SASELAMANI TOWNSHIP ESTABLISHMENT

BULK ENGINEERING SERVICES REPORT

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Abbreviations

L/s	-	Litres per second
Mℓ /day	-	Mega litres per day
kℓ/day	-	Kilo Litres per day
kℓ	-	Kilo Litres
PSC	-	Project Steering Committee
WC	-	Water Committee
IDP	-	Infrastructure Development Plan
DWS	-	Department of Water and Sanitation
RWS	-	Regional Water Scheme
StatsSA	-	Statistics South Africa
m^3	-	cubic metre
AADD	-	Average Annual Daily Demand
VIP toilet	-	Ventilated Improved Pit toilet
MAP	-	Mean Annual Precipitation
ADWF	-	Average Dry Weather Flow
CBD	-	Central Business District

1 INTRODUCTION

The Saselamani township establishment entails the proposed formalisation and proclamation of the Saselamani CBD on the remainder of Tshikundu's location Farm 262 MT and the remainder of Portion 1 of Tshikundu's location farm 262 MT.

The proposed township will have 1635 stands.

Figure 1 Portion 1 of Tshikundu's location site

KV Development Group appointed Dalimede Projects (PTY) Ltd to prepare the bulk engineering services report for the proposed township.

This report outlines the civil engineering services needed for the township, i.e. roads, water, sewer.

2 SITE DESCRIPTION

Saselamani is situated 50km north of Thohoyandou along the road R524. The area is administered by Collins Chabane Local Municipality, under the Vhembe District Municipality, Limpopo Province, South Africa. GPS coordinates of site are 22°49'56.78"S 30°51'20.83"E.
The locality map is presented on the figures below.

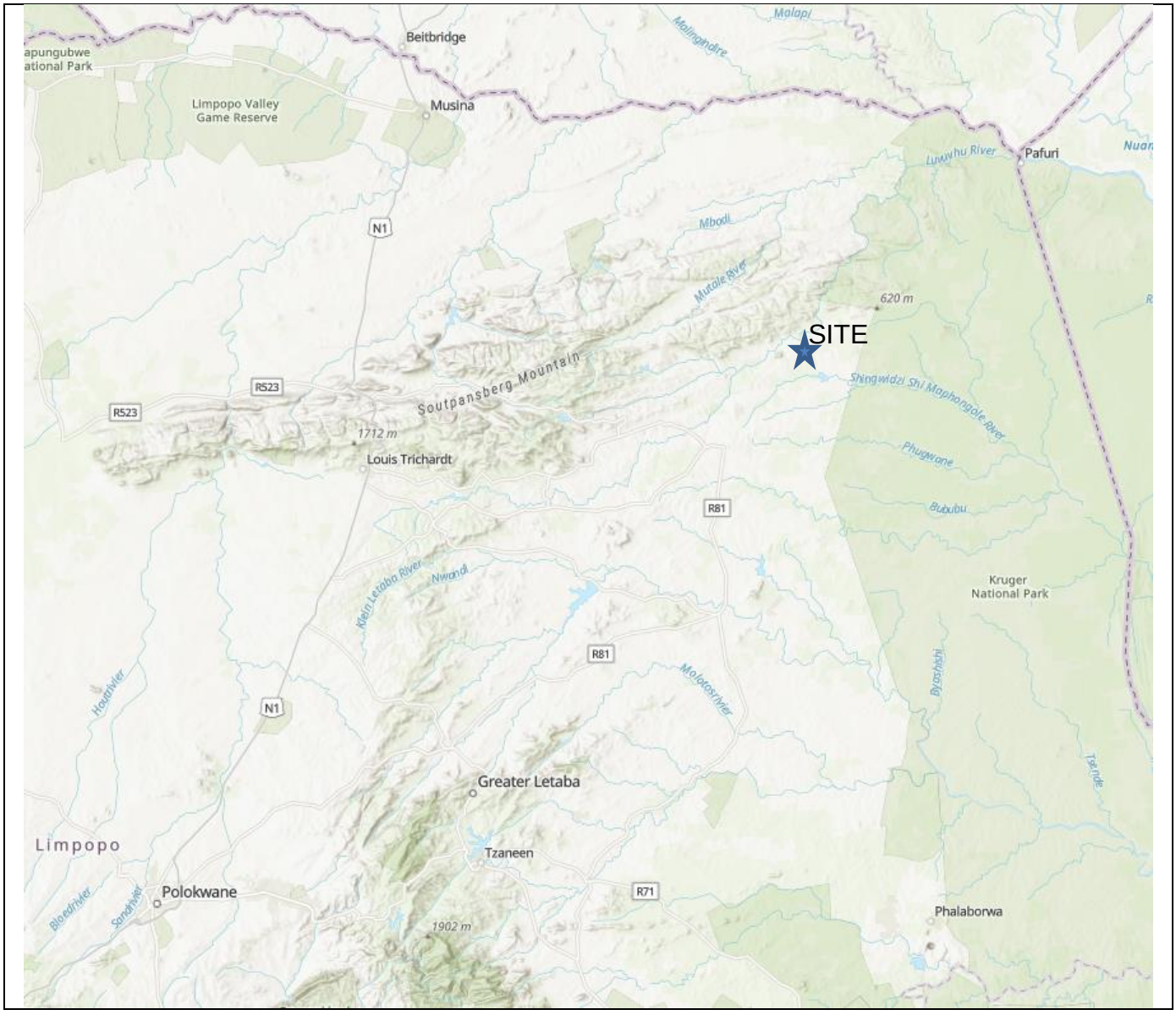

Figure 2: Locality plan

Figure 3 Locality

3 TOWN PLANNING

The proposed township is to be partitioned as follows:

LAND USE

ZONING	LAND USE DESCRIPTION	NO, OF RESIDENTIAL OPPORTUNITIES	AREA (HA)	%
RESIDENTIAL	RESIDENTIAL	1429	188.74	33.48
BUSINESS	BUSINESS PURPOSES	97	7.57	1.34
INSTITUTIONAL	COMMUNITY FACILITIES	32	38.11	6.76
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE\ RECREATIONAL FACILITIES	15	92.19	16.36
URBAN AGRICULTURE	AGRICULTURAL PURPOSES	32	80.45	14.27
MUNICIPAL PURPOSES	MUNICIPAL	5	8.88	1.57
RESIDENTIAL 3	GUEST HOUSES	11	18.04	3.20
LIGHT INDUSTRY	WAREHOUSES	13	13.08	2.32
GOVERNMENT	STATE DEPARTMENT	1	0.99	0.17
ROAD/SERVITUDES			115.56	20.50
TOTAL		1635	563.64	100

Table 1 Land use

The proposed land use is shown in the figure below.

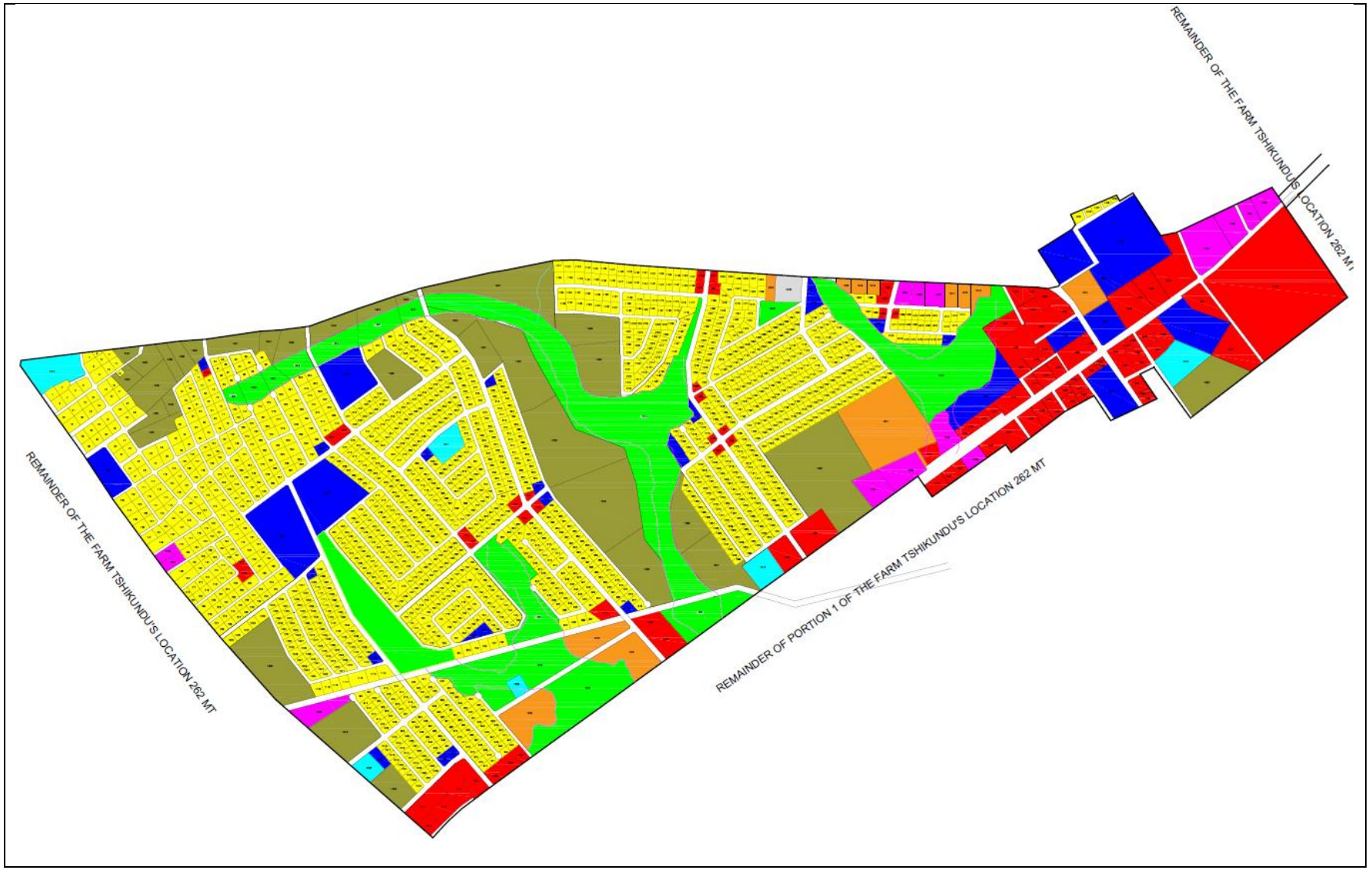

Figure 4: Proposed land use

4 TOPOGRAPHY AND ACCESS

The proposed township site is generally 99% flat and 1% hilly. The flat slopes will not require bulk earthworks platforms for buildings, unless the insitu soils are replaced by imported materials.

The township can be accessed from existing tarred roads, viz;

- R524, owned by SANRAL
- D3639, owned by RAL
- D3661, owned by RAL

See the figure below.

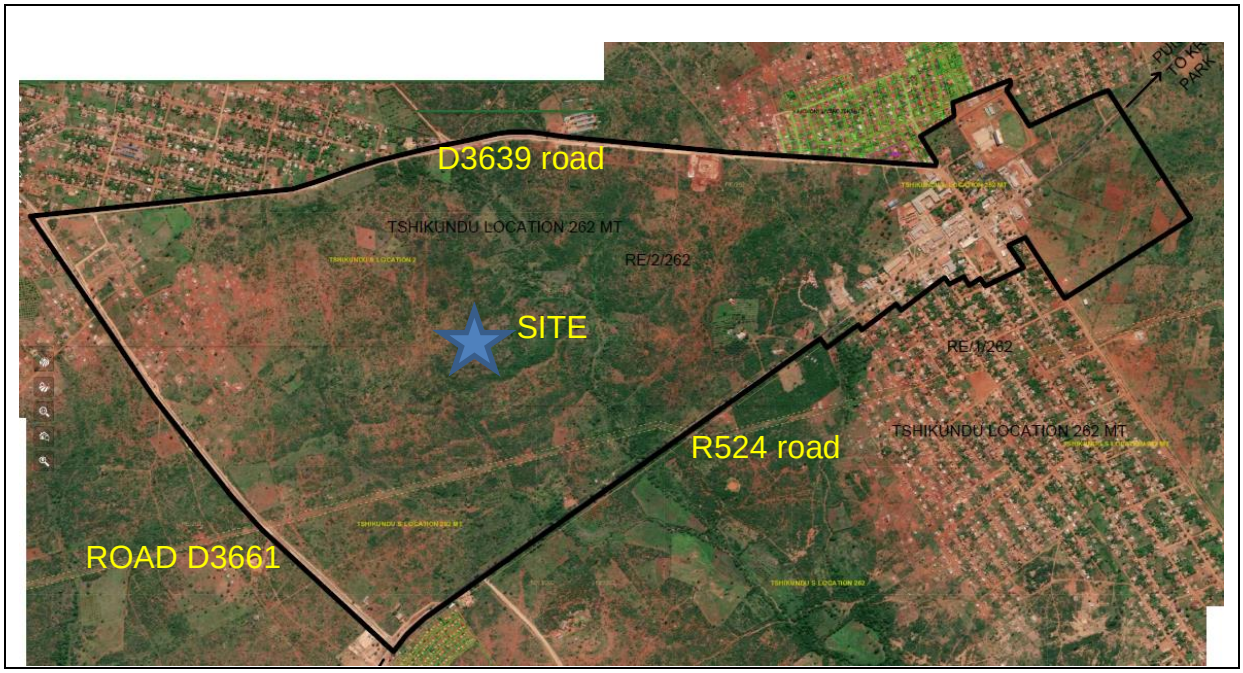

Figure 5 Access road

5 WATER SERVICE

5.1 Water source

The Saselamani proposed township falls under the Xikundu WTW Water Scheme.

5.1.1 Xikundu WTW Water Scheme

The Xikundu WTW was built to supply Xikundu-Mhinga and Lambani areas. Raw water is abstracted from the weir on Luvuvhu river (22°48'26.71"S 30°47'53.35"E). Raw water is then pumped to the Xikundu WTW. Documentation on water licencing could not be obtained.

The design capacity of the Xikundu water treatment works is 20Mℓ / day.

The Xikundu WTW was also designed to have a future provision for further extension of 10Mℓ/day capacity. This future extension would increase the design capacity to 30Mℓ/day.

However, the actual capacity is 15.7 Mℓ/day.

The Xikundu WTW pumps potable water to the NR3 command 5Mℓ reservoir in Xikundu Xifaxane village mountain. The NR3 command reservoir then feeds the water scheme reservoirs, through gravity pipelines, at the following villages; Xikundu Xifaxani, Ximixoni, Magomani, Manghena, Nhlengani, Botsoleni, Mabiligwe, Makahlule, Makuleke, Maphophe and Saselamani.

The settlements fed by the water scheme are shown in the figure below.

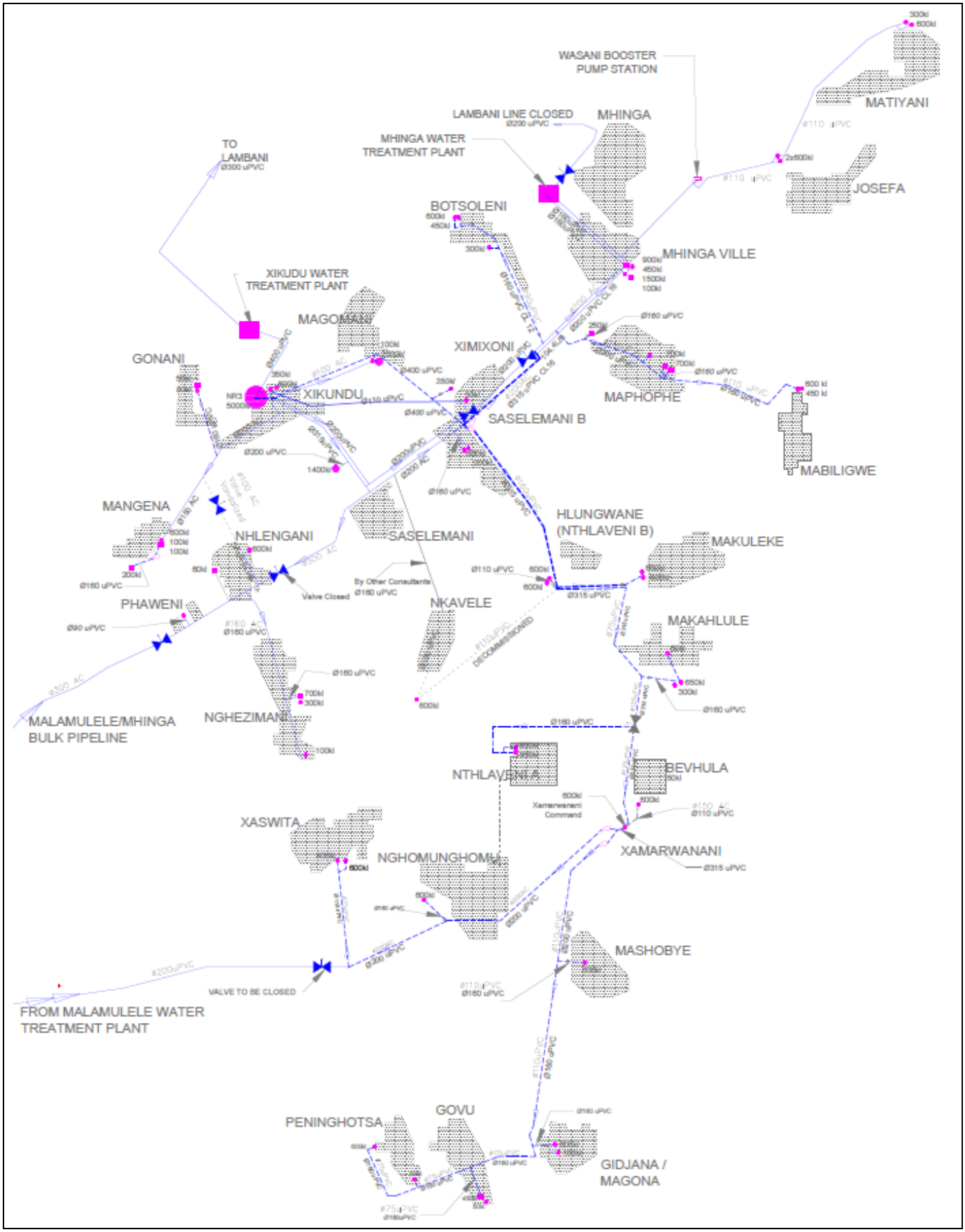

Figure 6 Settlements supplied by the Xikundu WTW water scheme

5.2 Bulk water pipelines

The existing water supply bulklines are shown in the figure above as blue lines linking the settlements. The existing bulklines are characterised but vandalism and unauthorised connections. Some pipe sections have houses built over them.

5.3 Boreholes

There are existing boreholes for water supply within Xikundu village, see the table below.

Borehole number	Latitude	Longitude	Borehole Depth (m)	Water Level (m)	Depth to Pump (m)	Discharge (l/s)	Duty Cycle (hr)	Daily Abstraction (kl)	Equipment	Power	Water Quality
H15-0047A	22°49'50.84"S	30°49'49.12"E	119.92	7.03	36	2.5	24	216.00	No equipment	No power	Class 0
H15-0102	22°49'27.84"S	30°48'51.77"E	46.3	6.76	30	1.3	24	112.32	Mono-type pump	Electric motor	Class 2
H15-0147	22°50'24.83"S	30°48'37.08"E	122.28	10.79	24	1.8	24	155.52	No equipment	No power	Class 1
BH	22°49'42.28"S	30°50'7.08"E	71	9.57	38	1	24	86.40	No equipment	No power	Class 2

Table 2 Xikundu boreholes

The borehole sites are shown in the figure below.

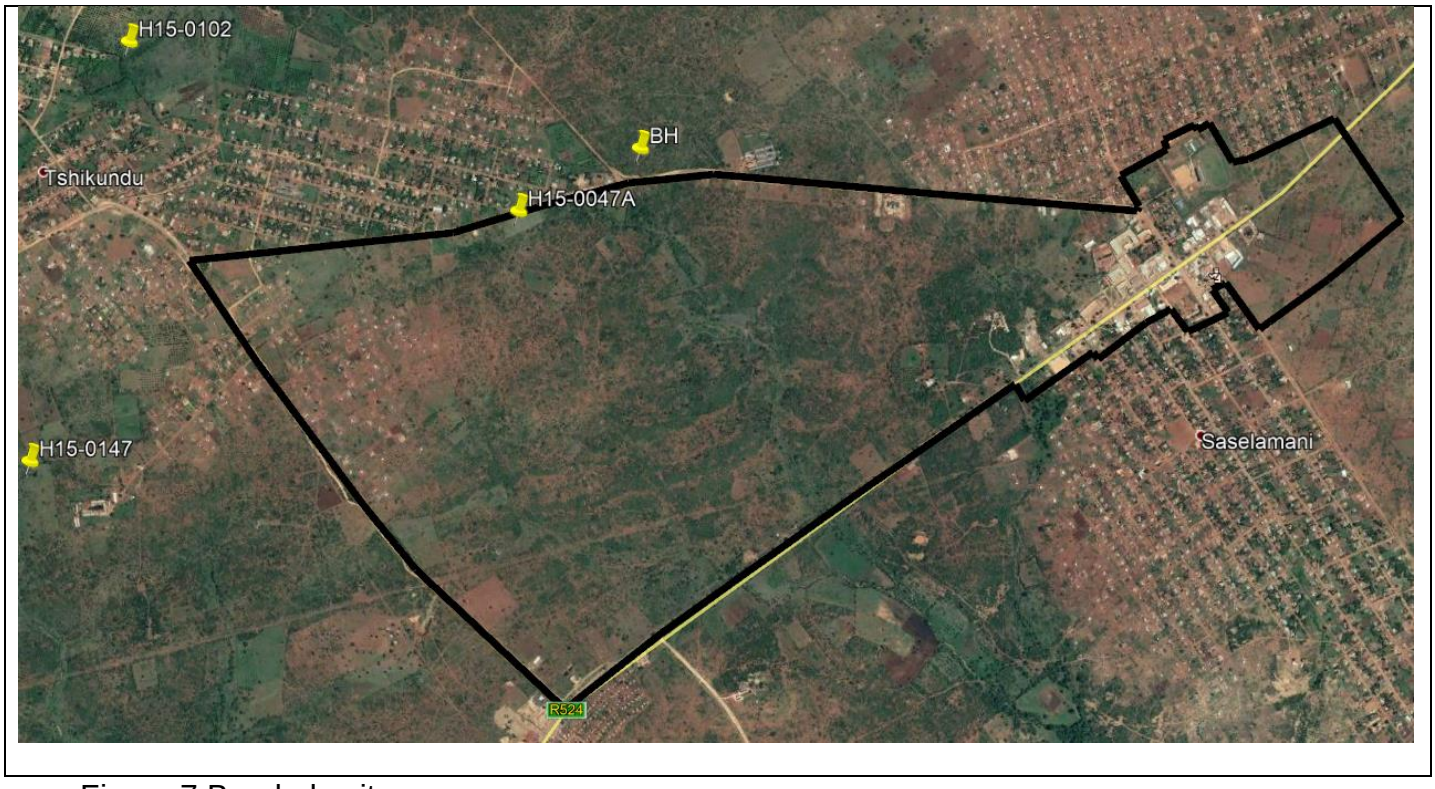

Figure 7 Borehole sites

5.4 Water Storage

The Xikundu village has existing water storage structures as follows;

- 5,000kℓ command Xikundu - NR3 concrete reservoir,
- 600kℓ concrete reservoir,
- 350kℓ concrete reservoir,
- 300kℓ concrete reservoir, not in use.

Figure 8 Xikundu reservoirs

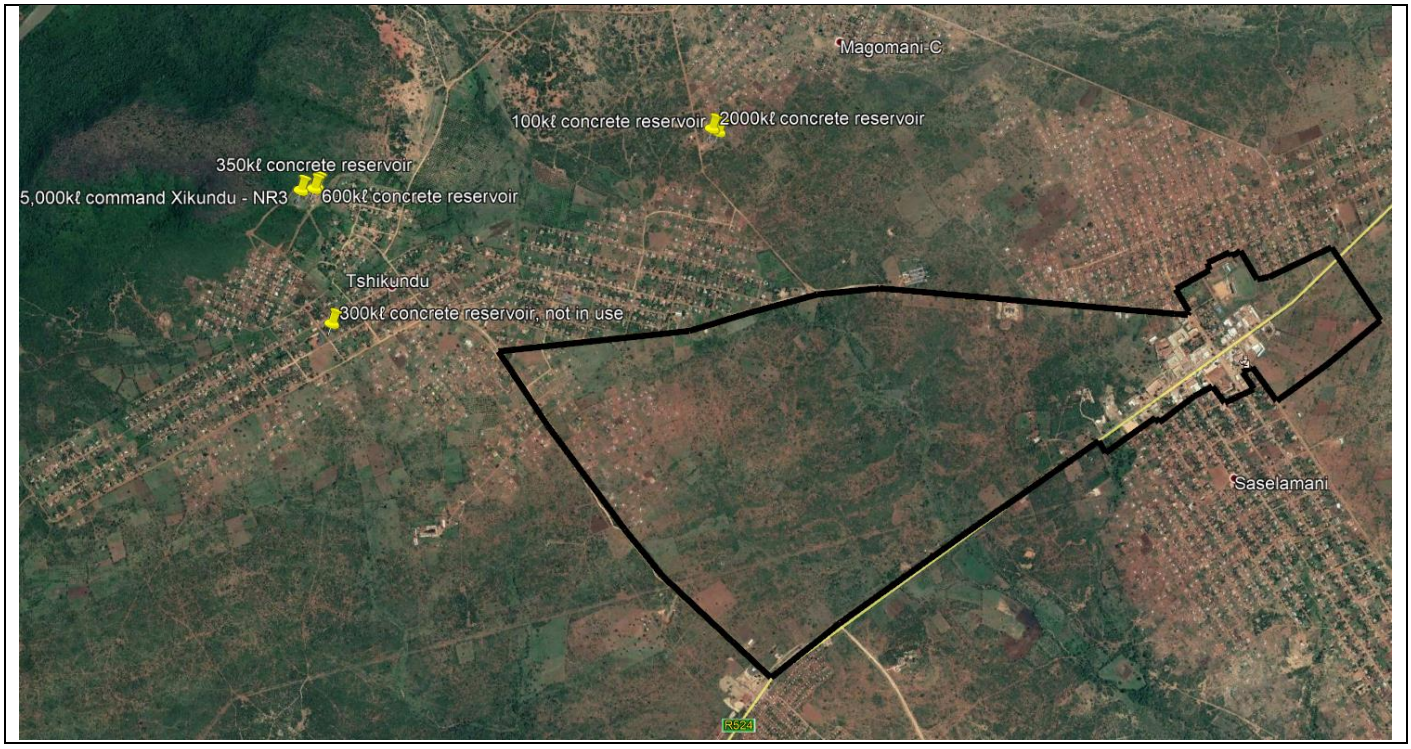

Figure 9 Water storage onsite

Water meter records could not be obtained. Water supply to the existing village homesteads has not been reliable.

5.5 Other Water Source To Be Further Investigated

Due to current water shortage experienced in the Xikundu WTW Water Scheme, it is essential that possible water sources be identified. Funding for these options can be multi-sectoral.

It is proposed to focus on three specific scenarios in order to increase water source to meet water demand, i.e.;

- Increasing the capacity of the Xikundu water treatment works.
- Developing additional boreholes to supply the proposed township.
- Combination of the above.

Figure 10 Xikundu WTW site

5.6 Water design criteria

The water design criterion to be used is listed in the table below. The water demands and fire flow were adopted from document titled: *The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.*

Item	Design element	Criteria
i.	Average Annual Daily Demand (AADD), for residential 1	0.6kℓ/unit/day
ii.	Average Annual Daily Demand (AADD), for residential 2	0.5kℓ/unit/day
iii.	Average Annual Daily Demand (AADD), for business	0.400kℓ/100m^2
iv.	Average Annual Daily Demand (AADD), for park	12.5-15kℓ/hectare
v.	Average Annual Daily Demand (AADD), for Municipal	400ℓ/100m^2
vi.	Average Annual Daily Demand (AADD), for Institutional	400ℓ/100m^2
vii.	Gross Average Annual Daily Demand (GAADD)	Allow 10% losses
viii.	Daily Instantaneous Peak Factor (DIPF)	1.5
ix.	Design Peak Flow Rate (DPFR) for domestic flows.	25ℓ/s
x.	Maximum static head	90m
xi.	Minimum residual head under conditions of domestic peak flow	10m
xii.	Maximum linear flow velocity under conditions of domestic peak flow	3m/s
xiii.	Pipe type	uPVC

Item	Design element	Criteria
xiv.	Minimum pipe class	9
xv.	Fire flow at any one hydrant under the conditions of domestic peak flows (one hydrant at a time)	15 ℓ/s
xvi.	Minimum residual head (fire plus domestic peak flow)	25m
xvii.	Maximum linear flow velocity under conditions of fire-fighting	3m/s
xviii.	DWS storage reservoirs sizing criteria: 48 Hrs x AADD Pumped from One Source 36 Hrs x AADD Pumped from Multiple Sources 24 Hrs x AADD Gravity Source	
xix.	Hospital, building according to Floor Area Ratio (FAR)	1.2 kℓ/100m^2
xx.	Church buildings	0.3 kℓ/100m^2
xxi.	Church grounds	1.2 kℓ/Ha
xxii.	School, crèche, educational buildings	60 ℓ/student
xxiii.	School, crèche, educational grounds	12 kℓ/Ha
xxiv.	Institutional, FAR = 0.4	0.6 kℓ/100m^2
xxv.	Sport grounds / Recreational	40 kℓ/Ha
xxvi.	Average Annual Daily Demand (AADD), for warehousing, FAR = 0.4	0.30kℓ/100m^2
xxvii.	Hotels, guest houses, lodges, boarding houses, retirement centres & villages, Buildings according to FAR = 0.4	0.90kℓ/100m^2

Table 3 The water design criteria

5.7 Water demands

The estimated water demand for the proposed township is shown in table below.

As per the table below, the water demand calculations indicate that the township will require 2936kℓ/d AADD, 3230kℓ/d Gross Average Annual Daily Demand, and a 4845kℓ/d Peak Demand.

Township water demand

Land Use	No. of Erven	Area (Ha)	Floor Area Ratio, FAR	Unit flow	Unit of measure	Water Demand	
Residential	1 429	188.74		0.6	kℓ/erf/day	857.4	kℓ/d
Business	97	7.57	0.4	0.400	kℓ/100m^2	121.1	kℓ/d
Institutional (Community facilities)	32	38.11	0.4	0.600	kℓ/100m^2	914.6	kℓ/d
Public Open Space	15	92.19					
Urban Agriculture	32	80.45				**	
Municipal Purposes (Offices)	5	8.88	0.4	0.600	kℓ/100m^2	213.1	kℓ/d
Residential 3 (Guest houses)	11	18.04	0.4	0.900	kℓ/100m^2	649.4	kℓ/d
Light Industry (Warehouses)	13	13.08	0.4	0.300	kℓ/100m^2	157.0	kℓ/d
Government (State department)	1	0.99	0.4	0.600	kℓ/100m^2	23.8	kℓ/d
Road / Servitudes		115.56					
Totals	1 635	563.61					
Sub-total Average Annual Daily Demand (AADD)						2 936.4	kℓ/d
Gross Average Annual Daily Demand (GAADD) (added 10%)						3 230.1	kℓ/d
Gross Average Annual Daily Demand (GAADD) (added 10%)						37.4	ℓ/s
Multiply by a peak factor (Summer Peak Factor)				1.5	peak factor	4 845.1	kℓ/d
Multiply by a peak factor (Summer Peak Factor)				1.5	peak factor	56.1	ℓ/s
Peak Water Flow						56.1	ℓ/s

Table 4 The proposed township water demands

** The water demand for urban agriculture is to be sought from sources other than the treated water from the Xikundu WTW.

The Fire flow calculations are presented in the table below.

RISK CLASSIFICATION	**Total Fire Flow (ℓ/s)**	**Duration of Fire flow (h)**	**Total Fire Flow (l/s)**	**Required Fire Flow Storage**	
Low risk: Single residential housing	15	1	15	54.0	kℓ/d

Table 5 Fire flow demands

The new development will require 54kℓ fire water storage onsite. Fire flow pipelines should be designed to the capacity of 15ℓ/s.

The proposed township water storage = AADD + Fire storage
= 2936 + 54 = 2990 kℓ
The proposed township water storage = <u>say 3000 kℓ</u>

5.8 Water Reticulation

The proposed township will be serviced by house connections.
It is proposed that the following infrastructure be developed to for the water supply;

- Upgrade Xikundu WTW by the planned additional 10Mℓ module.
- Upgrade the 4km pumping main from the Xikundu WTW.
- Concrete 3200kℓ reservoir to serve the township.
- 5km gravity bulkline to the proposed township.
- Water reticulation for the proposed township.

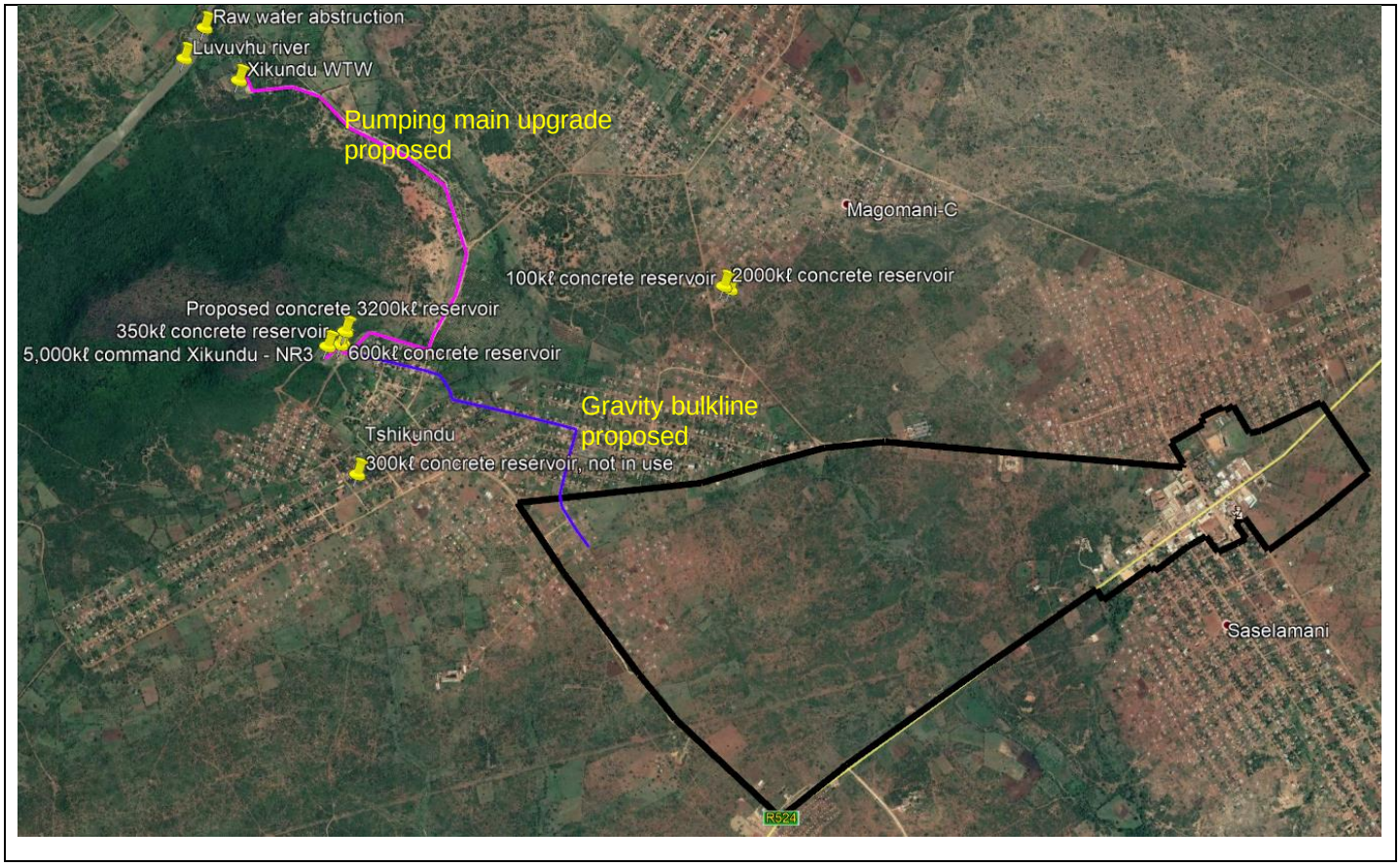

Figure 11 Proposed water infrastructure for Saselamani township

6 SEWER SERVICE

6.1 Existing Wastewater Treatment Works

There is no existing bulk wastewater treatment infrastructure in Saselamani. Domestic wet or dry sanitation is utilised in the village. This is the form of pit toilets, septic tanks and soakaways.

6.2 Wastewater Generated

The design guidelines were adopted from the CSIR document titled:
The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.

Land Use	**No. of Erven**	**Area (Ha)**	**Water Demand**		**Sewer Return**	**Sewer Flow**	
Residential	1429	188.74	857.4	kℓ/d	85%	728.8	kℓ/d
Business	97	7.57	121.1	kℓ/d	85%	103.0	kℓ/d
Institutional (Community facilities)	32	38.11	914.6	kℓ/d	85%	777.4	kℓ/d
Public Open Space	15	92.19	0.0	kℓ/d			
Urban Agriculture	32	80.45	0.0	kℓ/d			
Municipal Purposes (Offices)	5	8.88	213.1	kℓ/d	85%	181.2	kℓ/d
Residential 3 (Guest houses)	11	18.04	649.4	kℓ/d	85%	552.0	kℓ/d
Light Industry (Warehouses)	13	13.08	157.0	kℓ/d	85%	133.4	kℓ/d
Government (State department)	1	0.99	23.8	kℓ/d	85%	20.2	kℓ/d
Road / Servitudes		115.56	0.0	kℓ/d			
Totals	1 635	563.61	2936.4				
Sub-total Sewer ADWF						**2 496.0**	**kℓ/d**
15% Extraneous flow						374.4	kℓ/d
Gross Sewer						2 870.4	kℓ/d
Gross Sewer Flow						33.2	ℓ/s
Peak Factor						2.5	
Peak Sewer Flow						83.1	ℓ/s

Table 6 Sewer flow

The new development will have a sewer ADWF of 2496kℓ/d a gross sewer flow of 2870kℓ/d.

6.3 Sewer treatment

It is proposed that a combination of private domestic dry sanitation toilet systems and septic tank and soakaways be utilised to handle the township wastewater. The dry sanitation toilets used in the township must not be smelly or attract flies.

Domestic septic tanks and soakaways can be utilised provided the insitu soil percolation test results permit the use of soakaways.

There are toilets that can be bought from commercial suppliers; viz,

- Enviro-loo domestic toilets.
- Precast complete concrete structure toilets.

Enviro-loo domestic toilets

Precast complete concrete structure toilet

Figure 12 Typical dry sanitation toilet

7 Electricity

The electricity supply needs for the township are detailed in a separate report.

8 TOWNSHIP ROADS

The road infrastructure to service the township will be the standards of the Red Book, TMH, TRH books and the local municipality.

8.1 Classification of roads

Description	Class no.	Function	Reserve width	Roadway width
Access Road	5d	Access from existing bounding road	16m	7.4m
Internal Service Road	5f	Internal Road	13	6m
Internal Service Road	5f	Internal Road	10	6m

Table 7 Classification of roads

8.2 Geometric Design Standards

Design speed	60km/h
Minimum centre line radii	50m
Minimum gradient	0.5%
Favoured maximum gradient	10%
Maximum grade/grade length	12.5% over 70m
Maximum K-value : Crest	16
: Sag	16

Table 8 Class 5d – Access road

Design speed	30km/h
Minimum centre line radii	30m
Minimum gradient	0.5%
Favoured maximum gradient	12%
Maximum grade/grade length	16% over 50m
Maximum K-value : Crest	6
: Sag	8

Table 9 Class 5f – Internal roads

8.3 Pavement Design

The proposed pavement designs are based on anticipated traffic volumes and ground conditions, a detailed pavement design will require a geotechnical centreline investigation report.
The table below shows the proposed pavement design for the development.

Design	Description
Pavement	25mm Premix Asphalt / 80mm paving blocks / Concrete
Base	150mm Thick natural gravel stabilised with Cement to create C4 material compacted to 97% of Mod AASHTO
Subbase	150mm Thick natural gravel G7 material compacted to 97% of Mod AASHTO
Upper Selected Layer	150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density.
Lower Selected Layer	150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density.
Roadbed & Fill (where required)	150mm Thick layers compacted to 90% of Mod AASHTO Density. Minimum CBR= 3 at 90% of Mod AASHTO Density- G9

Table 10 Proposed pavement design

9 Stormwater Drainage

The stormwater will drain on according to the slope of the natural ground.

9.1 Stormwater systems

The terrain will be drained by V-drains or channelling of stormwater on the road surface to the natural low point. The stormwater will then flow over the veld to the stream. Stormwater discharge control will be applied in order to reduce the damaging effect of the increase in runoff due to densification.

9.2 Hydrology

The hydrological data used in the design of the stormwater drainage system is shown in the table below.

Hydrological Data	
a) Flood return period	1: 2 years for storm water pipe system. 1: 5 years for the combined storm water Pipe and road systems
b) Average yearly rainfall	499mm
c) Minimum time of concentration and run	As per Local Municipality Guidelines
d) Design Method	Rational method

Table 11 Hydrological data

9.3 Design Standards

The table below lists the standards to be used in the design of the stormwater drainage system:

Design Element	**Specification**
a) Minimum pipe size	600 concrete
b) Minimum pipe gradient	0.67%
c) Storm water details	Local Municipal Standard Details

Table 12 Stormwater design standard

10 SOLID WASTE

A regional landfill situated nearest the site is used to dispose solid waste. The local municipality is responsible for connecting and disposing the solid waste.
The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.

The solid waste generation range from 0.41 kg per capita per day in the poor areas, to 1.29 kg per capita per day.
The lower rate of 0.41kg/c/d was adopted for the township. Solid waste will be generated by the development.

Population estimate = 1429 residential erf x 4 people per erf = 5716 people

- Solid waste = 0.41kg/per person/day or (0.41kgx365 days)
- Waste generated per day = 0.41x 5716 = 2344kg = 2.34 tonne
- Waste generated per annum = 2.34x365 = 855 tonne

11 Conclusion

The proposed development will contribute towards improving the housing stock of the area and general livelihood of the residents.

Signature:

Signed by:
PR No.:
For Dalimede Projects (PTY) Ltd

ANNEXURES

ANNEXURE 1 Township Layout Plan