

1 July 2025

**The Project Manager**

c/o Zutari  
**GEORGE**  
6529

**Attention: Mr Rudolf Schröder**

Dear Sir,

**DEVELOPMENT OF A PORTION OF THE REMAINDER OF ERVEN 464 GEORGE, 324 AND 2819 PACALTSDORP (GWAYANG DEVELOPMENT SITE): CIVIL ENGINEERING SERVICES REPORT\_REV 01**

Below please find the Engineering Services Report for the proposed development of the Gwayang Development Site (portion of the Remainder of Erven 464 George, 324 and 2819 Pacaltsdorp), in George, Western Cape. This report is based on the latest preliminary town planning layout. Refer to enclosed Drawing: Gwayang Industrial Development, Sub-divisional Layout and Zoning, dated 19 March 2025 Rev D.

1. **INTRODUCTION**

1.1 **Brief**

As per Figure 1: Locality Map below, the preliminary project proposal is to prepare the entire property for full development of the site, in a phased manner, to include the following components:

- a) A municipal utility area component (Wastewater Treatment);
- b) An industry and service trade precinct;
- c) An industrial component;
- d) A residential area including various typologies and urban-living supportive uses;
- e) A continuous and sustainable conservation/open space system which ties into a sustainable urban drainage system (SUDS);
- f) A tourism/trade corridor area and urban gateway uses; and
- g) Possible Energy projects.

The ultimate intent of the Municipality is to create fully serviced erven for sale, if required, to support an integrated mixed-use development: the aim being optimal use of the land, within the strategic site context.

Ideally, the existing bulk civil infrastructure will be utilized to accommodate the proposed development, herein referred to as the Gwayang Development site. All future reticulation will conform to George Municipal Standards.

## 1.2 General

The proposed development area is located within the urban area of George, situated to the south and east of Groeneweide Park residential area and the George Show Grounds and to the west of the Tamsui Industrial area. The site is restricted to the North by the R102 (Airport Road), and to the South by the N2 National Road. The western side of the site encompasses the Gwayang Wastewater Treatment Works (WWTW) and shooting range. The remaining area of the site is generally vacant and used for cattle grazing.



Figure 1: Locality Map

The projected land use for the proposed development is as follows:

Land Use Description	Zoning - George Integrated Zoning Scheme By-Law	Units	Stands	Area (ha)	% of units
Group Housing	General Residential Zone II Group Housing	136	4	3.89	6.9%
Apartment Housing	General Residential Zone IV Flats/Apartments	1832	7	9.16	93.1%
Industry and Service Trade	Industrial Zone I	n/a	29	20.28	n/a
Industry	Industrial Zone II & III	n/a	21	30.57	n/a
Mixed Use / Business / Retail	Business Zone I	n/a	11	20.65	n/a
Public facilities (Creche's & religious centre)	Community Zone I & II	n/a	1	0.27	n/a
Municipal – Wastewater Treatment	Utility Zone	n/a	2	6.25	n/a
Private Open Space	Open Space Zone II	n/a	1	0.68	n/a
Open / conservation areas etc.	Open Space Zone I	n/a	15	57.62	n/a
Planned roads	Transport Zone II	n/a	1	31.05	n/a
<b>Total number of units/stands</b>		<b>1968</b>	<b>92</b>	<b>180.4</b>	<b>100%</b>

In order to implement the proposed development in a practical and more affordable manner, it was considered to follow a phasing approach to all infrastructure required. The proposed land use phasing is shown in the figure below, based on the preferred town planning layout.

The Traffic Analysis conducted by Techso (Pty) Ltd proposed the following initial phasing for consideration. In order to standardize, a comparable phasing will be adopted for Civil Engineering Services. Figure 2 below indicates the erven anticipated to be developed during Phases 1-3.



Figure 2: Proposed phasing for initial development

## 2. **BULK WATER SUPPLY SYSTEM**

### 2.1 **Proposed Water Demand for the Development**

The availability of network capacity in the vicinity of the site was investigated by GLS Consulting (GLS), previously appointed by George Municipality to compose a 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. GLS's Water Master Plan with reference m2022-12 made provision for water demand of 2,143 kl/day. This Master Plan has been updated (m2023-03) to include the proposed development. The updated water demand is 2,363 kl/day.

George Municipality indicated that a bulk water distribution line ('Airport Main line') with diameter between 160mm and 200mm, is positioned on the Northern border of the Gwayang Site, i.e. along the R102/ Hope Street. The current pipeline is an asbestos cement pipe, which will be upgraded to a 400 mm diameter PVC-O Class 12 and 16 pipeline, scheduled for implementation in the 2023/2024 and 2024/2025 financial years. Phase 1 (incorporating the Gwayang development) was scheduled for completion by June 2024. The pipeline will have sufficient capacity for the development in its entirety once the upgraded Phase 1 portion of the pipeline is commissioned. This pipeline will be the main water supply to the proposed development.

According to Table J.2 – J.4 for Calculating the Annual Average Daily Demand (AADD) from "The Neighbourhood Planning and Design Guide", the following calculation was done to determine the AADD for the various Land Uses:

The water use for the applicable areas of the proposed development is as follows:

<b>Description / Land Use</b>	<b>Calculations</b>	<b>AADD</b>
Group Housing	136no. x 0.5 kl/unit/day	68 kl/day
Apartment Housing	1832 no. x 0.3 kl/day	549.60 kl/day
Light Industrial	20.28 ha x 13 kl/ha/day	263.64 kl/day
Heavy Industrial	30.57 ha x 13 kl/ha/day	397.41 kl/day
Mixed Use / Business / Retail	20.65ha x 21 kl/ha/day	433.65 kl/day
Public facilities (Creche's & religious centre)	0.27 ha x 12 kl/ha/day	3.19 kl/day
Private Open Space	0.68 ha x 12 kl/ha/day	8.14 kl/day
Municipal	6.25 ha x 20 kl/ha/day	125 kl/day
Open / conservation areas etc.	N/A	-
<b>TOTAL AADD (kl/day)</b>		<b>1,848.64 kl/day</b>
<b>TOTAL AADD (ℓ/day)</b>		<b>1, 848,636.40 ℓ/day</b>

This development is classified as medium to high density Residential (Low-Income Housing) with a component of Business/ Commercial, Industrial as well as a variety of public facilities. According to Table J.9, the Total Peak Hour Demand is calculated as follows, based on the revised land use tables:

$$\begin{aligned}
 \text{Total Peak Hour Demand} &= [(617.60 \text{ kℓ/d} \times 4.6) + (1,094.70 \text{ ℓ/d} \times 3.3) + (3.19 \times 1)] \\
 &\quad \div (60 \times 60 \times 24) \\
 &= 0.07473 \text{ kℓ/s} \\
 &= 74.73 \text{ ℓ/s}
 \end{aligned}$$

Fire flow:

Such a development would fall into the moderate risk 1 – Industrial, business, high-rise flats  $\geq$  four storeys category according to Table J.17 – J.18 and as such, the following would apply:

- 50 ℓ/second total fire flow;
- 25 ℓ/second minimum flow at one hydrant;
- 15 m pressure at fire node;
- 5 m pressure at the rest of the system; and
- 4-hour design fire flow

## 2.2 Proposed Services

George Municipality requested GLS to determine whether the existing water system has sufficient capacity to accommodate the proposed development. Feedback received from GLS and George Municipality indicated that upgrading of existing infrastructure as well as the construction of new supporting bulk infrastructure must be constructed, and existing infrastructure upgraded and/or abandoned where necessary to accommodate the services demand of all new developments in George, including the proposed development.

Both the Old and New Water Treatment Works are currently operating under constraint. A 20Ml/day capacity upgrade of the new treatment works was completion earlier in 2025. The water treatment works, after commissioning of the 20Ml/day capacity, will have sufficient capacity for the development in its entirety.

A water reticulation system exists within the adjacent neighbourhoods to which the proposed development could connect (see enclosed GLS Water Master plan). A system of reservoirs, water pump stations and water mains deliver potable water to developed areas surrounding the proposed development. This development falls within the George main zone. Currently sufficient spare storage capacity exists within the zone.

The demand for fire flow will be addressed as part of the internal network design.

## 2.3 Water-use strategy

In terms of the light- and heavy industries allowed for in the development, it is proposed that a supplementary water source in the form of a dedicated pipeline of greywater, or inferior effluent, be employed as part of the water supply for non-potable uses. This will also entail a direct line from the Wastewater Treatment Works for a take-off point. It is proposed that each of these properties will have two water connections, i.e. one connection to the potable water network and the other to the re-used water source.

Greywater is a convenient alternative water source to potable water in instances where the reduced water quality can be tolerated, as in the instance of some parts of this development. It will further result in the potable water demand being subsequently less.

### 3. **BULK SEWAGE SYSTEM**

#### 3.1 **Wastewater Treatment Works**

The proposed development is located within the existing Gwayang Wastewater Treatment Works Main Outfall drainage area. Thus, effluent generated from the site will drain directly towards the existing Gwayang Wastewater Treatment Works (WWTW) and joins the Groeneweide Ext. Pumpstation F3, in the interim, and future Groeneweide Est. Pumpstation F1, as indicated on GLS's Updated Sewer System Layout (dated March 2023) attached.

Wastewater generated from the proposed development will gravitate into the existing system and be conveyed by means of gravity sewer lines into the existing systems to the Gwayang Wastewater Treatment Works, where it will be treated.

Feedback received from GLS and George Municipality indicated that the Gwayang Wastewater Treatment Works is currently operating under constraint and has insufficient capacity to support the development.

#### 3.2 **Wastewater Reticulation System**

A wastewater reticulation system exists within the boundaries of the proposed development. It is proposed that the development will drain to the Gwayang Wastewater Treatment Works where it will be treated as can be seen on GLS Sewer Master plan.

#### 3.3 **Wastewater Flow Demand**

Calculations are based on "The Neighbourhood Planning and Design Guide", including inputs from GLS Consulting.

- 3.3.1 According to Table K4 from "The Neighbourhood Planning and Design Guide", for Calculating the expected average daily wastewater flow per dwelling unit is as follows:

<b>Description / Land Use</b>	<b>Sewer ration (% AADD)</b>	<b>kℓ/day</b>
Group Housing	90%	61.20
Apartment Housing	98%	538.31
Light Industrial	80%	210.91
Heavy Industrial	80%	317.93
Mixed Use / Business / Retail	70%	303.56
Public facilities (Creche's & religious centre)	65%	2.08
Private Open Space		
Municipal		
Open / conservation areas etc.		
<b>TOTAL ADWF (kℓ/d)</b>		<b>1,434.279</b>

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

$$\text{ADWF} = 1,434.279 \text{ kℓ/d}$$

- 3.3.2 The proposed development is classified as medium to high density Residential (Low-Income Housing) with a component of Business/ Commercial, Industrial as well as a variety of public facilities, according to Table K8. The average Peak Factor to be used is 2,5. Calculations are based on the revised land use tables

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

$$\begin{aligned} Q &= 1,434.279 \times 2.5 \\ &= 3,585.70 \text{ k}\ell/\text{d} \\ \text{PDWF} &= 41.501 \text{ }\ell/\text{s} \end{aligned}$$

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:

$$\begin{aligned} Q &= 41.501 \times 1.15 \\ \text{PWWF} &= 47.726 \text{ }\ell/\text{s} \end{aligned}$$

### 3.4.1 Proposed Services

The proposed development falls within the Gwayang Wastewater Treatment Works' (WWTW) drainage area and will drain to the WWTW through the existing gravity sewer network where it will be treated. As mentioned before, feedback received from GLS and George Municipality indicated that the Gwayang Wastewater Treatment Works is currently operating under constraint and has insufficient capacity to support the development. The upgrading of existing infrastructure as well as the construction of new supporting bulk infrastructure would be required to accommodate the proposed development.

A 10MI/day capacity upgrade of the Gwayang Wastewater Treatment is currently within the planning phase. The timeframe for the upgrade of the facility to support the development is currently unknown. Furthermore, the capacity upgrade is dependent on the availability of capital funding.

The following upgrades to pump stations will be required:

- Pacaltsdorp Pump Stations 2, 5 and 7: The sanitation masterplan has earmarked the pump stations for abandonment to drain via a new gravity sewer system to the Gwayang WWTW.
- New gravity sewer mains will have to implemented in order to drain the portions situated on the southeastern boundary of the development which will also include the flow from these pump stations.
- Groeneweide Ext PS F1: The northern part of the development can drain via gravity to a new sewer pump station Groeneweide Ext PS F1, and pump via a new rising main to the existing Gwayang WWTW.
- Groeneweide Ext PS F3: The new gravity sewers collecting sewage from the abandoned Pacaltsdorp sanitation pump stations 2, 5 and 7 as well as the remainder of the development will drain via gravity to the future Groeneweide Ext PS F3, and pump via the future rising main to the existing Gwayang WWTW.

Furthermore, provision must be made for the future rerouting of an existing sludge-handling pipeline connecting the Outeniqua WWTW and the Gwayang WWTW. To this end, provision is to be made for a pipeline that may possibly run from the west, at the outlet of Gwayang WWTW, to the east, where it will connect to the Pacaltsdorp Pumpstation. This pipeline is however not planned for implementation by the George Municipality in the foreseeable future. The existing sludge-handling pipeline fed the area where the Gwayang Development is

currently planned. It is believed that the effluent was used for irrigation purposes in that area in the past.

George Municipality indicated that the existing municipal sanitation infrastructure (specifically the treatment works) cannot support the development. Alternative infrastructure will have to be considered if the development is to proceed prior to capacity upgrades.

No alternative exists for the treatment of wastewater from the development or any other development.

Other options could be identified that will require further investigation to determine their viability. Such options are:

- Implementation of an on-site package plant
- Construction of an interim pump station to pump all wastewater to the existing network that can drain to the Outeniqua Wastewater Treatment Works.

All interim infrastructure as well as the required infrastructure described above, will be for the cost of the development.

#### 4. **STORMWATER**

The site has a fairly low slope gradient, increasing towards natural drainage lines, and the in-situ soils have a low permeability. The Geotechnical Investigation indicated that surface water was encountered in some small existing dams and localised depressions across the site. The site also contains several small natural drainage lines.

It is proposed that the stormwater generated upstream of the development be conveyed through the development by means of both an underground system as well as an emergency overland flow system. However, all upstream stormwater generated by the existing developed area will have to be dealt with through the proposed development.

The objective is to disperse stormwater by applying sustainable urban drainage systems (SUDS), such as detention basins, retention ponds and swales. The topography slopes naturally to the southwestern corner of the site. Possible locations of attenuation ponds will be investigated during the detailed design stages of the project.

Accumulated stormwater will be dispersed by means of energy dissipating structures to minimize the effect of peak runoff downstream. Detention could be required in order to maintain current flow conditions; however, these detention facilities will have to be adequately designed during the detailed design stages of the project. A Stormwater Management Plan will be 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 is currently obtained from the existing access road, intersecting the R102 (Airport Road) via a stop-controlled intersection. Details regarding access have been investigated and discussed in a Traffic Impact Study conducted by Urban Engineering and Techso (Pty) Ltd.

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 1.29 kg/person/day.

The total population of the area has been estimated at 5 905 people, assuming an average of three (3) people per household.

Therefore:            5 905 x 1.29 kg/person/day  
                             = 7 617.45 kg/day  
                             = 7.62 tonnes/day

Volume = 7.62 tons/day x 365  
             = 2 780.37 tonnes/annum

Confirmation will be required by George Municipality whether the existing solid waste site will be able to accommodate the additional solid waste generated by the development.

It must further be noted that provision was not made for waste generated by any of the light and heavy industries, since it is not known what type of waste and waste volumes will be generated. Specific requirements in terms of handling of waste from these users will therefore have to be addressed at a later stage.

7. **FLOODLINES**

None of the industrial and residential properties are affected by Flood lines.

## 8. **GEOTECHNICAL CONDITIONS**

The majority of the site is generally considered suitable for the proposed urban development with some moderate geotechnical constraints expected. Some isolated areas were however found to have problematic ground conditions and would require further investigation. The natural topography will also play a role in the proposed town planning layout. The Geotechnical Investigation by Outeniqua Geotechnical Services, dated 06 June 2022 (Rev 0), indicates the presence of deposits of uncontrolled fill that could also present a hazard and obstacle to development, and these areas should be investigated further.

The Geotechnical Investigation further indicated that in-situ soil obtained from excavations for road box cuts and services trenches is likely to be too fine-grained for use as a natural construction material (compactable fill), and should be stockpiled for non-structural filling purposes, landscaping or general fill over pipe cradles. Clay material should be carted to spoil or used for construction of earth-fill retention ponds, or as directed by the engineer.

The Geotechnical Investigation and Report contains some recommendations for road design in terms of cutting of the roadbed and requirements of compaction. Good site landscaping and a piped underground stormwater management system is recommended for the collection, diversion, control and discharge of stormwater from properties and roads to prevent flooding and ingress into subsoils, which could potentially cause settlement of structures or erosion problems.

In-situ soil obtained from excavations for road box cuts and services trenches is likely to be too fine-grained for use as a natural construction material (compactable fill), and should be stockpiled for non-structural filling purposes, landscaping or general fill over pipe cradles. Clay material should be carted to spoil or used for construction of earth-fill retention ponds, for example.

In terms of foundation design, site testing indicates the presence of potentially problematic soils, possibly resulting in heave and/or settlement, and thus a requirement for improved foundation systems to mitigate movement of structures. The recommended improvements include removal and replacement of in-situ soil below foundations, stiffening of foundation reinforcement, and/or improved site drainage measures, as well as other additional systems. Further investigations may be required during construction.

Some portions of the site are classified as geotechnical Terrain 2 (Site class P), and marred by potentially highly problematic uncontrolled fill material, which is not suitable for development, and will have to either be removed completely or the area abandoned for open space. Further investigations in these areas need to be undertaken to determine the economic feasibility of developing these properties for their intended use.

## 9. **STANDARD OF ENGINEERING SERVICES TO BE PROVIDED**

Levels of services are as follows:

### 9.1 **Sewer**

- Pipe diameter: UPVC Class 34, SANS 791, 160mm diameter solid wall for main lines and 110mm solid wall for individual unit connections where required.
- Prefabricated Fibre cement shafts or concrete manhole rings to be used for manholes.

### 9.2 **Water**

- UPVC Class 9/12 pipes depending on residual pressure.
- Each erf will be serviced with a 20mm diameter connection and a Kamstrip Ultrasonic Smart water meter in a plastic meter box or similar approved meter by the Technical Services Directorate.
- Provision is made for fire hydrants according to design guidelines.
- All fire hydrants shall be 65 mm diameter (internal)
- All fire hydrant outlet shall be of bayonet coupling type.
- All valves shall be AVK type valves – left hand/closing or similar approved.
- Provision is made for a bulk water meter at the connection point.

### 9.3 **Roads and stormwater**

- The access road width will be 6.0m minimum.
- Class 3 and Class 4 roads must be asphalt paved.
- 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 around bell-mouths. Bellmouth's radius minimum 10m. The minimum radius for access roads is 8m.
- All stormwater drains will be provided with a sand trap of at least 300mm.
- Low water drifts to be utilised at natural watercourses to accommodate overland flow.

### 9.4 **Design Criteria and Standards**

#### 9.4.1 Design criteria

The following documents will serve as a base for the detail design criteria and standards:

- The Neighbourhood Planning and Design Guide ("Red Book"); and
- City of Cape Town Management of Urban Stormwater Impacts Policy – Version 1.1, 2009.
- George Municipality Minimum Standards for The Design of Civil Engineering infrastructure.

#### 9.4.2 Construction specifications

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

### 9.4.3 Roads

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

#### 9.4.3.1 *Design Criteria*

The design criterion for roads is as follows:

- Design life – 20 years.
- Subgrade CBR – 15 to 20.
- Subbase CBR – 45minimum (processed crushed stone)
- Base course CBR – 80minimum (processed crushed stone)
- Surfacing – 80mm interlocking concrete paving/ Cape Seal
- Minimum road grade – 0.5 % Longitudinal
- Minimum Crossfall – 2.00 %

### 9.4.4 Stormwater

The following references will be used as a basis for the design of the stormwater network:

Standards and Guidelines for Roads and Stormwater of the City of Cape Town (Version 3, February 2022)

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.

#### 9.4.4.1 *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 2 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 roadways 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.

#### 9.4.4.2 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.

#### 9.4.5 Sewers

The sewer drainage system forms an integral part of the sewage system. The drainage for the site is towards the Gwayang Wastewater Treatment Works through the existing gravity sewer network within the development, as described in Item 3.

##### 9.4.5.1 Minimum design criteria

- A conventional waterborne sewerage system is provided with a single connection. The main sewer line will be constructed within open areas on the site, topography dependent.
- Design parameters : Average daily flow – As calculated  
: Peak factor – As calculated  
: Extraneous flow – 15 %  
: Minimum velocity – 0.7m per second
- Minimum cover to pipes : 0.80m
- Minimum pipe size : 110mm diameter for unit connections  
: 160mm diameter for sewer mains
- Minimum gradients : 110mm diameter unit connection @ 1:60  
: Main lines at 80% capacity as follows:

No. of 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
More than 130	1:200

- Maximum manhole spacing of 80m.

##### 9.4.5.2 Pipelines

- Pipeline material for pipe sizes up to 160mm diameter. UPVC Class 34 complying with SABS.
- Pipes are generally laid on Class C bedding.

##### 9.4.5.3 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 polymer concrete/ precast concrete.

#### 9.4.6 Water

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

##### 9.4.6.1 *Minimum design criteria*

- The Neighbourhood Planning & Design Guide: Section J – Water Supply (Red Book 2019)
  - George Municipality Civil Engineering Services: Civil Engineering Standards & Requirements for Services (Updated January 2009)
- Peak factors for the development calculated in accordance with the “The Neighbourhood Planning and Design Guide: Section J – Water Supply (Red Book 2019)
  - Minimum pressures for the network are calculated for the fire flows of 15ℓ per second and peak demand at the point of lowest pressure under peak flow conditions.
  - Minimum cover to pipe to be 0.8m.
  - Minimum house connection size to be 25mm diameter HDPE.
  - Minimum pipe size to be 75mm diameter uPVC.

##### 9.4.6.2 *Pipeline materials*

- uPVC Class 16 heavy duty pipes complying to SABS 966
- Erf connection – HDPE Class 16 type 5 complying to SABS 533

##### 9.4.6.3 *Isolating Valves*

- 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 splays where applicable and not within the road surface.
- All valves shall be in accordance with SABS 1200 / SABS 664/1974 and approved by the relevant department head.
- Valves shall be clockwise opening / left hand closing.
- Direction of opening to be clearly marked on the valve body or spindle cap.
- All valves shall be heavy duty, class 16.
- All valves shall have non rising spindles.
- All valves shall be fitted with cast iron cap, secured with retaining bolts.
- All valve belltobies shall be polymer concrete as per AV Moulding, concrete, recycled plastic or cast iron depending on area and relevant condition.
- Only valves supplied with minimum thickness of 225 micron Copon EP 2300 epoxy paint allied to all internal surfaces after it has been thoroughly cleaned by grit blasting to SA ½ finished in compliance with the requirements of SIS 05 90 00 or valves with similar approved coatings, will be accepted.
- Isolating valves shall be placed in brick chambers.

#### 9.4.6.4 Fire hydrants

- Fire hydrants are to be spaced at a maximum of 120 m.
- All fire hydrant types shall be in accordance with SABS 1200, comply with the local Fire Department standard regulations, and approved by the relevant department head.
- All fire Hydrants shall be 65 mm diameter (Internal).
- Outlets shall be London round thread with loose cap and securing chain.
- Hydrant spindles shall be provided with cast iron caps, secured with retaining bolts.
- Hydrants shall be clockwise opening / left hand closing.
- Hydrant covers shall be polymer concrete as per AV Moulding, concrete recycled plastic or cast iron depending on area and relevant conditions.
- All hydrants shall be supplied installed complete with flanged CI extension piece complete with cadmium plated nuts and bolts to ensure depth not greater than 400mm.

#### 9.4.6.5 House connections

- House connections shall be installed as indicated on drawing no CES/W3 as part of new developments.
- SABS approved Ball Cocks, Gate valves or Ferrules shall be installed on the main water pipe.
- All cast iron saddles to be wrapped with Denso tape.
- Marker posts shall not be installed as house connections will be swapped from the old reticulation to the new reticulation.

#### 9.4.6.6 Fittings and specials

- Fittings and specials shall be manufactured from SS304L pipe with SS316L flanges with either a FBE coating or two-pack epoxy inside and out for corrosive soil conditions.
- uPVC fittings and specials shall be class 16, fitted with spigot and socket rubber ring joints and shall comply with the relevant requirements of SABS 966.
- Only stainless-steel bolts and nuts to be used on all underground saddles, flanges, short collar couplings, etc.
- All bolts and flanges shall be denso wrapped for corrosion protection.
- All pipe fittings (Valves, Hydrants and scour valve, beds) shall have thrust blocks.
- 90° bends will be avoided as far as possible and a combination of two 45° degree bends will be utilised.

#### 9.4.6.7 Road Crossing and Reinstatement

Road crossings for the main reticulation as well as house connections will be constructed by means of conventional trench excavation. Road crossings will be reinstated with the following layerworks:

- 40 mm Continuously Graded Asphalt
- 150 mm G2 base compacted to 98% MOD AASHTO.
- Subbase in 150 mm layers from top of bedding to underside of base consisting of G5 material compacted to 95% MOD AASHTO.

Directional drilling and/or moling will be considered for the installation of long house connections beneath the road surface as well as the main reticulation. This is proposed to reduce damage to the existing asphalt road surfacing but will be dependent on the prevailing ground conditions.

We trust that sufficient detail has been provided to enable you to decide regarding the way forward. However, should any additional information be required, or if you wish to discuss this recommendation with us, please do not hesitate to contact us.

Yours faithfully

Marilise van Wyk



Signed by: Marilise van Wyk,  
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**M VAN WYK Pr Tech Eng**  
**Senior Technologist**  
**pp Zutari**



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**M BOTHA Pr Tech Eng**  
**Technical Specialist**  
**pp Zutari**

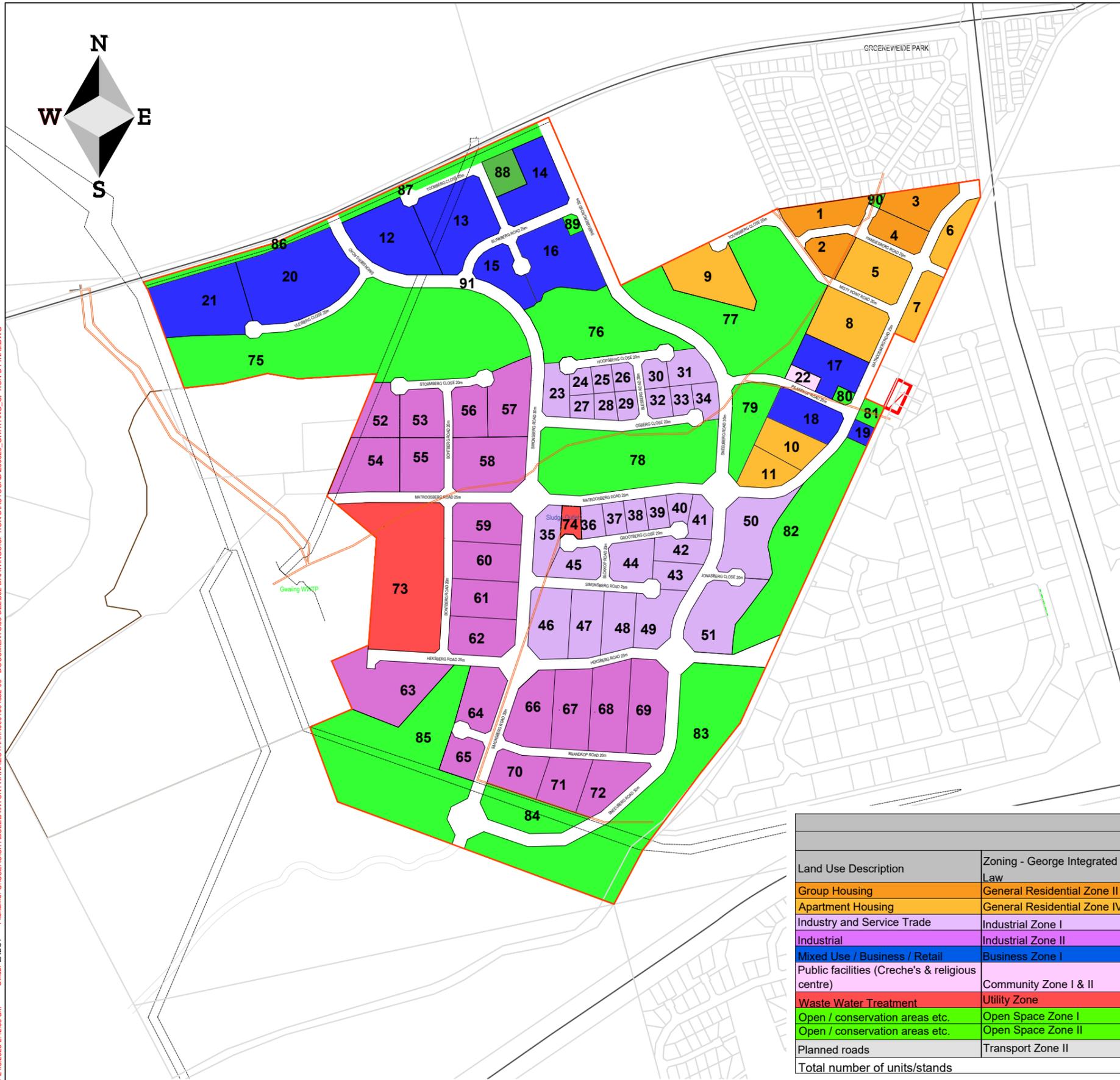
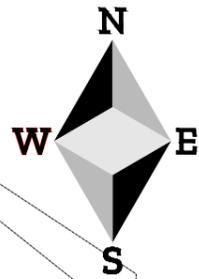
- Encl. *Site Development Plan: Drawing: Gwayang Industrial Development, Sub-divisional Layout and Zoning, dated 19 March 2025 Rev D*
- Letter from George Municipality with Reference Remainder of Erf 464: Proposed Gwayang Development: Availability of Bulk Water and Sewer Infrastructure & Associated Costs and Charges, dated 24 October 2023*
- Extract from GLS Sewer Master Plan: Gwayang drainage area 2023-03*
- Extract from GLS Water Master Plan: Bulk & Retic – George main zone 2023-03*
- Updates to Water and Sewer Master Plans received from GLS, dated 25 July 2023*
- Information on existing services received from George Municipality, Civil Engineering Services*



# ANNEXURES



Plot Date: 24/03/2025 2:42:59 am Office: ZADC1 Filename: C:\USERS\SIYABULELA.NTUNTUNAWA\CTAR\1004332-00 - DOCUMENTS\OPTION D\AU TOCAD\250320\_GWAYANG\_OPTION D FINAL.DWG

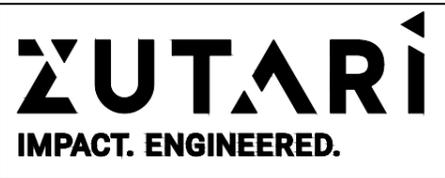


NOTATION	ERF NUMBER	ERF AREA sqm	ZONING (GEORGE INTEGRATED ZONING SCHEME)	NOTATION	ERF NUMBER	ERF AREA sqm	ZONING (GEORGE INTEGRATED ZONING SCHEME)
	1	11542 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		47	11783 sqm	INDUSTRIAL ZONE I
	2	7515 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		48	10281 sqm	INDUSTRIAL ZONE I
	3	11678 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		49	11593 sqm	INDUSTRIAL ZONE I
	4	8164 sqm	GENERAL RESIDENTIAL ZONE II GROUP HOUSING		50	21592 sqm	INDUSTRIAL ZONE I
	5	16372 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		51	20313 sqm	INDUSTRIAL ZONE I
	6	7600 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		52	10624 sqm	INDUSTRIAL ZONE II
	7	8249 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		53	11284 sqm	INDUSTRIAL ZONE II
	8	19860sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		54	17706 sqm	INDUSTRIAL ZONE II
	9	20122 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		55	12948 sqm	INDUSTRIAL ZONE II
	10	10621 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		56	9617 sqm	INDUSTRIAL ZONE II
	11	8716 sqm	GENERAL RESIDENTIAL ZONE IV FLATS/APARTMENT		57	16052 sqm	INDUSTRIAL ZONE II
	12	25103 sqm	BUSINESS ZONE 1		58	21173 sqm	INDUSTRIAL ZONE II
	13	27411 sqm	BUSINESS ZONE 1		59	14515 sqm	INDUSTRIAL ZONE II
	14	18839 sqm	BUSINESS ZONE 1		60	13623 sqm	INDUSTRIAL ZONE II
	15	10660 sqm	BUSINESS ZONE 1		61	13424 sqm	INDUSTRIAL ZONE II
	16	23893 sqm	BUSINESS ZONE 1		62	13148 sqm	INDUSTRIAL ZONE II
	17	14289 sqm	BUSINESS ZONE 1		63	27850 sqm	INDUSTRIAL ZONE II
	18	12839 sqm	BUSINESS ZONE 1		64	12607 sqm	INDUSTRIAL ZONE II
	19	2303 sqm	BUSINESS ZONE 1		65	7602 sqm	INDUSTRIAL ZONE II
	20	41165 sqm	BUSINESS ZONE 1		66	15785 sqm	INDUSTRIAL ZONE II
	21	30024 sqm	BUSINESS ZONE 1		67	16307 sqm	INDUSTRIAL ZONE II
	22	2662 sqm	COMMUNITY ZONE I & II		68	18083 sqm	INDUSTRIAL ZONE II
	23	7018 sqm	INDUSTRIAL ZONE I		69	18523 sqm	INDUSTRIAL ZONE II
	24	3116 sqm	INDUSTRIAL ZONE I		70	10894 sqm	INDUSTRIAL ZONE II
	25	3055 sqm	INDUSTRIAL ZONE I		71	11340 sqm	INDUSTRIAL ZONE II
	26	3226 sqm	INDUSTRIAL ZONE I		72	12610 sqm	INDUSTRIAL ZONE II
	27	3081 sqm	INDUSTRIAL ZONE I		73	59303 sqm	UTILITY ZONE
	28	3254 sqm	INDUSTRIAL ZONE I		74	3185 sqm	UTILITY ZONE
	29	3324 sqm	INDUSTRIAL ZONE I		75	125785 sqm	OPEN SPACE ZONE I
	30	3779 sqm	INDUSTRIAL ZONE I		76	39500 sqm	OPEN SPACE ZONE I
	31	7328 sqm	INDUSTRIAL ZONE I		77	75277 sqm	OPEN SPACE ZONE I
	32	4018 sqm	INDUSTRIAL ZONE I		78	58197 sqm	OPEN SPACE ZONE I
	33	3302 sqm	INDUSTRIAL ZONE I		79	15173 sqm	OPEN SPACE ZONE I
	34	4607 sqm	INDUSTRIAL ZONE I		80	1434 sqm	OPEN SPACE ZONE I
	35	8615 sqm	INDUSTRIAL ZONE I		81	2736 sqm	OPEN SPACE ZONE I
	36	4024 sqm	INDUSTRIAL ZONE I		82	48910 sqm	OPEN SPACE ZONE I
	37	3750 sqm	INDUSTRIAL ZONE I		83	88098 sqm	OPEN SPACE ZONE I
	38	3750 sqm	INDUSTRIAL ZONE I		84	16180 sqm	OPEN SPACE ZONE I
	39	3750 sqm	INDUSTRIAL ZONE I		85	81505 sqm	OPEN SPACE ZONE I
	40	3529 sqm	INDUSTRIAL ZONE I		86	7578 sqm	OPEN SPACE ZONE I
	41	5150 sqm	INDUSTRIAL ZONE I		87	13576 sqm	OPEN SPACE ZONE I
	42	7186 sqm	INDUSTRIAL ZONE I		88	6786 sqm	OPEN SPACE ZONE II
	43	6064 sqm	INDUSTRIAL ZONE I		89	1421 sqm	OPEN SPACE ZONE I
	44	9487 sqm	INDUSTRIAL ZONE I		90	816 sqm	OPEN SPACE ZONE I
	45	7751 sqm	INDUSTRIAL ZONE I		91	319202 sqm	TRANSPORT ZONE II
	46	15118 sqm	INDUSTRIAL ZONE I				

The Orange dashed line represents a 3m wide servitude along the existing sewer line over ERF 1, 2, 8, 18, 34, 35, 45, 46, 58, 73, 74, 77, 78, 79, 80, 81, 84, 90 and 91

The Black dashed line represents a 20m wide existing electrical servitude line over ERF 7, 11, 16, 19, 23, 27, 32, 36, 41, 42, 47, 53, 55, 61, 68, 72, 76, 82, 88 and 93

Gwayang Development - George										
Projected Land Use										
Land Use Description	Zoning - George Integrated Zoning Scheme By-Law	Units	Stands	Density	Stand Size (average)	Area (ha)	FAR	GLA (m2)	% of total area	% of units
Group Housing	General Residential Zone II Group Housing	136	4	35	285	3.89	na	na	2%	6.9%
Apartment Housing	General Residential Zone IV Flats/Apartments	1832	7	200	1.3	9.16	1.0	91536	5%	93.1%
Industry and Service Trade	Industrial Zone I	na	29	na	0.8	20.28	0.8	162277	11%	na
Industrial	Industrial Zone II	na	21	na	1.5	30.57	0.8	244572	17%	na
Mixed Use / Business / Retail	Business Zone I	na	11	na	4	20.65	1.5	309786	11.4%	na
Public facilities (Creche's & religious centre)	Community Zone I & II	na	1	na	0.27	0.27	1.0	2662	0%	na
Waste Water Treatment	Utility Zone	na	2	na	na	6.25	na	na	3.4%	na
Open / conservation areas etc.	Open Space Zone I	na	15	na	na	57.62	na	na	31.8%	na
Open / conservation areas etc.	Open Space Zone II	na	1	na	1.0	0.68	na	na	0.4%	na
Planned roads	Transport Zone II	na	1	na	na	31.92	na	na	17.6%	na
Total number of units/stands		1968	92			181.3			100%	100%



CLIENT	
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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

REV	DATE	REVISION DETAILS	APPROVED
A	13-02-2025		R Shroder
B	14-02-2025		R Shroder
C	25-02-2025		R Shroder
D	19-03-2025		

SCALE	AS SHOWN
SIZE	A3
DRAWN	A Florence-Brander
DESIGNED	A Florence-Brander
REVIEWED	R Schroder

PRELIMINARY  
NOT FOR CONSTRUCTION

APPROVED

DATE

PROJECT	Gwayang Industrial Development				
TITLE	Sub-divisonal Layout and Zoning				
DRAWING No.	PROJECT No.	WBS	TYPE	DISC	NUMBER
1004332	1004332	0000	DRG	UD	000
					REV
					C

Reference number: Erf RE 464 (Gwayang)  
Date: 24 October 2023

Enquiries: M Geyer  
044 801 9268

**ATTENTION: MRS M VAN WYK**

**ZUTARI (Pty) Ltd**  
**PO BOX 509**  
**George**  
**6530**

## **REMAINDER OF ERF 464: PROPOSED GWAYANG DEVELOPMENT**

### **AVAILABILITY OF BULK WATER AND SEWER INFRASTRUCTURE & ASSOCIATED COSTS AND CHARGES**

The accommodation of the proposed development in the George Municipal water and sanitation system refers.

The Civil Engineering Services (CES) Directorate confirms that the proposed development was taken into consideration in the current and future water and sanitation master plans as part of the George Municipal development area.

Upon conclusion of the above, the appointed master planning consultant, GLS, provided the required technical detail to confirm the water and sanitation system upgrades required and associated estimated costs to support the proposed development.

#### **1. PROPOSED DEVELOPMENT**

The proposed implementation plan of the development is included in Annexure A.

#### **2. WATER AND SANITATION BULK INFRASTRUCTURE CAPACITY**

In line with general growth and demand, new supporting bulk infrastructure must be constructed, and existing infrastructure upgraded and/or abandoned where necessary to accommodate the services demand of all new developments in George.

The capacity of the treatment works, and bulk infrastructure is discussed below.

##### **2.1. TREATMENT CAPACITY**

###### **a) Water Treatment:**

- The Water Treatment Works (old and new) is currently operating under constraint.
- A 20MI/day capacity upgrade of the new treatment works is in progress with an estimated completion date of during January/February 2025.
- After commissioning the treatment works, at the time, will have sufficient capacity for the development in its entirety once the 20MI/day capacity upgrade is commissioned.

###### **b) Wastewater Treatment:**

- The Gwaing Wastewater Treatment works has insufficient capacity to support the development.

- A 10Ml/day capacity upgrade is currently within the planning phase. The timeframe for the upgrade of the facility to support the development is currently unknown. Furthermore, the capacity upgrade is dependent on the availability of capital funding.

## 2.2. BULK PIPELINES AND PUMP STATIONS

### a) Water

- George Main Zone – reservoirs: The development falls within the George main zone. Currently sufficient spare storage capacity exists within the zone.
- Airport mainline: The upgrade of the Airport mainline is scheduled for implementation in the 2023/24 and 2024/25 financial year. Phase 1 (incorporating the Gwayang development) is scheduled for completion by June 2024. The pipeline will have sufficient capacity for the development in its entirety once the upgraded phase 1 portion of the pipeline is commissioned.

### b) Sanitation

#### Pacaltsdorp Pump Stations 2, 5 and 7:

- The sanitation masterplan has earmarked the pump stations for abandonment to drain via a new gravity sewer system to the Gwaing WWTW.
- New gravity sewer mains will have to be implemented in order to drain the portions situated on the southeastern boundary of the development which will also include the flow from these pump stations.

#### Groeneweide Ext PS F1:

- The northern part of the development can drain via gravity to a new sewer pump station Groeneweide Ext PS F1, and pump via a new rising main to the existing Gwaing WWTW.

#### Groeneweide Ext PS F3:

- The new gravity sewers collecting sewage from the abandoned Pacaltsdorp sanitation pump stations 2, 5 and 7 as well as the remainder of the development will drain via gravity to the future Groeneweide Ext PS F3, and pump via the future rising main to the existing Gwaing WWTW.

The existing municipal sanitation infrastructure (specifically the treatment works) cannot support the development. Alternative infrastructure will have to be considered if the development is to proceed prior to capacity upgrades.

## 3. ALTERNATIVE SANITATION BULK INFRASTRUCTURE CAPACITY

No alternative exists for the treatment of wastewater from the development or any other development.

Other options could be identified that will require further investigation to determine their viability.

Such options are:

- Implementation of an on-site package plant
- Construction of an interim pump station to pump all wastewater to the existing network that can drain to the Outeniqua WWTW's. Note that interim infrastructure as well as the infrastructure described in section 2.2b) will be for the cost of the development.

## 4. COST

The estimated pro-rata (excluding VAT) cost for water and sanitation infrastructure upgrades in support of the development amounts to:

- Water : R 50 791 000.00
- Sanitation : R 39 742 000.00
- **Total** : **R 90 533 000.00**

A breakdown of the cost indicated above are included in table 1 below for ease of reference.



**Table 1: Estimate pro-rata cost breakdown**

Description	GLS Table reference	Water (Excluding VAT)	Sanitation (Excluding VAT)
General items required	1 & 2	R 36 942 000.00	R 24 725 000.00
Development specific items required	1 & 2	R 13 849 000.00	R 15 017 000.00
<b>Total</b>		<b>R 50 791 000.00</b>	<b>R 39 742 000.00</b>

It should be noted that the unit cost for the water and sanitation infrastructure included in the water and sanitation master plan is under review. The cost and pro-rata cost indicated by GLS and captured in this memorandum is therefore subject to change and is furthermore subject to change based on actual construction cost.

Refer to annexure B for the associated water and sanitation costs.

## 5. BULK INFRASTRUCTURE IMPLEMENTATION

The developing Directorate will be required to perform the necessary project management services from commencement to close out for implementation of the bulk, link and internal infrastructure, excluding treatment works upgrades. The Directorate shall ensure sufficient capital budget is in place for the appointment of all consultants and specialists for the full project life cycle, the appointment of contractors and the associated construction costs.

The deliverables per stage shall be submitted to the Civil Engineering Services Directorate for approval and who shall be invited to attend all construction progress meetings.

## 6. DEVELOPMENT CHARGES

The current total development charges (DC's) relating to Civil Engineering Services (roads, water, and sanitation services only), and in accordance with the current guidelines, for the development as currently proposed were calculated on 24 October 2023 and amount to R 240 093 482.44 excluding VAT. This amount includes water, sanitation, and road development contributions and will also be adjusted according to the final approved land uses per individual erf.

The Developer is reminded of the following Clause relating to the calculation of development charges:

*“Any amendments or additions to the proposed development which is not contained within the calculation sheet as stated in clause 2 above which might lead to an increase in the proportional contribution to municipal public expenditure, will result in the recalculation of the development chargers and the amendment of these conditions of approval or the imposition of other relevant conditions of approval.”*

In addition, the development charges amount is subject to amendment based on annual escalation and applicable at the time that development contributions are due for payment. The Council has an approved Development Contributions Policy and guidelines for the calculation of DC's.

The CES Directorate notes that authority by Council is required to waive DC's for the proposed development. The Directorate: Human Settlements, Planning and Development and Investment Property Management will be required to prepare an item to obtain the necessary authorization from Council to waive any DC's, and the source of funding from municipal own financial resources will have to be identified at the same time.

## 7. COMMENCEMENT OF DEVELOPMENT

The development, in its entirety or in phases, is subject to confirmation by the Director: Civil Engineering Services regarding the availability of water supply & treatment capacity and sanitation bulk conveyance & treatment capacity at the time of the development implementation, or if developed in phases before the commencement of each phase.

A development/implementation program is to be provided by the Developer when requesting confirmation of the capacity from the Director: Civil Engineering Services. If the Developer does not adhere to the program provided and approved by the Director: Civil Engineering Services, the Director: Civil Engineering Services will be entitled to revise the availability of such bulk capacity.



No development may connect to the municipal water and sewer system unless the required bulk and link infrastructure is available, and a services agreement (if applicable) is signed between the Developer and the Municipality.

Yours faithfully,



**LIONEL DANIELS**

**ACTING DIRECTOR: CIVIL ENGINEERING SERVICES**

**ANNEXURES**

- A Proposed development layout
- B Water and Sewer masterplan items tables
- C Water and sewer masterplan items figures
- D Land use water and sanitation demand table



**Table 1: Sewer MP Items**

Item No	MP Type	Description	Existing Diam (mm)	New Diam (mm)	Length (m)	Design Flow	Cost	Pro-rata Cost
GW_17.00	MP	Upgrade existing Treatment Plant: Gwaiing WWTW	-	-	-	3.5 ML/d	R 93 851 000	R 20 999 000 22.37%
GW_17.01a	MP	Upgrade existing Flow Diversion	█	█	█	845.9 L/s	R 690 000	R 155 000 22.37%
GW_17.01b	MP	New Gravity	█	315	21	101.6 L/s	R 147 000	R 33 000 22.37%
GW_17.01c	MP	New Treatment Plant: Gwaiing WWTW	█	█	█	4.2 ML/d	R 109 666 000	R 24 537 000 22.37%
GW_39.01	MPa	Abandon existing Pump Station: Pacaltsdorp PS 5	-	-	-	- L/s	R 284 000	R - 0.00%
GW_39.02	MPa	Abandon existing Rising	150	200	434	- L/s	R 10 000	R - 0.00%
GW_39.03	MPa	Abandon existing Gravity	150	160	6	- L/s	R 10 000	R - 0.00%
GW_F17.01	FM	New Flow Diversion	-	-	-	1.4 L/s	R -	R - 0.00%
GW_F17.02	FM	New Gravity	-	160	47	1.4 L/s	R 341 000	R - 0.00%
GW_F17.03	FM	New Gravity	█	160	164	3.5 L/s	R 389 000	R 256 000 65.71%
GW_F17.04	FM	New Gravity	█	160	363	4.4 L/s	R 796 000	R 597 000 75.00%
GW_F17.05	FM	New Gravity	█	160	439	9.2 L/s	R 953 000	R 695 000 72.83%
GW_F17.06	FM	New Gravity	█	250	477	29.6 L/s	R 1 391 000	R 574 000 41.22%
GW_F17.07	FM	New Gravity	█	315	342	39.8 L/s	R 1 256 000	R 707 000 56.28%
GW_F17.08	FM	New Gravity	█	315	466	43.1 L/s	R 1 689 000	R 1 008 000 59.63%
GW_F17.09	FM	New Gravity (Future extension)	-	315	202	43.2 L/s	n.a.	n.a. 0.00%
GW_32.01	MPa	Abandon existing Pump Station: Pacaltsdorp PS 7	-	-	-	- L/s	R 284 000	R - 0.00%
GW_32.02	MPa	Abandon existing Rising	110	125	546	- L/s	R 10 000	R - 0.00%
GW_32.03	MPa	Abandon existing Gravity	110	110	5	- L/s	R 10 000	R - 0.00%
GW_F44.01	FM	New Flow Diversion	-	-	-	1.5 L/s	R -	R - 0.00%
GW_F44.02a	FM	New Gravity	-	160	39	1.5 L/s	R 291 000	R - 0.00%
GW_F44.02b	FM	New Gravity	-	160	15	1.5 L/s	R 83 000	R - 0.00%
OT_22.01	MPa	Abandon existing Pump Station: Pacaltsdorp PS 2	-	-	-	- L/s	R 284 000	R - 0.00%
OT_22.02	MPa	Abandon existing Rising	160	160	2 106	- L/s	R 10 000	R - 0.00%
OT_22.03	MPa	Abandon existing Gravity	149	160	8	- L/s	R 10 000	R - 0.00%
GW_F18.01	FM	New Flow Diversion	-	-	-	15.0 L/s	R -	R - 0.00%
GW_F18.02a	FM	New Gravity	-	160	156	15.0 L/s	R 374 000	R - 0.00%
GW_F18.02b	FM	New Gravity	-	160	94	15.0 L/s	R 630 000	R - 0.00%
GW_F18.02c	FM	New Gravity	-	160	59	15.0 L/s	R 175 000	R - 0.00%
GW_F18.03a	FM	New Gravity	-	160	67	15.8 L/s	R 191 000	R 10 000 5.06%
GW_F18.03b	FM	New Gravity	-	160	27	15.8 L/s	R 217 000	R 11 000 5.06%
GW_F18.03c	FM	New Gravity	-	160	92	15.8 L/s	R 243 000	R 13 000 5.06%
GW_F19.00	FM	New Gravity	█	160	379	7.5 L/s	R 830 000	R 830 000 100.00%
GW_F20.01a	FM	New Gravity	█	160	21	1.5 L/s	R 182 000	R 182 000 100.00%
GW_F20.01b	FM	New Gravity	█	160	193	1.5 L/s	R 448 000	R 448 000 100.00%
GW_F20.02	FM	New Gravity	█	160	147	2.7 L/s	R 355 000	R 355 000 100.00%
GW_F21.01a	FM	New Gravity	█	160	21	1.5 L/s	R 178 000	R 178 000 100.00%
GW_F21.01b	FM	New Gravity	█	160	312	1.5 L/s	R 692 000	R 692 000 100.00%
GW_F21.02	FM	New Gravity	█	160	237	3.4 L/s	R 538 000	R 538 000 100.00%
GW_F72.01	#1 FA	New Flow Diversion (Alternative)	-	-	-	43.2 L/s	R -	R - 59.49%
GW_F72.02	#1 FA	New Gravity (Alternative)	█	315	11	43.2 L/s	R 97 000	R 58 000 59.49%
GW_F73.01	#1 FA	New Pump Station (Alternative): Groeneweide Ext. PS F3	█	█	█	50.0 L/s	R 5 624 000	R 3 346 000 59.49%
GW_F73.02	#1 FA	New Rising (Alternative)	█	250	1 295	- L/s	R 3 112 000	R 1 852 000 59.49%
GW_F45.01	FM	New Gravity	█	160	437	4.1 L/s	R 949 000	R 949 000 100.00%
GW_F45.02	FM	New Gravity	█	160	503	12.7 L/s	R 1 082 000	R 1 082 000 100.00%
GW_F05.09	FM	New Gravity	█	200	37	23.4 L/s	R 140 000	R 91 000 64.53%
GW_F05.08	FM	New Gravity (Future connection)	-	160	79	8.8 L/s	n.a.	n.a. 0.00%
GW_F06.01	FM	New Pump Station: Groeneweide Ext. PS F1	-	-	-	23.4 L/s	R 4 081 000	R 2 634 000 64.53%
GW_F06.02	FM	New Rising	█	160	548	23.4 L/s	R 897 000	R 579 000 64.53%
<b>Total</b>							<b>R 233 490 000</b>	<b>R 63 409 000</b>

Notes: #1 Interim Pump Station prior to the implementation of future Groeneweide Ext. PS F2

Yellow - development specific at R39 742 000

Green - general at R24 725 000

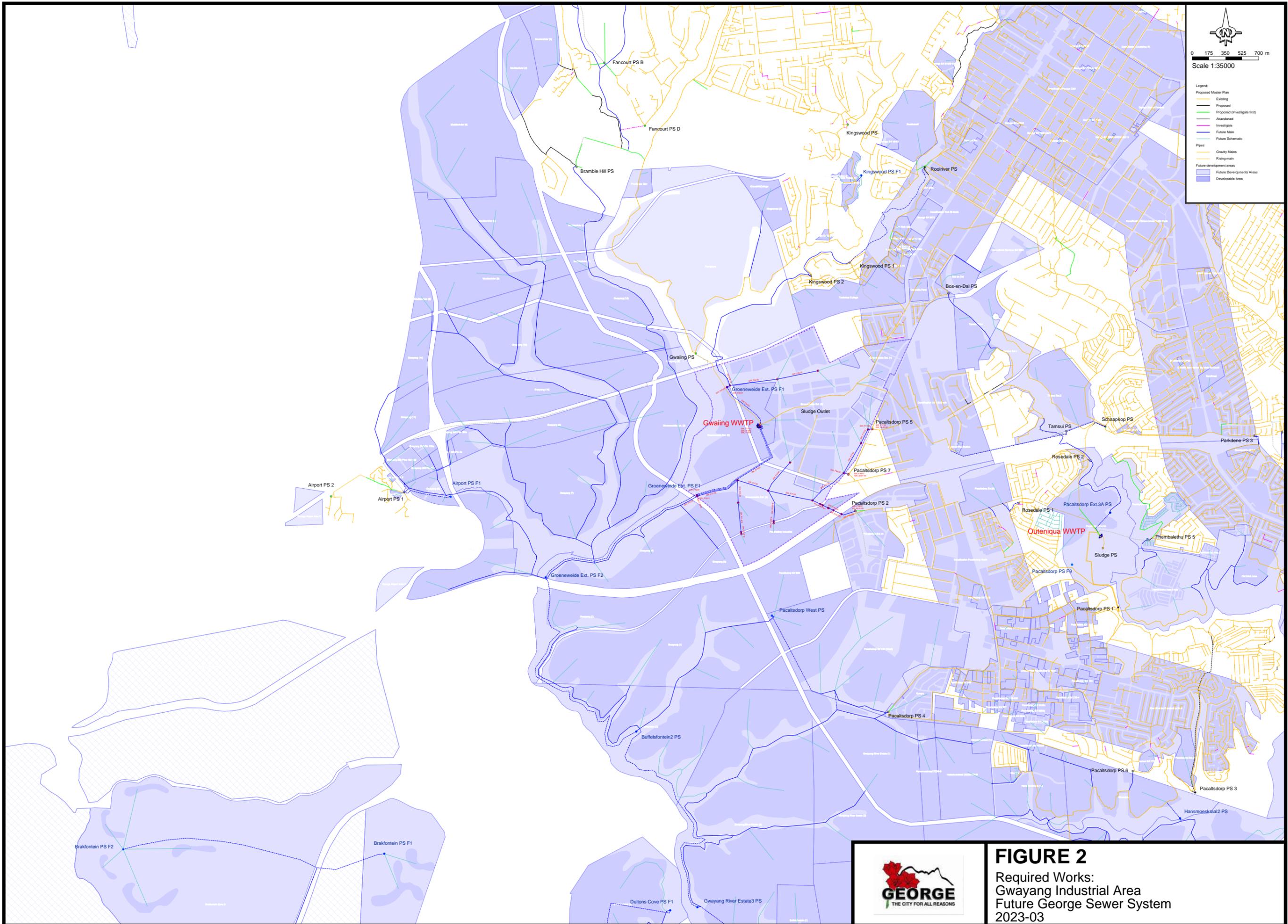
**Table 1: Water MP Items**

Item No	MP Type	Description	Extent	Size	Cost	Pro-rata Cost
GMR_B15.01	# <sup>1</sup> MP	Water Treatment Facility to install: Old WTP	4 500 m <sup>3</sup> /d @	306 m EGL	R 78 959 000	R 7 617 000 9.65%
GMR_B01.01	MP	Water Treatment Facility to install: New WTP	20 000 m <sup>3</sup> /d @	254 m EGL	R 279 600 000	R 26 972 000 9.65%
GMR_B01.06	MP	Pipe to install	7 m x	500 mm Ø	R 630 000	R 61 000 9.65%
GMR_B01.07	MP	Pump Only to install: New WTP PS	160 L/s @	50 m	R 1 532 000	R 148 000 9.65%
GMR_05.02d	MP	Pipe to install	13 m x	400 mm Ø	R 438 000	R 153 000 34.92%
GMR_05.03a	MP	Pressure Reducing Valve to install (future)	250 m EGL	350 mm Ø	n.a.	n.a. 34.92%
GMR_05.03b	MP	Pipe to install (interim)	1 x	400 mm Ø	R 383 000	R 134 000 34.92%
GMR_05.03c	MP	Pipe with meter to install	1 x	350 mm Ø	R 642 000	R 225 000 34.92%
GMR_05.04a	MP	Pipe to install	398 m x	400 mm Ø	R 2 676 000	R 935 000 34.92%
GMR_05.04b	MP	Pipe to install (future connection)	419 m x	400 mm Ø	n.a.	n.a. 0.00%
GMR_F27.01a	FM	Pressure Reducing Valve to install	250 m EGL	200 mm Ø	R 530 000	R 455 000 85.79%
GMR_F27.01b	FM	Pipe with meter to install	1 x	200 mm Ø	R 282 000	R 242 000 85.79%
GMR_F27.02	FM	Pipe to install	355 m x	250 mm Ø	R 929 000	R 797 000 85.79%
GMR_F27.03	FM	Pipe to install	258 m x	200 mm Ø	R 589 000	R 484 000 82.17%
GMR_F27.04	FM	Pipe to install	347 m x	200 mm Ø	R 773 000	R 605 000 78.17%
GMR_F27.05	FM	Pipe to install	345 m x	200 mm Ø	R 770 000	R 549 000 71.17%
GMR_F27.06	FM	Pipe to install	149 m x	200 mm Ø	R 364 000	R 227 000 62.13%
GMR_F27.07	FM	Pipe to install	421 m x	200 mm Ø	R 927 000	R 511 000 55.02%
GMR_F27.08	FM	Pipe to install	138 m x	200 mm Ø	R 342 000	R 156 000 45.59%
GMR_F28.01	MP	Pipe to install	40 m x	250 mm Ø	R 375 000	R 313 000 83.21%
GMR_F28.02a	FM	Pressure Reducing Valve to install	250 m EGL	200 mm Ø	R 530 000	R 442 000 83.21%
GMR_F28.02b	FM	Pipe with meter to install	1 x	200 mm Ø	R 282 000	R 235 000 83.21%
GMR_F28.03	FM	Pipe to install	14 m x	250 mm Ø	R 120 000	R 100 000 83.21%
GMR_F28.04	FM	Pipe to install	173 m x	250 mm Ø	R 497 000	R 406 000 81.61%
GMR_F28.05	FM	Pipe to install	306 m x	200 mm Ø	R 689 000	R 524 000 76.03%
GMR_F28.06	FM	Pipe to install	177 m x	200 mm Ø	R 422 000	R 298 000 70.60%
GMR_F28.07	FM	Pipe to install	320 m x	200 mm Ø	R 719 000	R 488 000 67.74%
GMR_F28.08	FM	Pipe to install	266 m x	200 mm Ø	R 606 000	R 367 000 60.55%
GMR_F28.09	FM	Pipe to install	304 m x	200 mm Ø	R 685 000	R 336 000 48.92%
GMR_F67.01	FM	Pipe to install	166 m x	160 mm Ø	R 305 000	R 274 000 89.66%
GMR_F67.02	FM	Pipe to install	131 m x	160 mm Ø	R 249 000	R 232 000 92.79%
GMR_F67.03	FM	Pipe to install	350 m x	160 mm Ø	R 600 000	R 540 000 89.87%
GMR_F67.04	FM	Pipe to install	137 m x	160 mm Ø	R 259 000	R 223 000 86.05%
GMR_F67.05	FM	Pipe to install	221 m x	160 mm Ø	R 393 000	R 190 000 48.13%
GMR_F67.06	FM	Pipe to install	178 m x	160 mm Ø	R 324 000	R 245 000 75.44%
GMR_F67.07	FM	Pipe to install	177 m x	160 mm Ø	R 322 000	R 267 000 82.90%
GMR_F67.08	FM	Pipe to install	185 m x	160 mm Ø	R 336 000	R 294 000 87.28%
GMR_F71.01	FM	Pipe to install	167 m x	160 mm Ø	R 306 000	R 273 000 89.07%
GMR_F71.02	FM	Pipe to install	343 m x	160 mm Ø	R 588 000	R 521 000 88.46%
GMR_F71.03	FM	Pipe to install	248 m x	160 mm Ø	R 436 000	R 342 000 78.28%
GMR_F71.04	FM	Pipe to install	334 m x	160 mm Ø	R 574 000	R 525 000 91.34%
GMR_F72.01	FM	Pipe to install	160 m x	160 mm Ø	R 296 000	R 187 000 62.98%
GMR_F72.02	FM	Pipe to install	353 m x	160 mm Ø	R 604 000	R 423 000 69.98%
GMR_F72.03	FM	Pipe to install	233 m x	160 mm Ø	R 412 000	R 274 000 66.45%
GMR_F74.01	FM	Pipe to install	269 m x	160 mm Ø	R 470 000	R 218 000 46.21%
GMR_F74.02	FM	Pipe to install	279 m x	160 mm Ø	R 486 000	R 281 000 57.64%
GMR_F75.01	FM	Pipe to install	388 m x	160 mm Ø	R 661 000	R 269 000 40.67%
GMR_F75.02	FM	Pipe to install	618 m x	160 mm Ø	R 1 030 000	R 400 000 38.76%
GMR_F75.03	FM	Pipe to install (future connection)	153 m x	160 mm Ø	n.a.	n.a. 0.00%
GMR_F76.01a	FM	Pipe to install	90 m x	160 mm Ø	R 183 000	R 80 000 43.37%
GMR_F76.01b	FM	Pipe to install	27 m x	160 mm Ø	R 170 000	R 74 000 43.37%
GMR_F76.01c	FM	Pipe to install	1 170 m x	160 mm Ø	R 1 913 000	R 830 000 43.37%
GMR_F76.02a	FM	Pipe to install	158 m x	160 mm Ø	R 292 000	R 25 000 8.48%
GMR_F76.02b	FM	Pipe to install	17 m x	160 mm Ø	R 121 000	R 11 000 8.48%
GMR_F76.02c	FM	Pipe to install	66 m x	160 mm Ø	R 145 000	R 13 000 8.48%
GMR_F77.00	FM	Pipe to install (future connection)	176 m x	160 mm Ø	n.a.	n.a. 0.00%
<b>Total</b>					<b>R 386 766 000</b>	<b>R 50 791 000</b>

Notes: #<sup>1</sup> Refurbish WTP to original design capacity of 25 000 m<sup>3</sup>/d.  
#<sup>2</sup> Construct the pump station building in accordance to the ultimate flow, install only phase 1 pump equipment (minimum pump capacity).

Green - general at R36 942 000.00  
Remainder - development specific at R13 849 000





0 175 350 525 700 m  
 Scale 1:35000

Legend:

- Proposed Master Plan
- Existing
- Proposed
- Proposed (investigate first)
- Abandoned
- Investigate
- Future Main
- Future Schematic

Pipes

- Gravity Mains
- Rising main

Future development areas

- Future Developments Areas
- Developable Area



**FIGURE 2**  
 Required Works:  
 Gwaying Industrial Area  
 Future George Sewer System  
 2023-03

**Table 3: Water demand and sewer return flow contribution**

Land Use	Unit of measure (No/100m2/ha...)	No. Units (No/100m2/ha...)	UWD/unit (kl/unit/d)	Sewer ratio (% x UWD)	AADD Inc. UAW (kl/d)	PDDWF Excl. Infiltr. (kl/d)
<b>Groeneweide Ext. (1)</b>						
Group Housing	4.01 ha @ 35 units/ha	141	0.333	85%	46.87	39.84
Apartment Housing	9.29 ha @ 200 units/ha	1858	0.167	90%	309.71	278.74
	<b>Sub-Total</b>	<b>1999</b>			<b>356.58</b>	<b>318.58</b>
<b>Groeneweide Ext. (2)</b>						
Light Industrial	19.04 ha @ FSR of 0.6	1143	0.333	70%	381.00	266.70
Heavy Industrial	38.14 ha @ FSR of 0.6	2289	0.333	70%	763.00	534.10
Mixed Use / Business / Retail	15.47 ha @ FSR of 0.6	929	0.556	70%	516.11	361.28
Public facilities (Creche's & religious centre)	0.26 ha @ FSR of 0.6	16	0.667	65%	10.67	6.93
	<b>Sub-Total</b>	<b>4377</b>			<b>1 670.78</b>	<b>1 169.01</b>
<b>Groeneweide Ext. (3)</b>						
Industrial (dry), Large (FSR)	51.49 ha	100	0.222	85%	22.22	15.56
	<b>Sub-Total</b>	<b>100</b>			<b>22.22</b>	<b>15.56</b>
<b>Groeneweide Ext. (4)</b>						
Industrial (dry), Large (FSR)	23.49 ha	658	0.222	85%	146.22	102.36
	<b>Sub-Total</b>	<b>658</b>			<b>146.22</b>	<b>102.36</b>
<b>Pacaltsdorp Industrial</b>						
Industrial (dry), Large (FSR)	26.94 ha	754	0.222	85%	167.56	117.29
	<b>Sub-Total</b>	<b>754</b>			<b>167.56</b>	<b>117.29</b>
<b>Total</b>					<b>2 363</b>	<b>1 723</b>

## Marilise Van Wyk

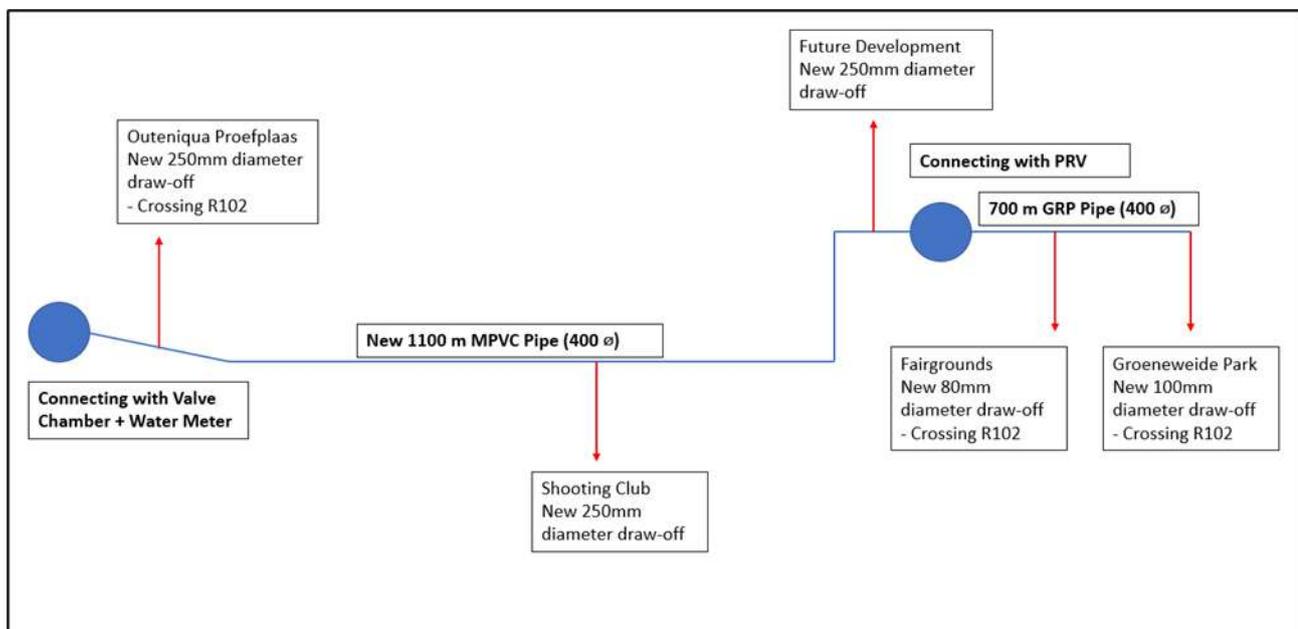
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**From:** Fabian Abrahams <fabrahams@george.gov.za>  
**Sent:** Tuesday, 28 February 2023 15:49  
**To:** Marilise Van Wyk  
**Cc:** Alton Michaels  
**Subject:** Existing CES\_Gwayang Development  
**Attachments:** 20230228\_Existing CES\_Zutari\_Gwayang Development.pdf

Marilise,

Aangeheg soos bespreek.

Neem asb kennis dat die die 200 mm diameter pyp opgradeer gaan word met 'n 400 mm diameter PVC-O Klas 12 en 16. Onder uittreksel vir inligting.



Regards / Groete

**Fabian Abrahams (Pr Eng Techni)**  
Senior Engineering Technician (CAD/GIS)  
Civil Engineering Services: Planning, PMU & Support Services

**Office:** 044 801 9348  
**Cell:** 083 452 4805  
**Email:** [fabrahams@george.gov.za](mailto:fabrahams@george.gov.za)



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gmun@george.gov.za



www.george.gov.za



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**Pipes - Existing System Type**

- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

**Nodes**

- all other values

**Tanks - Tank Types**

- all other values
- BULK
- WTP
- GL\_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

**Pumps - Pump Types**

- all other values
- Closed PUMP
- Open PUMP

**Valves - Valve Types**

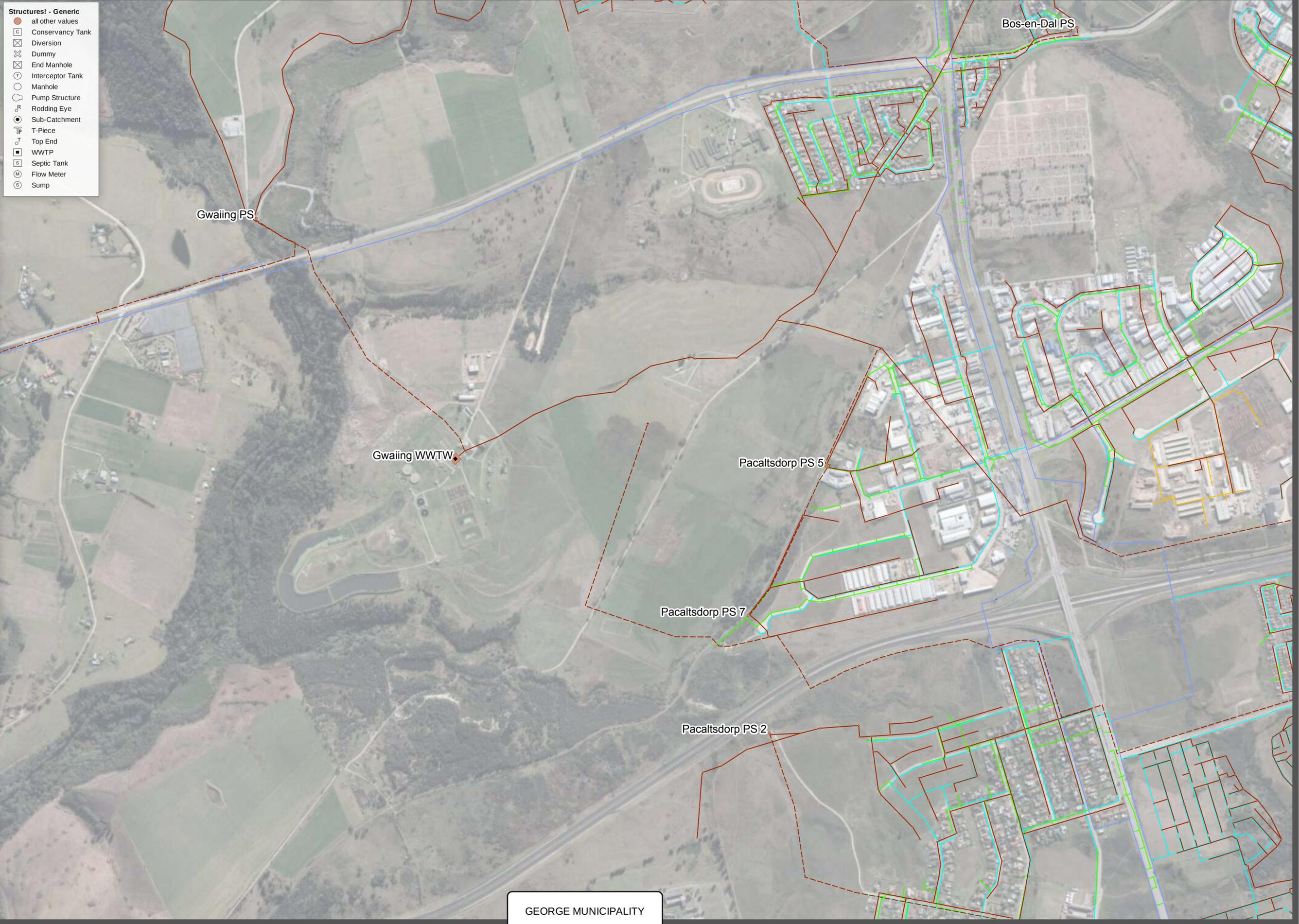
- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

**George Stormwater**

**Gravity Pipes! - Generic**

- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

**Rising Mains**



GEORGE MUNICIPALITY



Existing Civil Engineering Services

2023-02-28 15:35



- Pipes - Existing System Type**
- Future
  - Raw
  - Bulk
  - Distribution Main
  - Reticulation
  - Raw - Private
  - Bulk - Private
  - Distribution Main - Private
  - Reticulation - Private
  - Raw - External
  - Bulk - External
  - Distribution Main - External
  - Reticulation - External
  - Fire Reticulation
  - Closed PIPE
  - CV
  - Bridge
  - Culvert
  - Encased
  - Meter
  - Pipe Sleeve

- Nodes**
- 

- Tanks - Tank Types**
- all other values
  - BULK
  - WTP
  - GL\_TANK
  - TANK
  - TOWER
  - BOREHOLE
  - DAM
  - RIVER
  - WELL
  - BPT
  - SUMP

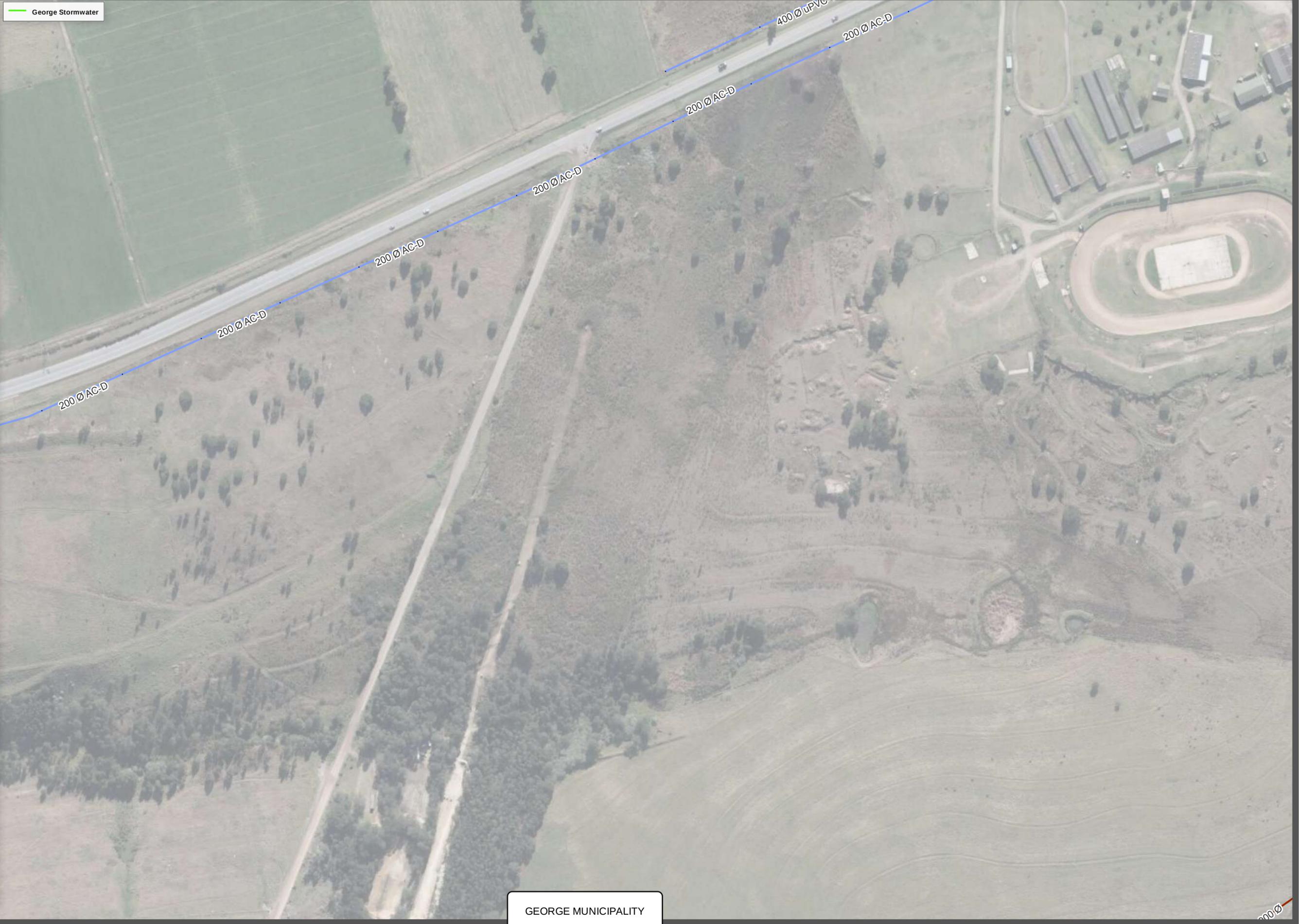
- Pumps - Pump Types**
- all other values
  - Closed PUMP
  - Open PUMP

- Valves - Valve Types**
- all other values
  - Closed FCV
  - Open FCV
  - Closed PRV
  - Open PRV
  - Closed PBV
  - Open PBV
  - Closed PSV
  - Open PSV
  - Closed TCV
  - Open TCV

- Gravity Pipes! - Generic**
- all other values
  - Bridge
  - Culvert
  - Encased
  - Siphon
  - Sted
  - Tunnel

- Rising Mains**
- 

- Structures! - Generic**
- all other values
  - Conservancy Tank
  - Diversion
  - Dummy
  - End Manhole
  - Interceptor Tank
  - Manhole
  - Pump Structure
  - Rodding Eye
  - Sub-Catchment
  - T-Piece
  - Top End
  - WWTP
  - Septic Tank
  - Flow Meter
  - Sump



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# Water: System Type

2023-02-28 15:39



**Pipes - Existing System Type**

- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

**Nodes**

- 

**Tanks - Tank Types**

- all other values
- BULK
- WTP
- GL\_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

**Pumps - Pump Types**

- all other values
- Closed PUMP
- Open PUMP

**Valves - Valve Types**

- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

**Gravity Pipes! - Generic**

- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

**Rising Mains**

- 

**Structures! - Generic**

- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump



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# Water: System Type

2023-02-28 15:39



- Pipes - Existing System Type**
- Future
  - Raw
  - Bulk
  - Distribution Main
  - Reticulation
  - Raw - Private
  - Bulk - Private
  - Distribution Main - Private
  - Reticulation - Private
  - Raw - External
  - Bulk - External
  - Distribution Main - External
  - Reticulation - External
  - Fire Reticulation
  - Closed PIPE
  - CV
  - Bridge
  - Culvert
  - Encased
  - Meter
  - Pipe Sleeve

**Nodes**

- Tanks - Tank Types**
- all other values
  - BULK
  - WTP
  - GL\_TANK
  - TANK
  - TOWER
  - BOREHOLE
  - DAM
  - RIVER
  - WELL
  - BPT
  - SUMP

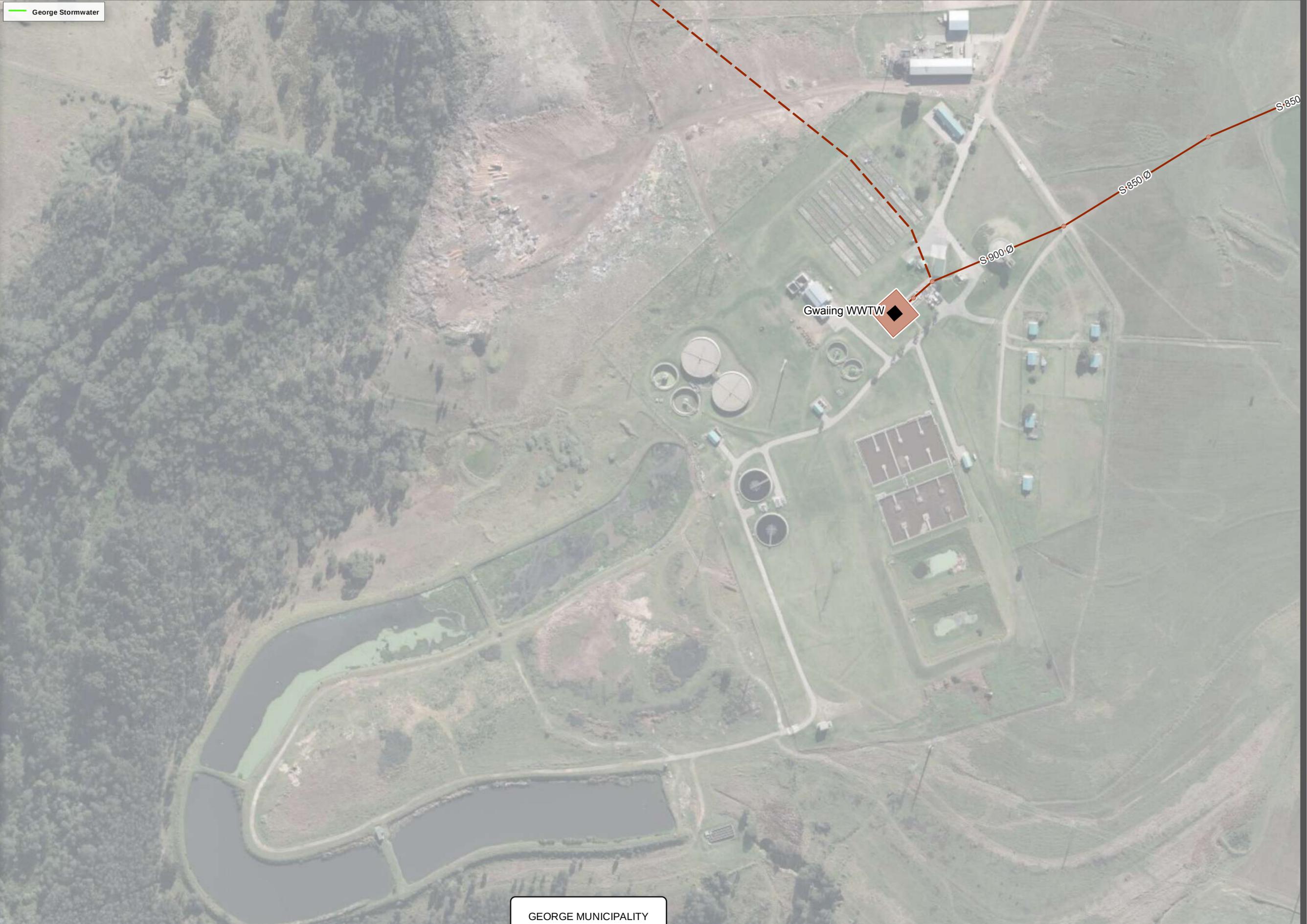
- Pumps - Pump Types**
- all other values
  - Closed PUMP
  - Open PUMP

- Valves - Valve Types**
- all other values
  - Closed FCV
  - Open FCV
  - Closed PRV
  - Open PRV
  - Closed PBV
  - Open PBV
  - Closed PSV
  - Open PSV
  - Closed TCV
  - Open TCV

- Gravity Pipes! - Generic**
- all other values
  - Bridge
  - Culvert
  - Encased
  - Siphon
  - Sted
  - Tunnel

**Rising Mains**

- Structures! - Generic**
- all other values
  - Conservancy Tank
  - Diversion
  - Dummy
  - End Manhole
  - Interceptor Tank
  - Manhole
  - Pump Structure
  - Rodding Eye
  - Sub-Catchment
  - T-Piece
  - Top End
  - WWTP
  - Septic Tank
  - Flow Meter
  - Sump



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Water: System Type

2023-02-28 15:39



- Pipes - Existing System Type**
- Future
  - Raw
  - Bulk
  - Distribution Main
  - Reticulation
  - Raw - Private
  - Bulk - Private
  - Distribution Main - Private
  - Reticulation - Private
  - Raw - External
  - Bulk - External
  - Distribution Main - External
  - Reticulation - External
  - Fire Reticulation
  - Closed PIPE
  - CV
  - Bridge
  - Culvert
  - Encased
  - Meter
  - Pipe Sleeve

- Nodes**
- 

- Tanks - Tank Types**
- all other values
  - BULK
  - WTP
  - GL\_TANK
  - TANK
  - TOWER
  - BOREHOLE
  - DAM
  - RIVER
  - WELL
  - BPT
  - SUMP

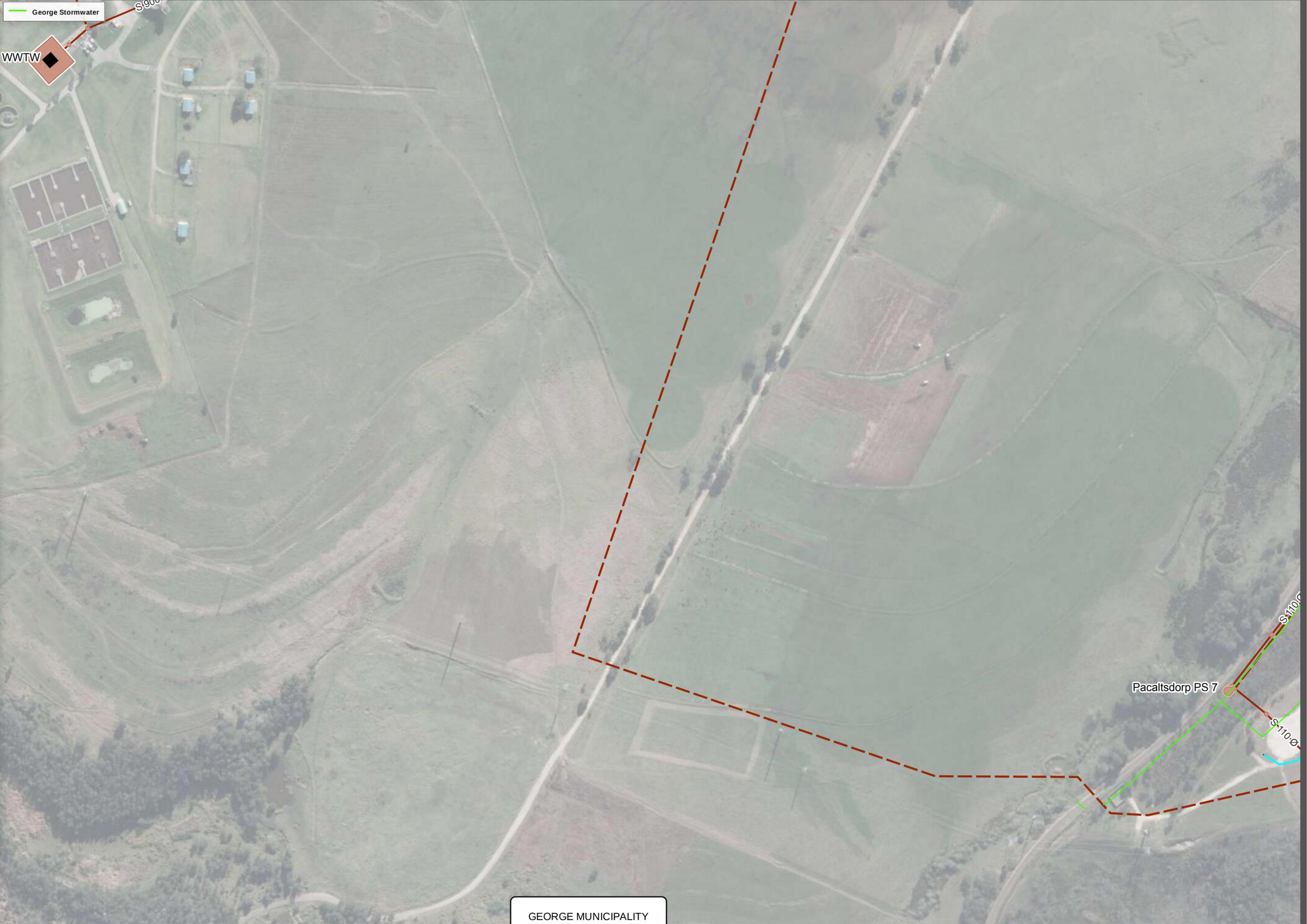
- Pumps - Pump Types**
- all other values
  - Closed PUMP
  - Open PUMP

- Valves - Valve Types**
- all other values
  - Closed FCV
  - Open FCV
  - Closed PRV
  - Open PRV
  - Closed PBV
  - Open PBV
  - Closed PSV
  - Open PSV
  - Closed TCV
  - Open TCV

- Gravity Pipes! - Generic**
- all other values
  - Bridge
  - Culvert
  - Encased
  - Siphon
  - Sted
  - Tunnel

- Rising Mains**
- 

- Structures! - Generic**
- all other values
  - Conservancy Tank
  - Diversion
  - Dummy
  - End Manhole
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  - Manhole
  - Pump Structure
  - Rodding Eye
  - Sub-Catchment
  - T-Piece
  - Top End
  - WWTP
  - Septic Tank
  - Flow Meter
  - Sump



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Water: System Type

2023-02-28 15:40





**Pipes - Existing System Type**

- Future
- Raw
- Bulk
- Distribution Main
- Reticulation
- Raw - Private
- Bulk - Private
- Distribution Main - Private
- Reticulation - Private
- Raw - External
- Bulk - External
- Distribution Main - External
- Reticulation - External
- Fire Reticulation
- Closed PIPE
- CV
- Bridge
- Culvert
- Encased
- Meter
- Pipe Sleeve

**Nodes**

- all other values
- BULK
- WTP
- GL\_TANK
- TANK
- TOWER
- BOREHOLE
- DAM
- RIVER
- WELL
- BPT
- SUMP

**Pumps - Pump Types**

- all other values
- Closed PUMP
- Open PUMP

**Valves - Valve Types**

- all other values
- Closed FCV
- Open FCV
- Closed PRV
- Open PRV
- Closed PBV
- Open PBV
- Closed PSV
- Open PSV
- Closed TCV
- Open TCV

**Gravity Pipes! - Generic**

- all other values
- Bridge
- Culvert
- Encased
- Siphon
- Sted
- Tunnel

**Rising Mains**

- all other values
- Conservancy Tank
- Diversion
- Dummy
- End Manhole
- Interceptor Tank
- Manhole
- Pump Structure
- Rodding Eye
- Sub-Catchment
- T-Piece
- Top End
- WWTP
- Septic Tank
- Flow Meter
- Sump



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# Water: System Type

2023-02-28 15:41

