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Our Ref: 503048/22.5/MB/gc

03 March 2022

Power Construction (Pty) Ltd.
PO Box 129
Blackheath
7580

Attention : Mr Steven Levey

Dear Sir,

CONSTRUCTION OF INTERNAL CIVIL ENGINEERING SERVICES FOR ERVEN 20128 - 20129: THE VILLAGE RIDGE: ENGINEERING SERVICES REPORT

Below please find the Engineering Services Report for The Village Ridge, based on the latest proposed town planning layout as received from Formaplan CC Town Planners, refer to enclosed Drawing no. Village R 1.5, dated February 2022.

1. INTRODUCTION

1.1 Brief

The George Municipal area has seen a period of rapid growth in recent years which has had the effect that the demand for affordable housing has dramatically increased.

Power Construction, part of the Power Group of companies, initially proposed the development of an affordable housing scheme in the central George Municipal area which consisted of 189 serviced units. Due to a directive from the Department of Environmental Affairs and Development Planning, the developers were accused of the destruction of wetlands areas when construction commenced.

Since then, a new layout has been proposed where the development will be outside of the demarcated wetland boundaries. The amended layout consists of 158 serviced units, including 155 residential and 3 business zoned sites. This report covers the proposed engineering services for the residential development of the amended layout.

1.2 General

The proposed development is situated at the King George Park, South East of Kingswood Golf Estate and West from the George CBD, refer to enclosed Drawing no. 503048-0000-DRG-CC-0001 indicating the extent of the site. The climate is moderate, with rainfall occurring throughout the year and the mean annual precipitation being in the order of 662mm. The average midday temperature ranges from 18.2°C in July to 27.6°C in February.

The proposed number of developed erven contained is as follows:

Land – Use	No of Erven	Extent (±Ha)	% of Total
Single Residential Zone I	95	1.651	36.53
General Residential Zone II	60	0.404	8.93
Business Zone III	3	0.030	0.67
Business Zone I (Cell Phone Tower)	1	0.007	0.15
Public Open Zone I	8	0.618	13.66
Public Open Zone III (Conservation Area)	2	0.760	16.8
Transport Zone II		1.052	23.26
TOTAL	**169**	**4.521ha**	**100**

2. BULK WATER SUPPLY SYSTEM

2.1 General Description

George is supplied with water mainly from the Garden Route Dam but makes use of various other pumped sources such as from the Gwaing River. The water is purified at the George WTP's.

Water is supplied to all areas within George through a network of bulk water lines distributing water to and from each reservoir supply area.

2.2. Proposed Water Demand for Housing Project

Our calculations are based on the "Guidelines for Human Settlement Planning and Design".

Existing network capacity in the vicinity of the site have been confirmed by George Municipality through the recent report done by GLS Consulting (GLS) through their appointment by George Municipality to draw up the Water Master Plan for the Municipal area and to determine the effect of any form of developments in the Municipal area on the Water Master Plan. This proposed development SDP was submitted to GLS in order to determine whether the existing water network system has sufficient capacity to accommodate the proposed housing development.

According to Table 8.14: Water Demand from ""Guidelines for Human Settlement Planning and Design", the following calculation was done to determine the Annual Average Daily Demand (ADDD) for the various Land Uses: ² This has been based on the assumption that all erven will be 200m² or less in size with an average demand of 400 ℓ/day/unit.

The proposed number of developed erven contained for the development is as follows:

Description	Calculations	Annual Average Daily Demand (AADD)
Single Residential Zone I	95 erven x 400ℓ/erf/day	38 000 ℓ/day
General Residential Zone II	60 erven x 400ℓ/erf/day	24 000 ℓ/day
Business Zone III	300m^2 @ 400ℓ/day per 100m^2 area	1 200 ℓ/day
Business Zone I (Cell phone Tower)	-	0 ℓ/day
Public Open Zone I	-	0 ℓ/day
Public Open Zone III (Conservation area)	-	0 ℓ/day
Transport Zone II	-	0 ℓ/day
	TOTAL AADD	**63 200 ℓ/day**

This equates to 63 equivalent erven and from the design codes, we expect to design for a peak factor of 12.

Peak Domestic Demand = 12 x 63 200 ℓ/d
= 758 400 ℓ/d
= 8,778 ℓ/s

Fireflow:

Such a development would fall into a low risk-group 2 category and as such, the following would apply:

- 500 ℓ/min
- 1 hour design fire flow

With the supply spread over a wide area, according to the GLS Water Master Plan the existing reservoirs have sufficient storage capacity and capacity for fire flow conditions to accommodate this particular development.

According to the Water Master Plan for the Municipal area, sufficient capacity exists at the Water Treatment Plants.

A water reticulation system exists within the adjacent neighborhoods to which the proposed development will connect (see GLS Figure 1). A system of reservoirs, water pump stations and water mains deliver potable water to developed areas.

2.3 Proposed Services

No upgrades to the water reticulation system are required in order to accommodate this development within the existing water distribution system. However, certain upgrades are required to accommodate the development in future system (Bulk reticulation, see enclosed GLS report).

As per the following drawings, Figure 1 received from GLS, and 503048-0000-DRG-CC-0001 from Zutari, water reticulation exists within the proposed construction area. All existing services will either be rerouted or accommodated within the future development area.

3. BULK SEWAGE SYSTEM

3.1 Wastewater Treatment Works

George Municipality has more than one WWTW. The proposed development falls within the Rooirivier Pump Station sub-drainage area and drains to the Gwaing WWTW.

Wastewater generated from the proposed development will gravitate to the Rooirivier PS, pumped and drained to the Gwaing WWTW where it will be treated.

3.2 Wastewater Reticulation System

A normal gravity wastewater reticulation system exists in the adjacent neighborhood to which the proposed development will drain (See GLS Figure 2 attached). A system of wastewater pump stations and rising mains delivers the accumulated wastewater to the Gwaing Wastewater Treatment Works.

3.3 Wastewater Flow Demand

Our calculations are based on the "Guidelines for Human Settlement Planning and Design".

3.3.1 According to the guidelines, the expected average daily wastewater flow per dwelling for the three income groups is as follows:

Income group	Low	Medium	High
Litres per dwelling	500	750	1000
Average persons per dwelling	7	6	5

The proposed area to be serviced is as follows:

AREA	INCOME GROUP	NO OF ERVEN
The Village Ridge	Medium	155 erven

Due to the size of the proposed erven and dwellings, the expected flow can be adjusted to approximately 500 ℓ/dwelling/day with an average of 4 occupants per dwelling.

Based on the above, the Average Dry Weather Flow (ADWF) for the residential erven would therefore be:

Q = 155 x 500
Q = 77 500 ℓ/d
= 77,5 kℓ/d
ADWF = 0,078 Mℓ/d

3.3.2 For the remaining of Land Uses, we can assume that 75% of the water demand as determined under item 2.2 will end up in sewer reticulation system:

Business Zone III = 1200 ℓ/day

Based on the above the ADWF for the remaining land uses would therefore be:

Q = (1200 ℓ/day) x 0,75
= 900 ℓ/day
= 0,9 kℓ/day
ADWF = 0,001 Mℓ/day

3.3.3 The number of persons is:

155 x 4
= 620 persons

This equates to a peak factor of 3.5.

This would lead to an expected Peak Dry Weather Flow (PDWF) as follows:

Q = (900 + 77 500) x 3.5
= 274 400 ℓ/d
= 0,274 Mℓ/d

PDWF = 3.176 ℓ/s

If an infiltration rate of 15% is used for the ingress of stormwater into the system, the Peak Wet Weather Flow (PWWF) is calculated as follows:

Q = 274 400 x 1.15
= 315 560 ℓ/d
= 0,316 Mℓ/d

PWWF = 3,652 ℓ/s

3.4 Proposed Services

No upgrades to the existing bulk sewage reticulation system is envisaged in order to accommodate this development. Certain items have however been identified as possible upgrades required to alleviate existing shortcomings in the existing reticulation system (See enclosed GLS report). Bulk sewer items have also been identified as possible future requirements.

The sewerage line between the erf connection manhole and bulk sewerage system has been identified as a 110mm pipeline. This pipeline will be required to be upgraded to a 160mm sewerage pipeline to accommodate the development.

4. STORMWATER

No bulk stormwater systems are required as the stormwater will be dispersed via an energy dissipating outlet towards the southeast corner of the site and an attenuation pond situated at the northeast corner of the site where the overflow will disperse towards the existing wetland (Camfersdrift River). Upstream flow or ingress will be accommodated in this design. A Stormwater Management Plan has been compiled and detailed design will be done with this in mind in order to minimize the peak runoff.

5. ACCESS ROADS

Access to the proposed development area will be provided via the existing circle on the southern perimeter of the site. The circle can be accessed from the north via Loch Lomondry Avenue and from the south via King George Drive. This circle will be upgraded to allow waste disposal vehicles to access the development. A TIA report was completed as part of the approvals process.

6. SOLID WASTE

Refuse removal will be dealt with once a week as applicable to all the current residential areas in the George Municipal area.

Solid waste is based on an estimated 3.5 kg/person/day.

Therefore: (155 units x 4 people per unit x 3.5 kg/day)
= 2 170 kg/day
= 2,17 tons/day
Volume = 2,17 t/d x 0.75
= 1,628 m^3/d
= 48,840 m^3/month

Based on preliminary discussions with George Municipality the existing solid waste site will be able to accommodate the additional solid waste generated by the development.

7. FLOODLINES

This housing project is not affected by any floodlines.

8. EXTRAORDINARY DEVELOPMENT CONDITIONS AND LAND REHABILITATION

The general terrain and the underlying geology of these sites appear to be suitable for housing development. Some areas that are adjacent to natural drainage lines are quite steep and some terracing may be necessary.

Excessive hard rock excavations are not suspected in the area.

9. INTERNAL SERVICES

The proposed internal civil services (preliminary) are indicated on Drawing No 503048-0000-DRG-CC-0001. Below find a brief description of the services to be provided for the area.

9.1 Sewage

1152m of 160mm dia PVC-u heavy duty sewer pipe

34 No. Manholes

110mm dia PVC-u light duty house connections with end cap for 158 erven.

9.2 Water

711m of 110mm and 278m of 90mm dia HDPE Class 12 water pipe

3 No. Gate valves

4 No. Fire hydrants

20mm dia HDPE Class 12 water house connections for 158 erven.

9.3 Roads

5578m² bitumen roads. Road widths are 4.5m wide with combination kerbs on the lower side of the roadway, mountable kerbs on the upper side and barrier kerbs channels at intersections.

9.4 Stormwater

1974m of Combination/Mountable/Barrier kerb and channel

729m of 450mm dia concrete stormwater pipes and concrete box culverts

12 No. Stormwater Catchpits

16 No. Stormwater Manholes

2 No. Brick headwalls

10. STANDARD OF ENGINEERING SERVICES TO BE PROVIDED

Levels of services are as follows:

10.1 Sewer

- Pipe diameter: 160mm dia UPVC Class 34 solid wall for main lines and 110mm for house connections.
- Prefabricated fibre cement shafts to be used for manholes.
- Erf connection ends 1m into the erf with an inspection chamber.

10.2 Water

- Pipe diameter of 90 – 160 mm dia UPVC Class 9/12 pipes depending on residual pressure.
- Each erf will be serviced with a 20mm diameter connection and an Elster Kent/Honeywell plastic water meter in a plastic meter box or similar approved meter by the Technical Services Directorate.
- Provision is made for fire hydrants according to "Red Book" guidelines.
- All fire hydrants shall be 65mm dia (internal)
- All fire hydrant outlet shall be of "London Round Thread" coupling type.
- All valves shall be AVK type valves – left hand closing or similar approved.

10.3 Roads and stormwater

- The road width will be 4.5m in 8 and 10m reserves.
- All road surfaces will be either asphalt or paved surface.
- Sub-base and base materials will be imported.
- Sub-surface drainage, where applicable, will be installed.
- The underground piped stormwater drainage system will be minimum 450mm diameter.
- Barrier kerbs will be installed with channels around bellmouths. Bellmouth's radius minimum 6m.
- All stormwater drains will be provided with a sand trap of at least 300mm.

10.4 Design Criteria and Standards

10.4.1 Design criteria

The following document serves as a base for the detail design criteria and standards : Guidelines for Human Settlement Planning and Design ("Red Book").

10.4.2 Construction specifications

All materials and workmanship shall comply with the specifications as set out in the South African National Standards for Civil Engineering (SANS).

10.4.3 Roads

The road system forms an integral part of the local area plan.

10.4.3.1 *Design Criteria*

The design criterion for roads is as follows:

- Road reserve widths are 10m and 8m.
- Design life of the roads is 20 years.
- Sub-grade CBR: 15 to 20.
- Sub-base CBR: 45 min. (processed crushed stone)
- Base course CBR: 80 min. (processed crushed stone)
- Surfacing: Asphalt, paving
- Minimum road grade: 0.475 %
- Minimum road crossfall: 2 %

10.4.4 Stormwater

The storm water system forms an integral part of the road and urban planning layout. The system rests on three legs, the minor system, the major system and an emergency system. The minor storms are catered for in the pipe system while the major storms are routed through a linked system of roads and public open spaces using attenuation techniques. The emergency system recognizes failure of the minor and major system by storms greater than provided for in major system or in the event of malfunction of the minor system by providing continuous overland flow routes to minimize flooding of residential areas.

10.4.4.1 *Minimum design criteria for storm water system*

The data to be used for the design of the system is as follows:

- Minor system : 5 year return period conveyed in an underground pipe system. Preferably the overland flow shall not exceed 200m.
- Major system : 50 year return period. The difference between the 5 year and 50 year to be conveyed in the road prism with depth not exceeding 150mm within the road reserve width.
- The minimum gradients for pipelines are designed to give a minimum velocity of 0.7m per second with the pipe flowing full.
- The maximum velocity used is 3.5m per second.
- Major storm water overflows are to be provided to convey the excess storm water from the streets into designated public open spaces.
- Storm water flow velocities in road ways will be kept as low as possible and related to the surface finish to prevent scour and erosion.

- Roads are to be graded to ensure free and continuous flow to the main storm water system and to prevent local ponds at intersections.

10.4.4.2 *Pipelines*

- Storm water pipes are generally 50D, 75D or 100D as required by the loading and installation conditions.
- Pipes are generally laid on Class C bed.
- The minimum cover on pipes is 0.80m.
- The minimum pipe diameter is 450mm for longitudinal runs and catch pit connections.

10.4.5 Sewers

The sewer drainage system forms an integral part of the sewage system. The drainage for the site is in different directions due to the topography of the site.

10.4.5.1 *Minimum design criteria*

- A conventional waterborne sewerage system is provided with single connections to individual erven. The main sewer line will be constructed within roads reserves or midblock sewers on the site topography depending.
- Design parameters: Average daily flow - 500ℓ / erf / day

: Peak factor – Harmon formula
: Extraneous flow – 15 %
: Minimum velocity – 0.7m per second

- Minimum cover to pipes : 0.80m
- Minimum pipe size : 110mm diameter for house connections
  : 160mm diameter for sewer mains
- Minimum gradients : 110mm diameter house connection 1:60
  : main lines at 80% capacity as follows:

Dwelling units	Grade
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

- House connection depth shall generally be 1.0m but at least be able to drain 80% of an erf.
- Maximum manhole spacing of 80m.

10.4.5.2 *Pipelines*

- Pipeline material for pipe sizes up to 160mm diameter :
  - uPVC Class 34 solid wall pipe complying with SANS 791
- Pipes are generally laid on Class C bedding.

10.4.5.3 *Manholes*

- Dolomite aggregate and low alkali sulphate resistant cement to SABS 471 shall be used for all concrete, mortar or screed.
- Manhole cover to be central over main pipe on downstream side.
- Manhole covers and frames to be Concrete.

10.4.6 Water

The water reticulation network forms an integral part of the water distribution system.

10.4.6.1 *Minimum design criteria*

The design criteria generally as per the "Red Book" guidelines and specifically as follows:

- An average domestic consumption of 400ℓ per day per erf.
- Peak factors for the development will be calculated in accordance with Figure 9.9 of the "Red Book".
- Minimum pressures for the network are calculated for the fire flows of 30ℓ per second and peak demand at the point of lowest pressure under peak flow conditions.
- Valves to be placed such that a maximum of 4 valves need to be closed to isolate a section of pipeline.
- Valves to be spaced so that the length of main included in an isolated section does not exceed 600m.
- All valves to be installed at T-pieces where applicable and not within the road surface.
- Minimum cover to pipe to be 0.8m.

10.4.6.2 *Pipeline materials*

- Network – uPVC Class 9/12, dia 90 – 110mm complying to SABS 966
- Erf connections – HDPE Class 12, JASWIC

We trust that we have provided sufficient information for your purposes and look forward to hearing from you shortly. Please do not hesitate to contact us if you should require any further information.

Yours faithfully

M BOTHA Pr Tech Eng
Technical Specialist
pp Zutari

AC KEYSER Pr Tech Eng
Office Manager
pp Zutari

Encl: Drawing No. 503048-0000-DRG-CC-0001
Drawing No. Village R 1.5
GLS Report: George Erf 21028 and 21029 dated 08 May 2018
GLS Figure 1 (Water)
GLS Figure 2 (Sewer)

BENCHMARK				
POINT	Y-Coord	X-Coord	HEIGHT	DESCRIPTION
RIDGE1	51351.964	3759351.907	225.399	HIC NXT TO MHR
RIDGE2	51268.109	3759412.360	225.136	12MM NEXT ROAD
RIDGE3	51310.863	3759391.330	225.366	12MM

PROPOSED STORMWATER DETENTION POND

NEW MANHOLE TO BE CONSTRUCTED ON EXISTING SEWER LINE

EXISTING STORMWATER HEADWALL

UPGRADED SEWER LINE TO BE CONNECTED TO EXISTING MANHOLE POSITION AND LEVEL TO BE CONFIRMED ON SITE

EXISTING 110mm Ø SEWER LINE TO BE UPGRADED TO 160mm Ø

PROPOSED STORMWATER OVERFLOW FROM DETENTION POND TO BE CONNECTED TO EXISTING STORMWATER PIPE

EXISTING 350mm Ø STORMWATER LINE TO BE UPGRADED TO 450mm Ø

CONSTRUCT NEW MANHOLE ON EXISTING STORMWATER LINE

NEW MANHOLE TO BE CONSTRUCTED ON EXISTING STORMWATER LINE

EXISTING STORMWATER LINE TO BE REROUTED

NEW MANHOLES TO BE CONSTRUCTED ON EXISTING SEWER LINE

Rem. Erf 20958

21020 9356 21026 21027 21014 21025 19681

DALMARY ST · MILTON ST · LOCH KATRINE STREET · RUSKIE ST · GLEN MASSAN STREET · MILTON STREET · GLEN BRANTER STREET · GARTMORE STREET · LOCH LOMONDY AVENUE · KING GEORGE DRIVE

GREEN CORRIDOR · GREEN CORRIDOR · GREEN CORRIDOR · GREEN CORRIDOR

Existing stormwater 350mm pipe · Ext stormwater 350mm pipe · Ext stormwater 350mm pipe · Ext stormwater 350mm pipe

FH · BOX CULVERTS · 110 Ø

DISCLAIMER

IF CONSTRUCTION DRAWINGS ARE ISSUED UNSIGNED, THE MASTER WITH THE ORIGINAL SIGNATURE OF APPROVAL WILL BE HELD AT THE ZUTARI OFFICE OF THE APPROVER

GENERAL NOTES:

1. ALL CONSTRUCTION MUST BE DONE IN ACCORDANCE WITH SANS 1200.
2. FOR SEWER LAYOUT SEE DRG NO. 503048-0000-DRG-CC-0002.
3. FOR WATER LAYOUT SEE DRG NO. 503048-0000-DRG-CC-0003.
4. FOR ROADS AND STORMWATER LAYOUT SEE DRG NO. 503048-0000-DRG-CC-0004.
5. FOR ROADS DETAILS SEE DRG NO. 503048-0000-DRG-CC-0012 & 0013.
6. FOR STORMWATER DETAILS SEE DRG NO. 503048-0000-DRG-CC-0014 & 0015.
7. FOR SEWER DETAIL PLAN SEE DRG. 503048-0000-DRG-CC-0008 & 009.

LEGEND:

PROPOSED	EXISTING
SEWER PIPE LINE	BENCHMARK
SEWER MANHOLE	SEWER PIPE LINE
SEWER ERF CONNECTION	SEWER MANHOLE
WATER PIPE LINE	WATER PIPE LINE
FIRE HYDRANT	FIRE HYDRANT
VALVE	VALVE
WATER ERF CONNECTIONS	WATER ERF CONNECTIONS
STORMWATER PIPE	FENCE
CATCHPIT	50 YEAR FLOOD LINE
STORMWATER MANHOLE	100 YEAR FLOOD LINE
STORMWATER PIPE TO DETENTION POND	
SILT RETENTION AND ENERGY DISSIPATER HEADWALL	
"STOP" - ROAD SIGN	
BARRIER KERB & CHANNEL	
MOUNTABLE KERB (MK10)	
COMBINATION KERB (CK 5)	

POND BUFFERING
DELINEATED WETLANDS
19m BUFFERS

RESPONSIBLE PERSONS

	NAME	SIGNATURE	DATE
DRAWN			
DESIGNED			
CHECKED			

ZUTARI
IMPACT. ENGINEERED.

CLIENT

POWER GROUP

REV	DATE	REVISION DETAILS	APPROVED
A	15/10/2020	FOR APPROVAL	AC KEYSER
0	05/5/2021	FOR CONSTRUCTION	AC KEYSER
1	25/5/2021	REVISED ERF CONNECTIONS	AC KEYSER
A	26/8/2021	NEW CADASTRAL AND SERVICES ADDED	AC KEYSER
B	6/9/2021	NEW CADASTRAL AND SERVICES ADDED	AC KEYSER
C	29/11/2021	PREFERED LAYOUT AND AS-BUILT SERVICES	AC KEYSER
D	31/1/2022	REVISED LAYOUT WITH NEW DESIGN	AC KEYSER
E	22/2/2022	REVISED LAYOUT AND STORMWATER	AC KEYSER

SCALE	SIZE	
1:500	A1	FOR DISCUSSION NOT FOR CONSTRUCTION

DRAWN	APPROVED
M RICHARDS	DATE
DESIGNED: G COETZEE	AC KEYSER ECSA-200670108
REVIEWED: M BOTHA	

PROJECT

THE VILLAGE RIDGE

TITLE

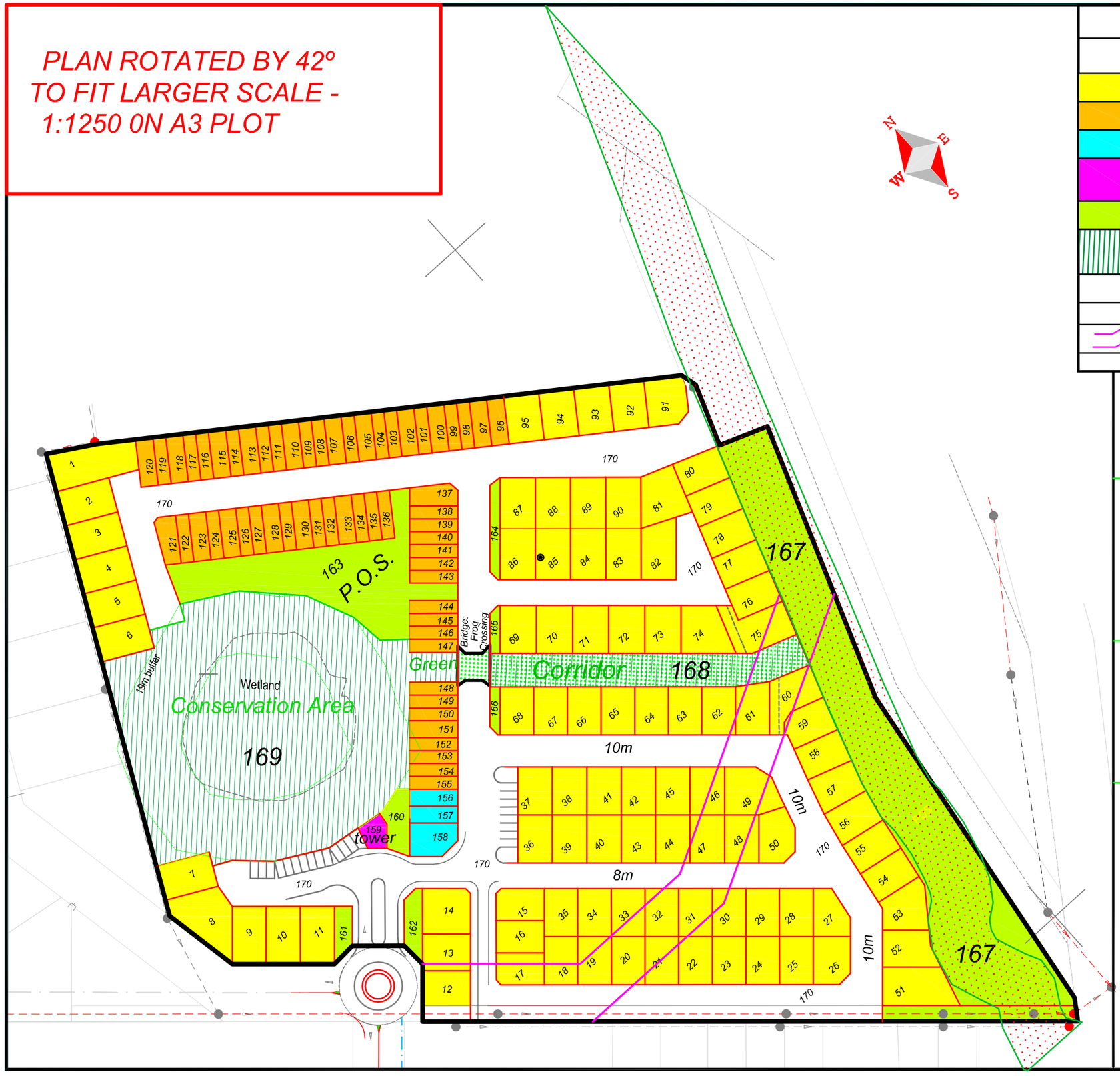
GENERAL SERVICES LAYOUT

DRAWING NUMBER

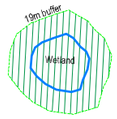
PROJECT No.	WBS	TYPE	DISC	NUMBER	REV
503048	0000	DRG	CC	0001	E

Plot Date: 3/3/2022 12:31:27 pm Office: ZAGRJ Filename: P:\PROJECTS\503048 VILLAGE RIDGE ESTATES DEL DES\03 CAD\DRAWINGS\FOR DISCUSSION\2022-02-21\503048-0000-DRG-CC-0001REVE.DWG

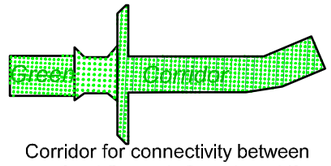
PLAN ROTATED BY 42º
TO FIT LARGER SCALE -
1:1250 0N A3 PLOT



Legend					
Zoning		ERF Nos	No. erven	Area m²	%
	Single Residential Zone I	AS INDICATED ON PLAN	95	16 513	36.53
	General Residential Zone III		60	4 035	8.93
	Business Zone III		3	304	0.67
	Utility Zone (Cell PhoneTower)		1	69	0.15
	Open Space Zone I		8	6 175	13.66
	Open Space Zone III (conservation area-froggs)		2	7 598	16.80
	Transport Zone II		1	10 517	23.26
TOTAL				45 210	100
The portion of Loch Lomond Closed by Municipality					
SEE ATTACHED SCHEDULE FOR ERF SIZES.					



Wetland flat area with 19m Buffer Area: Scale reduced



Corridor for connectivity between wetland flat and Camphersdrift wetland
Scale reduced

19m Buffer Area from river wetland: Scale reduced

PHASING OF DEVELOPMENT

STILL TO BE DETERMINED

NOTE:
All measurements on this plan are approximate and must be verified by a landsurveyor.

Client: Klient:

VILLAGE
RIDGE ESTATE

FORMAPLAN cc
STADS- & STREEKSBEPLANNERS
TOWN- & REGIONAL PLANNERS
P.O. Box 9824, George 6530 / 8 St John St
Tel: (044) 873-4385 Faks: (044) 874-5632

Project: Projek:
Village Ridge Estate
Residential Development

Title: Titel:
Proposed Rezoning, Subdivision Plan - Amendment of Approval.

Property: Eiendom
Erven 21028 & 21029, Now Erf 28930, GEORGE.

Scale: Skaal: 1 : 1250 on A3 Plot

Drawing Number: Tekening Nommer:
Village R 1.5

Date: Datum:
February 2022

25 | 1989 - 2014
celebrating 25 years of excellence

8 May 2018

Director: Civil and Technical Services
George Municipality
PO Box 19
GEORGE
6530

ATTENTION: Mr. Reggie Wesso

Dear Sir,

WATER AND SEWER MASTER PLANS: PROPOSED TOWNSHIP DEVELOPMENT – GEORGE ERF 21028 and 21029

The request from Aurecon dated 24 April 2018 with regards to accommodating the proposed development in the George water and sewer systems refers.

This letter should be read in conjunction with the following planning reports which are available at the George Municipality Water and Sanitation department:

- George Water Distribution Network: Computer Analysis and Master Planning (GLS, dated March 2018)
- George Sewer System: Computer Analysis and Master Planning (GLS, dated March 2018)

All costs shown in this report are year 2017/18 Rand value estimates and **include** 40% surcharge for P&Gs, contingencies and fees but **exclude** VAT.

GLS Consulting (Pty) Ltd
Tel +27 21 880 0388 | **email:** info@gls.co.za
PO Box 814, Stellenbosch, 7599, South Africa
13 Elektron Street, Techno Park, Stellenbosch
www.eoh.co.za | www.gls.co.za
Reg no: 2007/003039/07

1 WATER DISTRIBUTION NETWORK

1.1 Distribution Zone

The proposed development was taken into consideration in the above mentioned water master plan as part of the George Erf 21028-21029 future development area.

The master plan indicates that the proposed development falls in the George Main zone as shown in **Figure 1 (Water)** attached.

1.2 Revised Water Demand

The combined AADD for the proposed development as originally calculated and used for the analysis of the water distribution network in the master plan was 53.4 kL/d.

The revised AADD, peak flow and fire flow calculated for the proposed development and used in the re-analysis of the water distribution network is 80.0 kL/d calculated as follows:

- 200 Cluster housing units > 30 units/ha @ 0.4 kL/d/unit (density = 46 units/ha) = 80.0 kL/d
- Peak flow: 3.00 zone peak hour factor = 2.8 L/s
  Note: Higher peak flow factors might be applicable for internal networks.
- Fire flow for Cluster housing > 30 units/ha : 20 L/s (1 hydrant) @ 10 m minimum pressure

1.3 Accommodation of Proposed Development in the Existing Water Distribution Network

Accommodation of the proposed development, with its revised AADD, requires implementation of the following additions and adjustments to the *existing* water system as indicated in **Figure 1 (Water)** attached:

1.3.1 Water Bulk Items

Items required to alleviate existing deficiencies in the bulk water system:

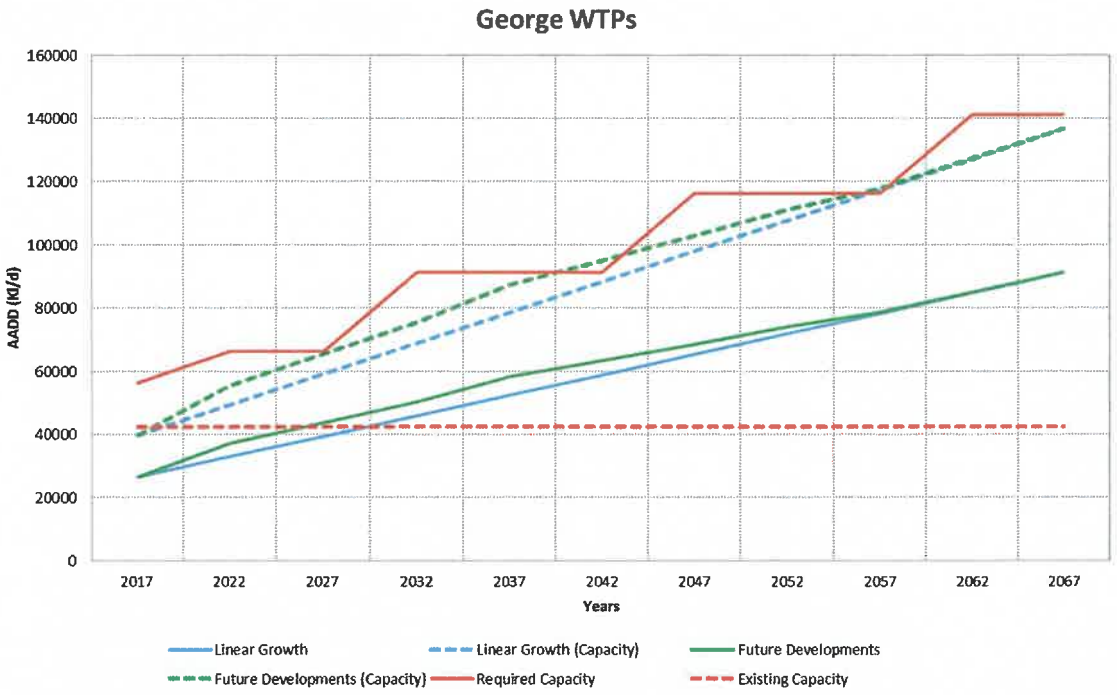
Upgrades currently under construction;

- New 12 500 kL Reservoir @ Old WTP

Items required to upgrade the existing WTP in the future bulk water system:

•	GMR_B01.06	New 7m x 500mmØ bulk connection to New WTP	R 198 800
•	GMR_B01.07	Upgrade existing New WTP PS (install pump only) @ WTP	R 1 080 800
•	GMR_B01.01	Upgrade existing New WTP (phase 1a of 4), 10 000 kL/d module	R 105 000 000

The following graph shows the Design Capacity of the George WTP's and Predicted Demands based on the phasing of Future Developments and Linear Growth.



1.3.2 Reticulation Items

The proposed connection points (A & B) to the existing water system are shown in Figure 1 (Water).

Items required to alleviate existing deficiencies in the water distribution system:

- None

Items required to accommodate the proposed development in the future system (Excluding fire flow requirements):

• GMR_08.01	New 414m x 315mmØ distribution main	R 1 505 140
• GMR_08.02	New 80m x 315mmØ distribution main	R 335 160

Items required to accommodate the proposed development in the future system (Including fire flow requirements):

- None

1.4 Internal Reticulation

The design of the internal network for the proposed development is beyond the scope of this report. The design of the internal network should allow for fire flow as listed in paragraph 1.2 above.

For internal network design purposes the water distribution network provides the following energy grade lines (EGLs) at the proposed connection point (see **Figure 1 (Water)**):

- Static EGL = 295 m.asl
- Residual EGL = 262 m.asl
- Ground Level = 225 m.asl

1.5 Adjustments to the Master Plan

No adjustments to the water master plan are required due to the increased AADD of the proposed development.

2 SEWER NETWORK

2.1 Drainage Area

The proposed development was taken into consideration in the above mentioned sewer master plan as part of the George Erf 21028-21029 future development area.

The master plan indicates that the proposed development falls in the Rooirivier PS sub-drainage area as shown in **Figure 2 (Sewer)** attached. This sub-drainage area drains to the Gwaiing WWTW.

2.2 Revised Sewer Flow

The combined peak day dry weather flow (PDDWF) for the proposed development as originally calculated and used for the analysis of the sewer system in the master plan was 39.8 kL/d.

The revised PDDWF calculated for the proposed development and used in the re-analysis of the sewer system is 64.7 kL/d with an instantaneous peak dry weather flow (IPDWF) of 1.5 L/s. The design flow, or instantaneous peak wet weather flow (IPWWF), is 2.2 L/s.

2.3 Accommodation of the Proposed Development in the Existing Sewer System

Accommodation of the proposed development, with its revised PDDWF, requires implementation of the following additions and adjustments to the *existing* sewer system as indicated in **Figure 2 (Sewer)** attached:

2.3.1 Sewer Bulk Items

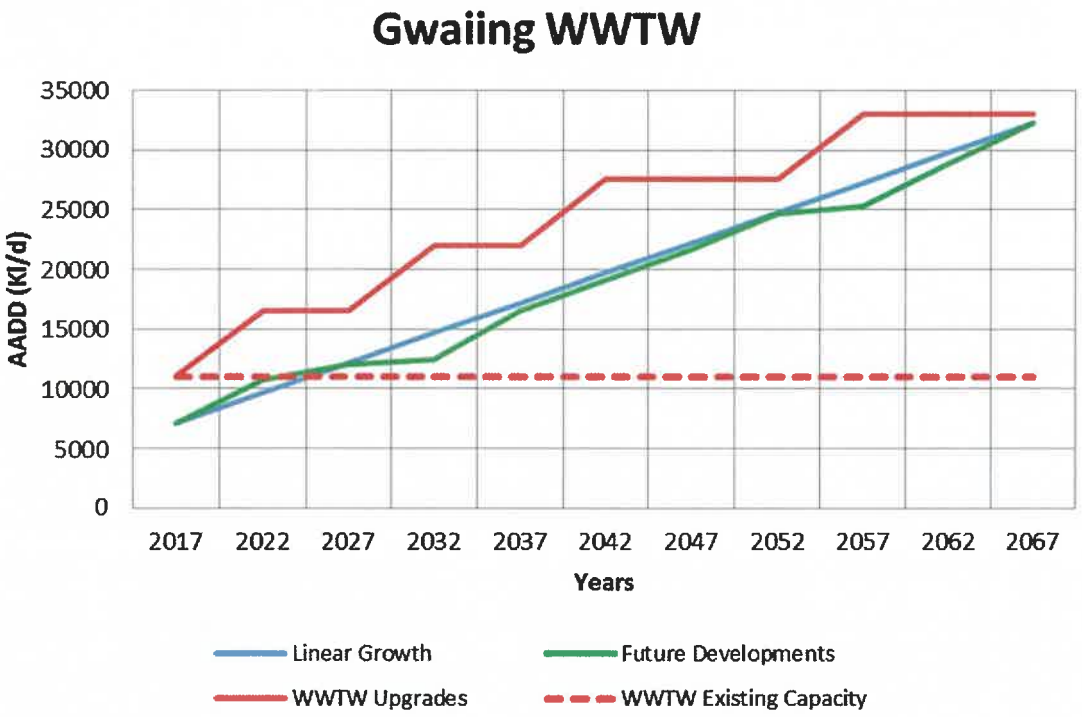
Items required to alleviate existing deficiencies in the bulk sewer system:

- None

Items required to accommodate the proposed development in the future sewer system:

• GW_17.01a	Upgrade existing inlet works, flow diversion (Design Flow = 971 L/s)	R 1 274 000
• GW_17.01b	Upgrade existing inlet works, gravity pipe (Design Flow = 156 L/s)	R 139 000
• GW_17.01c	Upgrade existing WWTW, phase 1 of 4 (Design Flow = 5 500 kL/d)	R 94 444 700

The following graph shows the Design Capacity of the Gwaiing WWTW, the Average Flow, and Predicted Flow based on the phasing of Future Developments and Linear Growth.



2.3.2 *Sewer Reticulation Items*

The proposed connection points (A & B) to the existing sewer system are shown in Figure 2 (Sewer).

Items required to alleviate existing deficiencies in the existing sewer system:

•	GW_09.06	Upgrade existing 936m x 150mmØ to 250mmØ (Design Flow = 29 L/s)	R 2 320 900 #
•	GW_V07.06	Investigate existing 300mmØ pipe slope (full flow velocity < 0.6 m/s)	R 2 300
•	GW_09.05	Investigate existing 300mmØ pipe slope (full flow velocity < 0.6 m/s)	R 2 300 #
•	GW_09.09	Upgrade existing 107m x 400mmØ to 525mmØ (Design Flow = 87 L/s)	R 627 200 #
•	GW_09.10	Upgrade existing 19m x 400mmØ to 525mmØ (Design Flow = 100 L/s)	R 254 500 #

Note: # - In the master plan an investigation of this pipe is proposed implying that not all information on slopes, inverts etc. was available. The pipe should therefore first be investigated through field inspections and surveys to verify that upgrading is in fact required.

•	GW_11.01	Downsize* existing Rooirivier PS from 215 L/s to 104 L/s	R 697 100

*Note: * - Required only if overflow problems occurs during peak flow conditions downstream of the PS.*

Items required to accommodate the proposed development in the existing sewer system:

- None

Items required to accommodate the proposed development in the future sewer system:

- None

The above Design Flows (or IPWWF) and thus pipe sizes were calculated taking cognizance of future developments upstream of the proposed development. As the Design Flow already accommodates stormwater ingress, the pipes can be designed to flow 100% full with the Design Flows provided above.

2.4 Adjustments to the Master Plan

No adjustments to the sewer master plan are required due to the increased PDDWF of the proposed development.

Yours sincerely,

Per: Dr BF Loubser
GLS Consulting

(Report done by: Jurie van der Merwe)

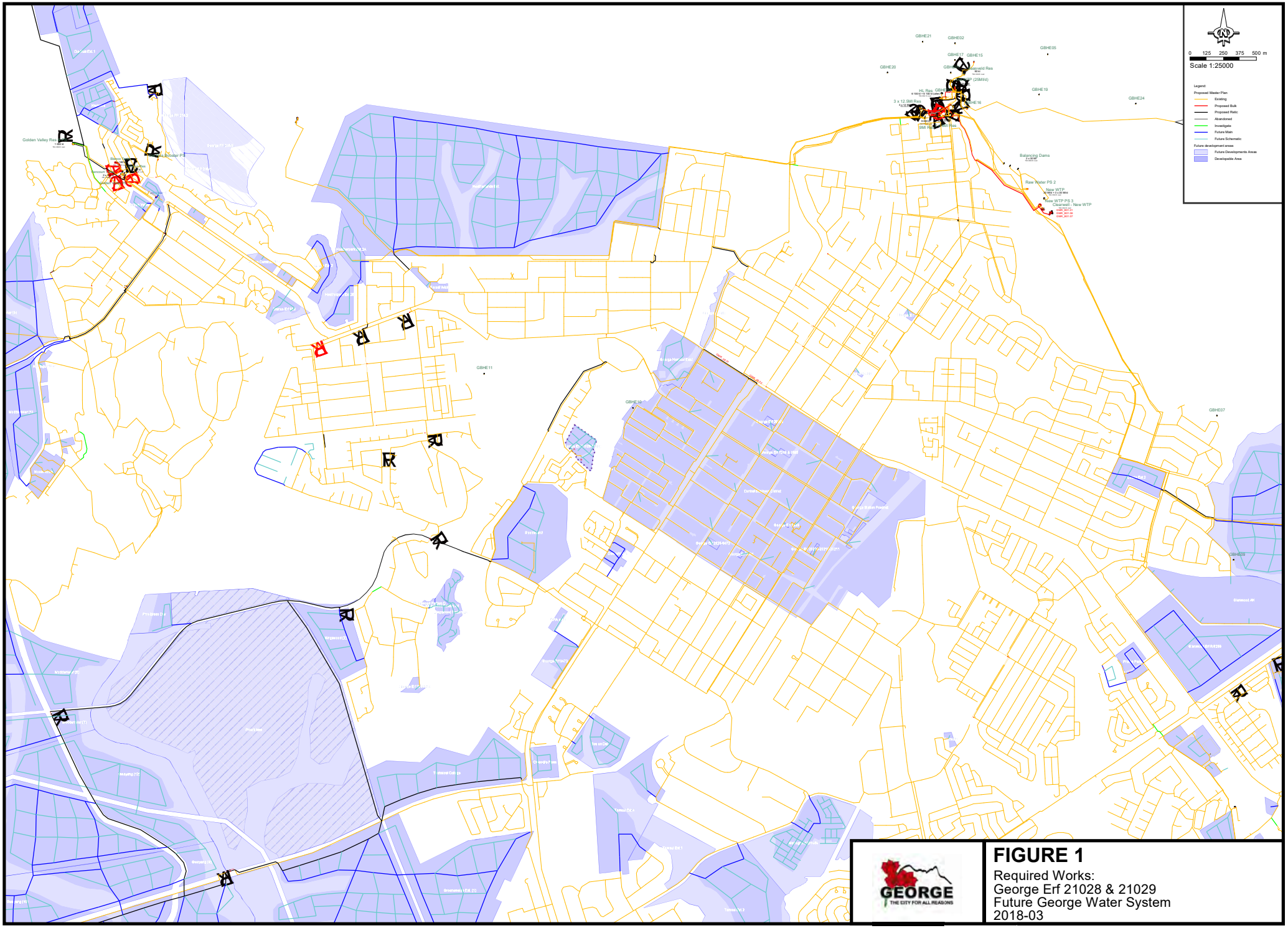
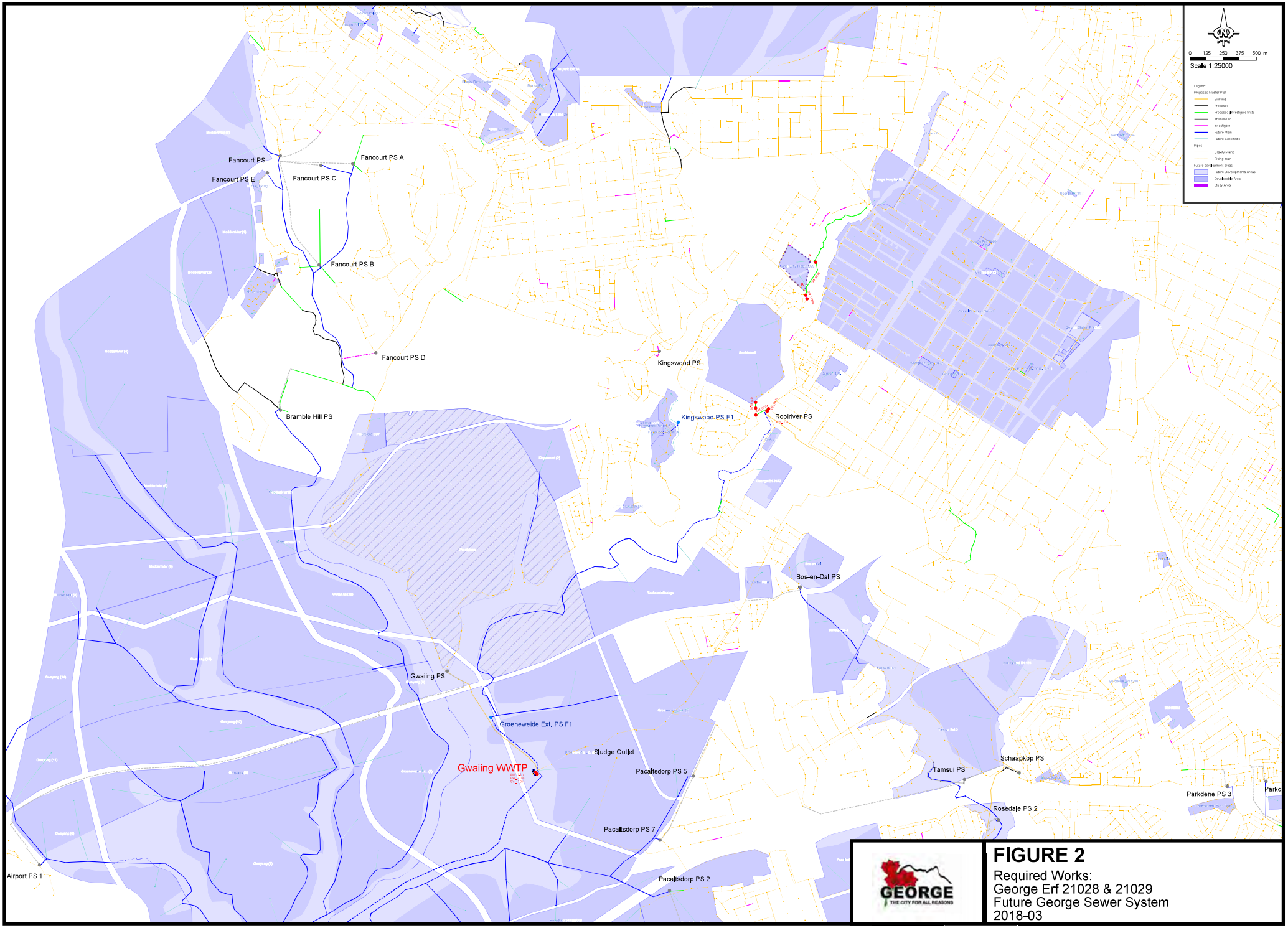


FIGURE 1

Required Works:
George Erf 21028 & 21029
Future George Water System
2018-03



GEORGE
THE CITY FOR ALL REASONS

FIGURE 2

Required Works:
George Erf 21028 & 21029
Future George Sewer System
2018-03