Proposed development of Spar Sedgefield on Erf 4970, Sedgefield

Preliminary Engineering Services Report

May 2017
Proposed development of Spar Sedgefield on Erf 4970

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May 2017
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</table>
Proposed development of Spar Sedgefield on Erf 4970

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CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION AND BACKGROUND</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>LOCALITY, LAYOUT AND ACCESS</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>GEOTECHNICAL INVESTIGATION</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>PROPOSED LAND USE</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>PRELIMINARY ENGINEERING SERVICES DESIGN</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>5.1 Water</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>5.2 Sewer</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>5.3 Roads, access and parking</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>5.4 Stormwater</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>5.5 Solid Waste</td>
<td>19</td>
</tr>
<tr>
<td>6</td>
<td>CONCLUSIONS AND RECOMMENDATIONS</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>6.1 Conclusions</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>6.2 Recommendations</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>ADDENDA</td>
<td>23</td>
</tr>
</tbody>
</table>
1 INTRODUCTION AND BACKGROUND

Element Consulting Engineers has been appointed by CPS Group for the rendering of professional civil engineering services for the proposed commercial retail development on erf 4970, Sedgefield. The project proposes the development of a Spar, Clicks, Mugg&Bean and Pep with a total GLA of 3015m² on an erf of 6676m².

A pre-application meeting has been held with representatives of the municipality to discuss the development as well as the requirements for the application submission. A minor number of issues have been raised during this meeting. All of the engineering aspects raised will be addressed in this preliminary engineering services report.

This report will detail and discuss the preliminary engineering services design of the proposed development in terms of firstly the bulk engineering services and secondly the internal engineering designs in parallel with the engineering standards and technical design criteria applicable to the project.
2 LOCALITY, LAYOUT AND ACCESS

The proposed development site, erf 4970, Sedgefield, is located centrally in town, adjacent to the N2. The site is bounded by the service road for the N2 on the north, Vink Avenue to the east, built-up properties to the south and Swan Road to the west.

Current and proposed access to the site is obtained from the service road, via the Vink Avenue intersection with the N2.

The diagram below indicates this locality and access in additional detail.

![Figure 1: Locality plan](image1.png)

The preliminary Site Development Plan (SDP), as prepared by Chameleon Architects, is shown below and is included as addendum.

![Figure 2: Proposed Site Development Plan (SDP) layout](image2.png)
3 GEOTECHNICAL INVESTIGATION

A formal geotechnical investigation has not been performed yet and will be performed during the detail design stage. A visual inspection of the site was conducted in order to assess conditions on site.

Holistically, the conclusion reached is that the in-situ materials found on site are adequate for the construction of engineering services and foundations for commercial retail development.

**General Soil Profile**
Inspection of the site indicated relatively consistent soil horizons throughout with a light brown sand of significant depth present. Darker brown silty sand is evident in the lower lying areas. The materials appear slightly moist and are fairly loose. No perched water table is evident and a low to moderate water retention rate is expected. Flat to undulating gradients are evident.

**Ground water**
No ground water and/or perched water are evident. A low to moderate water retention rate is expected. Lateral movement of stormwater will not be critical due to the flat gradient although erosion of the silty sands may occur on the lower lying areas.

**Engineering Services**
A TLB will suffice for trenching and excavations of all services and foundations in all materials. Although the possibility of rock is deemed to be extremely small, rock may be present at deeper depths. This will be determined by a formal geotechnical investigation.

**Foundations for commercial retail development**
The visual investigation indicated that the in-situ materials are adequate to support single level commercial retail development. Reinforced strip footings will be adequate for the development. Fill areas to be adequately compacted to a minimum specification to be determined from the formal geotechnical investigation and detail design.

**Slope Stability**
Gradients on the site is flat to undulating. No natural slope instability is present.

**Construction materials**
A number of commercial operators are located in close proximity to the site for the provision of imported construction materials.
4  PROPOSED LAND USE

The proposed development of erf 4970, Sedgefield, entails the proposed development of 2,845m2 GLA of commercial retail space and 170m2 GLA of commercial restaurant space.

The preliminary Site Development Plan (SDP), as prepared by Chameleon Architects, is included as addendum.
5 PRELIMINARY ENGINEERING SERVICES DESIGN

This chapter will discuss the preliminary engineering services design of the proposed development in terms of firstly the bulk engineering services and secondly the internal engineering designs in parallel with the engineering standards and technical design criteria applicable to the project. A set of preliminary design drawings is also available for reference and discussion purposes only, and should be consulted in parallel to the discussions below.

5.1 Water

Water Demand

The Average Annual Daily Demand (AADD) for this development was calculated based on the Gross Leasable Area of 3015 m².

The Guidelines for Human Settlement Planning and Design specify a 400 l/day usage for a gross floor area of 100 m² for retail space. This figure has been used as a guideline for calculating the water demand for this proposed development: The following water demands can subsequently be expected:

\[ AADD = \left( \frac{3015}{100} \right) \times 400 = 12,060 \text{ l/day} \]

Peak factors will be considered during the detail design stage of the project.

Bulk Water Availability

Preliminary investigations and site inspections indicated that bulk water is available for this development. A letter to this regard, confirming the allocation and availability of bulk water for this development, will be obtained from the municipality in due course.

Connection Point

The site is serviced by two bulk lines. A 90mm uPVC line runs along Vink Avenue on the eastern boundary of the site. A 50mm uPVC line is available on the southern boundary of the site. The locality of these existing bulk water lines in relation to the proposed development site is indicated in the diagram below and also in the layout drawing attached as addendum.
The availability of two water mains within the proposed developable area makes this an ideal situation as the two water mains can be connected and a ring feed system can be established. This will be finalized during detail design stage.

Preliminary Design Drawing

A preliminary design layout drawing is attached as addendum.

Standard of Water Engineering Services

- Pipe diameters varying between 25mm and 50mm depending on pressure available and flow required.
- Pipe type and class to be uPVC class 6 To 12, depending on existing pressure classes.
- Site to be serviced with a 25mm HDPE connection and Aqua-Loc box and meter.
- Fire hydrants to be provided according to the “Guidelines for engineering services and amenities”. To be confirmed during detail design.

Design Criteria and Standards

The following design criteria will be applicable to the project:
- Erf Area to be developed = 6676.8 m²
- Building Area = 3474 m²
- Gross Leasable Area = 3015 m²
- Peak factors as prescribed considered.
- Minimum pressures for the network are calculated for a fire flow 30l/sec and peak demand at the point of lowest pressure under peak conditions.
- Maximum of 2 valves to isolate a pipe section.
- Minimum cover to pipes to be 900mm.
- Pipe material to be uPVC class 6 or 12 depending on existing network pressures.
- Pipe diameters to be 25mm to 75mm depending on flow and pressure.
- Erf connections to be HDPE Class 10.
5.2 Sewer

Design Flow

The Average Dry Weather Flow (‘ADWF’) can be calculated as 60% of the AADD, amounting to an ADWF for this development of 7,236 l/day or 0.084 l/s.

The peak demand with a peak factor of 3 is 0.25l/s.

Allowance must also be made for stormwater inflow into the sewer system which can be calculated conservatively at 15%. This will be finalized during the detail design stage with the relevant officials at the municipality.

Connection Point

A 160mm diameter uPVC Class 34 gravity sewer line is available on the eastern boundary of the property in Vink Avenue. This existing 160mm diameter sewer gravity line has sufficient capacity to accommodate the generated flow.

The diagram below indicates the existing sewer network servicing the site.

![Figure 4: Existing bulk sewer line layout servicing the site](image)

As can be seen in the diagram above, a manhole is available for connecting into directly on the south-eastern corner of the property in Vink Avenue. The photograph below indicates this manhole on site.
Proposed development of Spar Sedgefield on Erf 4970, Sedgefield

Figure 5: Sewer manhole connection point on the south-eastern corner of the site with a view north-west over the site.

Bulk sewerage treatment capacity

Correspondence with the Knysna Municipality indicates that the existing Waste Water Treatment Works (WWTW) is being upgraded and is due for completion within 12 months. Treatment capacity will be available at the treatment plant upon completion of the plant upgrades. A letter from the Knysna Municipality confirming the above will be obtained in due course.

Preliminary Design Drawing

A preliminary design layout drawing is attached as addendum.

Bulk Sewer: Standard of Internal Engineering Services

- A conventional waterborne sewerage system will be provided.
- Pipe diameters of generally 110mm for all service connections and minor lines and 160mm and above for main lines, as required per the detailed designs.
- Pipe type and class to be uPVC class 34.
- Precast concrete rings manholes with concrete floor and premanufactured concrete lid.

Design Criteria and Standards

- Minimum flow velocities designed for as 0.7m/s.
- Minimum cover to all pipes to be 800mm.
- Pipe sizes varying between 110mm diameter minimum to 160mm diameter for main lines.
- Minimum design gradients to be 1:60
• Erf connection depth to be minimum 1.0 m and at least be able to drain 80% of the erf.
• Manhole covers and frames to be Polymer Concrete.
• Manholes to be central over main pipe on downstream side.
• Manhole spacing to be maximum 120m
• All concrete, mortar or screed used with manholes to be from dolomite aggregate and low alkali sulphate resistant cement to SABS 471.
• Pipelines to be uPVC class 34 and to be laid on Class C bedding.

5.3 Roads, access and parking

Access

Access to the development is proposed at two points from the service road on the northern boundary of the site. Both of these access points leads directly into two separate parking areas, respectively a western and eastern parking area. A delivery access is provided from Vink Avenue on the eastern boundary of the site. The access points are indicated in the following diagram.

![Figure 6: Proposed access points to the development.](image)

Sight distances at all of the proposed access points are excellent and satisfactory for development purposes in both the vertical and horizontal alignments.

An array of photographs below indicates sight distances at all of the access.
Figure 7: Eastern view along the service road at eastern access on the service road indicating excellent sight distance in both the horizontal and vertical alignments.

Figure 8: Western view along the service road at the eastern access on the service road indicating excellent sight distance in both the horizontal and vertical alignments.
Figure 9: Eastern view along the service road at the western access on the service road indicating excellent sight distance in both the horizontal and vertical alignments.

Figure 10: Western view along the service road at the western access on the service road indicating excellent sight distance in both the horizontal and vertical alignments.
Figure 11: Northern view along Vink Avenue at the proposed access point indicating excellent sight distance in both the horizontal and vertical alignments.

Figure 12: Southern view along Vink Avenue at the proposed access point indicating excellent sight distance in both the horizontal and vertical alignments.

Traffic Impact Statement

A Traffic Impact Statement has not been performed. The necessity of a Traffic Impact Statement will be discussed with officials of the Knysna Municipality during the detail design stage.
Internal Standards and Design Criteria

- Access width of 6.0m.
- Pavement structural materials to be imported from commercial sources.
- All minimum radii at bellmouths to be 8m.
- Road design life of 20 years.
- Subgrade material CBR of 15-20.
- Subbase material CBR of minimum 45 – obtained from commercial sources.
- 30mm Asphalt surfacing.
- Minimum road grade of 0.45% and crossfall of 2%.

Parking

Two formal parking areas are proposed, one each on the western and eastern sides of the proposed development. Final layout will be designed and discussed with the relevant municipal officials during the detail design stage.

Preliminary Design Drawing

A preliminary design layout drawing is attached as addendum.

5.4 Stormwater

Design

Stormwater design on this proposed development is notable as the development property and immediate surrounding area are not currently serviced with a formal stormwater network. Discussions with the relevant municipal officials confirmed this issue as problematic. The discussions also confirmed that the municipality will not consider the provision of only surface stormwater infrastructure discharging onto the existing street surfaces. A formal stormwater system will have to be provided. A formal stormwater reticulation system will be provided by a combination of surfaced parking areas and roadways, kerbs, channels, cut-off drains, inlet structures and concrete stormwater pipes.

Although a kerb inlet is evident on the south-western corner of the intersection of Vink Avenue and the service road, this is not a stormwater system and is only a single culvert draining into the channel along the N2. The proposed eastern parking area can be drained through this culvert, although this needs to be confirmed during the detail design stage.

A number of alternatives for the design of a formal stormwater system have been discussed with the relevant officials as viable possibilities and will be considered during detail design stage of the project. These alternatives are as follows:
1. Option 1 (preferred): Formal stormwater system discharging into the channel along the N2. This option will be most feasible from a cost perspective but entails negotiations with SANRAL.

2. Option 2: Formal stormwater system via Swan Road discharging into the lagoon. This option will be affordable but will trigger an environmental scoping process resulting in delays on the implementation of the project.

3. Option 3: Formal stormwater system connecting with the existing formal stormwater system at the intersection of Flamingo and Kingfisher Streets. This option is least cost effective but does not involve any other party than Knysna Municipality.

The diagrams and photographs below indicate the three options diagrammatically.

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**Figure 13:** Existing culvert draining proposed eastern parking area.

**Figure 14:** Kerb inlet on north-eastern corner of the site through which drainage of the proposed eastern parking area will be performed.
Figure 15: Headwall outlet into channel along N2.
Proposed development of Spar Sedgefield on Erf 4970, Sedgefield

Figure 16: Option 1 drainage with new system into N2 road reserve.

Figure 17: Option 1 formal stormwater system discharging into the channel along the N2.
Figure 18: Option 2 drainage with new system via Swan Road into lagoon.

Figure 19: Option 2 formal stormwater system via Swan Road discharging into the lagoon.

Figure 20: Option 3 drainage via connection to existing system at the intersection of Flamingo and Kingfisher Streets.
**Internal Standards and Design Criteria**

The integrated stormwater and road system forms an integral part of layout planning. The system rests on three legs, namely the minor system, the major system and the emergency system. Minor storms and normal flowoff are catered for in the normal road prism and piped system. Major storms are routed through a linked system of road prisms and public open spaces, using attenuation techniques. The emergency system recognizes failure of the minor and major systems and provides for emergency runoff by providing continuous overland flow routes to minimize flooding of residential areas.

The following standards and design criteria are envisaged:

- Minor system designed for 2 year return period and conveyed in a combination of maximum 200m aboveground in the road prism and underground piped system.
- Major system designed for 50 year return period. Difference between the 50 year and 2 year flood to be conveyed in the road prism with depths not exceeding 150mm and into designated public open spaces.
- Minimum gradients for pipelines to allow minimum flow speeds of 0.7m/s at full flow.
- Maximum pipeline flow velocities to be 3.5m/s.
- Stormwater pipes to be 100D as required by specific loadings or installation conditions.
- Bedding to be Class C.
- Minimum cover on pipes to be 800mm.
- Minimum pipe diameter to be 450mm.

**Preliminary Design Drawing**

A preliminary design layout drawing is attached as addendum.

**5.5 Solid Waste**

A formal solid waste collection area will be provided in the site development plan. A formal arrangement for the removal of solid waste need to be entered into with the Knysna Municipality.
6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions can be reached from the Preliminary Engineering Services Report on the proposed commercial retail development on erf 4970, Sedgefield:

1. The proposed development envisages 2,845m² GLA of commercial retail space and 170m² GLA of commercial restaurant space.

2. A formal geotechnical investigation has not been performed yet. A visual inspection of the site was conducted in order to assess conditions on site. A formal geotechnical investigation will be performed during the detail engineering design stage. Holistically, the conclusion reached is that the in-situ materials found on site are adequate for the construction of engineering services and foundations for commercial retail development.

3. Water:
   a. Bulk water is available for the development and a letter of allocation and confirmation will be obtained from the municipality in due course.
   b. The site is serviced by two bulk lines. A 90mm uPVC line runs along Vink Avenue on the eastern boundary of the site. A 50mm uPVC line is available on the southern boundary of the site.
   c. The availability of two water mains within the proposed developable area makes this an ideal situation as the two water mains can be connected and a ring feed system can be established. This will be finalized during detail design stage.
   d. Standard of engineering services and design criteria have been discussed.
   c. The demand for this proposed development is calculated at approximately 12.1kl/day. Peak factors will be considered during detail design stage.

4. Sewer:
   a. A 160mm diameter uPVC Class 34 gravity sewer line is available on the eastern boundary of the property in Vink Avenue. A manhole is available for connecting into directly.
   b. Standard of internal engineering services and design criteria have been provided.
   c. The design daily flow created by the development is calculated at approximately 7.2kl/day and the design peak flow is calculated at 0.25l/sec.
   d. The existing 160mm diameter sewer gravity line has sufficient capacity to accommodate the generated flow.
   e. Bulk sewerage treatment capacity for the development will be available after completion of the upgrades at the treatment plant. A timeframe for
this is approximately 12 months. This upgrading project is already underway. A letter of confirmation from the municipality will be obtained in due course.

5. Roads, access and parking:
   a. Access to the proposed development is proposed at two points from the service road on the northern boundary of the site. Both of these access points leads directly into two separate parking areas. A delivery access is provided from Vink Avenue on the eastern site boundary.
   b. Sight distances at both of the two proposed access points from the service road on the northern boundary of the site is satisfactory for development purposes in both the vertical and horizontal alignments.
   c. A Traffic Impact Statement has not been performed. The necessity of a Traffic Impact Statement will be discussed with officials of the Knysna Municipality during the detail design stage.
   d. Standard of engineering services and design criteria have been provided.
   e. Parking and access to be paved with 30mm asphalt surfacing.

6. Stormwater:
   a. Stormwater design on this proposed development is notable as the development property and immediate surrounding area are not currently serviced with a formal stormwater network.
   b. A formal stormwater reticulation system will be required and provided by a combination of surfaced roadways, kerbs, channels, cut-off drains, inlet structures and concrete stormwater pipes.
   c. A number of alternatives for the design of a formal stormwater system have been discussed with the relevant officials as viable possibilities and will be considered during detail design stage of the project. These alternatives are discussed in detail in the report.
   d. Standards of design and engineering services have been provided.

7. A formal arrangement for the removal of solid waste need to be entered into with the Knysna Municipality

With reference to all of the conclusions above, it can holistically be concluded that the proposed development can be designed and constructed to acceptable specifications and standards from an engineering design perspective.
6.2 Recommendations

With reference to the conclusions above, the following is recommended:

1. That all outstanding correspondence be obtained.
2. That all preliminary design specifications and standards be accepted and approved.
3. That all services connection points be approved.
4. That a formal stormwater system be designed during the detail design stage of the project to the satisfaction of the Knysna Municipality in line with the discussions contained in the report.
5. That the proposed access points be approved.

Notwithstanding the above, it is the holistic recommendation of Element Consulting Engineers that the proposed development be approved from an engineering design perspective.
ADDENDA