



NKETOANA LOCAL
MUNICIPALITY

PROPOSED TOWNSHIP ESTABLISHMENT ON FARM MORGEN 542, REITZ

ENGINEERING SERVICES REPORT

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1. INTRODUCTION

1.1 BACKGROUND

Batsumi Consulting Engineers were appointed by Gert Tack Konstruksie to conduct an assessment of the existing engineering infrastructure to determine any capacity constraints, if any, to meet the demand of the proposed new township development on Morgen 542, located in the town of Reitz.

Considered to be home of one of the major players in the South African Agricultural Sector (VKB) and located in the Northern Parts of the Thabo Mofutsanyana District (Free State Province), the town of Reitz was founded in 1889 and forms part of the Nketoana Municipality alongside towns such as Petrus Steyn and Lindley.

This report aims to highlight any potential maintenance, upgrade or expansion that may be needed for the infrastructure in place which would result in the adequate supply of services required for a functional and sustainable development.

The proposed development has been planned to accommodate the following:

*7x 3000m² Residential stands

*7x 1500m² Residential stands

*10x 1000m² Residential stands

*10x 800m² Residential stands

*10x 20 units per hectare Townhouses

*10x 40 units per hectare Townhouses

*10x 40 units per hectare Townhouses

The rest of what is remaining will be reserved for internal roads and open spaces.

1.2 SITE DESCRIPTION

Secure and completely fenced-off, the site is primarily covered by vegetation (**Figure 23**) with its topography falling from North to South (4.76%). It also comprises of 2 buildings with a quarry (**Figures 05 & 06**) on the northern most part of the site and a small dam at the toe (extreme south) of the site.

The combined length (Perimeter) of the site is approximately **1.45km** with the current access in Viljoen Street. The site also has high voltage overhead powerlines passing through the site and a borehole in the middle of the property.

1.3 LOCALITY & EXTENT

The Proposed New Township will be located South of the town Central Business District with the following centroid:

Co-ordinate System: **Hartebeeshoek 1994: Lo27**

-56 522.080; -3 077 868.136

World coordinate System: **WGS 84**

-27.8131563° S; 28.4263578° E

The extent of the site is approximately= 8.5383 Ha. (1566m above sea level)

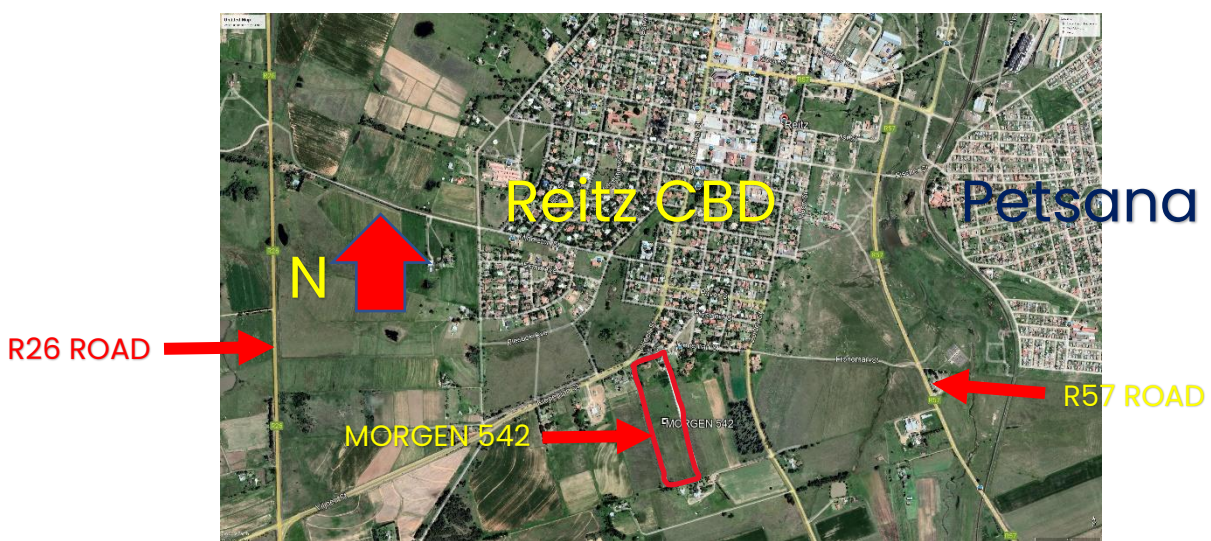


Figure 01: Site Locality

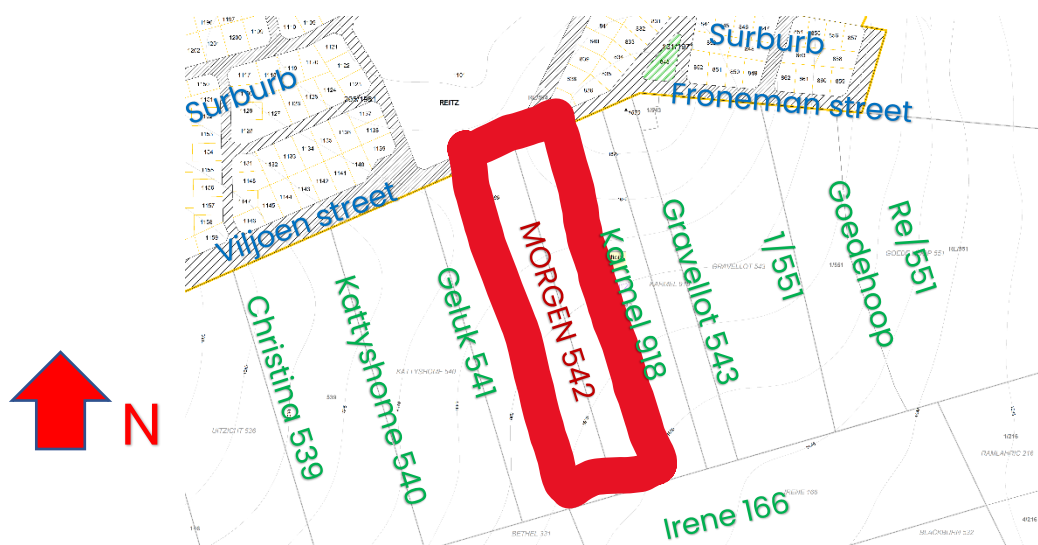


Figure 02: Site Extent

2. CIVIL SERVICES

2.1 WATER SUPPLY

2.1.1 EXISTING BULK INFRASTRUCTURE

Nketoana Municipality currently pumps out raw water from Liebenbergvlei river to the Reitz Water Treatment Works for purification. Potable water is then pumped to the Reservoir and Gravity-fed to the town of Reitz and Petsana. The Treatment Works also supplies Petrus Steyn via a dedicated pipeline since it falls under Nketoana's jurisdiction.

A water pressure of 140kPA (**Figure 04**) could be measured in close proximity to the property and the current occupants/ residents of Morgen 542 are using onsite elevated-potable water storage tanks of capacities between 1500-2000Litres. (**Figure 03**)

Other existing water infrastructure found on the farm:

*A borehole - currently not connected to reticulation system. Farm owner confirmed that the borehole contains water, however water quality and drawdown rates are still to be determined. **See Figures 07 & 08**

2.1.2 PROPOSED DEMAND & RETICULATION

Demand

The following design criteria are proposed:

Annual Average Water Demand (AAWD) (l/day)

Area Schedule

Number	TYPE	AREA	TOTAL
7	RESIDENTIAL	3000	21 000
7	RESIDENTIAL	1500	10 500
10	RESIDENTIAL	1000	10 000
10	RESIDENTIAL	800	8 000
10	TOWNHOUSES	500	5 000
10	TOWNHOUSES	250	2 500
10	TOWNHOUSES	250	2 500

59 500m² ~ 5.95Ha.

Gross Area of stands, A= 59 500.00m²

Adopted from the Technical Paper: Journal of the South African Institute of Civil Engineering, Vol 56, No.1, April 2014, Page 63-68, Paper 947 "**Proposed Guideline for modelling Water Demand by Suburbs**":

AAWD (mean)= 0.00089A+0.3

Therefore: **AADD= 53.255kl/day**

Sustained Summer Daily Demand (SSDD) [if required]

Type of development: Dwelling house, House Connection;

SSDD (kl/day)	1.2 x AADD= 63.906
Minimum residual pressures	
Moderate Risk	24 m
Maximum residual pressures	90 m
Storage	24 hr (bulk supply is via gravity feed from the main reservoirs)

From the aforementioned it can be concluded that the demands on the services for this development will, in the final instance, be as follows:

Water demand = **53.255kl/day**

2.1.3 FIRE SERVICES

It is expected that during occupation, the buildings will not be storing any highly flammable goods and as a result, only fire extinguishers and Firewalls will be needed to contain any breakouts.

Moreover, there is an existing ring-main located within a 180m min. radius from the proposed development making it ideally for new connections.

With reference to the abovementioned, new hydrants are required and the following design parameters shall be adopted:

Category: Moderate Risk Area

These are areas in which the risk of fire and of spread of fire is moderate, such as industrial areas, areas zoned "general residential" with a floor space ratio of less than 1,0 (residential zones II and III) where buildings are not more than three storeys in height, and commercial areas normally occurring in residential districts where buildings are not more than three storeys in height.

FIRE-RISK CATEGORY	MINIMUM HYDRANT FLOW RATE FOR EACH HYDRANT (LITRES/ MINUTE)	MINIMUM RESIDUAL HEAD (METRES)	DURATION OF DESGN FIRE FLOW (HOURS)
<i>Moderate</i>	1500	15	4

2.2 SANITATION

2.2.1 EXISTING BULK INFRASTRUCTURE

On the northern side of the proposed development, there is a wastewater and sewer disposal chamber alongside Froneman Street. The invert level of this particular chamber is higher than the rest of the development. **See Figure 10**

2.2.2 PROPOSED CONVEYANCE & DISPOSAL

The following design criteria are proposed:

Average daily dry weather flow (ADDWF): Assumed at 90 – 95% of water consumption, depending on specific use.

Average daily wet weather flow (ADWWF): $ADWWF = 1,15 \times ADDWF$

Peak daily wet weather flow (PDWWF l/s): $PDWWF = 2,5 \times ADWWF$ Sewer pipelines (gravity)

Full flow capacity design:

- Minimum full flow velocity: 0,7 m/s
- Maximum full flow velocity: 2,5 m/s

- Minimum gradients

Pipe Diameter	Min. Gradient	Minimum Capacity (l/s)
160	1:200	15
200	1:300	22
250	1:400	34
300	1:500	49

The sewerage outflows associated with the different users have been calculated and are provided as follows:

$$ADDWF = 0.95 \times 53.255 \text{kl/day} = 48.063 \text{kl/day}$$

$$ADWWF = 1.15 \times 48.063 \text{kl/day} = 55.272 \text{kl/day}$$

$$PDWWF = 2.5 \times 55.272 \text{kl/day} = 138.180 \text{kl/day}$$

Therefore, the Sewer outflow= **48.063kl/day**

A water-borne sewer disposal system is proposed and the internal reticulation will use piping with a minimum diameter of 110 mm and appropriate manholes will be installed at a maximum of 80 m as prescribed by the local authority.

The sewer disposal pipe from every proposed individual property will be installed to a connection point on each site, from where it will gravitate via a pipe to a system of chambers located at the South Eastern corner of the site and then pumped up north to eventually discharge into the Municipal's existing sewer chamber in Froneman Street.

2.3. ROADS

Morgen 542 currently has 5 (five) access points. One of these points is located along Springbok Avenue/Viljoen Street which runs from the R26 road to the town's Central Business District. The road is currently in a good state (type: skid-resistant surfaced road) and has a width of approximately 7.6 metres. **See Figure 11 & 18**

The other 4 accesses are located in Froneman Street (**Figure 26**). The road is a gravel route with a gradual fall towards the development. **See Figures 12 & 25**

2.4. STORMWATER MANAGEMENT

Approximately one third of the development's topography (the Northern most part of the site) will slope towards the existing stormwater infrastructure at Viljoen Street while the rest will be directed towards the Natural Channel located along the Southern Boundary of the site using roadside kerbing, piping, grid-inlets, concrete channels and existing retention dam. (**See Figures 13 & 14**)

3. FLOODLINES

Various technics including flood-routing, possible detention and retention, to mention a few, will be employed for the final designs to properly manage the stormwater caused by precipitation on the site's catchment areas.

The project area does not have any perennial or non-perennial streams. All storm water consists of surface run-off which can be addressed under the storm water design of the roads.

The run-off falls away from the development, therefore it does not pose any threat to the residential area. The 1: 100-year flood line will have no effect.

It is recommended to provide sufficient storm water servitudes in order to convey storm water away from the houses.

The proposed establishment is situated near a densely-developed part of town which is well below the 1:100 Flood-line

4. SOLID WASTE MANAGEMENT

A weekly solid waste removal system is currently operational and will be able to accommodate the additional volumes of waste generated by the proposed development.

The collection of general waste will be done by the Nketoana Local Municipality Waste collection and Disposal unit.

No medical waste or any other similar hazardous waste would emanate from the residential buildings unless otherwise encountered for which it would be contracted to an accredited hazardous waste disposal company arranged by the developer.

5. TELECOMMUNICATIONS

There are existing telecommunications lines in the vicinity of the development which may be used if the need arises. (**See Figure 15**)

And although Telkom's then policy did state that "*unless if there is a demand which produces sufficient revenue to cover the capital expenditure, Telkom will provide the necessary infrastructure*", it has since moved away from the use of traditional copper as it has digitalized its networks.

6. TRAFFIC IMPACT ASSESSMENT

Any further information regarding any potential upgrades of the existing road infrastructure (tarred or gravel roads, road markings, signages, etc) and internal infrastructure will be in strict accordance with any and/or all of the relevant traffic and road design standards applicable to the Republic of South Africa and will comply with the current by-laws as set by the Nketoana Local Municipality.

The aforementioned issues are covered in a separate report (**See *Traffic Impact Assessment report*, Compiled by KMA Consulting**)

7. ENVIRONMENTAL ISSUES

All of the issues relating to the Rules and Regulations gazetted by the Department of Water Affairs and Forestry of the Republic of South Africa and other relevant World Environmental Preservation and Conservation statutory bodies pertaining to this particular development are covered in a separate report (**See *Environmental Impact Assessment report*, Compiled by Green Box Consulting**)

8. GEOTECHNICAL INVESTIGATION

In this instance, an aerial photographic interpretation, remote sensing, field survey that did not include hand auger, soil classification and digging of test pits with various machinery as well as a collection of soil samples was conducted and a report compiled to address all of what is been mentioned above.

In summary,

** "The underlying geology comprises of the sandstone of the Tarkastad formation of the Karoo Supergroup. The Tarkastad Formations consists mainly of fine to medium grained olive brown sandstones and reddish mudstones*

**The residual soils, Tarkastad Formation, can be expected to have intermediate collapsible properties and shallow bedrock. Therefore, moderate geotechnical constraints are expected for the housing development. Engineering design must incorporate the potential for collapse with safety and erosion problems if the underlying soil horizons are exposed."*

That particular report has been attached as an Addendum to this report.

9. ELECTRICITY

The electricity onsite is currently supplied by Nketoana Local Municipality. High-Voltage Overhead Eskom lines and an Electric Box were noted on the Property. **See Figures 16 & 17.**

This is a specialist field and all of the issues pertaining to this topic are covered in a separate report (See **Electrical Engineering Services report**, Compiled by SW Engineering)

10. CONCLUSION AND RECOMMENDATIONS

* The proposed site is ideally situated for this type of development as there is Engineering Infrastructure available to support the establishment and commission of the property.

* The Local Municipality is yet to Officially confirm that there is bulk capacity to meet the water supply, wastewater disposal and solid waste demands that will be posed by the new proposed development at Morgen 542.

* Minor Maintenance would have to be considered for the effective conveyance of the stormwater generated from the development as there is debris and vegetation within the disposal channels & stormwater piping.

*All accesses, roads and other related issues on potential upgrades will be covered in the Traffic Impact Assessment Report.

* Refer to the Geotechnical Desktop Study for recommendations pertaining to onsite soil conditions.

11. DECLARATION

I, **MORNE DEYZEL**, hereby declare that the highest level of professionalism and diligence was exercised in compiling this report and that the above is true and accurate in every respect.



Signature:

Date: 12/08/2022

12. APPENDIX

LIST OF FIGURES



Figure 03: Elevated Water Supply Tank



Figure 04: Water Pressure Reading



Figure 05: Onsite Quarry



Figure 06: Water present at Quarry



Figure 07: Existing Borehole



Figure 08: Borehole Pump



Figure 09: Manhole in Viljoen Street



Figure 10: Closest Sewer Chamber



Figure 11: Access in Springbok Avenue



Figure 12: Access in Froneman Street



Figure 13: Natural Stormwater Channel



Figure 14: STW Drain in Springbok Ave.



Figure 15: Telecommunications line



Figure 16: Electric Box with Plugs



Figure 17: Overhead Powerlines



Figure 18: Springbok Avenue



Figure 19: Road Signage in Viljoen Street



Figure 20: Small Dam (Retention)



Figure 21: Rain-water Harvesting



Figure 22: Water Feature (Springbok Ave.)



Figure 23: Property Landscape



Figure 24: Water Meter

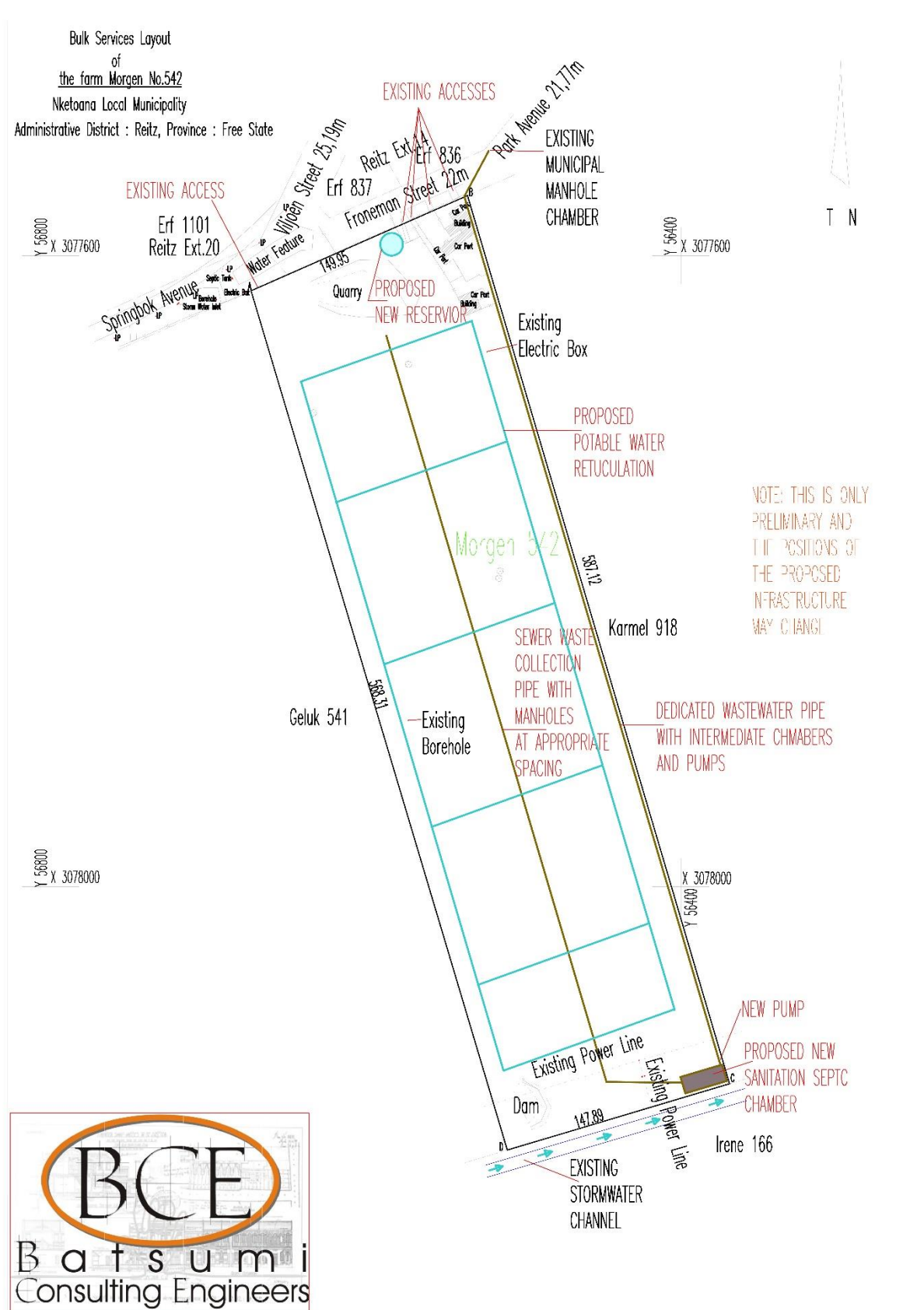


Figure 25: Access Point (Froneman)



Figure 26: Froneman Street

SCHEMATIC OF EXISTING & PROPOSED INFRASTRUCTURE



DETAILED CONTOUR MAP FOR MORGEN 542

