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.

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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.

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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.

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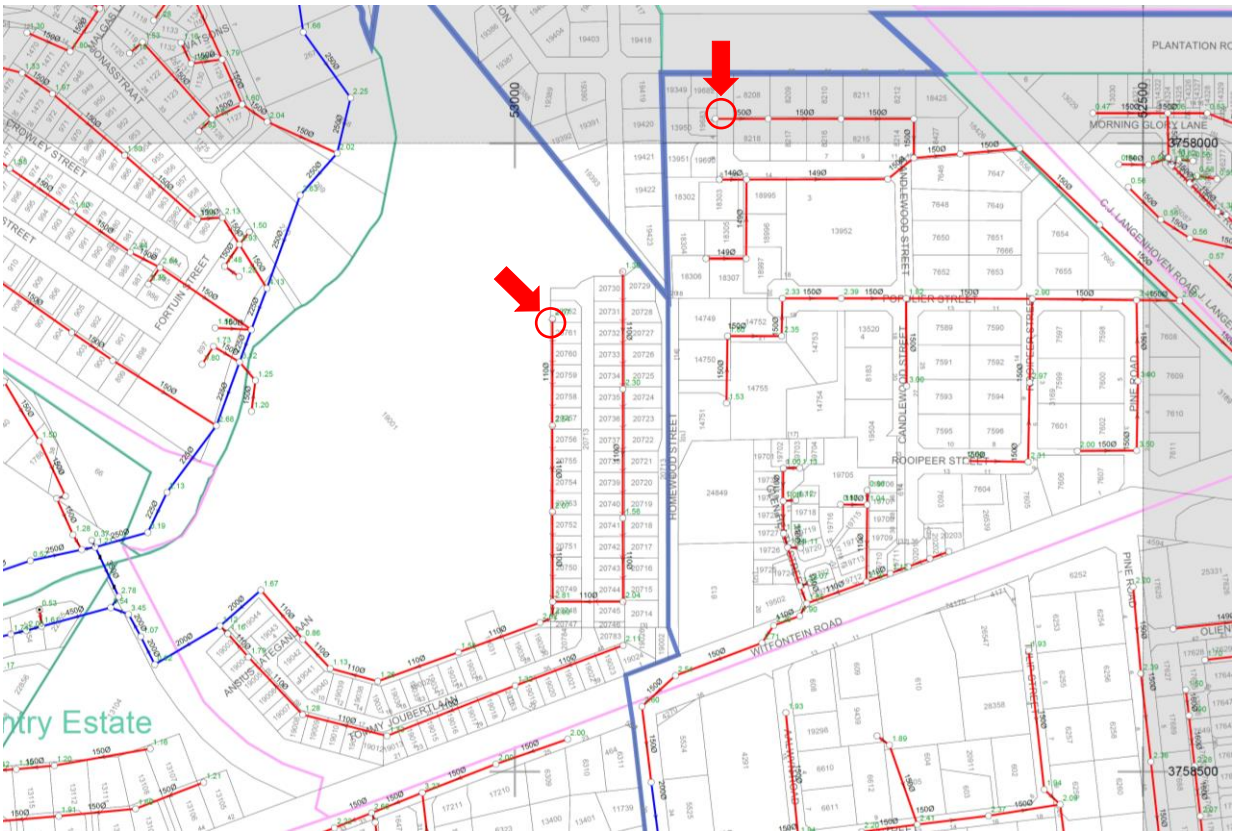
The 2nd connection that will connect the planned phase two (2), three (3) and four (4) and is located along the Candlewood Street, off from Plantation Road. This connection is a Ø150mm pipe. Again, as confirmed the hydraulic flow of this network would not be exceeded with the connection of the estate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

Figure 2-3: Municipal Sewer Layout



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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
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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).

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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.

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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**

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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
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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

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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
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CHEL Building & Civil Services (Pty) Ltd. Reg No. 2022/274155/07
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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
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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

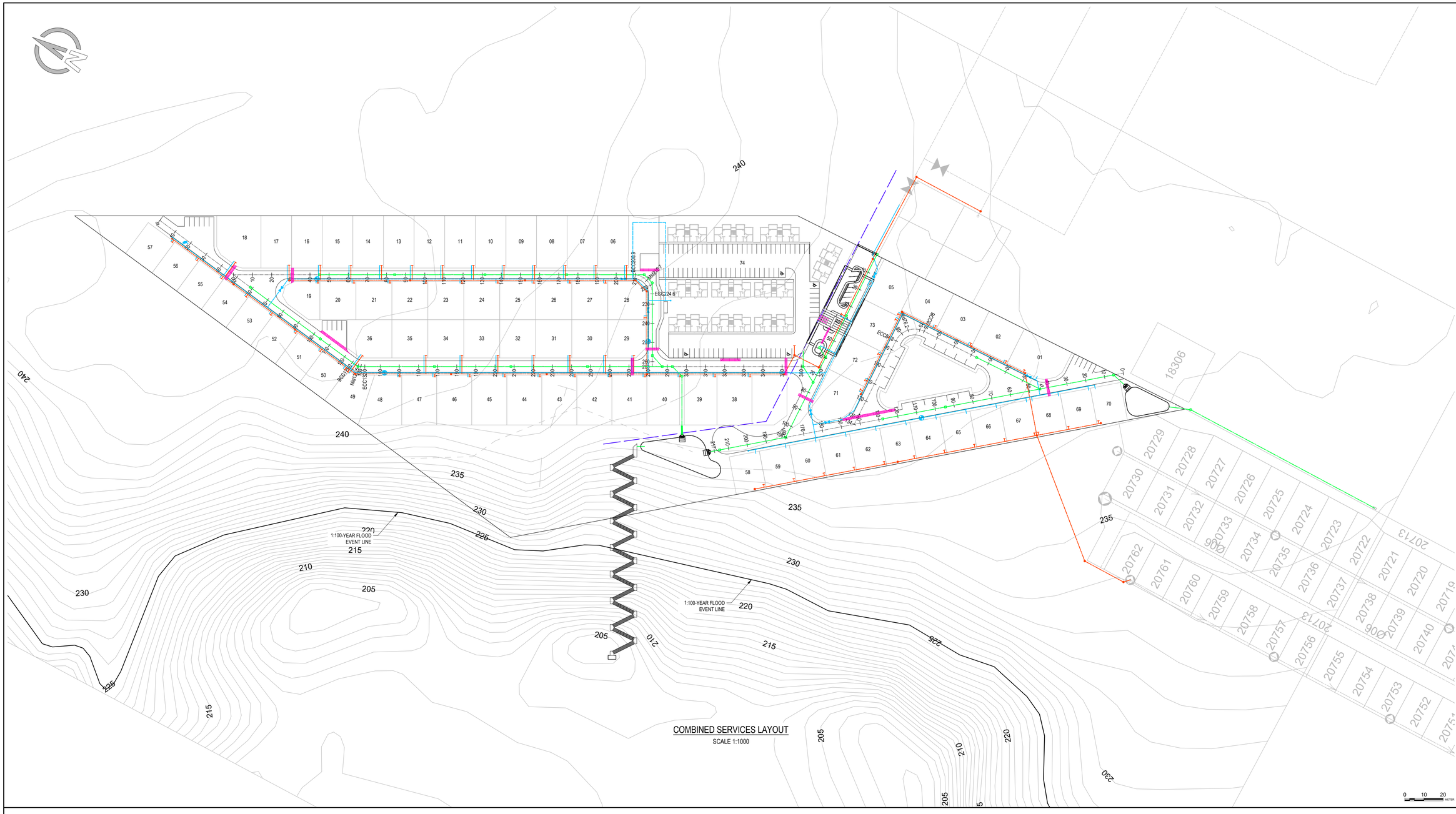
Blanco

Heather Park

Blanco

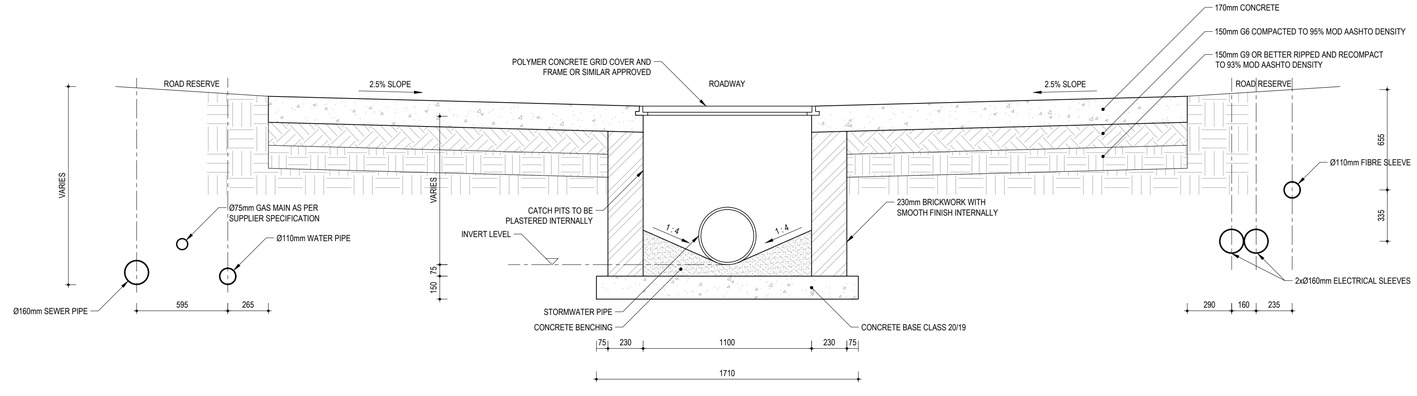
Dormehls Drift

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

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COMBINED SERVICES LAYOUT AND DETAIL

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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
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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
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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

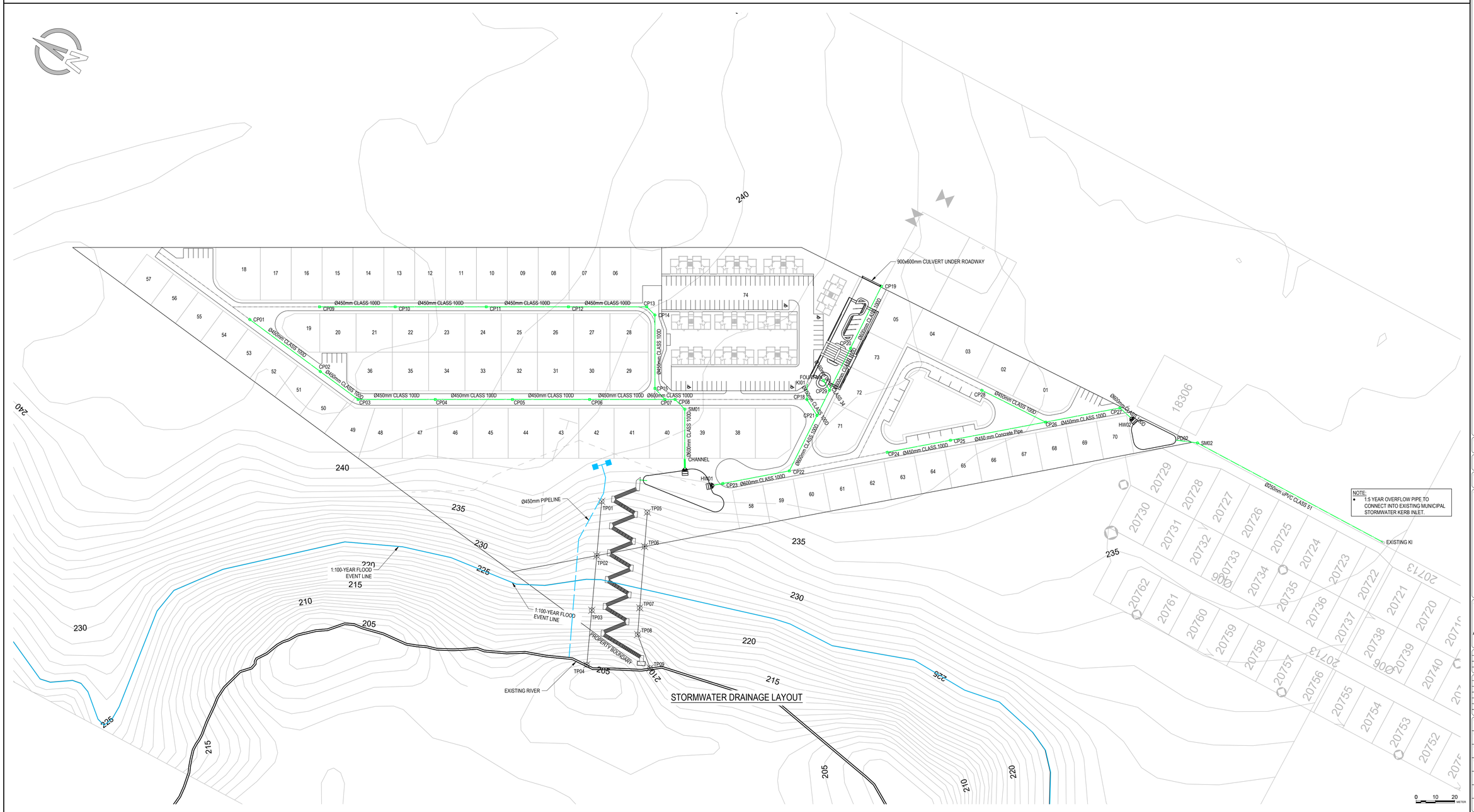
STORMWATER STRUCTURE COORDINATES WGS84 LO23			
Structure Name	Y Coordinate	X Coordinate	Invert Level
CP09	53029.387941	3757691.305	240.983
CP10	53010.905969	3757725.875	240.591
CP11	52988.652165	3757767.499	240.119
CP12	52968.567165	3757805.067	239.285
CP13	52949.425122	3757840.872	238.054
CP14	52951.202009	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

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

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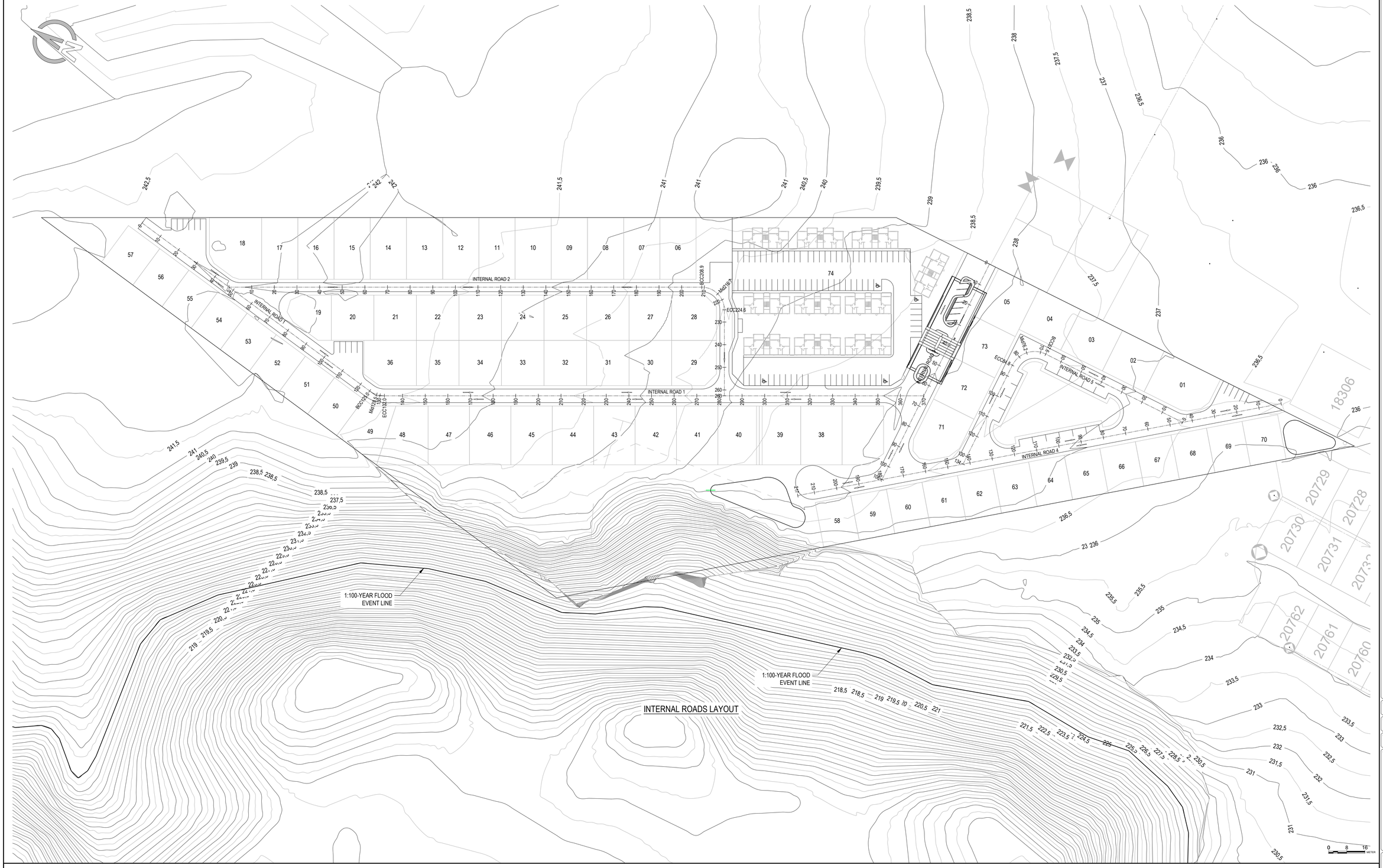

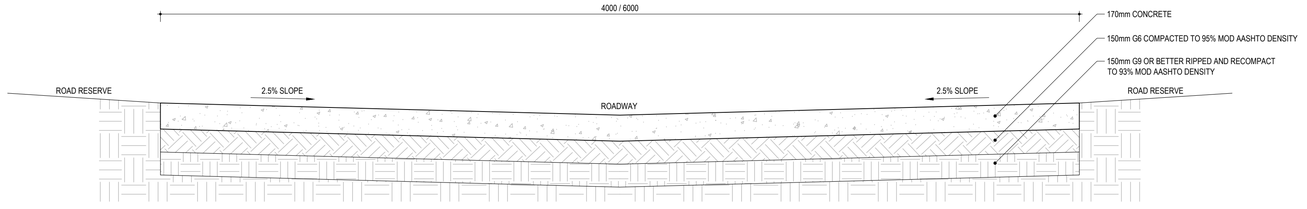

TYPICAL ROAD CROSS SECTION

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

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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.

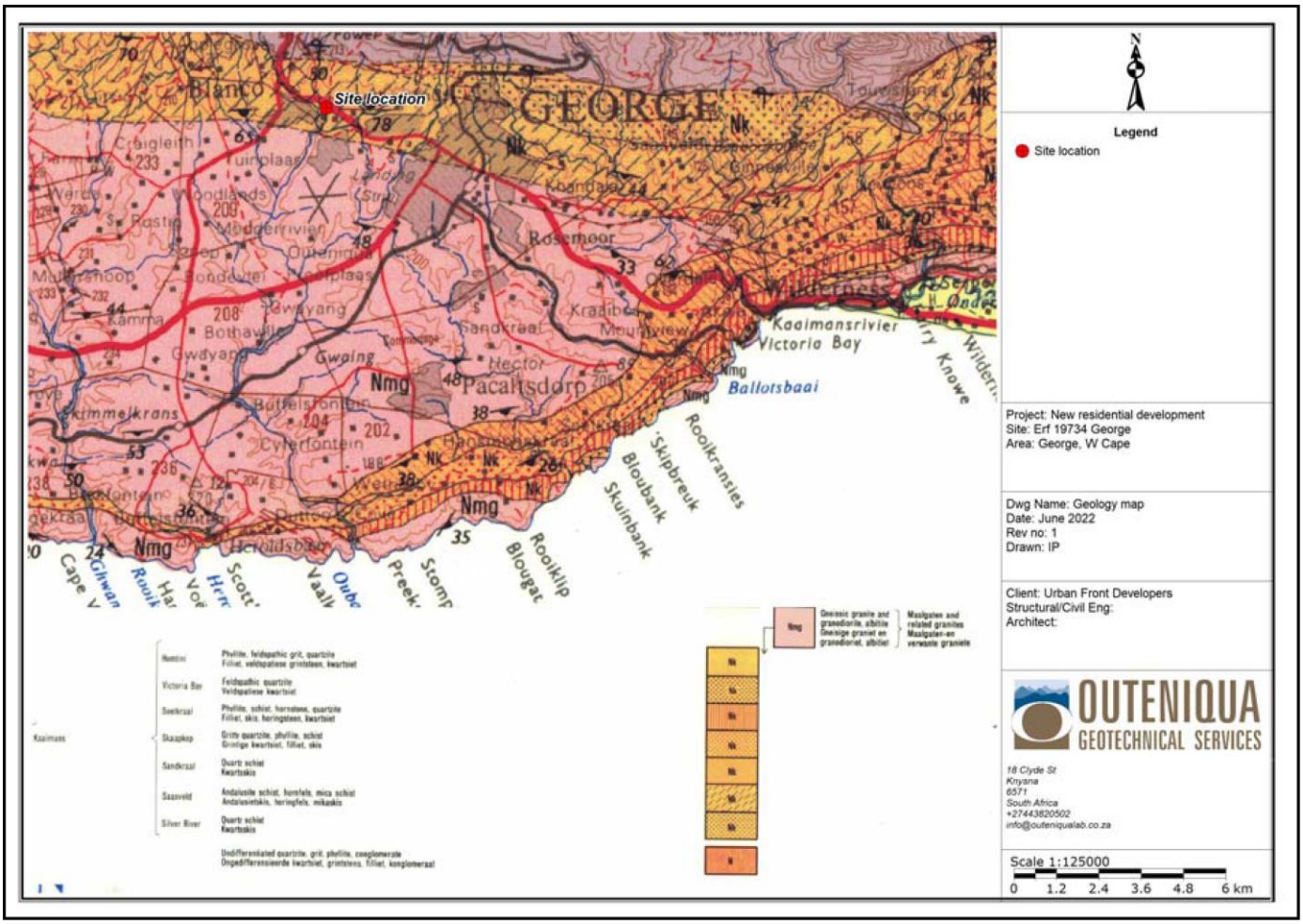

Figure 1: Geological Map of the site.

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.

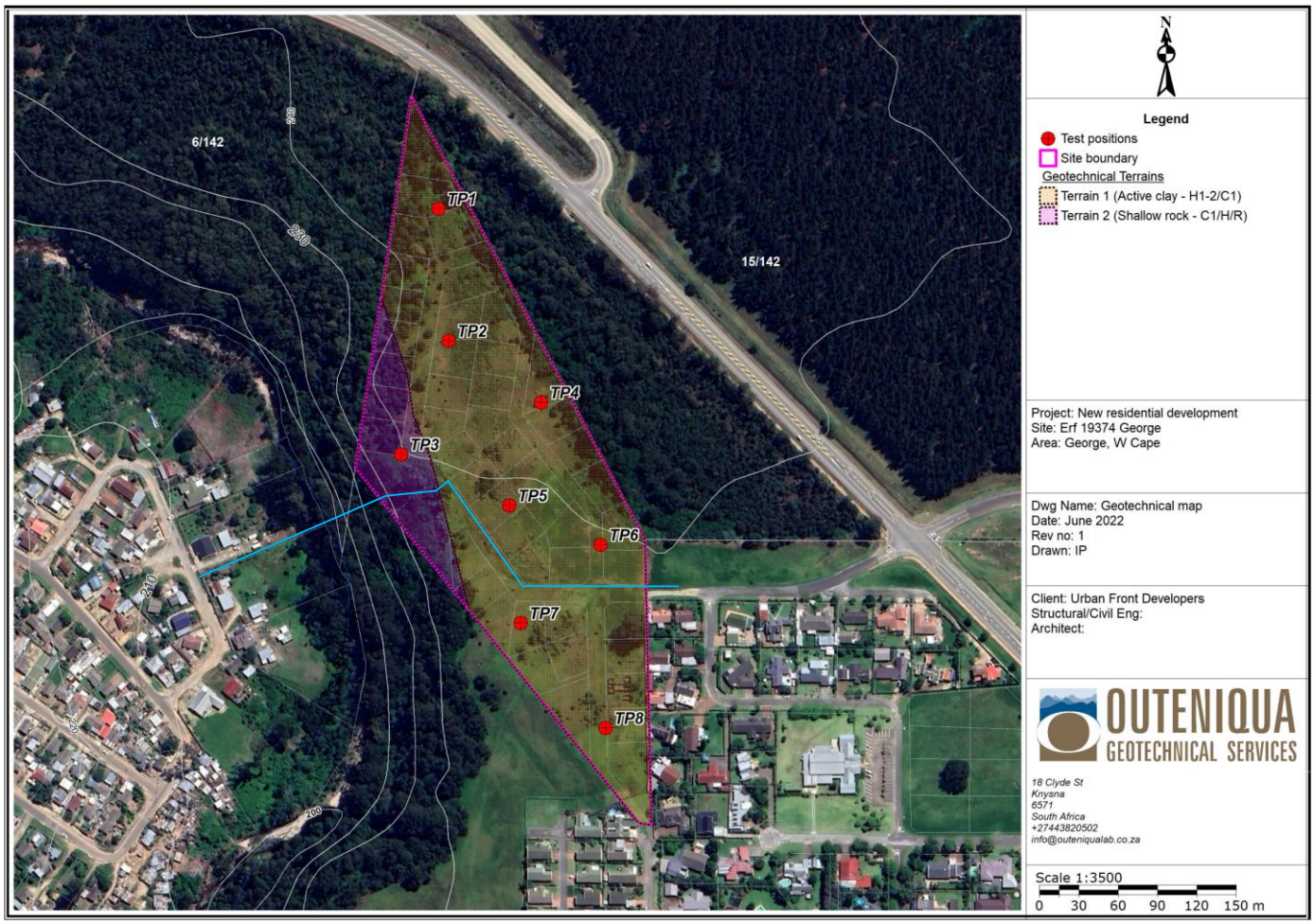

Figure 3: Soil Investigation Test Pit locations. **BLUE** line represents the 450mm dia Municipal water Supply line across the development site.

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.

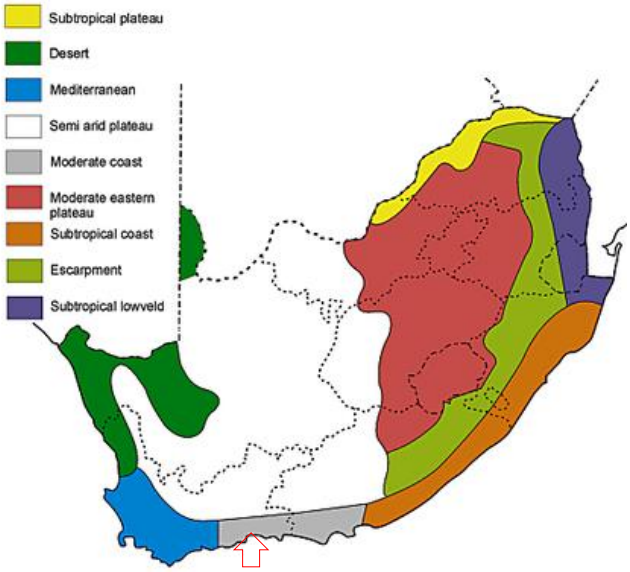

Figure 4: Climate zones of South Africa.

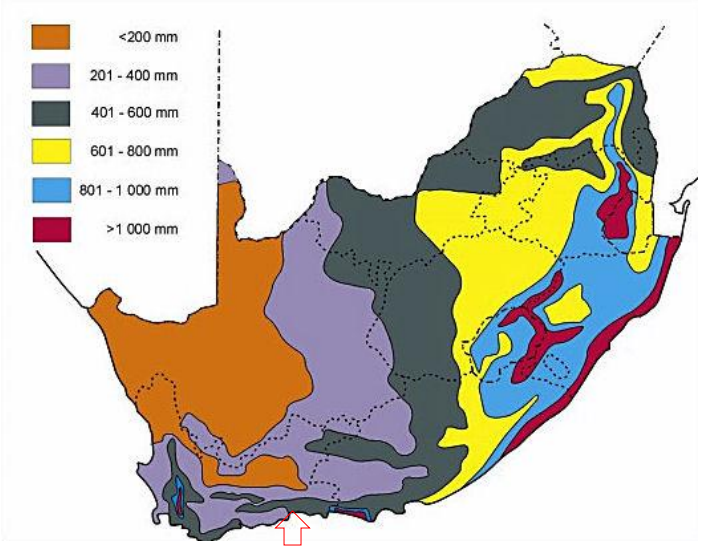

Figure 5: Rainfall zones of South Africa.

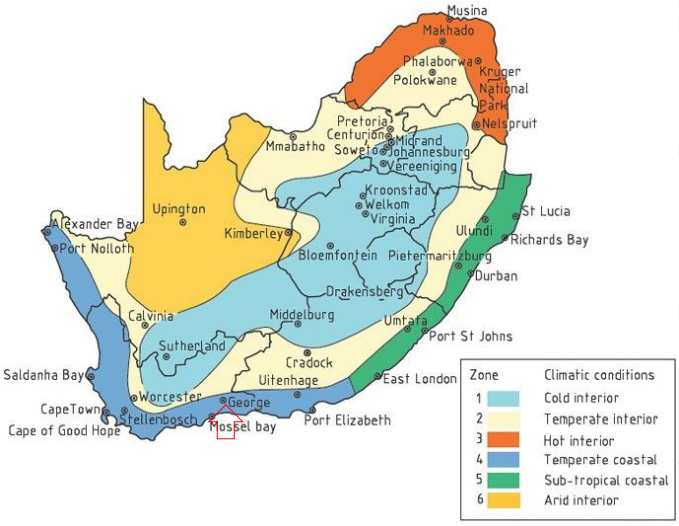

Figure 6: Climate conditions of South Africa.

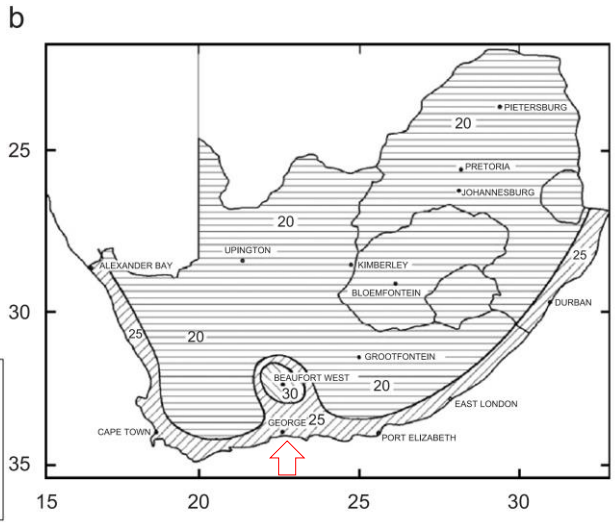

Figure 7: Maximum mean hourly wind speed – 50-year return period.

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.

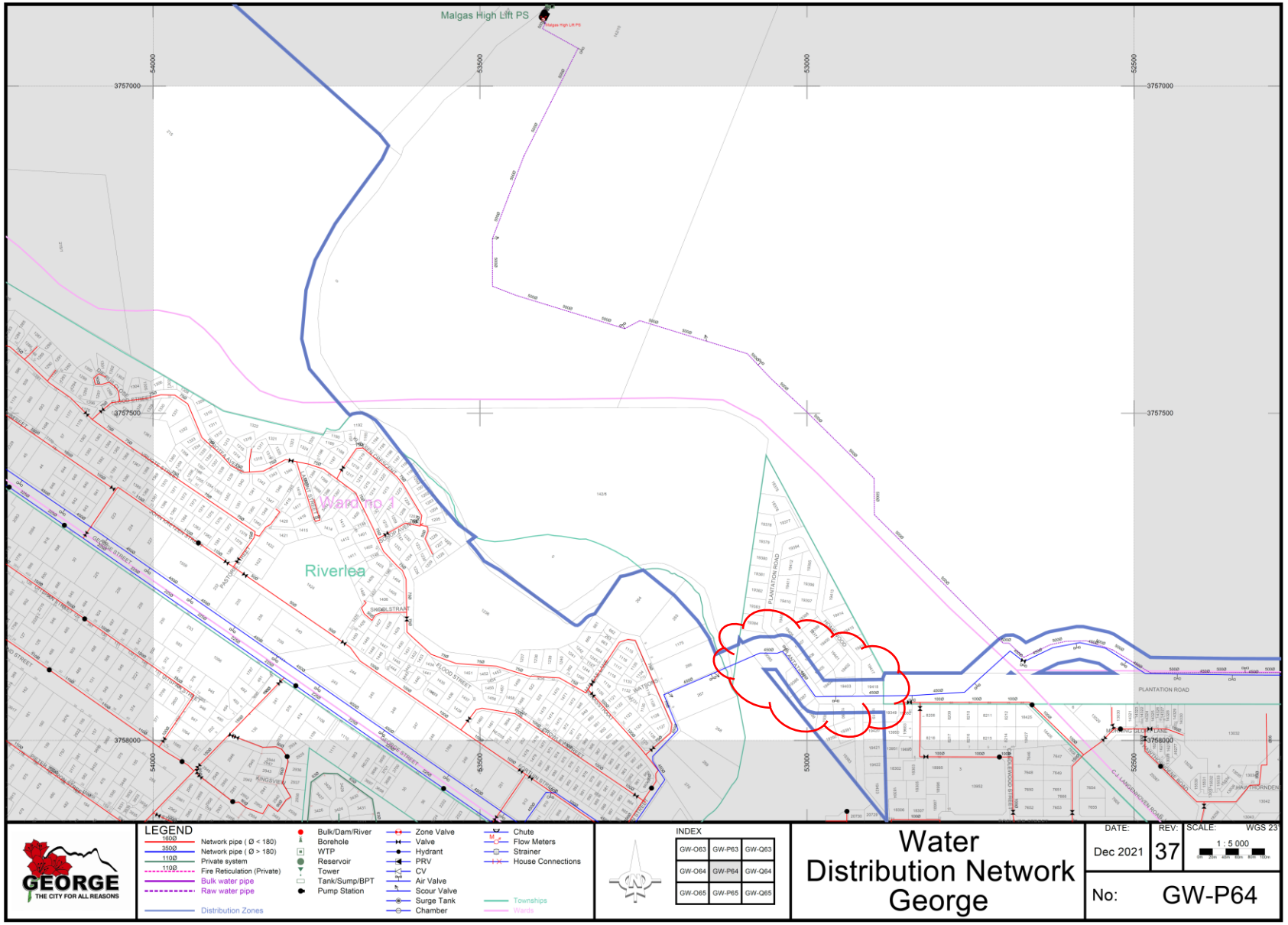

Figure 8: 450mm dia Municipal Bulk Supply GRP Pipe that runs through the planned development site.

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.

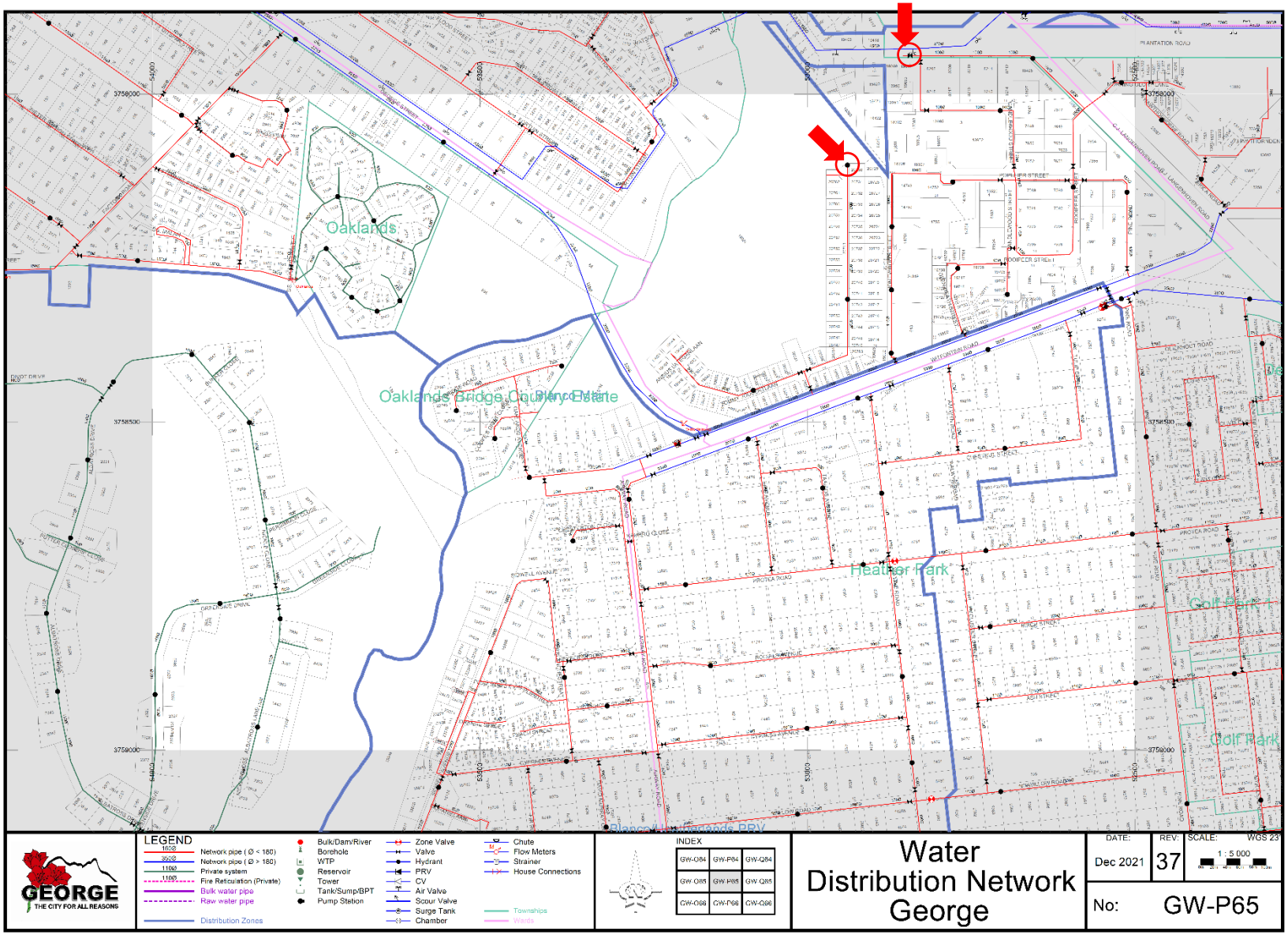

Figure 9: Proposed Water Connection Points – as pointed out by GLS Consulting Engineers.

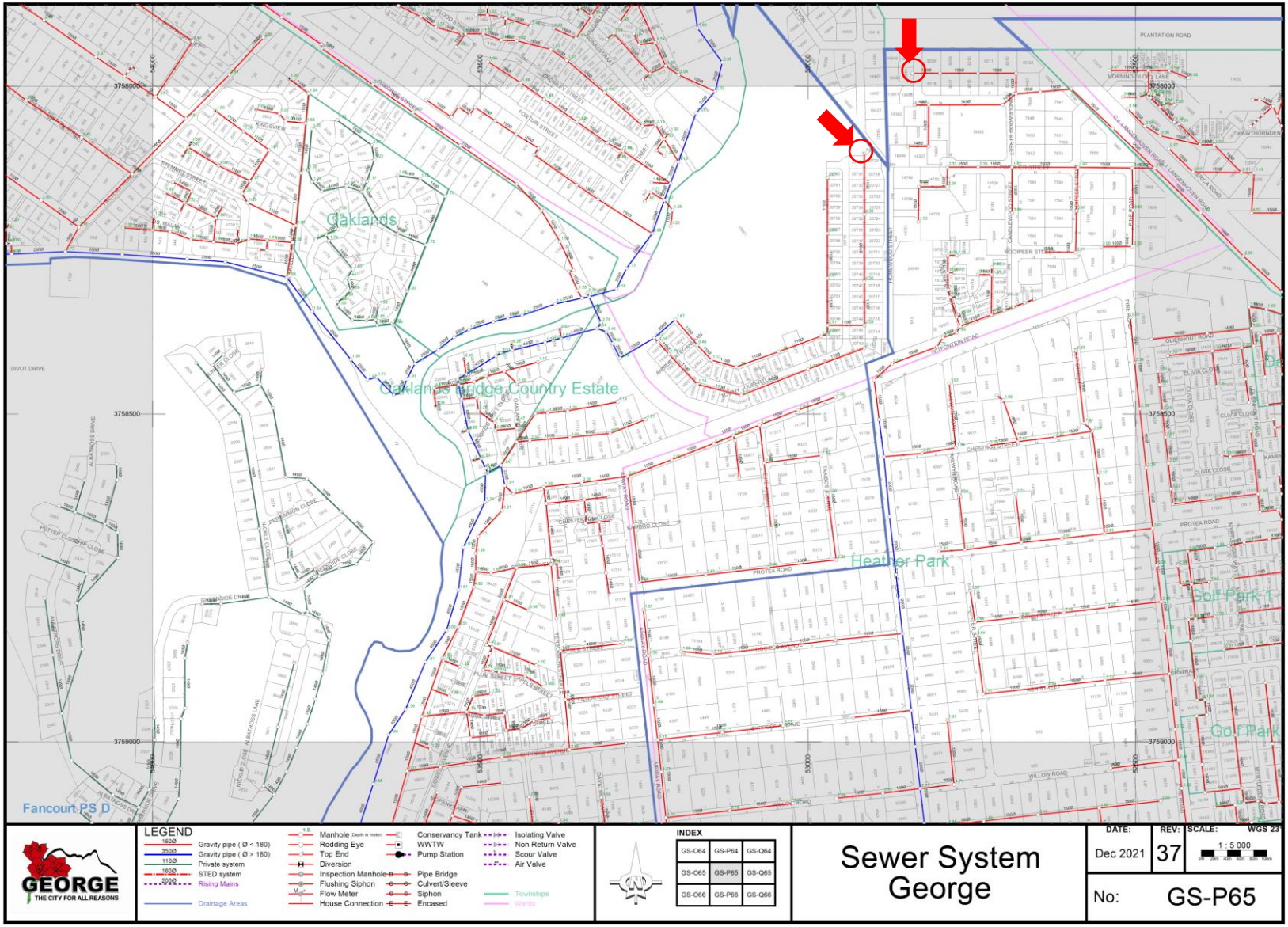

Figure 10: Proposed Sewer Connection Points – as pointed out by GLS Consulting Engineers.

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.

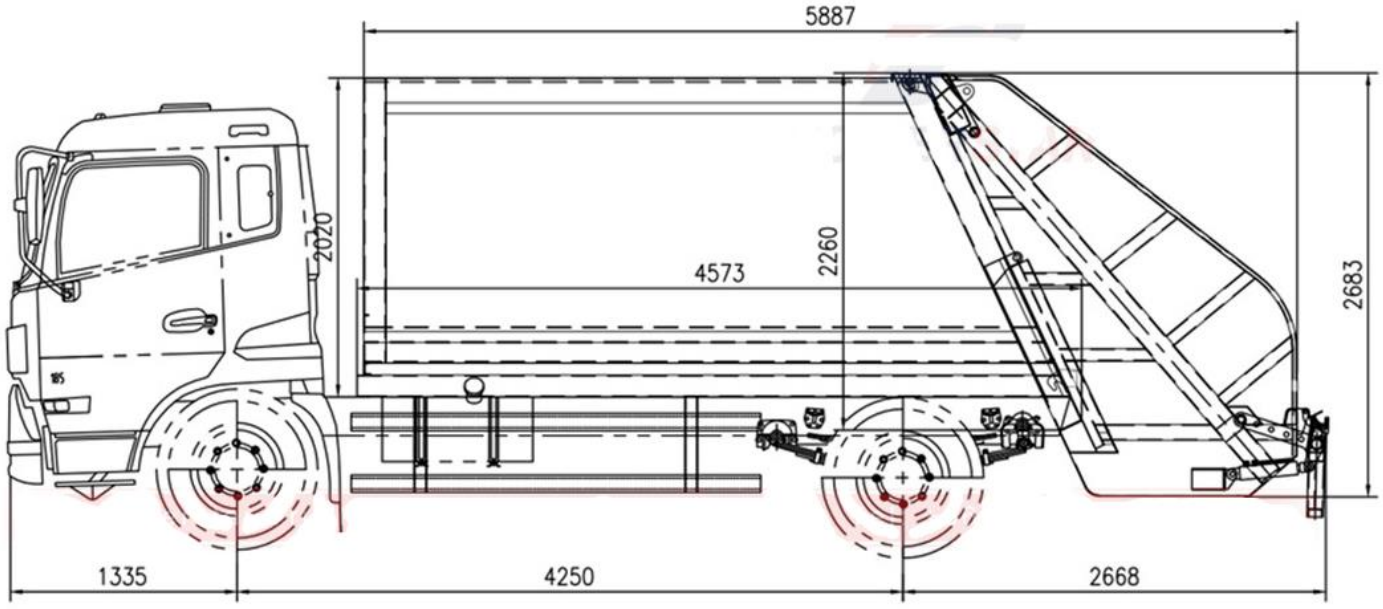

Figure 11: Typical Dimensions of a 12m² waste compactor truck.

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.

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2. ***Guidelines for Human Settlement Planning and Design – Volume 2:***
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4. Table 1: Climate Summary for George
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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*
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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*
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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>*

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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

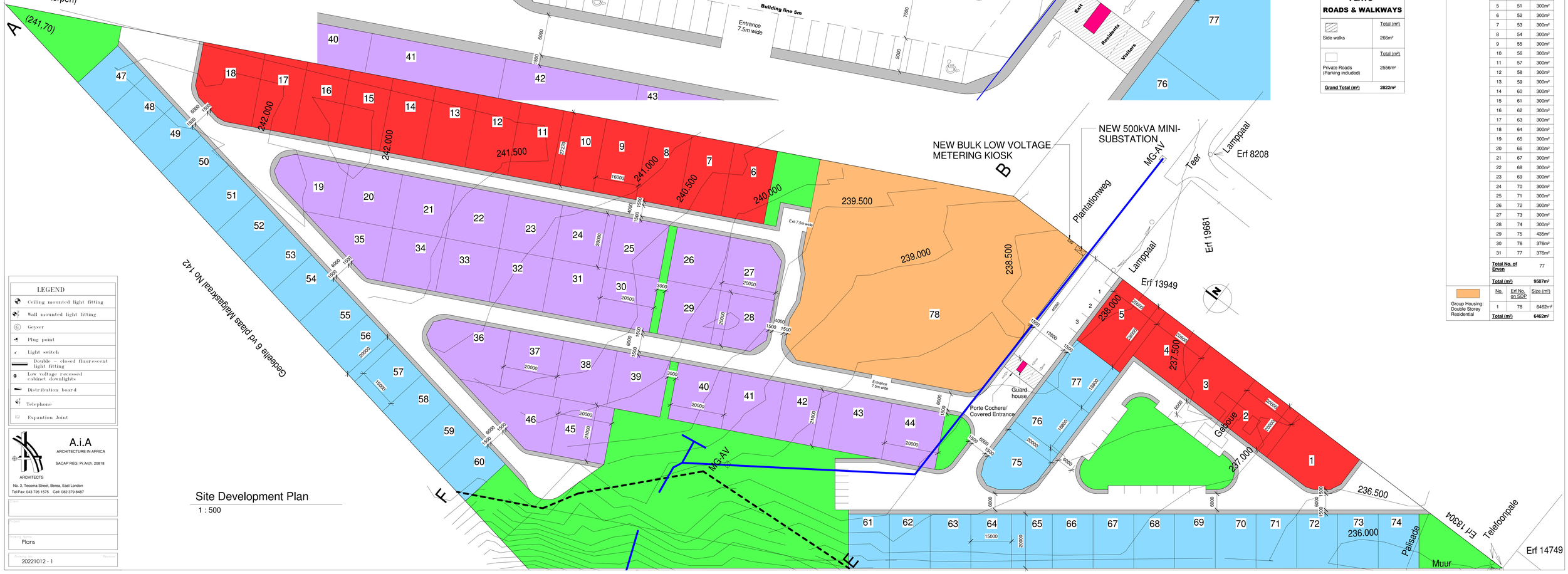
Blanco

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:

- Ø100mm uPVC CLASS 9 WATER PIPE
- Ø160mm uPVC CLASS 34 SEWER PIPE
- Ø375mm AND Ø450mm CONCRETE CLASS 100D STORMWATER PIPE
- STORMWATER CATCH PIT
- SEWER MANHOLE
- RODDING EYE
- WATER PIPE END CAP
- PREPOSED SEWER HOUSE 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 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
ARCHITECTS
No. 3, Tecoma Street, Berea, East London
Tel/Fax: 043 726 1575 Cell: 082 379 8487

REFERENCE DRAWINGS

REV	DATE	DESCRIPTION

REVISIONS

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REVIEWER: L FOURIE | DATE: 21 NOVEMBER 2022

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