-year** pre-development conditions, which is considered sufficient, as all future upstream developments will be required to design attenuation ponds for the **1:5-year** pre-development runoff.

A **1,800mm x 1,500mm** box culvert will be constructed at the location indicated in **Annexure F**.

A representative example is provided below, while the final design and drawings will be submitted to the relevant local authorities for approval.

PORTION 5&6 – SUNRELLA AGRICULTURAL HOLDINGS

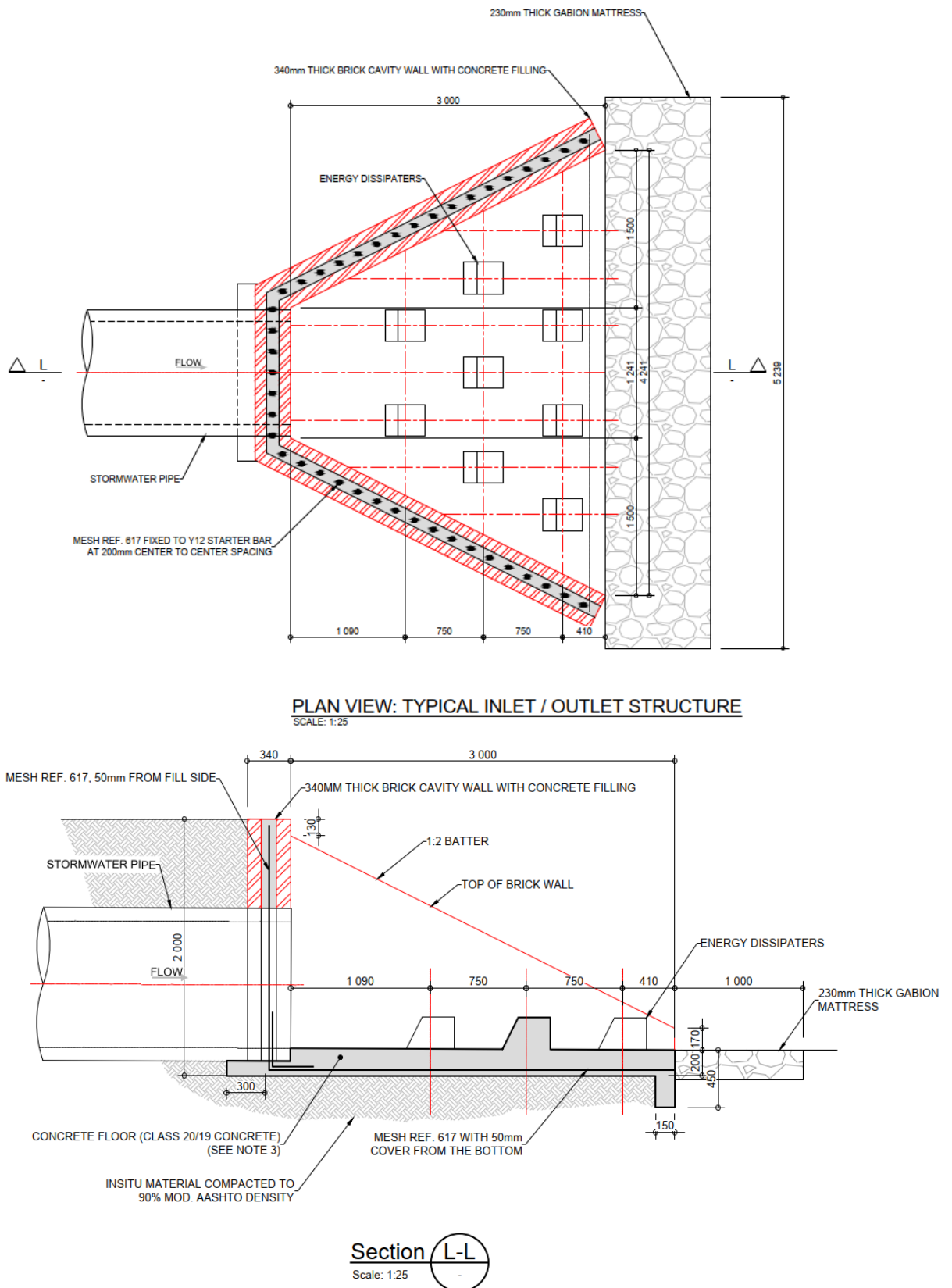


Figure 3: Typical outlet structure

9.5 EXTERNAL STORMWATER REQUIREMENTS

The road stormwater network will be installed next to Preller Road, as part of Extension 11 development.

The stormwater system will be designed to accommodate the 1:25 year storm event for the external road and surrounding areas flow, and including the flow discharged from the culvert system channelling the upstream catchment area.

The total estimated flow from the catchments is:

- 1:25-year Culvert Discharge Flow = 3.66 m³/s
- 1:25-year Road Flow = $C \cdot I \cdot A / 3.6 = (0.9 \cdot 157 \cdot 0.003352) / 3.6 = 0.132 \text{ m}^3/\text{s}$
- 1:5-year Pre-development Lanseria X11 Discharge Flow = 0.250 m³/s

Total accumulated flow is 4.042 m³/s.

A 1500mmΦ conduit pipe network is required to be installed running parallel to Preller Road and discharging to the natural watercourse.

The stormwater calculations are included in **Annexure G**.

10 CONCLUSIONS

It can be concluded that:

- The stormwater runoff would increase due to the proposed development.
- The stormwater runoff for the 1:100 year storm event can be discharged from the site by means of surface flow into the natural watercourse on the north-eastern side to ensure no flooding occurs on site.
- The quantity and rate of stormwater runoff from the site will be buffered and controlled as per the requirements of the Johannesburg Roads Agency by means of attenuation facilities.
- The attenuation pond outlet will include an erosion and energy dissipation structure as approved by the JRA and designed in accordance with the NTC Road drainage Manual.
- Upstream catchment stormwater management will be channelled through culvert that has been designed to accommodate the **1:50-year** pre-development conditions, which is considered sufficient, as all future upstream developments will be required to design attenuation ponds for the **1:5-year** pre-development runoff.

11 RECOMMENDATION

It is recommended that the Stormwater Management Report for the township establishment of Erf 976 and Erf 977, Lanseria Extension 79 on Portion 5 and Portion 6 of the farm Sunrella Agricultural Holdings Township be supported by the Johannesburg Roads Agency (JRA) as the quantity and the rate of stormwater runoff from the site can be controlled as per the requirements of JRA.



F.H.B van Eyk Pr. Eng. (20160826)

Annexures:

- Annexure A: Site Location Map
- Annexure B: Proposed Township Layout
- Annexure C: Existing Zoning Certificate
- Annexure D: Conditions of Contract
- Annexure E: Existing Stormwater Information
- Annexure F: Stormwater Management Layout Drawing
- Annexure G: Stormwater Calculations
- Annexure H: Culvert Calculations

ANNEXURE A: SITE LOCATION MAP



- GENERAL NOTES:
1. REFER TO ALL RELEVANT DRAWINGS & SPECIFICATIONS, DO NOT SCALE ANY DIMENSIONS.
 2. WHERE DISCREPANCIES OCCUR BETWEEN THE PROJECT DRAWINGS OR SPECIFICATIONS, THESE SHOULD BE REPORTED IMMEDIATELY TO THE PRINCIPAL AGENT.
 3. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE AND CORRELATED WITH THE ARCHITECTS DRAWING BEFORE CONSTRUCTION COMMENCES.
 4. ALL WATERPROOFING AND EARTH POISONING DETAILS TO BE IN ACCORDANCE WITH THE ARCHITECT'S SPECIFICATION AND INSTRUCTIONS.

A	26/11/24	FOR INFORMATION	KB
Rev. No:	Date:	Revision Details:	By:

Client:

Architect:

e•d•s
Structural, Civil and
Transportation Engineers

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Fax: 012 991 1373
e-mail: info@edseng.co.za

Project:

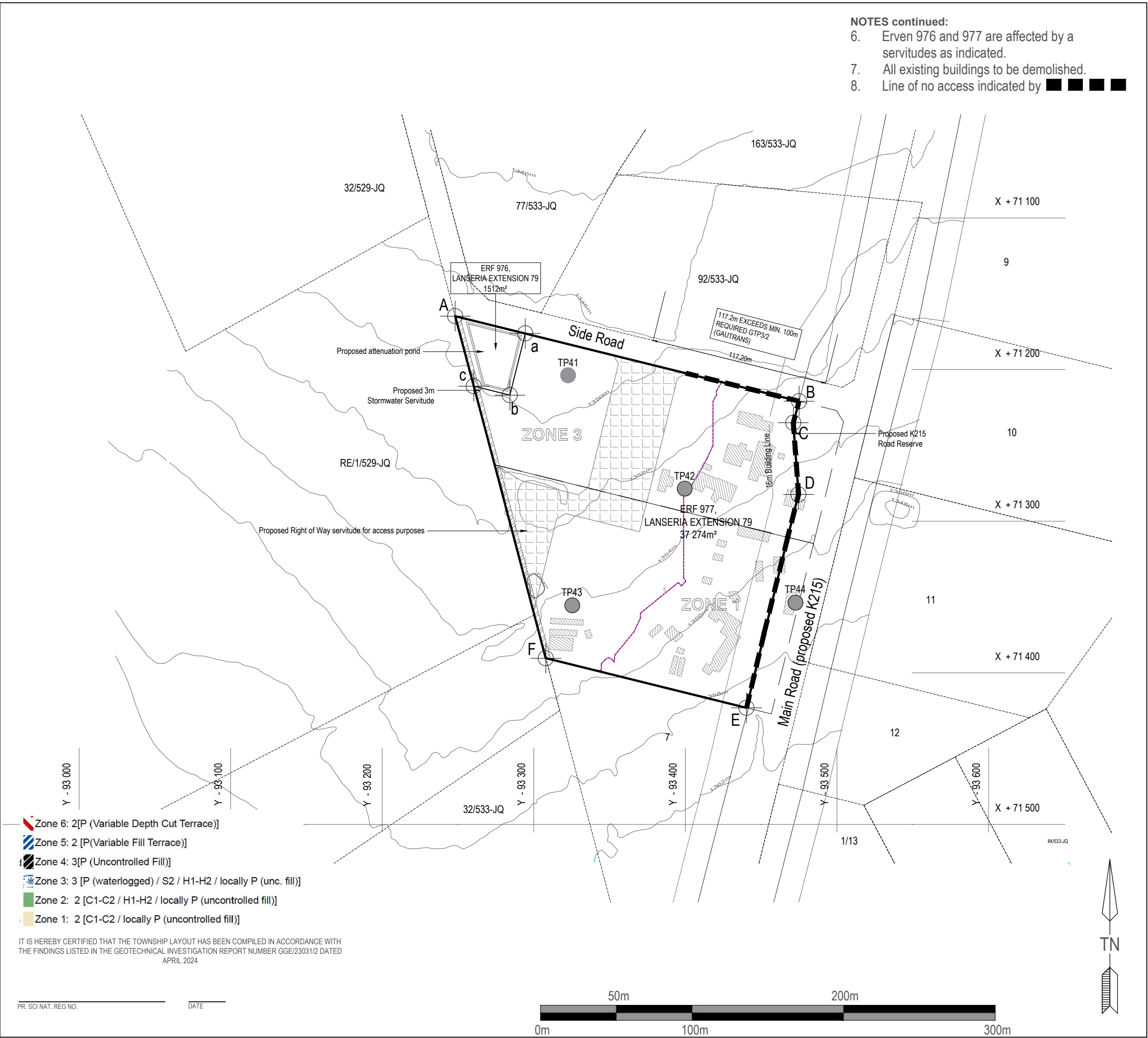
**LANSERIA
PROJECT RUNWAY**

Description:

**LOCALITY PLAN
(FIGURE 1)**

Paper size:	Drawn:	Checked:	Designed:
A3	KB	D vd M	D vd M
Scale:	Project Number:	Drawing Number:	Revision:
1:5000	2019-094	0050	A

ANNEXURE B: PROPOSED TOWNSHIP LAYOUT



LOCALITY PLAN

SCALE 1 : 50 000

NOTES:

- The township boundaries are indicated by points ABCDEFA.
- Proposed K215 Provincial Road Alignment and line of no access indicated.
- Erf 976 is indicated by points AabcA and measures 1 512m² in extent.
- Erf 977 is indicated by points aBCDEFcba and measures 37 274m² in extent.
- All areas and distances are estimated, subject to final survey for General Plan purposes.

PROPOSED TOWNSHIP: **LANSERIA EXTENSION 79**

SITUATED ON: **HOLDINGS 5 AND 6**

OF THE FARM: **SUNRELLA AGRICULTRUAL HOLDINGS**

LOCAL AUTHORITY: **CITY OF JOHANNESBURG METROPOLITAN MUNICIPALITY**

LAND USE TABLE				
USE	AREA	OF TOWNSHIP	# OF ERVEN	ERF NUMBERS
"INDUSTRIAL 3"	38 786m²	100.00 %	2	976 - 977
"ROADS"	0 m²	0.00 %		
TOTAL	38 786m²	100 %	2	976 - 977

SIZE OF ERVEN			STREETS	
USE	MINIMUM	RULING	MINIMUM GRADIENT:	N / A
			MAXIMUM GRADIENT: <td>N / A</td>	N / A
			TOTAL LENGTH: <td>N / A</td>	N / A
SCALE: 1 : 2 5 0 0 on A 3				
LA VIEW: CPD/LSA X79/1				

DATE	SUBMISSION / AMENDMENT	CONTOUR INTERVAL:	2m
12.2024	1/SUBMISSION	GEODETIC SYSTEM:	WGS 84
		CONTOUR SURVEY:	City of Johannesburg GIS
		DESIGNED BY:	B. Oosthuizen
		APPLICANT:	B.E. Fletcher

IT IS HEREBY CERTIFIED THAT THE PROPERTY SHOWN ON THIS DRAWING IS NOT AFFECTED BY FLOODWATER 1:50 AND 1:100 YEAR RECURRENCE INTERVAL EVENT DETERMINED IN ACCORDANCE WITH SECTION 144 OF THE NATIONAL WATER ACT (ACT 36 OF 1998).

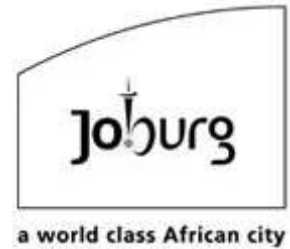
INITIAL AND SURNAME

PR. ENG. REG NO.

DATE

ANNEXURE C: EXISTING ZONING CERTIFICATES

**ZONING INFORMATION
CERTIFICATE PAD
FOR APPLICATION SUBMISSIONS**



Date: 12/03/2024

Requested by:	Sandy Ngwenya
Town Planning Scheme:	City of Johannesburg Land Use Scheme 2018
Name of Applicant:	THE TOWN PLANNING HUB CC
Erf/Holding Name/Farm Portion:	Holdings 5 and 6
Township/Holding Name/Farm Name:	Sunrella A.H.
Street Name and No:	Main avenue
ZONING INFORMATION	
Use Zone:	Undetermined
Height Zone:	A (As per attached table 4)
Floor Area Ratio:	As per attached table 6
Coverage:	As per attached table 5
Density:	No Density
Building Line:	As per attached table 7
Parking:	As per scheme
AMENDMENT SCHEME APPLICABLE:	N/A
Served By:	Sandy Ngwenya

Terms and Conditions:

The Town Planning Scheme is open for inspection on the 8th Floor 158 loveday Street Braamfontein between 8:00 and 15:30 weekdays. The applicant must verify the information contained herein by inspection of the scheme. Whilst the utmost is done to ensure accuracy the City of Johannesburg does not accept responsibility for any incorrect information given on this form. The applicant's attention is drawn to the general provisions of the Town Planning Scheme. It should be noted that the provisions of the Town Planning Scheme do not override any restrictive conditions that may be contained in the Title Deeds. PLEASE NOTE: No Information will be given telephonically due to the technical and interpretive complications.

ANNEXURE D: CONDITIONS OF ESTABLISHMENT

STATEMENT OF THE CONDITIONS UNDER WHICH THE APPLICATION MADE BY GROWTHPOINT PROPERTIES LIMITED (REGISTRATION NUMBER 1987/004988/06) (HEREINAFTER REFERRED TO AS THE TOWNSHIP OWNER) IN TERMS OF THE PROVISIONS OF PART 3 OF CHAPTER 5 OF THE CITY OF JOHANNESBURG MUNICIPAL PLANNING BY-LAW, 2016 (AS AMENDED 2023) (HEREINAFTER REFERRED TO AS THE BY-LAW), FOR PERMISSION TO ESTABLISH A TOWNSHIP ON HOLDINGS 5 AND 6, SUNRELLA AGRICULTURAL HOLDINGS, GAUTENG PROVINCE, HAS BEEN APPROVED.

1. CONDITIONS TO BE COMPLIED WITH PRIOR TO THE OPENING OF THE TOWNSHIP REGISTER AND THE DECLARATION OF THE TOWNSHIP AS AN APPROVED TOWNSHIP.

(1) CANCELLATION OF EXISTING CONDITIONS OF TITLE

The township owner shall at its own costs, cause the following restrictive conditions and/or servitudes to be cancelled or the township area to be freed there from:

T53698/2024 (Holding 5 Sunrella Agricultural Holdings)

A.(a); A.(b); A.(c); A.(c)(i); A.(c)(ii); A.(d); A.(d)(i); A.(d)(ii); A.(d)(iii); A.(d)(iv); A.(d)(v); A.(d)(vi); A.(e); A.(f); A.(g); A.(h); A.(i); A.(j); A.(j)(i); A.(j)(ii); A.(j)(iii); A.(j)(iv)

T27363/2024 (Holding 6, Sunrella Agricultural Holdings)

A.(a); A.(b); A.(c); A.(c)(i); A.(c)(ii); A.(d); A.(d)(i); A.(d)(ii); A.(d)(iii); A.(d)(iv); A.(d)(v); A.(d)(vi); A.(e); A.(f); A.(g); A.(h); A.(i); A.(j); A.(j)(i); A.(j)(ii); A.(j)(iii); A.(j)(iv)

(2) GENERAL

- (a) The township owner shall, prior to approval of the General Plan, make arrangements with Corporate Geo-Informatics (CGIS) for the allocation of a street name to the public road (or street names to the public roads) in the township (to be indicated on the layout plan so that it forms part of the General Plan).
- (b) The local authority shall, after approval of the General Plan, make arrangements with Corporate Geo-Informatics (CGIS) for the allocation of street numbers to the newly created erven in the township.
- (c) Excision in terms of section 69 of the By-law

The holding on which the township is being established has been excised and the description of the land has been submitted as being farmland.
- (d) A satisfactory geo-technical report (in triplicate) shall be submitted to the local authority and the Amendment Scheme shall not be considered/approved by the local authority until such time as the comments on the said report, have been obtained and included in the mentioned Amendment Scheme.
- (e) The township owner shall submit acceptable proof that all outline scheme reports have been submitted to the Municipal Entities (Johannesburg Water and Johannesburg Roads Agency).
- (f) Authorisation/exemption to establish the township in terms of the National Environmental Management Act (No 107 of 1998) shall be obtained from the Department of Agriculture and Rural Development and shall be submitted to the local authority.
- (g) The comments of the South African National Roads Agency Limited on the establishment of the township, shall be obtained and shall be submitted to the local authority.

- (h) The comments of the Department: Mineral Resources on the establishment of the township, shall be obtained and shall be submitted to the local authority.
- (i) The comments of the Department of Roads and Transport (Gauteng Provincial Government) on the establishment of the township, shall be obtained and shall be submitted to the local authority.
- (j) The township owner shall obtain and submit a certificate from Eskom that electricity supply to the township, is available. Provided that if supply is not available and the township has been approved by the local authority 5 years or more than 5 years ago, a letter from Eskom shall be submitted confirming that supply is not available.
- (k) The township owner shall, after approval of the General Plan of the township, submit the relevant Amendment Scheme to the local authority for approval, in order that it can be published simultaneously with the declaration of the township as an approved township.
- (l) The township owner shall comply with the provisions of sections 28(5), (9), (10) and (11) of the By-Law.

2. CONDITIONS OF ESTABLISHMENT

(1) NAME

The name of the township is **Lanseria Extension 79**.

(2) DESIGN

The township consists of erven and roads as indicated on layout plan CPD/LSAX79/1.

(3) DESIGN AND PROVISION OF ENGINEERING SERVICES IN AND FOR THE TOWNSHIP

The township owner shall, to the satisfaction of the local authority, make the necessary arrangements for the design and provision of all engineering services of which the local authority is the supplier.

(4) ELECTRICITY

The local authority is not the bulk supplier of electricity to or in the township. The township owner shall in terms of Chapter 6 Part 1 of the By-law make the necessary arrangements with ESKOM, the licensed supplier of electricity for the provision of electricity.

(5) GAUTENG PROVINCIAL GOVERNMENT (DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT)

Should the development of the township not been commenced with before the application to establish the township, shall be resubmitted to the Department of Agriculture and Rural Development for exemption/authorisation in terms of the National Environmental Management Act, 1998 (Act 107 of 1998), as amended.

(6) GAUTENG PROVINCIAL GOVERNMENT (DEPARTMENT OF ROADS AND TRANSPORT)

- (a) Should the development of the township not be completed before the application to establish the township, shall be resubmitted to the Department of Roads and Transport for reconsideration.

- (b) If however, before the expiry date mentioned in (a) above, circumstances change in such a manner that roads and/or PWV routes under the control of the said Department are affected by the proposed layout of the township, the township owner shall resubmit the application for

the purpose of fulfilment of the requirements of the controlling authority in terms of the provisions of Section 48 of the Gauteng Transport Infrastructure Act, 2001 (Act 8 of 2001).

- (c) The township owner shall comply with the conditions of the Department as set out in the Department's letter dated

(7) NATIONAL GOVERNMENT (DEPARTMENT: MINERAL RESOURCES)

Should the development of the township not been completed before the application to establish the township, shall be resubmitted to the Department: Mineral Resources for reconsideration.

(8) ACCESS

Access to or egress from the township shall be provided to the satisfaction of the local authority and/or Johannesburg Roads Agency (Pty) Ltd and/or the Department of Roads and Transport.

(9) ACCEPTANCE AND DISPOSAL OF STORMWATER DRAINAGE

The township owner shall arrange for the stormwater drainage of the township to fit in with that of the adjacent road/roads and all stormwater running off or being diverted from the road/roads shall be received and disposed of.

(10) REFUSE REMOVAL

The township owner shall provide sufficient refuse collection points in the township and shall make arrangements to the satisfaction of the local authority for the removal of all refuse.

(11) REMOVAL OR REPLACEMENT OF EXISTING SERVICES

If, by reason of the establishment of the township, it should be necessary to remove or replace any existing municipal, TELKOM and/or ESKOM services, the cost of such removal or replacement shall be borne by the township owner.

(12) DEMOLITION OF BUILDINGS AND STRUCTURES

The township owner shall at its own costs cause all existing buildings and structures situated within the building line reserves, side spaces or over common boundaries to be demolished to the satisfaction of the local authority, when requested thereto by the local authority.

(13) OBLIGATIONS WITH REGARD TO THE CONSTRUCTION AND INSTALLATION OF ENGINEERING SERVICES AND RESTRICTIONS REGARDING THE TRANSFER OF ERVEN

- (a) The township owner shall, after compliance with clause 2.(3) above, at its own costs and to the satisfaction of the local authority, construct and install all engineering services including the internal roads and the stormwater reticulation, within the boundaries of the township. Erven and/or units in the township may not be transferred into the name of a purchaser, prior to the local authority certifying to the Registrar of Deeds that these engineering services had been constructed and installed.
- (b) The township owner shall fulfil its obligations in respect of the installation of electricity, water and sanitary services as well as the construction of roads and stormwater drainage and the installation of systems therefor, as agreed between the township owner and the local authority in terms of clause 2.(3) above. Erven and/or units in the township, may not be transferred into the name of a purchaser, prior to the local authority certifying to the Registrar of Deeds that sufficient guarantees/cash contributions in respect of the engineering services have been submitted or paid to the said local authority.

(14) OBLIGATIONS WITH REGARD TO THE PROTECTION OF ENGINEERING SERVICES

The township owner shall, at its costs and to the satisfaction of the local authority, survey and register all servitudes required to protect the constructed/installed services. Erven and/or units in the township may not be or transferred into the name of a purchaser, prior to the local authority certifying to the Registrar of Deeds that these engineering services had been or will be protected to the satisfaction of the local authority.

(15) CONSOLIDATION OF ERVEN

The township owner shall, at its own costs, after proclamation of the township, submit an application for consent to consolidate Erven 976 and 977, to the local authority for approval.

3. DISPOSAL OF EXISTING CONDITIONS OF TITLE.

All erven shall be made subject to existing conditions and servitudes, if any:-

4. CONDITIONS OF TITLE

(A) Conditions of Title imposed by the local authority in terms of the provisions of Chapter 5 Part 3 of the By-Law

(1) ALL ERVEN

- (a) Each erf is subject to a servitude, 2m wide, in favour of the local authority, for sewerage and other municipal purposes, along any two boundaries other than a street boundary and in the case of a panhandle erf, an additional servitude for municipal purposes 2m wide across the access portion of the erf, if and when required by the local authority: Provided that the local authority may dispense with any such servitude.
- (b) No building or other structure shall be erected within the aforesaid servitude area and no large rooted trees shall be planted within the area of such servitude or within 2m thereof.
- (c) The local authority shall be entitled to deposit temporarily on the land adjoining the aforesaid servitude such material as may be excavated by it during the process of the construction, maintenance or removal of such sewerage mains and other works as it, in its discretion may deem necessary and shall further be entitled to reasonable access to the said land for the aforesaid purpose subject to any damage done during the process of the construction, maintenance or removal of such sewerage mains and other works being made good by the local authority.

(2) ERVEN 976 AND 977

The erven are subject to a 3m wide servitude for stormwater services in favour of the local authority, along the western boundary as indicated on layout plan CPD/LSA X79/1.

5. CONDITIONS TO BE INCORPORATED IN THE TOWN PLANNING SCHEME IN TERMS OF SECTION 54 OF THE BY-LAW, IN ADDITION TO THE PROVISIONS OF THE CITY OF JOHANNESBURG LAND USE SCHEME, 2018.

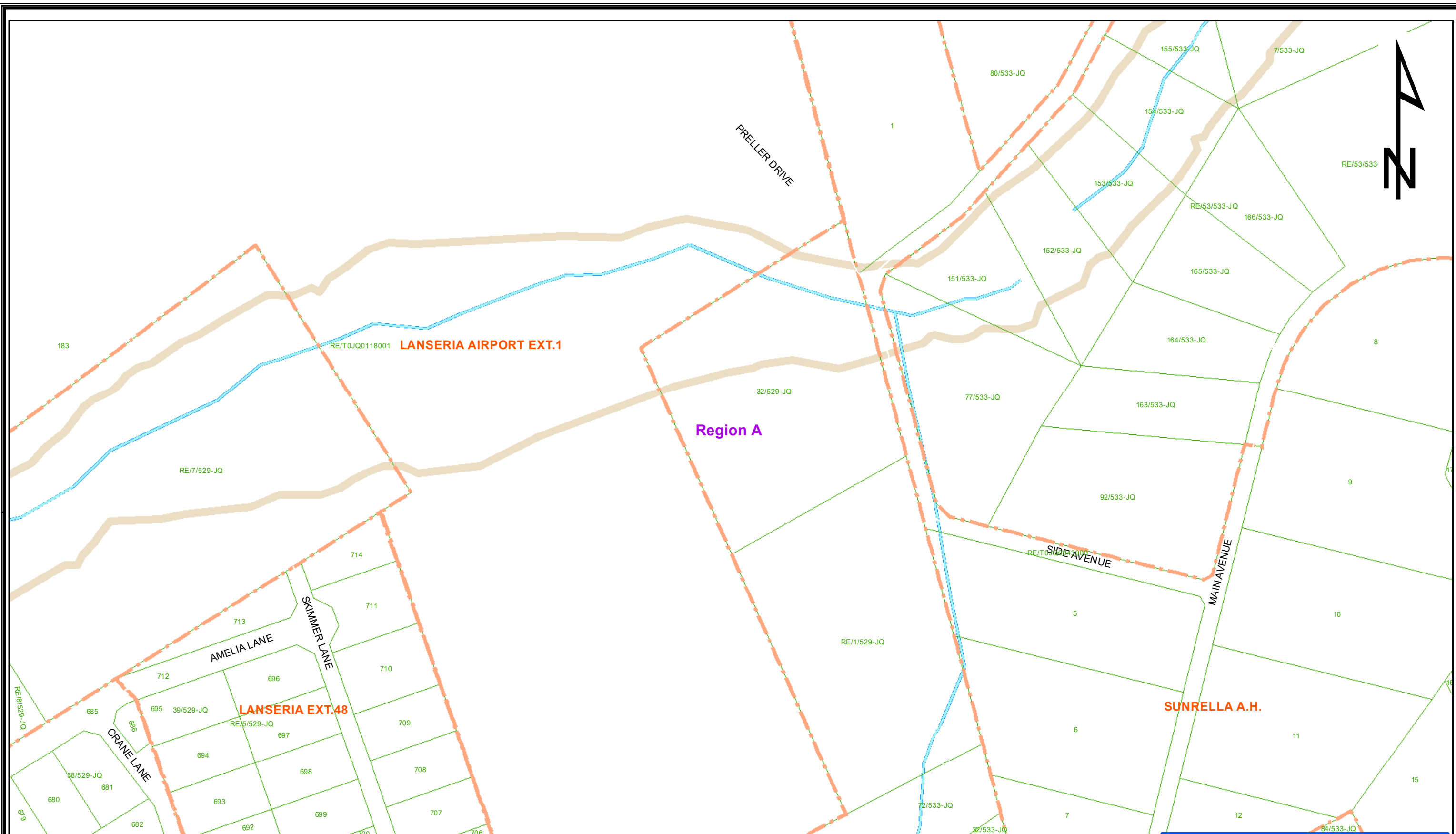
(1) ERVEN 976 AND 977

COLUMN 1: USE ZONE

"Industrial 3"

COLUMN 2:	DESCRIPTION OF PORTION OF LAND Erven 976 and 977, Lanseria Extension 79
COLUMN 3:	PRIMARY RIGHTS As per Scheme, Industrial purposes, commercial purposes, business purposes (excluding restaurants, motor showrooms, showrooms, medical consulting rooms, domestic service industries), builders yard, building material storage.
COLUMN 4:	USES WITH CONSENT (LAND USE TABLE 2) As per Scheme
COLUMN 5:	USES NOT PERMITTED (LAND USE TABLE 2) As per Scheme
COLUMN 6:	WIDTH OF SERVITUDE AREA 3m Stormwater Servitude along the western boundary
COLUMN 7:	STOREYS OR HEIGHT IN METERS 25m (3 storeys)
COLUMN 8:	COVERAGE As per Scheme, 60%
COLUMN 9:	F.A.R OR FLOOR AREA As per Scheme, 0.6 Offices restricted to 2500 m ²
COLUMN 10:	PARKING PROVISION As per Scheme, Adequate, paved parking spaces, together with the necessary manoeuvring area, shall be provided on the erf to the satisfaction of the Council, in the following ratios: Commercial: 0.3 bays per 100m ² Offices: 2 bays per 100m
COLUMN 11:	DENSITY Not applicable
COLUMN 12:	BUILDING LINE PROVISION As per Scheme Street: 3m Main Road (K215): 16m (may be relaxed to 10m with approval)
COLUMN 13:	GENERAL PROVISIONS 1. A Site Development Plan to the satisfaction of the council, shall be submitted for evaluation and approval prior to the submission of building plans and/or the development of the erf.
COLUMN 14:	AMENDMENT SCHEME NUMBER

ANNEXURE E: EXISTING STORMWATER INFORMATION

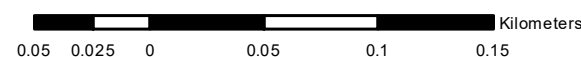


JRA Stormwater Reticulation

**** PLEASE NOTE:**
THIS IS NOT A WAY-LEAVE APPROVAL
INFORMATION SUPPLIED BY THIS OFFICE
IS NOT GAURENTEED. ALL INFORMATION
MUST BE CONFIRMED ON SITE BEFORE
WORK COMMENCES.



1:3,300



Legend

- ROADS**
- NATIONAL
 - PROVINCIAL
 - MOTORWAY
 - MAJOR ROADS
 - INDUSTRIAL
 - LOCAL ROADS
 - GRAVEL
 - PRIVATE

- Rea Vaya (BRT)**
- ROUTE CODE**
- TRUNK ROUTE
 - COMPLIMENTARY
 - FEEDER ROUTE
 - Gauteng_Road_Reserve

- S'water Inlets**
- ASSET**
- CATCH PIT
 - END CAP
 - INLET
 - GRID
 - HEADWALL

- INLET MANHOLE
- JUNCTION BOX
- KERB OUTLET
- MANHOLE
- OUTLET MANHOLE
- UNDEFINED

- Stormwater_Assets**
- Category, SubCategory**
- Channels
 - Natural Channels
 - Conduit
 - Erosion Protection Structure
 - Inlets
 - Manholes

- CULVERTS**
- CULVERT
 - LINED CHANNEL
 - UNLINED CHANNEL
 - DRAIN
 - UNDEFINED

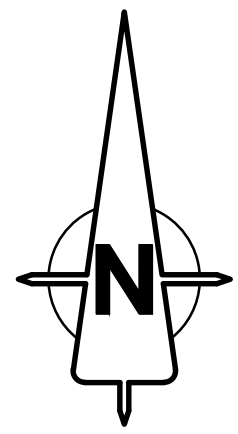
- Hazards**
- HAZARD**
- High Hazard
 - Medium Hazard
 - Low Hazard
 - Floodline_100yr

City of Johannesburg

Johannesburg Roads Agency Road Asset Management Systems:

Telephone : +2711 298 5019
e-mail : servicesinfo@jra.org.za
Compiler : Ron Segenhout
Projection: Transverse Mercator (Lo 29)
Datum: Hartebeeshoek 94 (WGS84 Ellipsoid)
Map Size: A3
Workspace : L:\GIS\0000 - ArcMap Templates\A3 (landscape) - Way-leaves.mxd
07/10/2022 09:43:15

ANNEXURE F: STORMWATER MANAGEMENT LAYOUT DRAWING



SUBSOIL OUTLET TO RECONSTRUCTED WETLANDS



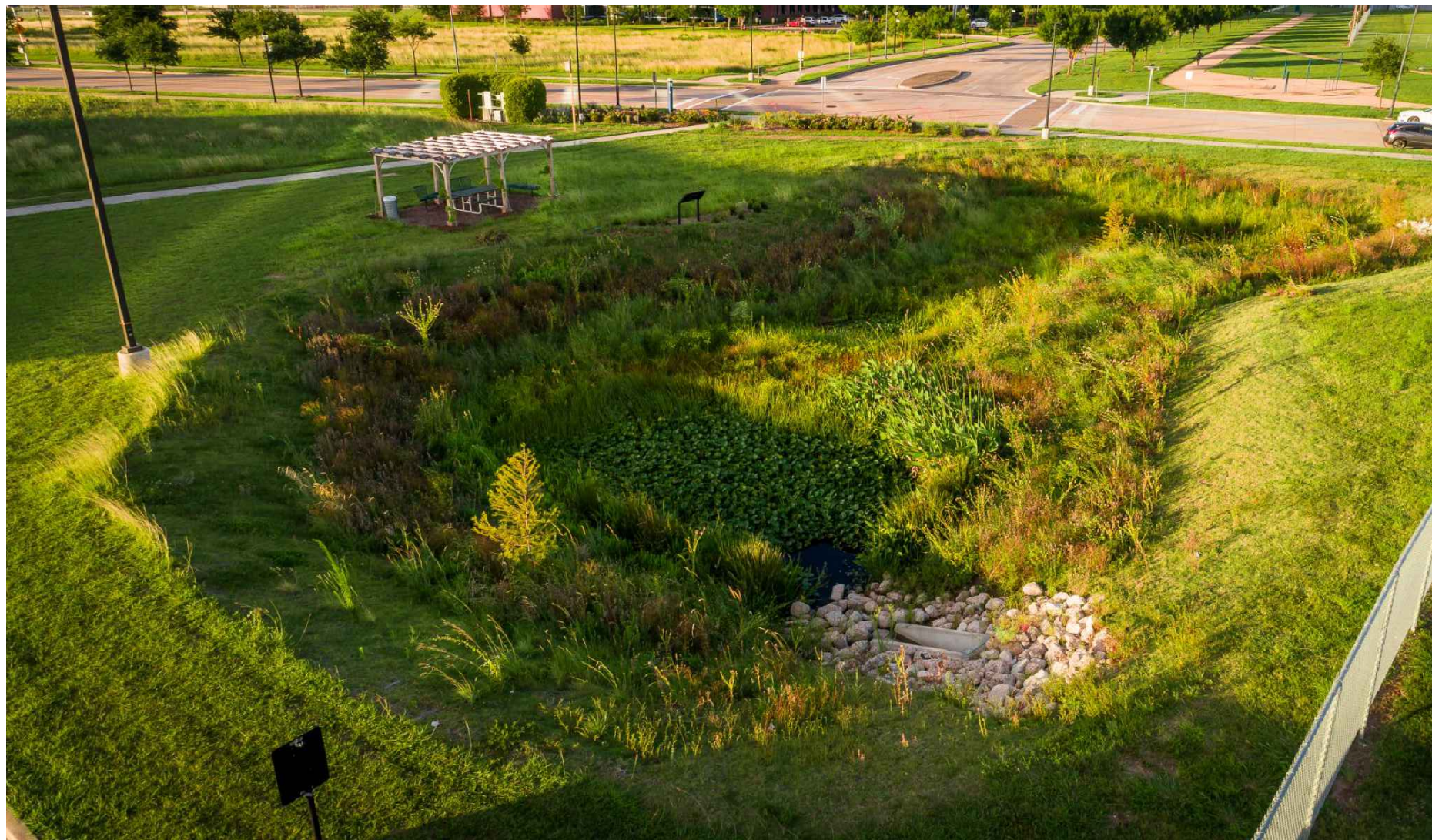
STORMWATER OUTLET TO RECONSTRUCTED WETLANDS



SUBSOIL PIPE SYSTEM



TYPICAL CULVERT OUTLET STRUCTURE TO NATURAL WATER COURSE



ATTENUATION STRUCTURE AND RECONSTRUCTED WETLANDS AREA ON SITE

- GENERAL NOTES:
1. REFER TO ALL RELEVANT DRAWINGS & SPECIFICATIONS, DO NOT SCALE ANY DIMENSIONS.
 2. WHERE DISCREPANCIES OCCUR BETWEEN THE PROJECT DRAWINGS OR SPECIFICATIONS, THESE SHOULD BE REPORTED IMMEDIATELY TO THE ENGINEER.
 3. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE BEFORE CONSTRUCTION COMMENCES.
 4. ANY SOFTWARE MODEL SHARED BY EDS ENGINEERS TO ANY EXTERNAL COMPANY OR PARTY TO BE USED FOR INFORMATION ONLY.
 5. ALL CONSTRUCTION INFORMATION TO BE USED AS INDICATED ON DRAWINGS THAT WERE ISSUED FOR CONSTRUCTION.

NOTES: EARTHWORKS

1. THE STANDARD SPECIFICATION SANS 1200 C, D, DM, M, ME (EXCLUDING PAYMENT CLAUSES) IS APPLICABLE.
2. EARTHWORKS OPERATION MUST BE PLANNED IN SUCH A WAY THAT CUT TO FILL WILL BE A SMALL TANDEM OPERATION. TEMPORARY STOCKPILING OF MATERIAL WILL NOT BE MEASURED OR PAID FOR SEPARATELY BUT WILL ONLY BE MEASURED ONCE AS CUT TO FILL.
3. CLASSES OF EXCAVATION NOTWITHSTANDING THE REQUIREMENTS OF CLAUSE 3.1 OF SANS 1200 D OR ANYTHING TO THE CONTRARY IN THE PROJECT SPECIFICATIONS OR THE SCHEDULE OF QUANTITIES, EXCAVATIONS WILL BE CLASSIFIED ONLY AS EXCAVATIONS IN HARD OR SOFT MATERIAL, WHICH CLASSES OF EXCAVATIONS SHALL BE DEFINED AS FOLLOWS:
 - HARD EXCAVATION: HARD EXCAVATION IS DEFINED AS WEATHERED OR UNWEATHERED BOULDERS EXCEEDING 0.5 m³ IN VOLUME, OR WEATHERED AND SOLID ROCK WHERE THAT APPEARS IN BULK IN BANKS, WHICH REQUIRES BLASTING, PNEUMATIC WEDGE DRIVING OR SPLITTING TO EFFECT EXCAVATION THEREOF. THE CONTRACTOR MUST NOTIFY THE ENGINEER WHEN HARD EXCAVATION IS ENCOUNTERED IN ORDER TO ALLOW MEASUREMENT THEREOF BEFORE EXCAVATION.
 - SOFT EXCAVATION: SOFT EXCAVATION COMPRISES EXCAVATION IN ALL MATERIAL NOT CLASSIFIED AS HARD EXCAVATION.
4. THE ENGINEER SHALL DECIDE UNDER WHICH OF THE ABOVEMENTIONED CLASSES OF EXCAVATION ANY MATERIAL WILL BE CLASSIFIED AND PAID FOR AND HIS DECISION SHALL BE FINAL AND BINDING.
5. THE TOPSOIL MUST BE REMOVED AND SPREAD OR STORED ON SITE AS REQUIRED FOR LANDSCAPING. THE EXCESS TO BE SPOILED OFF SITE.
6. ALL EARTHWORK BATTERS TO BE AT 1:2 SLOPES UNLESS OTHERWISE INDICATED.
7. ALL LEVELS INDICATED ARE FINISHED FLOOR OR ROAD LEVELS.
8. TOLERANCE OF SUB BASE TO BE ± ZERO -10mm TO BE SURVEYED ON 3m X 3m GRID BEFORE CASTING OF CONCRETE.

Rev: No. Date: Revision Details: By:

Client:

GROWTH-POINT
PROPERTIES

Architect:

empoweredspaces
TECHNOLOGIES

eds
Structural, Civil and
Transportation Engineers
Sussess Office Park
473 Lynwood Road
Lynnwood
Pretoria, Gauteng
Tel: 012 991 1205
e-mail: info@edseng.co.za

Project:

**LANSERIA
EXTENSION 79**

Description:

**RECONSTRUCTED WETLANDS
MASTER PLAN**

Paper size: A0
Scale: 750

Drawn: PdL
Project Number: 2019-094

Checked: GvdW
Drawing Number: 3850

Designed: GvdW
Revision: A

ANNEXURE G: STORMWATER CALCULATIONS

Stormwater - Standaard Intensiteitskrommes

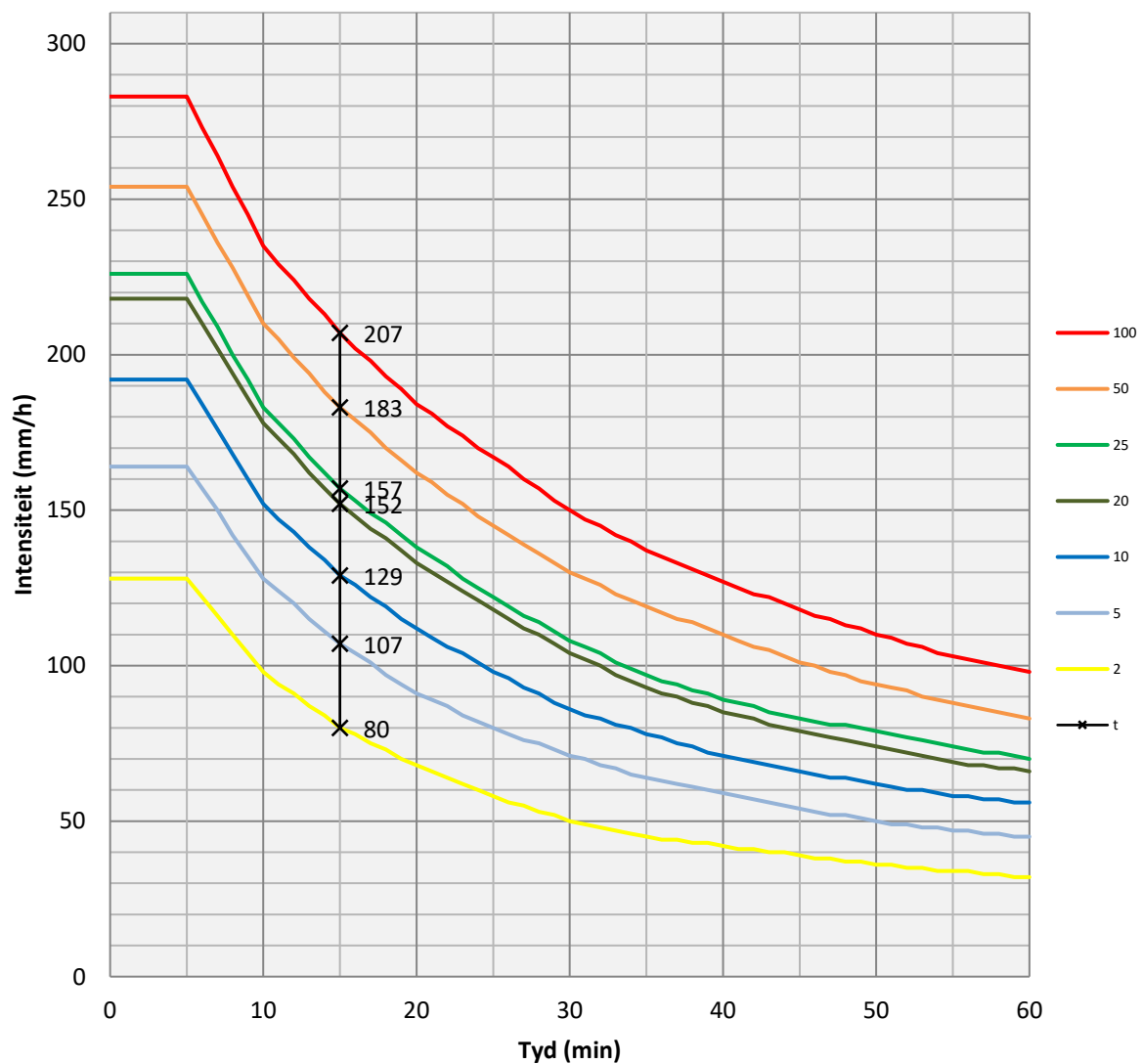
Klas =	B
t =	15

Carolina, Cedara, Estcourt, Jan Smuts, Kokstad, Krugersdorp, Mafeking, Piet Retief, Potchefstroom, Pretoria, Roodeplaat, Rustenburg, Sheerprun, Tloomba

Tyd waarvoor die Intensiteit bepaal word (min)

Herhaalings Periode T	100	50	25	20	10	5	2
Tyd t (min)	15	15	15	15	15	15	15
Reenval Intensiteit I (mm/hr)	207	183	157	152	129	107	80

Reenval Intensiteitkromme



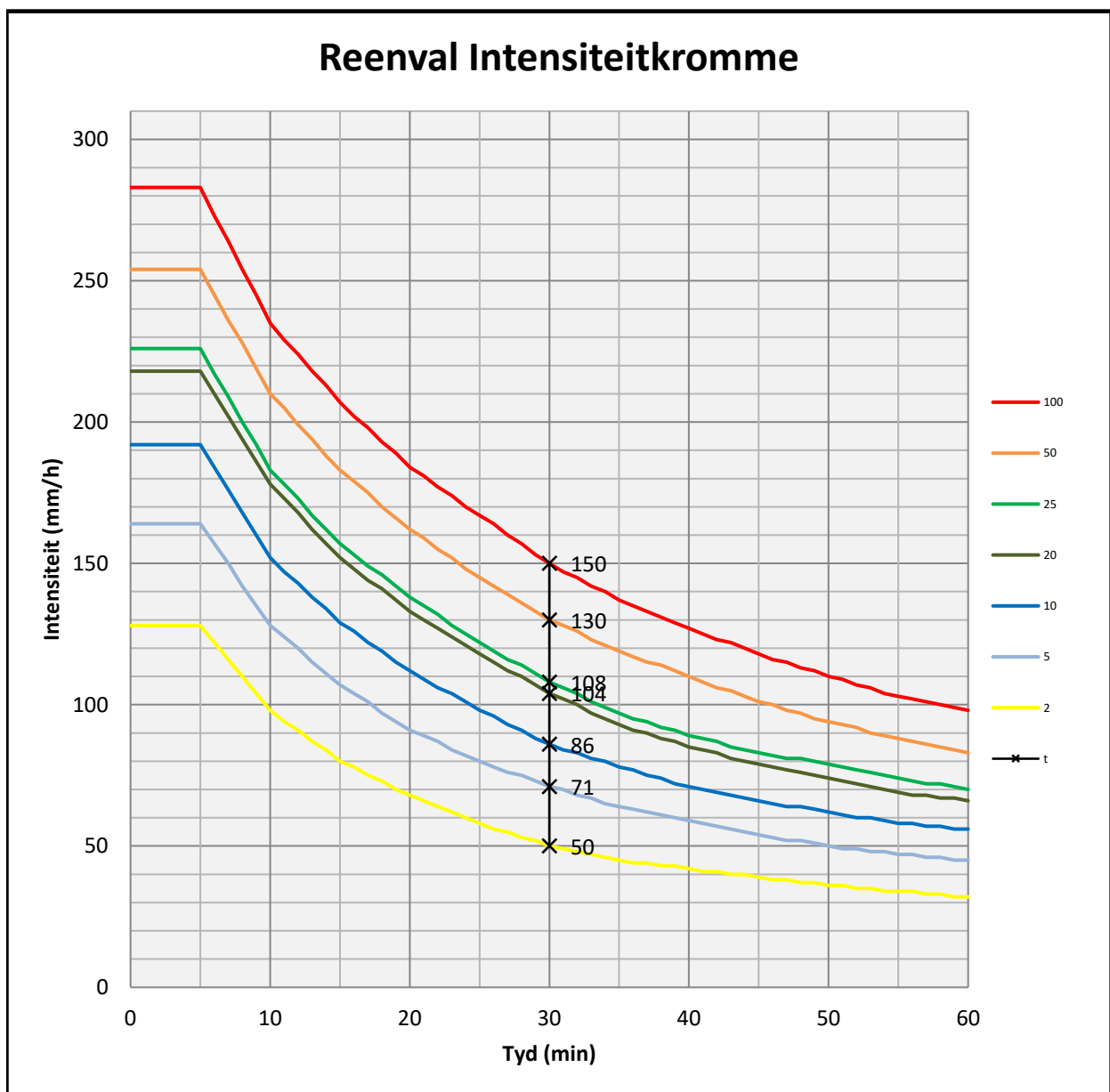
Stormwater - Standaard Intensiteitskrommes

Klas =	B
t =	30

Carolina, Cedara, Estcourt, Jan Smuts, Kokstad, Krugersdorp, Mafeking,
Piet Retief, Potchefstroom, Pretoria, Roodeplaat, Rustenburg, Sheeprun,
Towwomba

Tyd waarvoor die Intensiteit bepaal word (min)

Herhaalings Periode T	100	50	25	20	10	5	2
Tyd t (min)	30	30	30	30	30	30	30
Reenval Intensiteit I (mm/hr)	150	130	108	104	86	71	50



RATIONAL METHOD (ALTERNATIVE 1)									
Description of Catchment		2021-09-23 Lateseria X566		Date		28/02/2025			
Calculated By		Dydm		PHYSICAL CHARACTERISTICS					
Size of catchment (A)	0.03679 km ²	Choose type of flow		Overland flow		Lanoterre - Johannesburg			
Longest watercourse (L)	0.31 km	Rainfall region		Rural (α)		Urban (β)			
Average slope (S _{av})	0.032256 m/m	AREA DISTRIBUTION FACTORS		Rural (α)		Urban (β)			
Dolomite area (D _a)	0%	Rural (α)		100%		0%			
Mean annual precipitation (MAP) ⁽³⁾	705 mm	URBAN ⁽³⁾		%		Factor	C _s		
Surface Slope	%	Factor	C _s	Description		%	Factor	C _s	
Wetlands and pans	0%	0.03	0	Lawns				0.1	0
Flat areas	100%	0.08	0.08	Sandy, flat (<2%)				0.4	0
Hilly	0%	0.16	0	Sandy, steep (>7%)				0.2	0
Sleep areas	0%	0.26	0	Heavy soil, flat (<2%)				0.17	0
Total	100%	-	0.08	Heavy soil, steep (>7%)				0.36	0
Permeability	%	Factor	C _p	Residential areas					
Very permeable	50%	0.04	0.02	Houses				0.5	0
Permeable	50%	0.08	0.04	Flats				0.7	0
Semi-permeable	0%	0.16	0	Industry				0.8	0
Impermeable	0%	0.26	0	Light Industrial				0.95	0
Total	100%	-	0.06	Heavy Industrial				0.9	0
Vegetation	%	Factor	C _v	Business					
Thick bush and plantation	0%	0.04	0	City centre				0.95	0
Light bush and farmlands	50%	0.11	0.055	Suburban				0.7	0
Grasslands	50%	0.21	0.105	Streets				0.95	0
No vegetation	0%	0.26	0	Maximum flood				1	0
Total	100%	-	0.16	Total (C _s)		0%	-	-	0
TIME OF CONCENTRATION (T _c)									
Notes: If T _c < 0.25 hours, use T _c = 0.25 hours.									
Overland flow ⁽³⁾	Defined catchment course								
L	0.4	L	0.31	$T_c = 0.604 \left(\frac{P L}{\sqrt{S_{av}}} \right)^{0.467}$ $T_c = \left(\frac{0.87 L^2}{1000 S_{av}} \right)^{0.385}$					
Sw	0.032256065	Sw	0.032256065						
T _c	30.48239 min	T _c	6.039832 min						
T _c	0.50604 hours	T _c	0.100981 hours	Run-off coefficient					
Run-off period (years), T	2	5	10	20	25	50	100		
Run-off coefficient, C _r	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
(C _r = C _s + C _p + C _v)									
Adjusted for dolomite areas, C _{rd}	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
(= C _r (1 - D _a) + C _{rd} (2 D _{av} x C _{av})) ⁽³⁾									
Adjustment factor for critical saturation, F ⁽³⁾	0.50	0.55	0.60	0.67	0.70	0.83	1.00		
Adjusted run-off coefficient, C _{rt}	0.15	0.165	0.18	0.201	0.209	0.249	0.3		
(= C _{rd} x F)									
Combined run-off coefficient, C _r	0.15	0.17	0.18	0.20	0.21	0.25	0.30		
(= cC _{rt} + 1C _r + VC _r)									
RAINFALL									
Return period (years), T	2	5	10	20	25	50	100		
Point rainfall (mm), P _p ⁽³⁾	80	107	129	152	157	183	207		
Point intensity (mm/hour), P _i (= P _p /T)	100%	100%	100%	100%	100%	100%	100%		
Area reduction factor (%), ARF ⁽³⁾	100%	100%	100%	100%	100%	100%	100%		
Average intensity (mm/hour), I _a	80	107	129	152	157	183	207		
(= P _i x ARF)	80	107	129	152	157	183	207		
Return period (years), T	2	5	10	20	25	50	100		
Peak flow (m ³ /s), Q=CIAQ3.6	0.13	0.19	0.25	0.33	0.35	0.49	0.67		

Types of flow		Overland flow	Defined watercourse
SLOPE CALCULATION		Overland flow	Defined watercourse
Height (m)		1359	
Flow (m)		1349	
H (m)		10	
S (mm)		0.032256065	
Defined watercourse			
H ₁ , m			
H ₂ , m			
S (mm)			0.00



RATIONAL METHOD (ALTERNATIVE 1)							
Description of Catchment		2021-094-23 Lanseria X5&6					
Calculated By		DvdM		Date		28/02/2025	
PHYSICAL CHARACTERISTICS							
Size of catchment (A)		0.03879 km ²		Choose type of flow			
Longest watercourse (L)		0.31 km		Rainfall region			
Average slope (S _{av})		0.032258 m/m		Lanceria - Johannesburg			
Dolomite area (D _{do})		0%		Rural (α)		Urban (β)	
Mean annual precipitation (MAP) ^⑥		705 mm		0%		100%	
RURAL ^①				URBAN ^②			
Surface Slope	%	Factor	C _s	Description	%	Factor	C ₂
Wetlands and pans		0.03	0	Lawns			
Flat areas		0.08	0	Sandy, flat (<2%)		0.1	0
Hilly		0.16	0	Sandy, steep (>7%)		0.2	0
Steep areas		0.26	0	Heavy soil, flat (<2%)		0.17	0
Total	0%	-	0	Heavy soil, steep (>7%)		0.35	0
Permeability	%	Factor	C _p	Residential areas			
Very permeable		0.04	0	Houses		0.5	0
Permeable		0.08	0	Flats		0.7	0
Semi-permeable		0.16	0	Industry			
Impermeable		0.26	0	Light Industrial	0%	0.8	0
Total	0%	-	0	Heavy Industrial	100%	0.8	0.8
Vegetation	%	Factor	C _v	Business			
Thick bush and plantation		0.04	0	City centre		0.95	0
Light bush and farm-lands		0.11	0	Suburban		0.7	0
Grasslands		0.21	0	Streets		0.95	0
No vegetation		0.28	0	Maximum flood		1	0
Total	0%	-	0	Total (C ₂)	100%	-	0.8
TIME OF CONCENTRATION (T _c)				Notes:			
Overland flow ^③		Defined watercourse		If T _c < 0.25 hours, use T _c = 0.25 hours.			
r	0.02	L	0.31	$T_c = 0.604 \left(\frac{rL}{\sqrt{S_{av}}} \right)^{0.467} \quad T_c = \left(\frac{0.87L^2}{1000S_{av}} \right)^{0.385}$			
Sav	0.032258065	Sav	0.032258065				
Tc	7.524334 min	Tc	6.058832 min				
Tc	0.125406 hours	Tc	0.100981 hours				
RUN-OFF COEFFICIENT							
Return period (years), T	2	5	10	20	25	50	100
Run-off coefficient, C ₁ (C ₁ = C _s + C _p + C _v)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Adjusted for dolomitic areas, C _{1D} (= C ₁ (1 - D _{do}) + C ₁ D _{do} (Σ(D _{do,av} × C _{2do}))) ^⑤	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Adjustment factor for initial saturation, F _i ^⑤	0.75	0.80	0.85	0.90	0.91	0.95	1.00
Adjusted run-off coefficient, C _{1T} (= C _{1D} × F _i)	0.6	0.64	0.68	0.72	0.7266667	0.76	0.8
Combined run-off coefficient, C _T (= αC _{1T} + βC ₂ + γC ₃)	0.80	0.80	0.80	0.80	0.80	0.80	0.80
RAINFALL							
Return period (years), T	2	5	10	20	25	50	100
Point rainfall (mm), P _T ^⑦							
Point intensity (mm/hour), P _T (= P _T /T _c)	80	107	129	152	157	183	207
Area reduction factor (%), ARF _T ^⑧	100%	100%	100%	100%	100%	100%	100%
Average intensity (mm/hour), I _T (= P _T × ARF _T)	80	107	129	152	157	183	207
Return period (years), T	2	5	10	20	25	50	100
Peak flow (m ³ /s), Q=CIA/3.6	0.69	0.92	1.11	1.31	1.35	1.58	1.78

Types of flow:	Overland flow
	Defined watercourse

SLOPE CALCULATION	
Overland flow	
H _{high} (m)	1359
H _{low} (m)	1349
H (m)	10
S (m/m)	0.032258065
Defined watercourse	
H _{0.10L} (m)	
H _{0.85L} (m)	
S (m/m)	0.00

Intensity Curve

STORMWATER RUN-OFF - Post Development

Project: Portion 5 and 6 of the
Farm Sunrella A/H

Date: 2025/02/28

Tc (minutes) 15

Q = C1A/3.6

C	0.9
I (mm/hr)	Return Period
80	2
107	5
129	10
152	20
157	25
183	50
207	100
A (km²)	0.038790

Return Period (years)	Q (m³/s)
2	0.776
5	1.038
10	1.252
20	1.475
25	1.524
50	1.776
100	2.009

Determine Run-off Coefficient:

URBAN ②			
Description	%	Factor	C ₂
Lawns			
Sandy, flat (<2%)	0%	0.1	0
Sandy, steep (>7%)	0%	0.2	0
Heavy soil, flat (<2%)	0%	0.17	0
Heavy soil, steep (>7%)	0%	0.35	0
Residential areas			
Houses	0%	0.5	0
Flats	0%	0.7	0
Industry			
Light Industrial	0%	0.8	0
Heavy Industrial	100%	0.9	0.9
Business			
City centre	0%	0.95	0
Suburban	0%	0.7	0
Streets	0%	0.95	0.000
Maximum flood	0%	1	0.000
Total (C₂)	100%		0.90

STORMWATER RUN-OFF - Pre Development

Project: Portion 5 and 6 of the
Farm Sunrella A/H

Date: 2025/02/28

Tc (minutes) 30

Q = CIA/3.6

C	0.3
I (mm/hr)	Return Period
50	2
71	5
86	10
104	20
108	25
130	50
150	100
A (km²)	0.038790

Return Period (years)	Q (m³/s)
2	0.162
5	0.230
10	0.278
20	0.336
25	0.349
50	0.421
100	0.485

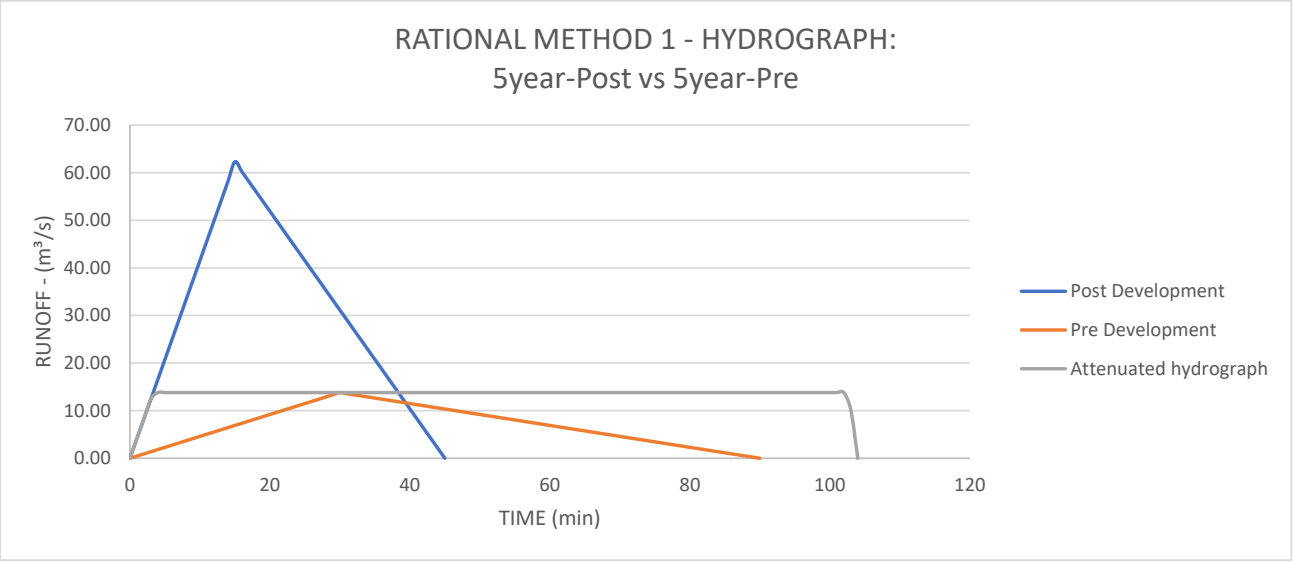
Determine Run-off Coefficient:

RURAL ^①			
Surface Slope	%	Factor	C _s
Wetlands and pans	0%	0.03	0
Flat areas	90%	0.08	0.072
Hilly	10%	0.16	0.016
Steep areas	0%	0.26	0
Total	100%	-	0.1
Permeability	%	Factor	C _p
Very permeable	0%	0.04	0
Permeable	70%	0.08	0.056
Semi-permeable	30%	0.16	0.048
Impermeable	0%	0.26	0
Total	100%	-	0.1
Vegetation	%	Factor	C _v
Thick bush and plantation	15%	0.04	0.006
Light bush and farm-lands	70%	0.11	0.077
Grasslands	15%	0.21	0.032
No vegetation	0%	0.28	0
Total	100%	-	0.1
Total			0.3

HYDROGRAPH - RATIONAL METHOD 1

Location: Portion 5 and 6 of the Farm Sunrella A/H
Date: 28/02/2025

Site 3.879 ha
Tc(Pre-development) 30 min
Tc(Post-development) 15 min
Tc Factor 3

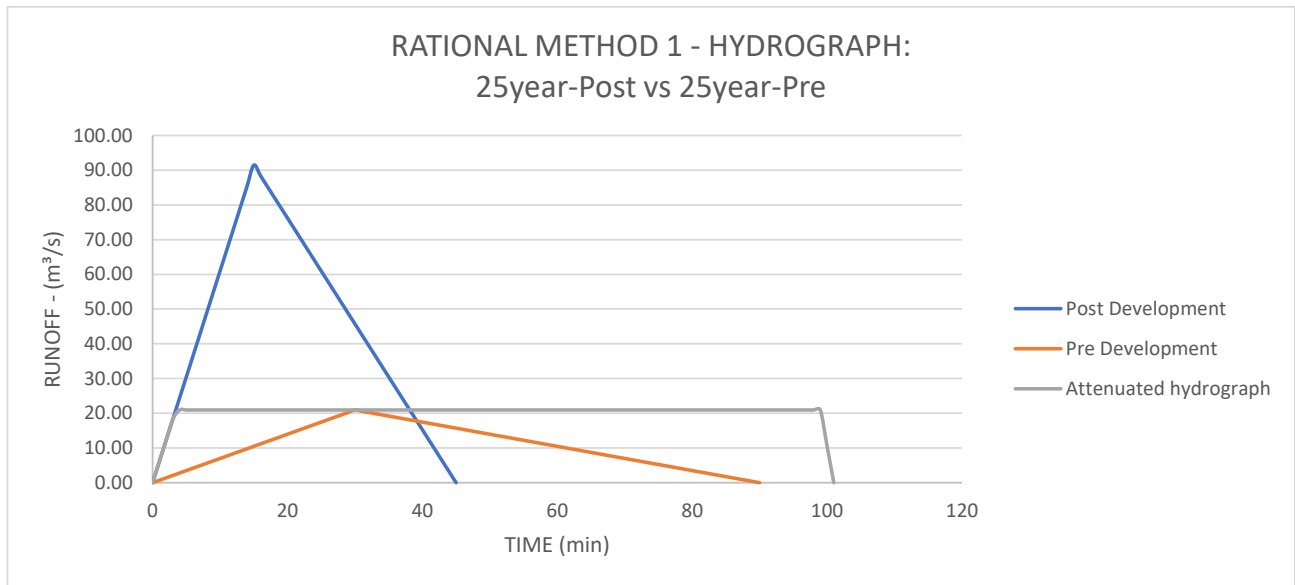


Attenuation Pond Volume 863.59 m³
Attenuation 222.6326 m³/ha (JRA Requirements: 300-350m³/ha)
Attenuation Pond Height 1.5 m
Attenuation Pond Area 575.728 m²

HYDROGRAPH - RATIONAL METHOD 1

Location: Portion 5 and 6 of the
Farm Sunrella A/H
Date: 28/02/2025

Site 3.879 ha
Tc(Pre-development) 30 min
Tc(Post-development) 15 min
Tc Factor 3



Attenuation Pond Volume 1244.86 m³
Attenuation 320.9219 m³/ha (JRA Requirements: 300-350m³/ha)
Attenuation Pond Height 1.5 m
Attenuation Pond Area 829.904 m²

EXTERNAL PRELLER ROAD STORMWATER PIPE

Pipe list			Graph			
100D Concrete (ND)	ID					
150	153					
225	229					
300	292					
375	369					
450	445					
525	514					
600	585					
675	647					
750	718					
825	788					
900	853					
1050	986					
1200	1127					
1350	1262					
1500	1383					
1650	1524					
1800	1665					
1950	1800					
Calculation			Calculation Input			
h	1.106	m	Pipe Size	1500	mm	
r	-0.4149	m	Slope (1:x)	125		
R	0.6915	m	Slope	0.008	m/m	
s	3.062	m	Flow Depth	1106.4	mm	
a	1.106	m	Diameter	1383	mm	
Θ	253.74	deg	Manning	0.012		
			Results			
			A	1.288338	m ²	
			V	4.18	m/s	
			Q _{Calculated}	5.391	m ³ /s	
			Q _{Calculated}	5391	ℓ/s	
			% Full	80%		
			Q _{Required}	2400	ℓ/s	

ANNEXURE H: CULVERT CALCULATIONS

CULVERT DESIGN CHECK

MAP	750 mm	A	0.64433 km2
I20	125 mm/hr	C	0.4
I50	165 mm/hr	Q5	2.30 m3/s
		Q25	3.70 m3/s
		Q50	4.50 m3/s
Freeboard above culvert	0.6 m		
B - Width (m)	1.8 m		
D - Height (m)	1.5 m		

Inlet Control					
Q25	3.70		Q50	4.50	
Cb	0.9		Cb	0.9	
B	1.8		B	1.8	
D	1.5		D	1.5	
g	9.81		g	9.81	
H1	1.8 m		H1	1.8 m	
H1/D	1.2	<1.2	H1/D	1.2	<1.2
Q(check)	6.669932		Q(check)	6.669932	

Outlet Control					
Q25	3.70		Q50	4.50	
Ch	0.8		Ch	0.8	
B	1.8		B	1.8	
D	1.5		D	1.5	
g	9.81		g	9.81	
H1	2.1 m		H1	2.1 m	
H1/D	1.4	>1.2	H1/D	1.4	>1.2
Q(check)	9.076627		Q(check)	9.076627	

Rational Method used for pipe sizing

R= Returning period

R= 50 years

A= Area

A= 644330 m²

C=Run-off. Coefficient

C= 0.4

Map=Mean Annual Presipitation

Map= 750 mm

tc= Time Of Concentration

tc= 1.570 h

I= Intensity To Be Calculated

I= 63 mm/h

Q= 4.505 m³/s

I/S= 4505.436 L/s

Rational Method used for pipe sizing

R= Returning period

R= 25 years

A= Area

A= 644330 m²

C=Run-off. Coefficient

C= 0.4

Map=Mean Annual Presipitation

Map= 750 mm

tc= Time Of Concentration

tc= 1.570 h

I= Intensity To Be Calculated

I= 51 mm/h

Q= 3.660 m³/s

I/S= 3659.551 L/s

Rational Method used for pipe sizing

R= Returning period

R= 5 years

A= Area

A= 644330 m²

C=Run-off. Coefficient

C= 0.4

Map=Mean Annual Presipitation

Map= 750 mm

tc= Time Of Concentration

tc= 1.570 h

I= Intensity To Be Calculated

I= 32 mm/h

Q= 2.258 m³/s

I/S= 2258.067 L/s

RATIONAL METHOD (ALTERNATIVE 1)

Description of Catchment		2019.094.Lanserria		Date		05/03/2025	
Calculated By		DvdM					
PHYSICAL CHARACTERISTICS							
Size of catchment (A)	0.64433	km ²	Choose type of flow	Overland flow			
Longest watercourse (L)	2.35	km	Rainfall region				
Average slope (S _{av})	0.014894	m/m	AREA DISTRIBUTION FACTORS				
Dolomite area (D _%)	0%		Rural (α)	Urban (β)			
Mean annual precipitation (MAP) ®#	675	mm	100%	0%			
RURAL ®			URBAN ®				
Surface Slope	%	Factor	C _s	Description	%	Factor	C ₂
Wetlands and pans	0%	0.03	0	Lawns			
Flat areas	50%	0.08	0.04	Sandy, flat (<2%)	12%	0.1	0.012
Hilly	50%	0.16	0.08	Sandy, steep (>7%)	0%	0.2	0
Steep areas	0%	0.26	0	Heavy soil, flat (<2%)	0%	0.17	0
Total	100%	-	0.12	Heavy soil, steep (>7%)	0%	0.35	0
Permeability	%	Factor	C _p	Residential areas			
Very permeable	0%	0.04	0	Houses	35%	0.5	0.175
Permeable	50%	0.08	0.04	Flats	0%	0.7	0
Semi-permeable	50%	0.16	0.08	Industry			
Impermeable	0%	0.26	0	Light Industrial	5%	0.8	0.04
Total	100%	-	0.12	Heavy Industrial	0%	0.9	0
Vegetation	%	Factor	C _v	Business			
Thick bush and plantation	0%	0.04	0	City centre	15%	0.95	0.1425
Light bush and farm-lands	50%	0.11	0.055	Suburban	0%	0.7	0
Grasslands	50%	0.21	0.105	Streets	33%	0.95	0.3135
No vegetation	0%	0.28	0	Maximum flood	0%	1	0
Total	100%	-	0.16	Total (C ₂)	100%	7.32	0.683
TIME OF CONCENTRATION (T _c)				Notes:			
Overland flow®		Defined watercourse		If T _c < 0.25 hours, use T _c = 0.25 hours.			
r	0.4	L	2.35	$T_c = 0.604 \left(\frac{rL}{\sqrt{S_{av}}} \right)^{0.467}$ $T_c = \left(\frac{0.87L^2}{1000S_{av}} \right)^{0.385}$			
L	2.35	L	2.35				
S _{av}	0.014893617	S _{av}	0.014893617				
T _c	1.567 hours	T _c	0.647 hours				
Tc	94.025 min	Tc	38.814 min	RUN OFF COEFFICIENT			

Types of flow: Overland flow
Defined watercourse

SLOPE CALCULATION

Overland flow

H_{high} (m) 1395
H_{low} (m) 1360
H (m) 35
S (m/m) 0.014893617

Defined watercourse

H_{0.10L} (m) 235
H_{0.85L} (m) 1997.5
S (m/m) 1.00

0.4

<u>Rational Method used for pipe sizing</u>			
R= Returning period	R=	50 years	
A= Area	A=	644330 m ²	
C=Run-off. Coefficient	C=	0.4	
Map=Mean Annual Presipitation	Map=	646 mm	
tc= Time Of Concentration	tc=	0.250 h	
I= Intensity To Be Calculated	I=	180 mm/h	
	Q=	12.870 m ³ /s	
	I/S=	12869.866 L/s	

<u>Rational Method used for pipe sizing</u>			
R= Returning period	R=	25 years	
A= Area	A=	644330 m ²	
C=Run-off. Coefficient	C=	0.4	
Map=Mean Annual Presipitation	Map=	646 mm	
tc= Time Of Concentration	tc=	0.250 h	
I= Intensity To Be Calculated	I=	146 mm/h	
	Q=	10.454 m ³ /s	
	I/S=	10453.580 L/s	

<u>Rational Method used for pipe sizing</u>			
R= Returning period	R=	5 years	
A= Area	A=	644330 m ²	
C=Run-off. Coefficient	C=	0.4	
Map=Mean Annual Presipitation	Map=	646 mm	
tc= Time Of Concentration	tc=	0.250 h	
I= Intensity To Be Calculated	I=	90 mm/h	
	Q=	6.450 m ³ /s	
	I/S=	6450.213 L/s	

RATIONAL METHOD (ALTERNATIVE 1)									
Description of Catchment		2019-094-Lanseria X5&6 Culvert Catchment Area							
Calculated By		DvdM				Date		05/03/2025	
PHYSICAL CHARACTERISTICS									
Size of catchment (A)		0.64433 km ²		Choose type of flow		Overland flow			
Longest watercourse (L)		2.35 km		Rainfall region					
Average slope (S _{av})		0.014894 m/m		AREA DISTRIBUTION FACTORS					
Dolomite area (D _{av})		0%		Rural (α)			Urban (β)		
Mean annual precipitation (MAP) ^④		675 mm		100%			0%		
RURAL ^①					URBAN ^②				
Surface Slope		%	Factor	C _S	Description		%	Factor	C ₂
Wetlands and pans		0%	0.03	0	Lawns				
Flat areas		50%	0.08	0.04	Sandy, flat (<2%)		12%	0.1	0.012
Hilly		50%	0.16	0.08	Sandy, steep (>7%)		0%	0.2	0
Steep areas		0%	0.26	0	Heavy soil, flat (<2%)		0%	0.17	0
Total		100%	-	0.12	Heavy soil, steep (>7%)		0%	0.35	0
Permeability		%	Factor	C _P	Residential areas				
Very permeable		0%	0.04	0	Houses		35%	0.5	0.175
Permeable		50%	0.08	0.04	Flats		0%	0.7	0
Semi-permeable		50%	0.16	0.08	Industry				
Impermeable		0%	0.26	0	Light Industrial		5%	0.8	0.04
Total		100%	-	0.12	Heavy Industrial		0%	0.9	0
Vegetation		%	Factor	C _V	Business				
Thick bush and plantation		0%	0.04	0	City centre		15%	0.95	0.1425
Light bush and farm-lands		50%	0.11	0.055	Suburban		0%	0.7	0
Grasslands		50%	0.21	0.105	Streets		33%	0.95	0.3135
No vegetation		0%	0.28	0	Maximum flood		0%	1	0
Total		100%	-	0.16	Total (C ₂)		100%	7.32	0.683
TIME OF CONCENTRATION (T _c)									
Overland flow ^③					Defined watercourse				
r	0.4				If T _c < 0.25 hours, use T _c = 0.25 hours.				
L	2.35		L		2.35				
Sav	0.014893617		Sav		0.014893617				
Tc	1.567 hours		Tc		0.647 hours				
Tc	94.025 min		Tc		38.814 min				
RUN-OFF COEFFICIENT									
Return period (years), T		2	5	10	20	25	50	100	
Run-off coefficient, C ₁ (C ₁ = C _S + C _P + C _V)		0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Adjusted for dolomitic areas, C _{1D} (= C ₁ (1 - D _{av}) + C _{1D} (Σ(D _{factor} × C _{Sav}))) ^⑤		0.4	0.4	0.4	0.4	0.4	0.4	0.4	
Adjustment factor for initial saturation, F ₁ ^⑤		0.50	0.55	0.60	0.67	0.70	0.83	1.00	
Adjusted run-off coefficient, C _{1T} (= C _{1D} × F ₁)		0.2	0.22	0.24	0.268	0.278667	0.332	0.4	
Combined run-off coefficient, C _T (= αC _{1T} + βC ₂ + γC ₃)		0.20	0.22	0.24	0.27	0.28	0.33	0.40	
RAINFALL									
Return period (years), T		2	5	10	20	25	50	100	
Point rainfall (mm), P _T ^⑥		32	45	56	66	70	83	98	
Point intensity (mm/hour), P _{IT} (= P _T /T _c)		20.4201	28.71577	35.73518	42.11646	44.66897	52.96464	62.53656	
Area reduction factor (%), ARF _T ^⑦		100%	100%	100%	100%	100%	100%	100%	
Average intensity (mm/hour), I _T (= P _{IT} × ARF _T)		20.4201	28.71577	35.73518	42.11646	44.66897	52.96464	62.53656	
Return period (years), T		2	5	10	20	25	50	100	
Peak flow (m ³ /s), Q=CIA/3.6		0.73	1.13	1.54	2.02	2.23	3.15	4.48	
Peak flow (l/s), Q=CIA/3.7		731.0	1130.7	1535.0	2020.2	2227.9	3147.2	4477.1	

Types of flow:	Overland flow
	Defined watercourse

SLOPE CALCULATION	
Overland flow	
H _{high} (m)	1395
H _{low} (m)	1360
H (m)	35
S (m/m)	0.014893617
Defined watercourse	
H _{0.10L} (m)	235
H _{0.85L} (m)	1997.5
S (m/m)	1.00

0.4

Stormwater - Standaard Intensiteitskrommes							
Klas	B	Caroline, Cedara, Edmore, Jan Gert, Kibstad, Kogerskop, Mankeng, Puri, Riet, Rietfontein, Pretoria, Roodersdal, Roodenburg, Steynburg, Teyateyanan					
T	94	Tijd waarvoor de intensiteit bepaald wordt (min)					
Herhaalings Periode T	100	50	25	20	10	5	2
Tyd t (min)	94	94	94	94	94	94	94
Reënel Intensiteit I (mm/hr)	98	83	70	66	56	45	32