GROOTDRINK 370 HOUSING DEVELOPMENT

Engineering Services Investigation Report

Investigation of the available and required bulk civil and electrical services for the Grootdrink village development in the !Kheis municipal area

OCTOBER 2020

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EXECUTIVE SUMMARY

This report was compiled to investigate the bulk infrastructure serving the Grootdrink village and to determine whether the bulk infrastructure is adequate for the development of an additional 370 stands, through a low-cost housing development.

The bulk engineering services report includes the following categories:

- Bulk Water Infrastructure
- Bulk Sewer Infrastructure
- Bulk Road and Storm Water Infrastructure
- Bulk Electrical Infrastructure

After investigating the infrastructure, it was found that the existing bulk infrastructure is not even sufficient to accommodate the current infrastructure in Grootdrink. The extent of the upgrading of the bulk services, to accommodate the Grootdrink 370 Houses project, must therefore also include upgrading to address the current deficit. Some critical repair works on the current bulk infrastructure works also need to be done. The bulk services for each category that require attention before the project can commence is summarised below:

- **Bulk Water Infrastructure**

  Upgrading of the entire bulk water supply system is required as these 370 houses will require an additional 50% of the demand related to the existing 702 houses.

- **Bulk Sewer Infrastructure**

  Construction of two new pump stations.
  Construction of two new rising mains .
  Repair and extension of the current wastewater treatment works (Oxidations ponds);

- **Bulk Electrical Infrastructure**

  Formal bulk upgrade process to be finalised between Eskom and the municipality;
  Minor modification to the load centre.

The cost estimation for the upgrading of the bulk services needed to service the current infrastructure in Grootdrink as well as the 370 additional houses are:

DESCRIPTION	AMOUNT TO REPAIR OF EXISTING INFRASTRUCTURE	AMOUNT NEW/UPGRADED INFRASTRUCTURE	TOTAL BULK INFRASTRUCTURE
Water Bulk Services	R 500 000.00	R 17 991 184.47	R 18 491 184.47
Bulk Sewer Services	R 2 000 000.00	R 12 974 037.54	R 14 974 037.54
Roads and Access	R -	R -	R -
Electrical	R -	R -	R -
TOTAL CONSTRUCTION	**R 2 500 000.00**	**R 30 965 222.01**	**R 33 465 222.01**
10% Contingencies	R 250 000.00	R 3 096 522.20	R 3 346 522.20
SUB TOTAL	**R 2 750 000.00**	**R 34 061 744.21**	**R 36 811 744.21**
10% Professional fees	R 275 000.00	R 3 406 174.42	R 3 681 174.42
SUB-TOTAL	**R 3 025 000.00**	**R 37 467 918.63**	**R 40 492 918.63**
15% VAT	R 453 750.00	R 5 620 187.79	R 6 073 937.79
GRAND TOTAL	**R 3 753 750.00**	**R 46 494 280.84**	**R 50 248 030.84**

This report can be used both for business plans and funding applications from the various funding schemes available

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1. INTRODUCTION

1.1 Disclaimer

This is the draft version of the final report. Recommendations and conclusions still have to be approved by the Client.

1.2 Terms of Reference

I. BVI Consulting Engineers was appointed by Macroplan to undertake this Bulk Engineering Services Study (Water, Sewer, Electricity and Roads & Storm Water) for the proposed Grootdrink 370 housing project. Grootdrink is one of six villages located close to the Orange river within the jurisdiction of !Kheis Local Municipality.

1.3 Site Location

I. The site is situated approximately 45 km to the north-west of Groblershoop in the Northern Cape (Figure 1 – Locality Plan).

II. The development is located at the following coordinates: 28°33'44" S; 21°44'46" E

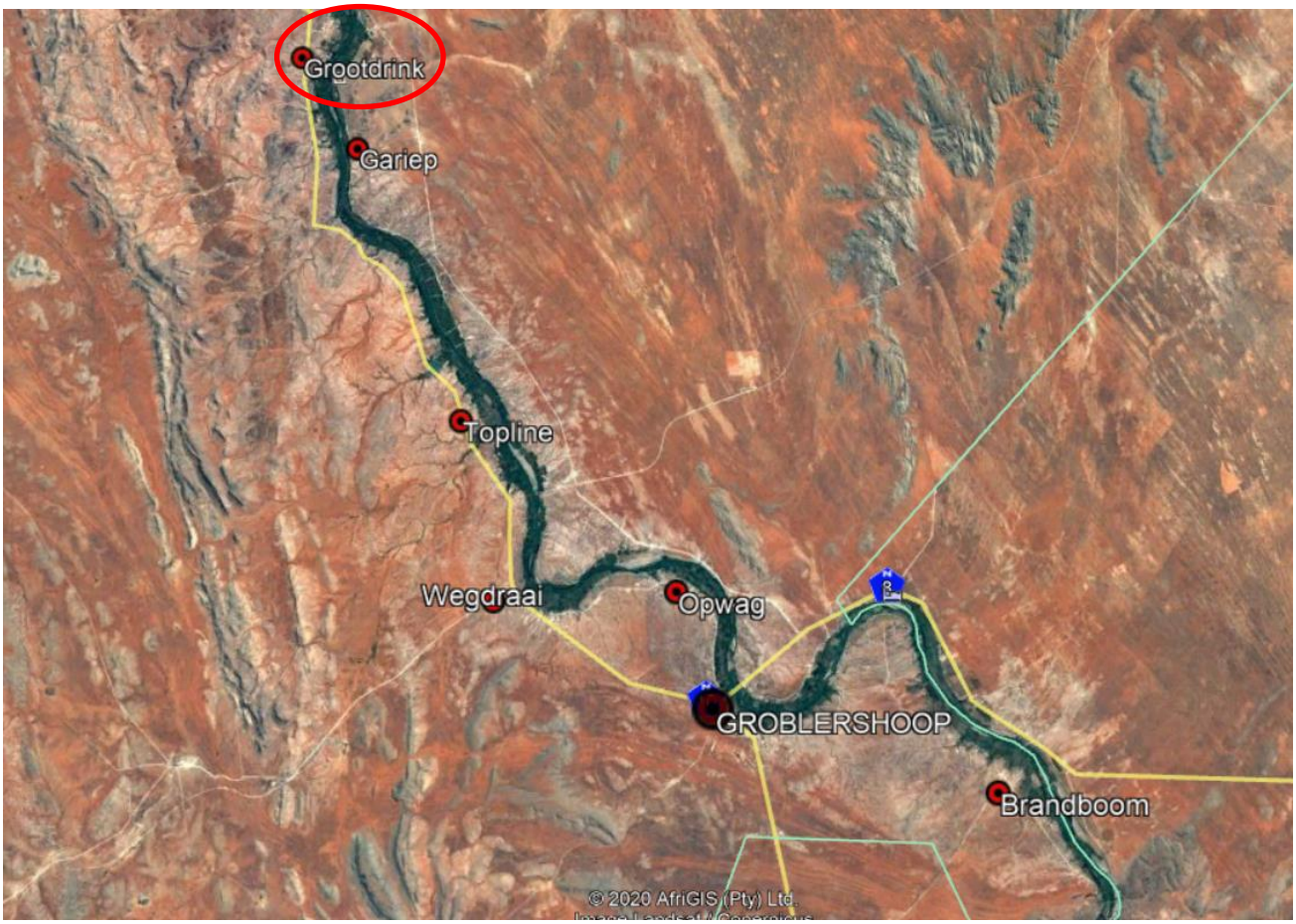


Figure 1: Grootdrink 370 Housing Development Locality Plan

II. The planned development consists of 370 low-cost houses next to the existing village (Figure 2: 370 Stands Development Area)

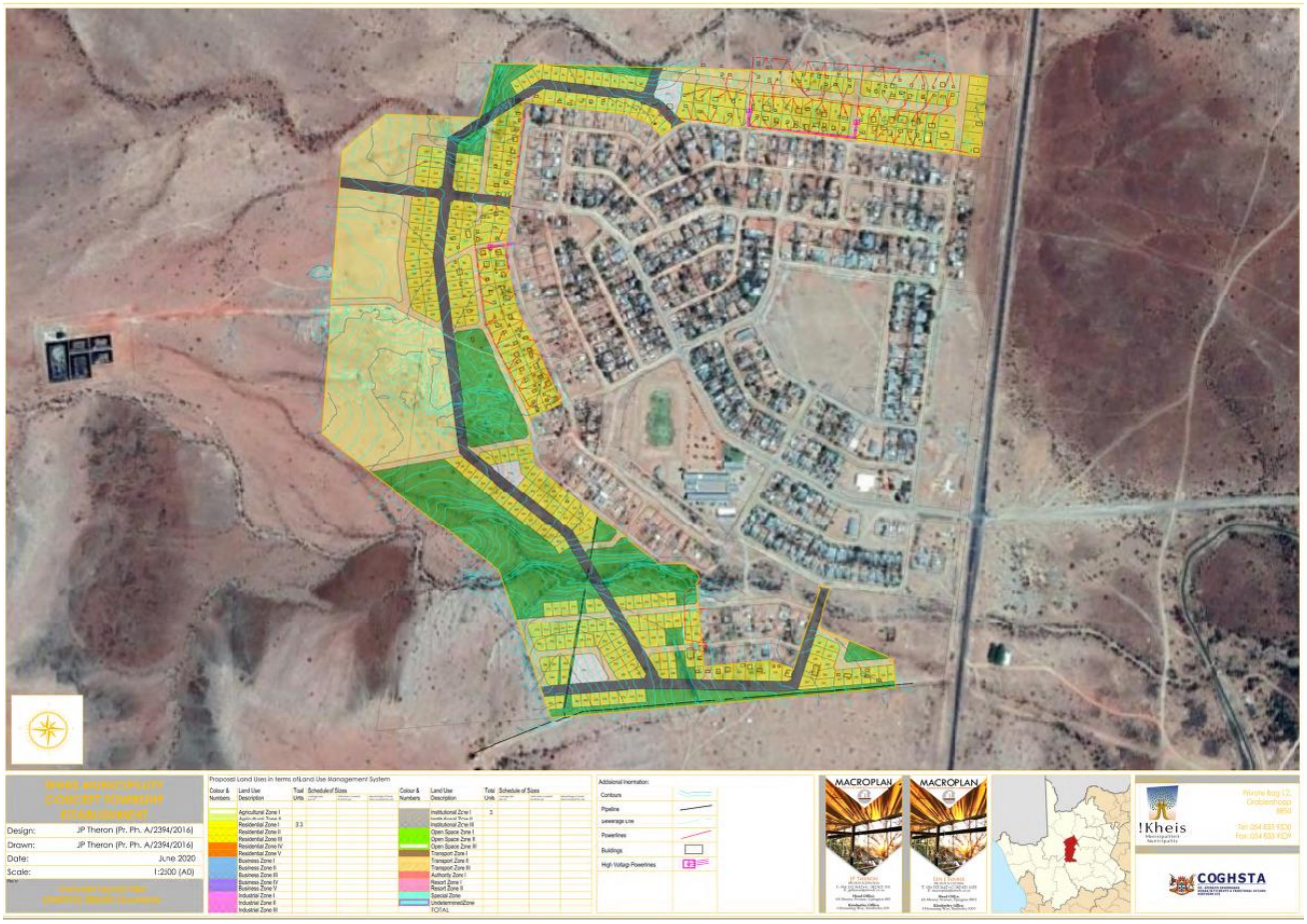


Figure 2: Grootdrink 370 Housing Development Locality Plan

III. The purpose of the Bulk Engineering Services Assessment is to determine the availability and capacity of existing bulk services to service the proposed development. This report presents the findings of a preliminary visual inspection and desktop investigation relating to bulk services and further sets out the criteria and standards for the internal services for the new development.

IV. The Bulk Engineering Services addressed in this report are the following:

- Water Supply
- Sewerage
- Roads and Access
- Storm Water Management
- Electricity Supply
- Solid Waste

igure 2: Grootdrink 370 Housing Development Development Area

2. TOPOGRAPHY

The physical characteristics of the site can be summarised as follows:

- The ground cover comprises mostly of natural veld with short grass;
- Topographically, the site has a relatively gentle sloping terrain to the East and towards the middle of the village
- Calcrete is close to the surface of the natural ground level, which makes excavations very hard.

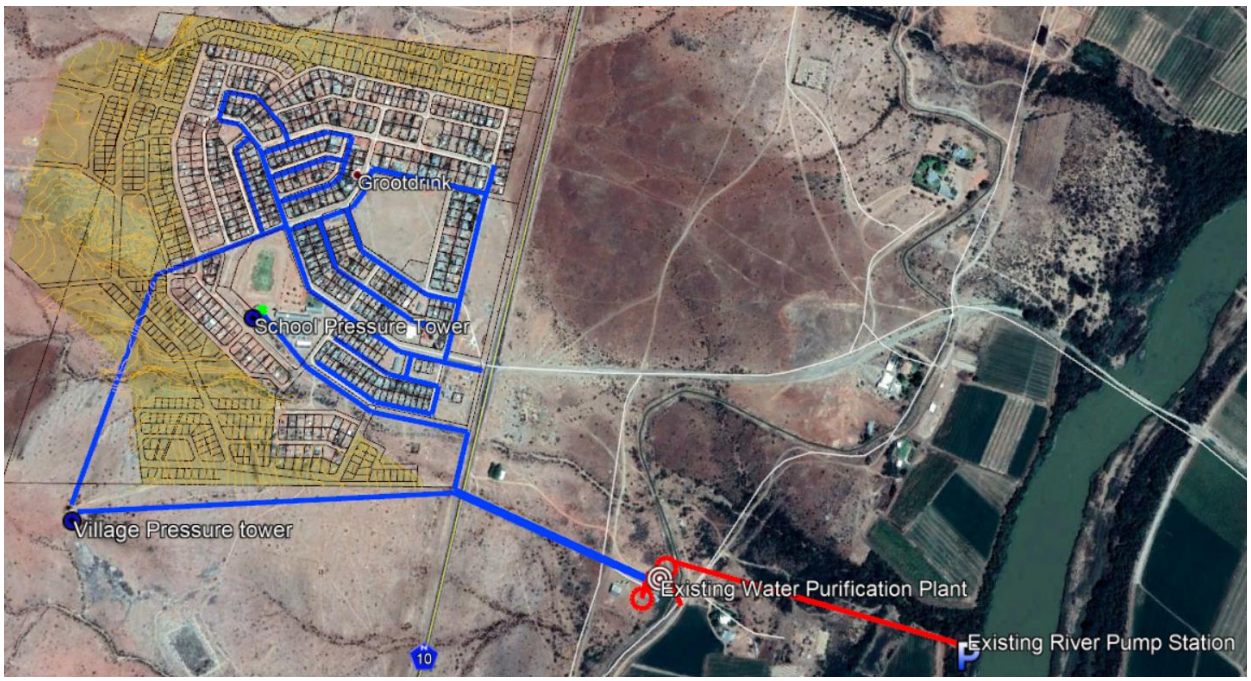
3. WATER SUPPLY

3.1 Existing Water Infrastructure

Overview

The bulk water infrastructure supplying Grootdrink village with water can be summarised as follows:

- A raw water river pump station delivering **15l/s;**
- A **750m** long, **140mm** diameter PVC Class 6 raw water supply line between the river and the water purification works, next to the canal.
- A raw water canal pump station delivering **20l/s**;
- The water treatment works consisting of:
    - An **75m^3** open raw water storage dam
    - A **50000 l/h** UFMC water treatment system
    - A **530m^3** Sectional steel storage tank
    - A high lift pump station delivering **15.2 l/s**
    - A **1200m** long, 140mm diameter PVC Class 6 potable water supply line between the sectional steel storae reservoir and sectional steel pressure towers to the south of the village
- Two sectional steel pressure towers with a capacity of **300m^3** to the south of the village
- Distribution into the village



Raw Water Supply

Water supplied to Grootdrink is extracted from Orange River by means of a pump set fitted on a pipe ramp structure with quick coupling pipes. The pump station consists of one pump that delivers 15l/s. The ramp is used to move the pump above the water when the river rises. It can be operational within a 1:10 year flood.

Raw water is pumped from the river pump station to the purification plant, delivering a maximum flow rate of 15l/s through a 750m long, 140mm diameter Class 6 PVC pipeline to a 75m^3 raw water storage dam next to the Water Treatment Works.

Water treatment and storage site

The below shows the site layout where the treatment works (UFMC water treatment system), raw and potable water storage reservoirs and high lift pump stations are located.

Water is pumped from the raw water storage dam through the Water Treatment Plant (50 00 l/h UFMC water treatment system) to a 530 m^3 sectional steel potable water storage reservoir. From there, it is pumped through a 1200m long, 140mm diameter PVC Class 6 potable water supply line to the sectional steel pressure towers to the south of the village.

The photo's below shows the filter and high lift pump sets in the pump building and potable water reservoir

Water Treatment Plant

The Water Treatment Works (WTW) consists of a dosing system as well as 50000 l/h UFMC water treatment system as shown on the photos below

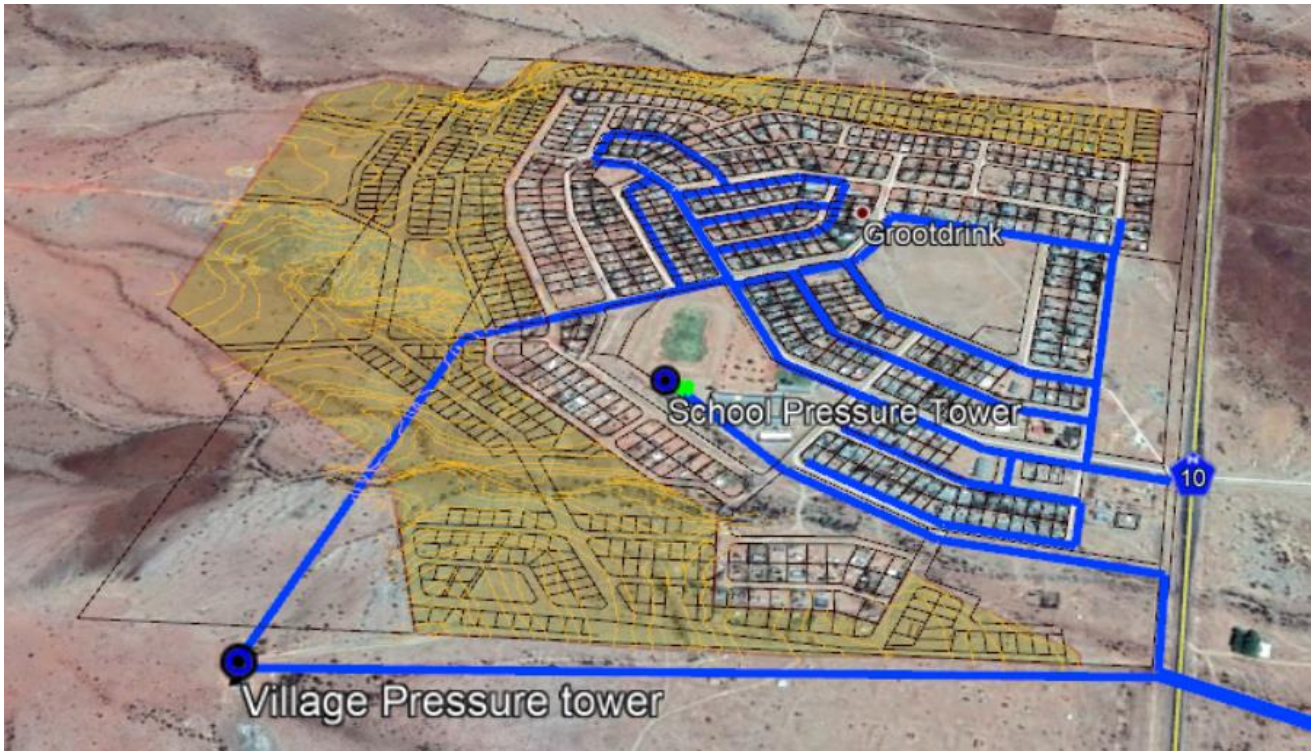
Photo's below shows the settlement tank, as well as the filters inside the container:

Pressure Towers

Potable water is delivered to the elevated sectional steel storage tanks to the south of the village. The Pressure towers have a combined capacity of 300 m^3

Reticulation System

The potable water is delivered from the elevated storage tank into the reticulation network via a 140mm diameter PVC Class 6 pipeline. The reticulation network is shown in the drawing below.



Condition of the water supply system

Most of the elements of the water supply system are currently manually operated. These include the river pump, the water treatment works, and the reservoir levels. Most of the water meters and pressure gauges are out of service. One of the filter pumps is missing.

3.2 Current water demands and capacity of the existing bulk water supply system

The Red Book was used as a basis for calculations of the theoretical capacity for the current bulk water supply system as well as required infrastructure.

The table below shows factors capacities and operating hours used in the calculations:

FACTORS	1	Design Loss Factor Water treatment works (LFw)		10,0%	
	2	Design Loss Factor Total conveyance losses (LFr)		15,0%	
	3	Summer peak factor (SPF)		1,5	
	4	Peak factor reticulation (PFR) From Red Book (Instantenous Peak)		6	
OPERATING HOURS	1	Source Pump Station (SPSH)	(Maximum operating hours per day that required volume of water	16	hours
	2	Water purification plant (WTPH)	(Maximum operating hours per day that required volume of water	16	Hours
	3	Lifting Pump Station **(LPS%)**	(% of Instantanious peak flow)	150%	
STORAGE	1	Storage in elevated tanks	(Hours of Instantanous Peak Demand)	4	hours
	2	Potable Water Storage Reservoirs	(Hours of Annual Average Daily Demand*SPF)	48	hours
	3	Raw Water Storage Reservoirs	(Hours of Summer Average Daily Demand)	1	days

The table below shows the current theoretical demands and capacity of the existing bulk water infrastructure:

	BULK AND CONNECTOR SERVICES CAPACITY CALCULATION : CURRENT						
	NO.	DESCRIPTION	UNITS		DEMAND PER UNIT		Criteria
GENERAL	1	Sub-Economical Houses (Existing)	702	Houses x	600 l/ household per day		421.2 m^3/d
	2	Sub-Economical Houses (135 houses development)		Houses x	600 l/ household per day		0 m^3/d
	4	Economical Houses (Existing)	0	Houses x	1200 l/ household per day		0 m^3/d
	5	Economical Houses (135 houses development)	0	Houses x	1200 l/ household per day		0 m^3/d
	7	Primary School Hostel	0	Learners	150 l/ Learner per day		0 m^3/d
	8	Schools	500	Learners	25 l/ Learner per day		12.5 m^3/d
	9	High School Hostel	0	Learners	150 l/ Learner per day		0 m^3/d
	10	High School	0	Learners	25 l/ Learner per day		0 m^3/d
	11	Clinics	0	m^2 x	500 l/100m^2 per day		0 m^3/d
	12	Businesses, Government and Municipal	0	m^2 x	400 l/100m^2 per day		0 m^3/d
	13	Developed Parks, Sportsgrounds and Day Cares	0.50	ha	5 mm water per day		25 m^3/d
		ANNUAL AVERAGE DAILY DEMAND (AADD)					**458.7 m^3/d**

							CURRENT CAPACITY	
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	458.7 m^3/day	19.1 m^3/hour	5.3 l/s		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	527.5 m^3/day	22.0 m^3/hour	6.1 l/s		
	3	Summer Gross Daily Demand (SGDD)	SPF*GAADD	791.3 m^3/day	33.0 m^3/hour	9.2 l/s		
	4	Instantanious Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		114.7 m^3/hour	31.9 l/s		
	5	Storage Capacity Elevated Storage	hours*IPD			458.7 m^3	**300.0 m^3**	**65%**
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD***LPS%**	247 mm dia	172.0 m^3/hour	47.8 l/s	**15.0 l/s**	**31%**
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD			917.4 m^3	**530.0 m3**	**58%**
	8	**Water Treatment Plant Capacity (WTPC)**	**SGDD*24/WTPH**	**1186.9 m3/day**	**49.5 m3/hour**	**13.7 l/s**	**14.0 l/s**	**102%**
	9	**Source Pump Station Capacity and Pipeline Flow**	**WTPC*(1+LFW)*24/SPS**	**174 mm dia**	**85.3 m3/hour**	**23.7 l/s**	**15.0 l/s**	**63%**
	10	Raw Water Storage Capacity	Days*SGDD			791.0 m^3	**75.0 m3**	**9%**

It is clear from the table that the existing infrastructure is already under pressure to handle the demand. The only element of the current water supply system that has the required capacity is the water treatment plant

3.3 Bulk Water Infrastructure Requirements

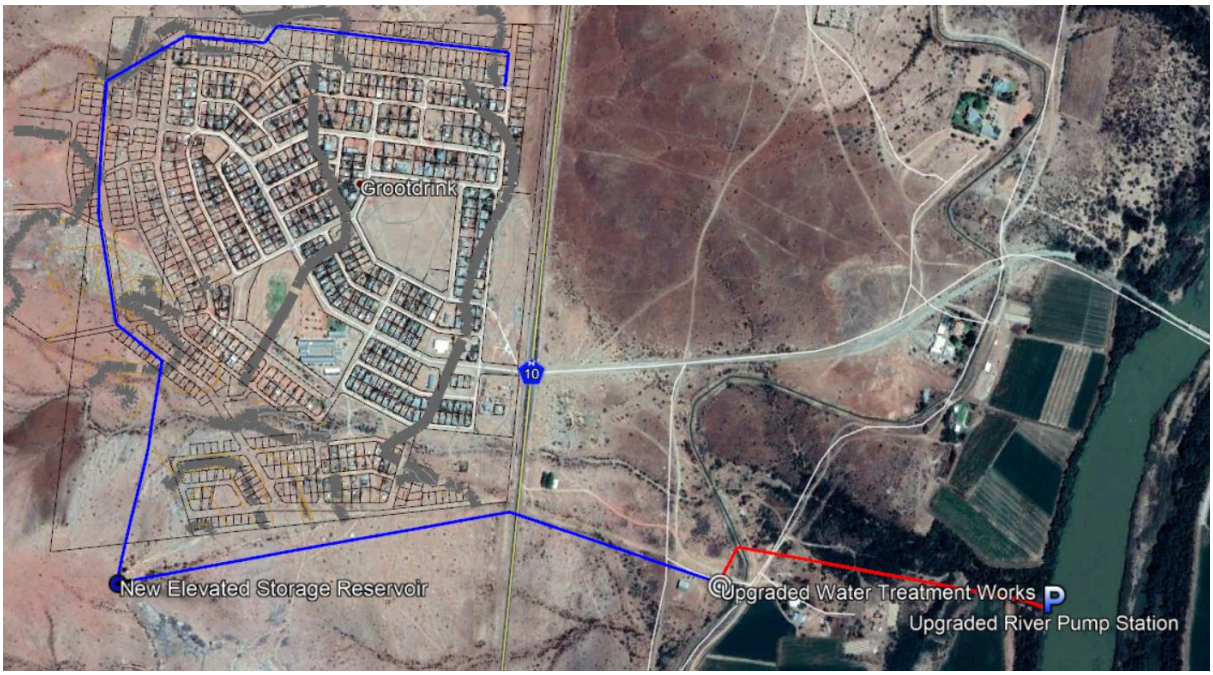
The table below compares the current infrastructure capacities with the capacity that is required for the 370 stands development. Cells highlighted in red would require upgrading in order to accommodate the expected demands.

		BULK AND CONNECTOR SERVICES CAPACITY CALCULATION : FUTURE				
	NO.	DESCRIPTION	UNITS		DEMAND PER UNIT	Criteria
GENERAL	1	Sub-Economical Houses (Existing)	702	Houses x	600 l/ household per day	421.2 m^3/d
	2	Sub-Economical Houses (135 houses development)	370	Houses x	600 l/ household per day	222 m^3/d
	4	Economical Houses (Existing)	0	Houses x	1200 l/ household per day	0 m^3/d
	5	Economical Houses (135 houses development)	0	Houses x	1200 l/ household per day	0 m^3/d
	7	Primary School Hostel	0	Learners	150 l/ Learner per day	0 m^3/d
	8	Schools	500	Learners	25 l/ Learner per day	12.5 m^3/d
	9	High School Hostel	0	Learners	150 l/ Learner per day	0 m^3/d
	10	High School	0	Learners	25 l/ Learner per day	0 m^3/d
	11	Clinics	0	m^2 x	500 l/100m^2 per day	0 m^3/d
	12	Businesses, Government and Municipal	0	m^2 x	400 l/100m^2 per day	0 m^3/d
	13	Developed Parks, Sportsgrounds and Day Cares	0.50	ha	5 mm water per day	25 m^3/d
		ANNUAL AVERAGE DAILY DEMAND (AADD)				**680.7 m^3/d**

THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	680.7 m^3/day	28.4 m^3/hour	7.9 l/s	CURRENT CAPACITY		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	782.8 m^3/day	32.6 m^3/hour	9.1 l/s			
	3	Summer Gross Daily Demand (SGDD)	SPF*GAADD	1174.2 m^3/day	48.9 m^3/hour	13.6 l/s			
	4	Instantanious Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		141.8 m^3/hour	39.4 l/s			
	5	**Storage Capacity Elevated Storage**	**hours*IPD**			**567.3 m^3**	**300.0 m^3**		**53%**
	6	**Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank**	**IPD*LPS%**	**274 mm dia**	**212.7 m^3/hour**	**59.1 l/s**	**15.0 l/s**		**25%**
	7	**Potable Water Storage Capacity (Main Storage)**	**hours*AADD**			**1361.4 m^3**	**530.0 m3**		**39%**
	8	**Water Treatment Plant Capacity (WTPC)**	**SGDD*24/WTPH**	**1761.3 m3/day**	**73.4 m3/hour**	**20.4 l/s**	**14.0 l/s**		**69%**
	9	**Source Pump Station Capacity and Pipeline Flow**	**WTPC*(1+LFW)*24/SPS**	**212 mm dia**	**126.6 m3/hour**	**35.2 l/s**	**15.0 l/s**		**43%**
	10	Raw Water Storage Capacity	Days*SGDD			8219.0 m^3	75.0 m3		1%

Recommended upgrades to the Grootdrink bulk water infrastructure are: (shown on the drawing below)

- Upgrading of the river pump station to a raft with a duty and standby pump that supply **35l/s.**
- An additional/new **200mm** diameter Class 6 PVC pipeline between the river pump station and the existing potable water storage reservoir.
- Upgraded Water Treatment Works capable of delivering **74m^3/h** on the existing treatment works site
- A new **830m^3** sectional steel reservoir next to the upgraded water treatment works
- A new **300m3** sectional steel pressure tower on the highest point to the north.
- A new **60l/s** uplifting pump station at the treatment works.
- A new **250mm** pipeline between the lifting pump station and the pressure tower.
- A new **200mm** pipeline through the planned extension to create a new ring network.



Fire Fighting Requirements

Areas to be protected by a fire service should be classified according to a fire-risk category. The new development can be classified as a “Low risk – Group 4” according to the “Guidelines for Human Settlement Planning and Design”.

No specific provision for fire fighting water is required in water storage, or reticulation mains in these areas. Hydrants should, however, be located at convenient points in the area on all mains of 75 mm nominal internal diameter and larger, and in the vicinity of all schools, commercial areas and public buildings.

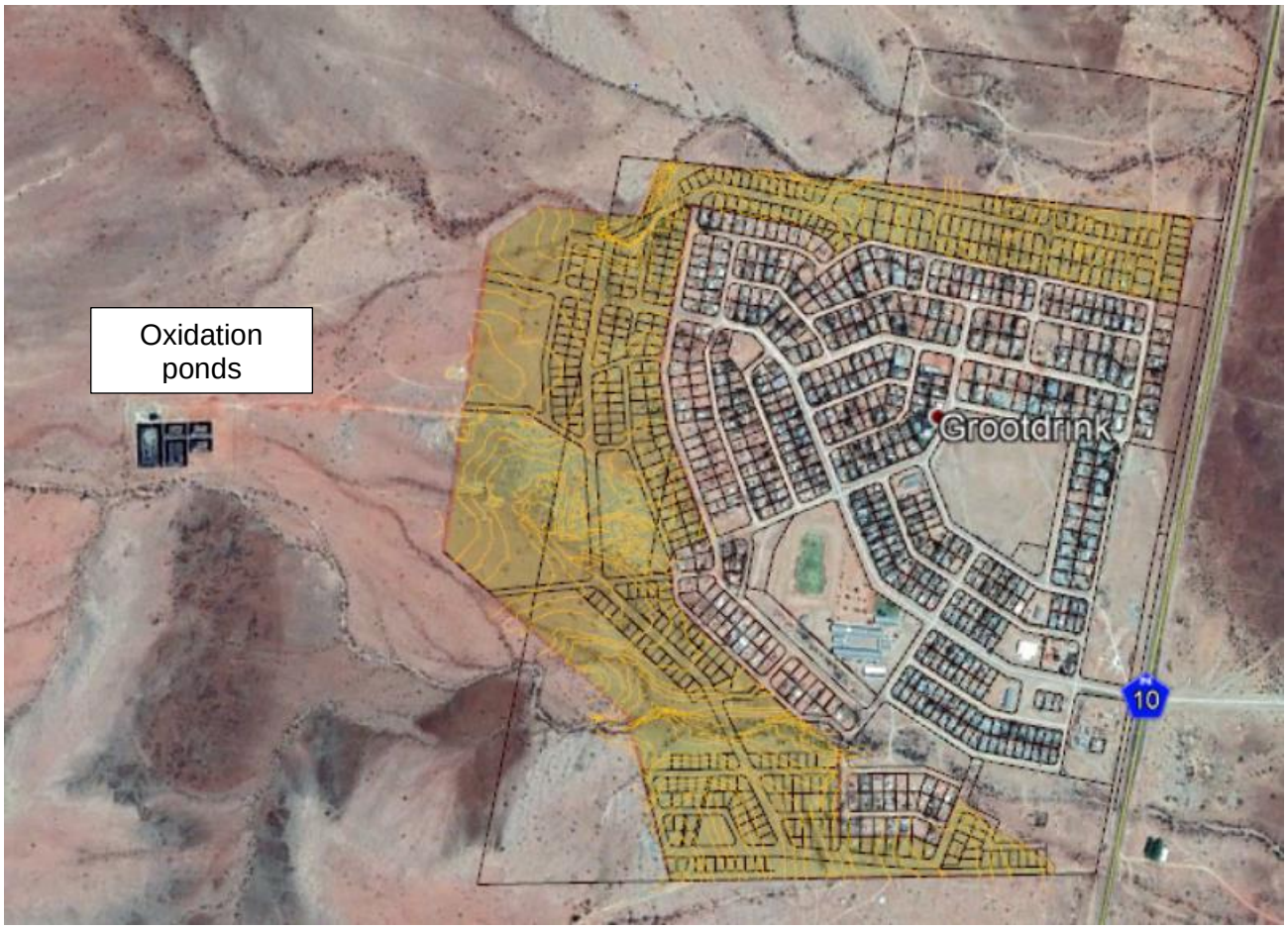
Fire fighting in areas zoned “Low-risk – Group 4” should generally be carried out using trailer-mounted water tanks or fire appliances that carry water, which can be replenished from the hydrants provided in the reticulation, if necessary.

4. SEWERAGE

4.1 Existing Sewage Infrastructure

Overview

Houses in the Grootdrink village is currently serviced by conservancy tanks or VIP toilets. There are presently no waterborne sewer systems. The conservancy tanks are currently emptied by a honey sucker truck and spilt in an oxidation pond system to the west of the village as shown on the Google image below.



Oxidation ponds

The layout of the oxidation ponds can be seen on the Google image below.

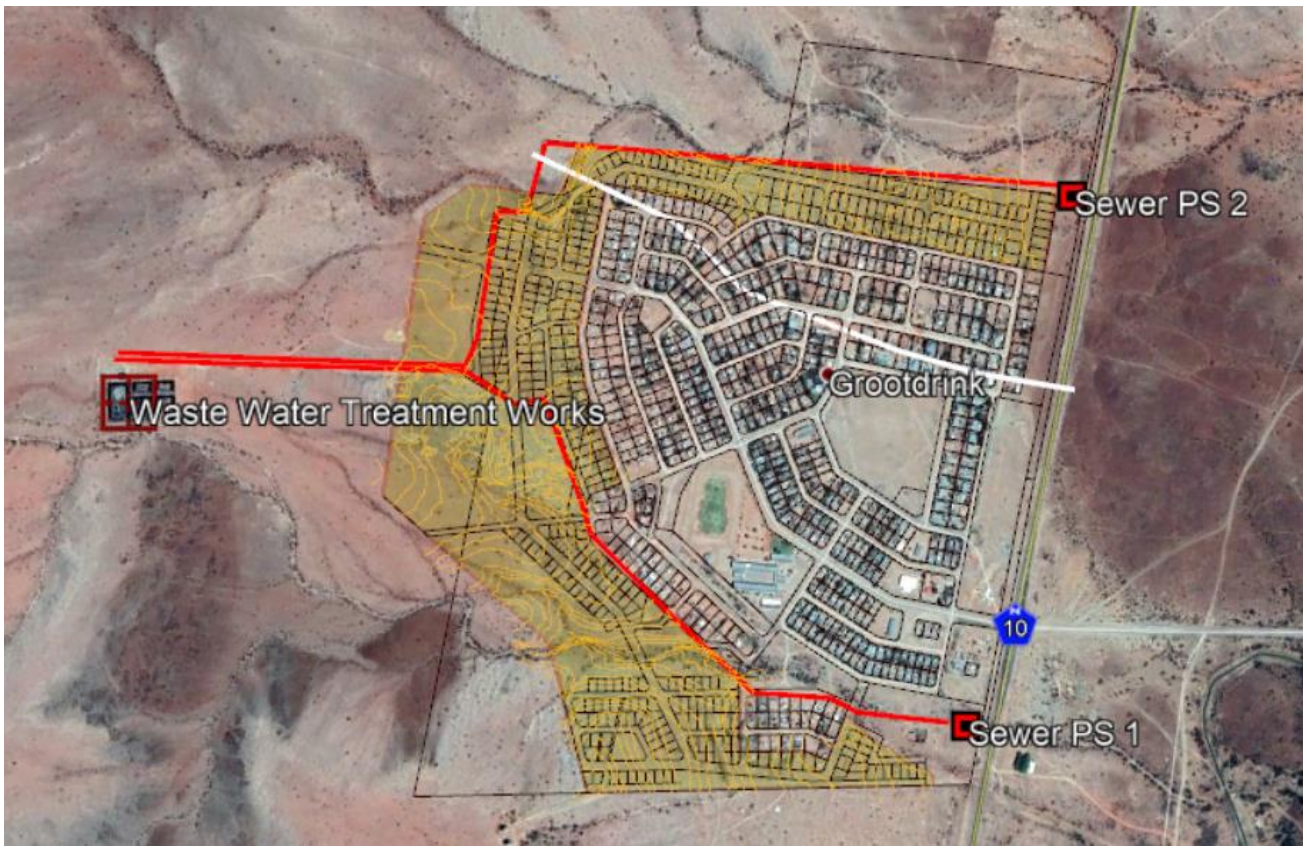
Photos below show the inlet-structure, and set of oxidation ponds.

Condition of the oxidation pond system

The condition of the oxidation ponds is poor. The concrete inlet and the concrete primary dams need attention. Portions of the HDPE lining of the secondary ponds were removed and needed to be replaced or repaired.

4.2 Bulk Sewer Infrastructure Requirements

If a full borne sewer sewerage system is required for the new 370 houses development, the associated bulk infrastructure will consist of two pump stations, rising main pipeline and oxidation ponds as shown on the Google image below.



The total sewer flow is calculated as follows:

GROOTDRINK TOTAL SEWER FLOW						
Sewer flow per day - Sub economical houses	1072	sub economical houses @	500	l/day	**536 000**	**l/day**
Sewer flow per day - Economical houses	0	economical houses @	750	l/day	**-**	**l/day**
Sewer flow per day - Hostels	0	persons @	140	l/day	**-**	**l/day**
Sewer flow per day - Schools	500	persons @	20	l/day	**10 000**	**l/day**
Businesses and State Institutions	0	buildings	100	l/day	**-**	**l/day**
SEWER FLOW PER DAY - TOTAL					**546 000**	**l/day**

The sizes and capacities of the proposed pump stations and rising mains were calculated as follows:

PUMP STATION No 1 AND RISING MAIN						
Sewer flow per day - Sub economical houses	860	sub economical houses @	500	l/day	**430000**	**l/day**
Sewer flow per day - Economical houses		economical houses @	750	l/day	**0**	**l/day**
Sewer flow per day - Hostels	0	persons @	140	l/day	**0**	**l/day**
Sewer flow per day - Schools	1000	persons @	20	l/day	**20000**	**l/day**
Businesses and State Institutions	0	buildings	100	l/day	**0**	**l/day**
SEWER FLOW PER DAY - TOTAL					**450000**	**l/day**
Average sewer flow					**5.2**	**l/s**
Factor for inflow from other sources	30%				**1.6**	**l/s**
Sewer flow with inflow from other sources					**6.8**	**l/s**
PEAK NETWORK SEWER FLOW	6.8		3.5		**23.7**	**l/s**
FLOWRATE FROM OTHER PUMP STATIONS					**0**	**l/s**
TOTAL PEAK FLOW					**23.70**	**l/s**
ACTUAL PUMP ABILITY	**1.63**	times peak flow			**38.6**	**l/s**
Theoretical pump station capacity for normal pump operation	1	hours of peak flow			**85**	**m^3**
Theoretical pump station capacity for emergency storage	4	hours of normal flow			**98**	**m^3**
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY					**183**	**m^3**
Pump details						**kW**
Rising main diameter					**265**	**mm**
Rising main material					**PVC**	
Rising main length					**1600**	**m**
Static pump height					**27**	**m**
Friction losses					**12**	**m**
Total pump height					**42**	**m**

PUMP STATION No 2 AND RISING MAIN						
Sewer flow per day - Sub economical houses	212	sub economical houses @	500	l/day	**106000**	**l/day**
Sewer flow per day - Economical houses	0	economical houses @	750	l/day	**0**	**l/day**
Sewer flow per day - Hostels	0	persons @	140	l/day	**0**	**l/day**
Sewer flow per day - Schools	0	persons @	20	l/day	**0**	**l/day**
Businesses and State Institutions	0	buildings	100	l/day	**0**	**l/day**
SEWER FLOW PER DAY - TOTAL					**106000**	**l/day**
Average sewer flow					**1.2**	**l/s**
Factor for inflow from other sources	30%				**0.4**	**l/s**
Sewer flow with inflow from other sources					**1.6**	**l/s**
PEAK NETWORK SEWER FLOW	1.6		3.5		**5.6**	**l/s**
FLOWRATE FROM OTHER PUMP STATIONS					**0**	**l/s**
TOTAL PEAK FLOW					**5.58**	**l/s**
ACTUAL PUMP ABILITY	**1.84**	times peak flow			**10.3**	**l/s**
Theoretical pump station capacity for normal pump operation	1	hours of peak flow			**20**	**m^3**
Theoretical pump station capacity for emergency storage	4	hours of normal flow			**23**	**m^3**
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY					**43**	**m^3**
Pump details						**kW**
Rising main diameter					**137**	**mm**
Rising main material					**PVC**	
Rising main length					**1800**	**m**
Static pump height					**27**	**m**
Friction losses					**12**	**m**
Total pump height					**39**	**m**

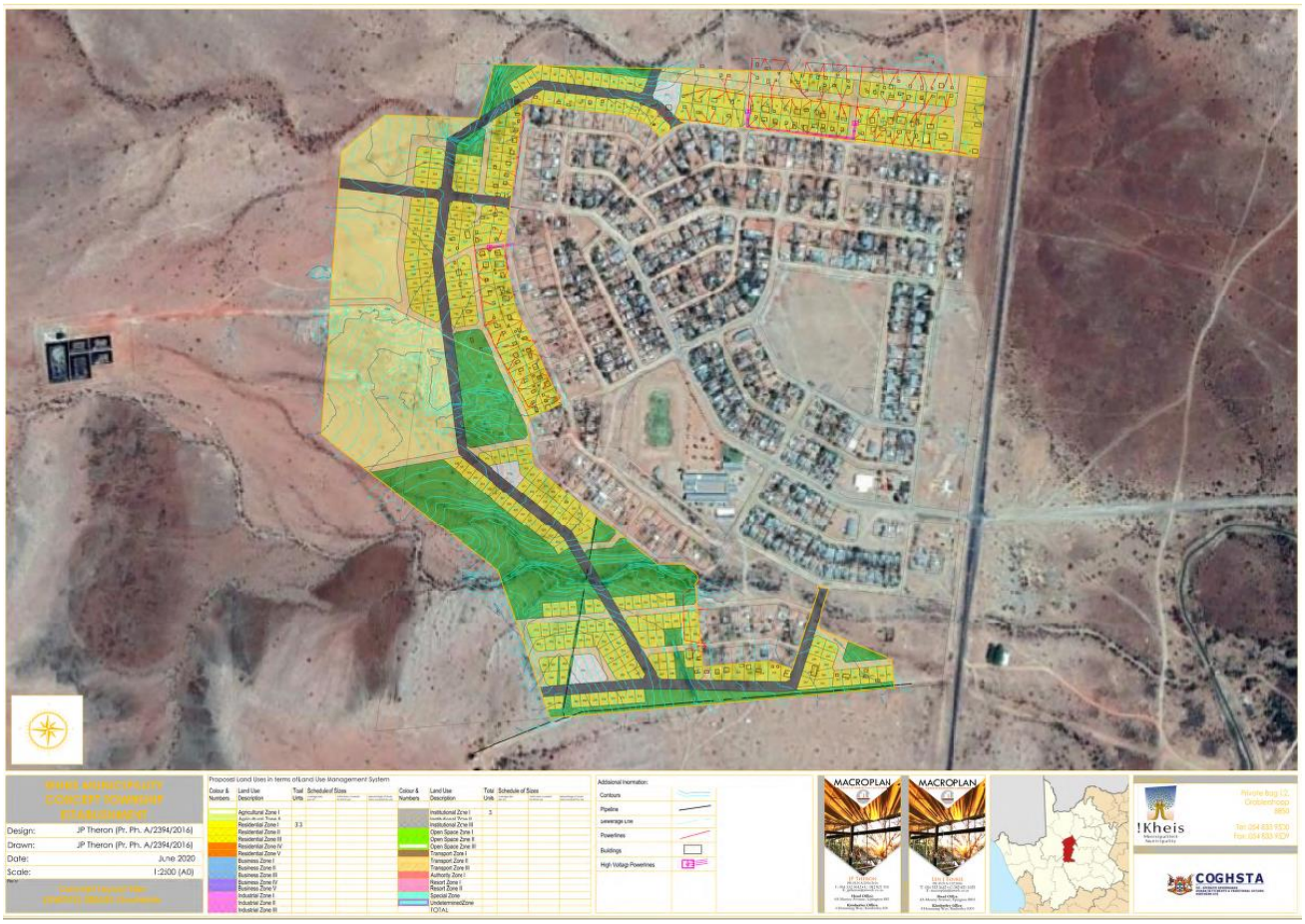
Recommended Grootdrink bulk sewer infrastructure construction (excluding internal sewer lines) are as follows (shown on the drawing above):

- Construction of two new sewer pump stations capable of delivering **50 l/s** direct to the Waste Water Treatment Plant.
- New **250mm** diameter and **160mm** diameter Class 6 PVC pipelines (1600m & 1800m) between the pump stations and a upgraded Waste Water Treatment Plant (oxidation ponds).
- Upgrading of the Waste Water Treatment Plant (oxidation ponds) to a capacity of **0.7Ml** per day.

5. ROADS AND STORMWATER

5.1 Roads and Access

Access to the development will be from the existing Residential Collector Streets (Class 4b), as shown on the drawing below:



No problems are foreseen regarding roads and access.

5.2 Stormwater Management

The guiding principle underlying the stormwater management strategy is that, where possible, the peak run-off from the post-developed site should not exceed that of the pre-developed site for the full range of storm return periods (1:2 to 1:50). Where possible, measures should be incorporated into the site development plan to attenuate the post-development flows to pre-development rates.

The stormwater network must be designed to accommodate (flood frequencies as prescribed by “The Red Book”) the minor storm event (1:5 year) in open channels or side drains of streets. The major storm (1:50 year) should be managed through controlled overland flows, above-ground attenuation storage (if required) and berms at the higher end of the site (if required). As no formal storm water

system exists in the area, the concentration of stormwater must be avoided as far as possible. Earthworks on plots should therefore encourage free drainage of the area.

Grootdrink is a small village that generally drains from the East. Existing roads will be adequate for this purpose.

6. SOLID WASTE

The solid waste site will be upgraded to accommodate the additional 370 erven.

7. ELECTRICAL SUPPLY

7.1 Electrical Demands and Availability

This section of the report covers the availability of the Bulk Electrical connection to the future 370 Community stands, an expected additional load of the proposed development will initially be 444 KVA as per INEP guidelines, and the accommodation of this load will form the basis of this report. The community of Grootdrink falls directly under “Eskom Distribution” and the existing electrified homes in the community purchase electricity directly from Eskom and not through !Kheis local Municipality.

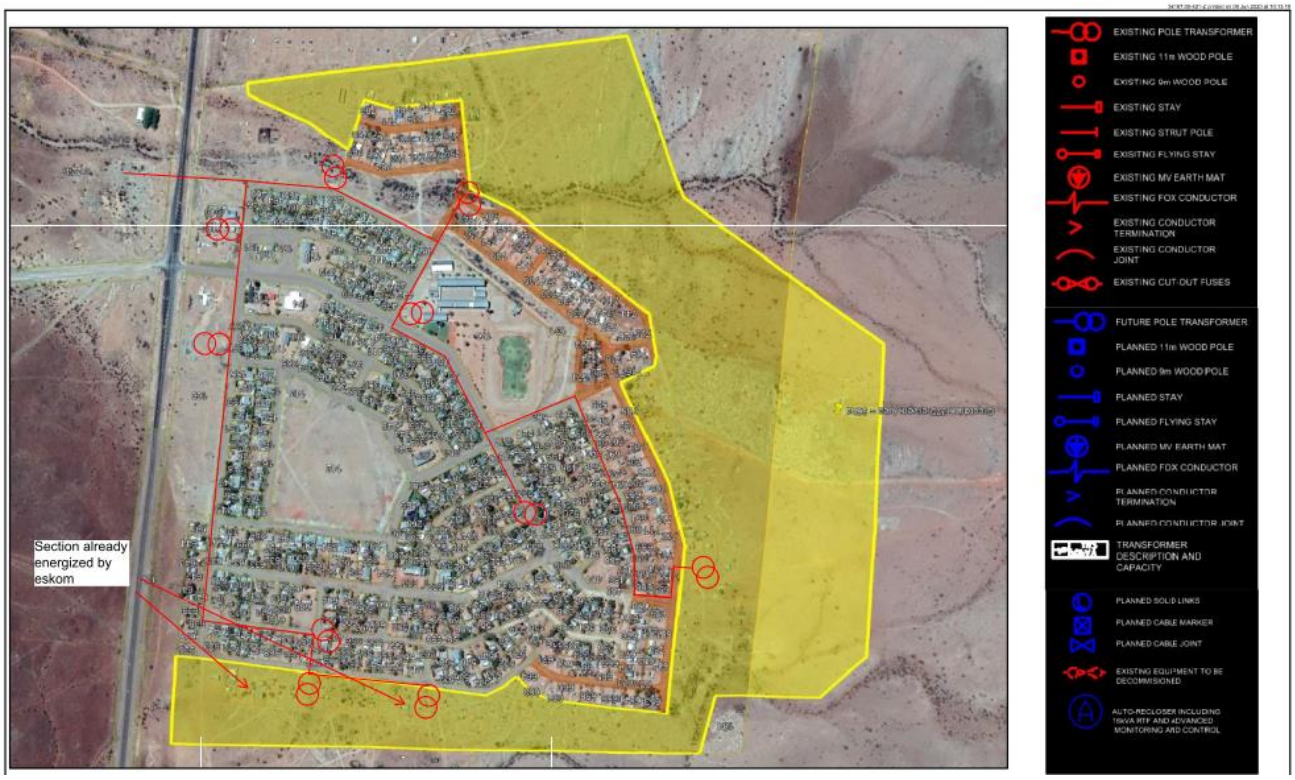
The bulk connection to the community/town is via a 22kV overhead line fed from the 10MVA Grobelershoop sub-station.

7.2 Existing Electrical Network

The bulk connection to the community/town is via a 22kV overhead line fed from the Eskom 10MVA Grobelershoop sub-station, this sub-station is currently in the process of being upgraded to 20MVA and will be commissioned in December 2020.

The existing MV electrical network in the Grootdrink area runs through the town via 22 KV overhead line feeders connecting to various pole-mounted transformers (see below). The existing overhead line feed is running through a section of the proposed development, and 35 informal homes have been electrified by Eskom.

The existing feeder can easily handle the future additional 444 kVA load only after the upgraded Eskom Groblershoop sub-station is brought online as indicated by Eskom’s network planning department.



7.3 Electrical Network Extension

The internal electrical network extension in the Grootdrink community will only be done by Eskom after the formulation processes are completed as this area falls under the Eskom Distribution

8. COST ESTIMATE

The cost estimate for the proposed activities is as provided below. The level of accuracy is commensurate with a concept level design.

DESCRIPTION			QUANTITY	QUANTITY UNIT	AMOUNT TO REPAIR OF EXISTING INFRASTRUCTURE	AMOUNT NEW INFRASTRUCTURE	TOTAL
Water Bulk Services							
Source pump station - Raft						300 000	300 000
Source pump station - Civil Works			35.0	l/s		875 000	875 000
Source pump station - Mechanical			35.0	l/s		945 000	945 000
Source pump station - Canal			-	l/s		-	-
Pump line from source to raw water storage reservoir	200	mm dia	750.0	m		990 754	990 754
Raw water storage - Concrete dam			-	m3		-	-
Raw water storage - HDPE lined dam			-	m3		-	-
Water Treatment Works			0.8	Ml/day	500 000	5 520 000	6 020 000
Potable Water Storage - Sectional Steel Tank			830.0	m3		2 075 000	2 075 000
Potable Water Storage - Concrete			-	m3		-	-
Potable Water Storage - HDPE lined dam with floating roof			-	m3		-	-
Potable water pump station - Building			-	sq.m		-	-
Potable water pump station - Mechanical			60.0	l/s		1 620 000	1 620 000
Pump line from storage reservoir to Pressure Tower	250	mm dia	1 200.0	m		1 823 421	1 823 421
Elevated Starage Tower - Sectional Steel			300.0	m3		1 200 000	1 200 000
Elevated Starage Tower - Concrete			-	m3		-	-
Main gravity line from elevated reservoir to the distribution network	200	mm dia	2 000.0	m		2 642 010	2 642 010
						-	-
Sub-Total (Water)					**500 000**	**17 991 184**	**18 491 184**
Bulk Sewer Services							
Sewer Pump Station No 1 - Civil/Structural			183.0	m3		1 464 000	1 464 000
Sewer Pump Station No 1 - Mechanical/Electrical/Control			183.0	m3		329 400	329 400
Pump Line from Sewer Pump Station No 1 to Treatment Works	250	mm dia	1 630.0	m		2 476 813	2 476 813
Sewer Pump Station No 1 - Civil/Structural			43.0	m3		344 000	344 000
Sewer Pump Station No 1 - Mechanical/Electrical/Control			43.0	m3		77 400	77 400
Pump Line from Sewer Pump Station No 2 to Treatment Works	140	mm dia	1 820.0	m		2 032 424	2 032 424
Treatment Works Oxidation Ponds			250.0	kl/day	2 000 000	6 250 000	8 250 000
Sub-Total (Sewer)					**2 000 000**	**12 974 038**	**14 974 038**
Roads and Access							
None						-	
Electrical							
None							
TOTAL CONSTRUCTION					**2 500 000**	**30 965 222**	**33 465 222**
10% Contingencies					250 000	3 096 522	3 346 522
SUB TOTAL					**2 750 000**	**34 061 744**	**36 811 744**
10% Professional fees					275 000	3 406 174	3 681 174
SUB-TOTAL					**3 025 000**	**37 467 919**	**40 492 919**
15% VAT					453 750	5 620 188	6 073 938
GRAND TOTAL					**3 753 750**	**46 494 281**	**50 248 031**

Notes:

1) The base date of the calculations is October 2020;
2) No provision was made for EIA, registration and/or land acquisition;
3) No allowance was made for institutional and/or social development.

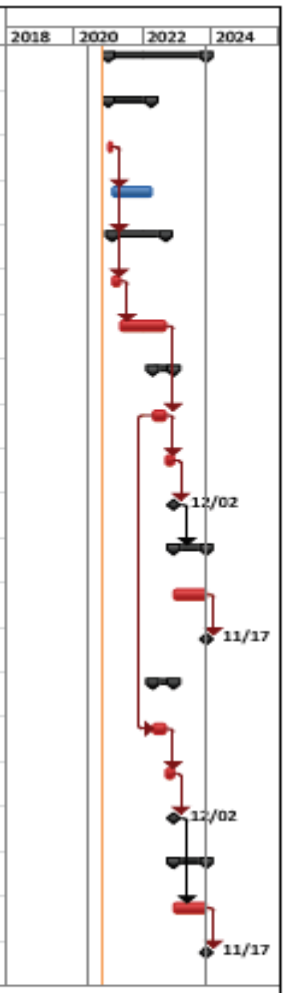
8.1 Funding

Funding can be applied for through the Municipal Infrastructure Grant (MIG) and Regional Bulk Infrastructure Grant (RBIG). For repair work at the water treatment works, the Water and Sanitation Infrastructure Grant (WSIG) can also be applied for.

This report can be used for funding application from the various schemes available.

9. PROJECT TIMELINE

ID	Task Mode	Task Name	Duration	Start	Finish
1		BULK INFRASTRUCTURE TIMELINE	750 days	Mon 21/01/0	Fri 23/11/17
2		APPLICATION FOR FUNDS	330 days	Mon 21/01/0	Fri 22/04/08
3		Application for RBIG & Mig funding	30 days	Mon 21/01/04	Fri 21/02/12
4		Approval of feasibility study & readyness re	300 days	Mon 21/02/15	Fri 22/04/08
5		EIA PROCESS	410 days	Mon 21/02/1!	Fri 22/09/09
6		Appointment of EIA Specialist	60 days	Mon 21/02/15	Fri 21/05/07
7		EIA study	350 days	Mon 21/05/1(	Fri 22/09/09
8		DESIGN, DOCUMENTATION AND PROCUREMENT BULK SERVICES	160 days	Mon 22/04/25	Fri 22/12/02
9		Design and documentation	100 days	Mon 22/04/2!	Fri 22/09/09
10		Procurement	60 days	Mon 22/09/1:	Fri 22/12/02
11		Contractor appointed	0 days	Fri 22/12/02	Fri 22/12/02
12		CONSTRUCTION	250 days	Mon 22/12/0!	Fri 23/11/17
13		Construction period	250 days	Mon 22/12/05	Fri 23/11/17
14		Construction completed	0 days	Fri 23/11/17	Fri 23/11/17
15		DESIGN, DOCUMENTATION AND PROCUREMENT INTERNAL SERVICES	160 days	Mon 22/04/25	Fri 22/12/02
16		Design and documentation	100 days	Mon 22/04/25	Fri 22/09/09
17		Procurement	60 days	Mon 22/09/12	Fri 22/12/02
18		Contractor appointed	0 days	Fri 22/12/02	Fri 22/12/02
19		CONSTRUCTION	250 days	Mon 22/12/05	Fri 23/11/17
20		Construction period	250 days	Mon 22/12/05	Fri 23/11/17
21		Construction completed	0 days	Fri 23/11/17	Fri 23/11/17



Project: 34167 - Grootdrink Devel
Date: Fri 20/10/23

Task		Manual Task	
Split		Duration-only	
Milestone		Manual Summary Rollup	
Summary		Manual Summary	
Project Summary		Start-only	
External Tasks		Finish-only	
External Milestone		Deadline	
Inactive Task		Critical	
Inactive Milestone		Critical Split	
Inactive Summary		Progress	

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10. CONCLUSION

The findings of this report are:

- That the current sewer and water bulk infrastructure is not in good condition and do not have the capacity to serves the town in its current form according to norms and standards.
- That the water and sewer infrastructure needs to be upgraded to a level that it can provide bulk services to the current residential area that currently is lacking behind as well as to serve the new 370 housing development
- That around **R50m** is needed for this purpose that must be secured from programs that funds this type of bulk infrastructure The seven !Kheis projects need to be prioritised.
- That these bulk services reports can be used for initial funding motivation, technical reports and program-specific business plans also need to be completed.
- That the process will take about two years from the point where funds is approved to where the bulk services are in place.
- That EIA's (low-cost activities) needs to get started as soon as possible to ensure that there are no hold-ups when funding is available.