GARIEP 135 HOUSING DEVELOPMENT

Engineering Services Investigation Report

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

AUGUST 2020

Prepared for:
MACROPLAN

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APPROVAL:

Author signature		Approver signature	

EXECUTIVE SUMMARY

This report was compiled to investigate the bulk infrastructure serving the Gariep village and to determine whether the bulk infrastructure is adequate for the development of an additional 135 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 sufficient to accommodate the Gariep 135 Houses project. 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 135 houses will almost double the demand related to the existing 150 houses.

- **Bulk Sewer Infrastructure**

  Construction of two new pump stations (6.6 l/s x 2).
  Construction of two new 110mm rising mains (1.3km and 2.1km).
  Construction of a new 0.5ML waste water treatment works;

- **Bulk Electrical Infrastructure**

  Upgrading and exstension of the exsiting bulk electrical supply system is required by Eskom,the exstension of the electrical system will not be a problem as the main sub-station in Grobelaarshoop is currently being upgraded and will be commissioned in December 2020
  .

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 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

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 Gariep 135 housing project. Gariep 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 40 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°36'48" S; 21°46'55" E

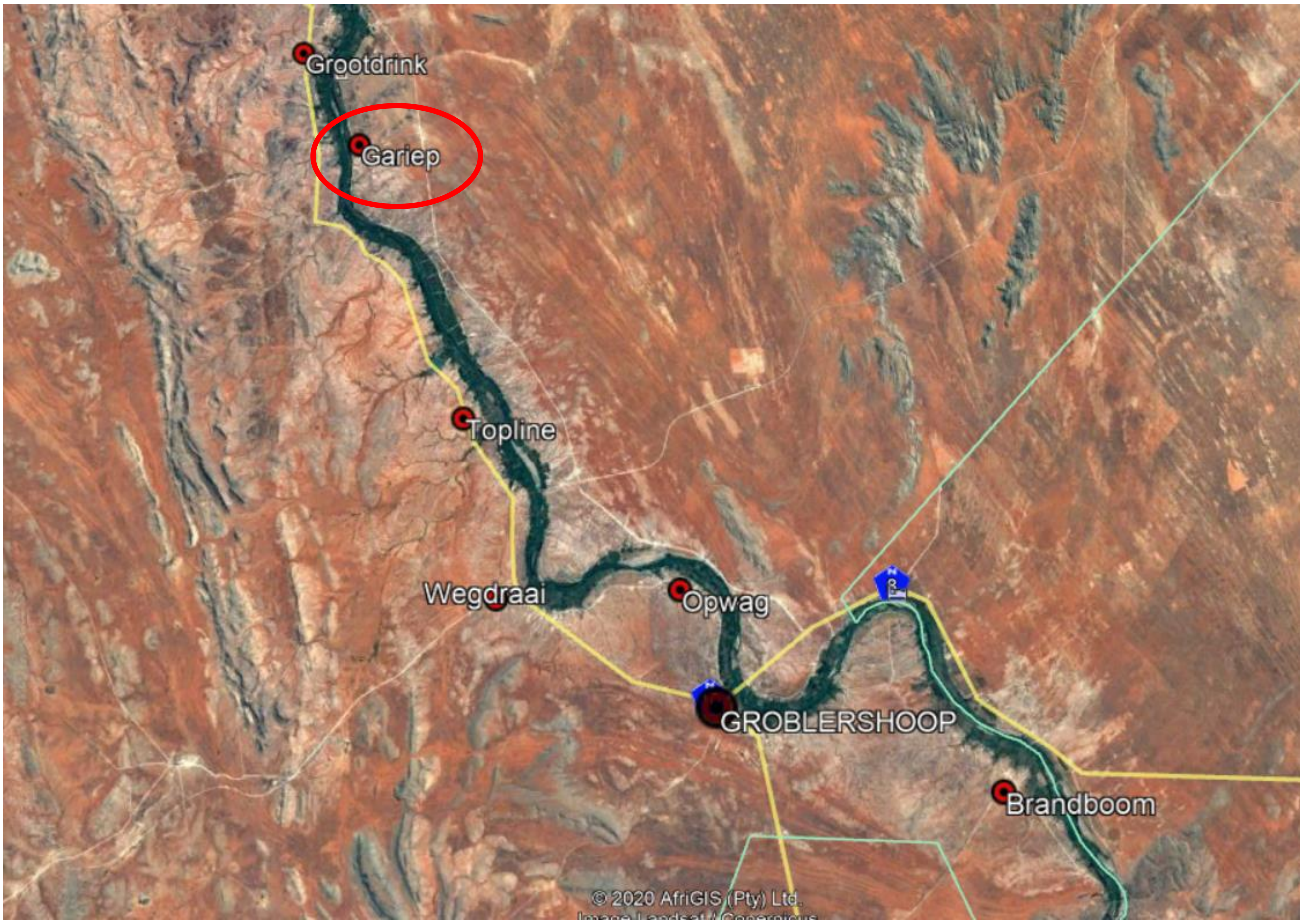


Figure 1: Gariep 135 Housing Development Locality Plan

II. The planned development consists of 135 low-cost houses next to the existing village (Figure 2: 135 Stands Development Area)

Figure 2: Gariep 135 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

Figure 2: Gariep 135 Housing Development Development Area

2. TOPOGRAPHY

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

- Ground cover comprises mostly of natural veld with short grass;
- Topographically, the site has a relatively gentle sloping terrain from 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 Gariep village with water can be summarised as follows:

- A raw water river pump station delivering 6l/s;
- A 950mm long, 90mm 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
  - A package type water treatment plant,
  - A Sectional steel storage tank
  - A high lift pump station
  - A High level 10 000l plastic storage tank on a stand
- Distribution into the village

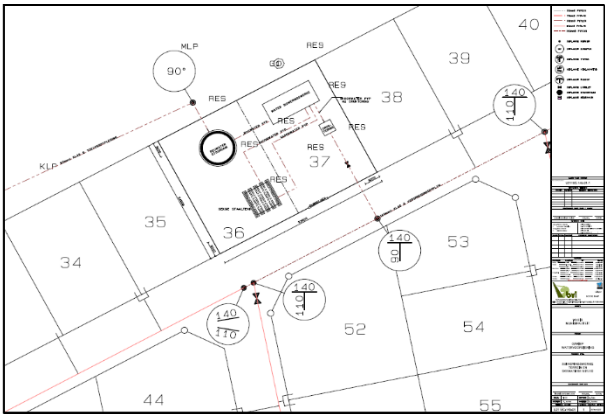
Figure 3: Existing Bulk Water Infrastructure

Figure 2 shows the existing bulk water infrastructure that supply water to Gariep Village

Raw Water Supply

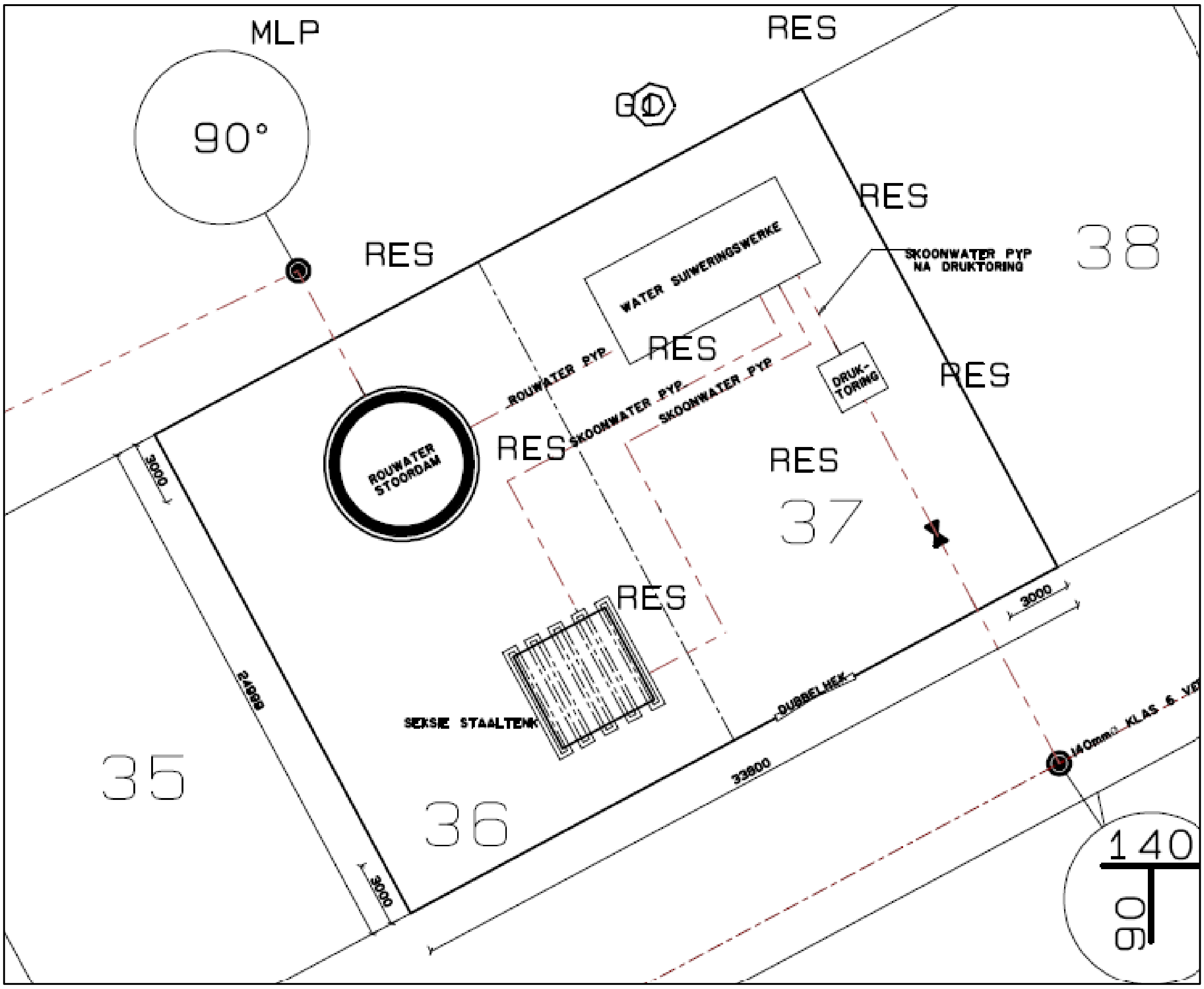
Water supplied to Gariep is extracted from Orange River by means of a mobile pump station fitted on a trailer with the switchgear fitted to the trailer. The pump station consists of one pump that delivers 6l/s. The suction point is under the 1:10 year flood because of a sand bank on the northern side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

Raw water is pumped from the rivier pump station to the purification plant, delivering a maximum flow rate of 6l/s through a 950m long, 90mm diameter Class 6 PVC pipeline to a 60 m^3 raw water storage dam next to the Package Plant Water Treatment Works in the village



Water treatment and storage site

The drawing below shows the site layout where the treatment works, raw and potable water storage reservoirs, as well as the pressure tower, is located.



Water is pumped from the raw water storage dam through the Water Treatment Plant to a 110 m^3 sectional steel potable water storage reservoir. From there, it is pumped into the 10m^3 elevated storage tank before is gravitates into the village network.

The photo’s below shows the reservoirs and treatment plant.

Water Treatment Plant

The Package Plant Water Treatment Works (WTW) was constructed in 2008 to supply water at a rate of 2 l/s.

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

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. The elevated tank is not functional, and water is distributed to the village from the sectional steel reservoir that stores pottable water. Most of the water meters and pressure gauges are out of service.

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

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

The table blow 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)		7	
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 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)	153	Houses x	600	l/ household per day	91,8 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	100	Learners	25	l/ Learner per day	2,5 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)					**119,3 m^3/d**

	NO.	DESCRIPTION	FORMULA				CURRENT CAPACITY	
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	119,3 m^3/day	5,0 $m^3/hour$	1,4 l/s		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	137,2 m^3/day	5,7 $m^3/hour$	1,6 l/s		
	3	Summer Gross Daily Demand (SGDD)	SPF*GAADD	205,8 m^3/day	8,6 $m^3/hour$	2,4 l/s		
	4	Instantanious Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		39,8 $m^3/hour$	11,0 l/s		
	5	Storage Capacity Elevated Storage	hours*IPD			159,1 m^3	10,0 m^3	6%
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD***LPS%**	145 mm dia	59,7 $m^3/hour$	16,6 l/s	10,0 l/s	60%
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD			238,6 m^3	116,0 m3	49%
	8	**Water Treatment Plant Capacity (WTPC)**	**SGDD*24/WTPH**	**308,7 m3/day**	**12,9 m3/hour**	**3,6 l/s**	**1,7 l/s**	**48%**
	9	**Source Pump Station Capacity and Pipeline Flow**	**WTPC*(1+LFW)*24/SPS**	**89 mm dia**	**22,2 m3/hour**	**6,2 l/s**	**6,0 l/s**	**97%**
	10	Raw Water Storage Capacity	Days*SGDD			206,0 m^3	60,0 m3	29%

It is clear from the table that the existing infrastructure is already under pressure to handle the demand. Water from the raw water storage dam is also used to irrigate the sportsfield. The biggest problems are with bulk and elevated storage.

3.3 Bulk Water Infrastructure Requirements

The table below compares the current infrastructure capacities with the capacity that is required for the 135 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)	153	Houses x	600 l/ household per day	91,8 m^3/d
	2	Sub-Economical Houses (135 houses development)	135	Houses x	600 l/ household per day	81 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	100	Learners	25 l/ Learner per day	2,5 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)				**200,3 m^3/d**

	NO.	DESCRIPTION	FORMULA				CURRENT CAPACITY	
THEORETICAL DEMANDS	1	Annual Average Daily Demand (AADD)	AADD	200,3 m^3/day	8,3 m^3/hour	2,3 l/s		
	2	Gross Annual Average Daily demand (GAADD)	(1+Lfr)*AADD	230,3 m^3/day	9,6 m^3/hour	2,7 l/s		
	3	Summer Gross Daily Demand (SGDD)	SPF*GAADD	345,5 m^3/day	14,4 m^3/hour	4,0 l/s		
	4	Instantanious Peak Demand (IPD) (Main supply pipeline to reticulation)	AADD*PFR		58,4 m^3/hour	16,2 l/s		
	5	Storage Capacity Elevated Storage	hours*IPD			233,7 m^3	10,0 m^3	4%
	6	Lifting Pump Station Capacity and Pipeline Flow between Main Storage and Elevated tank	IPD***LPS%**	176 mm dia	87,6 m^3/hour	24,3 l/s	10,0 l/s	41%
	7	Potable Water Storage Capacity (Main Storage)	hours*AADD			400,6 m^3	116,0 m3	29%
	8	**Water Treatment Plant Capacity (WTPC)**	**SGDD*24/WTPH**	**518,3 m3/day**	**21,6 m3/hour**	**6,0 l/s**	**1,7 l/s**	**28%**
	9	**Source Pump Station Capacity and Pipeline Flow**	**WTPC*(1+LFW)*24/SPS**	**115 mm dia**	**37,3 m3/hour**	**10,3 l/s**	**6,0 l/s**	**58%**
	10	Raw Water Storage Capacity	Days*SGDD			346,0 m^3	60,0 m3	17%

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

- Construction of a new 12l/s mobile river pump station with a duty and standby pump.
- New 125mm diameter Class 6 PVC pipeline between the river pump station and the existing potable water storage reservoir.
- Upgraded Water Treatment Works capable of delivering 24m^3/h on the existing treatment works site
- A new 360m^3 sectional steel reservoir next to the upgraded water treatment works
- A new 250m3 sectional steel pressure tower on the highest point to the north.
- A new 24l/s uplifting pump station at the treatment works.
- A new 200mm pipeline between the lifting pump station and the pressure tower.

Figure 4: Proposed Water Bulk Infrastructure

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

All the houses in the Gariep village is currently serviced by VIP toilets. There are no sewer bulk infrastructure.

4.2 Bulk Sewer Infrastructure Requirements

If a full borne sewer sewerage system is required for the new 135 houses development, the associated bulk infrastructure will most possibly consist of a pumpstation, rising main pipeline and oxidation ponds as shown on the Google image below.

The total sewer flow is calculated as follows:

GARIEP TOTAL SEWER FLOW						
Sewer flow per day - Sub economical houses	288	sub economical houses @	500	l/day	**144 000**	**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	100	persons @	20	l/day	**2 000**	**l/day**
Businesses and State Institutions	0	buildings	100	l/day	**-**	**l/day**
SEWER FLOW PER DAY - TOTAL					**146 000**	**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	150	sub economical houses @	500	l/day	**75000**	**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	100	persons @	20	l/day	**2000**	**l/day**
Businesses and State Institutions	0	buildings	100	l/day	**0**	**l/day**
SEWER FLOW PER DAY - TOTAL					**77000**	**l/day**
Average sewer flow					**0,9**	**l/s**
Factor for inflow from other sources	30%				**0,3**	**l/s**
Sewer flow with inflow from other sources					**1,2**	**l/s**
PEAK NETWORK SEWER FLOW	1,2		3,5		**4,1**	**l/s**
FLOWRATE FROM OTHER PUMP STATIONS					**0**	**l/s**
TOTAL PEAK FLOW					**4,05**	**l/s**
ACTUAL PUMP ABILITY	**1,63**	times peak flow			**6,6**	**l/s**
Theoretical pump station capacity for normal pump operation	1	hours of peak flow			**15**	**m^3**
Theoretical pump station capacity for emergency storage	4	hours of normal flow			**17**	**m^3**
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY					**31**	**m^3**
Pump details						**kW**
Rising main diameter					**110**	**mm**
Rising main material					**PVC**	
Rising main length					**2100**	**m**
Static pump height					**30**	**m**
Friction losses					**12**	**m**
Total pump height					**42**	**m**

PUMP STATION No 2 AND RISING MAIN						
Sewer flow per day - Sub economical houses	138	sub economical houses @	500	l/day	**69000**	**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					**69000**	**l/day**
Average sewer flow					**0,8**	**l/s**
Factor for inflow from other sources	30%				**0,2**	**l/s**
Sewer flow with inflow from other sources					**1,0**	**l/s**
PEAK NETWORK SEWER FLOW	1,0		3,5		**3,6**	**l/s**
FLOWRATE FROM OTHER PUMP STATIONS					**0**	**l/s**
TOTAL PEAK FLOW					**3,63**	**l/s**
ACTUAL PUMP ABILITY	**1,84**	times peak flow			**6,7**	**l/s**
Theoretical pump station capacity for normal pump operation	1	hours of peak flow			**13**	**m^3**
Theoretical pump station capacity for emergency storage	4	hours of normal flow			**15**	**m^3**
TOTAL REQUIRED THEORETICAL PUMP STATION CAPACITY					**28**	**m^3**
Pump details						**kW**
Rising main diameter					**110**	**mm**
Rising main material					**PVC**	
Rising main length					**1300**	**m**
Static pump height					**20**	**m**
Friction losses					**12**	**m**
Total pump height					**32**	**m**

Recommended Gariep 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 6.7 l/s direct to the Waste Water Treatment plant.
- New 110mm diameter Class 6 PVC pipelines (2100m & 1300m) between the pump stations and a new Waste Water Treatment Plant (oxidation ponds).
- Construction of a Waste Water Treatment Plant (oxidation ponds) with a capacity of 0.5Ml 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 stormwater system exists in the area, concentration of stormwater must be avoided as far as possible. Earthworks on plots should, therefore, encourage free drainage of the area.

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

6. SOLID WASTE

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 135 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 Groberlaarshoop 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 Gariep 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 are as provided below. The level of accuracy is commensurate with a concept level design.

Description		Amount
Water Bulk Services		
New mobile 12l/s river pump station	R	850 000,00
0,85km 125mm Ø supply line	R	722 500,00
Upgrading of Water Treatment Works	R	700 000,00
New 360m^3 storage reservoir	R	900 000,00
New 240m^3 storage reservoir	R	840 000,00
New 24l/s lifting pump station	R	240 000,00
0,3km 200mm Ø line from lifting PS to elevated storage	R	285 000,00
Sub-Total (Water)	**R**	**4 537 500,00**
Bulk Sewer Services	R	-
New 0,25 ML oxidation pond system	R	2 675 662,36
New sewer pump station No 1	R	1 676 508,10
New sewer pump station No 2	R	1 676 508,10
2,1km 110mm Ø uPVC rising main (PS No.1)	R	2 233 596,40
1,3km 110mm Ø uPVC rising main (PS No.2)	R	1 451 837,66
Sub-Total (Sewer)	**R**	**8 262 274,95**
Roads and Access	R	-
None	R	-
Stormwater	R	-
None	R	-
Electrical	R	-
O/H ACSR line ring	R	2 300 000,00
Circuit breaker (11kV, LC1&2)	R	1 550 000,00
O/H ACSR line to POC	R	1 850 000,00
Sub-Total (Electrical)	**R**	**5 700 000,00**
Sub-Total	**R**	**18 499 774,95**
15% P&G's	R	2 774 966,24
Sub-Total	**R**	**21 274 741,19**
10% Contingencies	R	2 127 474,12
Sub-Total	**R**	**23 402 215,31**
10% Professional fees	R	2 340 221,53
Sub-Total	**R**	**25 742 436,84**
15% VAT	R	3 861 365,53
Grand Total	**R**	**29 603 802,37**

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

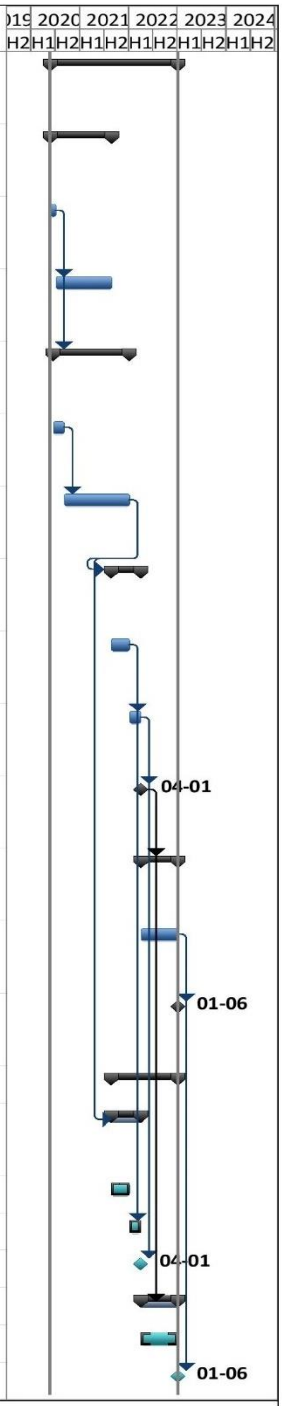
7.1 Funding

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**	**685 days?**	**Mon 20-05-25**	**Fri 23-01-06**
2			**APPLICATION FOR FUNDS**	**330 days**	**Mon 20-05-25**	**Fri 21-08-27**
3			Application for RBIG & Mig funding	30 days	Mon 20-05-25	Fri 20-07-03
4			Approval of feasibility study & readyness report	300 days	Mon 20-07-06	Fri 21-08-27
5			**EIA PROCESS**	**410 days**	**Mon 20-06-15**	**Fri 22-01-07**
6			Appointment of EIA Specialist	60 days	Mon 20-06-15	Fri 20-09-04
7			EIA study	350 days	Mon 20-09-07	Fri 22-01-07
8			**DESIGN, DOCUMENTATION AND PROCUREMENT**	**160 days**	**Mon 21-08-23**	**Fri 22-04-01**
9			Design and documentation	100 days	Mon 21-08-23	Fri 22-01-07
10			Procurement	60 days	Mon 22-01-10	Fri 22-04-01
11			Contractor appointed	0 days	Fri 22-04-01	Fri 22-04-01
12			**CONSTRUCTION**	**200 days**	**Mon 22-04-04**	**Fri 23-01-06**
13			Construction period	200 days	Mon 22-04-04	Fri 23-01-06
14			Construction completed	0 days	Fri 23-01-06	Fri 23-01-06
15			**INTERNAL SERVICES CONSTRUCTION**	**360 days?**	**Mon 21-08-23**	**Fri 23-01-06**
16			**DESIGN, DOCUMENTATION AND PROCUREMENT**	**160 days**	**Mon 21-08-23**	**Fri 22-04-01**
17			Design and documentation	100 days	Mon 21-08-23	Fri 22-01-07
18			Procurement	60 days	Mon 22-01-10	Fri 22-04-01
19			Contractor appointed	0 days	Fri 22-04-01	Fri 22-04-01
20			**CONSTRUCTION**	**200 days?**	**Mon 22-04-04**	**Fri 23-01-06**
21			Construction period	200 days	Mon 22-04-04	Fri 23-01-06
22			Construction completed	0 days	Fri 23-01-06	Fri 23-01-06



Project: 34702 Gamakor Developm
Date: Sat 20-05-23

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

10. CONCLUSION

Engineering services were assessed to determine spare capacity on the existing bulk infrastructure and compared to the estimated demand of the newly proposed Gariep 135 houses development.

The findings and conclusions in this report are based on a preliminary desktop study, as well as site visits.

- Bulk Water Infrastructure – The current capacity of the bulk water infrastructure is not enough to accommodate the proposed 135 houses development as is. It is proposed that the infrastructure should be upgraded, not only to provide adequate capacity for the Gamakor development, but also for future water demand increases. The following upgrades are proposed:
  - Construction of a new 12l/s mobile river pump station with a duty and standby pump.
  - New 125mm diameter Class 6 PVC pipeline between the river pump station and the existing potable water storage reservoir.
  - Upgraded Water Treatment Works capable of delivering 24m^3/h on the existing treatment works site
  - A new 360m^3 sectional steel reservoir next to the upgraded water treatment works
  - A new 250m3 sectional steel pressure tower on the highest point to the north.
  - A new 24l/s uplifting pump station at the treatment works.
  - A new 200mm pipeline between the lifting pump station and the pressure tower.

- Bulk Sewage Infrastructure – There is currently no bulk sewer infrastructure. Recommended Gariep 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 6.7 l/s direct to the Waste Water Treatment plant.
  - New 110mm diameter Class 6 PVC pipelines (2100m & 1300m) between the pump stations and a new Waste Water Treatment Plant (oxidation ponds).
  - Construction of a Waste Water Treatment Plant (oxidation ponds) with a capacity of 0.5Ml per day.
- Roads and Access: No bulk infrastructure upgrading required on the roads.
- Storm Water Management: No bulk infrastructure upgrading required on the storm water.
- Electricity Supply – Formal bulk upgrade process to be finalised between Eskom and !Kheis Municipality.
- Electrical Load Centre – The existing Load Centre “Keimoes Nommer 2” can accommodate the future additional load, with only minor modification to be done in the Load Centre and as agreed with the Municipality’s Electrical Department.

In conclusion, the engineering services are not in place (water and sewer) to meet the standard requirements. The infrastructure will have to be upgraded regardless of the implementation of the Gariep 135 houses development in order to meet current and expected future needs. The upgrading should be done in such a way as to take into consideration the Gariep 135 Houses development.