GROBLERSHOOP 1500 HOUSING DEVELOPMENT

Engineering Services Investigation Report

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

OCTBER 2020

Prepared for:
MACROPLAN

Attention: Mr Len Fourie

Prepared by:
BVi Northern Cape (Pty) Ltd
55 Bult Street,
Upington, 8801

Contact persons: Mr Niël Maritz (Civil)
& Mr Ricardo Humphries (Electrical)

Tel: 054 337 6600
Cell No: 078 824 5253 (R. Humphries)
082 783 5951 (N. Maritz)
Email: ricardoh@bvinc.co.za
nielm@bvinc.co.za

bvi ENGINEERING PROCUREMENT MANAGEMENT

DOCUMENT CONTROL RECORD

Project Name:	**Groblershoop 1500 Stands – Engineering Services Investigation Report**
Project Number:	34167 – GROBLERSHOOP
Report for:	MACROPLAN

REVISIONS:

Rev #	Date	Revision Details/Status	Prepared by / Author	Reviewed / Approved by
04	2020/10/23	Draft report to be circulated to relevant parties.	F.D. MARITZ	F.D. Maritz (Pr.Eng)

APPROVAL:

Author signature		Approver signature	

EXECUTIVE SUMMARY

This report was compiled to investigate the bulk infrastructure serving the Groblershoop town and to determine whether the bulk infrastructure is adequate for the development of an additional 1500 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 sufficient to accommodate the current infrastructure in Groblershoop. However, some bulk infrastructure components (e.g. pump motors, clearwater sump, etc.) shall require replacement/upgrade as part of existing bulk infrastructure.

The extent of the upgrading of the bulk services, to accommodate the Groblershoop 1500 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 1500 houses will require an additional 50% of the demand related to the existing 1346 houses.

- **Bulk Sewer Infrastructure**

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

- **Bulk Electrical Infrastructure**

  The 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 Groblershoop, as well as the 1500 additional houses are:

DESCRIPTION	AMOUNT TO REPAIR OF EXISTING INFRASTRUCTURE	AMOUNT NEW/UPGRADED INFRASTRUCTURE	TOTAL BULK INFRASTRUCTURE
Water Bulk Services	R 3 000 000.00	R 44 216 381.10	R 47 216 381.10
Bulk Sewer Services	R 2 000 000.00	R 18 204 043.97	R 20 204 043.97
Roads and Access	R -	R -	R -
Electrical	R -	R -	R -
TOTAL CONSTRUCTION	**R 5 000 000.00**	**R 62 420 425.07**	**R 67 420 425.07**
10% Contingencies	R 500 000.00	R 6 242 042.51	R 6 742 042.51
SUB TOTAL	**R 5 500 000.00**	**R 68 662 467.58**	**R 74 162 467.58**
10% Professional fees	R 550 000.00	R 6 866 246.76	R 7 416 246.76
SUB-TOTAL	**R 6 050 000.00**	**R 75 528 714.34**	**R 81 578 714.34**
15% VAT	R 907 500.00	R 11 329 307.15	R 12 236 807.15
GRAND TOTAL	**R 6 957 500.00**	**R 86 858 021.49**	**R 93 815 521.49**

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

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Disclaimer

This is a draft report and only outlines some of the findings of the investigation to date and should not be used as the final or complete report. No recommendations or conclusions have been made, and some portions of the report may be incomplete as the investigation is still in process.

1.2 Terms of Reference

BVI Consulting Engineers was appointed by Macroplan to undertake this Bulk Engineering Services Study (Water, Sewer, Electricity and Roads & Storm Water) for the proposed Groblershoop 1500 housing project. Groblershoop 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 at Groblershoop Town on the N10 some 115km to the south-east of Upington, in the Northern Cape (Figure 1 – Locality Plan).

II. The development is located at the following coordinates: 28°54'27.00"S; 21°59'40.00"E

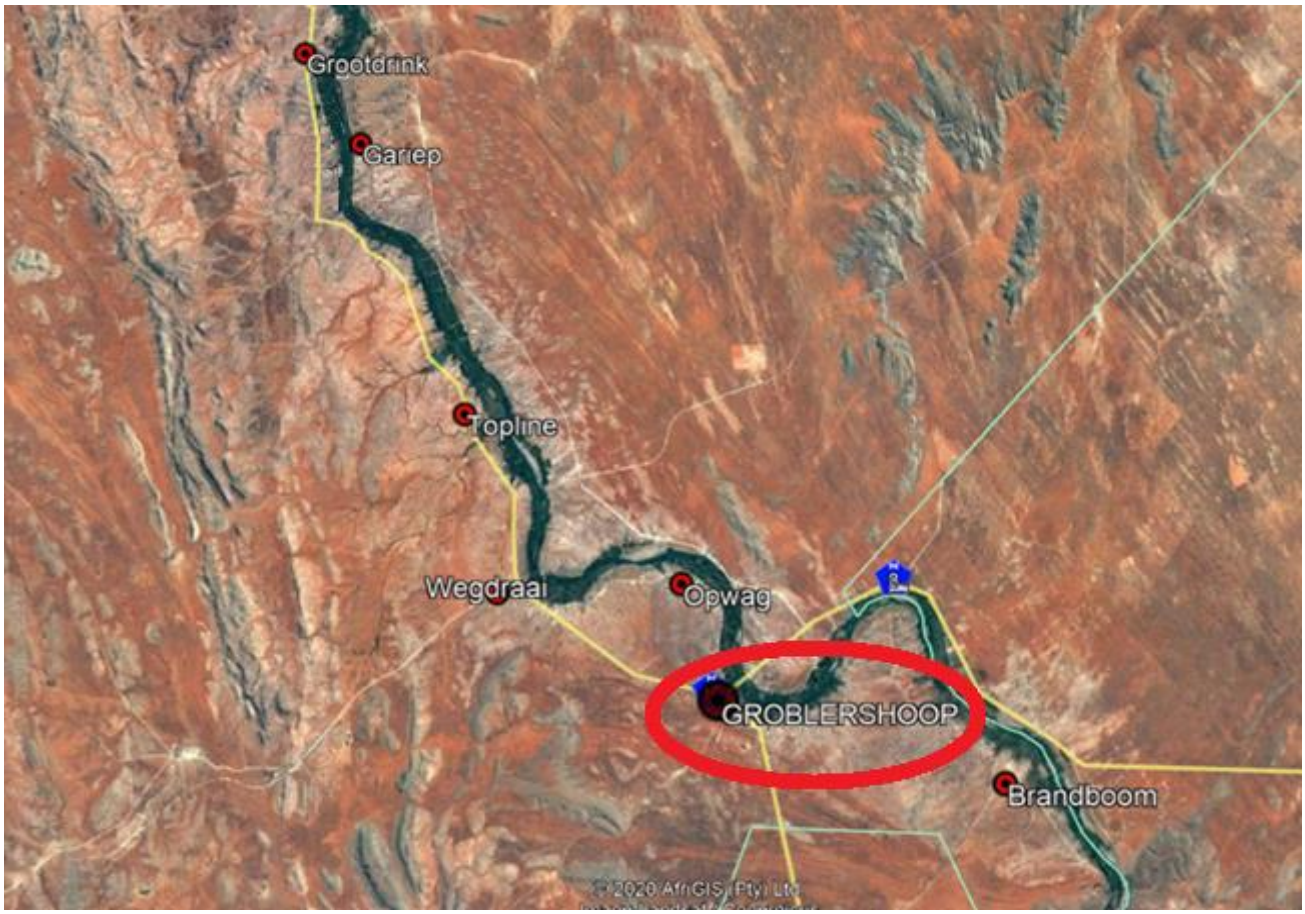


Figure 1: Groblershoop 1500 Housing Development Locality Plan

III. The planned development consists of 1500 low-cost houses next to the existing town village (ref. Figure 2: 1500 Stands Development Area)

Figure 2: Groblershoop 1500 Housing Development Locality Plan

IV. 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.

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

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

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 from the middle of the new development.
- Calcrete is close to the surface of the natural ground level, which makes excavations very hard.

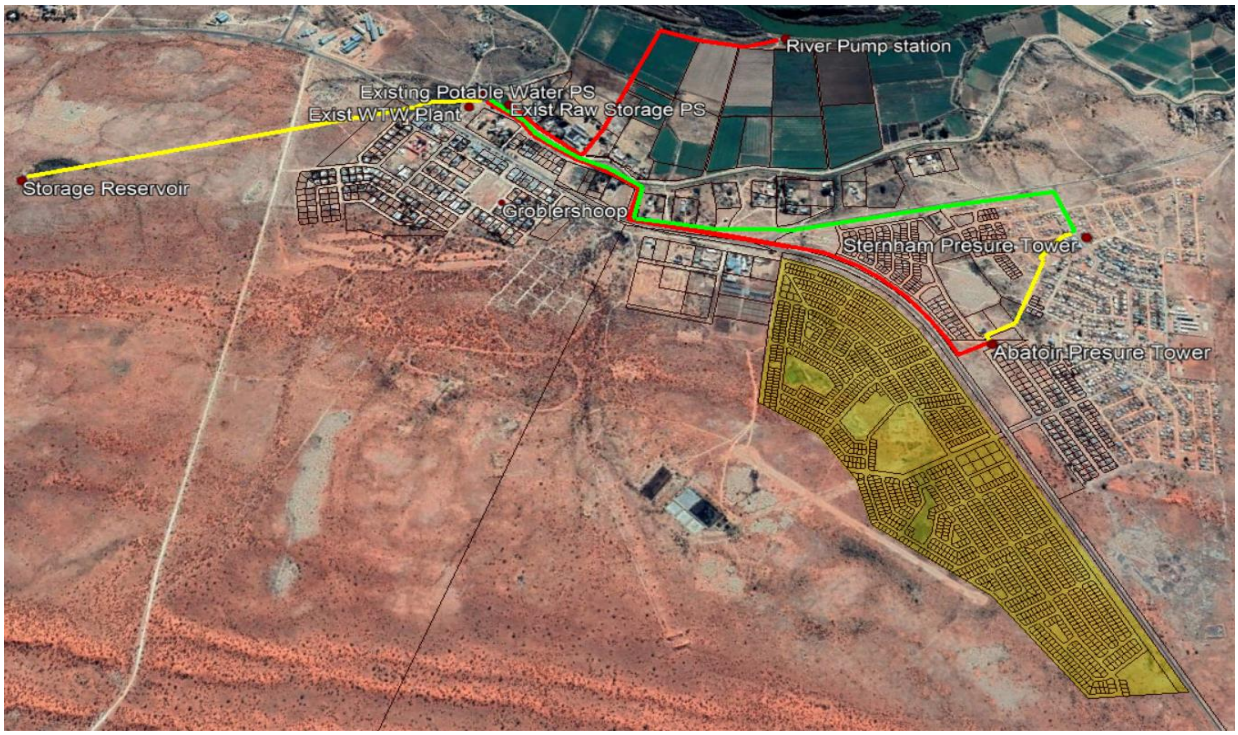
3. WATER SUPPLY

3.1 Existing Water Infrastructure

Overview

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

- A raw water river pump station delivering 6l/s;
- A 1,660m long, 160mm diameter PVC Class 6 raw water supply line between the river and the water purification works on the side of the village
- The water treatment works consisting of:
  - An open raw water storage dam
  - Raw water pump station
  - A package type water treatment plant (1200 m3/day),
  - An RC Concrete Clearwater storage tank
  - A Clearwater Pump station to:
    - 1.2ML RC Storage Reservoirs (Old Town)
    - 0.8ML Sternham Sectional steel reservoir (incl. High lift Pump station & Elevated Tank)
    - 55kL Wit Blok & Abattoir Elevated Tank
- 130kL Sternham Elevated Tank with High lift pump station
- 55kL Wit Blok & Abattoir Elevated Tank
- Distribution into the village



Raw Water Supply

Water supplied to Groblershoop is extracted from Orange River by means of a mobile pump station fitted on a trailer with the switchgear fitted to the trailer. The pump station consists of one pump that delivers 6l/s. The suction point is under the 1:10 year flood because of a sandbank on the northern side of the river.

Raw water is pumped from the river pump station to the purification plant, delivering a maximum flow rate of 6l/s through a 1,660m long, 160mm diameter Class 6 PVC pipeline to a 1,200 m^3 raw water storage dam next to the Package Plant Water Treatment Works in the village. The raw water pumps deliver the raw water from raw water storage reservoir to the Package Plant Water Treatment Works.

Water Treatment Plant & Clear Water Storage Pump station

The images below show the site layout where the treatment works, clear water pump station and clear water sump is located. The Package Plant Water Treatment Works (WTW) was constructed in 2008 to supply water at a rate of 28 l/s (100.8 m3/h).






Water is pumped from the raw water storage dam through the Water Treatment Plant to a **150 m^3 RC concrete clear water sump** situated beneath the Potable Water Pump stations. From there, it is pumped via the Old Town, Sternham and Abattoir/Wit Blok clear water pump stations to the following storage reservoirs from where it feeds into the village gravitational network :

- 1.2ML RC Storage Reservoirs (Old Town)
- 0.8ML Sternham Sectional steel reservoir (incl. High lift Pump station & Elevated Tank)
- 130kL Sternham Elevated Tank with High lift pump station
- 55kL Wit Blok & Abattoir Elevated Tank

The photos below shows the Old Town, Sternham and Abattoir/Wit Blok potable water pump stations:

Potable Water Storage Reservoirs

The potable water pump station pumps potable water to the following:

- 1.2ML RC Storage Reservoirs (Old Town)
- 0.8ML Sternham Sectional steel reservoir (incl. High lift Pump station & 130kL Elevated Tank)
- 55kL Wit Blok & Abattoir Elevated Tank

Photo's below shows the potable water storage reservoirs and elevated tanks for Old Town, Sternham and Abattoir/Wit Blok:

Reticulation System

The potable water is delivered from the 1.2ML Old town potable storage reservoirs into the old town reticulation network via a 160mm diameter uPVC Class 6 pipeline.

The Sternham high lift pump station pumps the potable water from the sectional steel Sternham potable water 0.8ML reservoir to the Sternham 130kL elevated storage tank. From there the water is delivered into the reticulation network via a 200mm diameter uPVC Class 6 pipeline.

The remaining potable water is delivered from the 0.55kL Abattoir/Wit Blok elevated storage tank into the Abattoir/Wit Blok reticulation network via a 110mm diameter uPVC Class 6 pipeline.

The reticulation network is shown in the images 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. The Strenham elevated tank is not functional, and water is distributed to the village from the sectional steel reservoir that stores potable water. Most of the existing pumps and motors are outdated, along with water meters and pressure gauges that are out of service.

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)		8	
OPERATING HOURS	1	Source Pump Station (SPSH)	(Maximum operating hours per day that required volume of w	16	hours
	2	Water purification plant (WTPH)	(Maximum operating hours per day that required volume of w	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 on the next page 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)	1346	Houses x	600 l/ household per day	807.6 m^3/d
	2	Sub-Economical Houses (135 houses development)	0	Houses x	600 l/ household per day	0 m^3/d
	3	Economical Houses (Existing)	202	Houses x	1000 l/ household per day	202 m^3/d
	4	Economical Houses (135 houses development)	0	Houses x	1200 l/ household per day	0 m^3/d
	5	Primary School Hostel	80	Learners x	150 l/ Learner per day	12 m^3/d
	6	Primary Schools	350	Learners x	25 l/ Learner per day	8.75 m^3/d
	7	High School Hostel	120	Learners x	150 l/ Learner per day	18 m^3/d
	8	High School	670	Learners x	25 l/ Learner per day	16.75 m^3/d
	9	Clinics	1600	m^2 x	500 l/100m^2 per day	8 m^3/d
	10	Businesses, Government and Municipal	4800	m^2 x	400 l/100m^2 per day	19.2 m^3/d
	11	Abbatoirs	350	Carcass	70 l/carcass per day	24.5 m^3/d
	12	Developed Parks, Sportsgrounds and Day Cares	0.20	ha	5 mm water per day	10 m^3/d
		ANNUAL AVERAGE DAILY DEMAND (AADD)				**1127 m^3/d**

							CURRENT CAPACITY	
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	1126.8 m^3/day	47.0 m^3/hour	13.0 l/s		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	1295.8 m^3/day	54.0 m^3/hour	15.0 l/s		
	3	**Summer Gross Daily Demand (SGDD)**	**SPF*GAADD**	**1943.7 m^3/day**	**81.0 m^3/hour**	**22.5 l/s**		
	4	Instantanious Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		375.6 m^3/hour	104.3 l/s		
	5	Storage Capacity Elevated Storage	hours*IPD			1502.4 m^3	10.0 m^3	1%
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD***LPS%**	446 mm dia	563.4 m^3/hour	156.5 l/s	10.0 l/s	6%
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD			2253.6 m^3	116.0 m3	5%
	8	**Water Treatment Plant Capacity (WTPC)**	**SGDD*24/WTPH**	**1943.7 m3/day**	**81.0 m3/hour**	**22.5 l/s**	**1.7 l/s**	**8%**
	9	**Source Pump Station Capacity and Pipeline Flow**	**WTPC*(1+LFW)*24**	**222 mm dia**	**139.7 m3/hour**	**38.8 l/s**	**6.0 l/s**	**15%**
	10	Raw Water Storage Capacity	Days*SGDD			1944.0 m^3	60.0 m3	3%

It is clear from the table that the existing infrastructure is already under pressure to handle the demand. The existing Water Treatment Plant is **under capacity with 1,700m3/day**. The river abstraction pump line requires an upgrade from 160mm dia. uPVC to **250mm dia. uPVC rising main**, including new proposed **river raft pump station**.

The biggest problems are with bulk and elevated storage, along with the insufficient small capacity **150m3 clear water sump**. The existing potable water pump station requires refurbishment and **replacement of existing old potable water pumps and motors** for the Sternham and Abattoir/Wit Blok elevated storage tanks supply.

3.3 Bulk Water Infrastructure Requirements

The table below compares the current infrastructure capacities with the capacity that is required for the 1500 stands development. Cells highlighted in red would require upgrading in order to accommodate the expected demands.

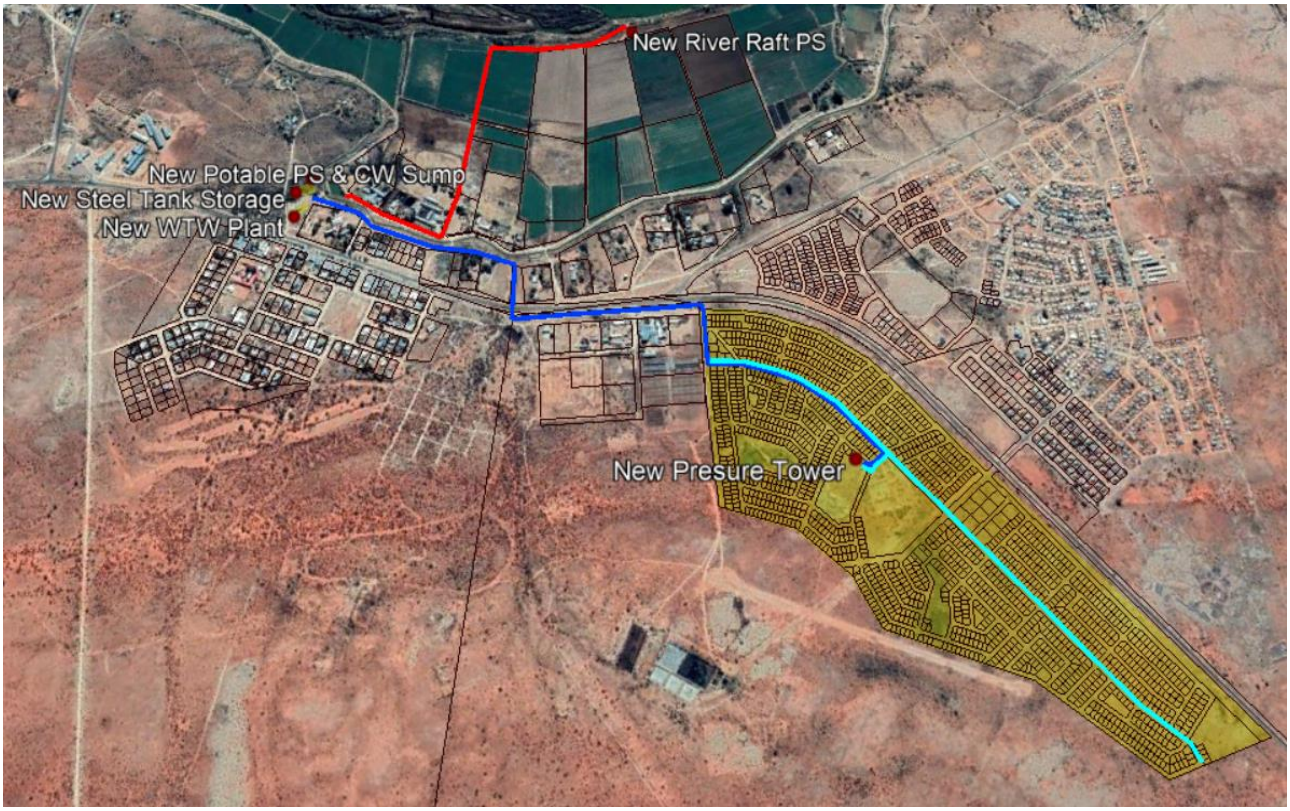
	BULK AND CONNECTOR SERVICES CAPACITY CALCULATION : CURRENT					
	NO.	DESCRIPTION	UNITS		DEMAND PER UNIT	Criteria
GENERAL	1	Sub-Economical Houses (Existing)	1346	Houses x	600 l/ household per day	807.6 m^3/d
	2	Sub-Economical Houses (135 houses development)	1500	Houses x	600 l/ household per day	900 m^3/d
	3	Economical Houses (Existing)	202	Houses x	1000 l/ household per day	202 m^3/d
	4	Economical Houses (135 houses development)	0	Houses x	1200 l/ household per day	0 m^3/d
	5	Primary School Hostel	80	Learners x	150 l/ Learner per day	12 m^3/d
	6	Primary Schools	350	Learners x	25 l/ Learner per day	8.75 m^3/d
	7	High School Hostel	120	Learners x	150 l/ Learner per day	18 m^3/d
	8	High School	670	Learners x	25 l/ Learner per day	16.75 m^3/d
	9	Clinics	1600	m^2 x	500 l/100m^2 per day	8 m^3/d
	10	Businesses, Government and Municipal	4800	m^2 x	400 l/100m^2 per day	19.2 m^3/d
	11	Abbatoirs	350	Carcass	70 l/carcass per day	24.5 m^3/d
	12	Developed Parks, Sportsgrounds and Day Cares	0.20	ha	5 mm water per day	10 m^3/d
		ANNUAL AVERAGE DAILY DEMAND (AADD)				**2027 m^3/d**

									CURRENT CAPACITY	
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	2026.8	m^3/day	84.5	m^3/hour	23.5 l/s		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	2330.8	m^3/day	97.1	m^3/hour	27.0 l/s		
	3	**Summer Gross Daily Demand (SGDD)**	**SPF*GAADD**	**3496.2**	**m^3/day**	**145.7**	**m^3/hour**	**40.5 l/s**		
	4	Instantanious Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR			675.6	m^3/hour	187.7 l/s		
	5	Storage Capacity Elevated Storage	hours*IPD					2702.4 m^3	10.0 m^3	0%
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD***LPS%**	599	mm dia	1013.4	m^3/hour	281.5 l/s	10.0 l/s	4%
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD					4053.6 m^3	116.0 m3	3%
	8	**Water Treatment Plant Capacity (WTPC)**	**SGDD*24/WTPH**	**3496.2**	**m3/day**	**145.7**	**m3/hour**	**40.5 l/s**	**1.7 l/s**	**4%**
	9	**Source Pump Station Capacity and Pipeline Flow**	**WTPC*(1+LFW)*24**	**298**	**mm dia**	**251.3**	**m3/hour**	**69.8 l/s**	**6.0 l/s**	**9%**
	10	Raw Water Storage Capacity	Days*SGDD					3496.0 m^3	60.0 m3	2%

The above indicates additional WTW plant requirement of 1552 m3/day for the planned new 1500 erven, in addition to the existing daily requirement of 1944 m3/day for a total future **3496m3/day daily summer peak WTW Plant** requirement.

Recommended upgrades to the Groblershoop bulk water infrastructure are as follows (shown on the drawing below):

- New river pump station to a raft with a duty and standby pump that supply **70l/s.**
- An additional/new **300mm** diameter Class 6 PVC pipeline between the river pump station and the existing potable water storage reservoir.
- Upgraded WTW Plant to **3496m^3/d** daily summer peak capable of delivering **146m^3/h** on the existing treatment works site.
- Upgrade exiting old potable water storage concrete reservoir with floating roof cover for additional **1830m^3** clear water storage next to the upgraded water treatment works.
- A new **1800m3** sectional steel storage reservoir next to the existing potable water pump station.
- A new **78l/s** uplifting pump station at the treatment works.
- A new **315mm** pipeline 3,500m long at 78L/s to new sectional steel pressure tower.
- A new **750m3** sectional steel pressure tower on highest point of planned 1500 development.
- A new **250mm** pipeline through the planned 1500 development to create a new ring network.
- Refurbish existing raw water and potable water pumps & motors.



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 firefighting 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.

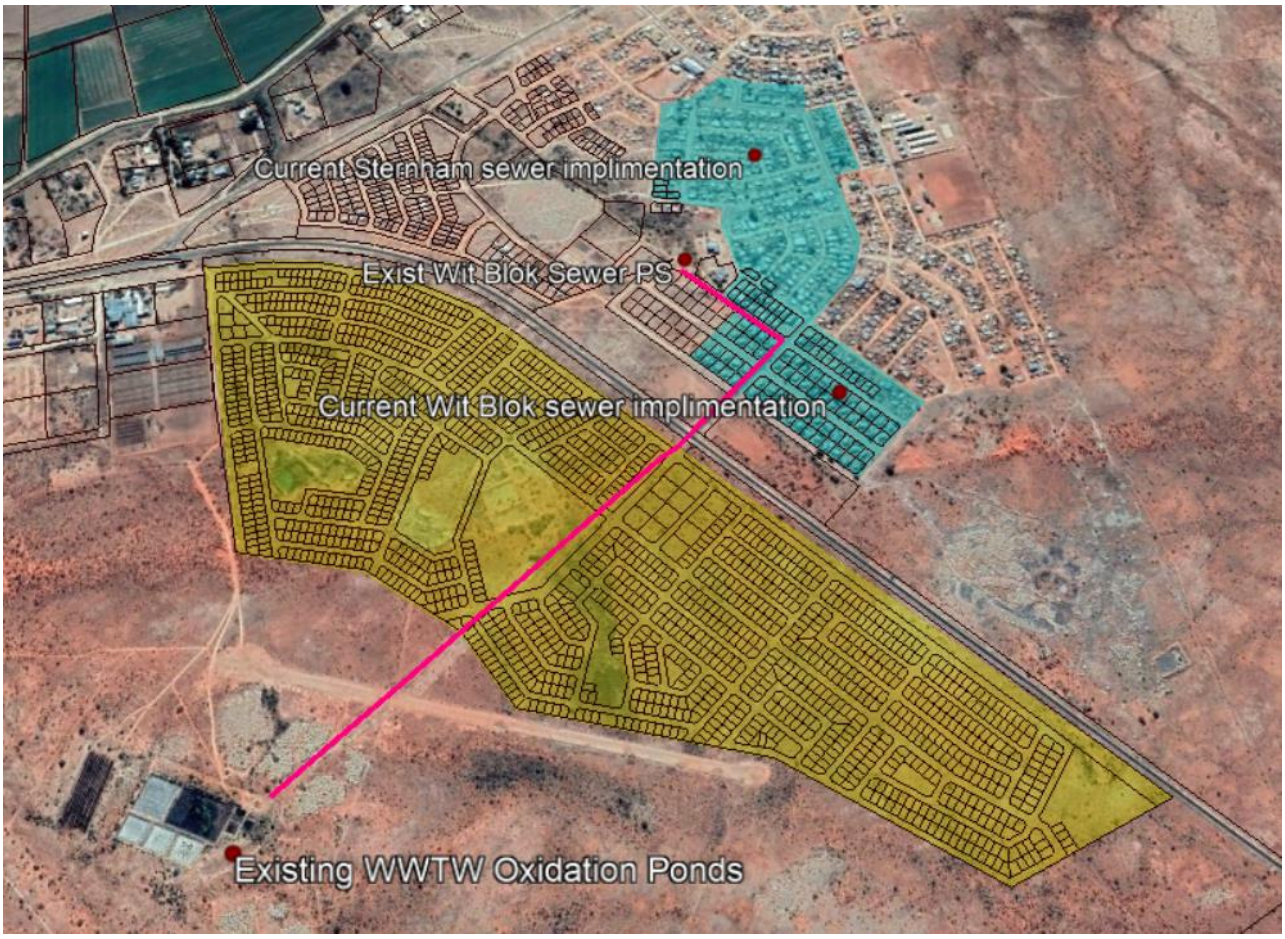
4. SEWERAGE

4.1 Existing Sewage Infrastructure overview

Overview

Houses in the Groblershoop village is currently serviced by conservancy tanks or VIP toilets. There are presently no waterborne sewer systems, except for recently implemented Wit Blok sewer pump station and riser main.

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 existing WWTW Oxidation Ponds system with **650m3/day current capacity** is adequate to service the Groblershoop town existing sewerage load.

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

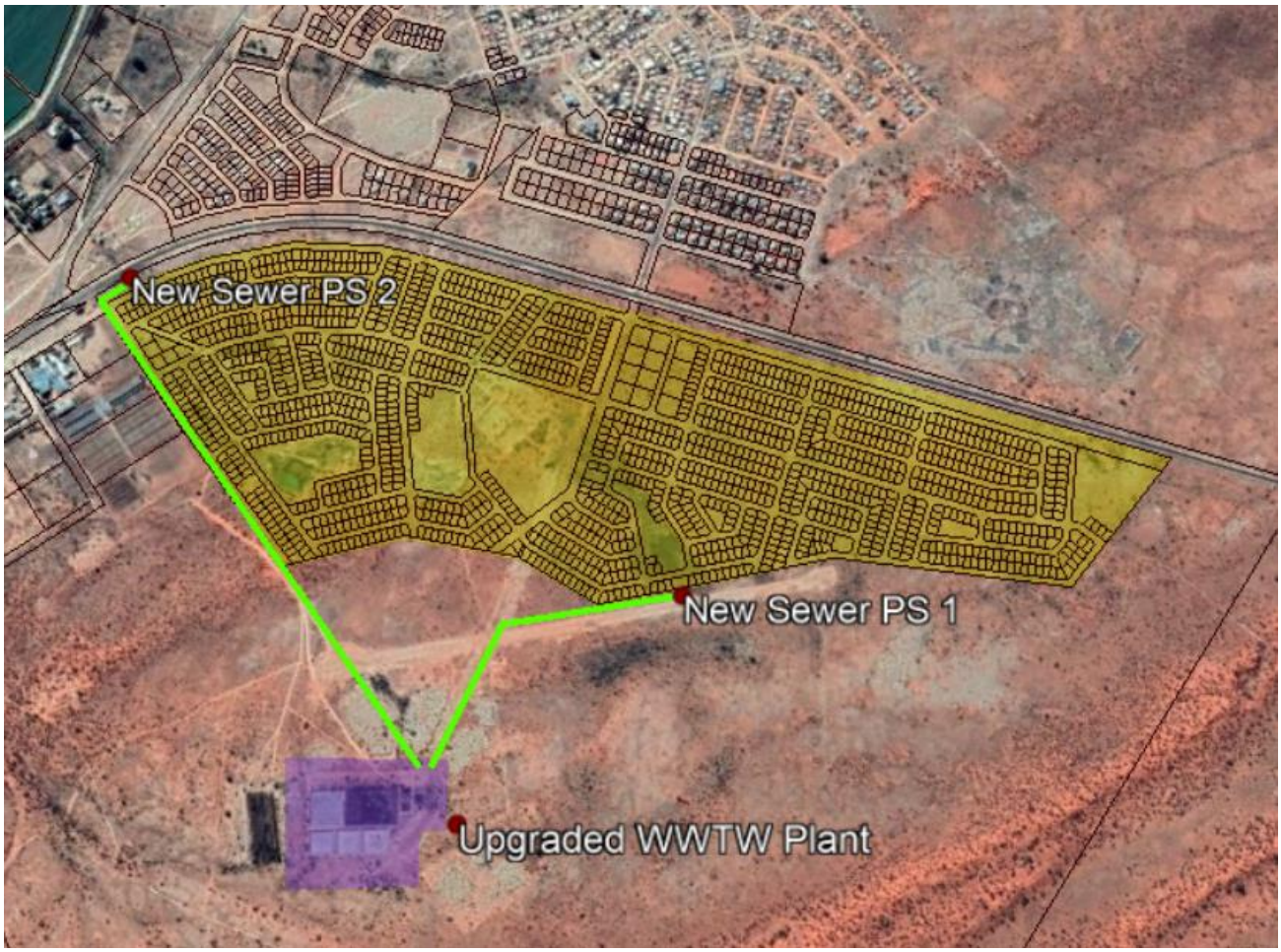
Condition of the oxidation pond system

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 1500 houses development, the associated bulk infrastructure will consist of two pump stations, rising main pipelines and upgraded WWTW oxidation ponds as shown on the Google image below.



The total sewer flow for the planned new 1500 erven development is calculated as follows:

GROBLERSHOOP TOTAL SEWER FLOW					
Sewer flow per day - Sub economical houses	1346	sub economical houses @	500 l/day	**673 000**	**l/day**
Sewer flow per day - Economical houses	202	economical houses @	750 l/day	**151 500**	**l/day**
Sewer flow per day - Hostels	200	persons @	140 l/day	**28 000**	**l/day**
Sewer flow per day - Schools	1020	persons @	20 l/day	**20 400**	**l/day**
Sewer flow per day - Abbatoir	350	carcasses @	42 l/day	**14 700**	**l/day**
Businesses and State Institutions	20	buildings	100 l/day	**2 000**	**l/day**
SEWER FLOW PER DAY - TOTAL				**889 600**	**l/day**

The sizes and capacities of the proposed **Two(2) new Sewer Pump stations** required for the new 1,500 sub-economic development, with sewer rising mains were calculated as follows:

PUMP STATION No 1 AND RISING MAIN					
Sewer flow per day - Sub economical houses	961	sub economical houses @	500 l/day	**480500**	**l/day**
Businesses and State Institutions	12	buildings	100 l/day	**1200**	**l/day**
SEWER FLOW PER DAY - TOTAL				**481700**	**l/day**
Average sewer flow				**5.6**	**l/s**
Factor for inflow from other sources	30%			**1.7**	**l/s**
Sewer flow with inflow from other sources				**7.2**	**l/s**
PEAK NETWORK SEWER FLOW	7.2		3.5	**25.4**	**l/s**
FLOWRATE FROM OTHER PUMP STATIONS				**0**	**l/s**
TOTAL PEAK FLOW				**25.37**	**l/s**
ACTUAL PUMP ABILITY	**1.84**	times peak flow		**46.7**	**l/s**
Theoretical pump station capacity for normal pump operation	1	hours of peak flow		**91**	**m^3**
Theoretical pump station capacity for emergency storage	4	hours of normal flow		**104**	**m^3**
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY				**196**	**m^3**
Pump details		1 x Duty & 1 x Standby		**7.5**	**kW**
Rising main diameter				**250**	**mm**
Rising main material				**PVC**	
Rising main length				**750**	**m**
Total pump height				**32**	**m**

PUMP STATION No 2 AND RISING MAIN					
Sewer flow per day - Sub economical houses	532	sub economical houses @	500 l/day	**266000**	**l/day**
Businesses and State Institutions	6	buildings	100 l/day	**600**	**l/day**
SEWER FLOW PER DAY - TOTAL				**266600**	**l/day**
Average sewer flow				**3.1**	**l/s**
Factor for inflow from other sources	30%			**0.9**	**l/s**
Sewer flow with inflow from other sources				**4.0**	**l/s**
PEAK NETWORK SEWER FLOW	4.0		3.5	**14.0**	**l/s**
FLOWRATE FROM OTHER PUMP STATIONS				**0**	**l/s**
TOTAL PEAK FLOW				**14.04**	**l/s**
ACTUAL PUMP ABILITY	**1.84**	times peak flow		**25.8**	**l/s**
Theoretical pump station capacity for normal pump operation	1	hours of peak flow		**51**	**m^3**
Theoretical pump station capacity for emergency storage	4	hours of normal flow		**58**	**m^3**
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY				**108**	**m^3**
Pump details		1 x Duty & 1 x Standby		**4.5**	**kW**
Rising main diameter				**200**	**mm**
Rising main material				**PVC**	
Rising main length				**1200**	**m**
Total pump height				**32**	**m**

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

- Construction of two(2) new sewer pump stations capable of delivering **73 L/s** direct to the Waste Water Treatment Plant.
- New **250mm** diameter and **200mm** diameter Class 6 PVC pipelines (750m & 1200m) 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 **1.1ML** per day.

5. ROADS AND STORMWATER

5.1 Roads and Access

No problems are foreseen regarding roads and access and access to the development will be from the existing Residential Collector Streets (Class 4b), as shown on the drawing below:

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 storm water 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, concentration of storm water must be avoided as far as possible. Earthworks on plots should therefore encourage free drainage of the area.

Groblershoop is a small village with new 1500 erven development draining from highest point outwards within the planned roads and public open spaces. Existing roads will be adequate for this purpose.

6. SOLID WASTE

The solid waste site will be upgraded to accommodate the additional 1500 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 1500 Community stands, an expected additional load of the proposed development will initially be 162KVA as per INEP guidelines, and the accommodation of this load will form the basis of this report. The community of Gariep falls directly under “Eskom Distribution” and the existing electrified homes in the community purchase electricity directly from Eskom and not through the Kheis local Municipality.

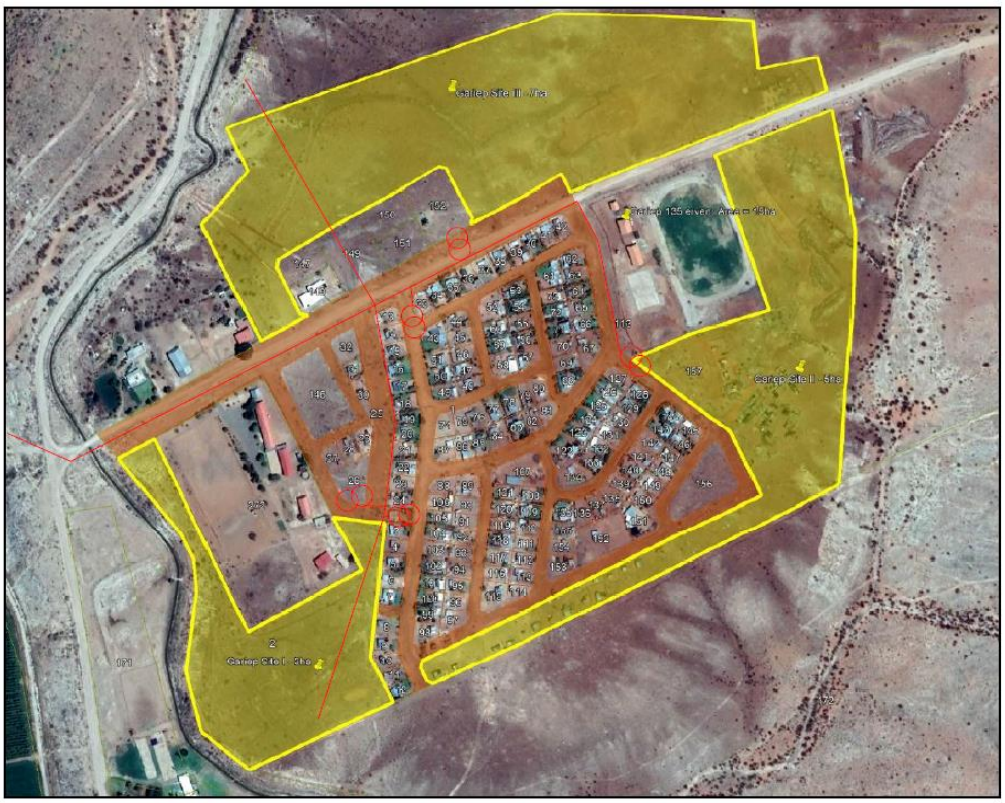
The bulk connection to the community/town is via a 22kV overhead line fed from the 10MVA Grobelaarshoop sub-station

7.2 Existing Electrical Network

The bulk connection to the community/town is via a 22kV overhead line fed from the Eskom 10MVA Grobelaarshoop 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 Gariep runs through the town via 22 KV overhead line feeder connecting to various pole-mounted transformers (see figure 1 below). The existing overhead line feed is running through a section of the proposed development “Gariep Site 1 - 3ha”.

The existing feeder can easily handle the future additional 162kVA 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			70.0	l/s		1 750 000	1 750 000
Source pump station - Mechanical			70.0	l/s		1 890 000	1 890 000
Source pump station - Canal			-	l/s		-	-
Pump line from source to raw water storage reservoir	300	mm dia	1 660.0	m		2 901 449	2 901 449
Raw water storage - Concrete dam			-	m3		-	-
Raw water storage - HDPE lined dam			-	m3		-	-
Water Treatment Works			2.4	Ml/day	2 000 000	16 560 000	18 560 000
Potable Water Storage - Sectional Steel Tank			1 800.0	m3		4 500 000	4 500 000
Potable Water Storage - Concrete			-	m3		-	-
Potable Water Storage - HDPE lined dam with floating roof			1 830.0	m3		1 464 000	1 464 000
Potable water pump station - Building			50.0	sq.m	1 000 000	250 000	1 250 000
Potable water pump station - Mechanical			78.0	l/s		2 106 000	2 106 000
Pump line from storage reservoir to Pressure Tower	315	mm dia	3 500.0	m		6 379 921	6 379 921
Elevated Starage Tower - Sectional Steel			750.0	m3		3 000 000	3 000 000
Elevated Starage Tower - Concrete			-	m3		-	-
Main gravity line from elevated reservoir to the distribution network	250	mm dia	2 050.0	m		3 115 011	3 115 011
						-	-
Sub-Total (Water)					**3 000 000**	**44 216 381**	**47 216 381**
Bulk Sewer Services							
Sewer Pump Station No 1 - Civil/Structural			196.0	m3		1 568 000	1 568 000
Sewer Pump Station No 1 - Mechanical/Electrical/Control			196.0	m3		352 800	352 800
Pump Line from Sewer Pump Station No 1 to Treatment Works	250	mm dia	750.0	m		1 139 638	1 139 638
Sewer Pump Station No 2 - Civil/Structural			108.0	m3		864 000	864 000
Sewer Pump Station No 2 - Mechanical/Electrical/Control			108.0	m3		194 400	194 400
Pump Line from Sewer Pump Station No 2 to Treatment Works	200	mm dia	1 200.0	m		1 585 206	1 585 206
Treatment Works Oxidation Ponds			500.0	kl/day	2 000 000	12 500 000	14 500 000
Sub-Total (Sewer)					**2 000 000**	**18 204 044**	**20 204 044**
Roads and Access							
None						-	
Electrical							
None							
TOTAL CONSTRUCTION					**5 000 000**	**62 420 425**	**67 420 425**
10% Contingencies					500 000	6 242 043	6 742 043
SUB TOTAL					**5 500 000**	**68 662 468**	**74 162 468**
10% Professional fees					550 000	6 866 247	7 416 247
SUB-TOTAL					**6 050 000**	**75 528 714**	**81 578 714**
15% VAT					907 500	11 329 307	12 236 807
GRAND TOTAL					**6 957 500**	**86 858 021**	**93 815 521**

Notes:

1) 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.

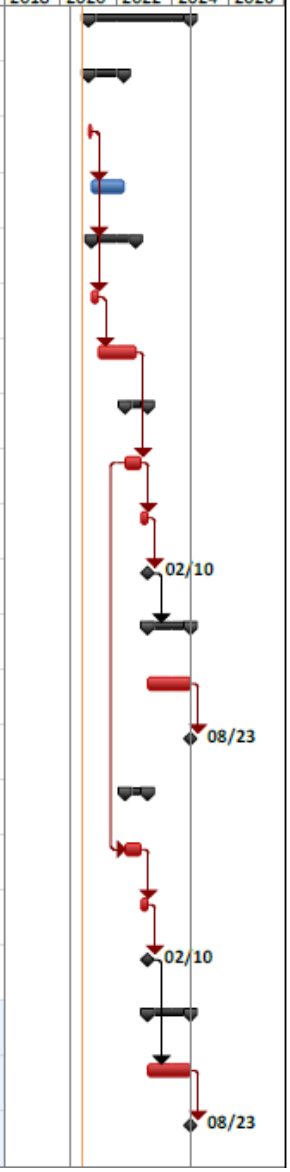
8.1 Funding

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**	950 days	Mon 21/01/04	Fri 24/08/23
2		**APPLICATION FOR FUNDS**	330 days	Mon 21/01/04	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 21/02/15	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 21/05/10	Fri 22/09/09
8		**DESIGN, DOCUMENTATION AND PROCUREMENT BULK SERVICES**	210 days	Mon 22/04/25	Fri 23/02/10
9		Design and documentation	150 days	Mon 22/04/25	Fri 22/11/18
10		Procurement	60 days	Mon 22/11/21	Fri 23/02/10
11		Contractor appointed	0 days	Fri 23/02/10	Fri 23/02/10
12		**CONSTRUCTION**	400 days	Mon 23/02/13	Fri 24/08/23
13		Construction period	400 days	Mon 23/02/13	Fri 24/08/23
14		Construction completed	0 days	Fri 24/08/23	Fri 24/08/23
15		DESIGN, DOCUMENTATION AND PROCUREMENT INTERNAL SERVICES	210 days	Mon 22/04/25	Fri 23/02/10
16		Design and documentation	150 days	Mon 22/04/25	Fri 22/11/18
17		Procurement	60 days	Mon 22/11/21	Fri 23/02/10
18		Contractor appointed	0 days	Fri 23/02/10	Fri 23/02/10
19		CONSTRUCTION	400 days	Mon 23/02/13	Fri 24/08/23
20		Construction period	400 days	Mon 23/02/13	Fri 24/08/23
21		Construction completed	0 days	Fri 24/08/23	Fri 24/08/23



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 need to be upgraded to a level that it can provide bulk services to current residential area that currently is lacking behind as well as to serve the new 1500 housing development.
- That around **R94m** 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 needs to be completed.
- That the process will take about two years from the point where funds as 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 is no hold-ups when funding are available.