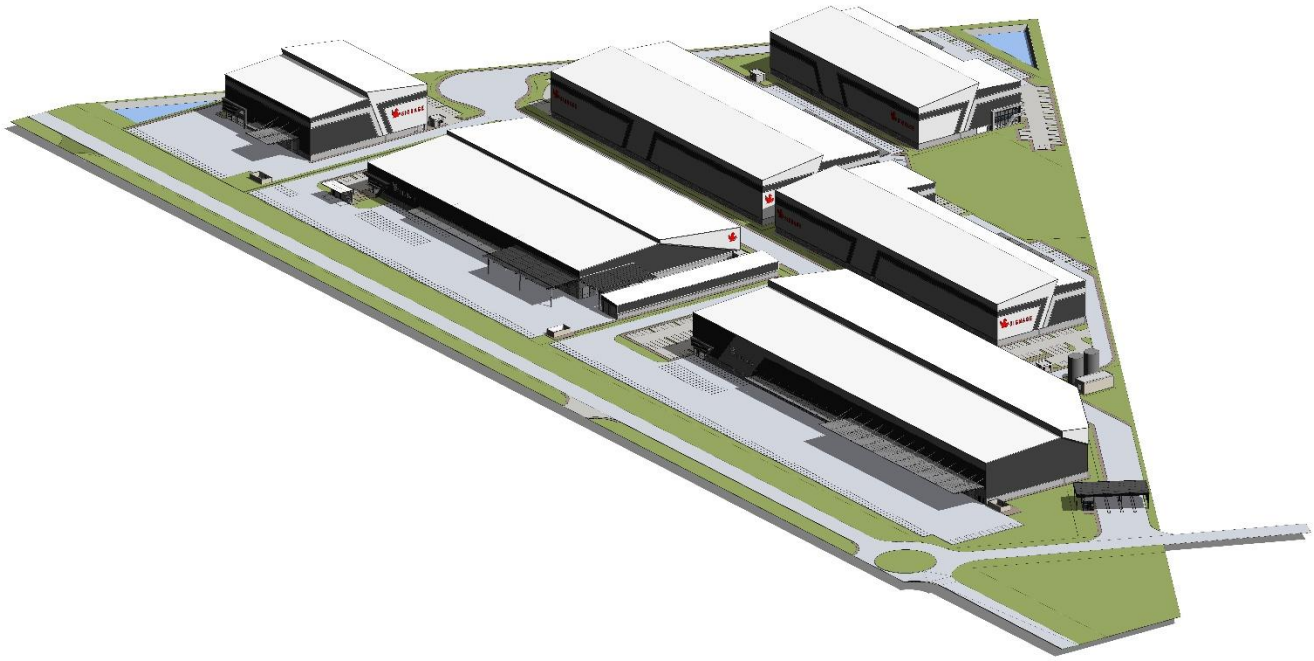
Proposed Industrial Park on Erf 10301, Wells Estate, Gqeberha



Civil Engineering Services Report

Revision A – 03 October 2025

Prepared for:

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Contents

1. INTRODUCTION

KLS Consulting Engineers has been appointed by Equites as the Consulting Civil Engineers for the proposed Industrial Park on Erf 10301, Wells Estate, Gqberha.

The purpose of this report will be to address all civil engineering issues generated from the proposed development. The following documents and guidelines have been used in the civil services infrastructure design and management implementation of this development:

- The Site Development Plan and proposed building layout of the Industrial Park by Empowered Spaces Architects
- Assessment of Access to Proposed Portions of Erf 8741 Wells Estate Report compiled by SSI Traffic Engineers
- "GUIDELINES FOR HUMAN SETTLEMENT PLANNING AND DESIGN" *(CSIR "Red Book")*
- The "ROADS DRAINAGE MANUAL" as published by the South African National Roads Agency

2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 Locality

The proposed development is situated on the R102 (Old Grahamstown Road) opposite the Shoprite Checkers Distribution Centre, Wells Estate.

Figure 1: Locality Plan

The erf size is approximately 16.6 ha. Access to the site will be off M. Kaulela Road.

2.2 Land-use

The Erf is zoned as Industrial 1 and the primary land-use of the development will be Warehousing with ancillary Offices. *Figure* 2 below indicates the layout of the proposed development. The total Warerhouse area is 58,082 m2 and 6,025 m2 Offices.

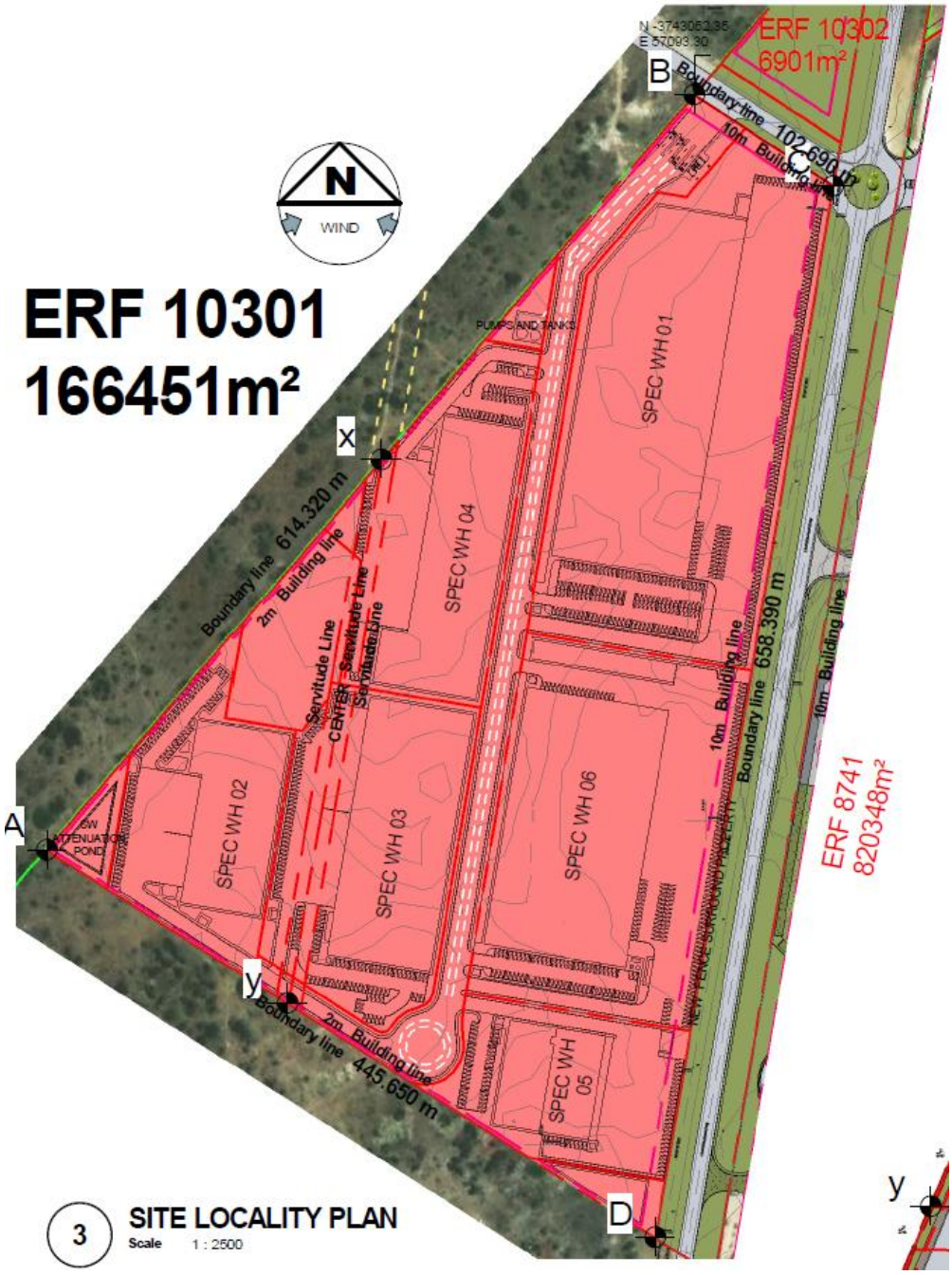

Figure 2 Site Development Plan (*refer to Appendix A*)

3. SITE CLEARANCE AND EARTHWORKS

A site-specific geotechnical investigation still needs to be done. A geotechnical report was done by SRK Consulting for the Shoprite DC to the south of the site, and it is anticipated that the same conditions will prevail. The Shoprite ground conditions are summarised in the SRK Geotech as follow (*see Figure 3 below*):

3.4.2 Pedogenic

An off-white, slightly- to moderately weathered, moderately- to highly fractured hardpan CALCRETE horizon was intersected within most of the excavations. Typically, only one hardpan horizon is present from 0.2 m to 0.6 m (occasionally as deep as 1.4 m, except at TP2 and TP3, where moist, light khaki brown, *loose,* intact sand of inferred Aeolian origin is 'sandwiched' between two hardpan calcrete horizons. The hardpan calcrete varies in thickness from 0.2 m to 0.9 m, with a variable basal contact intersected between 0.4 mbgl and 2.0 mbgl.

The hardpan calcrete horizon is predominantly underlain by a dry to slightly moist, light greenish grey to off-white, *medium dense to very dense,* intact, calcareous silty fine SAND with abundant, coarse gravel of calcrete origin and limestone nodules. Occasionally, this pedogenic horizon has undergone moderate- to strong cementation, resulting in refusal of excavations.

3.4.3 Residual Alexandria Formation

The strongly calcretised (pedogenic horizon) is underlain by the residual Alexandria Formation which is discontinuous across the site (intersected at a depth ranging from 1 m to 2 m below surface) and is described as moist to very moist (or wet) green-grey stained off-white (with occasional orange mottling), *medium dense to very dense,* intact calcareous silty fine- to medium grained SAND with limestone nodules, and minor to abundant shelly fragments. Coquinite, a rock-type characterised by shell fragments strongly-cemented by calcium carbonate, was intersected in TP8 only.

3.4.4 Residual Sundays River Formation

The Alexandria Formation is underlain by residual soils derived from the in situ weathering of Sundays River Formation. Residual Sundays River soils were intersected within most of the test pits. The horizon is typically described as a slightly moist, orange-brown stained grey, *very stiff,* silty CLAY with relic horizontal bedding and joints.

Figure 3: SRK Geotech – soil profile

Site clearance and topsoil stripping of the Road Reserve and services lines will be done prior to any roadworks or pipe laying.

4. ROADS AND PARKING AREAS

4.1 Existing Road Network

The proposed development will border on the R102 and M Kaulela Street.

- *R102 (Old Grahamstown Road)*
  A 6.8m wide provincial road classified as a minor arterial. The road has a single carriageway in both directions without any shoulders or kerbs

and acts as a distributor between Swartkops and Markman Industrial Area. The R102 was recently rebuilt and widened from M Kaulela Street northward towards the R335 under the Shoprite Distribution Centre extensions contract (2023/24).

- *M Kaulela Street*
  This street is 8.7m wide and classified as both a minor arterial *(section north-west of Dibanisa Road intersection)* and a local road *(section south- east of Dibanisa Road intersection)*.

- *R335 (Addo Road)*
  The R335 is classified as a mobility arterial with two 3.5m wide lanes and a 3m wide shoulder in both directions *(dual carriageway)*. This road has a 4.5m wide grassed median and raised pedestrian crossings are provided along either side of the R335.

Access to Erf 10301 will be from M Kaulela Street as shown on the site development plan.

4.2 Internal Roads

The internal distribution road will be 11m wide from kerb to kerb consisting of 2x 4m wide lanes and 2x 1.5m wide yellow shoulders, with paved walkways on both sides.

The main entrance off M Kaulela Street will be 4 lanes (2 in and 2 out) through a security checkpoint. The guardhouse will be set back from the street to allow for stacking of trucks.

The internal road is indicated in yellow in figure 5 below. Also refer to the Site Access drawing in Appendix B

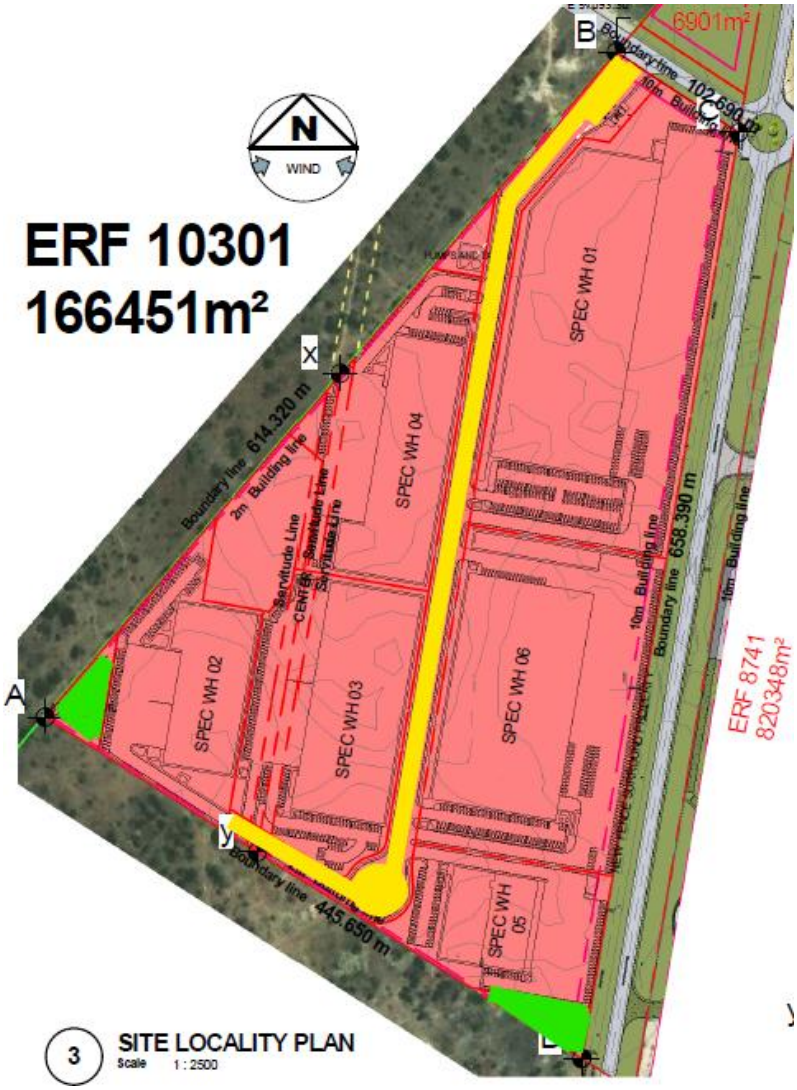

Figure 5: Internal road and retention ponds

5. STORMWATER MANAGEMENT

The standard stormwater principles, as set out by the guidelines mentioned in section 1 of this document, were employed for the preliminary design of the internal stormwater system.

Climate data from SAWS are used in runoff calculations. Parameters are summarized in Table 1: Refer to ***Appendix C*** for preliminary calculations.

Erf 10301, Wells Estate	
Reference Coordinates	33°50' S; 25°37' E
MAP (mm)	423
Total Catchment Size (m²)	166000
Peak Storm Duration (minutes)	15

Table 1: Site specific climate and parameters

The development will create large impervious areas that will substantially increase the stormwater run-off from the site. Stormwater run-off will be

concentrated to low points in the parking areas and marshalling yards, from where the minor portion of runoff will be conveyed via a conventional underground system. The internal roads, marshalling yards, parking areas and channels will act as overland flow routes for major storm events.

The stormwater detail design will consist of low and high points within the roads, parking areas and marshaling yards, to make provision for adequate crossfalls and longitudinal slopes for effective stormwater drainage.

The following minimum specifications will be implemented in the stormwater infrastructure design:

- 100 D Concrete Spigot & Socket pipes
- Minimum minor system pipe diameter (roof water collection) - 300mm
- Minimum major system pipe diameter - 450mm
- Minimum velocity inside a half full pipe - 0.9m/s
- Maximum spacing between manholes/inlets/catch pits – 90m

There is no formal stormwater system in the direct vicinity of the site. The recommendation would be to do a new SW connection from the existing stormwater canal to the south and crossing the R102 to the site (refer green line in Figure 4 below)

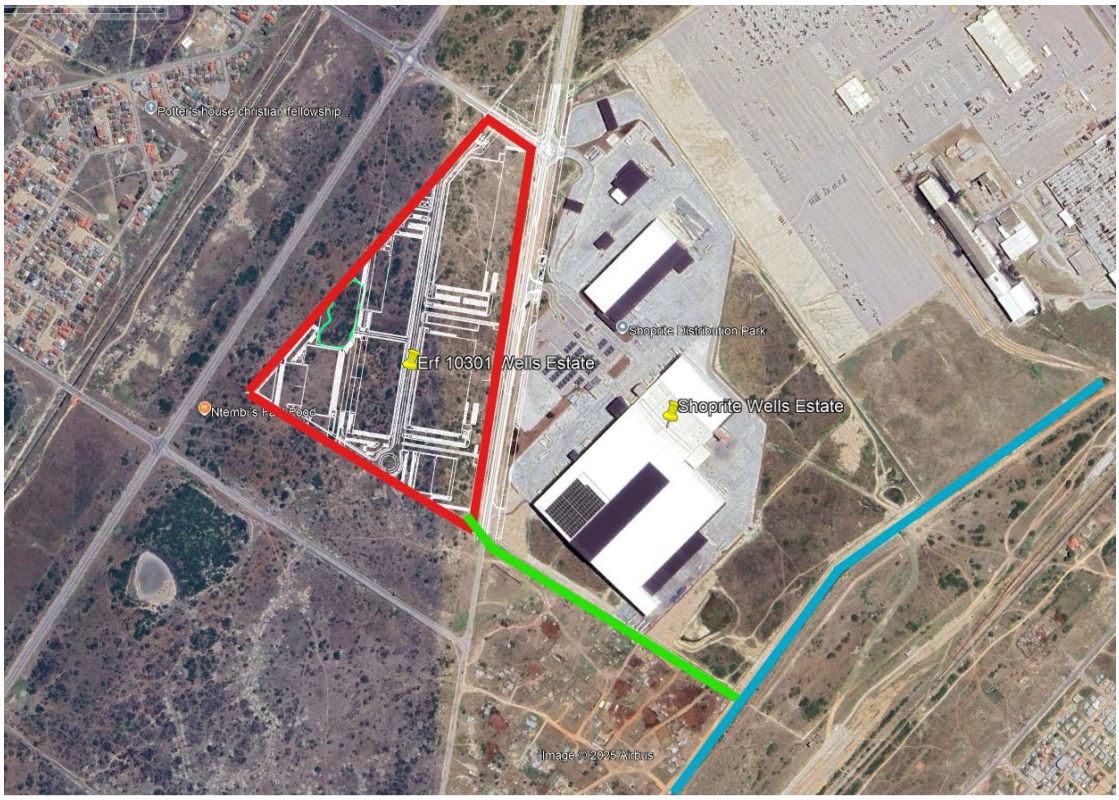

Figure 4: Proposed stormwater connection

The existing canal is shown in blue with the proposed culvert in green. The pipe route is across NMBM land, and it is recommended that the culvert be laid within an 8m wide servitude along the south-western Shoprite erf boundary.

Two attenuation ponds are proposed within the development, sized adequately to reduce peak flows to pre-development levels, reducing strain on the downstream infrastructure.

Table 2 gives a summary of the preliminary runoff calculations for the entire site, as per the SANRAL Drainage Manual Rational Method, Alternative 3.

Runoff Summary: Rational Method Alternative 3							
Return Period,	*years*	2	5	10	20	50	100
Runoff Coefficient	C_{pre}	0.3					
	C_{post}	0.79					
Rainfall Intensi	*mm/h*	34.0	50.0	62.8	76.4	96.4	114.0
Pre-Development Flo	m^3/s	0.470	0.692	0.869	1.057	1.334	1.577
Post-Development Flo	m^3/s	1.239	1.821	2.288	2.783	3.512	4.153

Table 2: Runoff Summary, Rational Method

4.3 Minor Flows (1:5 year and smaller rainfall events)

The internal stormwater system will consist of a conventional underground gravity pipe and culvert network, roadside channels in the parking area and inlet structures to drain the impervious areas. This system will be designed to have sufficient capacity to convey up a 1:5-year rainfall event towards the on-site attenuation ponds.

4.4 Major Flows (Larger than 1:5-year rainfall events)

During rainfall events with a return period larger than 1:5-years, the proposed roads, marshalling yards, parking areas and channels will act as overland flow routes which will channel and discharge the surface run-off via predetermined routes into the attenuation facilities. The design of these dams will make allowance to adequately attenuate the 1:50-year rainfall event, and convey runoff from a 1:100 year rainfall event from the site.

4.5 Attenuation

Two stormwater attenuation facilities/dams will be constructed on the south-western and south-eastern boundaries, respectively. The attenuation dams will act as dry detention basins, with a combined extended storage available to effectively attenuate up to a 1: 50-year post development flood, to 1:5-year pre-development flood levels.

These facilities will effectively manage and convey stormwater run-off of up to 1:100-year rainfall events to minimize the risk of flooding of internal and downstream properties.

The attenuation dam outlets will be connected to the existing stormwater channel to the south-east of the site, via a new culvert. The outlet capacity of the attenuation dams will be limited to 692l/s. The outlet structure of the attenuation facility will be designed to govern the outflow to not exceed the 1: 5-year pre-development flow for the overall development.

The dam sizing calculations using the ABT Grigg method is summarized in **Table 3.** A minimum combined storage volume of 2038m³ is required.

$V_{st} = 60\left(\frac{1+m}{2}\right) q_{pa} t_{ca} (1-a)^2$		
Ratio Hydrograph Recession Time =	m	1
Post-dev Peak Discharge (1:50) =	q_{pa} (in m^3/s)	3.512
Post-dev Time of Concentration =	t_{ca} (in min)	15.000
Peak Discharge (1:5 Pre) =	q_{pb} (in m^3/s)	0.692
q_{pb}/q_{pa} =	α	0.197
Storage Volume Required V_{st} =	**V_{st} (in m^3)**	**2038**

Table 3: Dam Sizing Calculations

The attenuation dams will be constructed with an emergency overflow which has the capacity to discharge the run-off generated from rainfall events larger than 1:50 years, up to a maximum of a 1:100-year rainfall event. The emergency outflow will release excess run-off as surface discharge onto the surrounding area which discharges into the existing open stormwater canal to the south-east of the site.

The total attenuation volume provided on site is 2359m³. Split between:
Dam A – 1146m³ and
DamB – 1213m³

This satisfies the minimum requirement, and the internal catchments will be shape to contribute proportionally to the respective ponds.

6. SANITATION

6.1 Existing Municipal Foul Sewer Network

For the subdivision of the larger erf 8741, a main foul sewer pump station and rising main were installed in the first half of 2025. This installation has been completed, inspected and signed off by NMBM.

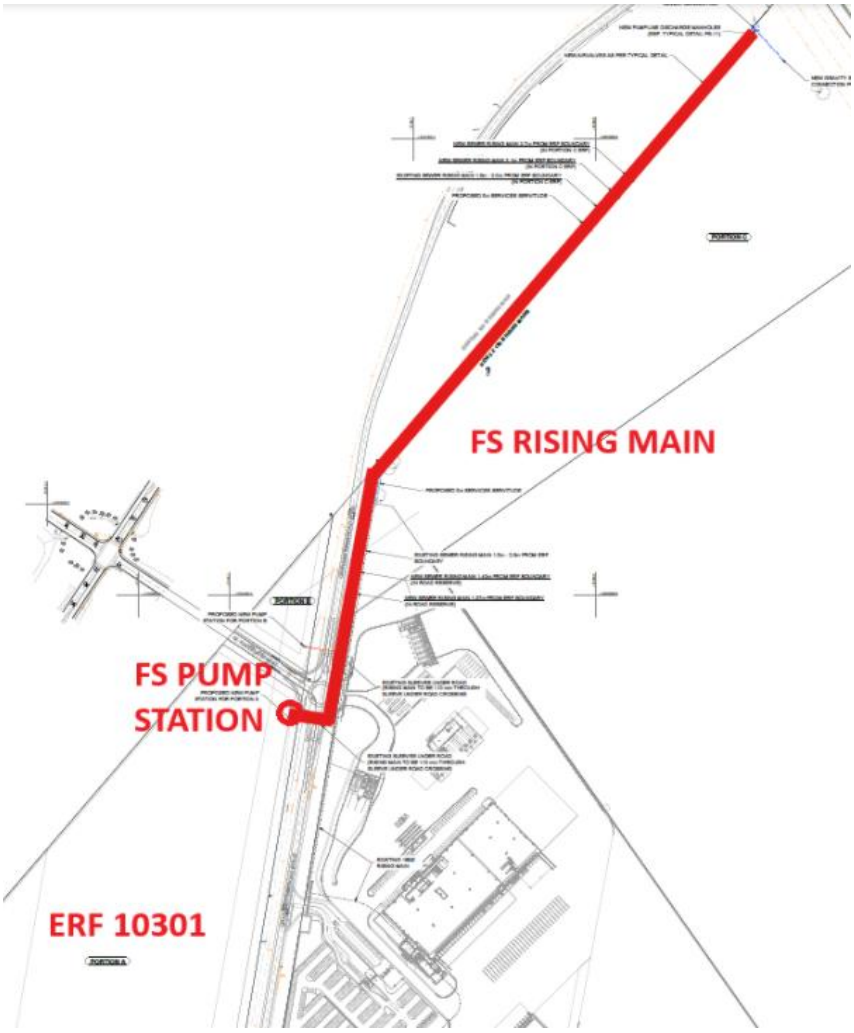

Figure 5: Existing sewer pump station and rising mains

6.2 Internal Sewage Network

Due to the flatness of the area, each of the 6 sites will have it's own sewer collection sump and pump station lifting the sewer and discharging into the main sewer pump station.

The internal sewer network for the individual sites will consist of a 160mm diameter uPVC Class 34 pipe network and round precast fibre cement manholes.

The development will generate the following sewage flows:

- Annual Average Daily Sewage Yield: 70670 litre per day
- Peak Daily Wet Weather Sewage Yield: 2.82 l/s

(*refer to* ***Appendix D***)

The bedding and blanket material for the internal sewage pipe trenches will be selected bedding sand from trench excavations on site or imported clean sand from commercial sources. The bedding material will comply with SANS 1200 regulations for Class C bedding and blanket. Manholes will be precast fibre cement solid shaft type.

7. WATER RETICULATION

7.1 Existing Bulk Municipal Network

An existing 300mm diameter municipal watermain run inside the R102 road reserve. The main metered water connection for Erf 10301 will be from this line.

7.2 Internal Water Reticulation Network

The proposed internal water reticulation network will consist of a 160mm diameter metered connection splitting into two separate lines: a 160mm diameter uPVC Class 16 for fire and a 110mm diameter uPVC Class 12 for potable water. The fire water line will be fitted with a suction hydrant, non-return valve and twin booster connection. There will also be central fire/sprinkler tanks for the Industrial Park. A third fire sprinkler line will run from the tanks to the 6 erven.

The estimated water demand from the development will be:

- Gross Annual Average Daily Demand: 88409 litre per day
- Instantaneous Peak Demand: 3.07 l/s

(refer to ***Appendix E****)*

Please note: Allowance was made for fire flows, but the internal fire water reticulation will be designed by a Fire Consultant and does not form part of the civil engineering scope of works.

The bedding and blanket material for the ring main and connections will be selected from trench excavations on site or clean sand imported from

commercial sources. This material will comply with SANS 1200 regulations for Class C bedding and blanket.

8. CONCLUSION

This report confirms that Civil Engineering bulk Services are available or could be made available for this development, and that the development is supported from a Civil Engineering perspective.

Report by:

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for KLS Consulting
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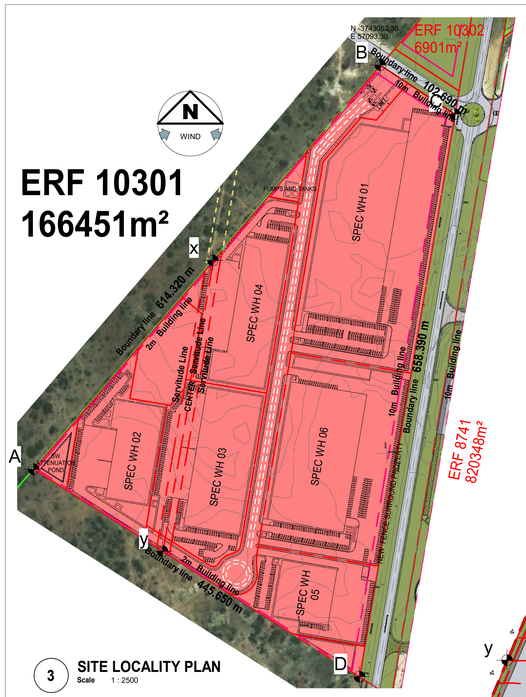
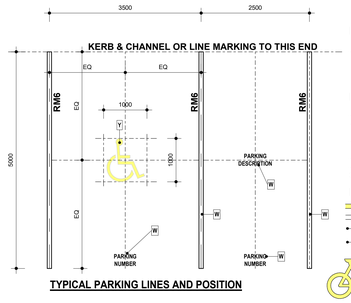
082 780 2000

APPENDIX A

Site Development Plan



3 **SITE LOCALITY PLAN**
Scale 1 : 2500



TYPICAL PARKING LINES AND POSITION

NOTE :

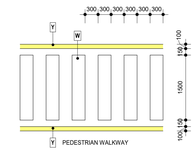
- ALL TRAFFIC SIGNS AND ROADMARKINGS TO COMPLY WITH SARTSM AND APPLICABLE ROAD TRAFFIC REGULATION (ACT 93 OF 1996)

NOTES ON ROADMARKINGS PAINT:

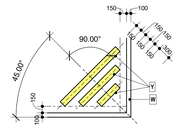
- PAINT MUST COMPLY WITH SABS 731.
- PAINT CONTAINER MUST HAVE A SABS MARK OF APPROVAL.
- THE WORDS 'ROAD MARKING PAINT' MUST BE PRESENT ON THE CONTAINER.
- APPLICATION - 0.42 l/sqm.
-ROAD MARKINGS AROUND ANY COLUMNS OR KERBS TO HAVE A 150mm OFFSET

LEGEND :

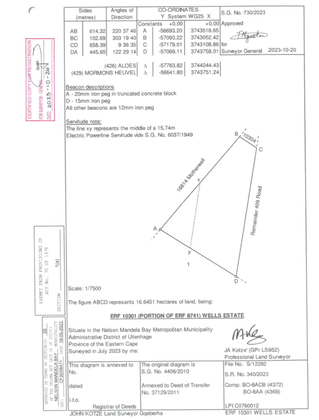
- YELLOW PAINT MARKINGS
- WHITE PAINT MARKINGS
- YELLOW PAINT MARKINGS
- WHITE PAINT MARKINGS
- BIKE SYMBOL
- LOW EMISSIONS CARS
- BIKE PARKING



WALKWAY PAINT MARKING DETAILS



TYPICAL PAINTED ISLAND MARKINGS



SCHEDULE OF RIGHTS

USE ZONE	OFFICE (G1)	
INDUSTRIAL 1	WAREHOUSE (J2)	
SITE AREA	166451 m²	
BULK AREA	67376 m²	
DENSITY	N/A	
ZONE		
BUILDING LINES	6	m along street boundaries
	16	m R21 EXPRESS
	30	R21 NATIONAL ROUTE
	N/A	m along *
HEIGHT ZONE	21	m
	3	storeys

COVERAGE	PERMISSIBLE		ACTUAL	
	100 %	166451 m2	44.26 %	73674 m2
	ratio		ratio	
F.A.R.	0.7	116515.7 m2	0.405	67376 m2
	ratio		ratio	
F.S.R	0	0 m2	0	0 m2
HEIGHT	3 storeys		2 storeys	
FAR			COV	

	WAREHOUSE	OFFICES	TOTAL	COVERAGE
SPEC WH 05	3774	1084	4858	4735
SPEC WH 06	14787	1280	16067	17795
SPEC WH 01	17686	1230	18916	20848
SPEC WH 02	5509	1063	6572	6396
SPEC WH 03	9915	1161	11076	12125
SPEC WH 04	8510	1061	9571	10939
GH	140	0	140	145
PUMP HOUSE	118	0	118	118
PRECINCT GH	58		58	573
TOTAL			67376	73674

PARKING RATIO	bays per 100	square meters	bays required
OFFICE (G1)	4	6879	275.16
WAREHOUSE (J2)	1	60181	601.81
	0	0	0
	0	0	0
PARKING	REQUIRED		PROVIDED
	876.97 bays		877 bays

GENERAL NOTES

ALL WORKS TO COMPLY WITH SANS 10400 OR BY RATIONAL APPROVED DESIGN TO COMPLY WITH FOLLOWING GUIDELINES

B: Structural Design SANS 10400-B, *Structural design*
C: Dimensions SANS 10400-C, *Dimensions*
D: Public Safety SANS 10400-D, *Public safety*
F: Site Operations SANS 10400-F, *Site operations*
G: Excavations SANS 10400-G, *Excavations*
H: Foundations SANS 10400-H, *Foundations*
J: Floors SANS 10400-J, *Floors*
K: Walls SANS 10400-K, *Walls*
L: Roofs SANS 10400-L, *Roofs*
M: Stairways SANS 10400-M, *Stairways*
N: Glazing SANS 10400-N, *Glazing*
O: Lighting and Ventilation SANS 10400-O, *Lighting and ventilation*
P: Drainage SANS 10400- P, *Drainage*
Q: Non-water-borne Means of Sanitary Disposal
SANS 10400-Q, *Non-water-borne means of sanitary disposal*
R: Stormwater Disposal SANS 10400-R, *Stormwater disposal*
S: Facilities for Persons with Disabilities SANS 10400-S, *Facilities for persons with disabilities*
T: Fire Protection SANS 10400-T, *Fire protection*
V: Space Heating SANS 10400-V, *Space heating*
W: Fire Installation SANS 10400-W, *Fire installation*

NOTE: COVERAGE TO BE UPDATED ON APPROVAL OF PRELIMINARY REVISED LAYOUT.

MICRO LOCALITY PLAN

MICRO LOCALITY PLAN

revision	date	drawn	description
G	2025.10.01	SM	ISSUED FOR SDP SUBMISSION
F	2025.09.19	SM	ISSUED FOR INFORMATION
E	2025.09.18	SM	ROADWAY, PLANTING,SW ATTENUATION AND SERVICES SITE AREA TAGS ADDED
D	2025.09.05	SM	REVISED TO INCLUDE PLANTING ON GC ZONE
C	2025.07.22	SM	ISSUED FOR INFORMATION
B	2025.07.15	SM	ISSUED FOR SDP SUBMISSION
A	2025.06.12	SM	ISSUED FOR SDP SUBMISSION

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P.O Box 5176, Rivonia,2128 info@espaces.co.za www.espaces.co.za

client: EQUITES
signature

project: PROPOSED NEW INDUSTRIAL PARK

stand number: ERF 10301,WELLS ESTATE SOUTH, GQEBERHA

engineer
contact
signature

project architect: Terence Shacklady
contact: terence@espaces.co.za
signature

drawing description: SITE PLAN

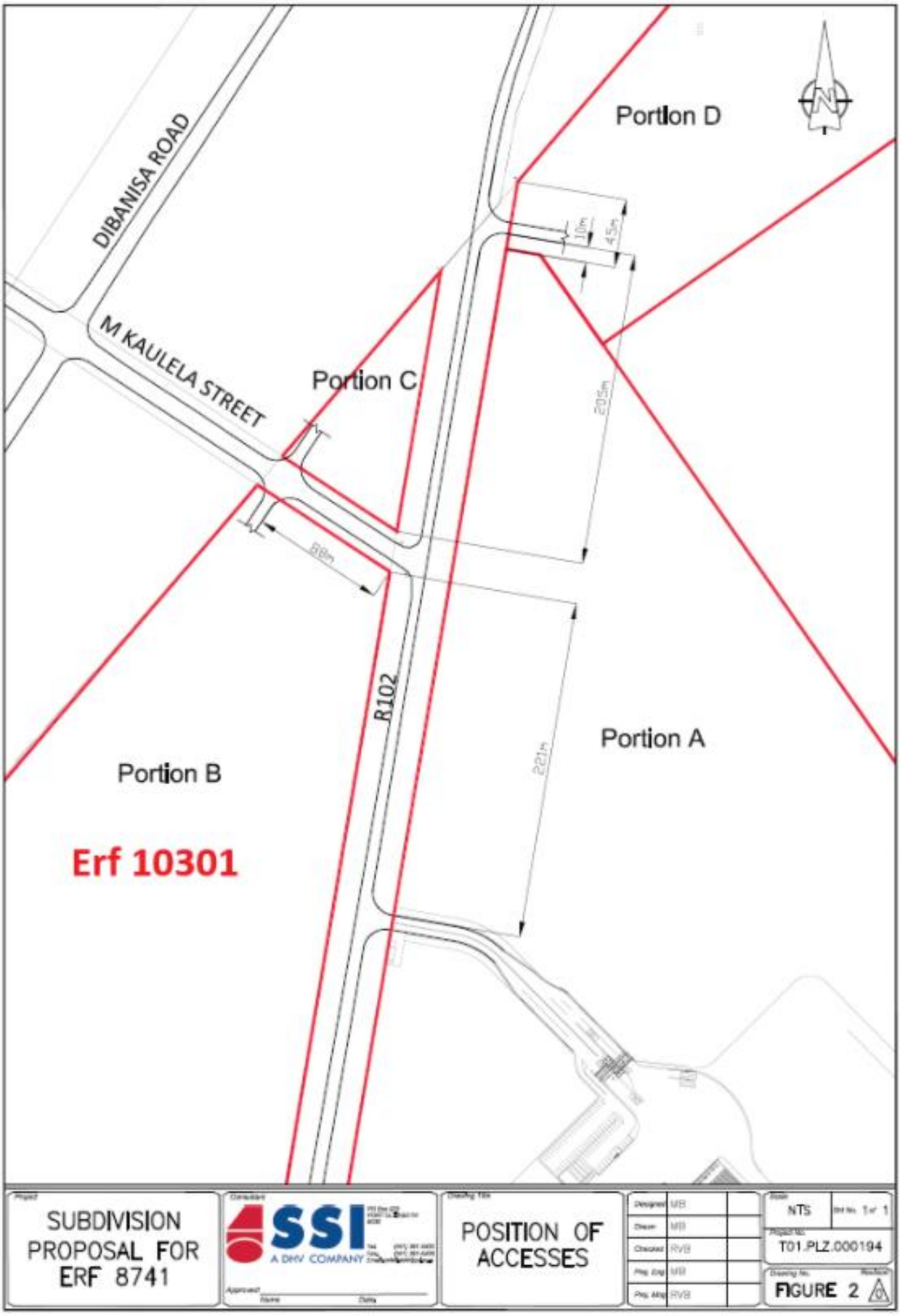
job number	drawing number
P039	SDP-0000
A0	drawn: HS; scale: As indicated; date: 2025.06.03

revision number	issued for
G	INFORMATION

20250716151746

APPENDIX B

Site Access


DIBANISA ROAD
M KAULELA STREET
Portion D
Portion C
Portion A
Portion B
Erf 10301
R102
10m
4.5m
205m
68m
221m
N
SUBDIVISION PROPOSAL FOR ERF 8741
SSI
A DHV COMPANY
POSITION OF ACCESSES
NTS
T01.PLZ.000194
FIGURE 2

APPENDIX C

Preliminary Stormwater Calculations

CONSULTING ENGINEERS
progress delivered

POST DEVELOPMNET FLOOD RUNOFF CALCULAITONS

Project no:	25067		
Project:	Erf 10301, Wells Estate		
Calculation Method:	Rational, Alternative 3		
Calculated by:	TK		
Date:	2025/10/2		
Checked By:	HK		Rev A
Date:	2025/10/2		

Catchment characteristics (All methods)

Description of catchment	Warehouse & Loading Yard, primarily impermeable surface
Name of watercourse (If applicable)	

Physical characteristics			Meteorological characteristics		
Size of catchment (A)	0.166	km^2	Rainfall region:		
Longest watercourse (L)	0.550	km	SAWS Rainfall Grid Coordinates	33°50' S; 25°37' E	
Average slope (S_{av})	0.010	m/m	Nearest Weather Station number	N/A	
Dolomitic area ($D_{\%}$)	0%	%	Mean annual precipitation (MAP)	423	mm
			2-year return period daily rainfall (M)		mm
Area distribution factors			Days of thunder per year (R)	3	days/year
Rural (α)	Urban (β)	Lakes (γ)	Notes:		
0.000	1.000	0.000			

Time of concentration (T_c) (All Methods)

Overland/Sheet flow $(= P_{IT} \times ARF_T)$		Defined watercourse		Notes:
$T_c = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$		$T_c = \left(\frac{0{,}87L^2}{1000S_{av}}\right)^{0.385}$		Minimum Tc of 15minutes (0.25 hours).
				Choose Between Defined and Overland for TC
0.250	hours	0.250	hours	

Catchment run-off coefficients (Rational Methods)

Rural				Urban			
Surface slope	**%**	**Factor**	**C_S**	**Description**	**%**	**Factor**	**C_S**
Vleis and pans (<3%)	0.0%	0.03	0.000	Lawns in sandy soil, flat grade(<2%)	10.00%	0.10	0.010
Flat Areas (3-10%)	0.0%	0.08	0.000	Lawns in sandy soil, steep grade(>7%)	0.00%	0.20	0.000
Hilly (10-30%)	0.0%	0.16	0.000	Lawns in heavy soil, flat grade(<2%)	0.00%	0.17	0.000
Steep Areas (>30%)	0.0%	0.26	0.000	Lawns in heavy soil, steep grade(>7%)	0.00%	0.35	0.000
Total	0.0%	-	0.000	Residential: Houses	0.00%	0.50	0.000
Permeability	**%**	**Factor**	**C_p**	Residential: Flats	0.00%	0.70	0.000
Very permeable	0.0%	0.04	0.000	Light industry	50.00%	0.80	0.400
Permeable	0.0%	0.08	0.000	Heavy industry	0.00%	0.90	0.000
Semi-permeable	0.0%	0.16	0.000	Business complexes in the city centre	0.00%	0.95	0.000
Impermeable	0.0%	0.26	0.000	Business complexes in suburban areas	0.00%	0.70	0.000
Total	0.0%	-	0.000	Street area	40.00%	0.95	0.380
Vegetation	**%**	**Factor**	**C_v**	Maximum Flood	0.00%	1.00	0.000
Thick bush and plantation	0.0%	0.04	0.000	Total (C_2)	100.00%	-	0.790
Light bush and farm-lands	0.0%	0.11	0.000	Notes:			
Grasslands	0.0%	0.21	0.000				
No vegetation	0.0%	0.28	0.000				
Total	0.0%	-	0.000				

Adjustment of run-off coefficients (Rational Methods)

Return period (years), T	2	5	10	20	50	100	
Rural run-off coefficient, C_1 $(C_1 = C_S + C_P + C_V)$	0.000	0.000	0.000	0.000	0.000	0.000	
Adjustment of above for dolomitic areas, C_{1D} $\left(= C_1(1 - D_{\%}) + C_1 D_{\%}\left(\sum\left(D_{factor} \times C_{S\%}\right)\right)\right)$	0.000	0.000	0.000	0.000	0.000	0.000	
Adjustment factor for initial saturation of rural areas, F_t	0.750	0.800	0.850	0.900	0.950	1.000	
Adjusted rural run-off coefficient, C_{1T} $(= C_{1D} \times F_t)$	0.000	0.000	0.000	0.000	0.000	0.000	
Combined run-off coefficient, C_T $(= \alpha C_{1T} + \beta C_2 + \gamma 1)$	0.790	0.790	0.790	0.790	0.790	0.790	

Flood run-off: Rational method (Alternative 3)

Return Period (years), T	2	5	10	20	50	100	
Point rainfall (mm), P_T	8.5	12.5	15.7	19.1	24.1	28.5	33.3
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	34.00	50.00	62.80	76.40	96.40	114.00	
Area reduction factor (%), ARF_T	100	100	100	100	100	100	
Average intensity (mm/hour), I_T	34.00	50.00	62.80	76.40	96.40	114.00	
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3{,}6}$	1.24	1.82	2.29	2.78	3.51	4.15	

APPENDIX D

Sewer Yield Calculations

Item no	Description	Total no. of units	Area (m²)	Sewage Yield per day			TOTAL (litre)
				Per unit litre/100m²/day	Per unit litre per unit	Per person litre per person	By area/ number
1	Warehouse Facility		26 174	270	- -	 -	70 670 - -

Annual Average Daily Sewage Yield (AADSY) **70 670 l/day**

Maximum Flow over 24 hour day = daily flow/daily hours/60/60 **2.45 l/s**

Peak Factor = 1

Peak Daily Dry Weather Sewage Yield (PDDWSY) **2.45 l/s**

Infiltration = 15%

Peak Daily Wet weather Se **2.82 l/s**

Design Methodology:

a) Units: Yield in litre per unit per day - SANS 10252-1 and CSIR Red Book Table C.1 Chapter 10 Appendix C
b) Peak factor calculation: The flow from Industrial Developments are contra-cyclical from residential:
c) Calculations based on an 8 hour day
d) Assume infiltration of 15%: During Heavy Rainfall in Winter

APPENDIX E

Water Demand Calculations

Item no	Description	Total no. of units/staff	Area (m^2)	Water demand per day			TOTAL (litre)
				Per unit litre/100m^2/day	Per unit litre per unit	Per person litre per person	By area/ number
1	Warehouse Facility		29 470	300			88 409 - -

Gross annual average daily water demand (GAADD) **88 409 l/day**

Max. Demand over 24 hour day = daily demand/daily hours/60/60 **3.07 l/s**

Instantaneous Peak Demand {P(i) = 1} **3.07 l/s**

Fire Flow (Fire Engineer to confirm) **25.00 l/s**

Design Methodology:

a) Units: Yield in litre per ha per day - SANS 10252-1 and CSIR Red Book Section J.4, Table J.2 & J.4

b) Peak factor calculation: The flow from Industrial Developments are contra-cyclical from residential (zero peak).

c) Water demand based on an 8 hour day

d) Fire Flow (Moderate Risk): 6000l/min for 4 hours = 25 l/s *(Fire Engineer to confirm)*