Date: 17 June 2025
CHEL File: CHEL-UCE-WWTW-Volume-001
Client File: UCE-George-CHEL-WWTW-Volume-001

Urban Front Developers
George
Western Cape
South Africa

Email: info@urbanfront.co.za
Cell: +27 72 503 1922

Attention: The Developer, Mr. Shaun Gomez

Dear Sir's.

RE: ERF 19374 BLANCO, GEORGE – WASTEWATER TREATMENT PLANT- VOLUME REPORT:

With reference to the attached letter from GLS Infrastructure Planning Consultants, dated 20th of March 2023, addressed to Ms Lindsay Mooiman, with Heading: WATER AND SEWER MASTER PLANS: DEVELOPMENT OF PROPOSED TOWNSHIP/REZONING – GEORGE ERF 19374 (URBAN COUNTRY ESTATE)

This is a technical report that provides clarity over the planned wastewater treatment works for the Urban Country Estate, based on the two (2) options the municipality provided to the developer with respect to the lack of wastewater services by the Municipality. This report provides the Volumes estimates for the estate and plant.

The below table outlines the water demand for the development and sewer return contribution as confirmed by the Engineers from GLS.

2.2 Revised Water Demand

The combined AADD for the proposed development as originally calculated and used in the analysis of the water distribution network in the master plan was 52.3 kL/d (theoretical demand).

The revised AADD, peak flow and fire flow calculated for the proposed development and used in this re-analysis of the water distribution network is 63.6 kL/d.

- Peak flow using a zone peak hour factor of 3.6‡ = 2.65 L/s
- Fire flow (Cluster housing > 30 units/ha) using a peak hour factor of 2.0 = 20 L/s @ 10 m
  (Note: Flow provided at 1 fire hydrant)

‡ Higher peak flow factors might be applicable for internal networks.

Extract from the GLS Engineer's report

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Land Use		Unit of measure (No/100m2/ha…)	No. Units (No/100m2/ha…)	UWD/unit (kL/unit/d)	Sewer ratio (% x UWD)	AADD Inc. UAW (kL/d)	PDDWF Excl. Infilt. (kL/d)
Phase 1			**Estimated Start Date: 01-Aug-23**		**Estimated Occupation Date: 26-Apr-24**		
T 2	Single Storey Residential (309m² Ave Erf size)	unit	17	0.556	70%	9.44	6.61
T 4	Double Storey Residential (452m² Ave Erf size)	unit	5	0.833	55%	4.17	2.29
Sub-Total			**22**			**13.61**	**8.90**
Phase 2			**Estimated Start Date: 23-Jan-24**		**Estimated Occupation Date: 30-Nov-24**		
T 2	Single Storey Residential (309m² Ave Erf size)	unit	8	0.556	70%	4.44	3.11
T 3	Single Storey Residential (415m² Ave Erf size)	unit	19	0.722	60%	13.72	8.23
Sub-Total			**27**			**18.17**	**11.34**
Phase 3			**Estimated Start Date: 01-Jul-24**		**Estimated Occupation Date: 30-May-25**		
T 2	Single Storey Residential (309m² Ave Erf size)	unit	6	0.556	70%	3.33	2.33
T 3	Single Storey Residential (415m² Ave Erf size)	unit	9	0.722	60%	6.50	3.90
T 4	Double Storey Residential (452m² Ave Erf size)	unit	13	0.833	55%	10.83	5.96
Sub-Total			**28**			**20.67**	**12.19**
Phase 4			**Estimated Start Date: 13-Jan-25**		**Estimated Occupation Date: 01-Dec-25**		
T 1	2 Bedroom Flats (70m² Ave Floor size)	unit	40	0.278	90%	11.11	10.00
Sub-Total			**40**			**11.11**	**10.00**
Total			**117**			**63.6**	**42.4**

2.3 *Revised Sewer Flow*

The combined peak day dry weather flow (PDDWF) for the proposed development as originally calculated and used in the analysis of the sewer system in the master plan was 42.7 kL/d (theoretical flow).

The revised PDDWF (excluding infiltration) calculated for the proposed development and used in the re-analysis of the sewer system is 42.4 kL/d. The design flow, or instantaneous peak wet weather flow (IPWWF), is 1.22 L/s.

Extract from the GLS Engineer's report

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

We have adopted the Engineers recommendations to the George Municipality as the Volumes for the Development. The reticulation services were designed in accordance with these volumes.

The below Summary for the wastewater treatment plant:

Daily estate sewer Volume:	42.4 kl/ day
Daily treatment capacity of	54 kl/ day
Safety factor:	21.48%
Total Plant Tank Volume:	189 kl
Total Annual Treatment Volume:	19 710 kl
Toilet Usage as a percentage of an Average Daily Household usage:	40%
Daily Recycling Volume:	16.96 kl
Total Irrigation Area:	5 556m²
Average Irrigation Volume for typical lawns:	25mm / week
Average Daily irrigation volumes for typical lawns:	3.57mm/ day
Average Volume of water per m² irrigated daily	3.57 litre/m²
Excess Volume of water to be stored daily:	5 605 Litres
Average evaporation rate in a pond in South Africa:	1400 to 2800mm / year
Average daily evaporation rate in a pond in South Africa:	4mm to 8mm / day
Average Volume of water evaporated daily	4 to 8 litres /m²
Pond Minimum Surface area:	195 m²
Average Wind Speed for George:	11.83km/hr
Average Humidity for George:	66%
Average Mean Temperature for George:	17.6 degrees
Estimated average daily evaporation:	1 485 litres per day
Estimated average daily evaporation:	7.6 litres /m²
Annual Sewer collection from Estate:	15 476 kl
Total Annual Treatment Volume of the Plant:	19 710 kl
Total Annual Recycling Volume:	6 190 kl
Total Annual Irrigation Volume:	7 239 kl
Total Annual Storage Volume:	2 045 kl
Total Annual Evaporation Volume:	542 kl

Your Sincerely

Henco Scholtz
Director
CHEL Building & Civil Services
Cell: 082 881 5456
Email: henco.chel@gmail.com

Date: 19th of June 2025
CHEL File: CHEL-UCE-George-PDR-002
Client File: UCE-George- Design Report-02

George Municipality
No 71 York Street
Po Box 19
George
Western Cape
6530

Phone: 044 801 1567
Email: jkoegelenberg@george.gov.za

Attention: The Director Human Settlements, Planning and Development – Mr. Jannie Koegelenberg

Dear Sir's.

RE: BULK ENGINEERING SERVICES DESIGN REPORT – URBAN COUNTRY ESTATE ON REMAINDER ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374 – HEATHER PARK; GEORGE

Henco Scholtz *(ND Civil)*
Director
CHEL Building & Civil Services
Cell: +27 82 881 5456
Email: henco.chel@gmail.com

Louis Fourie *(Pr Eng)*
Managing Member
Newground Projects
Cell: +27 82 576 6828
Email: louis@newground.co.za

Wesley Jevon *(C Eng)*
Design Engineer
Newground Projects
Cell: +27 61 383 834
Email: wesley@newground.co.za

REVISION 02 – 19 June 2025

Table of Contents

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

List of Figures

List of Tables

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

1. INTRODUCTION

1.1 Background

Urban Country Estate (Pty) Ltd. has appointed CHEL Building & Civil Services as Civil Engineers for the proposed development of the Urban Country Estate in Heather Park, near Blanco, George.

Urban Country Estate (Pty) Ltd has acquired the remainder portion ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374 and is planning a private gated development with seventy (70) freehold units and forty (40) complex rental units on this property.

This development requires various civil services that must be approved by George municipality. The proposed designs were done in accordance with George Municipality and/or other relevant regulations.

1.2 Objectives

This report sets out the proposed civil engineering bulk infrastructure which will be necessary to service this development of (70) freehold units and forty (40) complex rental units.

1.3 Scope of Works

The scope of work for this phase of the development will consist of the following:

- Construction of new roadways;
- Construction of new internal water reticulation pipework;
- Construction of new internal waterborne gravity sewer network;
- Construction of a wastewater treatment package plant facility;
- Construction of macerator pumping station with high pressure rising main.
- Construction of new internal stormwater network.
- Construction of new stormwater retention dam and cascading structure to transport stormwater from the development into the Malgas river.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

2. Site Conditions

2.1 Location

The Urban Country Estate is located at the Eastern end of Plantation Road next to the N12 main roadway in George, Western Cape. The general location can be seen in Figure 2-1 which shows the location of the settlement relative to its surroundings and major roadways. The coordinates for the site are 33°56'48"S, 22°25'38"E.

Figure 2-1: Satellite image showing the site location

2.2 The Development Site

The site is situated on the face of a hill sloping in a South-Easterly direction down towards a non-perennial river. The stormwater which is to be expected on the site will thus flow in a South-Eastern Direction towards the river. The site is currently covered by vegetation which will need to be cleared prior to construction.

The total area which the development will comprise of is approximately 6.88ha which equates to 68 800m2. The slope on which the site is situated has an average gradient of 12% and a maximum of approximately 30% which is located near the non-perineal watercourse.

The development will consist of 79 erven, accessed by means of two new roadways, as well as one high-density complex.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

2.3 Existing Services

Existing services layouts for the George area directly opposite the site was obtained from the offices of GLS Consulting Engineers in Stellenbosch, with approval from Land Development Manager for Civil Engineering Services of the George Municipality.

There is a 450mm ø Dia GRP water pipeline that runs across the proposed development site that was installed within the road reserves of the LAPSED ERF 19374 site development layout.
(Refer to Picture 5 below)

The site development plan has been adjusted to accommodate the pipe alignment along the main entrance road and have minimal impact on the estate and the planned sites. As far as practically possible and as required, extra supporting filling or cover protection will be provided to clearly demarcate this pipe service.

The pipe will be opened by hand in designated areas to allow visual contact with the pipe to instil an awareness for the pipe with the contracting team throughout the Civil Infrastructure construction process.

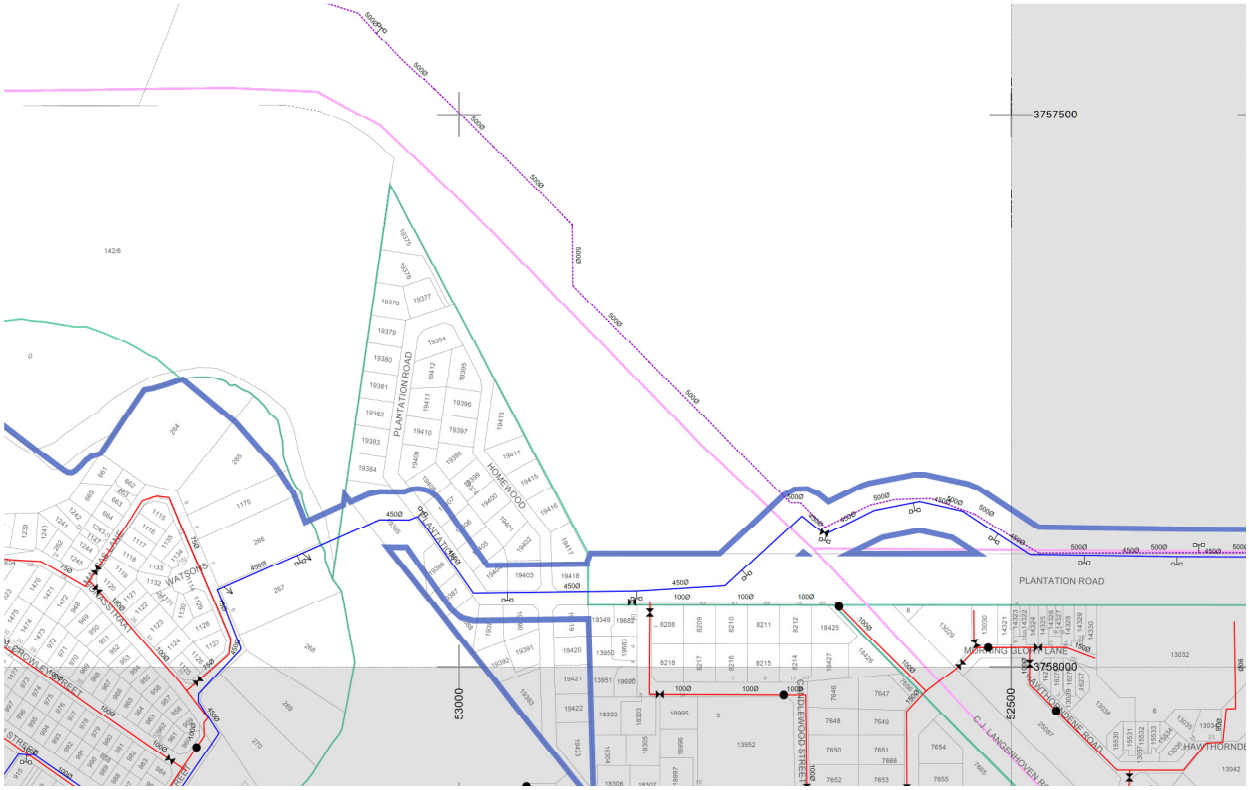
2.3.1 Water Supply

The closest existing municipal water main is a Ø100mm pipeline located in Plantation Road. Although GLS Consulting Engineers indicated that there is another Ø90mm water main which is a midblock water supply line, with a pump station in the neighbouring Heather Park, Homewood Development, Tommy Joubert Laan, that is near the South-eastern end of the planned development that can be connected to, we are of the opinion that it is sufficient to connect only to the Ø100mm pipeline in Plantation Road.

It was confirmed in a letter from the Director of Civil Engineering Service of the George Municipality, dated 13th February 2025 that the access to the Municipality water network would be permitted after the first quarter of 2025 when the treatment works will have sufficient capacity for the development in its entirety once the ±20Ml/day capacity upgrade is commissioned.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 2-2: Municipal Water Layout



The site currently has no existing services. It is, however, situated between two developed areas which have water and sewer services as well as residential roadways. The site can be accessed via two residential roads, namely Legion and George Street.

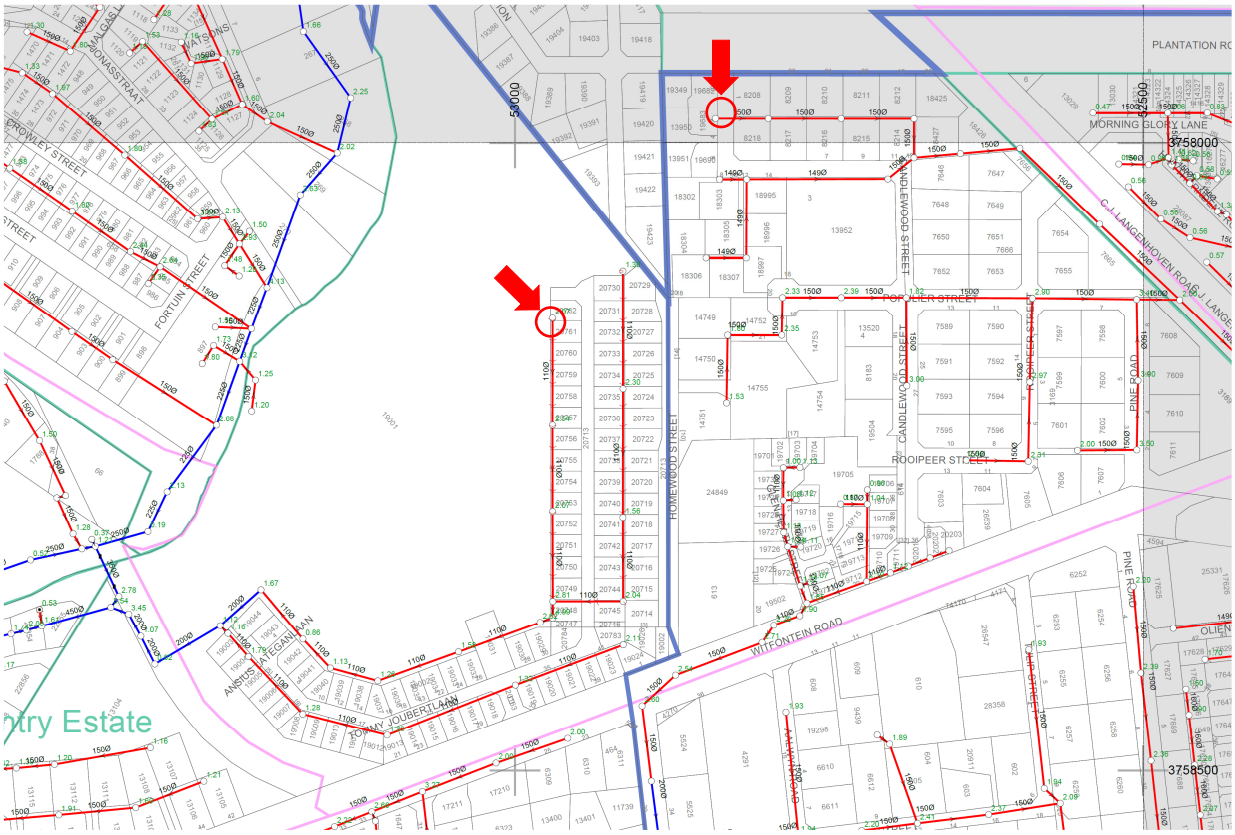
2.3.2 Sewerage

GLS Consulting Engineers indicated in 2022, that there are two (2) Sewer points that can be connected into. The planning was that this would be required in order to accommodate the lower, south-eastern part of the planned estate to the connection point in the neighbouring Heather Park, Homewood Development, Tommy Joubert Laan. The connection is a 110mm diameter sewer main. As confirmed with GLS Consulting Engineers, at the time, the connection of the planned phase one (1) of the development consisting of twenty-two (22) units will not exceed the hydraulic flow of this network system.

The planned 2nd connection that would connect the planned phase two (2), three (3) and four (4) and is located along the Candlewood Street, off from Plantation Road. This connection is a Ø150mm pipe. Again, as confirmed the hydraulic flow of this network would not be exceeded with the connection of the estate to this part of the network. *(Refer to Picture 7 below)*

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 2-3: Municipal Sewer Layout



It was however confirmed in a letter from the Director of Civil Engineering Service of the George Municipality, dated 13th February 2025 that the Gwaing Wastewater Treatment facility of the Municipality was operating under constraint. The 3.5Ml/day capacity upgrade was completed, however the treatment works however continues to operate under constraint and will only have sufficient capacity for the development in its entirety once a further 10Ml/day capacity upgrade is commissioned. The implementation date of this project is currently unknown. The upgrade is currently within the design stage and undergoing the required environmental processes.

The Municipality proposed two (2) Alternative Options:

<u>Alternative Proposal 1:</u>

The developer will be permitted to construct a conservancy tank, where practically possible to service parts of the development, in lieu of a connection to the Municipal network, and a discharge permit shall be issued permitting discharge of sewage at the Outeniqua WWTW. The developer will be fully responsible for the removal of the sewage, and cost thereof to the WWTW.

Due to the extent of the development the proposal is not practical but could be considered for very limited parts of the development, subject to the approval of the Municipality and the Developers capacity to service the conservancy tanks.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3. Design Overview

3.1 Baseline Assumptions

The proposed development is a private, gated residential estate consisting of seventy (70) freehold units and forty (40) complex rental units on this property. The planned development will consist of the following residential units and in mix relationship:

Table 3-1: Erven Breakdown

Item	Unit Description	Ave ERF Size	Ave FLOOR Size	No of Units	Ownership
1	2 Bedroom – 1 Bathroom Semi-detached Flat Units	-	70 m²	40	Rental Units
2	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	309 m²	160 m²	19	Freehold Title
3	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	415 m²	175 m²	32	Freehold Title
4	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	400 m²	160 m²	13	Freehold Title
5	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	452 m²	180 m²	6	Freehold Title
				110	

The average occupational density will be around 2.8 people per unit, lower than the national average of households. The development would cater for the medium income group and will fall within the development category 3 & 4 for services due to the lower-than-average occupational density per household. The average erf size is 381m².

The water demand and sewer return flow contribution of the proposed development was obtained from GLS Consulting Engineers and is outlined in the table below:

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 3-1: Water Demand and Sewer Run-off

Land Use		Unit of Measure (No/100m²/ha....)	No of Units (No/100m²/ha....)	UWD/ Unit Kl/unit/day	Sewer Ratio % x UWD	AADD Inc UAW kL/day	PDDWF Excl. Infilt. kL/day
Phase 1			**Estimated Start Date: 2nd Feb 2026**			**EstimatedOccupation Date: 02nd Nov 2026**	
T2	Single Storey Residiential (309m² Ave ERF Size)	Unit	12	0,566	70%	6,79	4,75
T4	Double Storey Residiential (454m² Ave ERF Size)	Unit	8	0,833	55%	6,66	3,67
Sub Total			**20**			**13,46**	**8,42**
Phase 2			**Estimated Start Date: 01st Jul 2026**			**EstimatedOccupation Date: 06th Apr 2027**	
T2	Single Storey Residiential (309m² Ave ERF Size)	Unit	5	0,566	70%	2,83	1,98
T3	Single Storey Residiential (415m² Ave ERF Size)	Unit	17	0,722	60%	12,27	7,36
Sub Total			**22**			**15,10**	**9,35**
Phase 3			**Estimated Start Date: 11th Jan 2027**			**EstimatedOccupation Date: 01st Oct 2027**	
T2	Single Storey Residiential (309m² Ave ERF Size)	Unit	4	0,566	70%	2,26	1,58
T3	Single Storey Residiential (415m² Ave ERF Size)	Unit	20	0,722	60%	14,44	8,66
T4	Double Storey Residiential (454m² Ave ERF Size)	Unit	4	0,833	55%	3,33	1,83
Sub Total			**28**			**20,04**	**12,08**
Phase 4			**Estimated Start Date: 01st Jul 2027**			**EstimatedOccupation Date: 01st Dec 2027**	
T1	2 Bedroom FLats (70m² Ave Floor Size)	Unit	40	0,278	90%	11,12	10,01
Sub Total			**40**			**11,12**	**10,01**
TOTAL			**110**			**59,72**	**39,85**

The AADD, peak flow and fire flow calculated for the proposed development is 63.60 kl/d.

- Peak flow using a zone peak hour factor of 3.6‡ = 2.48 L/s
- Fire flow (Cluster housing > 30 units/ha) using a peak hour factor of 2.0 = 20 L/s @ 10 m

(Note: Flow provided at 1 fire hydrant)

The George Municipality Civil Engineering Services Standards requires that provision be made for 15% extraneous flow in the sewer network. The Peak Wet Weather Flow (PWWF) is therefore equal to 39.85 kl/d.

The PDDWF (Excluding infiltration) calculated for the proposed development is 39.85 kl/d. The design flow, or instantaneous peak wet weather flow (IPWWF) is 1.15 L/s

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

3.2 Water Reticulation

The reticulation main that will be used for this development will be a Ø110mm class 9 uPVC pipe. This will connect to the existing Ø100mm municipal watermain in Plantation Road.

The DWAF Technical Guidelines for the Development of Water and Sanitation Infrastructure (DWAF, 2004) were consulted when considering the maximum allowable velocities.

The maximum and minimum allowable pipe velocities, according to the (DWAF, 2004) document, are indicated in

Table 3-2.

Table 3-2: Design Velocity Limits as per DWAF

Flow Type	Allowable Velocity
Minimum Raw water	0,6 m/s
Minimum Treated water	0,3 m/s
Maximum DPFR for Reticulations	1,5 m/s
Maximum Pump suction inside station	2,0 m/s
Maximum Design flow in Bulk Supply	3,0 m/s
Maximum Scour flow in Pipelines	5,0 m/s

Under normal flow conditions (no scour valve or hydrant open), the velocity limits according to

Table 3-2 are indicated as a minimum of 0.3 m/s (treated water) and a maximum of 1.5 m/s.

When considering what type of flow to design for, we suggest looking at the maximum DPFR for Reticulations when there are no scour valve or fire hydrant open and looking at the maximum Scour flow when either a scour valve or fire hydrant is opened. The reasoning behind classifying the type of flow as scour flow when a hydrant is open, is because the nature of a hydrant is much more in line with a scour valve than it is to normal flow conditions.

3.2.1 Fire Flow

The fire flow rate was obtained from GLS Consulting Engineers as (Cluster housing > 30 units/ha) using a peak hour factor of 2.0 = 20 L/s @ 10 m. This is based on the assumption that only 1 hydrant will be opened at a time. The velocities indicated in

Table 3-3 are based on the flow conditions when the development is fully developed.

The table shows the velocities within the pipe for two separate cases, namely:

- At normal design flow rate.
- When a hydrant is open in conjunction with the design flow rate.

Table 3-3: Water Reticulation Pipe Velocities

Pipe Size	Velocity without a hydrant	Velocity with a hydrant
Ø110mm	0.32 m/s	2.44 m/s

When comparing these velocities with that of

Table 3-2, we can see that the velocity under normal flow conditions is just above the prescribed minimum of 0,3 m/s. The velocity when a fire hydrant is opened is also below the prescribed maximum of 5 m/s.

As such we recommend that a Ø110mm class 9 main pipe should be installed for the internal reticulation.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3.3 Sewer

The proposed development will be provided with a conventional waterborne sanitation system. The system will consist of separate connectors to individual erven. The reticulation network will gravitate to the lowest suitable collection location in the respective designed phases into a macerating lift pump station chamber within the estate from where the sewerage would be pumped via high-pressure HDPE pipelines to the wastewater treatment package plant facility.

The macerating pump station chambers would have a capacity of approximately 8 hours peak flow and will have alternating redundancy pumps and a back-up generator to ensure continuous operations. These chambers will be wet wells with submerged pumps and control valves, placed in waterproof underground tanks/ chambers. These have been placed in accessible locations to allow for periodical servicing by appointed specialist.

All internal sewer reticulation pipelines will be Ø160mm class 34 uPVC pipes. All house connection pipes will be Ø110mm uPVC pipes. The minimum slopes on the sewer reticulation pipelines are indicated in the table below.

Table 3-4: Sewer Pipe Slopes

Dwelling units	Minimum Slope
Less than 6	1:80
6 to 10	1:100
11 to 80	1:120
81 to 110	1:150
111 to 130	1:180

Given the flat terrain and the presence of the existing municipal Ø450mm GRP water main, the sewer reticulation system was designed in two distinct zones, each draining to its respective lowest collection point. The network was configured to meet the minimum municipal-specified gradients where necessary while ensuring a self-cleansing flow where feasible. This approach also minimized the overall depth of the sewer network and macerating pump station chambers, improving both construction efficiency and long-term maintenance accessibility.

The decision to implement two smaller pump stations was further guided by the availability of readily accessible replacement pumps within the George area. The macerating pumps selected for the system are expected to operate within the 1.5 to 2.0 kW range.

The table below shows the number of different types of erven serviced by the sewer pipeline as well as the resulting flow rate between sewer structures.

Table 3-5: Sewer Run-off

Pipe		**Property Type**				**PWWF**
Start	**End**	**Type 1**	**Type 2**	**Type 3**	**Type 4**	**(l/s)**
RE01	MH01		1		3	0,051
MH01	MH02				2	0,078
MH02	MH03			1	4	0,143
MH03	MH04			2	1	0,182
MH04	MH05			6		0,257
MH05	MH06			6		0,332
MH06	MH07			3		0,370
MH07	MH20					0,370
MH20	PS02					0,791
PS02	MH22					**0,791**

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Pipe		Property Type				PWWF
Start	End	Type 1	Type 2	Start	End	(l/s)
MH13	MH14		4	2	1	0,084
MH14	MH15		4	3		0,168
MH15	MH16		4	3		0,251
MH16	MH17					0,251
MH17	MH06			1		0,264
RE04	MH18	16				0,115
MH18	MH19	2				0,129
RE10	MH23	4				0,029
MH23	MH24					0,086
MH24	MH19					0,143
MH19	MH20					0,158
RE07	MH23	4				0,029
RE08	MH23	4				0,029
RE05	MH24	4				0,029
RE06	MH24	4				0,029
RE02	MH19	2				0,014
RE02	MH09				6	0,080
MH09	MH10				4	0,133
MH10	MH25				3	0,267
MH25	PS01					0,267
PS01	MH22					**0,267**
RE03	MH11			3		0,038
MH11	MH12		5			0,095
MH12	MH10					0,095

No stormwater runoff from any property would be permitted into the sewer system. Regular audits would be conducted to ensure compliance.

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

3.3.1 Wastewater Treatment Option 2

Municipal Alternative Proposal 2:

Alternatively, design, implement, operate and maintain an on-site wastewater treatment package plant. The Developer should however note the requirements in terms of the National Water Act and registration as a Water Services Intermediary with the Municipality for compliance monitoring.

The Developer should note that this proposal includes the added advantage of treated effluent that could potentially be used for non-potable use that will reduce the potable water demand and associated development changes etc.

For this alternative the developer will have to indicate whether this is a temporary arrangement, or if the longer-term intention will be to connect to the municipal sewer system once capacity becomes available at the Gwaing WWTW.

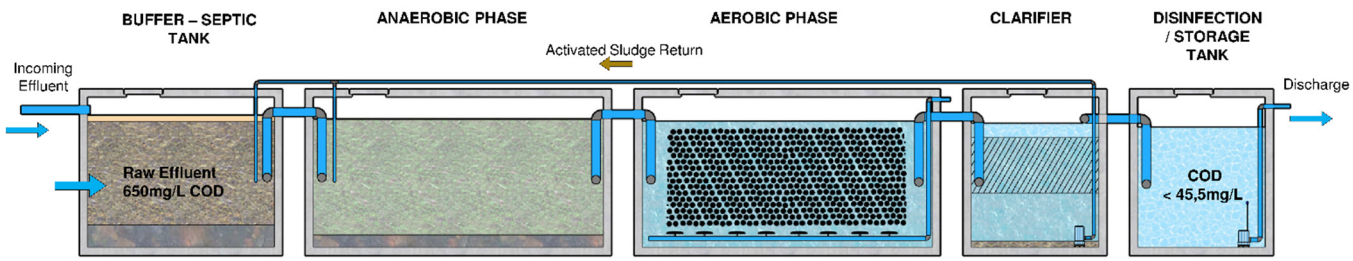
The Developer has appointed the Engineer to assess the Alternatives offered by the Municipality in paragraph 2.3.2 above

The Engineer has advised the Developer to use the Alternative Proposal 2 for a Permanent Long-term solution for the entire development. The report deals with the details of such a proposed wastewater treatment package plant within the perimeter of the development.

The preferred system is an activated sludge/ extended aeration plant with an aerated submerged bio-contactors process. It is further required due to the fact that the plant would be inside a residential development to be a completely covered underground tank system. The wastewater treatment package plant to consist of the following processes:

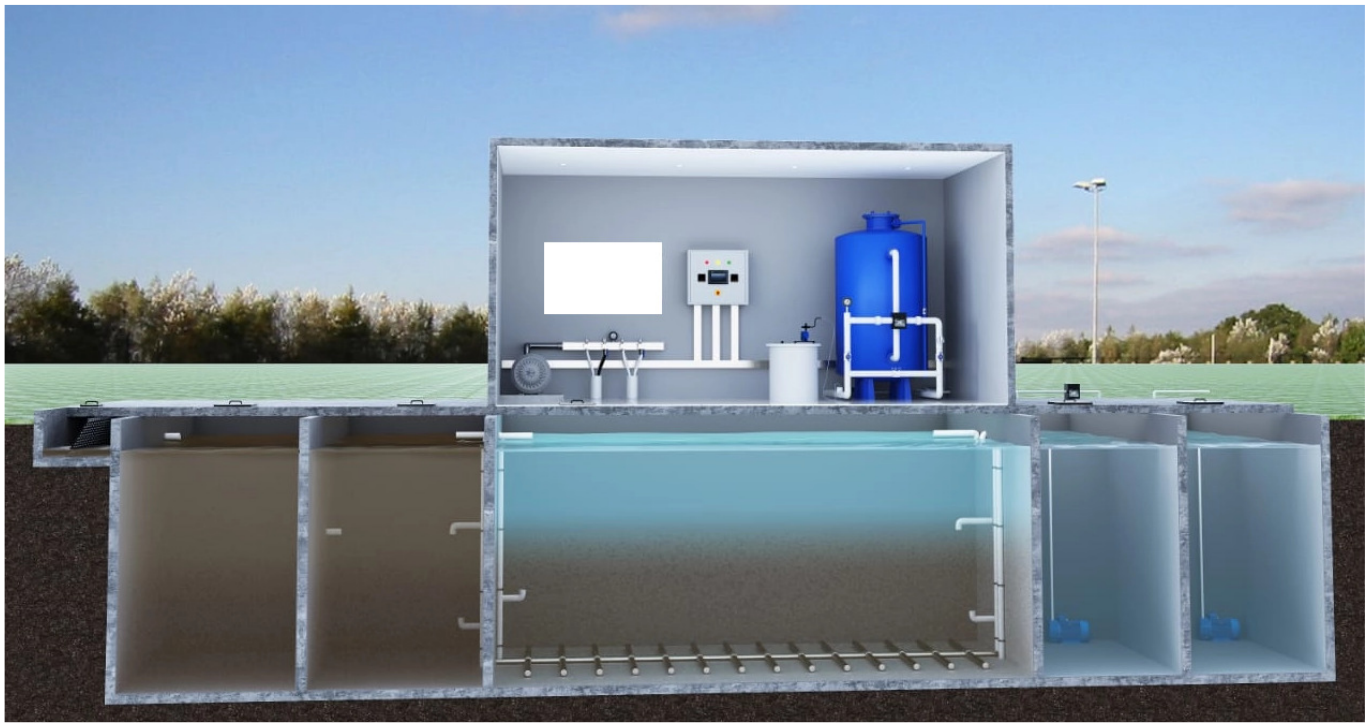
- Fine mesh Inlet screen.
- Buffer/ Balancing Anaerobic Tank
- Anaerobic Tank
- Aerobic Tank
- Clarifier Tank
- Disinfection/Storage Tank

Figure 4-2: Wastewater Treatment Process Flow



CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 5-3: Typical Wastewater Treament Plant Cross Section



The treatment capacity of the plant must be to the DWS Special Limits specification. It is further planned that water recycling would form part of the development's water use network in a separate waterpipe network to reuse the water for toilet flushing and irrigation.

The plant will be walled off with 2.4m Boundary walls, with access control vehicle gate from inside and outside the Estate.

The planned decentralized Wastewater Treatment (WWT) package plant will cater for the entire residential development. The influent would therefore have typical residential characteristics. A typical domestic sewage or a wastewater with a high domestic component will have typical characteristics, as shown below:

- BOD (as O^2) 250 to 350 mg/l
- COD (as O^2) 500 to 700 mg/l
- Settleable solids 8 to 10 ml/l
- Suspended solids 200 to 350 mg/l
- TKN 60 to 85 mg/l
- Ammonia (NH4 + -N) 40 to 50 mg/l
- Phosphate (P) 10 to 13 mg/l

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

An increase in concentrations should be anticipated with seasonal changes.

It will be required that a Long-Term Agreement (> 10 years) be signed with an independent service provider to perform the required, Daily, weekly & monthly management, operations and maintenance of the facility. It is further proposed that a Tri-party agreement be entered in between the A) Developer/ HOA; B) Municipality; C) Independent Service provider. This agreement to bind the parties to a mutual understanding of the roles and responsibilities of each party within the agreement.

The wastewater treatment plant will confirm to the Special Limit standards as per the National Water Act 36 of 1998.

In accordance with Section 2.7 discharging of domestic and industrial wastewater into water resources, clause (ii) discharges up 2000m³/day into a listed water resource set out in Table 2.3 that complies to:

a) *Complies to special wastewater limits as set out in Table 2.1.*
b) *Does not alter ambient water temperature of the receiving water resources by more than 2 degrees Celsius*
c) *Is not complex industrial wastewater*

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 6-4: Wastewater Treatment Process Flow

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

3.3.2 Wastewater Treatment Plant Process

Preliminary Treatment:

Solids Fine Mesh Screen:

Incoming effluent flows through a manually cleaned screen, where grit is collected, and non-biodegradable solids are manually raked off. The solids removed will be treated with lime and placed in drying bags and removed periodically.

Buffer or Flow Equalisation tank:

The buffer tank or flow equalisation tank assists with balancing incoming peak flows to avoid surges in the plant. Since flows are highly variable through the day it is important to install a flow equalization tank. This usually takes the form of a 12-hour retention tank from which the domestic wastewater is fed to the plant at a constant rate using a pump. This tank also forms part of the anaerobic/anoxic process.

Primary Treatment:

Phase 1 – Anaerobic/Anoxic:

The anaerobic/anoxic zone receives wastewater after manual screening via the buffer tank. The main function of this zone is to reduce nitrate to nitrogen gas (denitrification) while removing some carbonaceous materials. The anaerobic digestion also serves as separation of solids from liquids, a dual function which allows for settlement of solids and the other solids like oils, fats and greases will float to surface.

Phase 2 – Aerobic:

Aerobic zones follow the first anoxic zone where oxidation of remaining carbonaceous materials and ammonia to nitrate take place. Specially designed plastic carrier elements are in the aerobic zones to provide a large surface area for the attached biomass to grow, In the aerobic zones, fine-bubble aeration provides the oxygen required for the aerobic reaction, as well as airflow required to maintain plastic media in suspension.

Secondary Treatment:

Phase 3 – Clarification/Settling:

Effluent flows from the MBBRIFAS reactor zones to the secondary clarifier unit which gravity-settles the suspended biomass and inert solids to achieve the required effluent TSS limits. The settled activated sludge is returned via pre-timed pump process to the first phase Anaerobic zone, where it will activate and prime the incoming effluent. This process is referred to as Return Activated Sludge (R.A.S.)

Phase 4 – Disinfection

Elimination of pathogens using automated chlorination takes place before discharge.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Supplementary Treatment:

Bacterial Dosing:

The anaerobic and aerobic processes are enhanced by dosing of a blend of bacterial enzyme Biozyme products. These processes stimulate and accelerate the natural processes described previously.

De-sludge Process:

A sludge pump will be installed on the clarifier tank, which will pump excess sludge from the sludge blanked periodically into Bidem type bags, allowing the liquid to flow back into the plant through a sieve, thus reducing the transportable weight. Sludge management will be done in the form of chemical bacteria dosing, however Periodic sludge removal will be required and will be undertaken as required during maintenance contract period. This sludge removal process is only expected to be required every few years.

Discharge of Treated effluent/ Planned Effluent Re use:

As part of the estate's responsible development philosophy, a comprehensive water recycling system is planned to optimize resource efficiency and reduce potable water consumption. Treated wastewater will be reused for toilet flushing and garden irrigation, significantly lowering overall freshwater demand.

According to national water use statistics, toilet flushing accounts for approximately 30–40% of a household's daily water consumption. To facilitate this sustainable initiative, a dedicated recycled water supply network will be installed throughout the estate, ensuring efficient distribution to individual homes. All toilets will be connected to this separate water supply, distinct from other sanitary fixtures, with each unit receiving a metered connection to monitor recycled water usage. The reticulation main that will be used for this purpose in the development will be a Ø75mm class 10 HDPE pipe. This will connect to each House through a 20mm HDPE pipe connection.

In addition to toilet flushing, recycled water will be allocated for garden irrigation, supporting landscape maintenance while further reducing reliance on potable water.

To enhance the overall water quality within the estate, maturation ponds will be incorporated in line with national guidelines for package treatment plants. These ponds will serve both functional and aesthetic purposes, forming integrated water features within the estate's green areas. Any treated effluent not directly recycled will be pumped into these ponds, where surface water fountain systems will provide aeration, further improving water quality. Additionally, natural surface evaporation will play a role in further reducing excess water volumes.

This integrated approach to water management supports long-term sustainability, enhances the estate's environmental footprint, and provides a visually appealing landscape feature for residents.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3.3.3 Odour Control

The anaerobic/anoxic chambers will be equipped with breather stack pipes designed to direct any odours upward and away from the plant. Given the plant's covered underground design, odour impact on residents is expected to be minimal, especially when compared to other open-vented systems available on the market. This specific plant and technology have been carefully selected to mitigate odour nuisance effectively, ensuring a more discreet and environmentally considerate solution.

The drying bags in which the removal of non-biodegradable solids would be placed will be treated with lime and kept in shaded covered areas and removed periodically to a licenced waste facility.

3.3.4 Electricity Supply & Noise control

The wastewater treatment package plant technology selected for the development was considered with the following criteria, Simplicity, Effectiveness, reduced operational cost, reduced electricity consumption and lower noise emissions. The plant will have a consumption of less than 30kW/h power consumption. The plant will be supported by a Silent Standby Generator that will be housed in the Control Building together with the other electrical blowers and control panels, to further reduce the sound impact. The generator will allow uninterrupted power supply.

The pumps and blowers will be set on timers and float switches to run at predetermined timeframes

3.3.5 Operations & Maintenance

Operations

The plant will be operated by the Technology Suppliers Team in line with the supplier's operational procedures. A full-time plant operator/supervisor will be appointed to attend to the daily, weekly and monthly operations of the plant. The plant will be fitted with GSMM/ IOT interface notifications to the management team of the technology suppliers, who will have remote operational capabilities. The Plant is designed around redundancy and spare pumps and equipment will be kept on site. Record keeping of the plant operation is part of the process and these files will be kept on site. The Developer/ HOA will ensure compliance to all procedures and report on this to the Municipality & Department.

Maintenance

Strict maintenance programs will be followed in line with the technology supplier's operational procedures and maintenance specifications. This will include both preventative and repair maintenance. This will be done periodically and recorded and the records kept on site and reported.

3.3.6 Frequency of Monitoring

Grab samples will be taken monthly in all cases and will be analysed in an accredited laboratory. Monitory/ sampling to be done at:

- Treated wastewater at the point it leaves the package plant;
- Up and downstream of any discharge to a water resource;
- and at points up and downstream of an irrigation area if irrigation takes place within 100 m of a water resource.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3.3.7 Quantities disposed

The quantity of the treated wastewater disposed of must be metered daily and the daily totals recorded weekly in all cases. Record keeping to also include the following:

- quantity of treated wastewater disposed of;
- quality of treated wastewater disposed of;
- and failures or malfunctions in the system and details of actions taken to rectify the problem.

Treated effluent conforming to Special Limits standards could be stored in the provided pond on site. The pond will be aerated by means of floating water fountain/s. Estimated time period for water within the pond would be in excess of 30 days.

Figure 7-5: Typical aeration with floating water fountain

Special limit effluent further aerated in a natural pond with reed beds in excess of 30 days would be considered natural water, as the extended detention period further stabilizes the already conforming effluent water. Any discharge, if required would be approximately 1 000 kl / year.

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

3.3.8 Record Keeping

All sampling analysis records must be kept and a 6-monthly report containing details of the following must be submitted to the responsible authority:

- quantity of treated wastewater disposed of;
- quality of treated wastewater disposed of;
- and failures or malfunctions in the system and details of actions taken to rectify the problem.
- Daily logs must be kept and condensed in a monthly format.

3.3.9 Effluent Quality Requirement.

Treated effluent will conform to the Special Limits of the National DWS Standards.

Table 3-6: DWS Special treatment limits for wastewater

Substance	Parameter	Special Limit Standards
Faecal Coliforms	/100ml	0
Chemical Oxygen Demand	mg/l	30*
pH		5.5-7.5
Ammonia (ionised and deionised) as N	mg/l	2
Nitrate/ Nitrite as Nitrogen	mg/l	1.5
Chlorine	mg/l	0
Suspended Solids	mg/l	10
Electrical conductivity	mS/m	50 mS/m to max of 100
Ortho-phosphate as Phosphorous	mg/l	1 median and 2.5 max.
Fluoride	mg/l	1
Soap, oil or grease	mg/l	0
Dissolved Arsenic	mg/l	0.01
Dissolved Cadmium	mg/l	0.001
Dissolved Chromium	VI mg/l	0.02
Dissolved Copper	mg/l	0.002
Dissolved Cyanide	mg/l	0.01
Dissolved Iron	mg/l	0.3
Dissolved Lead	mg/l	0.006
Dissolved Manganese	mg/l	0.1
Mercury and it's compounds	mg/l	0.001
Dissolved Selenium	mg/l	0.02
Dissolved Zinc	mg/l	0.004
Boron	mg/l	0.5

Quality conformance and record keeping will be done as per the stipulations of the National Water Act 36 of 1998. Over and above this the WWTW will utilize the latest instrumentation for real time measure of multiple parameters

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 8-6: Proteus Instruments – Probe and controller

Proteus Water Quality Probe

An award-winning, patented, multi-parameter, real-time sensor platform to accurately and reliably measure BOD, COD, TOC and Coliforms (Total, Faecal or E. coli) in permanent and temporary applications.

The Proteus is the world's first scientifically proven real-time sensor for measuring BOD that can measure a wide range of water quality, environmental and industrial applications. A multiprobe that measures your choice of parameter, all in one package, that can deliver data in the toughest field conditions. The Proteus has been designed for its ease of use, reliable data and economical operation.

Applications

- BOD/COD/TOC Loading to Wastewater Treatment Works
- CSO Monitoring
- Coastal Water Monitoring
- Point Source Pollution Monitoring
- Total Coliform Monitoring (Total, Faecal or E. coli)
- Efficiencies of Wastewater Treatment Works
- Diffuse Pollution Monitoring
- Groundwater Water Quality Monitoring
- Survey tool combined with Bluetooth®
- SCADA, RTU and logger integration via RS232, SDI-12, Modbus® RTU

Parameters include:

BOD* COD* TOC* DOC*
Coliforms (Total, Faecal, E. coli)*
TAN*
Nitrate*
Total Phosphate*
Ortho-Phosphate*
Dissolved Oxygen
Pressure
Chloride
pH
Temperature
Optical Brighteners
ORP / REDOX
Tryptophan
Crude Oil
Refined Oils
Ammonium
EC / Salinity / TDS
Turbidity/TSS
Blue Green Algae (Freshwater & Marine)
Chlorophyll a (red excitation)
Chlorophyll a (blue excitation)
Rhodamine
Fluorescein Dye
CDOM

* Providing local adequate field calibration. Contact us for details.

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Figure 9-7: Proteus Instruments – Derived Parameter Specifications

Derived Parameter Specifications

Parameter		Range	Resolution	Accuracy	Comments
BOD	BOD mg/l	0 - 2000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
Coliform Counts	CFU/100 ml	>1 count/100ml	1 count/100ml	±10 Coliforms*	Local site calibration can improve accuracy. Can be used for faecal coliforms, E. coli or total coliforms.
COD	COD mg/l	0 - 4000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
DOC	DOC mg/l	0 - 3000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
TOC	TOC mg/l	0 - 3000 mg/l	0.01 mg/l	±5 % of reading*	Local site calibration can improve accuracy.
Ammonium (Optical or ISE)**	NH4	0-200 mg/l	0.01 mg/l	±0.1 mg/l 0 -10 mg/l* ±0.5 mg/l 10 - 200 mg/l*	Environmental/river applications typically 0 - 2 mg/l Wastewater applications typically 0 - 50 mg/l
Phosphate**	PO4	0 -100 mg/l	0.01mg/l	±0.1 mg/l 0 -2 mg/l* ±0.5 mg/l 2 -100 mg/l*	Environmental/river applications typically 0 - 1mg/l Wastewater applications typically 0 - 50 mg/l
Turbidity	Total Suspended Solids (TSS)	0 to 500 mg/l	4 digits max 2 d.p.	±2 % of reading or 0.2	Calculated using the correlation between turbidity and a sediment standard or sample. Local calibration can be applied **.

Benefits and Features

The proteus instrumentation allows the plant operators to have Real Time Live updates of the actual plant performance, allowing immediate alterations to be implemented to ensure continued compliance to the regulations. This will be for the first numbers of months of operations be correlated through scientific sampling and testing to establish the correlations and adjust the calibration of the instrumentation.

Electronic, as well as hard copy record keeping of this will be kept on site and stored in a cloud storage facility for reference.

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

3.3.10 Volume Summaries of the WWTW

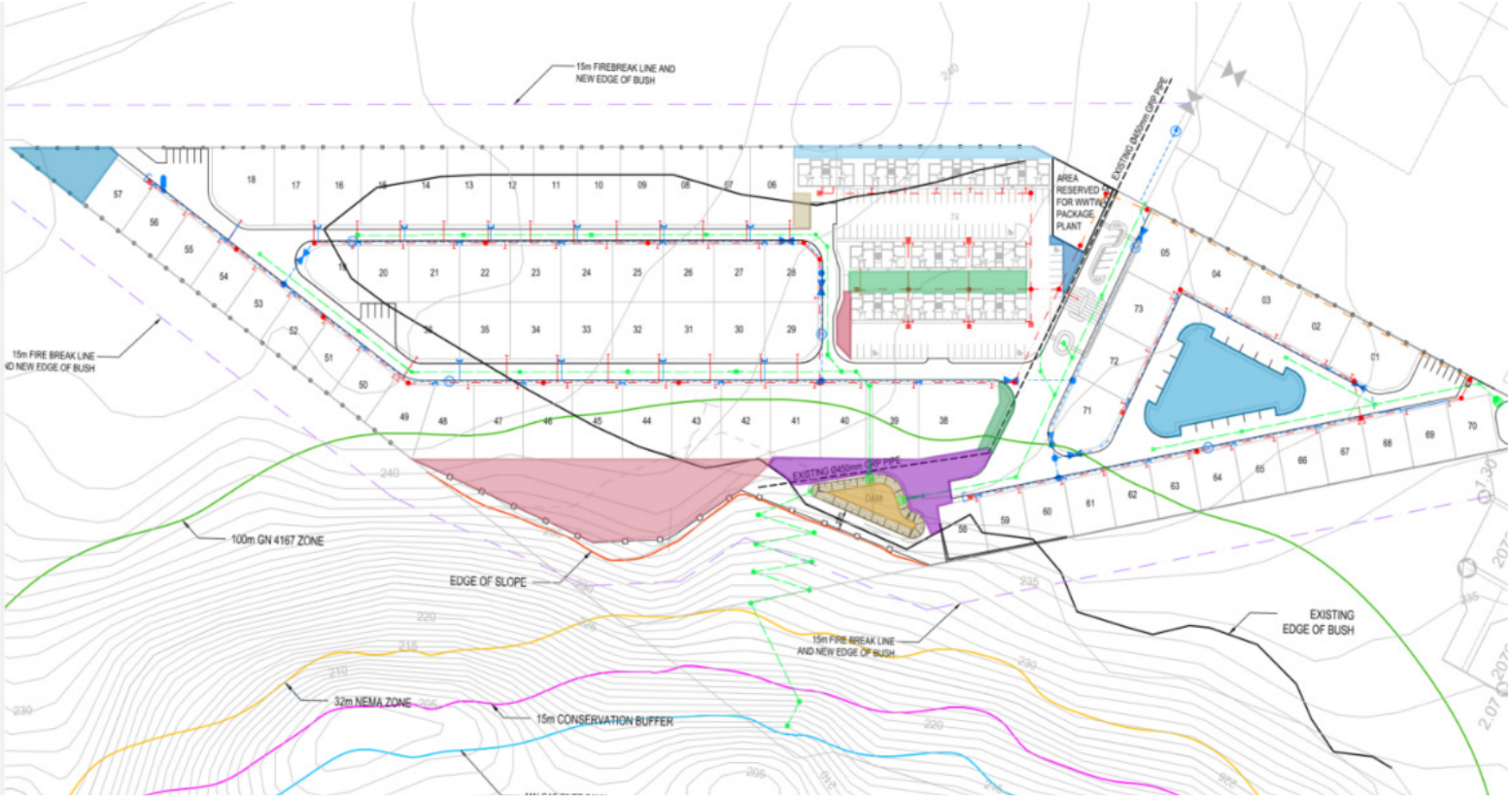
The below Summary for the wastewater treatment plant:

Daily estate sewer Volume:	39.85 kl / day
Daily treatment capacity of	54 kl / day
Safety factor:	25.47%
Total Plant Tank Volume:	192 kl
Total Annual Plant Treatment Capacity Volume:	19 710 kl / year
Toilet Usage as a percentage of an Average Daily Household usage:	35%
Average Daily Recycling Volume:	13.94 kl / day
Total Irrigation Area:	5 933 m²
Average Irrigation Volume for typical lawns:	25mm / week
Average Daily irrigation volumes for typical lawns:	3.57mm/ day
Average Volume of water per m² irrigated daily	3.57 litre / m²
Excess Volume of water to be stored daily:	4 730 Litres
Average evaporation rate in a pond in South Africa:	1400 to 2800mm / year
Average daily evaporation rate in a pond in South Africa:	4mm to 8mm / day
Average Volume of water evaporated daily	4 to 8 litres /m²
Pond Minimum Surface area:	250 m²
Average Wind Speed for George:	11.83km/hr
Average Humidity for George:	66%
Average Mean Temperature for George:	17.6 degrees
Estimated average daily evaporation:	2 137 litres per day
Estimated average daily evaporation:	8.54 litres /m²
Annual Sewer collection from Estate:	14 545 kl
Total Annual Treatment Volume of the Plant:	19 710 kl
Total Annual Recycling Volume:	5 088 kl
Total Annual Irrigation Volume:	7 730 kl
Total Annual Storage Volume:	1726 kl
Total Annual Evaporation Volume:	780 kl

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 10-8: Estate Irrigation Areas

Colour	Name	Unit	Quantity	Type
	Area Tool	m²	401.97	Bill
	Area Tool	m²	1232.43	Bill
	Area Tool	m²	482.47	Bill
	Area Tool	m²	360.79	Bill
	Area Tool	m²	2293.11	Bill
	Area Tool	m²	788.80	Bill
	Area Tool	m²	195.69	Bill
	Area Tool	m²	133.39	Bill
	Area Tool	m²	74.23	Bill
	Area Tool	m²	89.65	Bill
	Area Tool	m²	81.71	Bill
	Area Tool	m²	487.63	Bill



Estate Green Areas where irrigation will be done – Total Area 5 933 m²

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

3.4 Stormwater Drainage

3.4.1 Design Parameters

The stormwater runoff was calculated with a time of concentration of 8 minutes as calculated using the defined watercourse equation as seen below.

$$T_c = \left(\frac{0.87 L^2}{1000 S_{av}} \right)^{0.385}$$

The proposed roads were classified in accordance with TRH26 and are classified as class 5b (Local Street, Residential).

The hardening factors for the pre- and post-development were 0.36 and 0.75 respectively. The 075 hardening factor was calculated by using a hardening factor of 0.36 for all grassed areas and 1.0 for all roof and road areas.

The rainfall intensity was obtained using the Design Rainfall software developed for South Africa by Smithers and Schulze.

3.5 Stormwater Runoff

The stormwater runoff for this development will flow in a Southern direction. The majority of the runoff will be directed into the main attenuation dam located on the western side in the middle of the site. The volume retained will be the difference between the 1:5-year pre-development flood and the 1:50 year post-development flood.

The release rate out of the attenuation pond will be equal to the 1:5-year flood flow rate. This will be released into a cascading structure which will transport it down the steep slope into the Malgas river. The stormwater will be released onto Reno Mattresses at the bottom of the cascading structure to prevent any soil erosion.

The stormwater on the southern side of the development will be attenuated in a smaller pond located in the green zone in the middle of the southern side of the development (Phase 1). The outflow pipe will be directed to the south with an interim headwall located in George Erf 19001. Because of the topography of the site, it is not possible to direct the stormwater back up towards the main pond. Due to the lack of municipal infrastructure to the south of the development, the best solution would be to connect to the stormwater infrastructure of George Erf 19001 once it is developed.

3.5.1 Stormwater Runoff

Table 3- indicates all the catchment areas that contributed to the stormwater runoff of at the parking area. Area 1 is diverted to the main pond in the middle of the site. Area 2 is diverted to the small pond in Phase 1, while area 3 is the stormwater that falls below the roads and is therefore not diverted to any pond but rather runs off uncontrolled.

Table 3-7: Stormwater Runoff for Catchment Areas

Catchment	A (m^2)	Hardening Factor	$Q_{1:50}$ (ℓ/s)	$Q_{Total\ if\ uncontrolled}$	Q_{design} (ℓ/s)
Area 1 (controlled)	24026	1.00	1322.754	1419.310	222.296
	4872	0.36	96.556		
Area 2 (controlled)	6208	1.00	341.785	444.662	95.270
	5191	0.36	102.877		
Area 3 (uncontrolled)	9302	0.36	184.366	184.366	184.366
Total Area	49598	0.75	2047.984	2048.337	501.932

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

4 Internal Road

4.1 Road Classification

The internal roadways within the development will connect to Plantation Road with an access control gate at the entrance.

The proposed roads were classified in accordance with TRH26 and are classified as class 5b (Local Street, Residential).

4.2 Geometric Design

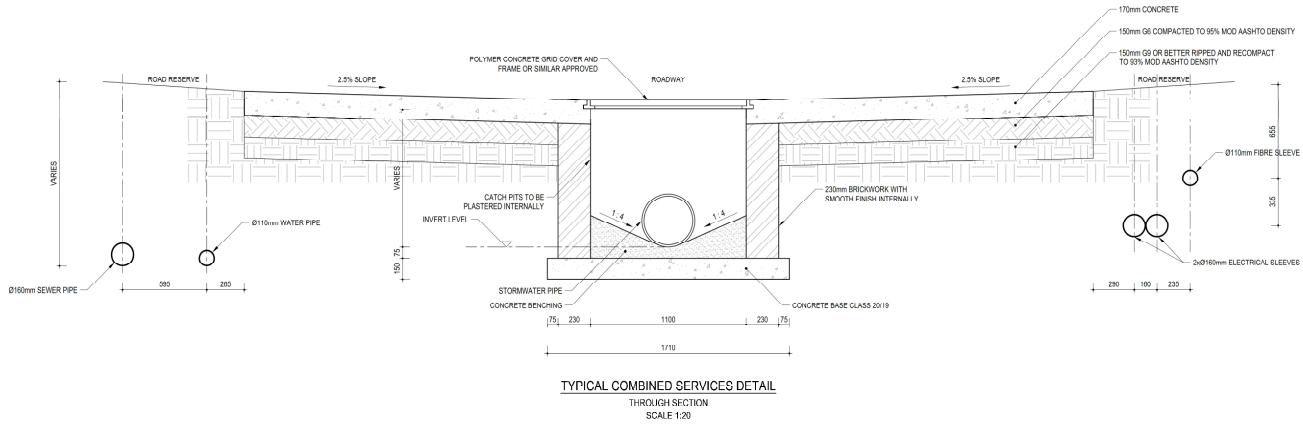
The majority of the roads will be 6m wide (3m per lane direction) with the exception of a 4m wide one-way road on the north-eastern side of the property (Internal Road 3). A one-way road for this section was decided upon for both traffic flow and safety purposes.

4.3 Pavement Design

All internal roads will have a rigid layerworks (concrete) design with the exception of the high-density flats being 60mm interlocking paving. The layerworks design for the concrete road was done based on "A guide to the design of new pavements for light traffic" by Austroads, while the layerworks for the paving was done based on UTG 2 (The Committee of Urban Transport Authorities, 1987:43).

A typical cross-section of the road can be seen in drawing PC22024/CIV/2101.

Figure 11-1: Typical Road Cross Section



CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

5 Bibliography

Chadwick, A., Morfett, J. and Borthwick, M., 2013. *Hydraulics in civil and environmental engineering*. Crc Press.

Committee of Land Transport Officials (COLTO), 1996. *TRH 4: Structural Design of Flexible Pavements for Interurban and Rural Roads.* Department of Transport.

Committee of Transport Officials, 2014. *South African Traffic Impact and Traffic Assessment Standards and Requirements Manual.* South African National Roads Agency Limited.

Roads Coordinating Body (RCB) of the Committee of Transport Officials (COTO), 2012. *TRH 26: South African Road Classification and Access Management Manual.* South African National Roads Agency Limited.

South African National Roads Agency SOC Ltd., 2014. *South African Pavement Engineering Manual*. South African National Roads Agency Limited.

(The Committee of Urban Transport Authorities, 1987), 1987. *UTG 2: Structural Design of Segmented Block Pavements for Southern Africa.* National Institute for Transport and Road Research.

van Vuuren, S.J. and van Dijk, M., 2011. *Waterborne sanitation operation and maintenance guide*. (Committee of Transport Officials, 2014) (Committee of Transport Officials, 2012)

A van Niekerk, A Seetal, P Dama-Fakir, L Boyd and P Gaydon Zitholele Consulting (Pty) Ltd, Golder Associates Africa (Pty) Ltd and Stewart Scott Incorporated. Report to the Department of Water Affairs Guideline document: Package plants for the treatment of domestic wastewater. December 2009

WISA, 1988. Manual for the design of small domestic wastewater works; ISBN-0-620-11110-0; Water Institute of South Africa.

Evaporation Rate Calculator, created by Steven Wooding, reviewers Dominik Czernia, (PhD) and Rijk de Wet, last updated July 30th 2024. https://www.omnicalculator.com/physics/evaporation-rate.

Climates to Travel, World Climate Guide. https://www.climatestotravel.com/climate/south-africa/george

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Annexure A: Locality Plan

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure B: Site Plan

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure C: Water Reticulation Drawings

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure D: Sewer WWT & Reticulation Drawings

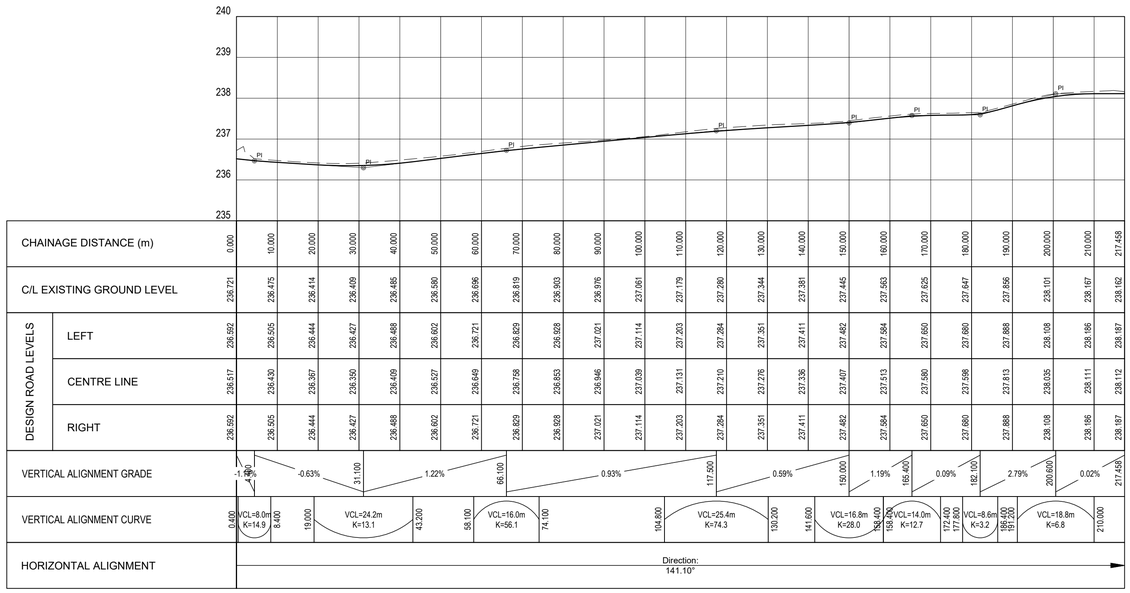
CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure E: Stormwater Drainage Drawings

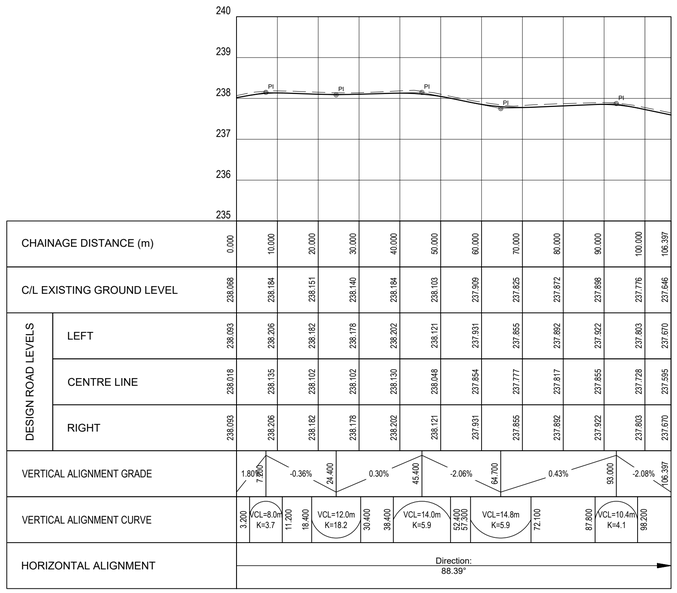
CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure F: Internal Road Drawings

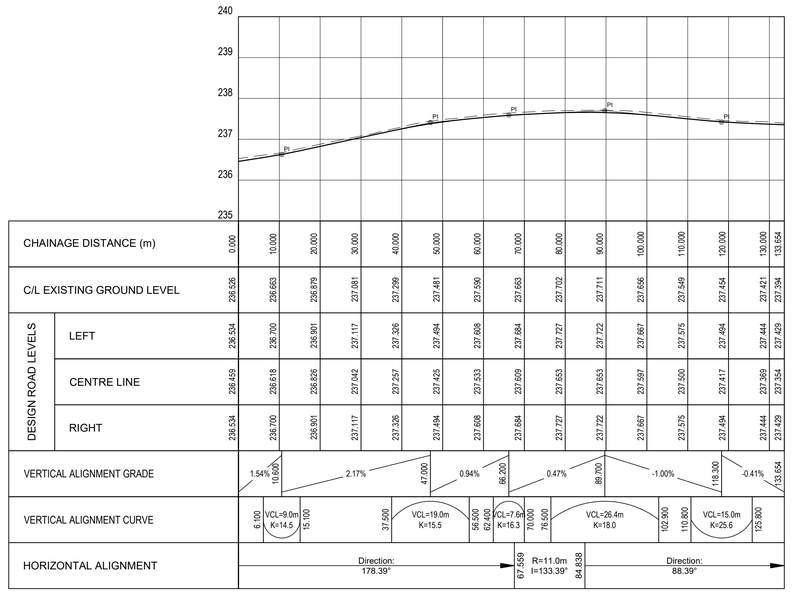
CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com



INTERNAL ROAD 4 LONGSECTION



INTERNAL ROAD 3 LONGSECTION



INTERNAL ROAD 5 LONGSECTION

NOTES:

1. ALL LEVELS ARE TO TOP OF CONCRETE.

PROJECT NUMBER:
PC22024

PROJECT NAME:
URBAN COUNTRY ESTATE

CLIENT:
URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5406

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 10 JULY 2023

DRAWING NAME:
INTERNAL ROADS LONGSECTIONS
SHEET 2 OF 2

DRAWING NUMBER:
PC22024/CIV/2603

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: H1:750V1:75
PAPER SIZE: A1
REVISION: 0C

SIGNATURE:
APPROVED BY ENGINEER:
DATE: 10/07/2023

INTERNAL ROADS LAYOUT

0 8 16 METER

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, DELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:

ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

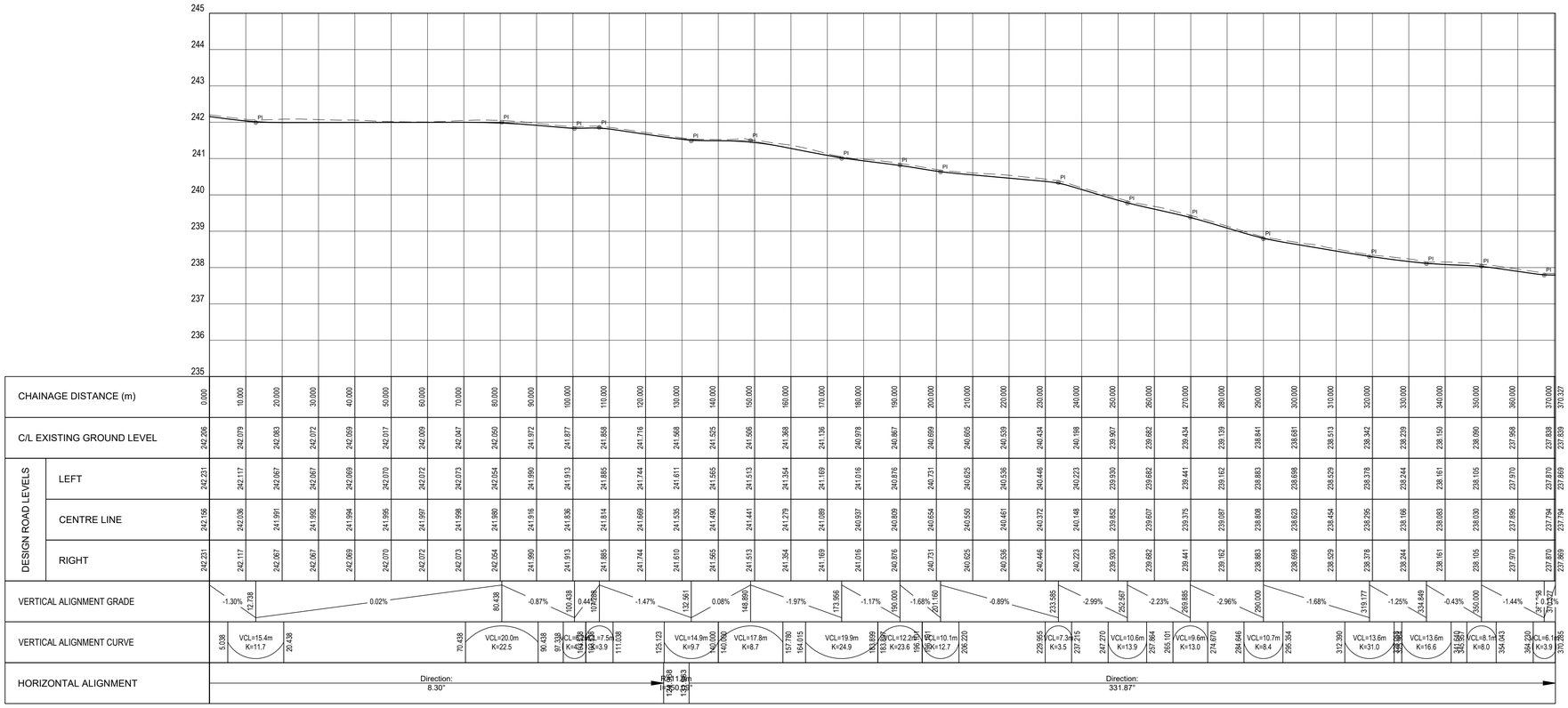
DESIGNER: T de JAGER	DRAFTER: J WEST
REVIEWER: L FOURIE	DATE: 10 JULY 2023

DRAWING NAME: INTERNAL ROADS LAYOUT

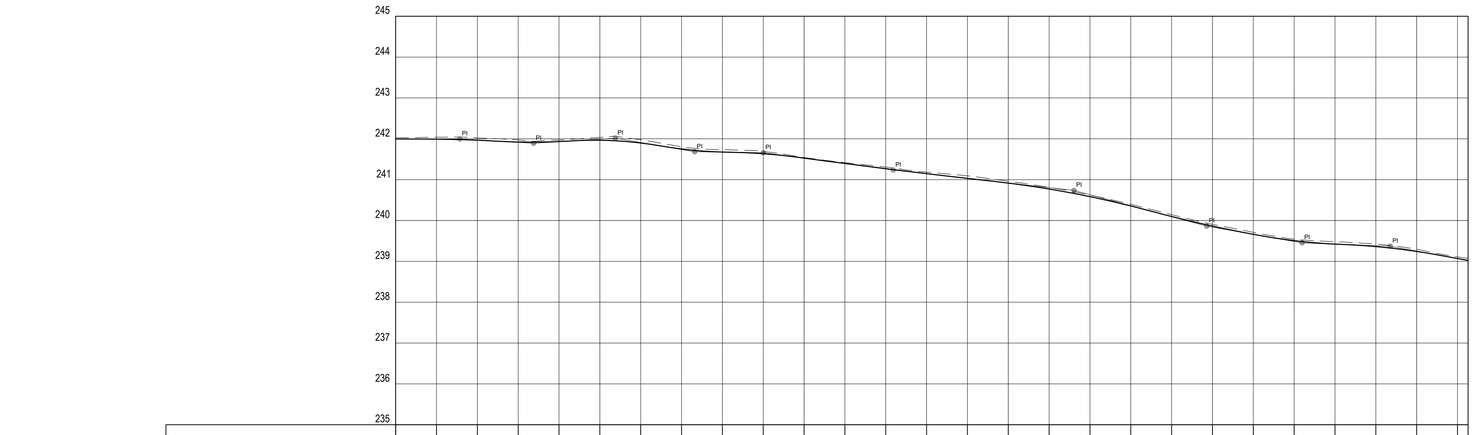
DRAWING NUMBER: PC22024/CIV/2601

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: 1 : 800	PAPER SIZE: A1	REVISION:	0C
SIGNATURE:	APPROVED BY ENGINEER:	DATE:	10/07/2023



INTERNAL ROAD 1 LONGSECTION



INTERNAL ROAD 2 LONGSECTION

NOTES:

1. ALL LEVELS ARE TO TOP OF CONCRETE.

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5406

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:

ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY MEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 543 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER | DRAWER: J WEST

REVIEWER: L FOURIE | DATE: 10 JULY 2023

DRAWING NAME: INTERNAL ROADS LONGSECTIONS SHEET 1 OF 2

DRAWING NUMBER: PC22024/CIV/2602

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: H1:750V1:75 | PAPER SIZE: A1 | REVISION: 0C

SIGNATURE: | APPROVED BY ENGINEER: | DATE: 10/07/2023

INTERNAL ROADS LAYOUT

0 8 16 METER

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, DELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:

ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER	DRAFTER: J WEST
REVIEWER: L FOURIE	DATE: 10 JULY 2023

DRAWING NAME: INTERNAL ROADS LAYOUT

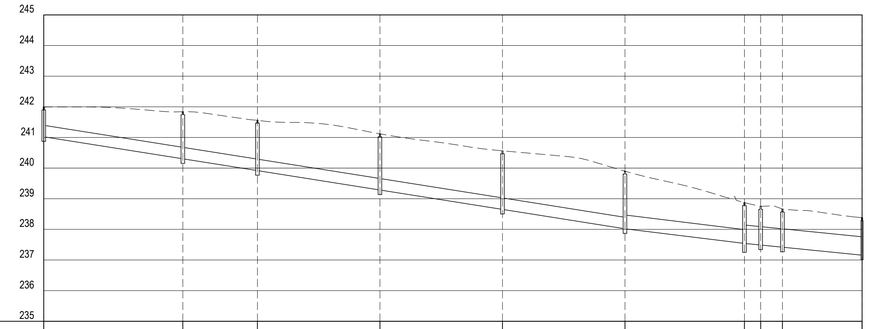
DRAWING NUMBER: PC22024/CIV/2601

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE	PAPER SIZE	REVISION
1 : 800	A1	0C

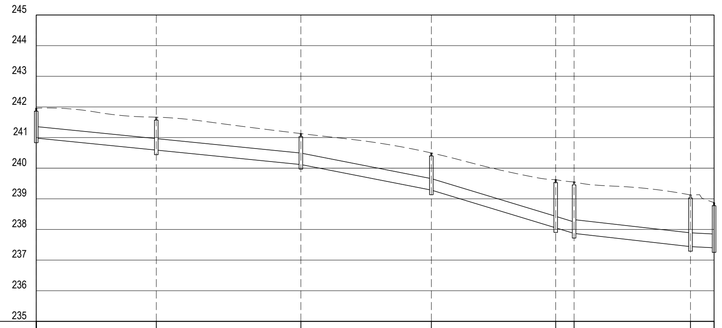
APPROVED BY ENGINEER:

SIGNATURE: DATE: 10/07/2023



FINAL COVER LEVEL	241.997	241.841	241.565	241.119	240.565	239.899	238.875	238.752	238.664	238.383
EXISTING GROUND LEVEL	241.997	241.841	241.565	241.119	240.565	239.899	238.875	238.752	238.664	238.383
INVERT LEVEL OF PIPE	241.022	240.303	239.918	239.285	238.652	238.019	237.542	237.489	237.418	237.158
DEPTH TO INVERT (m)	0.975	1.537	1.647	1.834	1.913	1.881	1.473	1.263	1.247	1.225
PIPE DESCRIPTION		Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø450mm CLASS 100D	Ø450mm CLASS 100D	Ø450mm CLASS 100D	Ø450mm CLASS 100D
CONSTRUCTION GRADIENT (%)		1.583%	1.583%	1.583%	1.583%	1.583%	1.223%	1.000%	1.000%	1.000%
PEG DISTANCE BETWEEN POINTS (m)		45.400	24.356	40.000	40.000	40.000	39.001	1.300	7.100	26.000
PEG DISTANCE ACCUMULATED (m)	0.000	45.400	69.756	109.756	149.756	189.756	228.757	234.057	241.157	267.157
STRUCTURE NO.	CP01	CP02	CP03	CP04	CP05	CP06	CP07	CP08	SM01	CHANNEL

STORMWATER LONGSECTION - CP01 TO CHANNEL

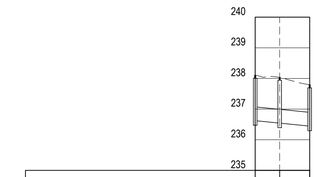


FINAL COVER LEVEL	241.958	241.666	241.130	240.497	239.629	239.553	239.127	238.875
EXISTING GROUND LEVEL	241.958	241.666	241.130	240.497	239.629	239.553	239.127	238.875
INVERT LEVEL OF PIPE	240.983	240.591	240.119	239.285	238.094	237.870	237.440	237.401
DEPTH TO INVERT (m)	0.975	1.075	1.011	1.212	1.575	1.683	1.687	1.473
PIPE DESCRIPTION		Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø375mm CLASS 100D	Ø450mm CLASS 100D	Ø450mm CLASS 100D
CONSTRUCTION GRADIENT (%)		1.000%	1.000%	1.957%	3.033%	3.059%	1.132%	0.500%
PEG DISTANCE BETWEEN POINTS (m)		39.200	47.200	42.600	40.600	6.000	38.000	7.700
PEG DISTANCE ACCUMULATED (m)	0.000	39.200	86.400	129.000	169.600	175.600	213.600	221.300
STRUCTURE NO.	CP09	CP10	CP11	CP12	CP13	CP14	CP15	CP07

STORMWATER LONGSECTION - CP09 TO CP07

FINAL COVER LEVEL	239.168	239.386	239.553
EXISTING GROUND LEVEL	239.168	239.386	239.553
INVERT LEVEL OF PIPE	238.243	238.006	237.870
DEPTH TO INVERT (m)	0.925	1.380	1.683
PIPE DESCRIPTION		Ø375mm CLASS 100D	Ø375mm CLASS 100D
CONSTRUCTION GRADIENT (%)		0.833%	0.833%
PEG DISTANCE BETWEEN POINTS (m)		28.500	16.300
PEG DISTANCE ACCUMULATED (m)	0.000	28.500	44.800
STRUCTURE NO.	CP16	CP17	CP14

STORMWATER LONGSECTION - CP16 TO CP14



FINAL COVER LEVEL	238.105	238.038	237.792
EXISTING GROUND LEVEL	238.105	238.038	237.792
INVERT LEVEL OF PIPE	236.622	236.542	236.444
DEPTH TO INVERT (m)	1.483	1.496	1.348
PIPE DESCRIPTION		Ø450mm CLASS 100D	Ø450mm CLASS 100D
CONSTRUCTION GRADIENT (%)		1.000%	1.000%
PEG DISTANCE BETWEEN POINTS (m)		8.000	9.800
PEG DISTANCE ACCUMULATED (m)	0.000	8.000	17.800
STRUCTURE NO.	KI01	CP18	CP21

STORMWATER LONGSECTION - KI01 TO CP21

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5406

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 543 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER | DRAFTER: J WEST

REVIEWER: L FOURIE | DATE: 10 JULY 2023

DRAWING NAME: STORMWATER LONGSECTIONS SHEET 1 OF 2

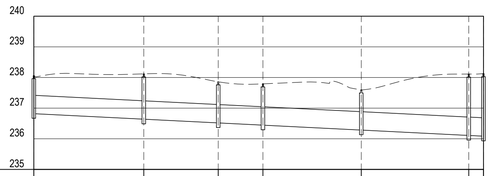
DRAWING NUMBER: PC22024/CIV/2503

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: H1:1000 V1:100 | PAPER SIZE: A1 | REVISION: 0C

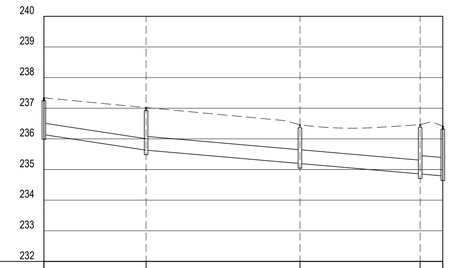
APPROVED BY ENGINEER:

SIGNATURE: | DATE: 10/07/2023



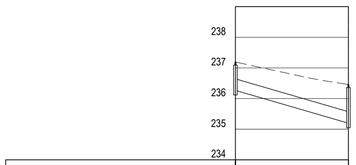
FINAL COVER LEVEL	238.061	238.118	237.859	237.792	237.595	238.112	238.127
EXISTING GROUND LEVEL	238.061	238.118	237.859	237.792	237.595	238.112	238.127
INVERT LEVEL OF PIPE	236.818	236.639	236.517	236.444	236.284	236.108	236.084
DEPTH TO INVERT (m)	1.243	1.479	1.342	1.348	1.312	2.004	2.043
PIPE DESCRIPTION		Ø600mm CLASS 100D	Ø600mm CLASS 100D	Ø600mm CLASS 100D	Ø600mm CLASS 100D	Ø600mm CLASS 100D	Ø600mm CLASS 100D
CONSTRUCTION GRADIENT (%)		0.500%	0.500%	0.500%	0.500%	0.500%	0.500%
PEG DISTANCE – BETWEEN POINTS (m)		35.900	24.300	14.600	32.100	35.100	1.800
PEG DISTANCE – ACCUMULATED (m)	0.000	35.900	60.200	74.800	106.900	142.000	146.800
STRUCTURE NO.	CP19	CP20	CP29	CP21	CP22	CP23	HW01

STORMWATER LONGSECTION - CP19 TO HW01



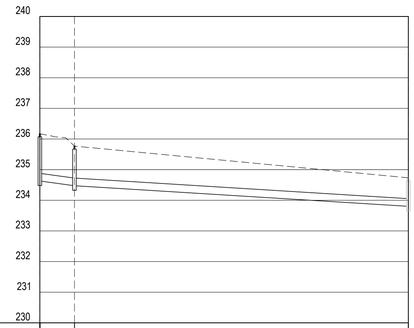
FINAL COVER LEVEL	237.342	237.020	236.459	235.465	238.414
EXISTING GROUND LEVEL	237.342	237.020	236.459	236.465	236.414
INVERT LEVEL OF PIPE	236.136	235.630	235.195	234.855	234.791
DEPTH TO INVERT (m)	1.206	1.390	1.264	1.610	1.623
PIPE DESCRIPTION		Ø375mm CLASS 100D	Ø450mm CLASS 100D	Ø450mm CLASS 100D	Ø600mm CLASS 100D
CONSTRUCTION GRADIENT (%)		1.518%	0.866%	0.866%	0.866%
PEG DISTANCE – BETWEEN POINTS (m)		33.359	50.231	39.229	7.407
PEG DISTANCE – ACCUMULATED (m)	0.000	33.359	83.590	122.820	130.226
STRUCTURE NO.	CP24	CP25	CP26	CP27	HW02

STORMWATER LONGSECTION - CP24 TO HW02



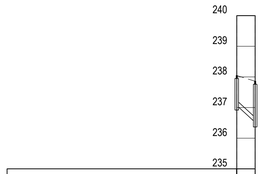
FINAL COVER LEVEL	237.192	236.459	
EXISTING GROUND LEVEL	237.192	236.459	
INVERT LEVEL OF PIPE	236.267	235.195	
DEPTH TO INVERT (m)	0.925	1.264	
PIPE DESCRIPTION		Ø375mm CLASS 100D	
CONSTRUCTION GRADIENT (%)		2.907%	
PEG DISTANCE – BETWEEN POINTS (m)		36.891	
PEG DISTANCE – ACCUMULATED (m)	0.000	36.891	
STRUCTURE NO.	CP28	CP26	

STORMWATER LONGSECTION - CP28 TO CP26



FINAL COVER LEVEL	236.170	235.768		234.733
EXISTING GROUND LEVEL	236.170	235.768		231.341
INVERT LEVEL OF PIPE	234.629	234.475		233.803
DEPTH TO INVERT (m)	1.541	1.293		0.931
PIPE DESCRIPTION		Ø250mm uPVC CLASS 51	Ø250mm uPVC CLASS 51	
CONSTRUCTION GRADIENT (%)		1.368%	0.617%	
PEG DISTANCE – BETWEEN POINTS (m)		11.300	109.000	
PEG DISTANCE – ACCUMULATED (m)	0.000	11.300		120.300
STRUCTURE NO.	PD02	SM02		Existing KI

STORMWATER LONGSECTION - PD02 TO EXISTING KI



FINAL COVER LEVEL	238.046	237.859	
EXISTING GROUND LEVEL	238.046	237.859	
INVERT LEVEL OF PIPE	237.099	236.517	
DEPTH TO INVERT (m)	0.977	1.342	
PIPE DESCRIPTION		Ø160mm uPVC CLASS 34	
CONSTRUCTION GRADIENT (%)		9.204%	
PEG DISTANCE – BETWEEN POINTS (m)		5.000	
PEG DISTANCE – ACCUMULATED (m)	0.000	6.000	
STRUCTURE NO.	Fountain	CP29	

STORMWATER LONGSECTION - FOUNTAIN TO CP29

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY MEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 10 JULY 2023

DRAWING NAME: STORMWATER LONGSECTIONS SHEET 2 OF 2

DRAWING NUMBER: PC22024/CIV/2504

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: H1:1000 V1:100
PAPER SIZE: A1
REVISION: 0C

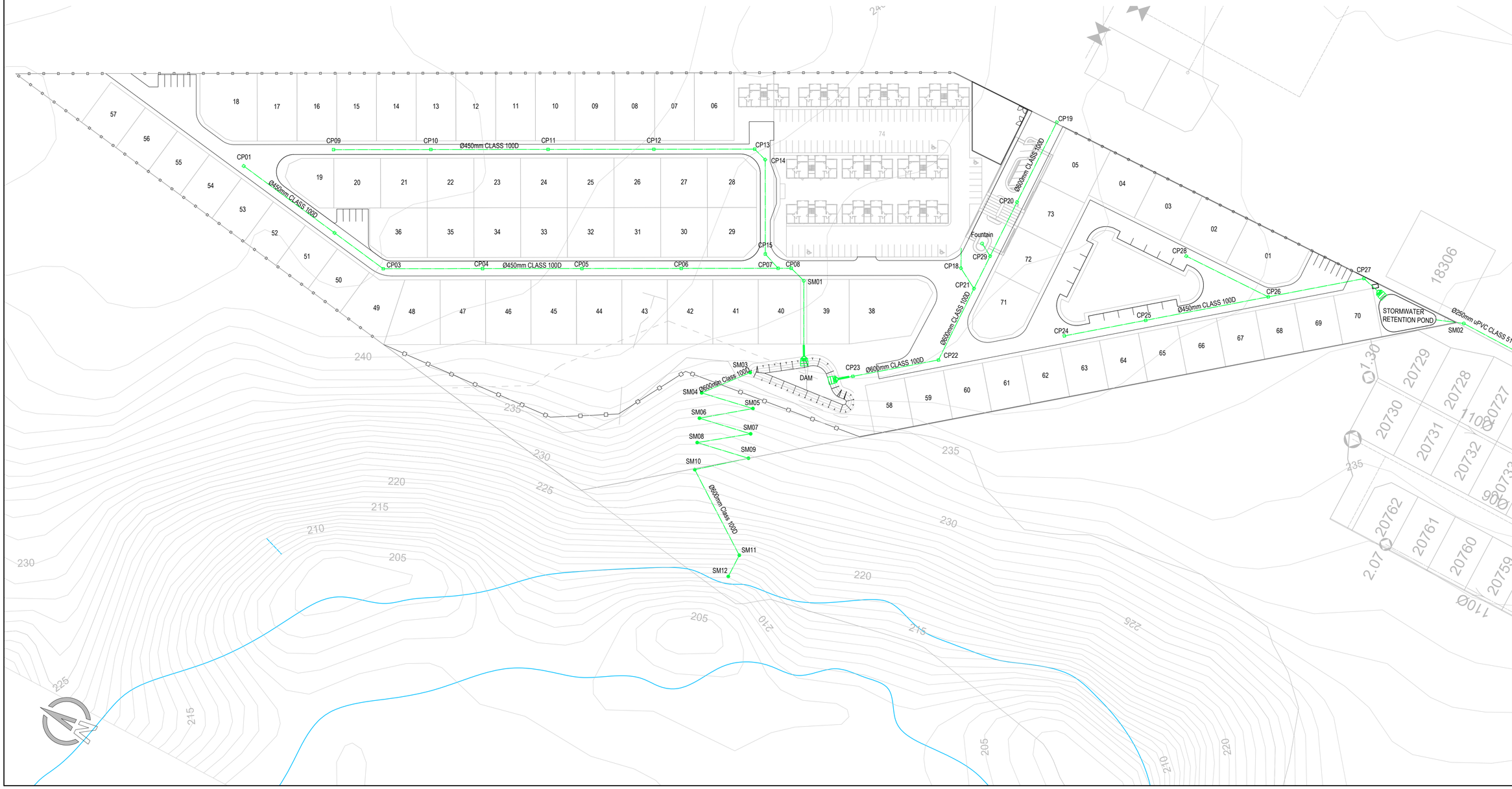
APPROVED BY ENGINEER:
SIGNATURE:
DATE: 10/07/2023

WATER PIPE COORDINATES
WGS84 LO23

STRUCTURE NAME	Y COORDINATE	X COORDINATE	PIPE INVERT LEVEL
AV01	53 049.413	3 757 620.643	241.145
EC02	53 005.048	3 757 932.052	236.888
FH01	53 058.617	3 757 745.365	240.161
FH02	53 032.014	3 757 691.198	240.667
FH03	52 979.258	3 757 859.057	238.060
FH04	52 947.087	3 758 003.884	236.094
HB01	53 065.690	3 757 732.137	240.413
HB02	53 039.086	3 757 677.970	240.764
HB03 & VB05	52 953.465	3 757 838.119	238.987
HB04 & VB06	52 955.955	3 757 846.611	238.391
HB09	52 883.946	3 757 941.180	237.151
HB10 & VB09	52 889.389	3 757 947.023	237.148
HB11	52 969.056	3 757 949.268	236.679
HB12 & VB 10	52 967.242	3 757 967.849	236.480
HB13	52 960.553	3 757 971.015	236.526
HB14 & VB11	52 903.675	3 757 969.452	236.873
HB15 & VB12	52 901.452	3 758 048.020	235.560
HB16 & VB13	52 907.526	3 758 052.913	235.552
RSV01	52 960.643	3 757 928.621	237.358

WATER PIPE COORDINATES
WGS84 LO23

STRUCTURE NAME	Y COORDINATE	X COORDINATE	PIPE INVERT LEVEL
RSV02	53 045.518	3 757 677.031	240.806
RSV03	52 956.596	3 757 832.262	239.066
RSV04	52 964.808	3 757 851.339	238.265
RSV05	52 892.888	3 757 947.122	237.127
RSV06	52 971.780	3 757 951.465	236.659
RSV07	52 972.299	3 757 961.522	236.553
RSV08	52 901.593	3 758 043.022	235.647
T01	53 057.392	3 757 675.297	240.884 240.884
T02	52 993.708	3 757 866.775	237.855
T04	52 960.398	3 757 848.984	238.325
T05	52 976.982	3 757 955.663	236.620 236.620
T06	52 982.442	3 757 960.068	236.578
VB01	53 063.281	3 757 715.636	240.692
VB02	52 975.259	3 757 901.283	237.199
VB03	52 958.412	3 757 932.794	237.411
VB04	52 980.670	3 757 787.234	239.963
WM01	52 897.886	3 757 947.263	237.098
Y01	52 949.894	3 757 948.728	236.792



PROJECT NUMBER:
PC22024

PROJECT NAME:
URBAN COUNTRY ESTATE

CLIENT:
URBAN COUNTRY ESTATE (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIF CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr.Arch. 20818
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: W JEVON	DRAFTER: H OOSTHUIZEN
REVIEWER: L FOURIE	DATE: 3 JUNE 2025

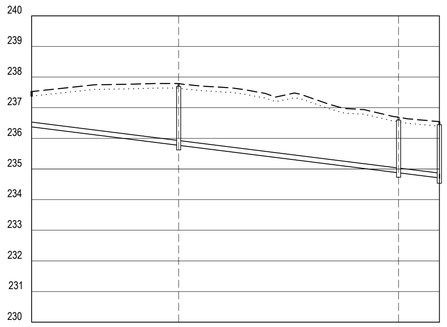
DRAWING NAME:
STORMWATER RETICULATION LAYOUT

DRAWING NUMBER:
PC22024/CIV/Z301

DRAWING ISSUED FOR: INFORMATION

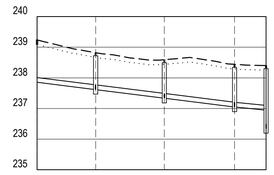
SCALE:	PAPER SIZE:	REVISION:
1 : 800	A1	0G

APPROVED BY ENGINEER:
SIGNATURE:
DATE: 03 June 2025



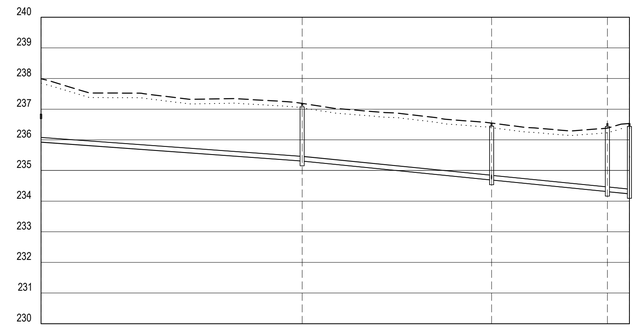
FINAL COVER LEVEL	237.526	237.791		236.690	236.546
EXISTING GROUND LEVEL	237.376	237.641		236.540	236.396
INVERT LEVEL OF PIPE	236.376	235.776		234.878	
DEPTH TO INVERT (m)	1.151	2.020		1.811	1.861
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø160 mm Class 34		Ø160 mm Class 34	Ø160 mm Class 34
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		1.250%		1.250%	1.250%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)					
DISTANCE — BETWEEN POINTS (m)		48.000		71.800	13.318
DISTANCE — ACCUMULATED (m)	0.000	48.000		119.800	133.118
STRUCTURE NO.	RE03	MH11		MH12	MH10

PROFILE VIEW ALIGNMENT - RE03 TO MH10



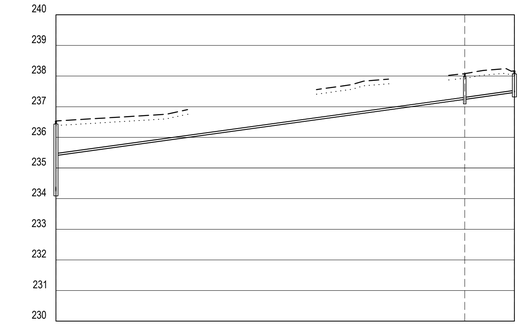
FINAL COVER LEVEL	239.239	238.821	238.593	238.442	238.402
EXISTING GROUND LEVEL	239.089	238.671	238.443	238.292	238.252
INVERT LEVEL OF PIPE	237.857	237.618	237.338	237.052	
DEPTH TO INVERT (m)	1.382	1.203	1.260	1.395	2.056
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		1.250%	1.250%	1.249%	1.000%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)					
DISTANCE — BETWEEN POINTS (m)		19.107	22.420	22.920	10.304
DISTANCE — ACCUMULATED (m)	0.000	42.992	65.412	88.332	111.867
STRUCTURE NO.	RE10	MH23	MH24	MH19	MH20

PROFILE VIEW ALIGNMENT - MH10 TO MH20



FINAL COVER LEVEL	236.838	237.175	236.546	236.535	236.535
EXISTING GROUND LEVEL	237.845	237.039	236.396	236.231	236.385
INVERT LEVEL OF PIPE	235.926	235.308	234.689	234.311	
DEPTH TO INVERT (m)	0.912	1.872	1.861	2.224	2.296
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		0.725%	1.000%	1.000%	1.000%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)					
DISTANCE — BETWEEN POINTS (m)		85.270	61.840	37.812	7.192
DISTANCE — ACCUMULATED (m)	0.000	351.940	147.110	184.922	192.114
STRUCTURE NO.	RE02	MH09	MH10	MH25	PS01

PROFILE VIEW ALIGNMENT - RE02 TO PUMP STATION



FINAL COVER LEVEL		238.077		238.170
EXISTING GROUND LEVEL	236.385	237.929		238.020
INVERT LEVEL OF PIPE	235.411	237.243		
DEPTH TO INVERT (m)		0.834		0.710
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø75mm HDPE PN16		Ø75mm HDPE PN16
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		-1.372%		-1.391%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)				
DISTANCE — BETWEEN POINTS (m)		133.483		16.199
DISTANCE — ACCUMULATED (m)	0.000	133.483		149.681
STRUCTURE NO.	PUMP STATION	HB02		MH22

PROFILE VIEW ALIGNMENT - SEWER RISING MAIN

PROJECT NUMBER:
PC22024

PROJECT NAME:
URBAN COUNTRY ESTATE

CLIENT:
URBAN COUNTRY ESTATE (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 981 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr Arch. 20818
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

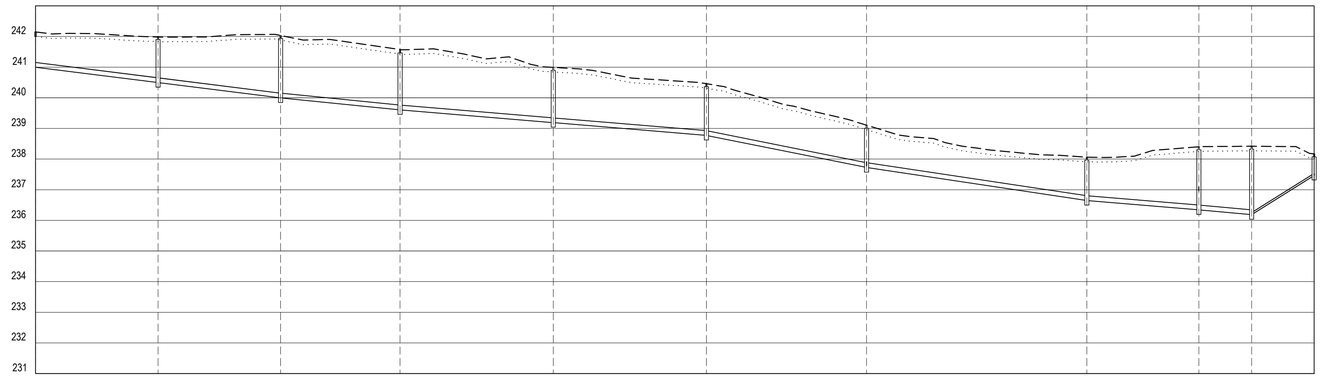
DESIGNER: W JEVON
DRAFTER: H OOSTHUIZEN
REVIEWER: L FOURIE
DATE: 3 JUNE 2025

DRAWING NAME:
SEWER RETICULATION LONGSECTIONS SHEET 2 OF 2

DRAWING NUMBER:
PC22024/CIV/2303

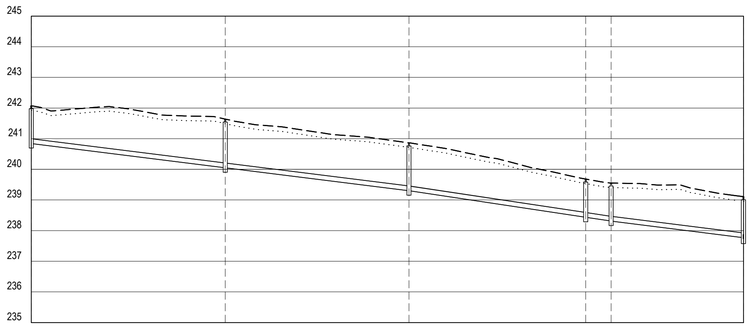
DRAWING ISSUED FOR: INFORMATION

SCALE: 1 : 1000 @ PAPER SIZE: A1
REVISION: 0E
APPROVED BY ENGINEER:
SIGNATURE:
DATE: 03 June 2025



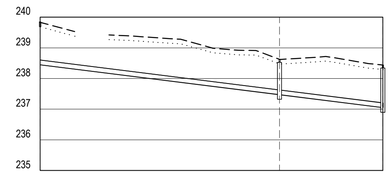
FINAL COVER LEVEL	242.149	242.000	242.033	241.564	240.993	240.460	239.107	238.059	238.402	238.419	238.170
EXISTING GROUND LEVEL	241.999	241.834	241.883	241.425	240.843	240.310	238.957	237.909	238.252	238.269	
INVERT LEVEL OF PIPE	240.998	240.498	239.998	239.608	239.192	238.775	237.729	236.650	236.346	236.189	
DEPTH TO INVERT (m)	1.155	1.502	2.035	1.956	1.801	1.685	1.382	1.408	2.056	2.230	0.702
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø75mm PN16
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		1.250%	1.250%	1.000%	0.833%	0.833%	2.000%	1.500%	0.833%	0.910%	-6.262%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)											
DISTANCE — BETWEEN POINTS (m)		40.000	40.001	39.000	50.000	50.000	52.301	71.900	36.556	17.241	20.424
DISTANCE — ACCUMULATED (m)	0.000	40.000	80.000	119.001	169.000	219.000	271.301	343.201	379.757	96.572	???
STRUCTURE NO.	RE01	MH01	MH02	MH03	MH04	MH05	MH06	MH07	MH20	PS02	MH22

PROFILE VIEW RE01 TO MH22



FINAL COVER LEVEL	242.075	241.641	240.863	239.681	239.553	239.107
EXISTING GROUND LEVEL	241.925	241.489	240.716	239.531	239.403	238.957
INVERT LEVEL OF PIPE	240.843	240.053	239.303	238.438	238.313	
DEPTH TO INVERT (m)	1.232	1.587	1.560	1.244	1.239	1.382
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34	Ø160 mm Class 34
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		1.247%	1.250%	1.500%	1.500%	1.254%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)						
DISTANCE — BETWEEN POINTS (m)		63.331	59.970	57.700	8.301	43.200
DISTANCE — ACCUMULATED (m)	0.000	63.331	123.301	181.000	189.301	232.501
STRUCTURE NO.	MH13	MH14	MH15	MH16	MH17	MH06

PROFILE VIEW ALIGNMENT - MH13 TO MH06



FINAL COVER LEVEL	239.844	238.624	238.442
EXISTING GROUND LEVEL	239.685	238.476	238.292
INVERT LEVEL OF PIPE	238.450	237.473	
DEPTH TO INVERT (m)	1.394	1.151	1.395
HYDRAULIC DESIGN — PIPE DESCRIPTION		Ø160 mm Class 34	Ø160 mm Class 34
HYDRAULIC DESIGN — CONSTRUCTION GRADIENT (%)		1.250%	1.250%
HYDRAULIC DESIGN — DESIGN FLOW (ℓ/s)			
DISTANCE — BETWEEN POINTS (m)		78.137	33.730
DISTANCE — ACCUMULATED (m)	0.000	78.137	375.105
STRUCTURE NO.	RE04	MH18	MH19

PROFILE VIEW ALIGNMENT - RE04 TO MH19

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN COUNTRY ESTATE (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr.Arch. 20818
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: W JEVON	DRAFTER: H OOSTHUIZEN
REVIEWER: L FOURIE	DATE: 3 JUNE 2025

DRAWING NAME: SEWER RETICULATION LONGSECTIONS SHEET 1 OF 2

DRAWING NUMBER: PC22024/CIV/2403

DRAWING ISSUED FOR: INFORMATION

SCALE:	PAPER SIZE:	REVISION:
1 : 1000	A1	0E

APPROVED BY ENGINEER:

SIGNATURE: DATE: 03 June 2025

STRUCTURE LIST-SEWER PIPELINE

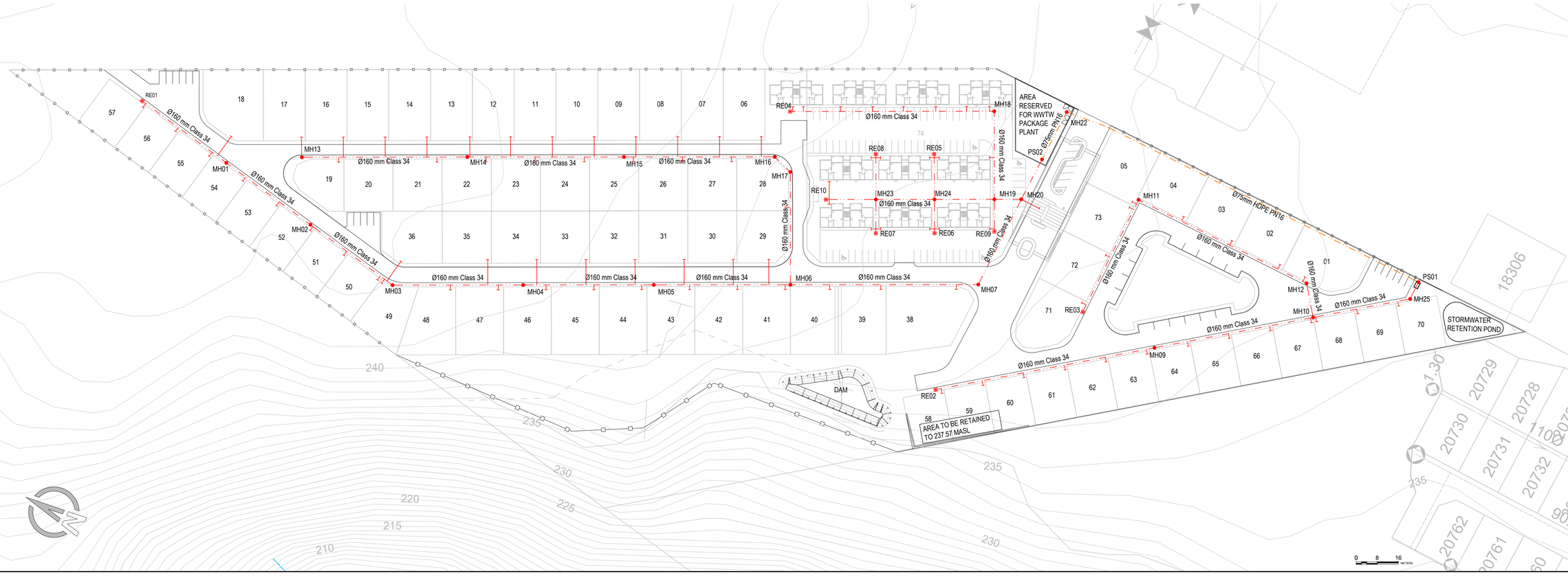
STRUCTURE NAME	Y COORDINATE	X COORDINATE	RIM ELEVATION	SUMP ELEVATION SUMP DEPTH	INVERT ELEVATION	MATERIAL
MH01	53 054.882	3 757 654.027	242.000	240.498 1.502	S01-INV IN 240.498 S02-INV OUT 240.498	Upvc Upvc
MH02	53 060.654	3 757 693.609	242.033	239.998 2.035	S02-INV IN 239.998 S03-INV OUT 239.998	Upvc Upvc
MH03	53 066.282	3 757 732.201	241.564	239.608 1.956	S03-INV IN 239.608 S04-INV OUT 239.608	Upvc Upvc
MH04	53 042.720	3 757 776.301	240.993	239.192 1.801	S04-INV IN 239.192 S05-INV OUT 239.192	Upvc Upvc
MH05	53 019.159	3 757 820.401	240.460	238.775 1.685	S05-INV IN 238.775 S06-INV OUT 238.775	Upvc Upvc
MH06	52 994.513	3 757 866.531	239.107	237.724 1.382	S06-INV IN 237.729 S20-INV IN 237.772 S07-INV OUT 237.729	Upvc Upvc Upvc
MH07	52 960.614	3 757 929.938	238.059	236.650 1.408	S07-INV IN 236.650 S08-INV OUT 236.650	Upvc Upvc
MH09	52 950.268	3 758 000.847	237.175	235.303 1.872	S09-INV IN 235.308 S10-INV OUT 235.308	Upvc Upvc
MH10	52 911.435	3 758 048.973	236.546	234.685 1.861	S14-INV IN 234.712 S10-INV IN 234.689 S11-INV OUT 234.689	Upvc Upvc Upvc
MH11	52 903.106	3 757 968.839	237.791	235.771 2.020	S12-INV IN 235.776 S13-INV OUT 235.776	Upvc Upvc
MH12	52 901.070	3 758 040.610	236.690	234.878 1.811	S13-INV IN 234.878 S14-INV OUT 234.878	Upvc Upvc
MH13	53 039.414	3 757 678.559	242.075	240.843 1.232	S16-INV OUT 240.843	Upvc
MH14	53 009.529	3 757 734.395	241.641	240.053 1.587	S16-INV IN 240.053 S17-INV OUT 240.053	Upvc Upvc
MH15	52 981.305	3 757 787.308	240.863	239.303 1.560	S17-INV IN 239.303 S18-INV OUT 239.303	Upvc Upvc
MH16	52 954.101	3 757 838.192	239.681	238.438 1.244	S18-INV IN 238.438 S19-INV OUT 238.438	Upvc Upvc
MH17	52 956.416	3 757 846.163	239.553	238.313 1.239	S19-INV IN 238.313 S20-INV OUT 238.313	Upvc Upvc
MH18	52 899.180	3 757 904.121	238.624	237.473 1.151	S21-INV IN 237.473 S22-INV OUT 237.473	Upvc Upvc
MH19	52 928.925	3 757 920.024	238.442	237.047 1.395	S22-INV IN 237.052 S27-INV IN 237.052 S32-INV OUT 237.052 S23-INV OUT 237.052	Upvc Upvc Upvc Upvc

STRUCTURE LIST-SEWER PIPELINE

STRUCTURE NAME	Y COORDINATE	X COORDINATE	RIM ELEVATION	SUMP ELEVATION SUMP DEPTH	INVERT ELEVATION	MATERIAL
MH20	52 924.067	3 757 929.111	238.402	236.346 2.056	S23-INV IN 236.949 S08-INV IN 236.346 S24-INV OUT 236.346	Upvc Upvc Upvc
MH22	52 886.404	3 757 928.724	238.170	237.468 0.702	P87-INV IN 237.468 P89-INV IN 237.468	Hdpe Hdpe
MH23	52 950.302	3 757 880.040	238.821	237.618 1.203	S29-INV IN 237.618 S28-INV IN 237.618 S25-INV IN 237.618 S26-INV OUT 237.618	Upvc Upvc Upvc Upvc
MH24	52 939.732	3 757 899.811	238.593	237.333 1.260	S31-INV IN 237.338 S30-INV IN 237.338 S26-INV IN 237.338 S27-INV OUT 237.338	Upvc Upvc Upvc Upvc
MH25	52 887.691	3 758 078.400	236.535	234.311 2.224	S11-INV IN 234.311 S11 (1)-INV OUT 234.311	Upvc Upvc
PS01	52 880.501	3 758 078.198	236.535	234.239 2.296	S11 (1)-INV IN 234.239 P88-INV OUT 235.411	Upvc Hdpe
PS02	52 906.827	3 757 928.918	238.419	236.189 2.230	S24-INV IN 236.189 P87-INV OUT 236.189	Upvc Hdpe
RE01	53 049.110	3 757 614.446	242.149	240.994 1.155	S01-INV OUT 240.998	Upvc
RE02	53 003.814	3 757 934.486	236.838	235.926 0.912	S09-INV OUT 235.926	Upvc
RE03	52 951.088	3 757 970.182	237.526	236.376 1.151	S12-INV OUT 236.376	Upvc
RE04	52 936.020	3 757 835.214	239.844	238.450 1.394	S21-INV OUT 238.450	Upvc
RE05	52 924.491	3 757 891.548	237.840	237.685 0.155	S30-INV OUT 237.685	Upvc
RE06	52 951.143	3 757 905.915	237.752	237.597 0.155	S31-INV OUT 237.597	Upvc
RE07	52 961.741	3 757 886.088	238.032	237.877 0.155	S29-INV OUT 237.877	Upvc
RE08	52 935.014	3 757 871.849	238.120	237.965 0.155	S28-INV OUT 237.965	Upvc
RE09	52 939.794	3 757 925.835	238.043	236.806 1.238	S32-INV IN 236.806	Upvc
RE10	52 959.311	3 757 863.190	239.239	237.857 1.382	S25-INV OUT 237.857	Upvc

STRUCTURE LIST-SEWER RISING MAIN

STRUCTURE NAME	Y COORDINATE	X COORDINATE	RIM ELEVATION	SUMP ELEVATION SUMP DEPTH	INVERT ELEVATION	MATERIAL
HB01	52 880.227	3 758 087.650	236.471	235.403 1.067		
HB02	52 884.147	3 757 944.765	238.077	237.243 0.834	P88-INV IN 237.243 P89-INV OUT 237.243	Hdpe Hdpe
HB03	52 886.404	3 757 928.724	238.170	237.461 0.710		



PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN COUNTRY ESTATE (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19668, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr Arch. 20818
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: W JEVON
DRAFTER: H OOSTHUIZEN
REVIEWER: L FOURIE
DATE: 3 JUNE 2025

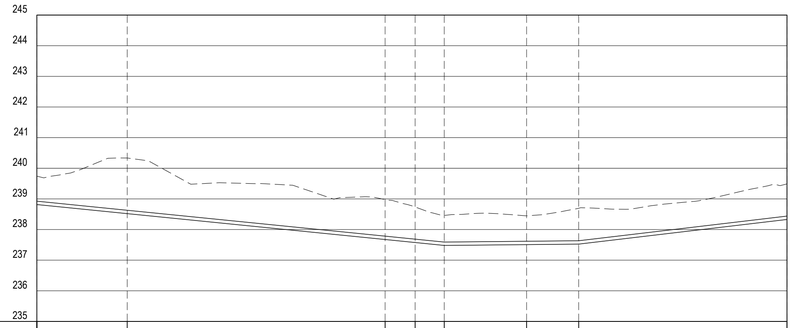
DRAWING NAME: SEWER RETICULATION LAYOUT

DRAWING NUMBER: PC22024/CIV/2401

DRAWING ISSUED FOR: INFORMATION

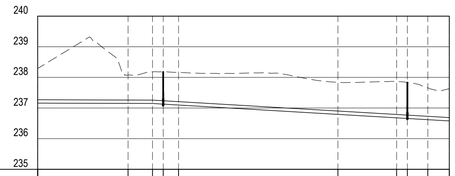
SCALE: 1 : 800
PAPER SIZE: A1
REVISION: 0F

APPROVED BY ENGINEER:
SIGNATURE:
DATE: 03 June 2025



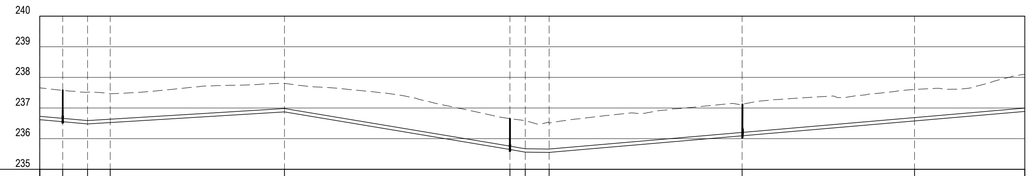
EXISTING GROUND LEVEL	239.734	240.335	238.980	238.743	238.460	238.447	238.695	239.488	
INVERT LEVEL OF PIPE	238.815	238.519	237.675	237.577	237.481	237.507	237.524	238.328	
TOP OF PIPE COVER	0.809	1.706	1.195	1.057	0.869	0.829	1.061	1.050	
PIPE DESCRIPTION		110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	
PIPE LENGTH (m)		29.50	84.20	9.80	9.50	26.90	17.00	68.00	
ACCUMULATED PIPE LENGTH (m)	0.000	29.500	113.700	123.500	133.000	159.900	176.900	244.900	
FITTING NAME	T03	HB05	HB06	HB07	VB07	HB08	VB08	T04	

WATER PIPELINE 3 LONGSECTION



EXISTING GROUND LEVEL	238.290	238.086	238.180	238.161	237.840	237.868	237.853	237.658	237.604
INVERT LEVEL OF PIPE	237.160	237.151	237.148	237.098	236.792	236.679	236.659	236.620	236.578
TOP OF PIPE COVER	1.020	0.819	0.922	0.953	0.938	1.079	1.066	0.929	0.916
PIPE DESCRIPTION		110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	
PIPE LENGTH (m)		29.50	7.99	3.50	52.03	19.17	3.50	6.68	7.02
ACCUMULATED PIPE LENGTH (m)	0.000	29.500	37.485	40.985	94.288	113.457	116.957	123.637	130.659
FITTING NAME	TIE-IN EXISTING	HB09	HB10 & VB09	RSV05	VM01	Y01	HB11	RSV06	T05	T06

WATER PIPELINE 4 LONGSECTION



EXISTING GROUND LEVEL	237.658	237.575	237.514	237.466	237.805	236.655	236.588	236.512	237.124	237.604	238.103
INVERT LEVEL OF PIPE	236.620	236.553	236.490	236.525	236.873	235.647	235.560	235.552	236.084	236.578	236.888
TOP OF PIPE COVER	0.929	0.913	0.923	0.830	0.821	0.898	0.918	0.850	0.920	0.916	1.105
PIPE DESCRIPTION		110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9
PIPE LENGTH (m)		7.50	8.10	7.40	56.90	73.60	5.00	7.80	63.00	56.30	36.00
ACCUMULATED PIPE LENGTH (m)	0.000	7.500	15.600	23.000	75.900	153.500	158.500	166.300	229.300	285.600	321.600
FITTING NAME	TI05	RSV07	HB12 & VB10	HB13	HB14 & VB11	RSV08	HB15 & VB12	HB16 & VB13	FH04	T06	EC02

WATER PIPELINE 5 LONGSECTION

PROJECT NUMBER:
PC22024

PROJECT NAME:
URBAN COUNTRY ESTATE

CLIENT:
URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5406

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 10 JULY 2023

DRAWING NAME:
WATER RETICULATION
LONGSECTIONS SHEET 2 OF 2

DRAWING NUMBER:
PC22024/CIV/2303

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: H1:1000 V1:100
PAPER SIZE: A1
REVISION: 0C

SIGNATURE:
APPROVED BY ENGINEER:
DATE: 10/07/2023

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
AV01	53049.413	3757620.643	241.145
EC02	53005.048	3757932.052	236.888
FH01	53058.617	3757745.365	240.161
FH02	53032.014	3757691.198	240.667
FH03	52979.258	3757859.057	238.060
FH04	52947.087	3758003.884	236.094
HB01	53065.690	3757732.137	240.413
HB02	53039.086	3757677.970	240.764
HB03 & VB05	52953.465	3757838.119	238.782
HB04 & VB06	52955.955	3757846.611	238.391
HB05	52928.223	3757822.763	238.519

WATER PIPE COORDINATES
WGS84 LO23

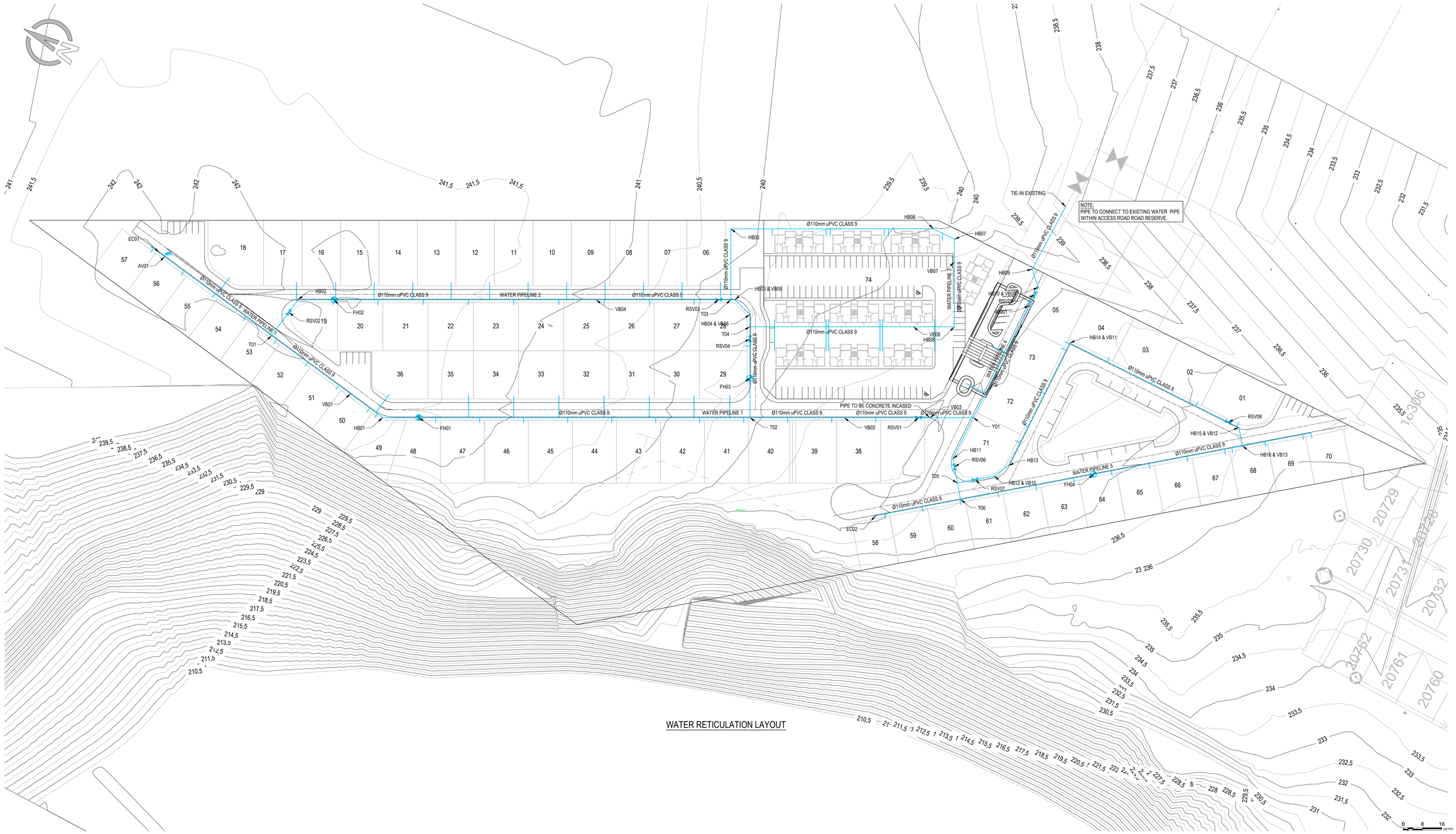
Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
HB06	52888.495	3757897.001	237.675
HB07	52888.212	3757906.797	237.577
HB08	52920.321	3757923.943	237.507
HB09	52883.946	3757941.180	237.151
HB10 & VB09	52889.389	3757947.023	237.148
HB11	52969.056	3757949.268	236.679
HB12 & VB10	52967.242	3757967.849	236.480
HB13	52960.553	3757971.015	236.526
HB14 & VB11	52903.675	3757969.452	236.873
HB15 & VB12	52901.452	3758048.020	235.560
HB16 & VB13	52907.526	3758052.913	235.552

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
RSV01	52960.643	3757928.621	237.358
RSV02	53045.518	3757677.031	240.806
RSV03	52956.596	3757832.262	238.918
RSV04	52964.808	3757851.339	238.265
RSV05	52892.888	3757947.122	237.127
RSV06	52971.780	3757951.465	236.659
RSV07	52972.299	3757961.522	236.553
RSV08	52901.593	3758043.022	235.647
T01	53057.392	3757675.297	240.884
T02	52993.708	3757866.775	237.855
T03	52954.239	3757836.672	238.815

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
T04	52960.398	3757848.984	238.328
T05	52976.982	3757955.663	236.620
T06	52982.442	3757960.068	236.578
VB01	53063.281	3757715.636	240.692
VB02	52975.259	3757901.283	237.199
VB03	52958.412	3757932.794	237.411
VB04	52980.670	3757787.234	239.963
VB07	52896.592	3757911.272	237.481
VB08	52928.337	3757908.951	237.524
WM01	52897.886	3757947.263	237.098
Y01	52949.894	3757948.728	236.792



WATER RETICULATION LAYOUT

LEGEND:

- WATER PIPE
- EXISTING/FUTURE WATER PIPE
- HOUSE CONNECTIONS
- ISOLATION VALVE
- AIR VALVE
- WATER FIRE HYDRANT
- WM BULK WATER METER

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19068, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 10 JULY 2023

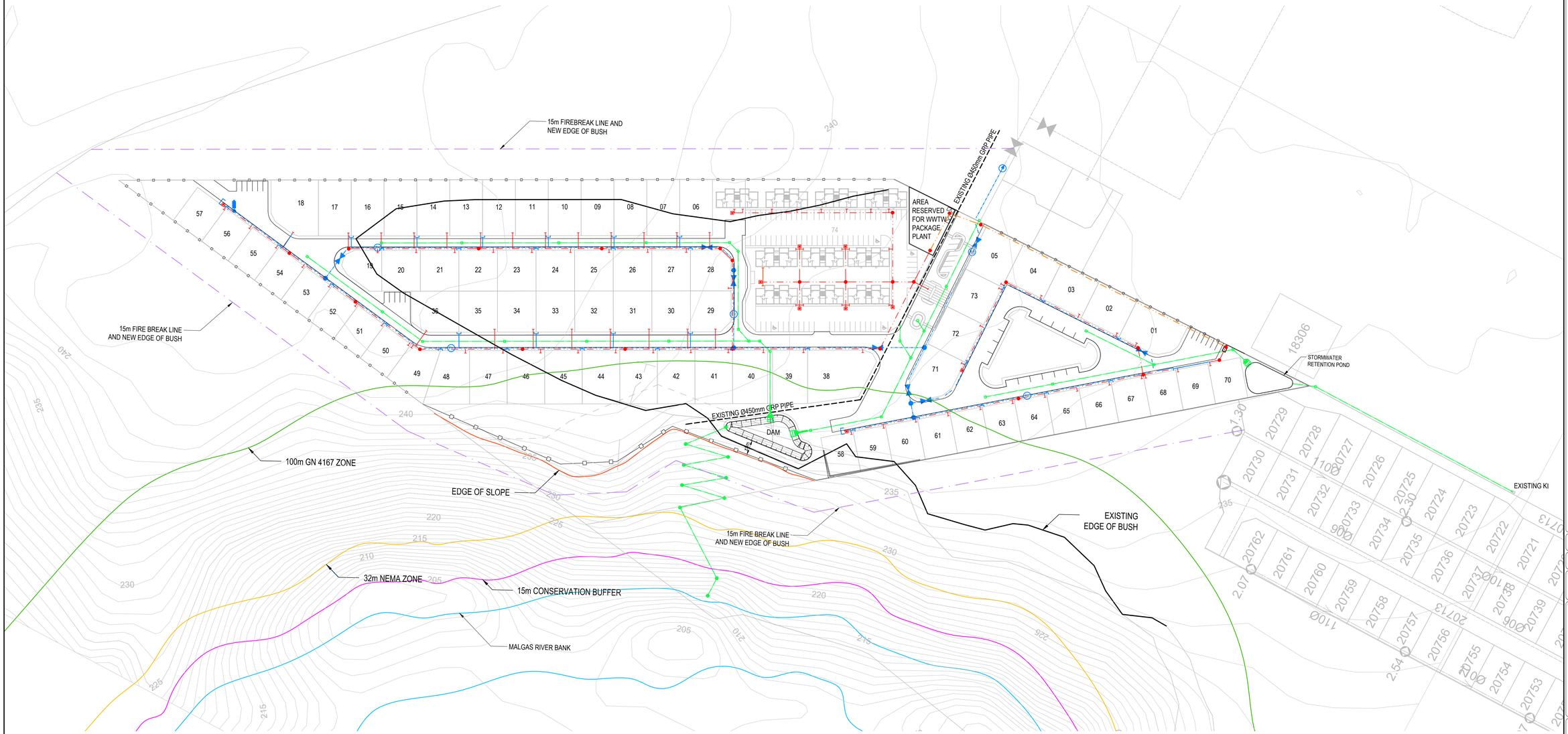
DRAWING NAME: WATER RETICULATION LAYOUT

DRAWING NUMBER: PC22024/CIV/2301

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: 1 : 800
PAPER SIZE: A1
REVISION: 0C

SIGNATURE:
APPROVED BY ENGINEER:
DATE: 10/07/2023



0 10 20 METERS

LEGEND:

- Ø110mm uPVC CLASS 9 WATER PIPE
- Ø160mm uPVC CLASS 34 SEWER PIPE
- Ø375mm, 450mm AND Ø600mm CLASS 100D STORM WATER PIPE
- EXISTING Ø450mm WATER PIPE
- FENCE LINE
- EDGE OF BUSH
- ISOLATION VALVE
- AIR VALVE
- WATER FIRE HYDRANT
- CONNECT TO EXISTING
- SEWER MANHOLE
- SEWER RODDING EYE
- EXISTING SEWER MANHOLE
- PROPOSED HOUSE CONNECTION
- STORMWATER CATCH PIT
- STORMWATER MANHOLE
- EXISTING CATCH PIT

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN COUNTRY ESTATE (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 15568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:

A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr Arch. 20818
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: W JEVON	DRAFTER: H OOSTHUIZEN
REVIEWER: L FOURIE	DATE: 3 JUNE 2025

DRAWING NAME: COMBINED SURVACES LAYOUT

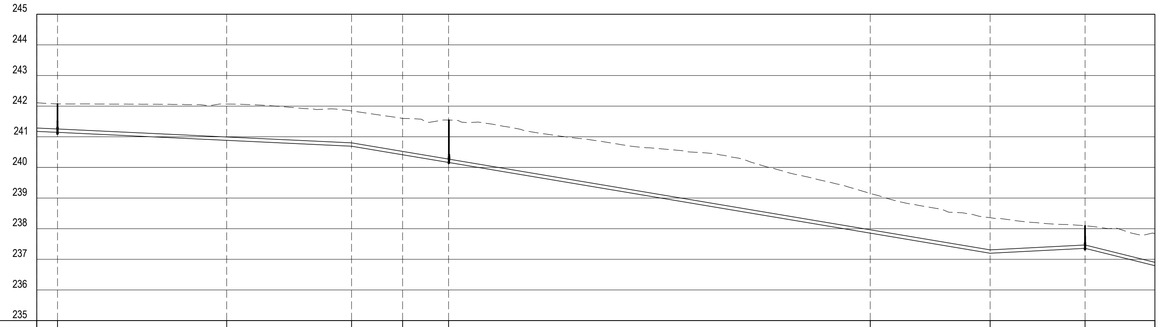
DRAWING NUMBER: PC22024/CIV/2100

DRAWING ISSUED FOR: INFORMATION

SCALE:	PAPER SIZE:	REVISION:
1:1000	A1	0F

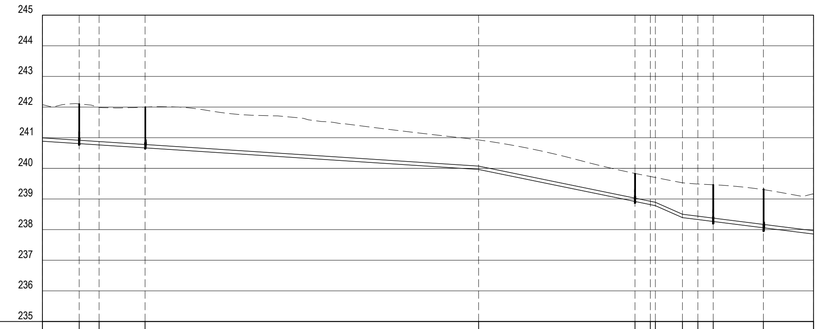
APPROVED BY ENGINEER:

SIGNATURE: DATE: 03 June 2025



EXISTING GROUND LEVEL	242.112	242.074	242.068	241.945	241.598	241.546	239.151	238.358	238.096	237.840
INVERT LEVEL OF PIPE	241.176	241.145	240.884	240.692	240.413	240.161	237.855	237.199	237.358	236.792
TOP OF PIPE COVER	0.826	0.819	1.074	1.042	1.075	1.274	1.187	1.049	0.628	0.938
PIPE DESCRIPTION	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9
PIPE LENGTH (m)	6.77	55.23	40.77	16.68	15.00	137.67	39.13	31.00	22.80	
ACCUMULATED PIPE LENGTH (m)	0.000	6.766	62.000	102.766	119.442	134.442	272.114	311.244	342.244	365.044
FITTING NAME	EC01	AV01	T01	VB01	HB01	FH01	T02	VB02	RSV01	Y01

WATER PIPELINE 1 LONGSECTION



EXISTING GROUND LEVEL	242.068	242.103	241.988	242.001	240.927	239.833	239.734	239.699	239.528	239.488	239.464	239.305	239.151
INVERT LEVEL OF PIPE	240.884	240.806	240.764	240.667	239.963	238.818	238.815	238.782	238.391	238.328	238.255	238.060	237.855
TOP OF PIPE COVER	1.074	1.186	1.114	1.224	0.854	0.905	0.809	0.808	1.027	1.050	1.088	1.135	1.187
PIPE DESCRIPTION	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9	110mm uPVC CLASS 9
PIPE LENGTH (m)	12.00	6.50	15.00	108.90	51.06	5.00	3.84	3.85	5.04	5.00	16.38	16.38	
ACCUMULATED PIPE LENGTH (m)	0.000	12.000	18.500	33.500	142.400	193.459	198.459	200.100	208.950	213.966	218.986	235.368	251.750
FITTING NAME	T01	RSV02	HB02	FH02	VB04	T01 REDD	T03	HB03 & VB05	HB04 & VB06	T04	RSV04	FH03	T02

WATER PIPELINE 2 LONGSECTION

PROJECT NUMBER:
PC22024

PROJECT NAME:
URBAN COUNTRY ESTATE

CLIENT:
URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5406

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY MEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER:	DRAFTER:
T de JAGER	J WEST
REVIEWER:	DATE:
L FOURIE	10 JULY 2023

DRAWING NAME:
WATER RETICULATION
LONGSECTIONS SHEET 1 OF 2

DRAWING NUMBER:
PC22024/CIV/2302

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE:	PAPER SIZE:	REVISION:
H1:1000 V1:100	A1	0C

APPROVED BY ENGINEER:
SIGNATURE:
DATE: 10/07/2023

Date: 11November 2024
CHEL File: CHEL-UCE-George-PDR-001
Client File: UCE-George- Design Report

George Municipality
No 71 York Street
Po Box 19
George
Western Cape
6530

Phone: 044 801 9111
Email: lwaring@george.gov.za

Attention: The Director Human Settlements, Planning and Development - Ms Lauren Waring

Dear Sir's.

RE: BULK ENGINEERING SERVICES DESIGN REPORT – URBAN COUNTRY ESTATE ON REMAINDER ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374 – HEATHER PARK; GEORGE

Henco Scholtz
Director
CHEL Building & Civil Services
Cell: 082 881 5456
Email: henco.chel@gmail.com

Louis Fourie
Managing Member
Newground Projects
Cell: 082 576 6828
Email: louis@newground.co.za

Tremayne de Jager
Design Engineer
Newground Projects
Cell: 079 881 7350
Email: tremayne@newground.co.za

Table of Contents

List of Figures

List of Tables

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

1. INTRODUCTION

1.1 Background

Urban Country Estate (Pty) Ltd. has appointed CHEL Building & Civil Services as Civil Engineers for the proposed development of the Urban Country Estate in Heather Park, near Blanco, George.

Urban Country Estate (Pty) Ltd has acquired the remainder portion ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374 and is planning a private gated development with seventy (70) freehold units and forty (40) complex rental units on this property.

This development requires various civil services that must be approved by George municipality. The proposed designs were done in accordance with George Municipality and/or other relevant regulations.

1.2 Objectives

This report sets out the proposed civil engineering bulk infrastructure which will be necessary to service this development of (70) freehold units and forty (40) complex rental units.

1.3 Scope of Works

The scope of work for this phase of the development will consist of the following:

- Construction of new roadways;
- Construction of new internal water reticulation pipework;
- Construction of new internal waterborne gravity sewer network;
- Construction of new internal stormwater network.
- Construction of new stormwater retention dam and cascading structure to transport stormwater from the development into the Malgas river.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

2. Site Conditions

2.1 Location

The Urban Country Estate is located at the Eastern end of Plantation Road next to the N12 main roadway in George, Western Cape. The general location can be seen in Figure 2-1 which shows the location of the settlement relative to its surroundings and major roadways. The coordinates for the site are 33°56'48"S, 22°25'38"E.

Figure 2-1: Satellite image showing the site location

2.2 The Development Site

The site is situated on the face of a hill sloping in a South-Easterly direction down towards a non-perennial river. The stormwater which is to be expected on the site will thus flow in a South-Eastern Direction towards the river. The site is currently covered by vegetation which will need to be cleared prior to construction.

The total area which the development will comprise of is approximately 6.88ha which equates to 68 800m2. The slope on which the site is situated has an average gradient of 12% and a maximum of approximately 30% which is located near the non-perineal watercourse.

The development will consist of 79 erven, accessed by means of two new roadways, as well as one high-density complex.

2.3 Existing Services

Existing services layouts for the George area directly opposite the site was obtained from the offices of GLS Consulting Engineers in Stellenbosch, with approval from Land Development Manager for Civil Engineering Services of the George Municipality.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

There is a 450mm dia GRP water pipeline that runs across the proposed development site that was installed within the road reserves of the LAPSED ERF 19374 site development layout.
(Refer to Picture 5 below)

The site development plan has been adjusted to accommodate the pipe alignment along the main entrance road and have minimal impact on the estate and the planned sites. As far as practically possible and as required, extra supporting filling or cover protection will be provided to clearly demarcate this pipe service.

The pipe will be opened by hand in designated areas to allow visual contact with the pipe to instil an awareness for the pipe with the contracting team throughout the Civil Infrastructure construction process.

2.3.1 Water Supply

The closest existing municipal water main is a Ø100mm pipeline located in Plantation Road. Although GLS Consulting Engineers indicated that there is another Ø90mm water main which is a midblock water supply line, with a pump station in the neighbouring Heather Park, Homewood Development, Tommy Joubert Laan, that is near the South-eastern end of the planned development that can be connected to, we are of the opinion that it is sufficient to connect only to the Ø100mm pipeline in Plantation Road.

Figure 2-2: Municipal Water Layout

The site currently has no existing services. It is, however, situated between two developed areas which have water and sewer services as well as residential roadways. The site can be accessed via two residential roads, namely Legion and George Street.

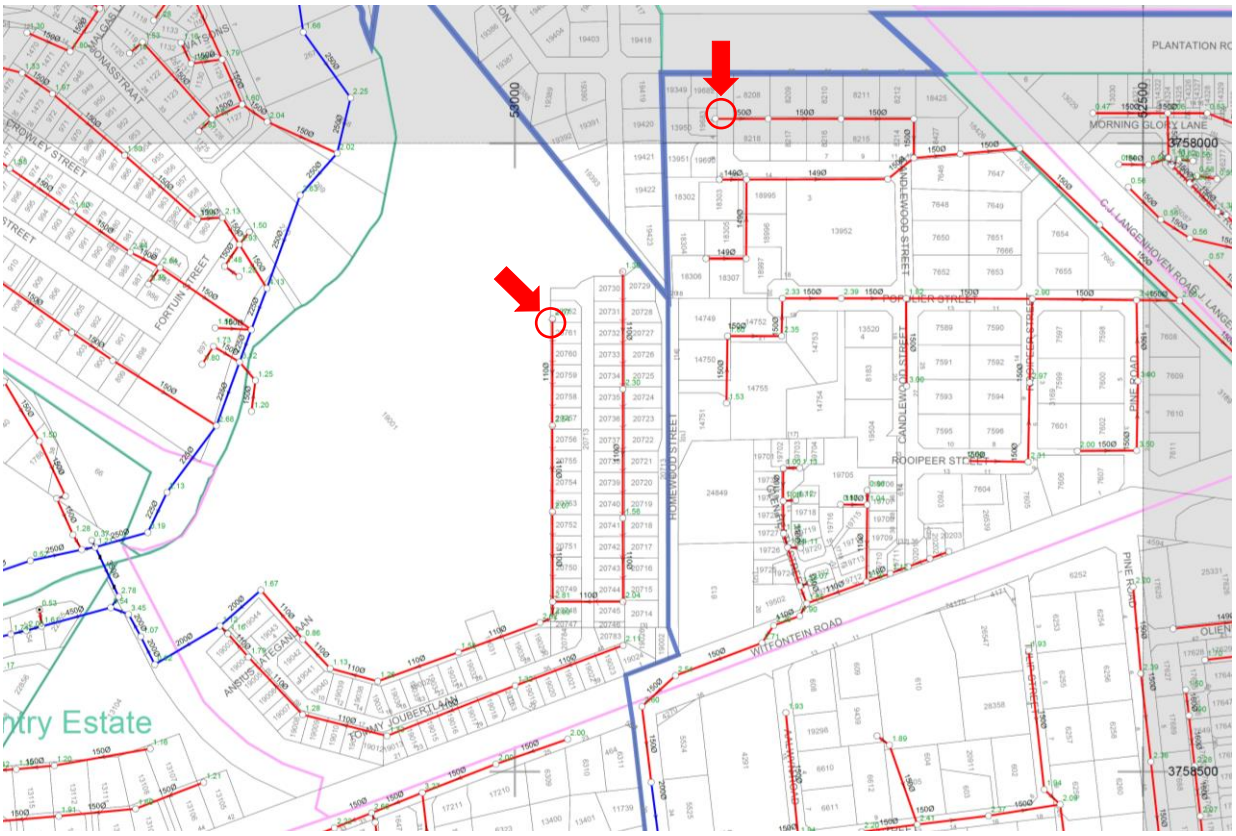
2.3.2 Sewerage

As indicated by GLS Consulting Engineers, there are two (2) Sewer points that can be connected into. This is required in order to accommodate the lower, south-eastern part of the planned estate to the connection point in the neighbouring Heather Park, Homewood Development, Tommy Joubert Laan. This connection is a 110mm diameter sewer main. As confirmed with GLS Consulting Engineers the connection of the planned phase one (1) of the development consisting of twenty-two (22) units will not exceed the hydraulic flow of this network system.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

The 2nd connection that will connect the planned phase two (2), three (3) and four (4) and is located along the Candlewood Street, off from Plantation Road. This connection is a Ø150mm pipe. Again, as confirmed the hydraulic flow of this network would not be exceeded with the connection of the estate to this part of the network. *(Refer to Picture 7 below)*

Figure 2-3: Municipal Sewer Layout



CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3. Design Overview

3.1 Baseline Assumptions

The proposed development is a private, gated residential estate consisting of seventy (70) freehold units and forty (40) complex rental units on this property. The planned development will consist of the following residential units and in mix relationship:

Table 3-1: Erven Breakdown

Item	Unit Description	Ave ERF Size	Ave FLOOR Size	No of Units	Ownership
1	2 Bedroom – 1 Bathroom Semi-detached Flat Units	-	70 m²	40	Rental Units
2	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	309 m²	160 m²	19	Freehold Title
3	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	415 m²	175 m²	32	Freehold Title
4	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	400 m²	160 m²	13	Freehold Title
5	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	452 m²	180 m²	6	Freehold Title
				110	

The average occupational density will be around 2.8 people per unit, lower than the national average of households. The development would cater for the medium income group and will fall within the development category 3 & 4 for services due to the lower-than-average occupational density per household. The average erf size is 381m².

The water demand and sewer return flow contribution of the proposed development was obtained from GLS Consulting Engineers and is outlined in the table below:

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Figure 3-1: Water Demand and Sewer Run-off

Land Use		Unit of Measure (No/100m²/ha....)	No of Units (No/100m²/ha....)	UWD/ Unit Kl/unit/day	Sewer Ratio % x UWD	AADD Inc UAW kL/day	PDDWF Excl. Infilt. kL/day
Phase 1			**Estimated Start Date: 01st Mar 2025**			**EstimatedOccupation Date: 01st Dec 2025**	
T2	Single Storey Residiential (309m² Ave ERF Size)	Unit	10	0,566	70%	5,66	3,96
T4	Double Storey Residiential (454m² Ave ERF Size)	Unit	2	0,833	55%	1,67	0,92
Sub Total			**12**			**7,33**	**4,88**
Phase 2			**Estimated Start Date: 01st Aug 2025**			**EstimatedOccupation Date: 01st May 2026**	
T2	Single Storey Residiential (309m² Ave ERF Size)	Unit	5	0,566	70%	2,83	1,98
T3	Single Storey Residiential (415m² Ave ERF Size)	Unit	18	0,722	60%	13,00	7,80
Sub Total			**23**			**15,83**	**9,78**
Phase 3			**Estimated Start Date: 12th Jan 2026**			**EstimatedOccupation Date: 01st Oct 2026**	
T2	Single Storey Residiential (309m² Ave ERF Size)	Unit	4	0,566	70%	2,26	1,58
T3	Single Storey Residiential (415m² Ave ERF Size)	Unit	27	0,722	60%	19,49	11,70
T4	Double Storey Residiential (454m² Ave ERF Size)	Unit	4	0,833	55%	3,33	1,83
Sub Total			**35**			**25,09**	**15,11**
Phase 4			**Estimated Start Date: 01st Jul 2026**			**EstimatedOccupation Date: 01st Dec 2026**	
T1	2 Bedroom FLats (70m² Ave Floor Size)	Unit	40	0,275	90%	11,00	9,90
Sub Total			**40**			**11,00**	**9,90**
TOTAL			**110**			**59,24**	**39,67**

The AADD, peak flow and fire flow calculated for the proposed development is 59.24 kL/d.

- Peak flow using a zone peak hour factor of 3.6‡ = 2.46 L/s
- Fire flow (Cluster housing > 30 units/ha) using a peak hour factor of 2.0 = 20 L/s @ 10 m

(Note: Flow provided at 1 fire hydrant)
The George Municipality Civil Engineering Services Standards requires that provision be made for 15% extraneous flow in the sewer network. The Peak Wet Weather Flow (PWWF) is therefore equal to 39.67 kL/d.

The stormwater runoff was calculated with a time of concentration of 8 minutes as calculated using the defined watercourse equation as seen below.

$$T_c = \left(\frac{0.87 L^2}{1000 S_{av}} \right)^{0.385}$$

The proposed roads were classified in accordance with TRH26 and are classified as class 5b (Local Street, Residential).

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3.2 Water Reticulation

The reticulation main that will be used for this development will be a Ø110mm class 9 uPVC pipe. This will connect to the existing Ø100mm municipal watermain in Plantation Road.

The DWAF Technical Guidelines for the Development of Water and Sanitation Infrastructure (DWAF, 2004) were consulted when considering the maximum allowable velocities.

The maximum and minimum allowable pipe velocities, according to the (DWAF, 2004) document, are indicated in

Table 3-2.

Table 3-2: Design Velocity Limits as per DWAF

Flow Type	Allowable Velocity
Minimum Raw water	0,6 m/s
Minimum Treated water	0,3 m/s
Maximum DPFR for Reticulations	1,5 m/s
Maximum Pump suction inside station	2,0 m/s
Maximum Design flow in Bulk Supply	3,0 m/s
Maximum Scour flow in Pipelines	5,0 m/s

Under normal flow conditions (no scour valve or hydrant open), the velocity limits according to

Table 3-2 are indicated as a minimum of 0.3 m/s (treated water) and a maximum of 1.5 m/s.

When considering what type of flow to design for, we suggest looking at the maximum DPFR for Reticulations when there are no scour valve or fire hydrant open and looking at the maximum Scour flow when either a scour valve or fire hydrant is opened. The reasoning behind classifying the type of flow as scour flow when a hydrant is open, is because the nature of a hydrant is much more in line with a scour valve than it is to normal flow conditions.

3.2.1 Fire Flow

The fire flow rate was obtained from GLS Consulting Engineers as (Cluster housing > 30 units/ha) using a peak hour factor of 2.0 = 20 L/s @ 10 m. This is based on the assumption that only 1 hydrant will be opened at a time. The velocities indicated in

Table 3-3 are based on the flow conditions when the development is fully developed.

The table shows the velocities within the pipe for two separate cases, namely:

- At normal design flow rate.
- When a hydrant is open in conjunction with the design flow rate.

Table 3-3: Water Reticulation Pipe Velocities

Pipe Size	Velocity without a hydrant	Velocity with a hydrant
Ø110mm	0.32 m/s	2.44 m/s

When comparing these velocities with that of

Table 3-2, we can see that the velocity under normal flow conditions is just above the prescribed minimum of 0,3 m/s. The velocity when a fire hydrant is opened is also below the prescribed maximum of 5 m/s.

As such we recommend that a Ø110mm class 9 main pipe should be installed for the internal reticulation.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3.2 Sewer

The proposed development will be provided with a conventional waterborne sanitation system. The system will consist of separate connectors to individual erven. The reticulation network will gravitate to the lowest suitable connection location onto the existing Municipal network.

Based on the GLS Consulting Engineers report, the sewer reticulation will be connected into the municipal network at two locations. The first being into a Ø150mm pipe in Candlewood Street. This will be a permanent connection and the hydraulic analysis indicated that the system has sufficient capacity for the additional flow from the development. The second connection is an interim connection prior to the development of George Erf 19001 into a Ø110mm pipe. The pipe has sufficient hydraulic capacity for the additional flow generated by the development. As soon as George Erf 19001 is developed, this interim connection will be terminated, and the sewer diverted into their sewer system.

Only 22 of the freestanding erven will gravitate towards the southern part of the development and connect into the Ø110mm pipe. The remainder of the development will connect to the Ø150mm pipe in Candlewood Street.

All internal sewer reticulation pipelines will be Ø160mm class 34 uPVC pipes. All house connection pipes will be Ø110mm uPVC pipes. The minimum slopes on the sewer reticulation pipelines are indicated in the table below.

Table 3-4: Sewer Pipe Slopes

Dwelling units	Minimum Slope
Less than 6	1:80
6 to 10	1:100
11 to 80	1:120
81 to 110	1:150
111 to 130	1:180

In order for the sewer pipeline to connect to the existing network, the pipeline from the sewer manhole MH16 to MH20 had to have a slope of 1:135. This was governed by the need for the sewer to pass under the existing Ø450mm GRP water main. We are of the opinion that this should not cause any issues as this pipe already is functioning as a bulk sewer line as it is servicing a large number of units. Furthermore, because it is the lowest part of the sewer line, most/all the solids would already have disintegrated by the time it reaches this part of the pipeline.

The table below shows the number of different types of erven serviced by the sewer pipeline as well as the resulting flow rate between sewer structures.

Table 3-5: Sewer Run-off

Start	End	X Type	Y Type	Z Type	Flats	Flow Rate (L/s)
RE01	MH01	3	1			**0.104**
MH01	MH02	2				**0.150**
MH02	MH03	4		1		**0.273**
MH03	MH04	2		1		**0.349**
MH04	MH05	3		3		**0.509**
MH05	MH06	3		3		**0.669**
MH06	MH07	3				**1.449**
MH07	MH08					**1.449**
MH08	MH09					**1.866**
MH09	MH10					**1.866**
MH10	MH11					**1.866**
MH11	MH12					**1.866**

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

MH13	MH14					**0.222**
MH14	MH15					**0.452**
MH15	MH16		4	3		**0.681**
MH16	MH17					**0.681**
MH17	MH06			1		**0.711**
RE02	MH18				12	**0.139**
MH18	MH19				2	**0.162**
MH19	MH08				2	**0.417**
MH20	MH21				4	**0.046**
MH21	MH22				8	**0.139**
MH22	MH19				8	**0.231**
MH23	MH24	5				**0.116**
MH24	MH25	5				**0.231**
MH25	MH26					**0.565**
MH26	MH27					**0.565**
MH27	Existing MH					**0.565**
MH28	MH29		1	3		**0.125**
MH29	MH30		2			**0.195**
MH30	MH31		2			**0.264**
MH31	MH25					**0.264**
MH32	MH25	3				**0.069**

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

3.4 Stormwater Drainage

3.4.1 Design Parameters

Making use of the defined watercourse equation, the time of concentration was calculated as 8min.

$$T_c = \left(\frac{0.87 L^2}{1000 S_{av}} \right)^{0.385}$$

The hardening factors for the pre- and post-development were 0.36 and 0.75 respectively. The 075 hardening factor was calculated by using a hardening factor of 0.36 for all grassed areas and 1.0 for all roof and road areas.

The rainfall intensity was obtained using the Design Rainfall software developed for South Africa by Smithers and Schulze.

3.5 Stormwater Runoff

The stormwater runoff for this development will flow in a Southern direction. The majority of the runoff will be directed into the main attenuation dam located on the western side in the middle of the site. The volume retained will be the difference between the 1:5-year pre-development flood and the 1:50 year post-development flood.

The release rate out of the attenuation pond will be equal to the 1:5-year flood flow rate. This will be released into a cascading structure which will transport it down the steep slope into the Malgas river. The stormwater will be released onto Reno Mattresses at the bottom of the cascading structure to prevent any soil erosion.

The stormwater on the southern side of the development will be attenuated in a smaller pond located in the green zone in the middle of the southern side of the development (Phase 1). The outflow pipe will be directed to the south with an interim headwall located in George Erf 19001. Because of the topography of the site, it is not possible to direct the stormwater back up towards the main pond. Due to the lack of municipal infrastructure to the south of the development, the best solution would be to connect to the stormwater infrastructure of George Erf 19001 once it is developed.

3.5.1 Stormwater Runoff

Table 3-6 indicates all the catchment areas that contributed to the stormwater runoff of at the parking area. Area 1 is diverted to the main pond in the middle of the site. Area 2 is diverted to the small pond in Phase 1, while area 3 is the stormwater that falls below the roads and is therefore not diverted to any pond but rather runs off uncontrolled.

Table 3-6: Stormwater Runoff for Catchment Areas

Catchment	A (m^2)	Hardening Factor	$Q_{1:50}$ (ℓ/s)	$Q_{Total\ if\ uncontrolled}$	Q_{design} (ℓ/s)
Area 1 (controlled)	24026	1.00	1322.754	1419.310	222.296
	4872	0.36	96.556		
Area 2 (controlled)	6208	1.00	341.785	444.662	95.270
	5191	0.36	102.877		
Area 3 (uncontrolled)	9302	0.36	184.366	184.366	184.366
Total Area	49598	0.75	2047.984	2048.337	501.932

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

4 Internal Road

4.1 Road Classification

The internal roadways within the development will connect to Plantation Road with an access control gate at the entrance.

The road is classified as class 5b (Local residential access road) according to TRH26.

4.2 Geometric Design

The majority of the roads will be 6m wide (3m per lane direction) with the exception of a 4m wide one-way road on the north-eastern side of the property (Internal Road 3). A one-way road for this section was decided upon for both traffic flow and safety purposes.

4.3 Pavement Design

All internal roads will have a rigid layerworks (concrete) design with the exception of the high-density flats being 60mm interlocking paving. The layerworks design for the concrete road was done based on "A guide to the design of new pavements for light traffic" by Austroads, while the layerworks for the paving was done based on UTG 2 (The Committee of Urban Transport Authorities, 1987:43).

A typical cross-section of the road can be seen in drawing PC22024/CIV/2101.

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

5 Bibliography

Chadwick, A., Morfett, J. and Borthwick, M., 2013. *Hydraulics in civil and environmental engineering*. Crc Press.

Committee of Land Transport Officials (COLTO), 1996. *TRH 4: Structural Design of Flexible Pavements for Interurban and Rural Roads.* Department of Transport.

Committee of Transport Officials, 2014. *South African Traffic Impact and Traffic Assessment Standards and Requirements Manual.* South African National Roads Agency Limited.

Roads Coordinating Body (RCB) of the Committee of Transport Officials (COTO), 2012. *TRH 26: South African Road Classification and Access Management Manual.* South African National Roads Agency Limited.

South African National Roads Agency SOC Ltd., 2014. *South African Pavement Engineering Manual*. South African National Roads Agency Limited.

(The Committee of Urban Transport Authorities, 1987), 1987. *UTG 2: Structural Design of Segmented Block Pavements for Southern Africa.* National Institute for Transport and Road Research.

van Vuuren, S.J. and van Dijk, M., 2011. *Waterborne sanitation operation and maintenance guide*. (Committee of Transport Officials, 2014) (Committee of Transport Officials, 2012)

CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz Tel: 082 881 5456 Email: henco.chel@gmail.com

Annexure A: Locality Plan

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure B: Site Plan

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure C: Water Reticulation Drawings

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure D: Sewer Reticulation Drawings

CHEL Building & Civil Services (Pty) Ltd.
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Reg No. 2022/274155/07
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure E: Stormwater Drainage Drawings

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

Annexure F: Internal Road Drawings

CHEL Building & Civil Services (Pty) Ltd.
Reg No. 2022/274155/07
No 141 Chip Close; Le Grand Estate; George; 6534
Director: HC Scholtz
Tel: 082 881 5456
Email: henco.chel@gmail.com

PROPOSED URBAN COUNTRY ESTATE DEVELOPMENT

CHEL Building & Civil Services

No 141, Chip Close,
LE GRAND Estate,
George,
6534

Tel: 082 881 5456
Email: henco.chel@gmail.com

Title:
URBAN COUNTRY ESTATE DEVELOPMENT

Sub Title: LOCALITY PLAN

Scale: 1 : 50 000

Drwg No.: CHEL/ UCE-2022/ GEN/ 01

CapeFarmMapper ver 2.6.10

CHEL Building & Civil Services

No 141, Chip Close,
LE GRAND Estate,
George,
6534

Tel: 082 881 5456
Email: henco.chel@gmail.com

Title: **URBAN COUNTRY ESTATE DEVELOPMENT**

Sub Title: LOCALITY PLAN

Scale: 1 : 9028

Drwg No.: CHEL/ UCE-2022/ GEN/ 02

PROPOSED URBAN COUNTRY ESTATE DEVELOPMENT
Lapsed ERF 19374

N9 – Cl Langenhoven Road

Plantation Road

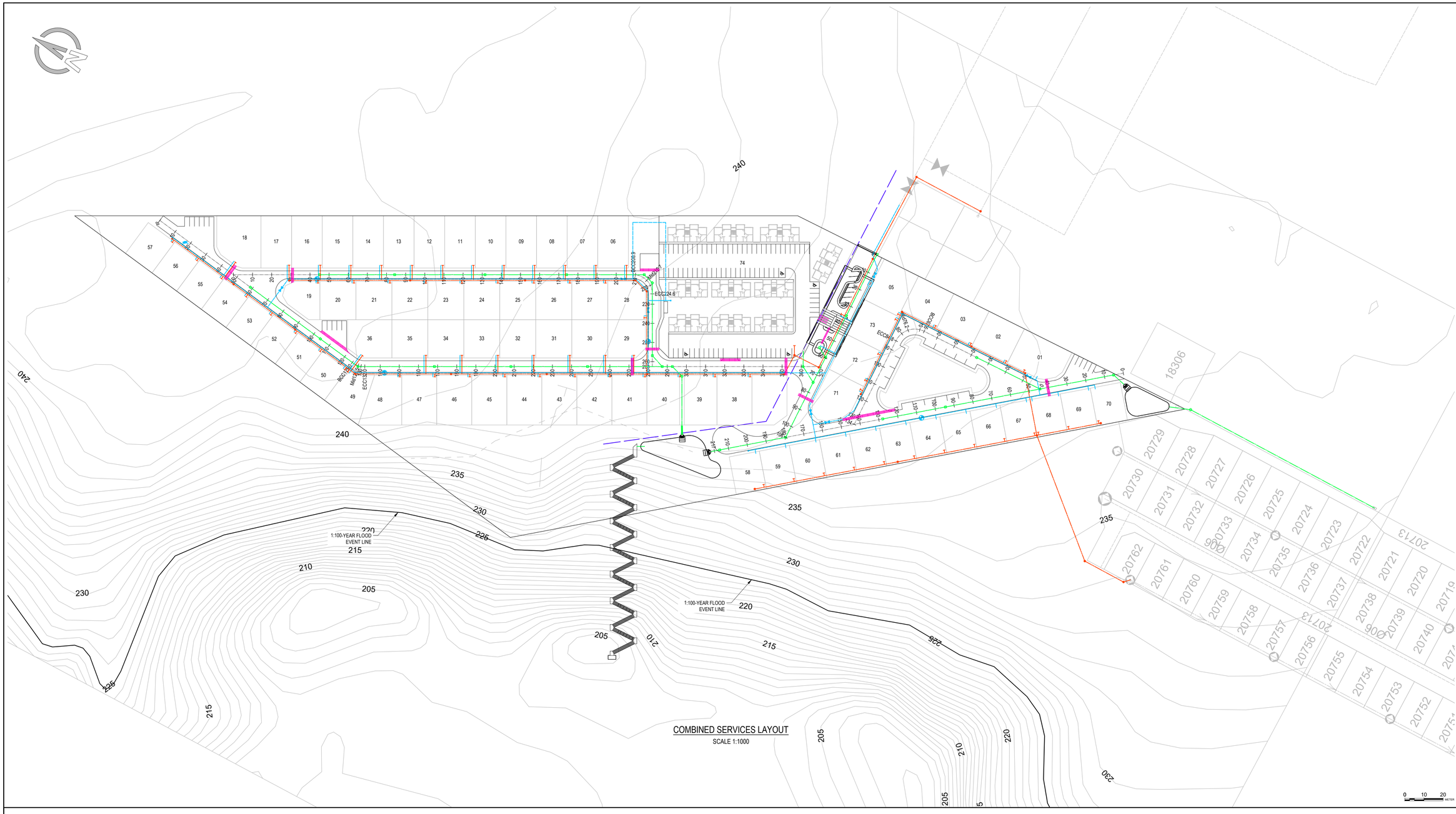
Blanco

Heather Park

Blanco

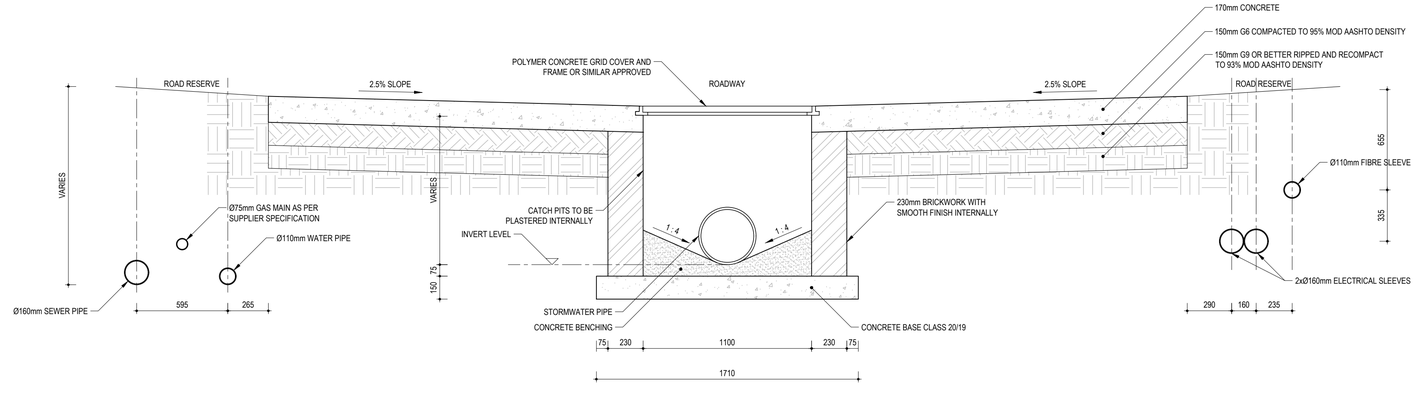
Dormehls Drift

Date: 20191219, GSD: 0.5m | Maxar | Esri South Africa, Esri, HERE, Garm



COMBINED SERVICES LAYOUT

SCALE 1:1000



TYPICAL COMBINED SERVICES DETAIL

THROUGH SECTION

SCALE 1:20

LEGEND:

- Ø110mm uPVC CLASS 9 WATER PIPE
- Ø160mm uPVC CLASS 34 SEWER PIPE
- Ø375mm, 450mm AND Ø600mm CLASS 100D STORMWATER PIPE
- ELECTRIC SLEEVES
- ISOLATION VALVE
- AIR VALVE
- WATER FIRE HYDRANT
- WM BULK WATER METER
- SEWER MANHOLE
- SEWER RODDING EYE
- EXISTING SEWER MANHOLE
- PROPOSED HOUSE CONNECTION
- STORMWATER CATCH PIT
- STORMWATER MANHOLE
- EXISTING CATCH PIT

PROJECT NUMBER:
PC22024

PROJECT NAME:
URBAN COUNTRY ESTATE

CLIENT:
URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 04 SEPTEMBER 2023

DRAWING NAME:
COMBINED SERVICES LAYOUT AND DETAIL

DRAWING NUMBER:
PC22024/CIV/2101

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: AS SHOWN
PAPER SIZE: A1
REVISION: 0D

SIGNATURE:
APPROVED BY ENGINEER:
DATE: 07/09/2023

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
AV01	53049.413	3757620.643	241.145
EC02	53005.048	3757932.052	236.888
FH01	53058.617	3757745.365	240.161
FH02	53032.014	3757691.198	240.667
FH03	52979.258	3757859.057	238.060
FH04	52947.087	3758003.884	236.094
HB01	53065.690	3757732.137	240.413
HB02	53039.086	3757677.970	240.764
HB03 & VB05	52953.465	3757838.119	238.978
HB04 & VB06	52955.955	3757846.611	238.391

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
HB09	52883.946	3757941.180	237.151
HB10 & VB09	52889.389	3757947.023	237.148
HB11	52969.056	3757949.268	236.679
HB12 & VB10	52967.242	3757967.849	236.480
HB13	52960.553	3757971.015	236.526
HB14 & VB11	52903.675	3757969.452	236.873
HB15 & VB12	52901.452	3758048.020	235.560
HB16 & VB13	52907.526	3758052.913	235.552
RSV01	52960.643	3757928.621	237.358
RSV02	53045.518	3757677.031	240.806

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
RSV03	52956.596	3757832.262	239.066
RSV04	52964.808	3757851.339	238.265
RSV05	52892.888	3757947.122	237.127
RSV06	52971.780	3757951.465	236.659
RSV07	52972.299	3757961.522	236.553
RSV08	52901.593	3758043.022	235.647
T01	53057.392	3757675.297	240.884
T02	52993.708	3757866.775	237.855
T04	52960.398	3757848.984	238.328
T05	52976.982	3757955.663	236.620

WATER PIPE COORDINATES
WGS84 LO23

Fitting Name	Y Coordinate	X Coordinate	Pipe Invert Level
T06	52982.442	3757960.068	236.578
VB01	53063.281	3757715.636	240.692
VB02	52975.259	3757901.283	237.199
VB03	52958.412	3757932.794	237.411
VB04	52980.670	3757787.234	239.963
WM01	52897.886	3757947.263	237.098
Y01	52949.894	3757948.728	236.792
Y01.	52949.894	3757948.728	236.792

LEGEND:
- WATER PIPE
- EXISTING/FUTURE WATER PIPE
- HOUSE CONNECTIONS
- ISOLATION VALVE
- AIR VALVE
- WATER FIRE HYDRANT
- WM BULK WATER METER

EXISTING Ø450mm GRP PIPE
TIE-IN EXISTING
NOTE:
PIPE TO CONNECT TO EXISTING WATER PIPE WITHIN ACCESS ROAD ROAD RESERVE.
Ø110mm uPVC CLASS 12
WATER PIPELINE 2
WATER PIPELINE 1
WATER PIPELINE 4
WATER PIPELINE 5
PIPE TO BE CONCRETE INCASED
1:100-YEAR FLOOD EVENT LINE
WATER RETICULATION LAYOUT
0 8 16 METER

PROJECT NUMBER: PC22024
PROJECT NAME: URBAN COUNTRY ESTATE
CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:
CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:
ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 08 SEPTEMBER 2023
DRAWING NAME: WATER RETICULATION LAYOUT
DRAWING NUMBER: PC22024/CIV/2301
DRAWING ISSUED FOR: PRELIM DESIGN
SCALE: 1 : 800
PAPER SIZE: A1
REVISION: 0D
SIGNATURE:
APPROVED BY ENGINEER:
DATE: 07/09/2023

SEWER STRUCTURE COORDINATES
WGS84 LO23

Structure Name	Y Coordinate	X Coordinate	Invert Level
Existing MH	52970.335439	3758139.980	232.280
MH01	53054.881820	3757654.027	240.432
MH02	53060.654108	3757693.609	240.032
MH03	53066.282089	3757732.201	239.008
MH04	53042.720471	3757776.301	238.591
MH05	53019.158852	3757820.401	237.344
MH06	52994.513399	3757866.531	236.955
MH07	52960.614068	3757929.938	236.422
MH08	52949.514129	3757929.901	236.339
MH09	52949.113877	3757944.095	236.234

SEWER STRUCTURE COORDINATES
WGS84 LO23

Structure Name	Y Coordinate	X Coordinate	Invert Level
MH10	52885.839748	3757942.285	235.764
MH11	52837.339755	3757942.258	235.404
MH12	52837.358652	3757980.208	235.122
MH13	53039.413895	3757678.559	240.843
MH14	53009.592320	3757734.395	240.016
MH15	52981.304615	3757787.308	239.536
MH16	52954.100660	3757838.192	237.620
MH17	52956.416298	3757846.163	237.340
MH23	53020.953005	3757944.602	234.555
MH24	52973.224767	3758003.746	233.719

SEWER STRUCTURE COORDINATES
WGS84 LO23

Structure Name	Y Coordinate	X Coordinate	Invert Level
MH25	52926.752536	3758061.333	233.086
MH26	52972.872539	3758114.390	232.502
MH27	52972.977180	3758137.390	232.311
MH28	52951.087690	3757970.182	236.527
MH29	52903.106484	3757968.839	235.927
MH30	52901.965998	3758009.323	235.482
MH31	52901.070447	3758040.610	234.316
MH32	52905.400430	3758087.792	233.645
RE01	53049.109532	3757614.446	240.932

LEGEND:
- SEWER PIPE
- EXISTING/FUTURE SEWER PIPE
- SEWER MANHOLE
- SEWER RODDING EYE
- EXISTING SEWER MANHOLE
- PROPOSED HOUSE CONNECTION

SEWER RETICULATION LAYOUT

1:100-YEAR FLOOD EVENT LINE

1:100-YEAR FLOOD EVENT LINE

0 8 16 METER

PROJECT NUMBER:	PC22024
PROJECT NAME:	URBAN COUNTRY ESTATE
CLIENT:	URBAN FRONT (Pty) Ltd.
CIVIL & STRUCTURAL ENGINEER:	CHEL BUILDING AND CIVIL SERVICES 141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534 TEL: 082 881 5456
	NEWGROUND PROJECTS 17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201 PO Box 19568, Tecoma, 5214 TEL: 043 722 5864 FAX: 086 520 6942 www.newground.co.za
ARCHITECT:	ARCHITECTURAL RESPONSIVE DESIGN 5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY TEL: 082 043 4033
REFERENCE DRAWINGS	
REVISIONS	REV / DATE / DESCRIPTION
DESIGNER: T de JAGER	DRAFTER: J WEST
REVIEWER: L FOURIE	DATE: 04 SEPTEMBER 2023
DRAWING NAME:	SEWER RETICULATION LAYOUT
DRAWING NUMBER:	PC22024/CIV/2401
DRAWING ISSUED FOR:	PRELIM DESIGN
SCALE: 1 : 800	PAPER SIZE: A1
REVISION:	0D
SIGNATURE:	APPROVED BY ENGINEER: DATE: 07/09/2023

STORMWATER STRUCTURE COORDINATES WGS84 LO23			
Structure Name	Y Coordinate	X Coordinate	Invert Level
CHANNEL	53009.834537	3757895.478	237.158
CP01	53052.228119	3757662.524	241.022
CP02	53058.782605	3757707.448	240.303
CP03	53062.301724	3757731.549	239.918
CP04	53043.442592	3757766.824	239.285
CP05	53024.583460	3757802.099	238.652
CP06	53005.724328	3757837.374	238.019
CP07	52987.336331	3757871.768	237.401
CP08	52984.837505	3757876.442	237.489

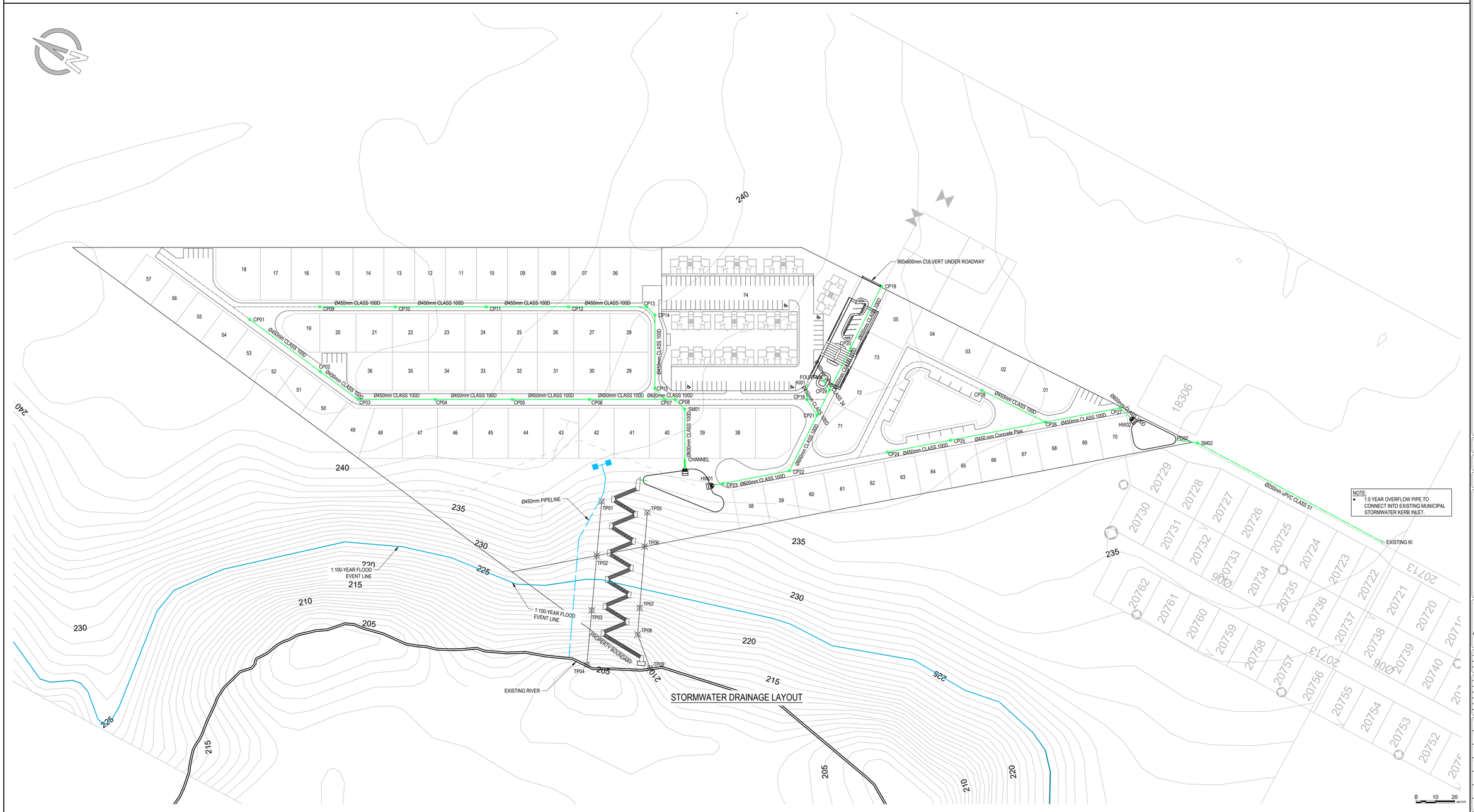
STORMWATER STRUCTURE COORDINATES WGS84 LO23			
Structure Name	Y Coordinate	X Coordinate	Invert Level
CP09	53029.387941	3757691.305	240.983
CP10	53010.905969	3757725.875	240.591
CP11	52988.652165	3757767.499	240.119
CP12	52968.567165	3757805.067	239.285
CP13	52949.425122	3757840.872	238.054
CP14	52951.202009	3757846.602	237.870
CP15	52984.706854	3757864.531	237.440
CP18	52952.635494	3757936.674	236.542
CP19	52882.680018	3757943.103	236.818

STORMWATER STRUCTURE COORDINATES WGS84 LO23			
Structure Name	Y Coordinate	X Coordinate	Invert Level
CP20	52918.565781	3757944.114	236.639
CP21	52957.450355	3757945.210	236.444
CP22	52989.537625	3757946.114	236.284
CP23	53011.579024	3757918.797	236.108
CP24	52957.134885	3757986.271	236.136
CP25	52936.186454	3758012.233	235.630
CP26	52904.643602	3758051.325	235.195
CP27	52880.009095	3758081.855	234.855
CP28	52905.683135	3758014.449	236.267

STORMWATER STRUCTURE COORDINATES WGS84 LO23			
Structure Name	Y Coordinate	X Coordinate	Invert Level
CP29	52942.856145	3757944.799	236.517
Existing KI	52877.069762	3758234.857	233.803
Fountain	52939.886613	3757939.585	237.069
HW01	53014.593233	3757915.062	236.084
HW02	52881.830186	3758089.034	234.791
KI01	52945.506439	3757933.044	236.622
PD02	52881.035568	3758115.285	234.629
SM01	52986.896345	3757883.237	237.418
SM02	52877.044076	3758125.857	234.475

LEGEND:

- STORMWATER PIPE
- M100 SUBSOIL DRAIN
- (CP) STORMWATER CATCH PIT
- (SM) STORMWATER MANHOLE
- (STRE) STORMWATER RODDING EYE
- (KI) STORMWATER KERB INLET
- EXISTING/FUTURE STORMWATER KERB INLET
- (CE) SUBSOIL DRAIN CLEANING EYE
- SUBSOIL PIPE (HB) HORIZONTAL BEND (VB) VERTICAL BEND
- (SWB) STORMWATER PIPE BEND



NOTE:

- 1:5 YEAR OVERFLOW PIPE TO CONNECT INTO EXISTING MUNICIPAL STORMWATER KERB INLET.

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:

ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: W JEVON	DRAFTER: W JEVON
REVIEWER: L FOURIE	DATE: 11 NOVEMBER 2024

DRAWING NAME: STORMWATER DRAINAGE LAYOUT

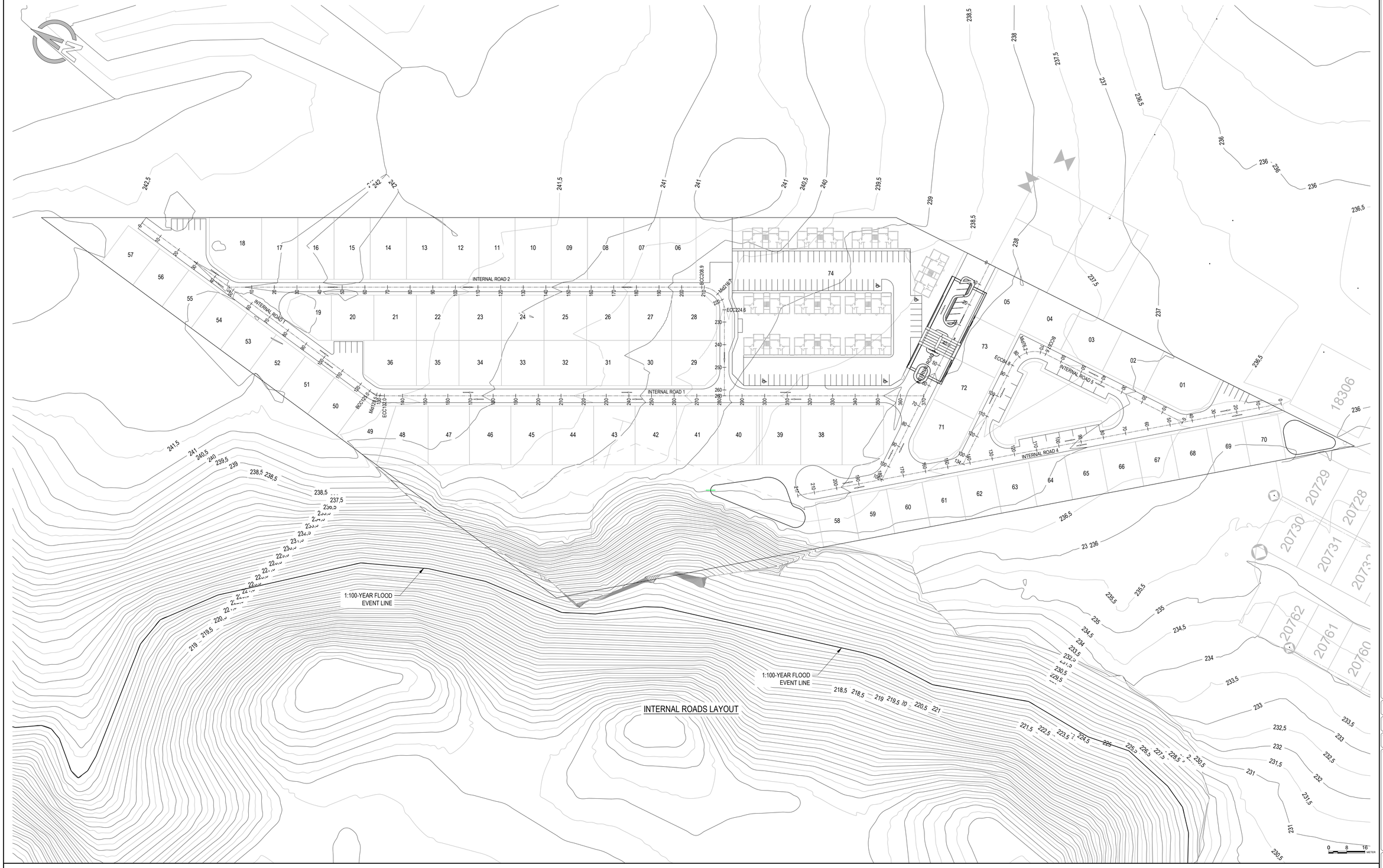
DRAWING NUMBER: PC22024/CIV/2502

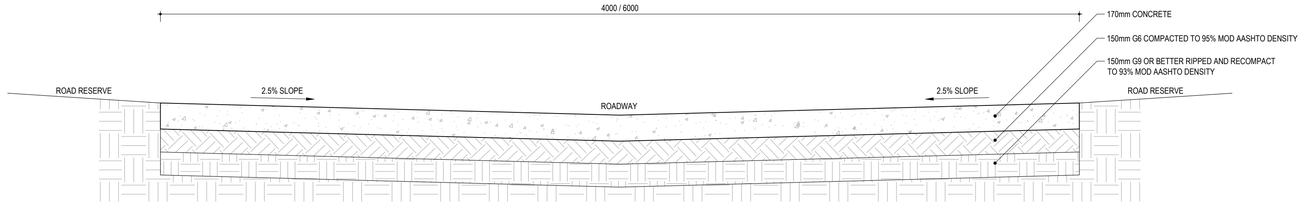
DRAWING ISSUED FOR: PRELIM DESIGN

SCALE:	PAPER SIZE:	REVISION:
1 : 1000	A1	0F

APPROVED BY ENGINEER:

SIGNATURE: DATE: 13 Nov 2024





TYPICAL ROAD CROSS SECTION

SCALE 1:20

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN FRONT (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 8942
www.newground.co.za

ARCHITECT:

ARCHITECTURAL RESPONSIVE DESIGN
5 LOFTY NEL STREET, VOORBAAI, MOSSEL BAY
TEL: 082 043 4033

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS:

DESIGNER: T de JAGER
DRAFTER: J WEST
REVIEWER: L FOURIE
DATE: 11 SEPTEMBER 2023

DRAWING NAME: INTERNAL ROADS LAYOUT AND DETAIL

DRAWING NUMBER: PC22024/CIV/2601

DRAWING ISSUED FOR: PRELIM DESIGN

SCALE: 1 : 800
PAPER SIZE: A1
REVISION: 0D

SIGNATURE:
APPROVED BY ENGINEER:
DATE: 10/09/2023

Date: 21 November 2022
CHEL File: CHEL-UCE-001
Client File: UCE –Bulk Engineering Services

CLIENT

Urban Country Estate (Pty) Ltd.
No 539 Crossberry Street
Xanadu Eco Estate,
Hartbeespoort,
Gauteng,
0216

URBAN COUNTRY ESTATE:

REMAINDER ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374

Heather Park, near Blanco,
George,
Western Cape

ENGINEERING SERVICES DEVELOPMENT REPORT

Report compiled by:

CHEL Building & Civil Services
No 141 Chip Close Street
Le Grand Estate
George
6534

Tel: 082 881 5456
Email: henco.chel@gmail.com

Urban Country Estate (Pty) Ltd.

URBAN COUNTRY ESTATE:
REMAINDER ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374
Heather Park, near Blanco,
George, Western Cape

ENGINEERING SERVICES DEVELOPMENT REPORT

INDEX

LIST OF FIGURES

LIST OF TABLES

ANNEXURES

Urban Country Estate (Pty) Ltd.

URBAN COUNTRY ESTATE:
REMAINDER ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374
Heather Park, near Blanco,
George, Western Cape

ENGINEERING SERVICES DEVELOPMENT REPORT

1. Introduction.

CHEL Building & Civil Services was appointed by the Developer, Urban Country Estate (Pty) Ltd. to prepare a bulk engineering service, feasibility report for the proposed Development of the Urban Country Estate in Heather Park, near Blanco, George.

The bulk engineering services, feasibility report is required for the EIA and rezoning applications and to obtain confirmation from George Municipality that the bulk services are available for the proposed development.

Urban Country Estate (Pty) Ltd has acquired remainder portion ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374 and is planning a private gated development with seventy-seven (77) freehold units and forty (40) complex rental units on this property.

This report sets out the proposed engineering bulk infrastructure which will be necessary to support this proposed development of 117 units which is envisioned to be constructed in four (4) phases.
See **Annexure B** for the Preliminary Site development Plan.

2. Site Description

2.1 Location

Heather Park, near Blanco falls under the jurisdiction of the George Local Municipality and is part of the Garden Route District. The town of George is 429 km East of Cape Town and 324km West of Port Elizabeth/ Gqeberha, via the N2.

The geographical position is approximately 33° 45′ latitude and 22° 50′ longitude.

Access to the site is gained via a black topped collector road, named Plantation Road that is accessed from the black topped national road N12 CJ Langenhoven Road that routes to Oudtshoorn, Northeast past the planned development site.

The exact location of the Erfs on which the development is planned is shown on the locality plan included in this report as **Annexure A.**

2.2 The Site

Remainder portion of ERF 6182; ERF 6179; ERF 6156 of LAPSED ERF 19374 forms the Development footprint that is 5.63418 Ha with green/park spaces taking up approximately 0.85 Ha. The proposed development is bounded on the south-eastern side by the suburb of Heather Park off from Plantation and Candlewood drive. On the western side of the site the Malgas River separates the development that falls within the Heather Park suburb from the Blanco suburb.

The development will have a grand dual entrance/ exit facility with 24-hour security and automated access control. The green/ parks will contain indigenous botanic gardens with seating/picnic arrangements in tranquil garden settings.

The Site is characterised by a gentle sloping landscape across the site that is surrounded by tree forest on the northern eastern, western and southwestern sides of the site. The site consists of mostly grass land and small brush, with isolated small trees scattered across the site. A steep drop-off slope is found along the Southwestern side of the site that slopes towards the Malgas River that is approximately 40m West of the Site boundary line. This slope provides access to a lower elevation area. The slopes will require small to moderate slope stabilization and is planned in the form of terraced platforms with staggered stabilized slopes and retaining structures. The retaining structures will be a combination of Timber logs and columns to gabion baskets and sections of Terraforce walls.

A Bulk Municipal water line crosses the site and will be incorporated as far as possible within the planned Site Development Plan layout. Relocation could be needed but will first be discussed with the Development and Infrastructure Planning department of the George Municipality. The cost thereof to be discussed with George Municipality in the form of an offset against the Development Contribution Levies.

A very large eucalyptus tree is located within the perimeter of the property, near the south, eastern side of the development that borders onto the existing Heather Park suburb. There is also an incomplete dwelling found approximately 35m south of the large eucalyptus tree. This incomplete dwelling will be demolished and removed from site. The Tree will also need to be felled by suitably qualified tree fellers under instruction of an Arborist under the approval of the Department Environmental Affairs and Development Planning.

The site falls from the Highest point of 242.0 m above Mean Sea Level to an elevation of 236.0 m on the Southern tip of the site that adjoins onto Homewood Street. The average slope of the site is 1.02%. There does not seem to be elevation problems that could be encountered. Suitable allowances will be made in the design and construction for the slope angles required for the services.

2.3 Geology

A detailed geotechnical investigation was conducted by Outeniqua Geotechnical Services. Testing and sampling were done in accordance with the Generic Specifications GFSH-2 for Geotechnical Site Investigations for Housing Developments as published by the National Department of Housing and the Site Investigation Code of practice as published by the geotechnical Division of SAICE and further to SANS-634, Geotechnical Investigations for Township Development.

The study conducted eight (8) data points randomly spaced and selected over the 5.63418 Ha site. The testing that was conducted consisted of six (6) foundation indicator tests, four (4) MOD AASHTO/ CBR/ Indicator tests as well as in situ cone penetrator (DCP) tests. All testing was conducted at a SANAS-Accredited soils laboratory (Outeniqua Lab) in accordance with SANS 3001 and ASTM methods.

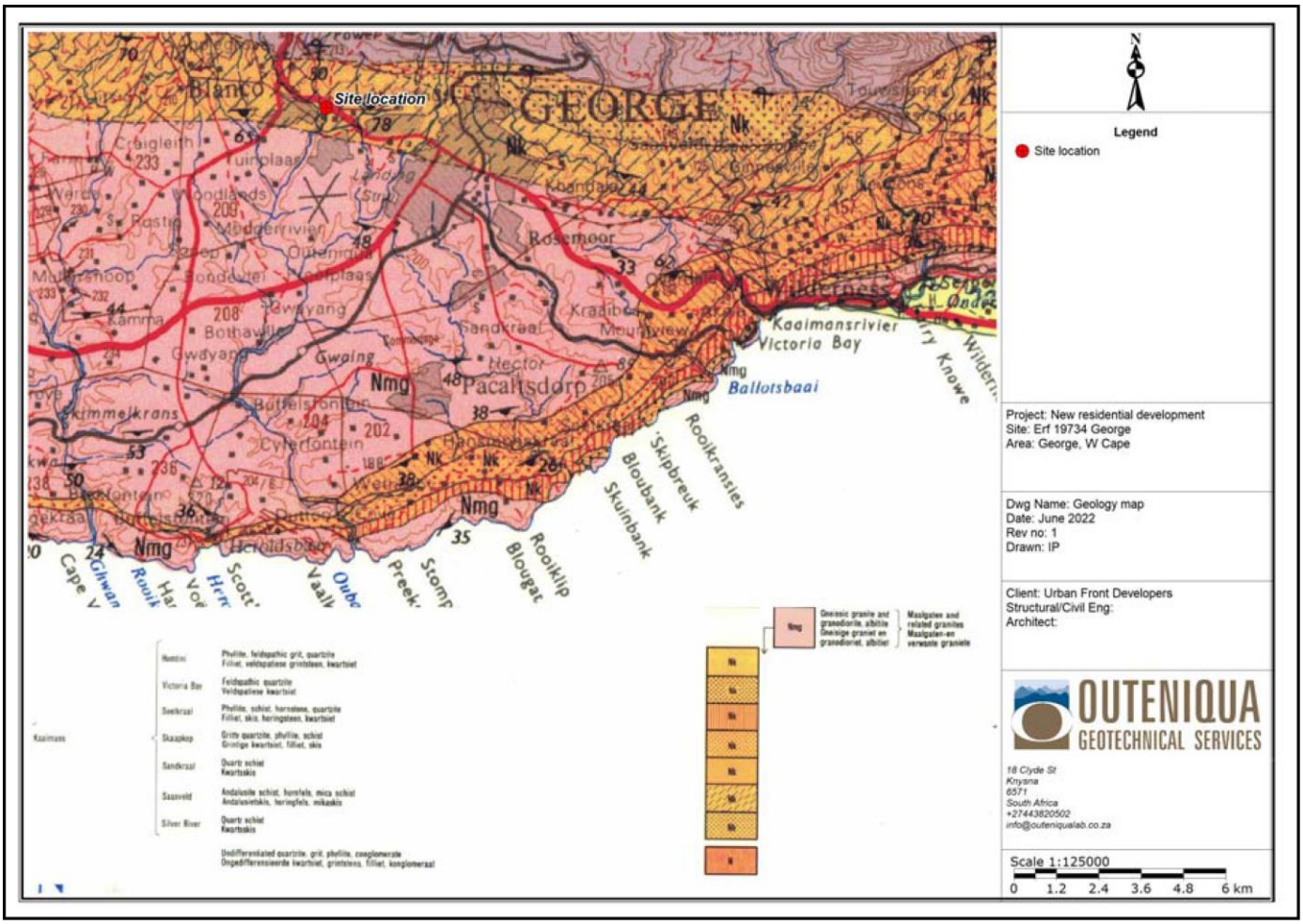


Figure 1: Geological Map of the site.

It is noteworthy to point out that the site is underlain by schist and hornfels of the Saasveld formation of the Kaaimans Group, which had been intruded by granite of the George pluton to the south of the site (Figure 1). The risk of seismic activity in the area is low. The geology of the site was generally considered suitable for urban development purposes with due consideration to local geotechnical constraints.

Test pits revealed variable soil profiles but was generally described as an assembly of fine grained, colluvial soils, including clayey silts and fine sand with sporadic gravel, overlying a sporadic pedogenic horizon (ferricrete nodules in clayey sandy matrix), which was then underlain by clayey sandy gravelly residual soil derived from the complete weathering of the underlying feldspathic sandstone or hornfels.

The underlying rock was only encountered in a few of the pits. The general soil profile was recorded as follows:

- 0-500mm: Moist to very moist, dark brown, soft to firm, intact, clayey silt with abundant roots (topsoil).
- 500-900mm: Moist, light brown, medium dense, intact, silty fine sand, colluvium.
- 900-1100mm: dark red orange, medium dense, pin holed & voided, clay & sandy gravel (ferricrete), pedogenic.
- 1100-2000mm: Moist, mottled light brown & dark red orange, stiff, micro shattered & slicken sided, silty clay with scattered gravel & cobbles, residual (completely weathered feldspathic sandstone – see Figure 2).
- >2000mm: Blotched grey & red orange, highly to completely weathered, highly fractured, soft rock, feldspathic sandstone/hornfels.

Figure 2: Active residual clay extracted from the test pits.

No Significant ground water tables were encountered in any of the test pits. Slight water seepage was encountered in Test Pit 5. TP 5 happens to be near the 450mm diameter Bulk Municipal water supply line that crosses the site. It is recommended that the area surrounding the pipe be investigated for any possible leakages.

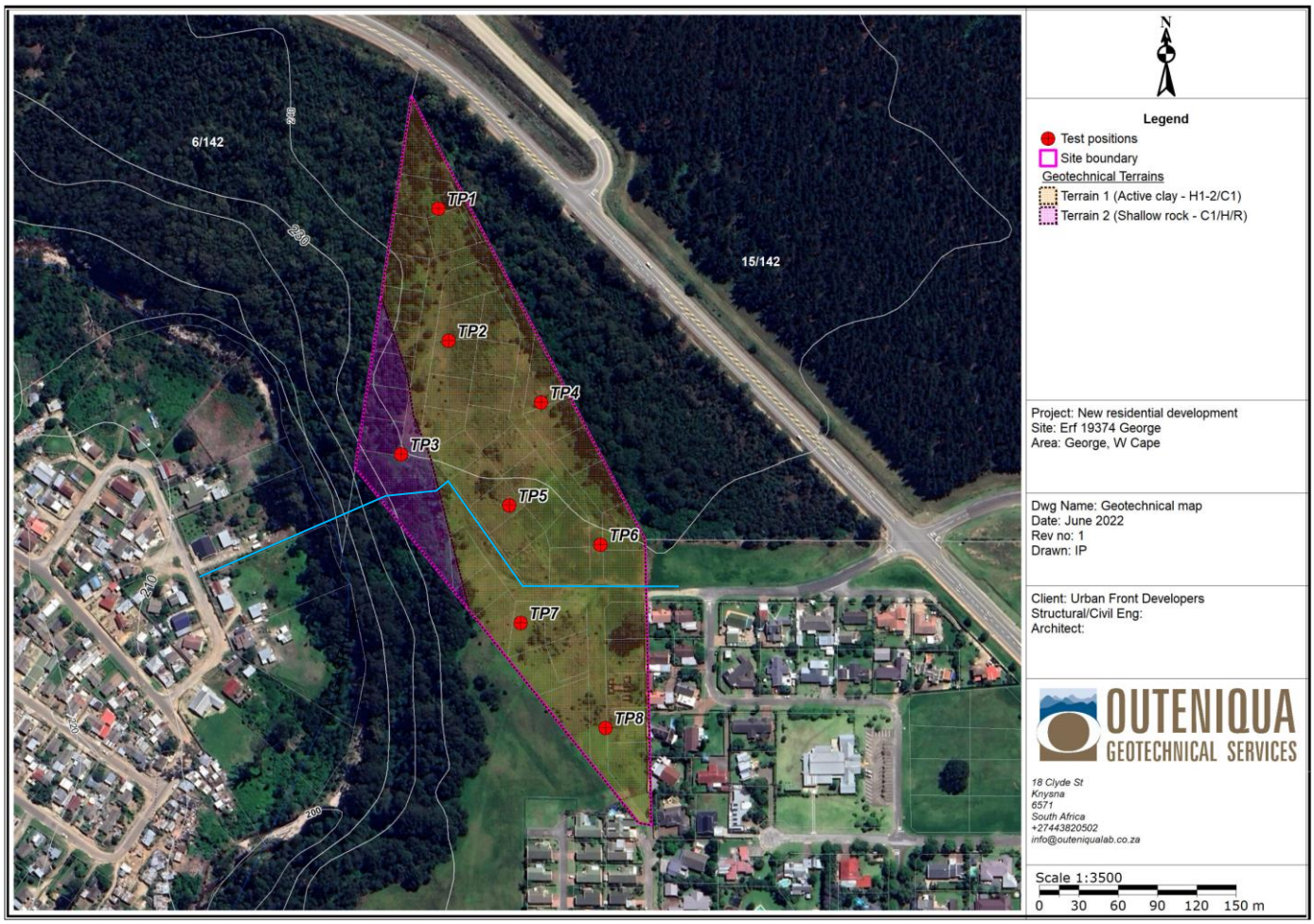


Figure 3: Soil Investigation Test Pit locations. **BLUE** line represents the 450mm dia Municipal water Supply line across the development site.

The DCP tests indicated a generally loose/soft soils in the upper 0.8m, which broadly correlated to the transported horizons, but the tests consistently improved below this depth to medium dense or dense consistency. The tests indicated allowable bearing capacities in the range of 125-150kPa below a nominal founding depth of 0.8m, with less than 10mm anticipated settlement (immediate or collapse-induced). The entire site was classified according to SANS 10400-H as C1.

For access roads and parking areas, it is recommended that allowance is made for importation of selected subgrade material of at least G7 quality to improve the road subgrade, below the conventional road layer works (subbase/base layers).

The site is generally suitable for the proposed development in terms of the geology but there are some geotechnical constraints which may have an effect the engineering. The constraints will be overcome by making allowance for it in the design and construction of the development.

2.4 Climate

George in the Garden Route is the oldest and central city as well as industrial hub of the South African Garden Route. George is approximately 15km inland and lies in close proximity to the majestic Outeniqua Mountains. The mountain tends to affect weather patterns and humidity levels. Suburbs close to the mountain experience more humid conditions than those further away. In general George temperatures are slightly lower than neighbouring towns Knysna or Mossel Bay. The close proximity to the mountain, which tends to bank cloud formations also affects temperature and rainfall. The effect of the mountain and close proximity to the coast tends to alter weather patterns pretty rapidly

The town has a Mediterranean maritime climate, with moderately hot summers, with mild to chilly winters. George boasts one of the richest rainfall areas in South Africa. Rains usually occur during the winter months, which are brought on by the humid sea-winds from the Indian ocean. As a general rule the Southern Cape & Garden Route's temperate weather falls between two climatic regions of summer and winter rainfall, which results in rain falling mostly at night, which tends to keep the area perennially green.

- Spring usually can be felt toward the end of August into September. October tends to experience a drop in temperature before full summer sets in. General 10-19ºC
- Summer is considered to be between the months of November to March, which are warmer, with December to February seeing mid-summer with daily temperatures ranging between 24-30ºC. February - March usually sees strong berg winds, which on odd days reach a peak where temperatures rise to as much as 38ºC.
- Autumn is commonly persistent pleasant weather and temperatures start cooling from about April, however the pleasant conditions may last until June. General 14-22ºC
- Winter runs through June, July and August. Temperatures usually fluctuate between 8-17ºC. In general, the barometer seldom drops below 10ºC. Most days are warm with evenings colder.

The site falls within the Temperate/ moderate coastal climate region of South Africa. The George climate is generally classified as mild and generally warm and temperate. There is significant rainfall throughout the year in George. Even the driest month still has a significant amount of rainfall. This location is classified as Cfb by Köppen and Geiger.

The average temperature in George is 16.7 °C. The total rainfall for the area in a year is around 657 mm. The least amount of rainfall occurs in June and July. The average in this month is 43 mm. Most precipitation falls in November, with an average of 75 mm. The number of thunderstorms in the area ranges between 5 to 10 no per annum. The month with the highest number of rainy days is November (10.23 days). The month with the lowest number of rainy days is May (7.0 days).

George Climate Summary

	January	February	March	April	May	June	July	August	September	October	November	December
Ave Temperature ˚C	20,2	20,4	19,4	17,5	15,7	13,7	13,2	13,5	14,3	16,0	17,2	19,1
Min Temperature ˚C	16,9	17,2	16,1	14,0	12,1	9,8	9,3	9,6	10,6	12,4	13,7	15,8
Max Temperature ˚C	24,0	24,2	23,3	21,5	20,0	18,1	17,6	17,9	18,6	20,0	21,0	22,9
Precipitation/ Rainfall (mm)	55	48	60	60	48	43	43	56	48	67	75	54
Humidity (%)	76	77	76	75	72	69	69	71	72	74	74	75
Rainy Days (d)	6	7	7	6	5	5	6	7	7	7	7	8
Ave Sun Hours (hours)	8,7	8,2	7,8	7,7	7,7	7,4	7,4	7,8	8	8,3	8,9	9,1
Ave Wind Speed (km/hrs)	12,23	11,75	10,94	10,62	11,43	12,55	12,71	12,39	12,39	12,39	12,55	12,39

Table 1: Climate summary for George

The temperatures are highest on average in February, at around 20.4 °C. In July, the average temperature is 13.2 °C. It is the lowest average temperature of the whole year. The month with the highest relative humidity is February (76.74 %). The month with the lowest relative humidity is July (69.05 %).

The month with the most hours of sunshine is December with an average of 9.09 hrs of sunshine. In total there is 281.81 hrs of sunshine throughout December. The month with the fewest daily hours of sunshine in George is January with an average of 9.09 hours of sunshine a day. In total there are 281.81 hours of sunshine in January.

Around 2952.62 hours of sunshine are counted in George throughout the year. On average there are 97.07 hours of sunshine per month. It is therefore favourable for the incorporation of Solar Renewable Energy solutions into the planned development.

There is marked seasonality in wind trajectories. In winter, the wind blows from west to southwest, driven by the northward trajectory of the westerly belt, and in summer it blows easterly to southeast, when atmospheric circulation is dominated by the tropical easterlies. The windier parts of the year are from May through to February with an average wind speed of 11.75km/hr. The windiest month is July with an average Wind Speed of 12.7km/hr

The Development Infrastructure will be designed for both 1:20 year and 1:50 year floods, with an interval of 1: 5 years occurrence.

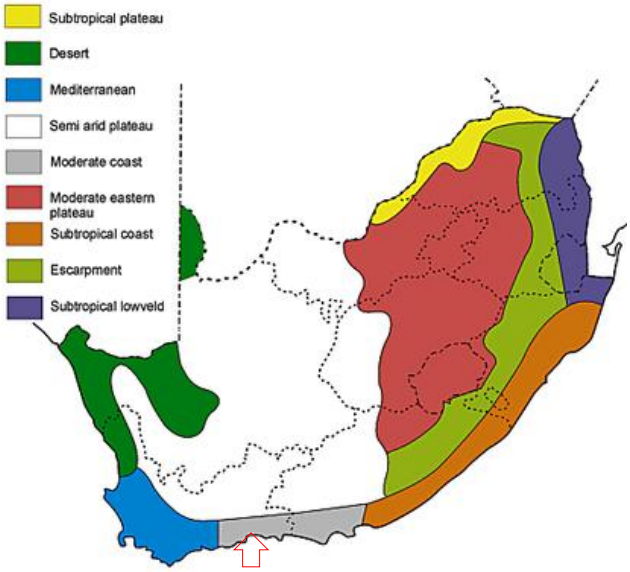


Figure 4: Climate zones of South Africa.

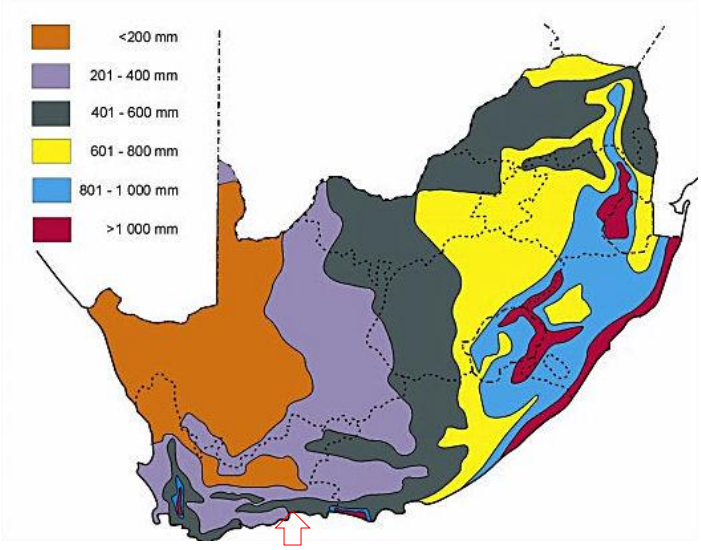


Figure 5: Rainfall zones of South Africa.

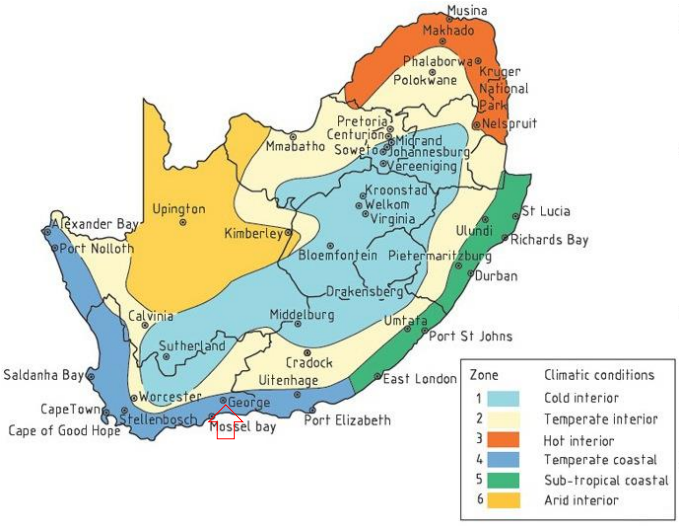


Figure 6: Climate conditions of South Africa.

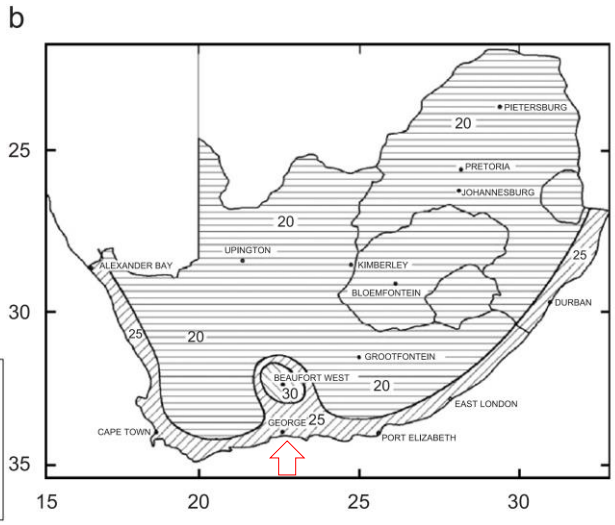


Figure 7: Maximum mean hourly wind speed – 50-year return period.

3. Existing Services

Existing services layouts for the George area directly opposite the site was obtained from the offices of GLS Consulting Engineers in Stellenbosch, with approval from Land Development Manager for Civil Engineering Services of the George Municipality.

Bulk Water supply Line.

There is a 450mm dia GRP water pipeline that runs across the proposed development site that was installed within the road reserves of the LAPSED ERF 19374 site development layout.
(Refer to Picture 5 below)

The site development plan has been adjusted to accommodate the pipe alignment along the main entrance road and have minimal impact on the estate and the planned sites.

It is recommended that this pipeline be accommodated within the road reserves as far as possible. As far as practically possible and as required, extra supporting filling or cover protection will be provided to clearly demarcate this pipe service. The pipe will be crossing the estate roads in

The pipe will be opened by hand in designated areas to allow visual contact with the pipe to instil an awareness for the pipe with the contracting team throughout the Civil Infrastructure construction process.

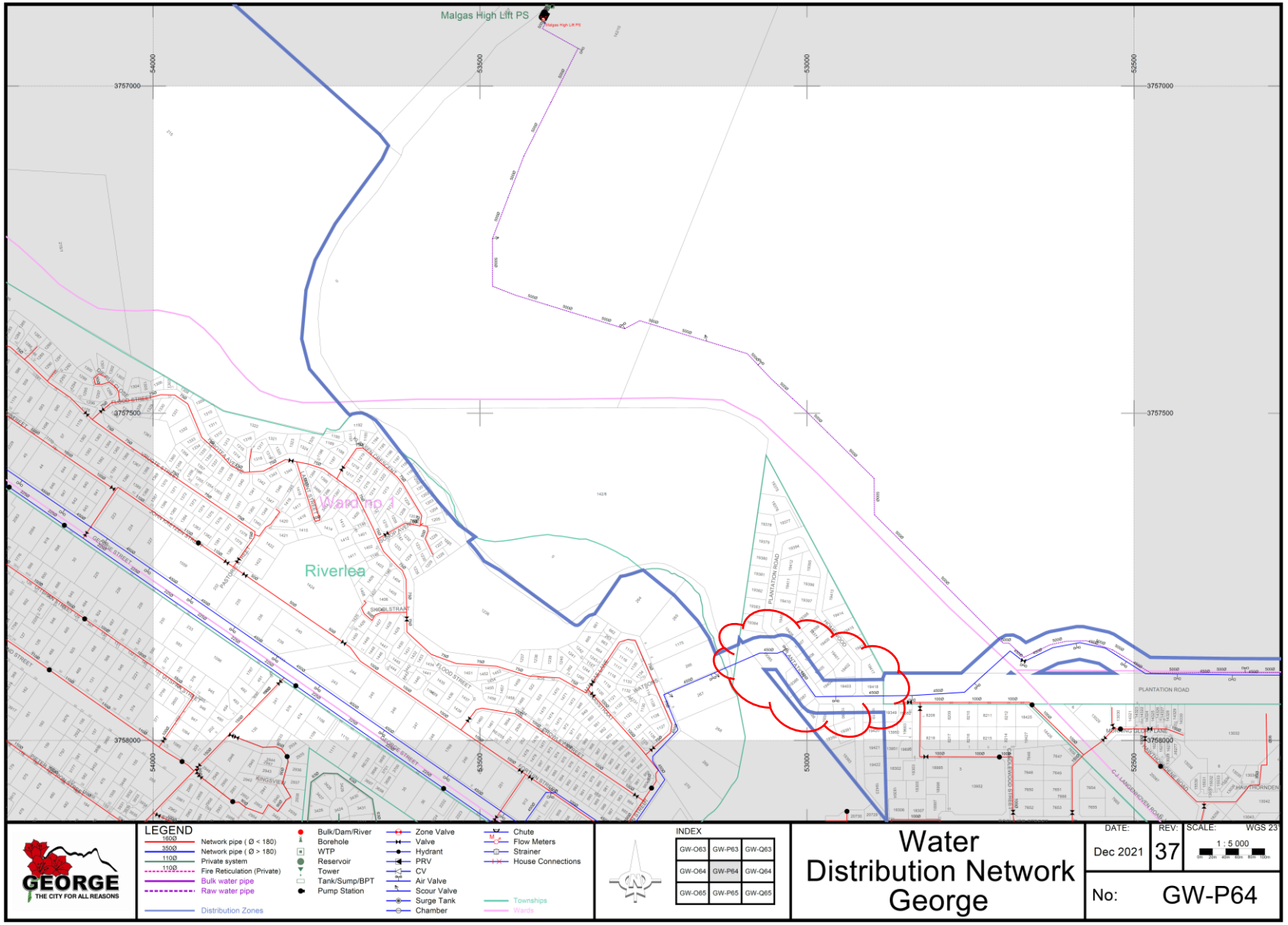


Figure 8: 450mm dia Municipal Bulk Supply GRP Pipe that runs through the planned development site.

Proposed Water Connections

As indicated by GLS Consulting Engineers, there are two (2) water points that can be connected into. This will allow for a ring feed within the planned development. This will ensure equal pressure within the network. The first connection point is near the planned entrance along the Plantation Road, while the second connection point is to a midblock water supply line, with a pump station in the neighbouring Heather Park, Homewood Development, Tommy Joubert Laan, that is near the South-eastern end of the planned development. These water lines are of 110mm and 90mm diameter uPVC respectively. *(Refer to Picture 6 below)*

Bulk connections to these water services would be required from Council. Details of the connection would be as per Council's requirements and specifications.

Proposed Sewerage Connections

As indicated by GLS Consulting Engineers, there are two (2) Sewer points that can be connected into. This is required in order to accommodate the lower, south-eastern part of the planned estate to the connection point in the neighbouring Heather Park, Homewood Development, Tommy Joubert Laan. This connection is a 110mm diameter sewer main. As confirmed with GLS Consulting Engineers the connection of the planned phase one (1) of the development consisting of twenty-two (22) units will not exceed the hydraulic flow of this network system.

The 2nd connection that will connect the planned phase two (2), three (3) and four (4) and is located along the Candlewood Street, off from Plantation Road. This connection is a 160mm diameter pipe. Again, as confirmed the hydraulic flow of this network would not be exceeded with the connection of the estate to this part of the network. *(Refer to Picture 7 below)*

Bulk connections to these water services would be required from Council. Details of the connection would be as per Council's requirements and specifications.

Stormwater

There is no existing stormwater system within the perimeter of the site, nor the Plantation Road. Only a shallow earth dish drain is found along the northern side of the Plantation Road that seems to create a pool of water near the Candlewood Street intersection with Plantation Road.

Storm water would need to be attenuated within the boundaries of the development and released at low velocities into the Malgas River. The stormwater release from the attenuation ponds would be done in a controlled manner through a system of energy breaking structures down the steep slope within the identified green public open space, to a lower elevated stormwater attenuation pond system from where it will be released into the Malgas River.

This system would be designed as per Council's requirements and specifications for their approval.

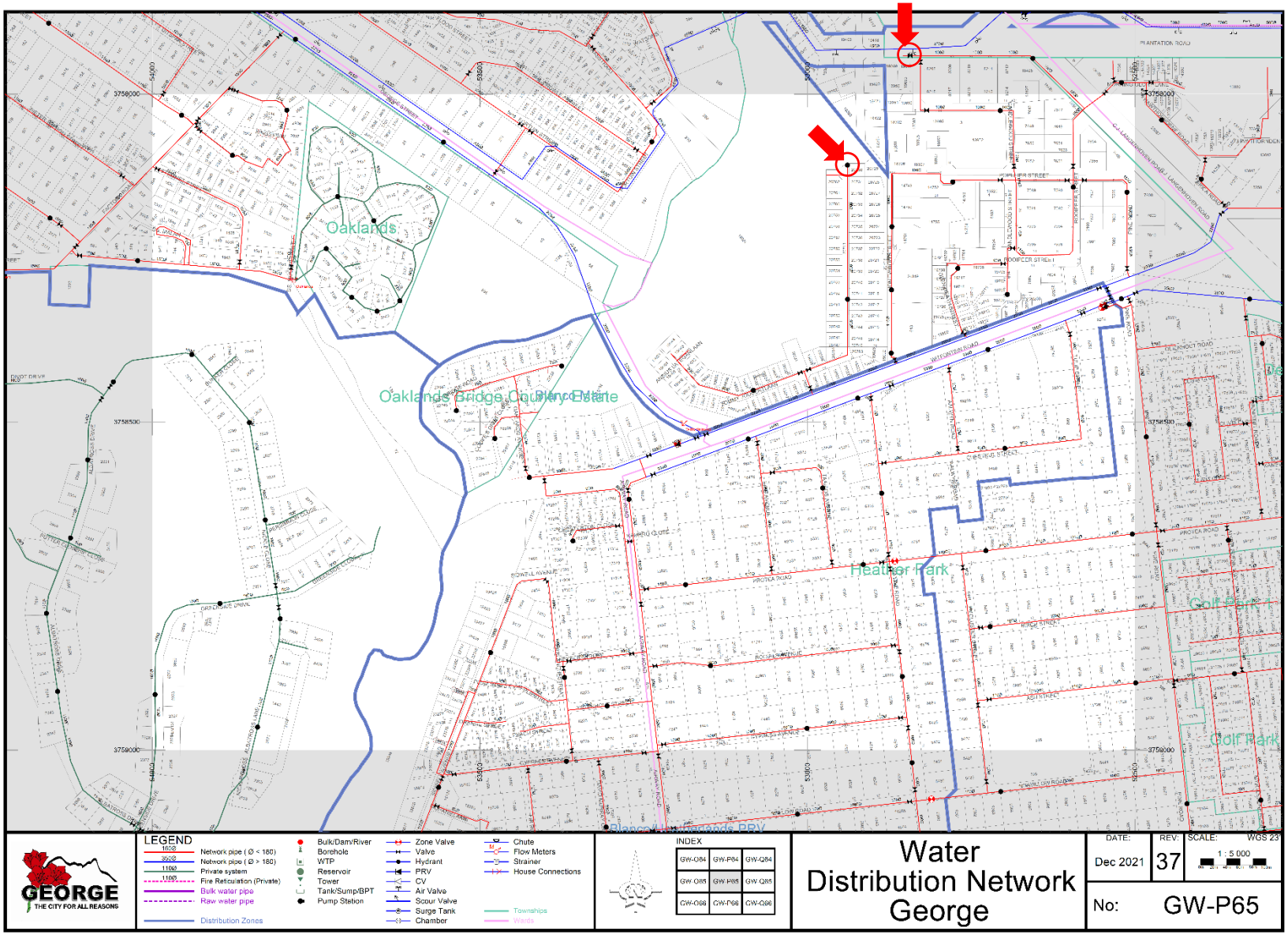


Figure 9: Proposed Water Connection Points – as pointed out by GLS Consulting Engineers.

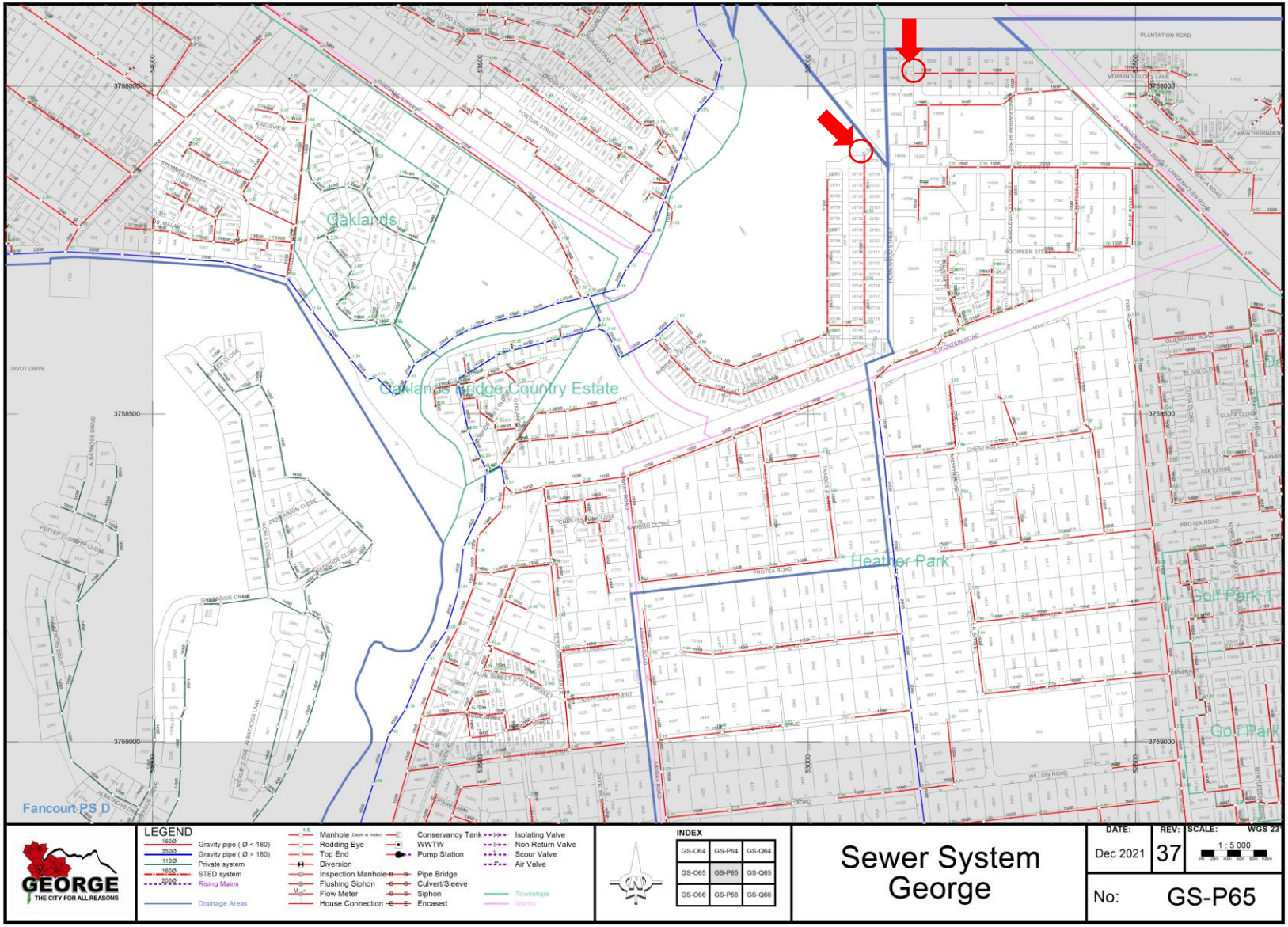


Figure 10: Proposed Sewer Connection Points – as pointed out by GLS Consulting Engineers.

4. Proposed Development

The proposed development is a private, gated residential estate consisting of seventy-seven (77) freehold units and forty (40) complex rental units on this property, subject to the necessary approvals for rezoning and subdivision obtained from the George Municipality and further consents from other governmental departments. The development is a Full Title Development. See **Annexure B**

All erven will be provided with services to full acceptable municipal standards and bulk infrastructure supporting the development has been described in the following sections. See **Annexure C**

The planned development will consist of the following residential units and in mix relationship:

Item	Unit Description	Ave ERF Size	Ave FLOOR Size	No of Units	Ownership
1	2 Bedroom – 1 Bathroom Semi-detached Flat Units	-	70 m²	40	Rental Units
2	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	309 m²	135 m²	31	Freehold Title
3	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	415 m²	150 m²	28	Freehold Title
4	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	452 m²	200 m²	18	Freehold Title
				117	

Table 2: Development unit distribution summary.

The average occupational density will be around 2.8 people per unit, lower than the national average of households. The development would cater for the medium income group and will fall within the development category 3 & 4 for services due to the lower-than-average occupational density per household. The average erf size is 381m²

5. Engineering Services

5.1 General Level of Services

Services will ultimately be provided to full municipal standards as prescribed in the Guidelines for Human Settlement planning and Design compiled by the CSIR Building and Construction Technology.

These shall broadly include surfaced roads with an acceptable stormwater collection and disposal system that fits the theme of the development, waterborne sewerage as well as potable water. Underground electrical and telecommunication connections to each erf/ unit. The Development will implement renewable power solutions for the rental units and will encourage owners of the freehold units to install solar. Investigations are underway for a private electrical microgrid within the Estate to accommodate PV Solar renewable energy within the development with a single bulk SSEG electrical connection to Municipal Electrical grid.

Limited calculations to determine the demand for the various services were prepared to obtain preliminary designs for the bulk services. The actual sizes of the bulk services will be determined through a final design process required for the Service Agreement and to be signed between the Developer and the George Municipality.

5.2 Road Network and Stormwater.

Access to the development is to be gained from the municipal Plantation Road, which is off from the N12 CJ Langenhoven Road, as recommended by SMEC South Africa in the Traffic Impact Assessment Report.

The estate entrance road will be an 8m wide road leading from Plantation Road that splits into the estate entrance area with an overall width of 13.8m wide that will accommodate two (2) lanes into the Estate and one (1) lane out of the Estate. The entrance lanes and exit lanes will be separated by a security access control building. See **Annexure C**

The internal roads are Class 5 roads and will be set in road servitudes that varies between 7 and 9m wide provided throughout the development. The total road network measures **1380 meters** and its layout have been dictated by the township layout and defined according to the topography so as to achieve a horizontal and vertical alignment that conforms to acceptable standards.

A 30km per hour design speed is laid down within the development and the road profile will be designed accordingly. The road pavement design will be a flexible pavement design covered by a concrete road surface.

The road surfaces width would be sloped to form a shallow V-drain shape with varying widths between 4m wide for one-way traffic and 6m wide for dual-way traffic with suitable provision for stormwater control in the centre of the road, using heavy duty grid inlets. The stormwater pipes are minimum 375mm diameter in size, laid at a minimum grade of 1:400 to ensure self-cleaning. The road and minor stormwater infrastructure are designed for a 1:5-year recurrence interval with the major system being designed for a 1:50 year recurrence interval.

The George Municipal Councill bulk services contribution fees for **2022/2023** are stipulated as additional trips and equates to 386.75trips with a unit cost of **R 1 870.84** exclusive of 15% VAT for roads and storm water.

The Roads and Stormwater Development Contribution Fee is calculated to **R 832 080.29** (Eight hundred and thirty-two thousand, and eighty rand and twenty-nine cents.) Inclusive of 15% VAT

5.3 Water Supply.

The potable water requirements for the development have been determined according to the guidelines for Human Settlement Planning and Design and George Municipality Guidelines and Standards for the Design of Water Supply and SABS 1200 DB1989 Earthworks and Pipe Trenches, for similar developments.

Rainwater harvesting will be standard at each home and throughout the estate. Each Home would be fitted with two (2) five thousand (5000) litre water tank, or a single ten thousand (10000) litre tank. Owners would be encouraged to install water filters and pressurization pumps to connect the tanks within the homes, water reticulation system. An investigation is presently underway by the Client to determine the feasibility of a central water storage facility at the Flat units. The investigation further is to determine the feasibility of a treatment plant to treat the rainwater to potable standards for self-consumption within the Flat units. A further study is underway to determine the feasibility of recycling the stormwater collected within the estate and the treatment thereof to potables standards for self-consumption within the development. This will reduce the normal residential water demand.

The developer will schedule a meeting with the Municipality at an appropriate time to discuss the various options and the

A piped water reticulation system with individual water meters will be provide at each erf and unit.

Item	Unit Description	Floor Size	No of Units	Average Consumption Data	Total Average Daily Consumption
1	2 Bedroom – 1 Bathroom Semi-detached Flat Units	70 m²	40	450 l/day	18.00 kl/day
2	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	135 m²	31	500 l/day	15.50 kl/day
3	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	150 m²	28	600 l/day	16.80 kl/ day
4	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	200 m²	18	750 l/day	13.50 kl/day
		14 785m²	117		63.80 kl/day

Table 3: Water Usage summary.

Design Limits that would be conformed to:

- Maximum residual Pressure designed for will be 90m (under static conditions)
- Minimum residual Pressure designed for will be 15m (under peak conditions)
- Summer Peak demand: 1.5 x AAD
- Instantaneous Peak (Over 10min period): 3.2 x AADD
- Single House connections will be 20mm diameter.
- Double House connections will be 32mm diameter.

The total average daily water demand (ADWD) for potable water for the development of 117 units, is calculated to be:

- 76.56 kl per day (0.886 l/s) this includes for an estimated 20% losses.
- Using a 1.5 peak summer factor, increases this demand to 114.84 kl (1.329 l/s)
- The instantaneous peak flow is 244 99 kl. (2.836 l/s)

Fire Fighting Requirements:

- The development can be classified as a Low Fire Risk Group 2 Area
- Spacing of Fire Hydrants is 150m.
- 1 Hour Fire duration.
- 500 l/min flow rate (8.3 l/s)

The Connection to the estate would have a total flow of 11.136 l/s.

- Instantaneous flow: 2.836 l/s
- Firefighting: 8.3 l/s

It is proposed that the Development be connected to the existing water network in two (2) locations to ensure suitable flow within the estate. The 1st connection would be to the main water pipe along Plantation Road which is a 100mm Ø uPVC Class 9 pipe. The 2nd connection would be to the main water pipe at the northern end of Tommy Joubert Laan Road which is a 90mm Ø uPVC Class 9 pipe.

The George Municipal Councill bulk services contribution fees for **2022/2023** are stipulated as a water demand of 37.26 kl /day and is costed at **R 38 860.00/ kl** exclusive of 15% VAT.

This equates to a Bulk Development Contribution Fee of **R 1 665 067.45** (One million, six hundred and sixty-five thousand, and sixty-seven rand and forty-five cents) inclusive of 15% VAT.

5.4 Sewerage.

The proposed development will be provided with a conventional waterborne sanitation system. The system will consist of separate connectors to individual erven. The reticulation network will gravitate to the lowest suitable connection location onto the existing Municipal network. It is proposed that the development connects onto the gravity sewerage line in two locations.

The 1st connection would be to the gravity sewer line along Candle Wood Street which is a 150mm Ø uPVC Class 34 pipe. This would connect approximately 95 units to the Municipal sewer network in this location. The 2nd connection would be to the gravity sewer line at the northern end of Tommy Joubert Laan Road which is a 90mm Ø uPVC Class 34 pipe. This would connect approximately 22 units to the Municipal sewer network in this location.

As confirmed with GLS Consulting Engineers neither of the hydraulic flows within the network systems as either of the planned connection points will be exceed.

It is assumed, based on recorded data, for low to medium income units ranging from 64m² to 200m² units that the expected outflow equates to approximately 70% of the water consumption.

Item	Unit Description	Floor Size	No of Units	ADWF	People / Erf	Harmon Peak Factor	PWWF / Erf
1	2 Bedroom – 1 Bathroom Semi-detached Flat Units	70 m²	40	315 l/day	2	3.8	0.0352 l/s/e
2	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	135 m²	31	375 l/day	3	3.8	0.0352 l/s/e
3	Single Storey Residential Homes with 2 to 3 Bedrooms and 2 Bathrooms	150 m²	28	450 l/day	3	3.8	0.0352 l/s/e
4	Double Storey Residential Homes with 3 to 4 Bedrooms and 2.5 Bathrooms	200 m²	18	563 l/day	4	3.8	0.0352 l/s/e

Table 4: Wastewater outflow summary.

Design Limits that would be conformed to:

- Assumed Sewage Flow = 70% of the water consumption excluding the losses.
- Peak Factor 2.5
- Percentage allowed for extraneous flow = 15 %
- Minimum sewer size 100mm diameter
- Minimum Pipe class 34
- Maximum Flow velocity 2.5 l/s

The maximum total daily outflow is expected to be 46,959 kl (0.543 l/s) with a peak factor of 117.398 kl (1.359 l/s) and Harman peak factor of 178.444 kl. (2.065 l/s)

The George Municipal Councill bulk services contribution fees for **2022/2023** are stipulated as a sewer demand of 37.12 kl /day and is costed at **R 38 810.00/ kl** exclusive of 15% VAT.

This equates to a Bulk Development Contribution Fee of **R 1 656 721.28** (One million, six hundred and fifty-Six thousand, seven hundred and twenty-one rand and twenty-eight cents) inclusive of 15% VAT.

5.5 Electricity supply.

The electrical reticulation will comprise of underground 11kV cables, which will be located within the road reserves and connect to the one internal miniature substation to the Bulk Electrical network.

The residential units and infrastructure components will each be provided with a separate metered underground electrical service, which will be connected to the internal substation.

Appropriate roadway and area lighting will be installed to meet the requirements of the development and will be designed to comply to SABS Code 098:1990.

The Developer is investigating a Grid Tied PV Solar solution that would see the carports be covered in PV Solar panels that feeds the power to a Central Inverter and Battery Storage facility with back-up generation capabilities. From here the power would be routed back to the units where each unit will be fitted with a Smart Prepaid meter system.

A Detailed Report will be submitted separately by the Appointed Electrical consultant appointed by the Developer.

5.6 Telecommunication services.

The internal telecommunication reticulation network will comprise of an underground conduit network, which will be designed and installed in accordance with national telecommunication standards.

Telecommunication service providers will install and operate the cables within the underground conduits which will be located within the road reserves and will be connect the internal telecommunication distribution points to their national Telecommunication service network.

Each residential unit will be provided with separate metered underground fibre communication connectivity to the IOT that will allow for Smart Home accessibility and management. This will also be linked to the security system of each individual residential unit and the umbrella estate security network system.

The system would comprise of 110mm diameter Telkom type cable sleeves at minimum 600mm cover depth at all road crossings. All communication manholes would be purpose-built HDPE type manholes conforming to SANS standards.

5.7 Solid Waste Handling.

The Developer wishes to engage with George Municipal Solid Waste department to collect the refuse within the estate on a weekly basis as per the Municipal collection time schedule for the Heather Park suburb.

The estate roads have been designed to accommodate the smaller Municipal waste compactor trucks as illustrated in picture 8 below. The size of the truck cannot exceed 12m³ in size and have more than a single axle and/ or exceed the over length of 8.40m

The Estate will enter into a service contract with the George Municipality for the removal and disposal of all solid waste. The estimated volume of solid waste is estimated at 0.085m³/ household per week with a total estimated volume for the development at 10m³ per week.

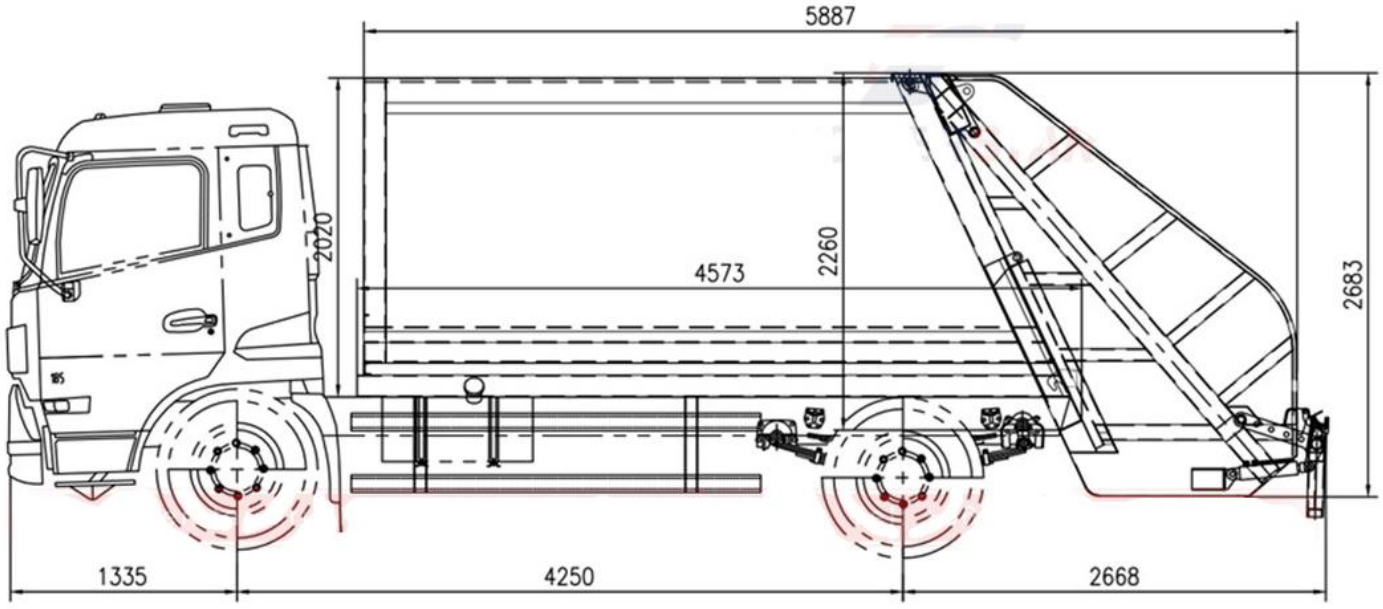


Figure 11: Typical Dimensions of a 12m² waste compactor truck.

The George Municipal Council do not have Development Contribution fees for Solid Waste handling and or Public Open Spaces. There is therefore no charge for this. Each Owner would be billed a Monthly Levey for the collection of their solid waste.

5.8 Summary of the Development Contribution Fees:

Development Contribution Fees due for this development:

Water	R 1 665 067.45
Sanitation	R 1 656 721.28
Roads & Stormwater	R 832 080.29
Total Amount excluding Electricity (incl VAT)	**R 4 153 869.02**

Should improvements to infrastructure be required as part of the Development approval these the allocated development contribution fees are to be credited for the specific upgrades. These would be drafted in a Service Level Agreement between the Developer and the George Municipality.

Bibliography:

1. ***Geotechnical Report for the Proposed Residential Development on the Subdivision of ERF 19374 George,*** *report number Ref No: 2022\Urban Front\Erf19374 George\Report\ Geotechnical Report 1.7.2022 Rev 0, dated 1st July 2022, prepared by Outeniqua Geotechnical services, drafted by Iain Paton*

2. ***Guidelines for Human Settlement Planning and Design – Volume 2:***
   Compiled under the patronage of the Department of Housing by CSIR Building and Construction Technology. Boutek Report Number BOU/E2001 with reprint in 2005 by Capture Press, Pretoria.
   ISBN 0-7988-5498-7

3. Climate description for George area with average rainfall and temperature data tables used.
   https://en.climate-data.org/africa/south-africa/western-cape/george-7176/
   https://www.gardenroute.com/george-climate_content_op_view_id_2878
   https://weatherspark.com/y/87789/Average-Weather-in-George-South-Africa-Year-Round

4. Table 1: Climate Summary for George
   https://en.climate-data.org/africa/south-africa/western-cape/george-7176/

5. Figure 1 to 3: *These are extracts from the* ***Geotechnical Report for the Proposed Residential Development on the Subdivision of ERF 19374 George,*** *report number Ref No: 2022\Urban Front\Erf19374 George\Report\ Geotechnical Report 1.7.2022 Rev 0, dated 1st July 2022, prepared by Outeniqua Geotechnical services, drafted by Iain Paton*

6. Figure 4: *South African climate condition map*
   https://www.south-africa-tours-and-travel.com/images/map-south-africa-climate-2-geography.png

7. Figure 5: *South African climate zone map*
   https://aeroliteinsulation.co.za/wp-content/uploads/2013/03/Climate-zones-map.jpg

8. Figure 6: *South African rainfall zone map*
   https://www.south-africa-tours-and-travel.com/images/xmap-south-africa-climate-1-rainfall.jpg.pagespeed.ic.51J4wtdh6z.webp

9. Figure 7: *South African mean wind speed distribution map*
   https://www.researchgate.net/profile/Gerrit-Basson/publication/348326602/figure/fig4/AS:977638684360707@1610098634485/7a-Mean-hourly-wind-speed-distribution-in-South-Africa-with-a-150-year-occurrence.jpg

10. Figure 8 to 10: *Drawings as received from GLS Consulting Engineers, located in Stellenbosch, and contracted by George Municipality as the Engineering Company responsible for planning and updating of infrastructure services within the Municipal district. Received via email from Mr. Jurie van der Merwe, dated 30th May 2022 at 16H35 <Jurie.vdMerwe@gls.co.za>*

11. ***George Local Municipality – Tariffs 2022/2023:***
    CES Development Charges Calculator, version 3.00 June 2020.
    Data provided by Mr. Ricus Fivaz, dated 17 November 2022 at 07H51 via email. <jmfivaz@george.gov.za>,

12. ***George Municipality, Civil Engineering Services – Civil Engineering Standards & Requirements for Services:***
Prepared for the George Municipality: Dept Civil Engineering Service.
Updated January 2009, Seventy-three (73) Page document.

13. ***George Municipality, Civil Engineering Services – Draft Standards Plans document:***
Prepared for the George Municipality.
Forty-none (49) Page document.

14. ***URBAN TRANSPORT GUIDELINES: Draft UTG 3: STRUCTURAL DESIGN OF URBAN ROADS:***
Draft UTG3, pp 1-74, Pretoria, South Africa 1988.
February 1988.
ISBN 0-7988 4465 5

15. ***Technical recommendations for Highways: TRH 4: 1996 - Structural Design of Flexible Pavements for Interurban and rural roads:*** *Published by Department of Transport for the Committee of Land Transport officials (COLTO) in Pretoria, South Africa in 1996.*
ISBN 1-86844-218-7

This report was drafted by HC Scholtz (N- Dip Civils *with 25-year experience*)
For CHEL Building and Civil Services.
This report was reviewed and approved by L. Fourie (Pr. Eng)
For New Ground Projects.

CHEL Building & Civil Services
No 141 Chip Close Street
Le Grand Estate
George
6534

Tel: 082 881 5456
Email: henco.chel@gmail.com

No 17 St Andrews Road
Selborne
East London
5201

Tel: 043 722 5864
Email: louis@newground.co.za

ANNEXURE A

1: 50 000 Locality Map of the Site

ANNEXURE B

Preliminary Site Development Plan

ANNEXURE C

Preliminary Site Development Plan with Combined services layouts

PROPOSED URBAN COUNTRY ESTATE DEVELOPMENT

CHEL Building & Civil Services

No 141, Chip Close,
LE GRAND Estate,
George,
6534

Tel: 082 881 5456
Email: henco.chel@gmail.com

Title:
URBAN COUNTRY ESTATE DEVELOPMENT

Sub Title: LOCALITY PLAN

Scale: 1 : 50 000

Drwg No.: CHEL/ UCE-2022/ GEN/ 01

CapeFarmMapper ver 2.6.10

CHEL Building & Civil Services

No 141, Chip Close,
LE GRAND Estate,
George,
6534

Tel: 082 881 5456
Email: henco.chel@gmail.com

Title: **URBAN COUNTRY ESTATE DEVELOPMENT**

Sub Title: LOCALITY PLAN

Scale: 1 : 9028

Drwg No.: CHEL/ UCE-2022/ GEN/ 02

PROPOSED URBAN COUNTRY ESTATE DEVELOPMENT
Lapsed ERF 19374

N9 – Cl Langenhoven Road

Plantation Road

Blanco

Heather Park

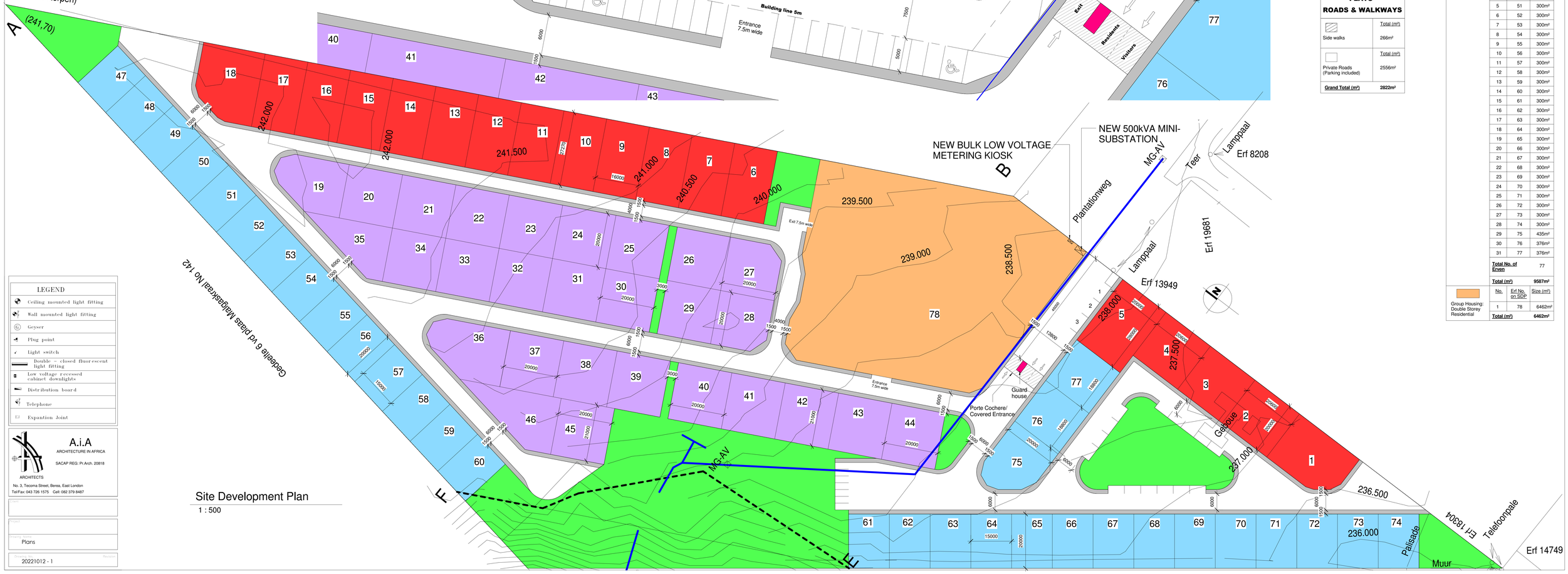
Blanco

Dormehls Drift

Date: 20191219, GSD: 0.5m | Maxar | Esri South Africa, Esri, HERE, Garm

Double Storey Residential - Site Development Plan

1 : 200



LEGEND 1

	No.	Size (m²)	Total (m²)
Group Housing: Double Storey Residential	Site 1	528m²	528m²
	Site 2 upto 4	412m²	1236m²
	Site 5	560m²	560m²
	Site 6 upto 17	436m²	5232m²
	Site 18	577m²	577m²
	Grand Total (m²)		**8133m²**
Group Housing: Single Storey Residential	No.	Size (m²)	Total (m²)
	Site 19	449m²	449m²
	Site 20 upto 26	400m²	2800m²
	Site 27 upto 28	387m²	774m²
	Site 29 upto 34	400m²	2400m²
	Site 35	389m²	389m²
	Site 36	532m²	532m²
	Site 37 upto 45	420m²	3780m²
	Site 46	500m²	500m²
	Grand Total (m²)		**11624m²**
Group Housing: Single Storey Residential	No.	Size (m²)	Total (m²)
	Site 47 upto 74	300m²	8400m²
	Site 75	435m²	435m²
	Site 76 upto 77	376m²	752m²
	Grand Total (m²)		**9587m²**
Flats: Double Storey Apartments	No.	Size (m²)	Total (m²)
	Orange Site	6462m²	6462m²
	Grand Total (m²)		**6462m²**
Private Space	No.	Size (m²)	Total (m²)
		8500m²	8500m²
	Grand Total (m²)		**8500m²**
Private Roads & Side walks	No.	Size (m²)	Total (m²)
		12030m²	12030m²
	Grand Total (m²)		**12030m²**
Total ERF Area			**56336m²**

S.D.P ROADS & WALKWAYS

	Total (m²)
Side walks	3048m²
Private Roads (Parking included)	8982m²
Grand Total (m²)	**12030m²**

FLATS ROADS & WALKWAYS

	Total (m²)
Side walks	266m²
Private Roads (Parking included)	2556m²
Grand Total (m²)	**2822m²**

LEGEND 2

	No.	Erf No. on SDP	Size (m²)
Group Housing: Double Storey Residential	1	1	528m²
	2	2	412m²
	3	3	412m²
	4	4	412m²
	5	5	560m²
	6	6	436m²
	7	7	436m²
	8	8	436m²
	9	9	436m²
	10	10	436m²
	11	11	436m²
	12	12	436m²
	13	13	436m²
	14	14	436m²
	15	15	436m²
	16	16	436m²
	17	17	436m²
	18	18	577m²
	Total (m²)		**8133m²**
Group Housing: Single Storey Residential	No.	Erf No. on SDP	Size (m²)
	1	19	449m²
	2	20	400m²
	3	21	400m²
	4	22	400m²
	5	23	400m²
	6	24	400m²
	7	25	400m²
	8	26	400m²
	9	27	387m²
	10	28	387m²
	11	29	400m²
	12	30	400m²
	13	31	400m²
	14	32	400m²
	15	33	400m²
	16	34	400m²
	17	35	389m²
	18	36	532m²
	19	37	420m²
	20	38	420m²
	21	39	420m²
	22	40	420m²
	23	41	420m²
	24	42	420m²
	25	43	420m²
	26	44	420m²
	27	45	420m²
	28	46	500m²
	Total (m²)		**11624m²**
Group Housing: Single Storey Residential	No.	Erf No. on SDP	Size (m²)
	1	47	300m²
	2	48	300m²
	3	49	300m²
	4	50	300m²
	5	51	300m²
	6	52	300m²
	7	53	300m²
	8	54	300m²
	9	55	300m²
	10	56	300m²
	11	57	300m²
	12	58	300m²
	13	59	300m²
	14	60	300m²
	15	61	300m²
	16	62	300m²
	17	63	300m²
	18	64	300m²
	19	65	300m²
	20	66	300m²
	21	67	300m²
	22	68	300m²
	23	69	300m²
	24	70	300m²
	25	71	300m²
	26	72	300m²
	27	73	300m²
	28	74	300m²
	29	75	435m²
	30	76	376m²
	31	77	376m²
	Total No. of Erven		77
	Total (m²)		**9587m²**
Group Housing: Double Storey Residential	No.	Erf No. on SDP	Size (m²)
	1	78	6462m²
	Total (m²)		**6462m²**

LEGEND

- Ceiling mounted light fitting
- Wall mounted light fitting
- Geyser
- Plug point
- Light switch
- Double - closed fluorescent light fitting
- Low voltage recessed cabinet downlights
- Distribution board
- Telephone
- Expantion Joint

A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr Arch. 20818
ARCHITECTS
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

Client:

Project:

Drawing: Plans

Drawing No: 20221012 - 1 Revision:

Site Development Plan

1 : 500

LEGEND:

(blue dashed line)	Ø100mm uPVC CLASS 9 WATER PIPE
(red dash-dot line)	Ø160mm uPVC CLASS 34 SEWER PIPE
(green dash-dot line)	Ø375mm AND Ø450mm CONCRETE CLASS 100D STORMWATER PIPE
(green square)	STORMWATER CATCH PIT
(red double circle)	SEWER MANHOLE
(red circle)	RODDING EYE
(blue end cap)	WATER PIPE END CAP
(red connection)	PREPOSED SEWER HOUSE CONNECTION
(blue connection)	PREPOSED WATER HOUSE CONNECTION

PROJECT NUMBER: PC22024

PROJECT NAME: URBAN COUNTRY ESTATE

CLIENT: URBAN COUNTRY ESTATE (Pty) Ltd.

CIVIL & STRUCTURAL ENGINEER:

CHEL BUILDING AND CIVILS

CHEL BUILDING AND CIVIL SERVICES
141 CHIP CLOSE, LE GRAND ESTATE, GEORGE, 6534
TEL: 082 881 5456

newground projects

NEWGROUND PROJECTS
17 ST ANDREWS ROAD, SELBORNE, EAST LONDON, 5201
PO Box 19568, Tecoma, 5214
TEL: 043 722 5864
FAX: 086 520 6942
www.newground.co.za

ARCHITECT:

A.i.A
ARCHITECTURE IN AFRICA
SACAP REG: Pr.Arch. 20818
ARCHITECTS
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

DESIGNER: T de JAGER	DRAFTER: J VAN DYK
REVIEWER: L FOURIE	DATE: 21 NOVEMBER 2022

DRAWING NAME: COMBINED SERVICES LAYOUT

DRAWING NUMBER: PC22024 / CIV / 2101

DRAWING ISSUED FOR: PRELIM

SCALE: 1:800	PAPER SIZE: A1	REVISION: 0C

APPROVED BY ENGINEER:

SIGNATURE: DATE: