JN CIVIL
CONSULTING ENGINEERS

LANSERIA EXT 81, PORTION OF PORTION 72, BULTFONTEIN 533 - JR

OUTLINE SCHEME REPORT_R1

DATE: 2024-11-10

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SYNOPSIS

This report serves as a summary of the services required by the proposed development and the impact of these services requirements on the municipal services.

Verification	Capacity	Name	Signature	Date
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1 INTRODUCTION

1.1 BACKGROUND

JN Civil Consulting has been appointed to compile and submit the Outline Scheme Report for the site Lanseria ext81, Portion of Portion 72, Bultfontein 533 JR.

1.2 PROJECT INFORMATION

The following information is relevant for the project

Development Name	Lanseria ext81, Portion of Portion 72, Bultfontein 533 JR.
Development Zoning	Industrial 1
Client representative	Craig Murchie
Client	Craig Murchie
Project Location	Lanseria
Site Area	30.7995 Ha

1.3 PROJECT PROFESSIONAL TEAM

Client	Craig Murchie
Townplanners	TPH Townplanners
Environmental consultants	Oryx Solutions Africa
Traffic Engineers	Corli Havenga Traffic Engineers
Geotechnical Engineers	Geoid Geotechnical Engineers
Civil Engineer	JN Civil Consulting Engineers

1.4 PURPOSE OF REPORT

This report serves as a summary of the civil services required for the site to be functional. Further to this, the report also indicates the demand that the proposed development will have on municipal infrastructure, being the following:

- Sewer

- Potable and Fire water

- Stormwater

- Roads and transportation

The design methodology of the above is provided, by indicating compliance with municipal standards.

The above information is to provide council with sufficient information, to make decisions regarding future developments, by considering the effect that the current development has on the bulk infrastructure within the large town planning scheme of Mogale City. This will also provide council

with information regarding the upgrading of bulk infrastructure and contributions should be required.

2 PROJECT DESCRIPTION

2.1 LOCATION

The proposed development is located within Lanseria, in Gauteng province, approximately 1km South of Lanseria airport. The site is bound by the R512 on the western side, an industrial park on the Norhtern side, open site area on the Southern side, and open site area on the eastern side.

The coordinates for the site is

- 25°56'59.26"S
- 27°55'14.29"E

The current zoning for the site is agricultural holding. Currently the site is undeveloped, with the exception of one smaller site on this site area that is developed, and this is in the Erf 956 in the South Western corner of the site. The site mostly consist of short veld gras, with some isolated trees scattered over the site area. The site is 100% covered with open veld grass, there is not too much thickets and bush on the site. Just outside the eastern site area, there is a wetland area and 32m buffer zone. Although the site is outside the buffer zone, it is still an affected area, and requires a WULA process.

From a site characteristics point of view, the site has average slopes, at an average elevation of 1376m above sea level along the perimeters. The site is shape is quite narrow and stretched out, with approximate average length of 200m North to Sout, and average width of 1870m wide from East. The site has a watershed approximately in the centre of the site. The Easter drainage area drains approximately 980m to the Eastern side, at a slope of 4%. The Western drainage area slopes for a distance of 715m, at a slope of 4% to the South western corner on site. The highest point on site is 1398, and the two low points elvations are 1358 in the Eastern corner, and 1368 in the South Western corner.

Figure 1: Proposed site drainage indication

3 STANDARDS AND DOCUMENTATION

The following guidelines and standards was used for calculating flows and design data.

3.1 SEWAGE

- "Guidelines and standards for the design and maintenance of water and sanitation Johannesburg"
- SANS 10252: Part 1 (2012) – Water supply and drainage for building;

3.2 WATER

- "Guidelines and standards for the design and maintenance of water and sanitation Johannesburg"
- SANS 10252: Part 1 (2012) – Water supply and drainage for building;

3.3 STORMWATER

- SANRAL drainage manual edition 9
- "Roads and stormwater manual volume 1 code of procedure" – Johannesburg Roads Agency

3.4 ROADS AND TRANSPORTATION

At this stage no details are required. At the correct stage, details will be provided for the entrance, as per the approved TIA.

- "Roads and stormwater manual volume 1 code of procedure" – Johannesburg Roads Agency
- Standard Design details for Roads and Stormwater Drainage Infrastructure.

A traffic impact assessment is currently being undertaken.

4 SERVICES AND CONNECTIONS TO MUNICIPAL INFRASTRUCTURE

This section of the report has to do with calculating the demands calculated for the following services:

- Bulk Sewer

- Bulk Water

- Bulk Stormwater

- Bulk Roads

Further to this, this section also proposes bulk connection details for the services onto the bulk municipal services.

4.1 BULK SEWAGE

4.1.1 EXISTING SYSTEM AND CONNECTION

According to council information, there is no existing sewer infrastructure within the area.

For this reason it is proposed to make use of on site sewer package plants, for the treatment of raw sewer. The sewer will be treated to a standard, safe enough for discharging into the downstream watercourse. This approval will be formally addressed with DWS by means of a formal WULA application by the environmentalist.

Figure 2: Proposed internal sewer layout.

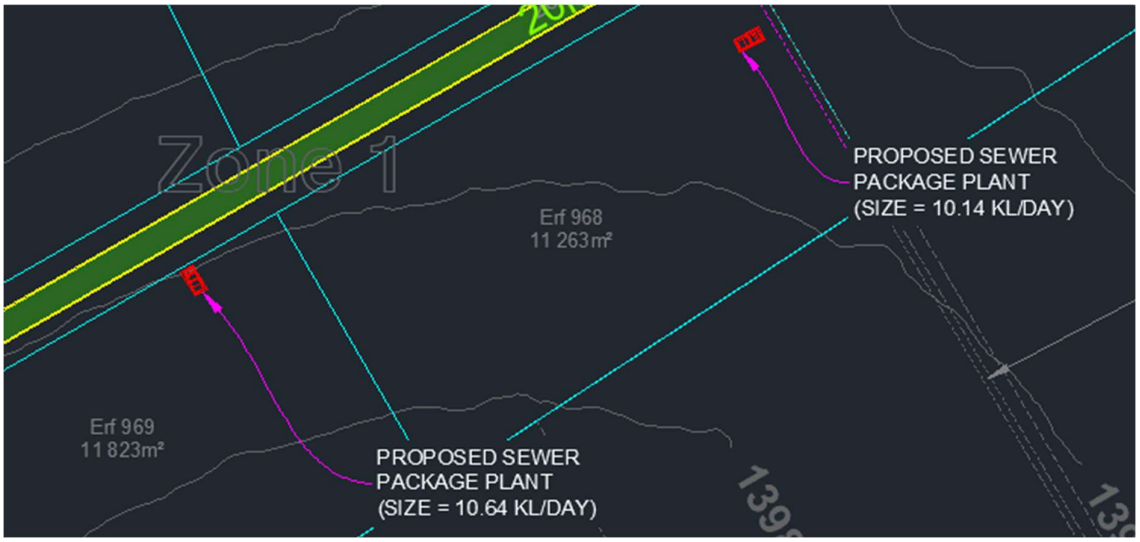

Figure 3: Proposed internal sewer layout connections

4.1.2 SEWAGE NETWORK SPECIFICATIONS

The following assumptions were made when calculating the peak flow:

For the annual average daily demand

- No fire flow contributing to the sewer outflow

For the peak daily demand

- A 15% infiltration factor for stormwater infiltration in the system

- A peak factor of 2.5 for the development.

Table 1: Design standards used for calculations.

Specification	Value
Flow capacity	0.70% of pipe depth
Minimum pipe gradient	1:60 (110mm dia) 1:140 (160mm dia) 1:200 (200mm dia)
Pipe material	uPVC Heavy duty Class 34 or 400kPa
Peak Factor	1.8 (Industrial 1)
Minimum Velocity at full flow	0.70m/s
Maximum Velocity at full flow	3.00m/s
Minimum Pipe Cover	1.4 m in road ways and 1.0m non-trafficked areas
Maximum manhole spacing	80m

4.1.3 ANNUAL AVERAGE DAILY DEMAN AND PEAK FLOW

Making use of the table as above from the redbook, as well as the attached Annexure A townplanning layout, the calculations in the below tables were carried out.

Table 2: AAWD calculations

	TOTAL AVERAGE DAILY DEMAND				
Zoning	**Erf**	**Area or units**	**FAR**	**Demand reference**	**Total Demand (Kl /day)**
Industrial 1	Erf 954	22 828 m²	0.6	9 kl / ha	20.54 kl
Industrial 1	Erf 955	12 826 m²	0.6	9 kl / ha	11.54 kl
Industrial 1	Erf 956	12 159 m²	0.6	9 kl / ha	10.94 kl
Industrial 1	Erf 957	12 606 m²	0.6	9 kl / ha	11.34 kl
Industrial 1	Erf 958	13 356 m²	0.6	9 kl / ha	12.02 kl
Industrial 1	Erf 959	12 864 m²	0.6	9 kl / ha	11.57 kl

Industrial 1	Erf 960	11 857 m²	0.6	9 kl / ha	10.67 kl
Industrial 1	Erf 961	10 982 m²	0.6	9 kl / ha	9.88 kl
Industrial 1	Erf 962	13 210 m²	0.6	9 kl / ha	11.88 kl
Industrial 1	Erf 963	16 135 m²	0.6	9 kl / ha	14.52 kl
Industrial 1	Erf 964	13 981 m²	0.6	9 kl / ha	12.58 kl
Industrial 1	Erf 965	23 284 m²	0.6	9 kl / ha	20.96 kl
Industrial 1	Erf 966	9 907 m²	0.6	9 kl / ha	8.92 kl
Industrial 1	Erf 967	7 521 m²	0.6	9 kl / ha	6.77 kl
Industrial 1	Erf 968	11 263 m²	0.6	9 kl / ha	10.14 kl
Industrial 1	Erf 969	11 823 m²	0.6	9 kl / ha	10.64 kl
Industrial 1	Erf 970	12 946 m²	0.6	9 kl / ha	11.65 kl
Industrial 1	Erf 971	15 335 m²	0.6	9 kl / ha	13.80 kl
Industrial 1	Erf 972	14 527 m²	0.6	9 kl / ha	13.07 kl
Industrial 1	Erf 973	13 487 m²	0.6	9 kl / ha	12.14 kl
TOTAL DEMAND					244.03 kl

Table 3: Peak AAWD calculations

	INSTANTANIOUS PEAK DEMAND (AADD)			
Average Annual daily demand	**Flow**	**Peak Factor**	**15% Stormwater**	**Demand (L/S)**
Erf 954	0.23	1.8	1.15	0.49 l/s
Erf 955	0.13	1.8	1.15	0.28 l/s
Erf 956	0.13	1.8	1.15	0.26 l/s
Erf 957	0.13	1.8	1.15	0.27 l/s
Erf 958	0.14	1.8	1.15	0.29 l/s
Erf 959	0.13	1.8	1.15	0.28 l/s
Erf 960	0.12	1.8	1.15	0.26 l/s
Erf 961	0.11	1.8	1.15	0.24 l/s
Erf 962	0.14	1.8	1.15	0.28 l/s
Erf 963	0.17	1.8	1.15	0.35 l/s
Erf 964	0.15	1.8	1.15	0.30 l/s
Erf 965	0.24	1.8	1.15	0.50 l/s
Erf 966	0.10	1.8	1.15	0.21 l/s
Erf 967	0.08	1.8	1.15	0.16 l/s
Erf 968	0.12	1.8	1.15	0.24 l/s
Erf 969	0.12	1.8	1.15	0.25 l/s

Erf 970	0.13	1.8	1.15	0.28 l/s
Erf 971	0.16	1.8	1.15	0.33 l/s
Erf 972	0.15	1.8	1.15	0.3 l/s
Erf 973	0.14	1.8	1.15	0.29 l/s
TOTAL				5.88 l/s

4.1.4 SEWER CONNECTION REQUIREMENTS

As there is no formal external sewer system and connection point, each site will have its own sewage package plant that will be constructed and located at the lowest corner of the site. Internal sewer networks will be constructed for the calculated flow demands, and connect to the sewage package plant. The package plant will discharge into the downstream watercourse. Each land owner will have to pay a levy towards the HOA, that will appoint a specialist by means of a service level agreement to maintain all sewer package plants.

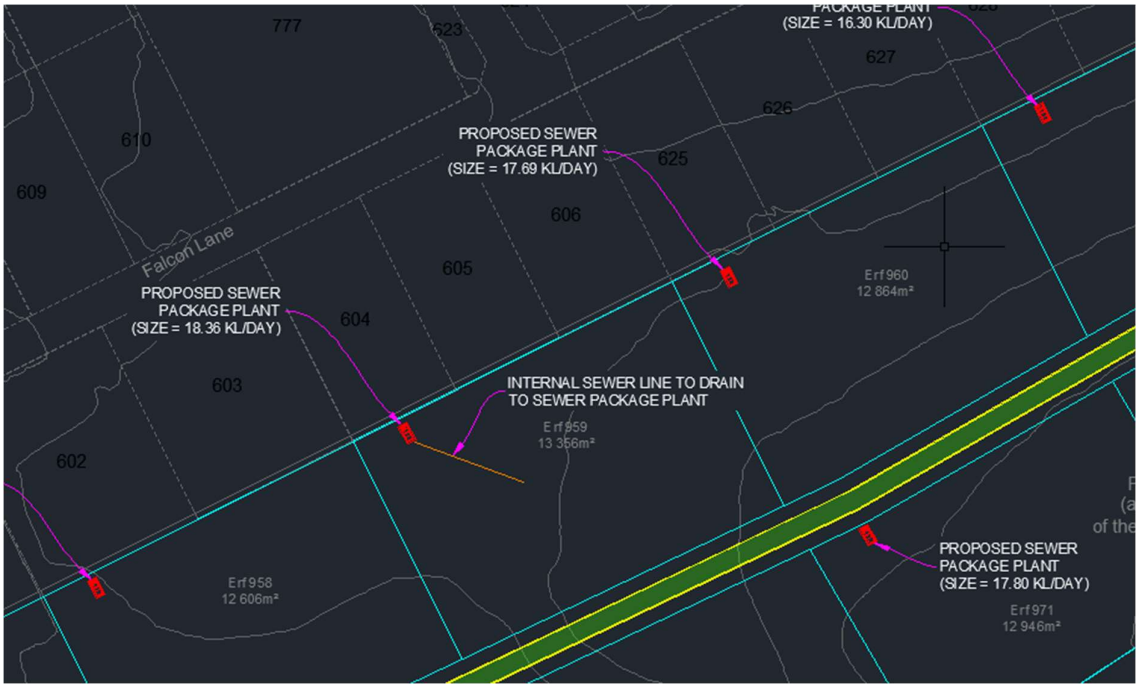

Figure 4: Internal Sewer connections

4.2 BULK WATER

4.2.1 EXISTING SYSTEM AND CONNECTION

This site seems to have an existing water line connection for the existing small site development. It is assumed that there is an external water line at this position. Council to please confirm this position and other information regarding existing water line.

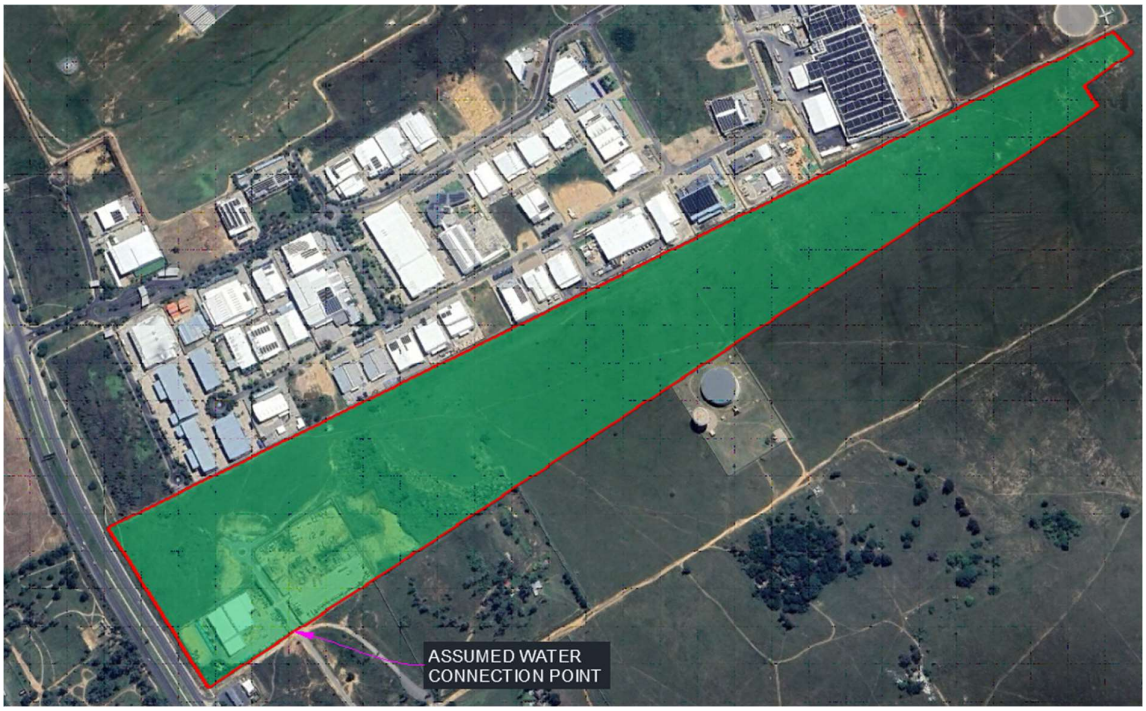

Figure 5: Existing water connection

4.2.2 WATER NETWORK SPECIFICATIONS

Table 4 below provides a summary of the design standards used for calculations.

Table 4: Design standards used for calculations

Specification	**Value**
Preferred pipe velocity (Fire flow)	0.7 m/s < 160mm diameter and 1 m/s > 200mm diameter
Maximum pipe velocity (Fire flow)	1 m/s – 3.5 m/s < 160mm diameter 1.5 m/s – 2.5 m/s > 200mm diameter
Daily peak factor	Daily peak factor of 4
Pipe material (townships)	110mm diam – 200mm diam mPVC Class 12 200mm diam – 315mm diam mPVC Class 16 315mm diam – 600mm diam HDPE Class 16, PE 100, SDR 11
Pipe Cover	Gravel roads = 1m (min) and 1.5m (max) All other areas = 0.8m (min) and 1.5m (Max)
Fire risk category	Business, Commercial, Industrial area
Distance Between Hydrants	180m apart
Minimum residual head at hydrant	15m
Minimum design flow	100 l/s

4.2.3 FIRE WATER DEMAND

According to the design document from Joburg water, the fire specification is categorized under "Business, commercial and Insustrial" areas.

As stated in Table 7, this fire risk category require the design to be tested with the additional flow of 100 l/s to be added to the potable water demand.

The minimum head required at a hydrant according to moderate risk category, is 15m.

4.2.4 ANNUAL AVERAGE DAILY WATER DEMAND

The annual daily demand was calculated using the zoning information, see attached Annexure A.

Table 5: AADD calculations for water demand

			TOTAL AVERAGE DAILY DEMAND		
Zoning	**Erf**	**Area or units**	**FAR**	**Demand reference**	**Total demand**
Industrial 1	Erf 954	22 828 m²	0.6	13.75 kl / ha	31.39 KL
Industrial 1	Erf 955	12 826 m²	0.6	13.75 kl / ha	17.64 KL
Industrial 1	Erf 956	12 159 m²	0.6	13.75 kl / ha	16.71 KL
Industrial 1	Erf 957	12 606 m²	0.6	13.75 kl / ha	17.33 KL
Industrial 1	Erf 958	13 356 m²	0.6	13.75 kl / ha	18.36 KL
Industrial 1	Erf 959	12 864 m²	0.6	13.75 kl / ha	17.69 KL
Industrial 1	Erf 960	11 857 m²	0.6	13.75 kl / ha	16.30 KL
Industrial 1	Erf 961	10 982 m²	0.6	13.75 kl / ha	15.10 KL
Industrial 1	Erf 962	13 210 m²	0.6	13.75 kl / ha	18.16 KL
Industrial 1	Erf 963	16 135 m²	0.6	13.75 kl / ha	22.19 KL
Industrial 1	Erf 964	13 981 m²	0.6	13.75 kl / ha	19.22 KL
Industrial 1	Erf 965	23 284 m²	0.6	13.75 kl / ha	32.02 KL
Industrial 1	Erf 966	9 907 m²	0.6	13.75 kl / ha	13.62 KL
Industrial 1	Erf 967	7 521 m²	0.6	13.75 kl / ha	10.34 KL
Industrial 1	Erf 968	11 263 m²	0.6	13.75 kl / ha	15.49 KL
Industrial 1	Erf 969	11 823 m²	0.6	13.75 kl / ha	16.26 KL
Industrial 1	Erf 970	12 946 m²	0.6	13.75 kl / ha	17.80 KL
Industrial 1	Erf 971	15 335 m²	0.6	13.75 kl / ha	21.09 KL
Industrial 1	Erf 972	14 527 m²	0.6	13.75 kl / ha	19.97 KL
Industrial 1	Erf 973	13 487 m²	0.6	13.75 kl / ha	18.54 KL
TOTAL DEMAND					**375.23 KL**

Table 6: Water demand peak flows

	INSTANTANIOUS PEAK DEMAND (AADD)			
Average Annual daily demand	**Flow**	**Seasonal Peak**	**Instantaneous peak**	**Demand (L/S)**
Erf 954	0.36	1.3	4	1.88 l/s
Erf 955	0.20	1.3	4	1.06 l/s
Erf 956	0.19	1.3	4	1.00 l/s
Erf 957	0.20	1.3	4	1.04 l/s
Erf 958	0.21	1.3	4	1.11 l/s
Erf 959	0.20	1.3	4	1.06 l/s
Erf 960	0.19	1.3	4	0.98 l/s
Erf 961	0.17	1.3	4	0.91 l/s
Erf 962	0.21	1.3	4	1.09 l/s
Erf 963	0.26	1.3	4	1.34 l/s
Erf 964	0.22	1.3	4	1.16 l/s
Erf 965	0.37	1.3	4	1.93 l/s
Erf 966	0.16	1.3	4	0.82 l/s
Erf 967	0.12	1.3	4	0.62 l/s
Erf 968	0.18	1.3	4	0.93 l/s
Erf 969	0.19	1.3	4	0.98 l/s
Erf 970	0.21	1.3	4	1.07 l/s
Erf 971	0.24	1.3	4	1.27 l/s
Erf 972	0.23	1.3	4	1.20 l/s
Erf 973	0.21	1.3	4	1.12 l/s
TOTAL				**22.47 l/s**

The demand of fire water increases the previous calculated water demand of 22.47 l/s, to a demand of 122.47 l/s.

4.2.5 BULK CONNECTION

For the bulk water connection, it is recommended that a connection from the internal water network is made, by connecting onto the bulk water line at the connection point indicated at the entrance.

A bulk water connection with water meter, as well as a fire hydrant booster connection is recommended. Refer to the Figure below, for the proposed detail connection.

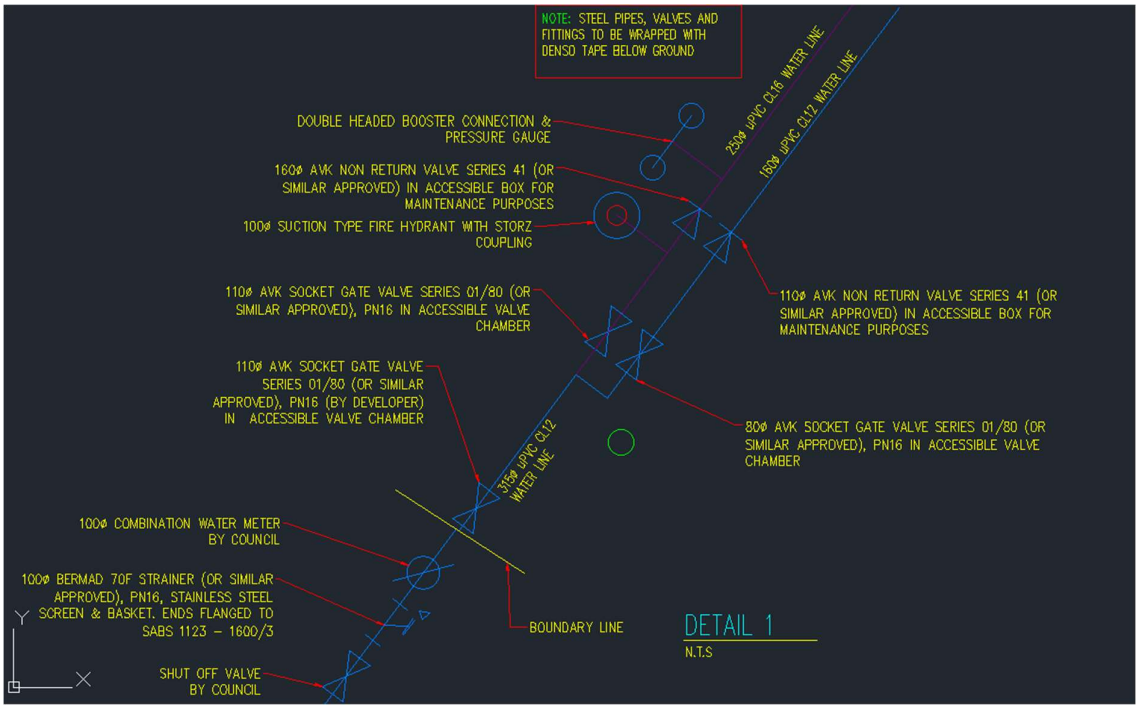

Figure 6: Water connection detail

Based on the calculated water demand, as well as considering the design guideline recommendations on preferred velocity and pipe material, it can be recommended that a 315mm diameter mPVC class 12 connection pipe be installed. On the inside of the site boundary, after the water meter connection and hydrant booster connection, domestic water and fire water can be split into two pipe systems. The domestic water connection can be a 110mm diameter mPVC class 12, and the fire water line proposed as a 250mm diameter mPVC Class 16.

4.3 BULK STORMWATER RUNOFF

4.3.1 STORMWATER DESIGN METHODOLOGY

There site is split into two drainage areas, as there is a watershed in the centre of the site. Drainage 1 drains towards the Southwestern corner. Drainage 2, drains to the South-eastern corner of the site, from where it connects to the formal roads stormwater infrastructure. The Figure below indicates the two drainage areas and low points

Figure 7: Existing stormwater connection

Drainage 2 will drain to the lowest corner as indicated “Stormwater connection point”. From this point, a field inlet structure will be constructed, where stormwater will connect onto a new proposed channel to be constructed to service all Northern neighbouring sites and eventually discharge into the river.

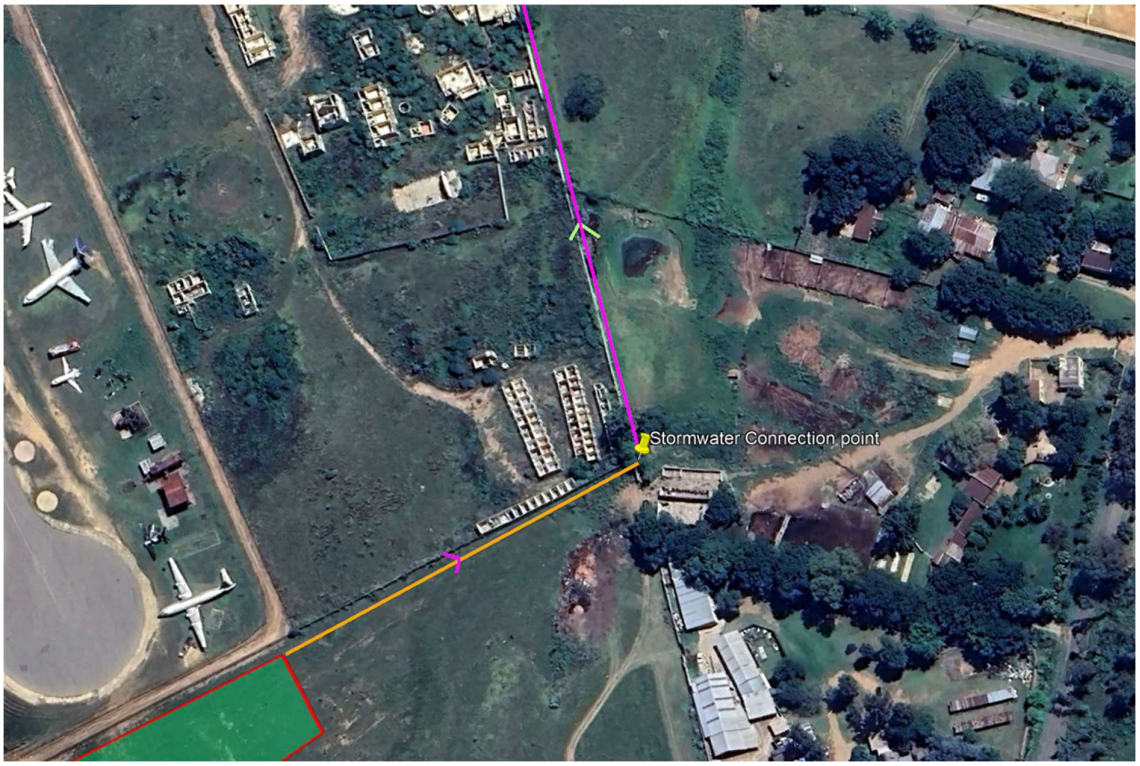

Figure 8: Existing stormwater connection drainage point 2

Drainage 1 will drain on the south western side of the site, directly into the formal road drainage system on the R512. The two figures below indicate the connection point for this drainage area.

Figure 9: Existing stormwater connection drainage point 1

Figure 10: Existing stormwater connection outlet

Figure 11: Existing stormwater connection position

4.3.2 RAINFALL DATA

The Smithers and Schulze method was used for determining the stormwater runoff. This approach uses estimates by using a regional scale variance approach, where the probabilistic relationships between the average daily rainfall, rainfall intensity, duration and return period are used to determine runoff. The project is located at 25°56'59.26"S 27°55'14.29"E with an altitude of 1376 m above mean average sea level (m.a.s.l). The mean annual precipitation (MAP) is estimated at 688 mm per annum by utilising the data from the following rainfall stations:

- 25°56'59.26"S
- 27°55'14.29"E

- LEEUWKOP (TNK) 0476031_W
- OLIFANTSFONTEIN 0513417_W
- SANDTON (POL) 0476093_W
- SPRINGKEL 0476246_W
- DOOMKLOOF 0513413_W
- JHB RIEPEN 0476067_W

Design rainfall depths, calculated for various recurrence intervals and storm durations are presented in Table 6 below

Table 7**:** Rainfall depths (mm) for different recurrence intervals and storm durations

STORM DURATION	RECURRENCE INTERVAL (YEAR) AND RAINFALL DEPTH (mm)				
	1:2	**1:5**	**1:10**	**1:20**	**1:50**
5 minutes	8.4	11.6	14.1	16.7	20.4
10 minutes	12.2	16.9	20.4	24.2	29.6
15 minutes	15.2	21.0	25.4	30.0	36.8
30 minutes	19.4	26.8	32.4	38.3	47.0
45 minutes	22.3	30.8	37.3	44.1	54.1
1 hour	24.7	34.1	41.3	48.8	59.9

4.3.3 STORMWATER RUNOFF

The development will increase the stormwater runoff, due to the surfacing of impermeable roadway pavers, as well as buildings. This increase in stormwater will be managed by means of attenuation ponds. The purpose of the attenuation ponds is to reduce the increased stormwater flow, by attenuating calculated volumes of stormwater. The pond is size is determined by making use of inflow and outflow hydrographs, where the post development 50 year rainfall is modelled as inflow, and the pre development 5 year rainfall is modelled as the outflow orifice. The volume required to acoomodate this difference, determines the attenuation pond size. Pre and post development runoff was calculated by making use of the rational method.
The results is as indicated in below, and detailed calculations as per Annexure B.

Table 8: Stormwater runoff – Pre Development

Pre Development		RECURRENCE INTERVAL (YEAR) AND GENERATED FLOW (L/S)							
	1:2	1:5	1:10	1:25	1:50	1:100	Pond size	C – f	Tc
DRAINAGE 1									
Erf 954	110 l/s	160 l/s	193 l/s	239 l/s	275 l/s	308 l/s	22 828 m²	0.29	15min
Erf 955	71 l/s	103 l/s	124 l/s	153 l/s	175 l/s	198 l/s	12 826 m²	0.33	
Erf 956	64 l/s	93 l/s	114 l/s	140 l/s	162 l/s	182 l/s	12 159 m²	0.32	
Erf 957	61 l/s	89 l/s	107 l/s	132 l/s	152 l/s	171 l/s	12 606 m²	0.29	
Erf 958	67 l/s	97 l/s	117 l/s	145 l/s	166 l/s	187 l/s	13 356 m²	0.30	
Erf 959	67 l/s	97 l/s	117 l/s	144 l/s	165 l/s	186 l/s	12 864 m²	0.31	
Erf 960	65 l/s	95 l/s	115 l/s	141 l/s	162 l/s	183 l/s	11 857 m²	0.33	
Erf 970	67 l/s	97 l/s	117 l/s	145 l/s	166 l/s	188 l/s	12 946 m²	0.31	
Erf 971	82 l/s	119 l/s	144 l/s	177 l/s	203 l/s	229 l/s	15 335 m²	0.32	
Erf 972	73 l/s	106 l/s	128 l/s	158 l/s	181 l/s	204 l/s	14 527 m²	0.30	
Erf 973	70 l/s	101 l/s	122 l/s	151 l/s	173 l/s	195 l/s	13 487 m²	0.31	
Road 1	73 l/s	106 l/s	129 l/s	159 l/s	182 l/s	205 l/s	14 638 m²	0.30	
DRAINAGE 2									
Erf 961	59 l/s	85 l/s	103 l/s	127 l/s	146 l/s	164 l/s	10 982 m²	0.32	
Erf 962	66 l/s	96 l/s	116 ls	143 l/s	164 l/s	185 l/s	13 210 m²	0.30	
Erf 963	78 l/s	113 l/s	137 l/s	169 l/s	194 l/s	219 l/s	16 135 m²	0.29	
Erf 964	65 l/s	95 l/s	115 l/s	142 l/s	162 l/s	183 l/s	13 981 m²	0.28	
Erf 965	120 l/s	175 l/s	211 l/s	261 l/s	299 l/s	337 l/s	23 284 m²	0.31	
Erf 966	55 l/s	79 l/s	96 l/s	118 l/s	136 l/s	153 l/s	9 907 m²	0.33	
Erf 967	38 l/s	55 l/s	66 l/s	82 l/s	94 l/s	105 l/s	7 521 m²	0.30	
Erf 968	55 l/s	79 l/s	96 l/s	118 l/s	135 l/s	153 l/s	11 263 m²	0.29	
Erf 969	55 l/s	80 l/s	97 l/s	120 l/s	137 l/s	155 l/s	11 823 m²	0.28	
Road 3	80 l/s	116 l/s	140 l/s	173 l/s	198 l/s	223 l/s	16 454 m²	0.29	

Table 9: Stormwater runoff – Post Development

Post Development	RECURRENCE INTERVAL (YEAR) AND GENERATED FLOW (L/S)								
	1:2	1:5	1:10	1:25	1:50	1:100	Pond size	C – f	Tc
DRAINAGE 1									
Erf 954	361 l/s	526 l/s	633 l/s	784 l/s	899 l/s	1 013 l/s	22 828 m²	0.95	15min
Erf 955	203 l/s	295 l/s	357 l/s	441 l/s	505 l/s	569 l/s	12 826 m²	0.95	
Erf 956	193 l/s	280 l/s	337 l/s	417 l/s	478 l/s	539 l/s	12 159 m²	0.95	
Erf 957	200 l/s	290 l/s	350 l/s	433 l/s	496 l/s	560 l/s	12 606 m²	0.95	
Erf 958	212 l/s	307 l/s	371 l/s	459 l/s	526 l/s	593 l/s	13 356 m²	0.95	
Erf 959	204 l/s	296 l/s	358 l/s	442 l/s	507 l/s	571 l/s	12 864 m²	0.95	
Erf 960	188 l/s	273 l/s	330 l/s	407 l/s	467 l/s	526 l/s	11 857 m²	0.95	
Erf 970	205 l/s	298 l/s	360 l/s	445 l/s	510 l/s	575 l/s	12 946 m²	0.95	
Erf 971	243 l/s	353 l/s	426 l/s	527 l/s	604 l/s	681 l/s	15 335 m²	0.95	
Erf 972	230 l/s	334 l/s	404 l/s	499 l/s	572 l/s	645 l/s	14 527 m²	0.95	
Erf 973	214 l/s	311 l/s	375 l/s	463 l/s	531 l/s	599 l/s	13 487 m²	0.95	
Road 1	232 l/s	337 l/s	407 l/s	503 l/s	576 l/s	650 l/s	14 638 m²	0.95	
	2 685	3900	4708	5820	6671	7521			
DRAINAGE 2									
Erf 961	174 l/s	253 l/s	305 l/s	377 l/s	433 l/s	487 l/s	10 982 m²	0.95	
Erf 962	209 l/s	304 l/s	367 l/s	454 l/s	520 l/s	586 l/s	13 210 m²	0.95	
Erf 963	256 l/s	371 l/s	449 l/s	554 l/s	635 l/s	716 l/s	16 135 m²	0.95	
Erf 964	222 l/s	322 l/s	389 l/s	480 l/s	551 l/s	621 l/s	13 981 m²	0.95	
Erf 965	369 l/s	536 l/s	647 l/s	800 l/s	917 l/s	1034 l/s	23 284 m²	0.95	
Erf 966	157 l/s	228 l/s	275 l/s	340 l/s	390 l/s	440 l/s	9 907 m²	0.95	
Erf 967	119 l/s	173 l/s	209 l/s	258 l/s	296 l/s	334 l/s	7 521 m²	0.95	
Erf 968	179 l/s	259 l/s	313 l/s	387 l/s	444 l/s	500 l/s	11 263 m²	0.95	
Erf 969	187 l/s	272 l/s	329 l/s	406 l/s	466 l/s	525 l/s	11 823 m²	0.95	
Road 3	261 l/s	379 l/s	457 l/s	565 l/s	648 l/s	730 l/s	16 454 m²	0.95	
	2133	3097	3740	4621	5300	5973			

Time of concentration has been capped to 15 minutes as per the SANRAL drainage document.

The attenuation ponds were sized by taking the difference the post development 25 year storm, and discharging the pre development 5 year storm. The table below indicates the calculated values.

Table 10: Stormwater attenuation pond sizes

Erf Number	RAINFALL VOLUMES AND PROPOSED ATTENUATION POND SIZE		
	Pre Development 5 year Volume (cubes)	Post Development 25 year Volume (cubes)	Pond size (Cubes)
DRAINAGE 1			
Erf 954	160 l/s	784 l/s	842.40
Erf 955	103 l/s	441 l/s	456.30
Erf 956	93 l/s	417 l/s	437.30
Erf 957	89 l/s	433 l/s	464.40
Erf 958	97 l/s	459 l/s	488.70
Erf 959	97 l/s	442 l/s	465.75
Erf 960	95 l/s	407 l/s	421.20
Erf 970	97 l/s	445 l/s	469.80
Erf 971	119 l/s	527 l/s	550.80
Erf 972	106 l/s	499 l/s	530.55
Erf 973	101 l/s	463 l/s	488.70
Road 1	106 l/s	503 l/s	535.95
			6 151.85
DRAINAGE 2			
Erf 961	85 l/s	377 l/s	394.20
Erf 962	96 l/s	454 l/s	483.30
Erf 963	113 l/s	554 l/s	595.35
Erf 964	95 l/s	480 l/s	519.75
Erf 965	175 l/s	800 l/s	843.75
Erf 966	79 l/s	340 l/s	352.35
Erf 967	55 l/s	258 l/s	274.05
Erf 968	79 l/s	387 l/s	418.50
Erf 969	80 l/s	406 l/s	440.10
Road 3	116 l/s	565 l/s	606.15
			4 927.50

The stormwater pipe systems, as well as surfacewater, will discharge into the attenuation pond. The piped systems will discharge by means of a headwall / energy dissipation structure. The outlet from the attenuation ponds to the downstream watercourse areas, will also be done by means of a headwall, with an energy dissipating structure. Figure 12 below indicates the typical detail. For the detailed layout, refer to Annexure C and D.

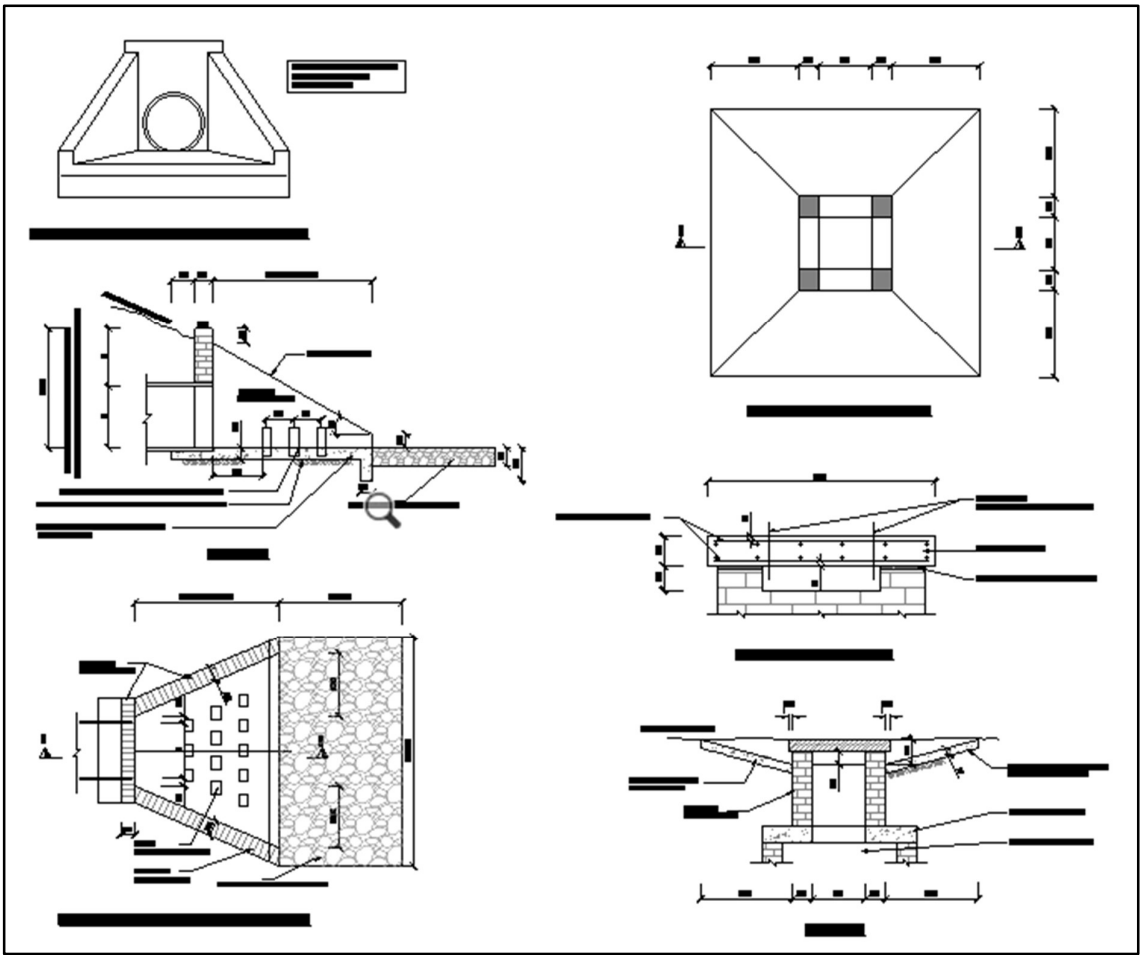

Figure 12: Headwall / Energy dissipator standard detail

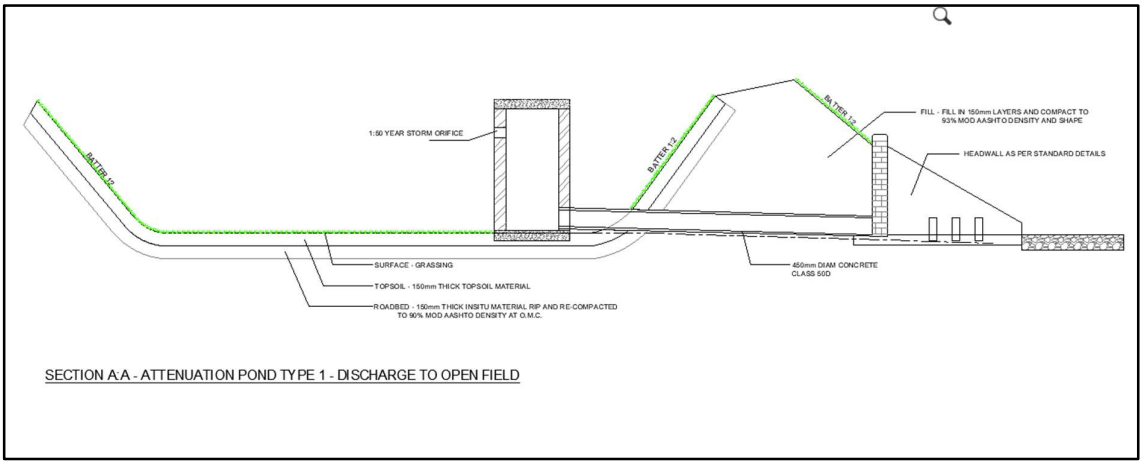

Figure 13: Attenuation pond standard detail

4.3.4 STORMWATER CONNECTIONS

There are 3 different scenarios for connecting stormwater to the external.

Drainage point 1 will be connection point 1, which drains to the South Eastern corner of site. This connection point will have to drain the following site areas (CM_954 – 960 / CM_970-974 / CM R1) The combined flow will be 1263 l/s, making a 900mm diameter concrete class 100D pipe, at a slope of minimum 1-3% suitable for connection.

Drainage point 2 will be connection point 2, which drains to the North eastern corner of site. This connection point will have to drain the 5 year pre development flow for the following site areas (CM_961-969 / CM_R3). The combined flow will be 973 l/s, making a 750mm diameter concrete class 100D pipe, at a slope of minimum 1-3% suitable for connection.

4.3.5 STORMWATER RECEIVING PIPE

There are 3 different scenarios for connecting stormwater to the external.

Drainage point 1 will discharge into a v-channel, that is part of the roads system. This channel should have sufficient capacity, as this channels surface systems is usually designed for the larger 50-year storms, and we are discharging pre development runoff into the channel, which should not really increase the current stormwater flow to this point.

Drainage point 2 will discharge by means of by means of an internal concrete pipe, connecting onto a future proposed open channel system. This channel will have to be constructed in the future, as part of a stormwater drainage system of Norther downstream sites.

5 ROADS AND TRANSPORT

5.1.1 ACCESS POSITION

The larger site area currently has an existing road entrance up to a point inside the site area, where it ends with a circle intersection. The road will be further extended to service the additional internal site areas, as the sites are proclaimed.

Figure 14: Existing access positions

5.1.2 ACCESS CAPACITY

At the time of compiling the report, the TIA has not been completed yet. Refer to attached Annexure O, for the approved TIA report.

6. GEOTECHNICAL

6.1.1 GEOTECHNICAL CONDITIONS

The site is on granite, with a diabase intrusion near the wetland. The geotechnical conditions will be further elaborated by the appointed Geotechnical engineer, Stuart Morgan, from GEOID geotechnical engineers have been appointed to compile a report, that will be attached when received.

7 CONCLUSION

7.1.1 CONCLUSION AND RECOMMENDATIONS

From the calculations included in this report, the following conclusions can be made.

- The sewage treatment as discussed will have to be sewer package treatment plants that will be located on each individual site, on the lower points of the site. The typical sewer demand ranges between 8KL – 12KL /day for the individual sites, with

a sewer flow of 0.62l/s to 0.5 l/s including 15% stormwater infiltration and 1.8 peak factor.

- The water will have a conventional formal connection, and a total demand for the site are of 375.23 KL / day AADD. The peak domestic water demand, including the 1.3 seasonal factor, as well as the instantaneuous peak factor of 4, will be 22.47 l/s. With a Moderate category for fire flow, an additional 100 l/s will have to be provisioned. The accumulates to a total demand of 122.47 l/s.
- The stormwater on site will have two drainage points, with two large attenuation ponds.
  Drainage 1 – Conventional connection to a v-channel of road infrastructure.
  Drainage 2 – Discharge by means of a stormwater pipe, to a future open channel connection point.
  Both regional Attenuation ponds will be constructed to treat stormwater to the pre 5 year flow rates, and by sizing ponds to attenuate the difference between the Post 25 and Pre 5 year storms.
- There is an existing access road, that will be extended to service internal site areas. The current TIA conducted, is approved.
- The site is underlain by granite, with an intrusion near the wetland area. A detailed Geotechnical study is being conducted.

ANNEXURE A – COMBINED SERVICES LAYOUT

ANNEXURE B – SEWER LAYOUT

ANNEXURE C – STORMWATER LAYOUT

ANNEXURE D – ATTENUATION POND DETAIL

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ANNEXURE E – WATER LAYOUT

ANNEXURE F – STORMWATER MANAGEMENT PLAN – PRE DEVELOPMENT

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ANNEXURE G – STORMWATER MANAGEMENT PLAN – POST DEVELOPMENT

ANNEXURE H – ATTENUATION POND SIZING TABLE WITH CALCULATIONS

ANNEXURE I – ATTENUATION POND SIZING HYDROGRAPHS

ANNEXURE J – PEAK RUNOFF CALCULATIONS

ANNEXURE K – SEWER PACKAGE TREATMENT PLANT DETAILS

ANNEXURE L – TOWNPLANNING LAYOUT

ANNEXURE M – ENVIRONMENTAL INFORMATION

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ANNEXURE N – GEOTECHNICAL REPORT

ANNEXURE O – APPROVED TRAFFIC IMPACT ASSESSMENT