RETHUSHENG SPECIAL SCHOOL

BULK SERVICES FEASIBLITY REPORT

RENOVATIONS AND ADDITIONS TO STORM DAMAGED SCHOOLS IN THE LIMPOPO PROVINCE CLUSTER A

CIVIL ENGINEERING

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1 TERMS OF REFERENCE

Muteo Consulting cc has been appointed by the Department of Public Works to provide professional civil and structural engineering services for the construction of Rethusheng Special School.

The scope of services includes the following project stages:

- Scoping
- Preliminary Design
- Detailed Design
- Tender Documentation
- Construction Supervision
- Project Closure

2 PROJECT LOCATION

The proposed site for the construction of Rethusheng Special School is situated in Mamehlabe Village, along Juno Road, within the Capricorn District Municipality, Limpopo Province. The geographical coordinates of the site are 23°33′21″S, 28°57′24″E.

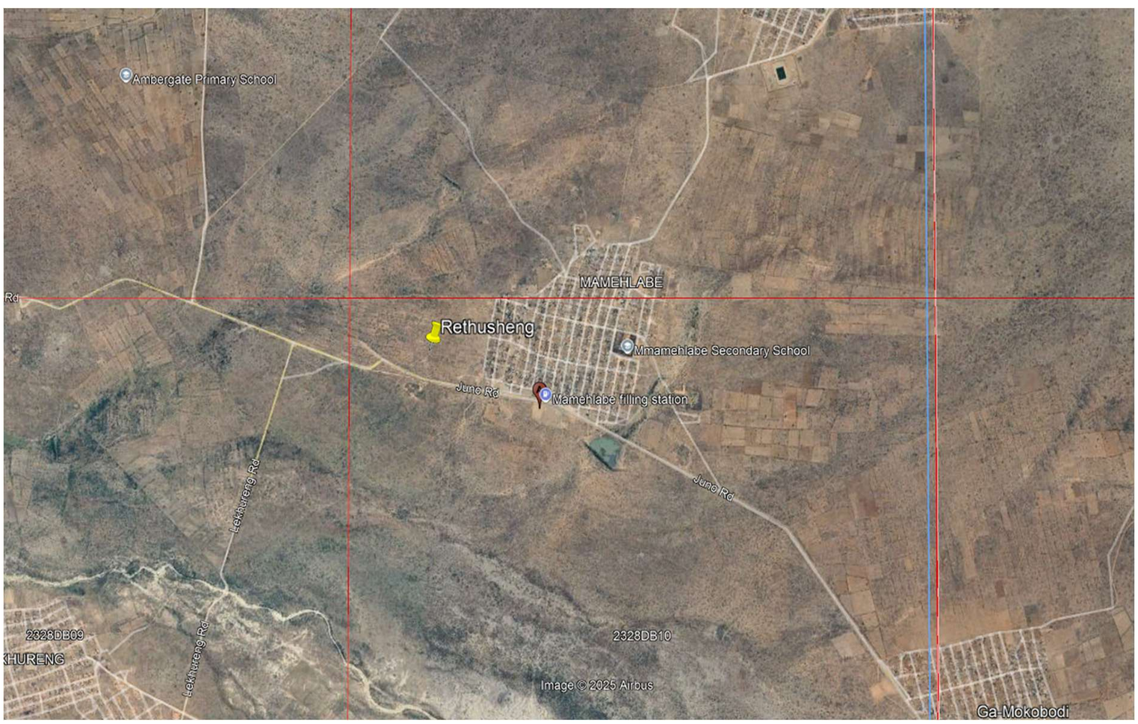

Figure 1: Locality Map

3 BULK SERVICES

3.1 WATER SUPPLY SOURCE

A sustainable and reliable water supply is critical for the operation of Rethusheng Special School. Based on the field investigation conducted on 11 March 2025, stakeholder interviews, and review of the site context, the following water supply options were evaluated. Enquiries with the **Capricorn District Municipality**, the local Water Services Authority (WSA), have confirmed that the district **does not supply water directly to institutions such as schools, clinics, or churches**. These responsibilities fall under the jurisdiction of the relevant sector departments, in this case, the Department of Public Works, Roads and Infrastructure, in collaboration with the Department of Education.

3.1.1 Existing Water Supply Infrastructure

The existing water supply infrastructure in the area comprises elevated steel storage tanks and communal standpipes, as shown in Figure 2 below. The water source is reported to be a series of boreholes; however, these could not be accessed during the site visit. Although the system is operational, it has been reported to be insufficient in meeting the current daily water demand of the village. As a result, it was concluded that connecting the proposed Rethusheng Special School to the existing network may not offer a sustainable long-term water supply solution. A detailed water balance assessment will be carried out during Stage 2 (Preliminary Design) of the project to investigate and evaluate viable alternative supply options.

Figure 2 : Existing Water Supply Infrastructure

3.1.2 Groundwater Abstraction

Hydrogeological assessments conducted in similar rural areas of Limpopo suggest that boreholes can yield between 0.5 and 2.5 L/s (DWAF, 2006). Based on these findings, groundwater presents the most sustainable long-term water supply solution for the proposed Rethusheng Special School. It is recommended that multiple boreholes be developed, each equipped with submersible pumps, and connected to a reticulated system supplying elevated steel storage tanks. This approach is less susceptible to seasonal fluctuations and, with appropriate filtration and chlorination, can provide water of acceptable quality for school use.

Geohydrological investigations were conducted were conducted on the site by Naledzi Waterworks on 08 August 2025. Three boreholes were drilled and the geohydrological results of the boreholes are as summarized in table 1 below. Detailed geohydrological results of the boreholes can be located under *Annexure 1: Prelim Geohydrological Report*.

Table 1: Boreholes testing summary of geohydrological findings

Borehole No.	Coordinates	Yield (l/s)	Duty cycle (hours)	Daily abstraction (kl/day)	Borehole depth (m)
BH1	-23.55531 28.95703	0.5	12 hours	21.5	100
BH2	-23.55684 28.95663	0.5	12 hours	21.5	120
BH3	-23.55685 28.95663	Dry	-	-	-
Total		**1.0**		**43**	

Figure 3: Boreholes Mapping

3.1.3 Surface Water from the Dam

A nearby dam, see Figure 3 below, was initially considered a potential supply. However, interviews with local community members have confirmed that the dam is seasonal and prone to upstream contamination from livestock and other external agents. Furthermore, the use of this surface water source would require authorisation from the Department of Water and Sanitation (DWS), which introduces additional regulatory and time constraints. As such, the dam is not recommended as a primary water source.

Figure 4: Existing Dam

3.2 SANITATION DISCHARGE AND TREATMENT

The site is currently unserviced by any central wastewater network. The surrounding community primarily uses **Ventilated Improved Pit (VIP) latrines (see figure 4 below)**, which offer basic odour control and user separation from waste but are not ideal for institutional settings due to limitations in capacity, hygiene control, and accessibility.

3.2.1 Options Analysis

1. **Conventional Pit Latrines:** Not suitable for schools due to high health risks and poor odour control.

2. **VIP Latrines:** Improved over conventional pits and in widespread use locally, but limited in scalability and accessibility, particularly for learners with disabilities.
3. **Conservancy Tanks:** Provide safe containment with regular desludging; operationally reliable but require consistent waste collection services and incur high maintenance costs.
4. **Septic Tanks with Soakaways:** Suitable for low- to medium-density usage; potential for groundwater contamination if not properly designed.
5. **Decentralised Wastewater Treatment Systems (DEWATS):** Scalable, modular, and capable of treating large volumes. Low energy consumption and allows for reuse of treated water, offering the best long-term sustainability.

Figure 5: Existing VIP Toilets

3.2.2 Proposed Sanitation Strategy

- Use **conservancy tanks** during the initial phase.
- Plan for phased upgrade to a **DEWATS-based system** to cater for future student population and reduce long-term operational costs.
- Toilets to be low-flush and universally accessible, meeting the needs of all learners, including those with disabilities.

3.3 Site Suitability

Soil percolation tests and groundwater separation distances must be validated during geotechnical investigations to ensure safe on-site effluent disposal. The sanitation system must comply with SANS 10400-P and WHO sanitation design guidelines for institutions.

3.4 STORMWATER MANAGEMENT

Flat terrain and clayey soils dominate the site, which, coupled with occasional intense rainfall, increases surface runoff risks. Culverts along Juno Road, visible in Figures 5 and 6 below, show current drainage pathways.

Figure 6: Existing Stormwater Drainage Paths

Figure 7: Existing Culvert

3.4.1 Stormwater Design Approach

Given the rural context, the following stormwater management techniques are most suitable:

- **Grassed swales:** Direct runoff while promoting infiltration.
- **Infiltration trenches:** Allow stormwater to percolate into the soil, reducing peak flow.
- **Retention ponds:** Temporarily hold stormwater to manage discharge rates.
- **Check dams and contour bunds:** Reduce flow velocity and promote sedimentation.
- **Permeable paving:** Reduce runoff from walkways and driveways.
- **Rock pitching at outfalls:** Minimise erosion.

3.4.2 Hydrologic Study Requirement

A comprehensive hydrologic and hydraulic study is essential to determine runoff coefficients, flow volumes, and critical drainage pathways. This study will inform the final sizing and positioning of stormwater infrastructure and ensure compliance with the Red Book (CSIR, 2000) and local by-laws.

3.5 ACCESS TO THE SITE FROM JUNO ROAD

3.5.1 Current Access Conditions

Juno Road is an existing bitumen-surfaced road (Figure 7), with secondary access through an unnamed gravel road (Figure 8), which is currently eroded and affected by inadequate drainage. These conditions pose risks to learner transportation, emergency access, and delivery logistics.

Figure 8: Juno Road

Figure 9: Access Road into Village Nearest to School

3.5.2 Proposed Upgrades

- Grading, compaction, and **bitumen surfacing** of the secondary road.
- Installation of stormwater side drains and culverts.
- **Entrance gateway** with bus drop-off loops, widening of road bends to accommodate large vehicles.
- Engagement with Local Authorities

Muteo Consulting has initiated dialogue with the Blouberg Local Municipality Technical Services to explore cost-sharing or alignment with existing Integrated Development Plan (IDP) priorities for rural access roads.

3.6 FLOOD MITIGATION

Flood risk is present due to low terrain elevation and the proximity to the seasonal dam. Flood levels will be mapped based on 1:50 and 1:100 AEP (Annual Exceedance Probability) storm events.

3.6.1 Design Interventions

- **Hydrologic and hydraulic study** to determine flood risk and peak flows.
- **Raising of platform levels** of dormitories and classrooms.
- **Diversion channels** around the perimeter.
- **Reinforced concrete culverts** sized for 1:100-year flood flows.
- Vegetative buffer zones near flood-prone areas.

3.7 SOLID WASTE MANAGEMENT

Daily school operations will generate a mixture of domestic, medical, and maintenance waste.

3.7.1 Waste Handling Strategy

- Provision of **segregated waste bins** across campus.
- A **secure refuse yard** (noted in site plan) for interim storage.
- Recycling bins for paper, plastics, and metals.

3.7.2 Disposal

Regular waste removal will be coordinated with **Capricorn DM Environmental Services**. For medical waste (from the school clinic), a separate agreement with a licensed hazardous waste contractor will be arranged.

3.7.3 Environmental Compliance

All waste management operations will comply with the **National Environmental Management: Waste Act (Act 59 of 2008)** and associated regulations.

4 RECCOMENDATIONS

This section covers the recommendations proposed by the team on each of the various sections of the civil scope of the project.

4.1 WATER SUPPLY

It is recommended that the site have its own onsite water supply due to non-reliability of existing water infrastructure in the village. However, the based on the calculated water demand using SANS 10252 Part 1, the site requires 3.5 l/s as opposed to the total supply from the boreholes of 1 l/s. It was therefore determined that the boreholes tested do not have sufficient capacity to supply the facility and we therefore recommend the following options argument the borehole supply:

- Testing and drilling of additional boreholes within the site to increase water supply.
- Implementation of a grey water harvesting system which will collect discharge from showers, basins and convey it to an on-site sump where it will be treated and recycled into useful effluent. This will reduce demand generated by the facility.
- Water harvesting tanks – Rainwater harvest tanks are recommended in applicable areas where space permits. However, due to the low annual rainfall of the area this may provide little benefit when compared to the space requirements for such infrastructure.
- In the long run the dam may serve as a primary source of water, subject to DWS permitting and treatment. Borehole water would then act as a backup.

4.2 SANITATION DISCHARGE AND TREATMENT

The recommended sanitation system for the facility is as follows:

- Use **conservancy tanks** during the initial phase.
- Plan for phased upgrade to a **DEWATS-based system** to cater for future student population and reduce long-term operational costs.
- Toilets to be low-flush and universally accessible, meeting the needs of all learners, including those with disabilities.

4.3 STORMWATER MANAGEMENT

Stormwater management strategies for flood control measures, managing stormwater within the proposed development, and reduction in post development runoff flows will be implemented to ensure appropriate stormwater disposal. The stormwater management plan recommendations are as follows:

- Stormwater discharge points to be provided with erosion control in the form of headwalls, gabion baskets and mattresses.
- Stormwater runoff is proposed to ultimately discharge across Juno Road as predevelopment flow with a headwall and erosion protection to reduce flow velocities.
- Minor and major stormwater systems should cater for the 5-year and 50-year design flood, respectively.
- The stormwater management system comprises of stormwater pipes, roads, overland flow paths and open channels discharging into an attenuation pond (dry type), indicated on Drawing No. NNB-RETHU-25-SWMP-001 and 002.
- Minor stormwater systems consist of underground pipe networks, and the major system consists of open channel flow.
- External stormwater catchment diversion with use of a catchwater channel and berm is proposed to divert runoff away from the site for the 100-year return period, mitigating the risk overland runoff flooding the site.
- The outlet orifices of the attenuation pond are to be appropriately sized for the 5yr, 50yr and 100yr return periods such that predevelopment flow conditions are met.
- Stormwater discharge points to be provided with erosion control in the form of headwalls, gabion baskets and mattresses.
- Stormwater runoff is proposed to ultimately discharge across Juno Road as predevelopment flow with a headwall and erosion protection to reduce flow velocities.

Reference can be made to *Annexure 2: Stormwater Management Report* for detailed stormwater management report.

4.4 FLOOD MITIGATION

The 100-year flood map generated from online data suggests that the proposed site is at low risk of inundation from adjacent watercourses. However, the accuracy and confidence of this assessment is deemed very low due to the elevation discrepancies and coarse resolution of the online data, which fails to adequately define the watercourse channels and floodplain areas, resulting in unrealistic flood map delineation.

Given the limitations of the online data, the results of this desktop floodline assessment are deemed inconclusive. To ensure a reliable and high-confidence conclusion to the floodline assessment, it is highly recommended that a detailed survey be conducted for the study area and watercourses. Reference can be made to *Annexure 3: Floodline Assessment Report* for detailed flood assessment report.

4.5 SOLID WASTE MANAGEMENT

Daily school operations will generate a mixture of domestic, medical, and maintenance waste. Regular waste removal will be coordinated with Capricorn DM Environmental Services. For medical waste (from the school clinic), a separate agreement with a licensed hazardous waste contractor will be arranged.

5 CONCLUSION

The proposed site for Rethusheng Special School is deemed technically suitable for development, provided the recommended infrastructure interventions are implemented. The engineering services strategy prioritises sustainability, safety, and scalability. Further detailed designs, and environmental authorisations will follow upon project approval.