

## 6. DESCRIPTION OF ALTERNATIVES IDENTIFIED

This section provides:

- ◆ Details of the alternatives considered in terms of the proposed project;
- ◆ A motivation for the preferred project alternative.

### 6.1 Alternative sites

The following alternatives were identified:

- ❖ Proposed site;
- ❖ Alternative site(s);
- ❖ No project option.

#### 6.1.1 Proposed site

The project applicant intends to develop a residential area on the Remaining Extent of the farm Rockdale 442 JS, Middelburg (Figure 5.1). The proposed site (approximately 230 ha in extent) belongs to the project applicant.

The site is bordered on the south by the N4 national road, on the east by the N11 national road/Hendrina Road and the Rockdale residential areas and to the north by Columbus Steel (Figure 3.1).

In view of the following, the applicant decided upon the development of the proposed site:

- ◆ The proposed site belongs to the project applicant.
- ◆ The said property is not suitable for cultivation purposes due to the rocky nature thereof.
- ◆ The said property is situated within the urban edge of the Steve Tshwete Local Municipality.
- ◆ The said property is located adjacent to the N4 national road which provides mobility and visibility.
- ◆ The proposed site is located opposite the Rockdale residential areas and would be seen as a natural extension of these residential areas.
- ◆ Access to the site can be obtained from the N11 national road (also known as the Hendrina road) extending past the existing Rockdale residential areas.
- ◆ Existing municipal services are located in the existing Rockdale residential areas and the proposed new development can link up with these existing services.
- ◆ A large area (approximately 230 ha) is available for an integrated development that could assist in alleviating the current housing backlog in the municipal area.
- ◆ The provision of stands for business and light industrial purposes as part of the overall integrated development could provide opportunities and potential employment to residents of the nearby Rockdale residential areas.

Section 6.12 provides details regarding the need and desirability of the proposed development.



### **6.1.2 Alternative site(s)**

No alternative sites were identified for the proposed development since the applicant owns the said property as indicated above.

### **6.1.3 No project option**

See Section 6.11 for further details in this regard.

## **6.2 Alternative land uses**

### **6.2.1 Alternative land use 1 (Agriculture)**

As indicated in Section 5.5.2, no agricultural activities (cultivation, grazing, etc.) have taken place on site for a number of years.

As indicated in Section 5.5.3.1, the dominant soil type is Mispah, a shallow, rocky soil that covers an area of approximately 119 ha (Figure 5.11). The Westleigh and Mispah soils (Figure 5.11) are not suitable for agricultural purposes due to the effective depth being shallower than 300mm (Table 5.4). These soils will not be able to facilitate adequate root development and store enough plant available water between 33 and 1,500kPa (Viljoen, 2017).

As indicated in Section 5.5.3.2 and Table 5.5, the Bainsvlei (350mm) and Avalon (350mm) soils have low agricultural potential under dryland and irrigation conditions. Production under dryland conditions of 30,000 plants/ha with average rainfall of 650mm/year will not be sustainable, especially during the summer period with extreme heat units. Production under irrigation conditions would require 6,100m<sup>3</sup>/ha/year of water for 100,000 plants/ha, which is the equivalent of 30,000l/ha 24hours, 7 days per week (Viljoen, 2017).

The majority of the site is classified (Table 5.8; Figure 5.12) as Wilderness (70%). An area of approximately 20% is classified as Grazing (Table 5.8; Figure 5.12) while less than 1% is classified as Arable (Table 5.8; Figure 5.12). Looking at grazing capacity, Figure 5.9 indicates the majority of the site as 5-7ha per Animal Unit (AU). Wetland/seepage land capability is indicated for approximately 7% of the site (Table 5.8; Figure 5.12).

In view of the above-mentioned, developing the site for agricultural purposes was thus not pursued. **Alternative land use 1 (Agriculture) was thus discarded.**

### **6.2.2 Alternative land use 2 (Industrial)**

The current SDF of the Steve Tshwete Local Municipality (SDF, 2015) identifies the proposed development site for future Industrial Activities.

However, a total of ±240,7ha of industrial land is still vacant in the Vaalbank Industrial area (i.e. adjacent and north of Columbus) and in SAE Business Park (i.e. west of Columbus) and in Middelburg x 49 (i.e. west of Columbus). The land south of the N4 along the R35 (Bethal road) is also currently utilised for Industrial /mining purposes. To date, this area has not been reflected in the SDF as Industrial land uses.

It is thus evident that currently there is ample vacant industrial land still available in the surrounding area. **Alternative land use 2 (Industrial) was thus discarded.**



### 6.2.3 Alternative land use 3 (Residential)

According to the latest Integrated Development Plan (IDP) for 2017-2022, the housing backlog in the Steve Tshwete Local Municipality stands at 12 480 with 14.4% of the households living in informal settlements. The IDP further states that 28 496 households are in need of some sort of housing assistance. In total, the housing need in the municipal area is therefore 40 976 units according to the latest IDP. There is thus an urgent need for additional housing in the municipal area (see Section 6.12 for further details).

As already indicated, the current SDF of the Steve Tshwete Local Municipality (SDF, 2015) identifies the proposed development area for future Industrial Activities. Preliminary discussions with the Local Municipality indicated that they would consider amending the SDF to accommodate residential development in the area due to the proximity of the Rockdale community (to the east of the N11). In addition, it is strategically situated along primary roads that provide good access for the purpose of residential development with connection to the centre of town, Middelburg Mall and other amenities and surrounding towns.

The proposed development site is still within the urban edge where the necessary infrastructure exists (see Section 6.5) that can be upgraded to accommodate the development rather than providing it outside the urban edge where no infrastructure is available. In addition, the proposed area will contribute to the densification of the area of Rockdale around the identified secondary node which will further strengthen this node. According to Figure 6.1, the proposed development area is earmarked for densification that includes residential, industrial and business land uses within the urban edge.

**In view of the above-mentioned, Alternative land use 3 (Residential 3) was thus pursued.**

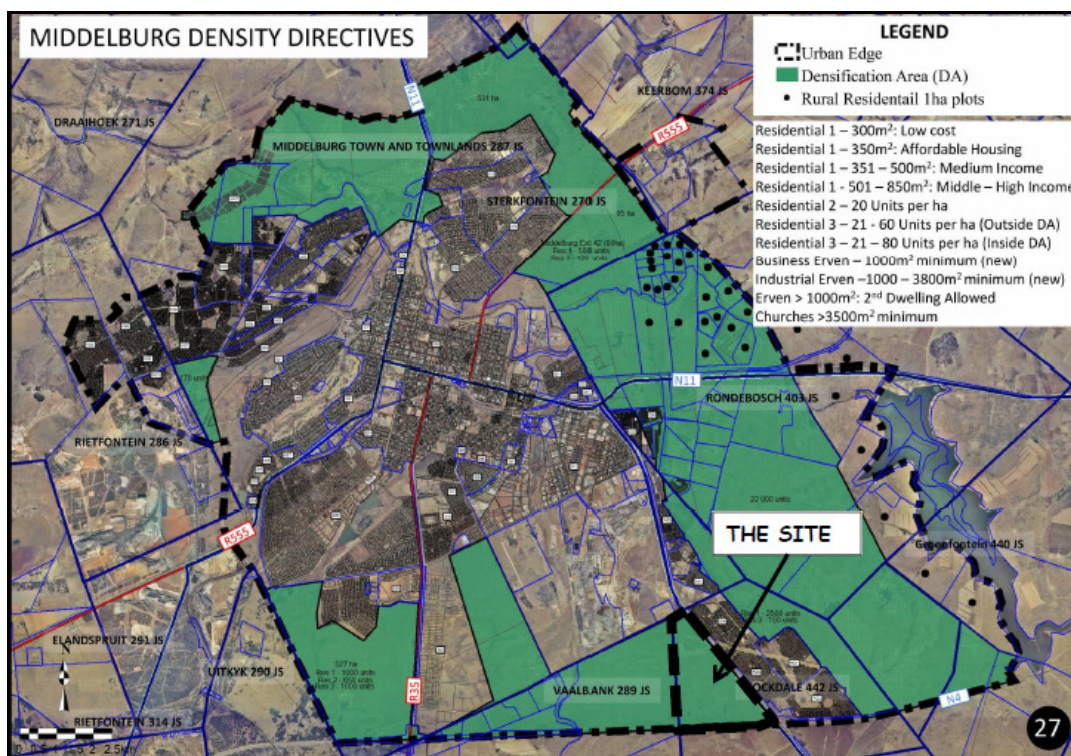


Figure 6.1: Densification directive (taken from SDF, 2015)



#### 6.2.4 No-project

See Section 6.11 for further details in this regard.

### 6.3 Alternative layout plans

The following alternatives were identified:

- ❖ Alternative layout 1: Figure 2.1; Figure 6.2;
- ❖ Alternative layout 2: Depending on outcome of the EIA;
- ❖ No project option.

#### 6.3.1 Alternative layout 1 (Figure 2.1; Figure 6.2)

Figure 2.1 provides the proposed layout plan (Alternative layout 1). The residential development would comprise of the following:

MAJOR LAND USE							
LAND USE	ZONING	NOTATION	DENSITY	NO. OF STANDS	NO. OF POTENTIAL RES. UNITS	% OF AREA	AREA OF STANDS
RESIDENTIAL	RESIDENTIAL 1		300m <sup>2</sup> –570m <sup>2</sup>	1218	1218	19,53%	44,46ha
	RESIDENTIAL 2		20units/HA	2	29	0,65%	1,48 ha
	RESIDENTIAL 3		60units/HA	4	633	4,64%	10,56 ha
BUSINESS	BUSINESS 2			2		2,01%	4,57 ha
GOVERNMENT	GOVERNMENT/MUNICIPAL			3		1,46%	3,33 ha
COMMUNITY	INSTITUTIONAL			4		1,26%	2,88 ha
PARK	PUBLIC OPEN SPACE			39		35,57%	80,97 ha
CEMETERY	MUNICIPAL			1		13,16%	29,95 ha
INDUSTRIAL	INDUSTRIAL 1			6		0,90%	2,06 ha
SCHOOL	EDUCATIONAL			1		3,07%	6,99 ha
SPORTS COMPLEX	PUBLIC OPEN SPACE			1		6,14%	13,97ha
ROADS						11,61%	26,43ha
TOTAL				1281	1880	100%	227,65 ha

Access to the site would be obtained from the N11 national road (also known as the Hendrina road) extending past the existing Rockdale residential areas (Figure 2.1; Figure 6.2).

*This layout plan was designed by Urban Dynamics in line with the findings of the preliminary wetland delineation and the building lines applicable to the N4 national road located to the south of the site.*

**Based on the findings of the specialist studies commissioned as part of the EIA, Alternative Layout 1 (Figure 6.2) was discarded in view of the following:**

- The geotechnical investigation (Section 5.3.2) indicated that the site is not suitable for a cemetery.
- The proposed Municipal and Residential 1 stands in the south western corner of the site would impact on:
  - Wetland buffer delineated around the Channelled Valley Bottom Wetland and Seep (Figure 5.18);
  - The buffer zone delineated around the *Anacamperos* plant community;
  - The buffer zone delineated around the Grass Owl habitat.





- The proposed access road in the northern part of the site would impact on the buffer zone delineated around the Northern Seep (Figure 6.2);



**Figure 6.2: Alternative layout plan 1 with delineated buffer zones.**

### **6.3.2 Alternative layout 2a: Figure 6.3a**

Alternative layout 2a (Figure 6.3a) was drafted based on the outcome of the specialist studies conducted as part of the EIA process.







**Figure 6.3a: Alternative layout plan 2a with delineated buffers and geotechnical zones**

As far as possible, this layout plan takes into account the following:

- Findings of the geotechnical study (i.e. where no development should take place and that the site is not suitable for a cemetery);
- Wetland buffers: buffer zones delineated around the identified wetlands;
- Grass Owl buffer: buffer zone delineated around the Grass Owl habitat;











- *Anacamperos* buffer: buffer zone delineated around the *Anacamperos* habitat.

The proposed Municipal stand and Residential 1 stands in the south western corner of the site were removed as indicated in Figure 6.3a in order to reduce the potential impact on the sensitive ecological area located in the south western portion of the site. No development will be allowed beyond the delineated watershed in the south western portion of the site as indicated in Figure 6.3a. This also eliminates the need for a sewage pump station (was to be built on the Municipal stand; Figure 6.2) and thus the potential pollution of the Channelled Valley Bottom Wetland and Seep associated with the tributary of the Vaalbankspruit. As indicated in Figure 6.3a, this sensitive ecological area will be zoned as a Public Open Space where no development will be allowed.

The proposed access road in the northern part of the site (Figure 6.3a) was rerouted to avoid impact on the buffer zone delineated around the Northern Seep.

The Eastern Seep adjacent to the N11 national road (Figure 5.18) would still be impacted. This impact will be discussed in further detail in Section 7 and Section 8 of this EIR.

The residential development according to Alternative layout 2a (Figure 6.3a) would thus comprise of the following:

MAJOR LAND USE: ROCKDALE WEST									
LAND USE	ZONING	NOTATION	DENSITY	NO. OF STANDS	NO. OF POTENTIAL RES. UNITS	FAR	COVERAGE %	% OF AREA	AREA OF STANDS
RESIDENTIAL	RESIDENTIAL 1		300m <sup>2</sup> -570m <sup>2</sup>	1835	1835			29.50%	64,49ha
	RESIDENTIAL 3		60units/HA	6	515	1.2	40%	3.93%	8,59ha
BUSINESS	BUSINESS 2			2		0.4	40%	1.73%	3,78ha
	BUSINESS 3			2		0.4	40%	0.48%	1,04ha
COMMUNITY	INSTITUTIONAL			4		0.4	35%	1.24%	2,72ha
PARK	PUBLIC OPEN SPACE			13				39.08%	85,45ha
MUNICIPAL	MUNICIPAL			28		0.4	35%	0.63%	1,38ha
TAXI RANK	PARKING			1				0.32%	0,71ha
COMBINED SCHOOL	EDUCATIONAL (1200)			1		2.0	70%	3.12%	6,83ha
SPORTS COMPLEX	PUBLIC OPEN SPACE			1				6.34%	13,86ha
ROADS								13.63%	29,79ha
TOTAL				1893	2350			100%	218,64 ha

THE FIGURE A-B-C-D-E-F-G-H-I REPRESENTS THE OUTSIDE BOUNDARY OF THE PROPOSED TOWNSHIP WITH AN AREA OF APPROXIMATELY 218HA

Access to the site would still be obtained from the N11 national road (also known as the Hendrina road) extending past the existing Rockdale residential areas (Figure 6.3a).

**Alternative layout 2a (Figure 6.3a) is thus the preferred option and will be evaluated during the impact assessment (Section 7).**

### 6.3.3 Alternative layout 2b: Figure 6.3b

Alternative layout 2b (Figure 6.3b) is basically Alternative layout 2a (Figure 6.3a). The only change is that an Eskom servitude (EPL servitude SG no.





A9097/723; Figure 6.3b), located in the south eastern corner of the site, was taken into account as part of the overall development plan. It is currently not known if Eskom will approve the cancellation of this servitude.



**Figure 6.3b: Alternative layout 2b taking the Eskom servitude into account.**





The residential development according to Alternative layout 2b (Figure 6.3b) would thus comprise of the following:

MAJOR LAND USE							
LAND USE	ZONING	NOTATION	DENSITY	NO. OF STANDS	NO. OF POTENTIAL RES. UNITS	% OF AREA	AREA OF STANDS
RESIDENTIAL	RESIDENTIAL 1		300m <sup>2</sup> –570m <sup>2</sup>	1760	1760	%	ha
	RESIDENTIAL 2		20units/HA	0	0	0%	
	RESIDENTIAL 3		60units/HA	6	500		
BUSINESS	BUSINESS 2			2			
GOVERNMENT	GOVERNMENT/MUNICIPAL			1			
COMMUNITY	INSTITUTIONAL			4			
PARK	PUBLIC OPEN SPACE			39			
CEMETERY	MUNICIPAL			1			
INDUSTRIAL	INDUSTRIAL 1			3			
SCHOOL	EDUCATIONAL			1			
SPORTS COMPLEX	PUBLIC OPEN SPACE			1			
ROADS							
TOTAL				1818	2260	100%	227,65 ha

**Alternative layout 2b (Figure 6.3b) is thus subject to obtaining approval from Eskom in terms of the cancellation of the Eskom servitude and will be evaluated in the impact assessment (Section 7).**

#### 6.3.4 No project option

See Section 6.11 for further details in this regard.

### 6.4 Phasing of the project

#### 6.4.1 Alternative phasing 1: Figure 6.4

According to Urban Dynamics (2017a), Alternative layout 1 (Figure 6.2) was divided into 11 possible phases so that the development costs could be broken down into phases which would reduce the holding cost and municipal contributions for each development phase.

Urban Dynamics (2017a) indicated that Phase 1 (Figure 6.4) would entail the development of the following land uses around the proposed main entrance to the development namely:

- 224 Residential 1 stands (300m<sup>2</sup>);
- Business site, Taxi Rank and Police Station (municipal);
- Community Facility;
- Access to Cemetery site.







Table 6.1 provides an indication of the proposed land uses per proposed development phase.

**Table 6.1: Proposed land uses per development phase (taken from Urban Dynamics, 2017a)**

Land Use	Density	Area	Quantity	Phase
<b>Residential</b> Residential 1	300m <sup>2</sup> - 570m <sup>2</sup>	44.46 ha	1218	Phase 1 – 224 stands
Residential 2	20 units/ha	1.48 ha	29 units	Future Phase
Residential 3	60 units/ha	10.56 ha	633 units	Future Phase
<b>Business</b> Proposed Neighbourhood Centre & Taxi Rank	n/a	4.57 ha	2	Phase 1
<b>Educational</b> Combined School	n/a	6.99 ha	1	Future Phase
<b>Community Facility</b> Crèche & Church	n/a	2.88 ha	4	1 in Phase 1, other in future phases
<b>Industrial</b> Light Industrial	n/a	2.06 ha	6	Future Phase
<b>Municipal</b> Government/ Municipal Cemetery	n/a	3.33 ha	3	Phase 1 & future phases
	n/a	29.95 ha	1	Entrance to Cemetery in Phase 1
<b>Open Space</b> Public Open Space	n/a	80.97 ha	39	Future Phase
Sports Complex	n/a	13.97 ha	1	Future Phase
Streets	n/a	26.43 ha	n/a	As required per Phase
<b>Total</b>		<b>227,65 ha</b>	<b>1880 (Residential units)</b>	

#### 6.4.2 Alternative phasing 2: Depending on outcome of EIA

As indicated in Section 6.3.2, the layout plan was revised as result of the findings of the specialist studies commissioned as part of the EIA. Alternative layout 2a (Figure 6.3a) and Alternative layout 2b (Figure 6.3b) were subsequently drafted. This called for a revised phasing of the project.

Urban Dynamics (2017b) indicated that the first phase of the development (Alternative layout 2a; Figure 6.3a and Alternative layout 2b; Figure 6.3b) will also be situated around the business sites and adjacent residential properties along the N11 highway (Figure 6.5) and would involve the following land uses to kick-start the development:

- 193 Residential 1 stands (± 300m<sup>2</sup>/erf);
- 2 "Business 2" stands;
- 2 "Business 3" stands.

The proposed "Business 2" stands make provision for a neighbourhood shopping centre and future business opportunities. A taxi rank is also provided adjacent to the business stands since the area of Rockdale, Nasaret



and Middelburg Extension 24 does not have a dedicated taxi rank (Urban Dynamics, 2017b).

The proposed "Business 3" stands will make provision for service related industries (e.g. small workshop, informal trading, motor workshop or business premises) in order to diversify the business node and also provide opportunities for smaller business ventures (Urban Dynamics, 2017b).



**Figure 6.5: Proposed Phase 1 development area (taken from Urban Dynamics, 2017b)**

Urban Dynamics (2017b) indicated that the other phases will be determined based on the installation of civil engineering services and link services needed for the entire development. A small number of stands will be serviced in each phase depending on the demand in the market at the time of implementation.

According to Urban Dynamics (2017b), the phased development will ensure that the development cost is broken down into manageable financial parts which will reduce the holding cost and municipal contributions payable for each of the development phases.

### **6.4.3 No project option**

See Section 6.11 for further details in this regard.





## 6.5 Level of services

The following alternatives in terms of level of services were identified and investigated:

- ❖ Alternative 1: Level of services in line with the Rockdale residential areas (i.e. provision of municipal services).
- ❖ Alternative 2: Level of services as per the minimum essential standards for low cost township establishment.
- ❖ Alternative 3: Level of services comprising a combination of Alternative 1 and Alternative 2.
- ❖ Alternative 4: Level of service depending on outcome of EIA.
- ❖ No project option.

### 6.5.1 Alternative 1: Level of services in line with the Rockdale residential areas (i.e. provision of municipal services)

Alternative 1 would involve supplying the following services as currently supplied within the existing Rockdale residential areas:

- Electricity supply to every stand with a metered connection;
- Water supply to every stand with a metered connection;
- Waterborne sanitation to every residential unit;
- Kerbed, bitumen surfaced road network;
- Underground storm water management and drainage infrastructure.

As indicated in Section 6.4.2, the first phase of the development (Alternative layout 2a, Figure 6.3a and Alternative layout 2b; Figure 6.3b) will be situated around the business sites and adjacent residential properties along the N11 highway (Figure 6.5). Strydom and Malan (2017) confirmed that the following bulk and link services are available for the proposed Phase 1 development (Figure 6.5):

- Major access roads: access to the development is from the existing N11 road.
- Outfall sewer: The proposed outfall sewer (sized to drain the effluent of the total development) will connect to the existing municipal outfall sewer that runs on the eastern side of Middelburg Extension 24 (Figure 6.7). See Section 6.7 for further details.
- Water supply: The bulk water supply will be supplied from the connection to the existing 200mm diameter water pipe in Rockdale Extension 2 (Figure 6.6). The link pipe has been sized to cater for the water demand of Phase 1 (Figure 6.5). See Section 6.6 for further details.

The development of the other phases will be determined based on the installation of civil engineering services and link services that conform to the level of services as required by the Steve Tshwete Local Municipality.

In view of the above-mentioned, **Alternative 1 (provision of municipal services) is the preferred option.**

### 6.5.2 Alternative 2: Level of services as per the minimum essential standards for low cost township establishments

Alternative 2 would be based on the minimum essential standards for low cost township establishments and would include the provision of pillar taps at regular intervals and a biological toilet system.

**Alternative 2 was discarded based on the availability of bulk and link services as indicated in Section 6.5.1 and the requirement to conform**



**to the level of civil services as required by the Steve Tshwete Local Municipality.**

### **6.5.3 Alternative 3: Level of services comprising a combination of Alternative 1 and Alternative 2**

Alternative 3 would comprise a possible combination of Alternative 1 and Alternative 2 until such time that services to the overall development could be provided.

**Alternative 3 was discarded based on the availability of bulk and link services as indicated in Section 6.5.1 and the requirement to conform to the level of civil services as required by the Steve Tshwete Local Municipality.**

### **6.5.4 Alternative 4: Level of service depending on outcome of EIA**

As indicated in Section 6.5.1, Strydom and Malan (2017) confirmed that bulk and link services are available for the proposed Phase 1 development (Figure 6.5). The development of subsequent phases would depend on the provision of services conforming to the level of civil services as required by the Steve Tshwete Local Municipality.

The installation of civil engineering services and link services required for the overall development will thus be phased based on the demand in the market at the time of implementation.

**Alternative 4 basically represents a phasing of services as indicated in Alternative 1 and is thus forms part of the preferred alternative.**

### **6.5.5 No project option**

See Section 6.11 for further details in this regard.

## **6.6 Water**

As indicated in the Scoping Report, the following alternatives in terms of water supply were identified and investigated as part of the EIA phase:

- |  |
|--|
| <ul style="list-style-type: none"><li>❖ Alternative 1: Water from Steve Tshwete Local Municipality;</li><li>❖ Alternative 2: Other water sources;</li><li>❖ No project option.</li></ul> |
|--|

### **6.6.1 Alternative 1: Water from Steve Tshwete Local Municipality**

In terms of the Water Services Act (Act No. 108 of 1997), the Steve Tshwete Local Municipality is the Water Services Authority for the Middelburg area (including the proposed development site area) and is thus obliged to fulfil the functions of Water Services provider for this development.

Water for Middelburg is sourced from the Middelburg Dam. From the Middelburg Dam it is pumped to a 10MI reservoir (located west of Nasaret) and then to the Vaalbank Water Treatment Works (Figure 6.6).

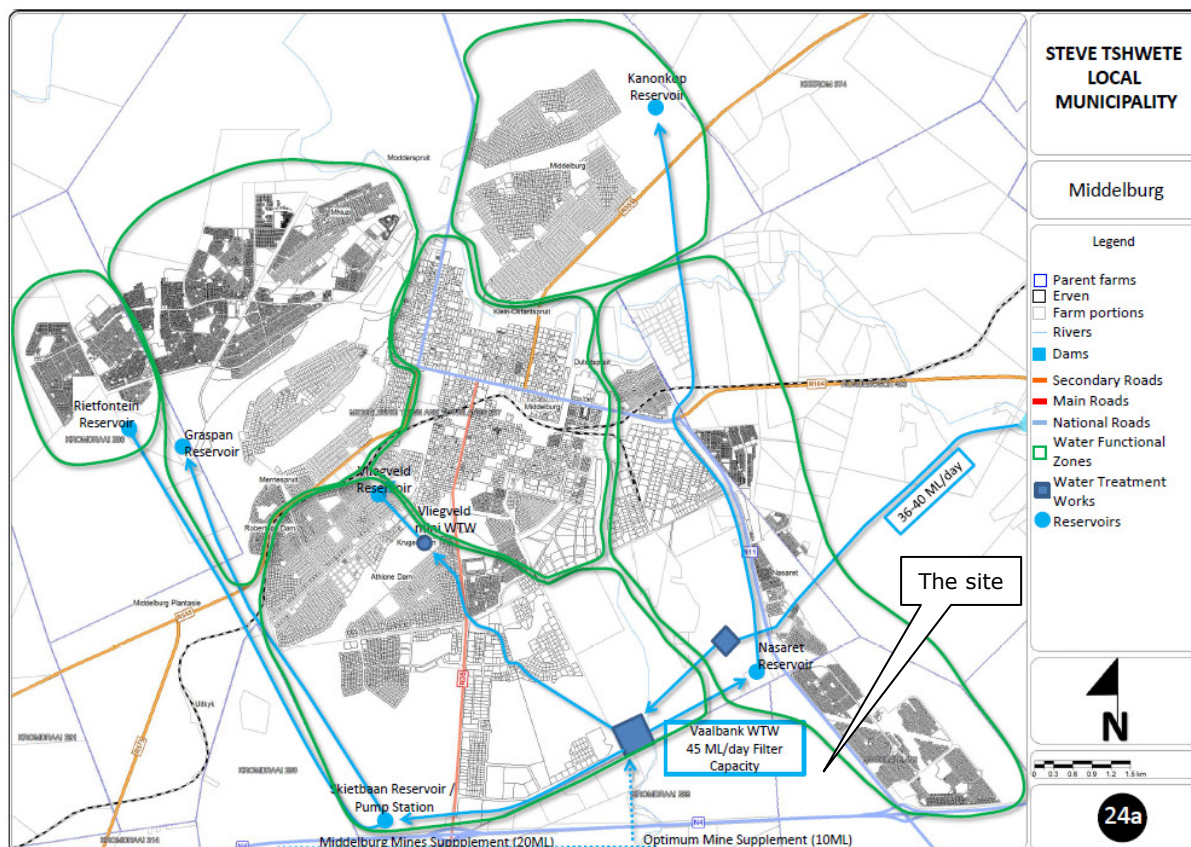
From the Vaalbank Water Treatment Works, water is pumped into three distribution systems, and more specifically three reservoirs:

- Nasaret Reservoir (Figure 6.6) which serves the Nasaret functional area and from which water is also pumped to the Kanonkop Reservoir which serves the townships north of the Klein Olifants River;





- The Vliegveld mini-water treatment works and Vliegveld reservoir (Figure 6.6) which serves the CBD and the residential extensions adjacent to the south of the railway line (the older parts of town).
- The Skietbaan reservoir/pump station (Figure 6.6) which serves the new southern extensions of town towards the N4 freeway.



**Figure 6.6: Municipal water provision by the Steve Tshwete Local Municipality (taken from SDF, 2015)**

The STLM has a licence to withdraw 36MI of water per day from the Middelburg Dam. According to the SDF (2015), between 36 and 40 MI/day is utilised and the demand will increase steadily in future.

According to the SDF (2015), the water supply will be supplemented in future by either:

- a 10MI supplement feeder line from Optimum Mine near Hendrina (Hendrina currently utilises 3MI of this water to serve its demand);
- alternatively, bulk water supply to Middelburg will be supplemented with 20MI/day by way of a link to Middelburg Mines via the existing Middelburg-Witbank Dam line which runs parallel to the N4 freeway. This water is of effluent quality and the project will cost approximately R64-million.

According to the SDF (2015), the current design of the Vaalbank WTW allows for a filter capacity of 45MI/day. This will, however have to be increased to 55MI/day over the next few years. The existing reservoirs and reticulation works in Middelburg are sufficient and no major capital investments are required. However, the replacement of older asbestos pipes in Mhluzi and the Vliegveld, Skietbaan and Vaalbank networks is a high priority (SDF, 2015).



### **Bulk water supply**

According to Strydom and Malan (2017), the bulk water supply will be supplied from the connection to the existing 200mm diameter water pipe in Rockdale Extension 2 (Figure 6.7).

The link pipe has been sized to only cater for the water demand of Phase 1 (Strydom and Malan, 2017). However, the water pipe to be pipe jacked under the N11 has been sized to cater for the future phases in order to ensure that further pipe jacking will not be necessary.

### **Bulk water demand**

Table 6.2 provides the water requirements for Phase 1 of the development.

**Table 6.2: Water requirements for Phase 1 of the development (Strydom and Malan, 2017)**

<b>AVERAGE DEMAND</b>	800 liters per household per day
<b>EXPECTED TOTAL WATER CONSUMPTION FOR TOTAL DEVELOPMENT</b>	2 600 kl per day
<b>TOTAL DEVELOPMENT EXPECTED PEAK FLOW</b>	120 l/s
<b>PEAK FACTOR</b>	4

### **Bulk water infrastructure required**

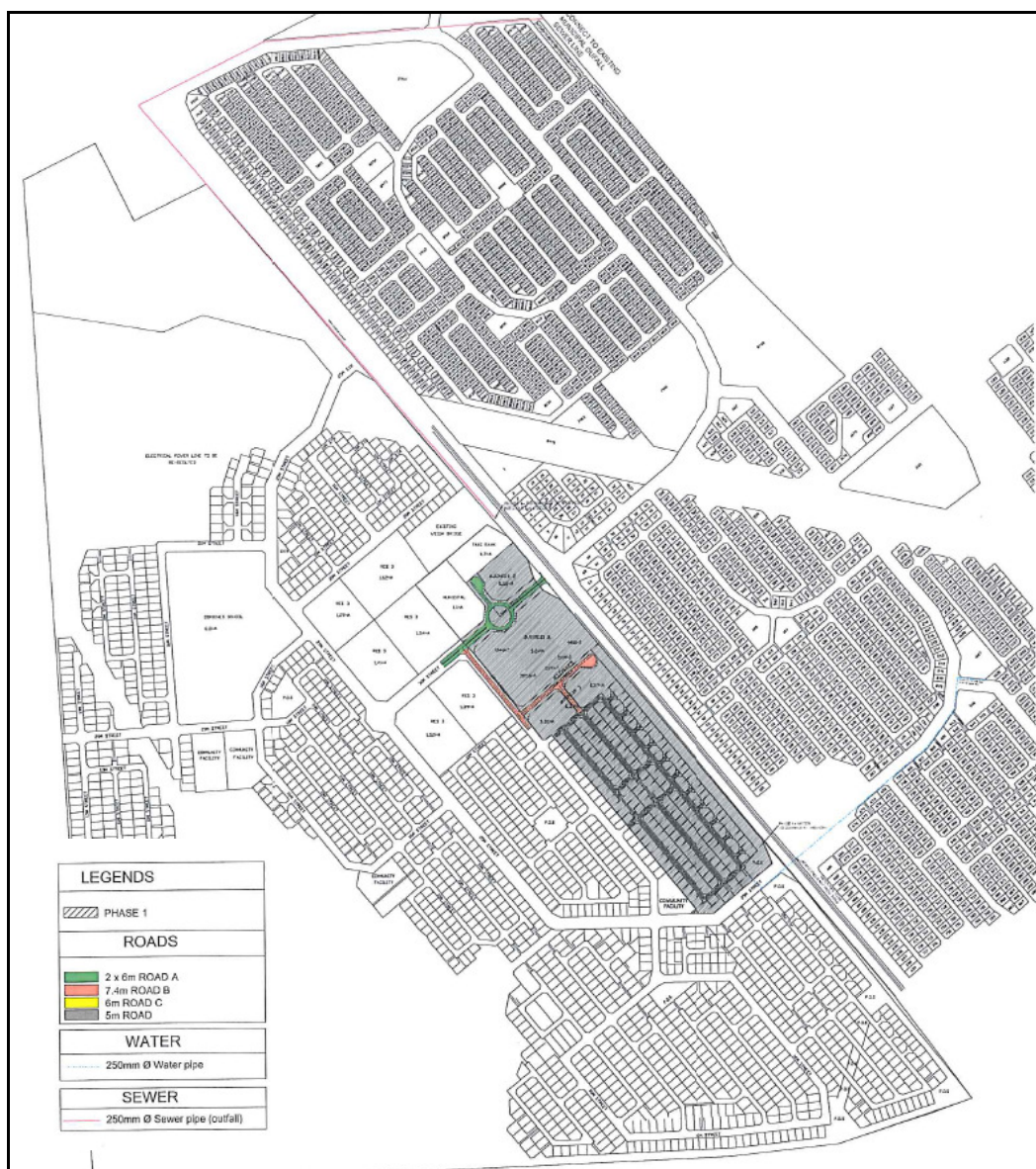
The water reticulation system will comprise of an integral water network (75mm diameter – 250mm diameter uPVC pipes) with appurtenant fittings, valves and fire hydrants with a water connection to each stand. Provision has been made for air valves in order to release trapped air from the network (Strydom and Malan, 2017).

The water connection will be situated 500mm within the stand which will enable the Local Municipality to carry out meter readings. The installation of the water meter is the responsibility of the owner and will follow the normal procedure of water connection payment at the Local Municipality who will then install the water meter. The network will be located inside the road reserves.

Table 6.3 provides the proposed standards with regard to the water reticulation network to be installed.







**Figure 6.7: Provision of services for the Phase 1 development (taken from Strydom and Malan, 2017)**

**Table 6.3: Proposed standard of the water reticulation network to be installed – Rockdale West Phase 1 (Strydom and Malan, 2017)**

<b>AVERAGE DEMAND</b>	800 liters per household per day Expected total water consumption for total development: 2 600 kl per day Total development expected peak flow: 120 l/s
<b>PEAK FACTOR</b>	4
<b>FIRE RISK CATEGORY</b>	Low Risk Group 3
<b>MINIMUM FLOW AT FIRE HYDRANTS</b>	350 l/min
<b>ABSOLUTE MINIMUM WATER PRESSURE</b>	12m and 7m with fire flow
<b>FIRE HYDRANT SPACING (MAXIMUM)</b>	240m
<b>MINIMUM PIPE SIZE</b>	75mm diameter for main lines. 20 and 25mm diameter HDPE for

	single and double house connections.
<b>PIPE MATERIAL</b>	uPVC (Main lines) and HDPE (connections)
<b>COVER TO PIPES</b>	800mm minimum
<b>HYDRANT VALVES</b>	Screw type
<b>VALVES</b>	Right hand (clockwise closing)
<b>WATER METERS</b>	Responsibility of developer to arrange with Council

**Alternative 1 (water from Steve Tshwete Local Municipality) is thus the preferred option with regards to water supply.**

### 6.6.2 Alternative 2: Other water sources

Other water sources could include surface water and groundwater.

On site, the central and northern portions drain towards the northwestern boundary where a tributary of the Vaalbankspruit originates (Figure 5.1). A non-perennial tributary of the Vaalbankspruit flows through the southwestern corner of the site (Figure 5.1 and 5.2) and flows to the west. The southern portion of the site drains towards this stream. A dam is present at the start of this system as well as a wetland (Figure 5.2).

Kotze (2017) indicated that the salinity (as reflected by electrical conductivity) was notably higher in the Vaalbankspruit at Site RD3 (71.5mS/m; Table 5.22). It is evident that various sources of salts (mining, agriculture) are entering the Vaalbankspruit upstream of the Rockdale tributary inflow.

In Section 5.9.1, the hydrogeological information indicates a fairly low groundwater potential (i.e. <0.5l/s) for the area (Engeolab, 2016; Celliers and Meyer, 2017). The site investigation revealed no boreholes to be present on site.

In view of the non-perennial nature of the Vaalbankspruit and its tributary and the potential pollution thereof due to upstream activities, the use of surface water was discarded.

The use of boreholes (groundwater) in order to supply water was also discarded in view of the size of the proposed development and the low groundwater yield.

**Alternative 2 (other water sources) was thus discarded.**

### 6.6.3 No project option

See Section 6.11 for further details in this regard.

## 6.7 Sewage

Currently, no internal sewer or link sewer exists within the proposed development site. The Alzu AI Station and Weigh Bridge located on site make use of septic tanks and French Drains.

As indicated in the Scoping Report, the following alternatives in terms of sewage treatment were identified and investigated as part of the EIA phase:





- ❖ Alternative 1: Connecting to existing municipal sewer;
- ❖ Alternative 2: Other sewage treatment options;
- ❖ No project option.

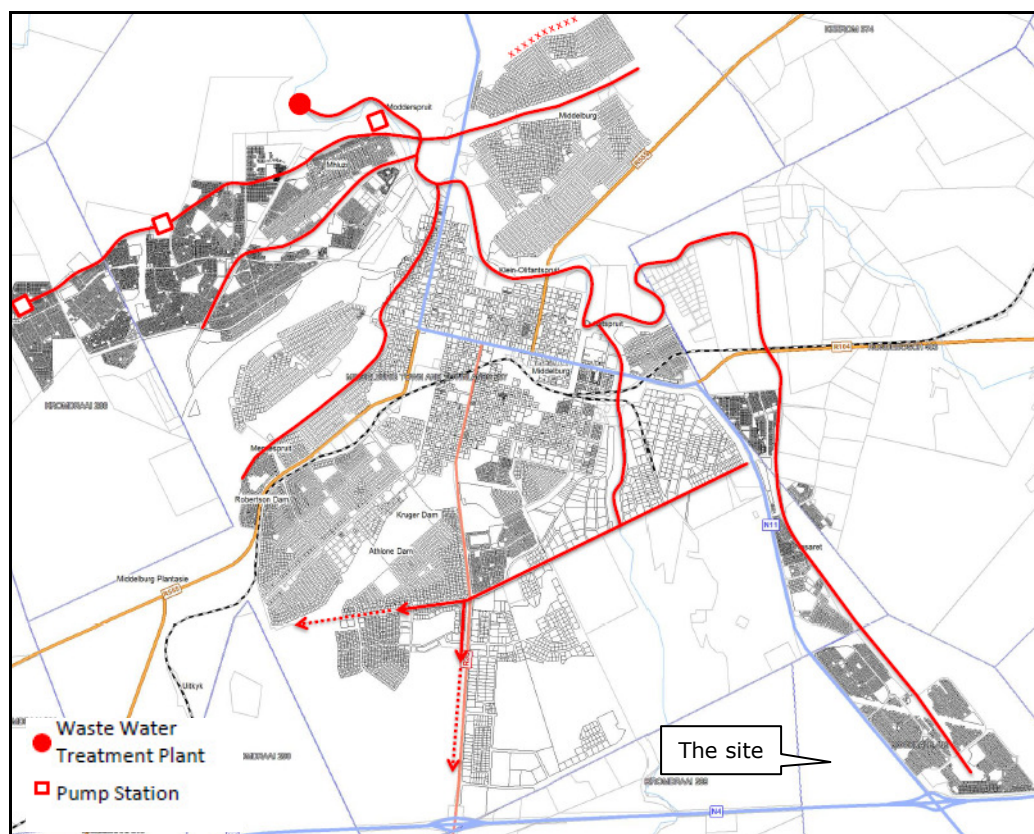
### 6.7.1 Alternative 1: Connecting to existing municipal sewer

According to Urban Dynamics (2017b), waterborne sanitation will be provided and sewage generated by the development will be treated by the Steve Tshwete Local Municipality.

Middelburg is served by the Boskrans Waste Water Treatment Works (WWTWs) located downstream along the Klein Olifants River at the north-western end of town (Figure 6.8). This WWTWs can currently accommodate about 22MI/day.

According to the SDF (2015), the high maintenance cost on the aged equipment (i.e. reached their design life) at Boskrans WWTW has become a major problem. The upgrading of the works is in progress to avoid massive failure. The intention is to upgrade it to 30MI/day in the short term and then to about 45MI/day in order to be able to continuously serve the increasing demand (SDF, 2015).

Waste water is pumped to the Boskrans WWTW along the main outfall sewer along the main outfall sewer via a pump station located just to the north of Mhluzi. Figure 6.8 provides an indication of the location of the main outfall sewers in Middelburg and the location of the WWTWs. As indicated, a main outfall sewer runs parallel to the east of route N11 and serves all the new developments/extensions of Nasaret and Rockdale along the eastern extents of town.



**Figure 6.8: Main outfall sewer system of Steve Tshwete Local Municipality (taken from SDF, 2015)**



### **Sewage to be generated**

Table 6.4 provides the information regarding sewage to be generated by Phase 1 of the development.

**Table 6.4: Sewage generated by Phase 1 of the development (Strydom and Malan, 2017)**

<b>AVERAGE DAILY FLOW</b>	800 liters per household per day
<b>EXPECTED PEAK DAILY FLOW FOR TOTAL DEVELOPMENT</b>	2 200 kl per day
<b>ALLOWANCE FOR INFILTRATION</b>	15%
<b>TOTAL DEVELOPMENT DESIGN FLOW</b>	59 l/s

### **Proposed outfall/link sewers**

A new outfall sewer will be constructed and will connect to the existing municipal outfall sewer that runs on the eastern side of Middelburg Extension 24 (Figure 6.8). According to Strydom and Malan (2017), the proposed outfall sewer has been sized to drain the effluent of the total development. Allowance has been made for pipe jacking under the N11 in an easterly direction (Figure 6.8).

A complete waterborne sewer will be provided with a sewer connection point at each stand (Strydom and Malan, 2017). The sewer lines will be located inside the stands at the midblock boundaries or the lowest boundary for single row stands, and will be connected to the proposed outfall sewer line.

Table 6.5 provides the proposed standards with regard to the sewer reticulation network to be installed.

**Table 6.5: Proposed standard of the sewer reticulation network to be installed – Rockdale West Phase 1 (Strydom and Malan, 2017)**

<b>AVERAGE DAILY FLOW</b>	800 liters per household per day
<b>EXPECTED PEAK DAILY FLOW FOR TOTAL DEVELOPMENT</b>	2 200 kl per day
<b>ALLOWANCE FOR INFILTRATION</b>	15%
<b>TOTAL DEVELOPMENT DESIGN FLOW</b>	59 l/s
<b>MINIMUM PIPE SIZE IN NETWORK</b>	160mm
<b>PIPE MATERIAL</b>	Structured Wall uPVC
<b>MAXIMUM MANHOLE SPACING</b>	80m
<b>PEAK FACTOR</b>	2.25
<b>MINIMUM FLOW SPEED</b>	0.7 m/s
<b>MINIMUM SLOPE</b>	1:120 for 110mm diameter & 1:200 for 160mm diameter
<b>MINIMUM COVER TO PIPES IN SERVITUDE</b>	800mm
<b>MINIMUM COVER TO PIPES IN SIDEWALK</b>	1000mm
<b>MANHOLES</b>	1000mm inside diameter with step irons if deeper than 1.2m
<b>RODDING EYES</b>	Positioned at the beginning of a line if there are 4 house connections or less before the next manhole. Rodding eyes to be installed with its own chamber and cover.

**Alternative 1 (connecting to existing municipal sewer) is thus the preferred option with regards to water supply.**



### **6.7.2 Alternative 2: Other sewage treatment options**

As indicated in Section 5.3.2.2, most of the site falls within geotechnical zone 1A (Table 5.2; Figure 5.5) characterised by relatively shallow bedrock with scattered outcrop that is intermediate to hard excavatable (<1.5m). The installation of conservancy tanks or septic tanks would thus be difficult.

Cilliers and Meyer (2017) indicated that permeabilities are expected to be high in the overburden material due to the high sand fraction and fine gravel content. Any contamination is therefore likely to move fairly rapidly within the transported cover soils while the residuum is less permeable. The site is therefore not suitable for septic tanks with French drains as it could lead to pollution of the groundwater and nearby surface environments.

Kotze (2017) reported that the macroinvertebrate assemblages indicated that the Rockdale tributary is in a moderate state, while conditions are very poor in the Vaalbankspruit. A similar scenario was also detected by *in-situ* water quality, habitat integrity and the fish assessment. It is therefore evident that the biotic integrity of this reach of the Vaalbankspruit is already in a deteriorated state and no further deterioration should be allowed (Kotze. 2017).

In terms of sewage package plants, the effluent would have to either be irrigated or released into the receiving environment. This could lead to both soil pollution, groundwater pollution and surface water pollution (i.e. the nearby Vaalbankspruit).

**In view of the above-mentioned, Alternative 2 (other sewage treatment options) was thus discarded.**

### **6.7.3 No project option**

See Section 6.11 for further details in this regard.

## **6.8 Electricity**

As indicated in the Scoping Report, the following alternatives in terms of electricity were identified and investigated as part of the EIA phase:

- |  |
|--|
| <ul style="list-style-type: none"><li>• Alternative 1: Connecting to existing municipal electricity network;</li><li>• Alternative 2: Other sources of electricity;</li><li>• No project option.</li></ul> |
|--|

### **6.8.1 Alternative 1: Connecting to existing municipal electricity network**

According to LTZ Consulting (2017), the proposed development site is situated within an area where infrastructure currently exists. A substation is also located within the site boundaries where possible supply can be obtained from. In addition, due to adjacent developments, other MV services are present in the area where possible extension could be established.

LTZ Consulting (2017) indicated that it is assumed that capacity from existing services in the area will be available for the proposed development. Feedback from the STLM in terms of the availability of supply has not been received to date.





LTZ Consulting (2017) indicated that the proposed development could be directly fed from the Rockdale Substation or joint into the existing MV network. An 11 kV MV internal network with miniature substations placed strategically to supply all properties could be constructed based on the electrical load requirement of the proposed development. The proposed new 11kV network could link into the existing network.

According to LTZ Consulting (2017), the low voltage network will be arranged by means of several LV circuits feeding from the miniature substations to a selected circuit of LV metering kiosks. Each kiosk will be equipped with the relevant LV circuit breakers to each stand as well as a pre-paid meter functioning as split unit.

Each stand will be supplied with a 3 core LV cable that is within the stand boundary and made off with an end cap for later connection.

Streetlights (4m post top lamps fitted with a 70W lamp) will be provided for all residential and industrial area stands as well as most access roads to various extensions of the development.

**Alternative 1 (connecting to existing municipal electricity network) is thus the preferred option.**

#### **6.8.2 Alternative 2: Other sources of electricity**

The provision of solar power or wind power would require a large area in terms of this infrastructure. This would impact on the number of houses that could be provided as the said infrastructure would have to be constructed within areas allocated for housing. As indicated in Section 6.4.2, no development (including infrastructure) is to take place within the designated Public Open Space areas.

**Alternative 2 (other sources of electricity) was thus discarded.**

#### **6.8.3 No project option**

See Section 6.11 for further details in this regard.

### **6.9 Storm water management**

As indicated in the Scoping Report, the following alternatives in terms of storm water management were identified and investigated as part of the EIA phase:

- Alternative 1: Connecting to existing municipal storm water system in the existing Rockdale residential area;
- Alternative 2: Providing a new storm water system;
- Alternative 3: A combination of Alternative 1 and Alternative 2;
- No project option.

#### **6.9.1 Alternative 1: Connecting to existing municipal storm water system in the existing Rockdale residential area**

Storm water drainage of the Phase 1 development (Figure 6.5) will connect to the existing storm water system of Rockdale. Existing culverts are present under the N11 road. This section of the development is located basically on the local catchment divide with the area draining towards Rockdale.



### **6.9.2 Alternative 2: Providing a new storm water system**

As previously indicated, the development of subsequent phases would depend on the provision of services conforming to the level of civil services as required by the Steve Tshwete Local Municipality.

A new storm water system draining towards the south west and west will have to be provided for these subsequent phases as indicated in Figure 6.4. According to Strydom and Malan (2017), allowance has been made for surface storm water management through pre-cast kerb inlets and pre-cast concrete storm water pipes.

Figure 6.9 provides an indication of the proposed storm water outlets that will be provided with stone pitching and energy breakers to engineering specifications. The said area will also be rehabilitated/vegetated with specific plants to ensure optimal drainage into the wetland area and prevent erosion.

### **6.9.3 Alternative 3: A combination of Alternative 1 and Alternative 2**

As indicated in Section 6.9.1, Alternative 1 (connecting to existing municipal storm water system in the existing Rockdale residential area) is the preferred alternative with regards to the development of Phase 1 while Alternative 2 (providing a new storm water system) is the preferred option for the subsequent phases.

In view of the above-mentioned, **Alternative 3 (a combination of Alternative 1 and Alternative 2) will thus be implemented and is thus the preferred option.**

### **6.9.4 No project option**

See Section 6.11 for further details in this regard.



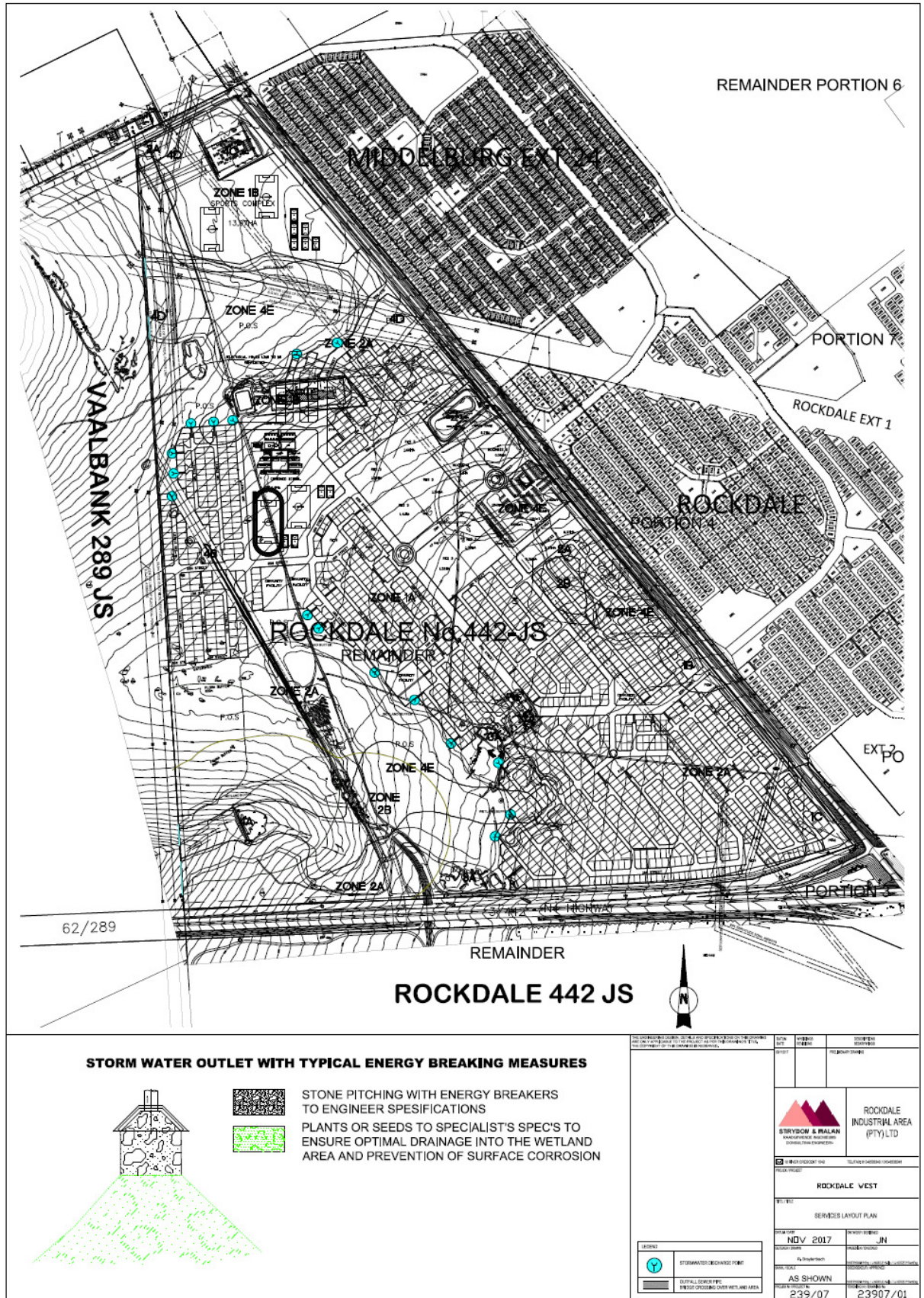


Figure 6.9: Proposed storm water drainage for overall development



## 6.10 Waste management

As indicated in the Scoping Report, the following alternatives in terms of waste management were identified and investigated as part of the EIA phase:

- Alternative 1: Waste collection by the Steve Tshwete Local Municipality and disposal thereof at the licensed Rietfontein Waste Disposal Site;
- Alternative 2: Development of a new onsite waste disposal site;
- Alternative 3: A combination of Alternative 1 and Alternative 2;
- No project option.

### 6.10.1 Alternative 1: Waste collection by the Steve Tshwete Local Municipality and disposal thereof at the licensed Rietfontein Waste Disposal Site

The said site is located within the Steve Tshwete Local Municipality urban boundary and it is therefore anticipated that the development would be serviced by the municipality. Waste collection will thus be done by the Steve Tshwete Local Municipality with disposal taking place at the licensed Rietfontein Waste Disposal Site.

**Alternative 1 (waste collection by the Steve Tshwete Local Municipality and disposal thereof at the licensed Rietfontein Waste Disposal Site) is thus the preferred option.**

### 6.10.2 Alternative 2: Development of a new onsite waste disposal site

As indicated in Section 5.3.2.2, most of the site falls within geotechnical zone 1A (Table 5.2; Figure 5.5) characterised by relatively shallow bedrock with scattered outcrop that is intermediate to hard excavatable (<1.5m). The dominant soil type is Mispah, a shallow, rocky soil that covers an area of approximately 119 ha (Figure 5.5). Not much cover material would thus be available.

In addition, Cilliers and Meyer (2017) indicated that permeabilities are expected to be high in the overburden material due to the high sand fraction and fine gravel content. Any contamination is therefore likely to move fairly rapidly within the transported cover soils while the residuum is less permeable.

Kotze (2017) reported that the macroinvertebrate assemblages indicated that the Rockdale tributary is in a moderate state, while conditions are very poor in the Vaalbankspruit. A similar scenario was also detected by *in-situ* water quality, habitat integrity and the fish assessment. It is therefore evident that the biotic integrity of this reach of the Vaalbankspruit is already in a deteriorated state and no further deterioration should be allowed.

In view of the above-mentioned, the site is therefore not suitable for an onsite waste disposal site as cover material is not available and it could lead to pollution of the groundwater and nearby surface environments (e.g. the Vaalbankspruit).

**Alternative 2 (development of a new onsite waste disposal site) was thus discarded.**



**6.10.3 Alternative 3: A combination of Alternative 1 and Alternative 2**  
As indicated in Section 6.10.2, the site is not suitable for a waste disposal site. **In view of this, Alternative 3 (a combination of Alternative 1 and Alternative 2) was thus discarded.**

#### **6.10.4 No project option**

See Section 6.11 for further details in this regard.

### **6.11 The 'No Project Option'**

The 'no project option' is the alternative of not going ahead with the proposed development. The 'no project option' is only considered if it is found that the development will have significant negative impacts on the environment, which cannot be mitigated or managed.

If the 'no project option' in terms of the proposed project was exercised, it would mean that:

- The applicant would have to investigate other land uses (e.g. industrial) for the site;
- The site would remain vacant;
- The applicant would have to discard the proposed development plans;
- The applicant would have to investigate alternative sites for the proposed integrated development.
- The housing backlog (currently 40 976 units required; SDF, 2015) in the Steve Tshwete Local Municipality would not be alleviated;
- It could result in the site being illegally occupied resulting in an informal settlement without services.

### **6.12 Need and desirability**

#### **6.12.1 Need**

Urban Dynamics (2017b) indicated the need of the proposed project as follows:

*According to the latest Integrated Development Plan (IDP) for 2017-2022, the housing backlog in the Steve Tshwete Local Municipality stands at 12 480 with 14.4% of the households living in informal settlements. The IDP further states that 28 496 households are in need of some sort of housing assistance. In total, the housing need in the municipal area is therefore 40 976 units according to the latest IDP.*

*The majority of the people on the housing waiting list fall within the low income housing bracket since they earn less than R3 500 per month and therefore rely on the local municipality to provide them with subsidised housing.*

*If 1000 housing units are provided per year, then it will take more than 40 years to alleviate the current housing need in this area. However, the increase in population puts further strain on the provision of housing in the municipal area resulting in the demand for housing growing on an annual basis.*



*It is very clear that the municipality will not be able to provide for all the housing needs within the community. Private developers could however assist in addressing this burning issue.*

*Apart from the need that the municipality has identified there is also additional pressure from time to time from the Mining Sector for the resettlement of farm workers that needs to be accommodated within the urban edge if mining activities need to expand. This need also increases the demand on the municipal stands available if the mining companies acquire it for the resettlement of farm workers.*

### **6.12.2 Desirability**

Urban Dynamics (2017b) indicated the desirability of the proposed project as follows:

*The proposed development site is located in close proximity to Columbus Steel, Middelburg Ferrochrome and other industries which are major employers in the local authority. The proposed development borders onto the main industrial area of Middelburg and therefore will ensure that the low income housing development is situated in close proximity to work opportunities as prescribed by the Breaking New Ground Policy published by the Department of Housing. The development will therefore provide an opportunity to residents to reside closer to the workplace as intended by government policies.*

*The development is furthermore within easy access of the N4 highway for longer distance trips. Mines and power stations around Middelburg are easily accessible on the N4-highway situated adjacent to the development area. Furthermore the proximity of the N11 is another positive aspect and will bring residents closer to surrounding work opportunities in Hendrina for example. However, the residents will utilise the internal ring roads in town to get from Point A to Point B in town and not the N4 highway.*

*The locality of the application site is situated in an area which lends itself to residential expansion within the urban edge. The extension possibilities of the Middelburg town are restricted due to topographical factors and mining activities in a western and south-western direction, the future direction of development as indicated in the latest SDF is to the north of the town and to the east and south-east of the town. The proposed development is situated adjacent to the existing Rockdale Township in an area that is known for residential development and can therefore be considered as a desirable locality for future residential development. The existing Rockdale townships on the eastern side of the N11 will therefore be expanded to the western side of the N11 making good use of the existing infrastructure that already provides access to housing opportunities.*

*The existing entrances on the N11 will also be utilised as indicated in the Traffic Report and it will unlock the area to the west of the N11 for future residential development. The traffic report also indicated that the proposed development is supported in terms of the layout plan of the roads, intersections and distances from the National Highway. The N11 provides access to the centre of town, the industrial area and to other towns such as Hendrina.*

*The grouping of residential areas around such an important primary road is feasible due to the fact that it is easily accessible by the residents and can*





*also provide easy access to other important amenities around town. The SDF also identifies a prominent Secondary Node at the northern corner of the site with a proposed link road to the west of the site towards the Middelburg Mall and the proposed Provincial Hospital site south of the Middelburg Mall.*

*The proposed area is further desirable for residential development due to the fact that the environmental and geological conditions are favourable for township establishment. The environmental issues that were raised during the Environmental Impact Assessment process can be mitigated and certain buffer zones were applied to protect the sensitive environments as explained in Point 9.3. The low agricultural potential of the property further indicates that no high potential agricultural lands needs to be sacrificed for the proposed development and that the property owner has no other alternative than to develop the land which is suitably located within the urban edge.*

*Furthermore, the implementation phase will have a positive economic impact as far as job creation is concerned and it can create opportunities for economic growth within the direct community during the construction phase and operation phase of the development.*



## 7. ENVIRONMENTAL IMPACT DESCRIPTION AND EVALUATION

This section of the report describes the impacts and risks identified (physical and social) as a result of the proposed project, including:

- the nature, significance, consequence, extent, duration and probability of the impacts;
- the degree to which these impacts can be reversed or may cause irreplaceable damage;
- the methodology used in determining and ranking the potential impacts;
- positive impacts.

### 7.1 Introduction

This section of the report describes and evaluates the potential impact of the proposed development on the environment. The impact of the development has to be assessed in terms of the following development phases:

- **Planning and design phase**
- **Construction phase**
- **Operational phase**

### 7.2 Evaluation of impacts

The evaluation of impacts is conducted in terms of the following criteria:

- **Nature of impact**
- **Extent of impact**

Site	Effect limited to the site and its immediate surroundings
Local	Effect limited to within 3-5 km of the site
Regional	Effect will have an impact on a regional scale

- **Duration of impact**

Short	Effect lasts for a period 0 to 5 years
Medium	Effect continues for a period between 5 and 10 years
Long	Effect will cease after the operational life of the activity either because of natural process or by human intervention
Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient

- **Probability**

Improbable	Less than 33% chance of occurrence
Probable	Between 33 and 66% chance of occurrence
Highly probable	Greater than 66% chance of occurrence
Definite	Will occur regardless of any prevention measures

- **Significance of impact**

Low	Where the impact will have a relatively small effect on the environment and will not have an influence on the decision
Medium	Where the impact can have an influence on the environment and the decision and should be mitigated
High	Where the impact definitely has an impact on the environment and the decision regardless of any possible mitigation



• **Status**

Positive	Impact will be beneficial to the environment
Negative	Impact will not be beneficial to the environment
Neutral	Positive and negative impact

It must be noted that many of the potential negative consequences can be mitigated successfully. It is however, necessary to make a thorough assessment of all possible impacts in order to ensure that environmental considerations are taken into account, in a balanced way, as far as possible, supporting the aim of creating a healthy and pleasant environment.

### **7.3 Description of impact assessment to be undertaken**

#### **Development of the Rockdale West residential area**

The impact assessment will be based on Alternative Layout 2a (Figure 6.3a), the preferred layout plan, and Alternative Layout 2b (Figure 6.3b).

As indicated in Section 6.3.2, Alternative layout 2a (Figure 6.3a) was based on the outcome of the specialist studies conducted as part of the EIA process. Alternative layout 2b (Figure 6.3b) is basically Alternative layout 2a (Figure 6.3a). The only change is that an Eskom servitude (EPL servitude SG no. A9097/723; Figure 6.3b), located in the south eastern corner of the site, was taken into account as part of the overall development plan. It is currently not known if Eskom will approve the cancellation of this servitude. Alternative layout 2b (Figure 6.3b) is thus subject to obtaining approval from Eskom in terms of the cancellation of the Eskom servitude and will also be referred to in the impact assessment (Section 7.6).

Urban Dynamics (2017b) indicated that the first phase of the development (Alternative layout 2a; Figure 6.3a and Alternative layout 2b; Figure 6.3b) will be situated around the business sites and adjacent residential properties along the N11 highway (Figure 6.5) and would involve the following land uses to kick-start the development:

- 193 Residential 1 stands ( $\pm 300\text{m}^2/\text{erf}$ ) = 5.79ha;
- 2 "Business 2" stands = 3.78ha;
- 2 "Business 3" stands = 1.04ha.
- Roads (access roads and internal roads as indicated in Figure 6.5)

The Phase 1 area will thus entail an area of approximately 16 ha. Further details are provided in Section 6.4.2.

Strydom and Malan (2017) confirmed that the following bulk and link services are available for the proposed Phase 1 development (Figure 6.5):

- Major access roads: access to the development is from the existing N11 road.
- Outfall sewer: The proposed outfall sewer (sized to drain the effluent of the total development) will connect to the existing municipal outfall sewer that runs on the eastern side of Middelburg Extension 24 (Figure 6.7). See Section 6.7 for further details.
- Water supply: The development will connect to the existing 200mm diameter water pipe in Rockdale Extension 2 (Figure 6.6). The link pipe has been sized to cater for the water demand of Phase 1 (Figure 6.5). See Section 6.6 for further details.
- Electricity: The proposed development site is situated within an area where infrastructure currently exists. LTZ Consulting (2017) indicated that the proposed development could be directly fed from the Rockdale





Substation or joint into the existing MV network. See Section 6.8 for further details.

- Storm water: As indicated in Section 6.9.1, Alternative 1 (connecting to existing municipal storm water system in the existing Rockdale residential area) is the preferred alternative with regards to the development of Phase 1. See Section 6.9 for further details.

The development of the other phases will be determined based on the installation of civil engineering services and link services that conform to the level of services as required by the Steve Tshwete Local Municipality.

For each of the above-mentioned phases, the construction phase will involve the pegging of the stands, installation of services and construction of the buildings and associated infrastructure. This will involve the following:

- ❖ Clearing of vegetation;
- ❖ Levelling of the site;
- ❖ Excavation of trenches;
- ❖ Installation and connection of services;
- ❖ Construction of access road and parking area;
- ❖ Laying of the required foundations;
- ❖ Building of the outer structure;
- ❖ Installation of the required internal fittings;
- ❖ Rehabilitation of the disturbed areas (i.e. landscaping).

Table 7.1 provides a summary of the main environmental impacts identified in terms of the construction of the proposed residential area.

#### **7.4 Operational phase**

The operational phase would involve the utilisation of the various buildings and facilities associated with the overall residential area (including the various services installed).

Table 7.1 provides further details with regards to potential impacts identified as a result of the utilisation of the facilities provided as part of the overall residential area.

#### **7.5 Decommissioning phase**

If required, this phase would involve the decommissioning of the buildings and facilities constructed as part of this project (if ever required). It is recommended that at the time of decommissioning, a specific Environmental Management Plan (EMP) be compiled which specifically addresses this phase. This EMP would have to address issues such as the removal of building rubble and the rehabilitation of the site. Soil conservation measures would also have to be implemented.

#### **7.6 Identification of potential impacts**

Table 7.1 provides an indication of the environmental features that will be impacted (directly and indirectly) during the construction, operational and decommissioning phases of the proposed project as indicated above.



**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
TOPOGRAPHY	<b>Phases 1 - 11 (Installation of services, roads and buildings):</b> The construction activities (e.g. removal of vegetation, sloping of the site, paving of the area, construction of buildings, surfacing of roads/parking area, etc.) associated with the subsequent phases would result in changes to the runoff patterns and an increased risk of soil erosion if mitigation measures are not implemented.	SITE	LONG	DEFINITE	LOW NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> During the operational phase, the direct impact on topography will continue in terms of slope, changed runoff patterns and an increased risk of soil erosion. Due to the flat nature of the site the risk of soil erosion is low.	SITE	LONG	HIGHLY PORBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> During decommissioning, the buildings and associated infrastructure will be demolished and removed from site. The site will be top soiled and shaped to conform to the original slope of the area, which will have a positive impact on the runoff from the site.	SITE	LONG	DEFINITE	LOW POSITIVE	MEDIUM POSITIVE
	<b>Phase 1 (Installation of services, roads and buildings):</b> The proposed Phase 1 area is located more or less on a local watershed with drainage occurring from the said site towards the east (i.e. towards the N11 national road and the existing Rockdale residential area). Cilliers and Meyer (2017) indicated that the rest of the site has a gentle to moderate slope towards the western boundary of the site. On site, the central and northern portions slope toward the northwestern corner while the southern portion of the site slopes towards the southwestern corner of the site. During the construction phase, the presence of local watersheds will have to be taken into account when installing the services (water, sewage, storm water, etc.) in order to ensure proper drainage and prevent impact on adjacent properties (e.g. existing Rockdale residential area, adjacent property belonging to Mr. Visser (JV Ranch)).	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phase 1 (Installation of services, roads and buildings):</b> During the operational phase, the presence of local watersheds could continue to impact on the services (water, sewage, storm water, etc.) and impact on adjacent properties (e.g. existing Rockdale residential area, adjacent property belonging to Mr. Visser (JV Ranch)) if these were not taken into account during the design and construction phases.	SITE	LONG	IMPROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE						
GEOLOGY	<b>Phase 1 (Installation of services, roads and buildings):</b> The construction of buildings/infrastructure within the Phase 1 area would impact on the underlying Vryheid Formation (sandstone, shale, gritstone, conglomerates, coal measures) of the Ecca Group, Karoo Sequence. The direct impact on geology will depend on the depth of the excavations required for the construction of the buildings and installation of infrastructure. The possible impact on the underlying geology cannot be mitigated.	SITE	PERMANENT	DEFINITE	LOW NEGATIVE	LOW NEGATIVE	<b>Phase 1 (Utilization of services, roads and buildings):</b> NONE. No further impact since no further construction would take place.						<b>Phase 1 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.					
	<b>Phases 2 to 11: (Installation of services, roads and buildings):</b> Development within the eastern portion of the site would impact on the Vryheid Formation (sandstone, shale, gritstone, conglomerates, coal measures) of the Ecca Group, Karoo Sequence. Development within the western portion of the site would impact on the Selonsrivier Formation (subordinate andesite and red porphyritic rhyolite (felsite) classified as volcanic rocks) of the Rooiberg Group, Transvaal Sequence. The direct impact on geology will depend on the depth of the excavations required for the construction of the buildings and installation of infrastructure. The possible impact on the underlying geology cannot be mitigated.	SITE	PERMANENT	DEFINITE	LOW NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> NONE. No further impact since no further construction would take place.							<b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.				

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
GEOTECHNICAL ASPECTS	<b>Phase 1 (Installation of services, roads and buildings):</b> The construction of buildings/infrastructure within the Phase 1 area would mostly impact on Geotechnical zone 1A (relatively shallow bedrock with scattered outcrop). However, Geotechnical zone 1B (low to moderately compressible soils), Geotechnical zone 2A (susceptible to sub-surface seepage) and Geotechnical zone 2B (susceptible to surface ponding and seepage) will also be impacted. The structures could be impacted if the geotechnical mitigation measures (normal founding, modified normal construction methods, provision of subsurface drainage) with regards to the above-mentioned are not implemented as part of the construction phase.	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phase 1 (Utilization of services, roads and buildings):</b> The structures will continue to be impacted upon through the operational phase if the geotechnical mitigation measures were not implemented.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phase 1 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.					
GEOTECHNICAL ASPECTS	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The development of the subsequent phases would impact on a number of Geotechnical zones (Figure 5.5) namely: • Zone 1A - relatively shallow bedrock with scattered outcrop; • Zone 1B - low to moderately compressible soils; • Zone 1C - moderately compressible soils. The structures could be impacted if the geotechnical mitigation measures (normal founding, modified normal construction methods, etc.) with regards to the above-mentioned are not implemented as part of the construction phase.	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> The structures will continue to be impacted upon through the operational phase if the geotechnical mitigation measures were not implemented.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.					
	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> Most of Geotechnical zone 2A (susceptible to sub-surface seepage) and 2B (susceptible to surface ponding and seepage) were incorporated into the Public Open Space corresponding to the identified wetland (Channelled Valley Bottom Wetland and Seep Wetland, Northern Seep) and its delineated wetland buffer zones. No development will thus take place within these areas. No impact is therefore predicted. However, where Geotechnical zone 2A and 2B extend outside these areas (e.g. small area near N11 off ramp; adjacent to the N11 road, etc.) mitigation measures recommended by Cilliers and Meyer (2017) would need to be implemented to avoid impact on the structures built.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> The structures will continue to be impacted upon through the operational phase if the geotechnical mitigation measures were not implemented.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.					
	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> Most of Geotechnical zone 3A (Remediation) will be incorporated into the Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b) and will thus not be developed. No impact is therefore predicted. However, where Geotechnical zone 3A extends outside these areas, mitigation measures recommended by Cilliers and Meyer (2017) would need to be implemented to avoid impact on the structures built.	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> The structures will continue to be impacted upon through the operational phase if the geotechnical mitigation measures were not implemented.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.					





**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	
																			EXTENT
<b>GEOTECHNICAL ASPECTS</b>	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> NONE. No development will take place in the following Geotechnical zones as recommended by Cilliers and Meyer (2017):</p> <ul style="list-style-type: none"> <li>• Zone 4A (small earth embankment dam);</li> <li>• Zone 4B (railway servitude);</li> <li>• Zone 4C (Eskom substation);</li> <li>• Zone 4D (Eskom servitude).</li> </ul> <p>These areas were zoned Public Open Space as indicated in Alternative layout 2 (Figure 6.3a &amp; 6.3b). No impact on these Geotechnical zones is thus anticipated.</p>						<p><b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> NONE. No further impact since no further construction would take place.</p>						<p><b>Phase 2 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.</p>						
<b>SOIL</b>	<p><b>Phase 1 (Installation of services, roads and buildings):</b> The development of the Phase 1 area (Figure 6.5) will impact predominantly on the Mispah soil type. It is however possible that small portions of Bainsvlei and Westleigh soils would also be impacted. Viljoen (2017) indicated that construction activities (land clearing/stripping, handling, stockpiling, placement, landscaping, construction of buildings/roads/etc.) would result in a change of the soil's physical, chemical and biological properties due to loss of topsoil, erosion, stockpiling and mixing of deep and surface soils. The reprofiling of the site could result in changed runoff patterns and an increased risk of soil erosion if mitigation measures are not implemented. The risk is however low due to the relatively flat nature of the site.</p>	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phase 1 (Utilization of services, roads and buildings):</b> Direct impact on soil will continue i.t.o. soil structure, nutritional and chemical values and soil compaction as a result of the presence of the infrastructure.</p>	SITE	LONG	DEFINITE	LOW NEGATIVE	LOW NEGATIVE	<p><b>Phase 1 (Decommissioning of the services, roads and buildings):</b> In general, the decommissioning and rehabilitation of the site would have a positive impact on the soil of the site since the infrastructure will be removed and the site will be topsoiled and shaped to conform to the original slope of the area. The revegetation of the site would lead to a decrease in surface water runoff velocity and a smaller risk of erosion and sedimentation of the nearby surface water environments (Rockdale tributary, Vaalbankspruit).</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEUTRAL	MEDIUM NEUTRAL	
	<p><b>Phase 1 (Installation of services, roads and buildings):</b> NONE. The development of the Phase 1 area would not impact on any wetland soils (Viljoen, 2017).</p>																		
	<p><b>Phase 1 (Installation of services, roads and buildings):</b> Phase 1 construction activities could lead to soil pollution if:</p> <ul style="list-style-type: none"> <li>• the construction vehicles are not maintained/repared resulting in oil leaks and fuel spills;</li> <li>• waste management measures are not implemented,</li> <li>• proper ablution and sanitation facilities are not provided for the site workers to use on site.</li> </ul>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phase 1 (Utilization of services, roads and buildings):</b> Soil pollution could take place if:</p> <ul style="list-style-type: none"> <li>• the onsite sanitation system does not have sufficient capacity resulting in spills;</li> <li>• waste management measures are not implemented for the overall development.</li> </ul>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phase 1 (Decommissioning of the services, roads and buildings):</b> Soil pollution may occur if:</p> <ul style="list-style-type: none"> <li>• The vehicles are not maintained/ repaired resulting in oil leaks and fuel spills;</li> <li>• Waste management measures are not implemented;</li> <li>• Proper sanitation and ablution facilities are not provided for use by site workers.</li> </ul> <p>The removal of any polluted soil and proper rehabilitation of the site after decommissioning will however, have a positive impact on the soil.</p>	SITE	SHORT	PROBABLE	MEDIUM NEUTRAL	MEDIUM NEUTRAL	

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)		
																			EXTENT	DURATION
SOIL	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The development of the subsequent phases will impact predominantly on the Mispah soil type as well as Bainsvlei, Westleigh and Avalon soils. Viljoen (2017) indicated that construction activities (land clearing/stripping, handling, stockpiling, placement, landscaping, construction of buildings/roads/etc.) would result in a change of the soil's physical, chemical and biological properties due to loss of topsoil, erosion, stockpiling and mixing of deep and surface soils. The reprofiling of the site could result in changed runoff patterns and an increased risk of soil erosion if mitigation measures are not implemented especially in the southern, south western and northern portion of the site in close proximity to the Channelled Valley Bottom Wetland and Seep Wetland and the Northern Seep as well as the Rockdale tributary and Vaalbankspruit.</p>	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> Direct impact on soil will continue i.t.o. soil structure, nutritional and chemical values and soil compaction as a result of the presence of the infrastructure. This could result in changed runoff patterns and an increased risk of soil erosion if proposed storm water control measures are not implemented especially in the southern, south western and northern portion of the site in close proximity to the Channelled Valley Bottom Wetland and Seep Wetland and the Northern Seep as well as the Rockdale tributary and Vaalbankspruit.</p>	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> In general, the decommissioning and rehabilitation of the site would have a positive impact on the soil of the site since the infrastructure will be removed and the site will be topsoiled and shaped to conform to the original slope of the area. The revegetation of the site would lead to a decrease in surface water runoff velocity and a smaller risk of erosion and sedimentation of the nearby surface water environments (Rockdale tributary and Vaalbankspruit) as well as the Channelled Valley Bottom Wetland and Seep Wetland and Northern Seep.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEUTRAL	MEDIUM NEUTRAL		
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> NONE. The development of the subsequent phases would not directly impact on any wetland soils (Viljoen, 2017). The area where the Katspruit soils were identified coincides with the Channelled Valley Bottom Wetland and Seep Wetland (southern and south western portion of the site) that has been zoned Public Open Space (Figure 6.3a &amp; 6.3b) and will not be developed.</p>																			
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> Construction activities associated with the development of the subsequent phases could lead to soil pollution if:  <ul style="list-style-type: none"> <li>the construction vehicles are not maintained/repared resulting in oil leaks and fuel spills;</li> <li>waste management measures are not implemented,</li> <li>proper ablation and sanitation facilities are not provided for the site workers to use on site.</li> </ul> </p>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE		<p><b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> Soil pollution could take place if:  <ul style="list-style-type: none"> <li>the onsite sanitation system does not have sufficient capacity resulting in spills;</li> <li>waste management measures are not implemented for the overall development.</li> </ul> </p>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE		LOW NEGATIVE	<p><b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> Soil pollution may occur if:  <ul style="list-style-type: none"> <li>The vehicles are not maintained/ repaired resulting in oil leaks and fuel spills;</li> <li>Waste management measures are not implemented;</li> <li>Proper sanitation and ablation facilities are not provided for use by site workers.</li> </ul>                     The removal of any polluted soil and proper rehabilitation of the site after decommissioning will however, have a positive impact on the soil.                 </p>	SITE	SHORT	PROBABLE	MEDIUM NEUTRAL	MEDIUM NEUTRAL
LAND USE/ AGRICULTURAL POTENTIAL/LAND CAPABILITY	<p><b>Phase 1 (Installation of services, roads and buildings):</b> NONE. The Phase 1 area is currently vacant with no agricultural activities or other formal land use activities taking place. Eskom powerlines, located adjacent to the N11 road, are present but will be accommodated within an area zoned as Public Open Space. However, the development of this area could impact on an Eskom servitude if Eskom does not agree to cancel the said servitude.</p>	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phase 1 (Utilization of services, roads and buildings):</b> The utilization of services, roads and buildings will continue to impact predominantly on the Mispah soil type as well as small portions of Westleigh soils. Both these soil types are not suitable for agricultural purposes since the effective soil depth is less than 300mm (Viljoen, 2017). It is possible that small portions of</p>	SITE	LONG	DEFINITE	MEDIUM POSITIVE	MEDIUM POSITIVE	<p><b>Phase 1 (Decommissioning of the services, roads and buildings):</b> The decommissioning of the buildings and associated infrastructure and rehabilitation of the site would allow for a different land use on site. The impact will depend on the existing land use in the area.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEUTRAL	MEDIUM NEUTRAL		

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	
																			EXTENT
LAND USE/ AGRICULTURAL POTENTIAL/LAND CAPABILITY	<b>Phase 1 (Installation of services, roads and buildings):</b> The development of the Phase 1 area will impact predominantly on the Mispah soil type as well as small portions of Westleigh soils. Both these soil types are not suitable for agricultural purposes since the effective soil depth is less than 300mm (Viljoen, 2017). It is possible that small portions of Bainsvlei soils would also be impacted that has a low dryland and low irrigation agricultural potential (Viljoen, 2017). Viljoen (2017) indicated the land capability of the said area as Wilderness. The development of the said area would thus not impact on a high potential agricultural area or an area currently utilised for agricultural purposes.	SITE	LONG	DEFINITE	LOW NEGATIVE	LOW NEGATIVE	Bainsvlei soils would also be impacted that has a low dryland and low irrigation agricultural potential (Viljoen, 2017). Viljoen (2017) indicated the land capability of the said area as Wilderness. The development of the said area would thus not impact on a high potential agricultural area or an area currently utilised for agricultural purposes. The development of the site will however assist in alleviating the housing backlog in the Middelburg area.						<b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> The decommissioning of the buildings and associated infrastructure and rehabilitation of the site would allow for a different land use on site. The impact will depend on the existing land use in the area.	SITE	LONG	HIGHLY PROBABLY	MEDIUM NEUTRAL	MEDIUM NEUTRAL	
	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> NONE. The development of the subsequent phases will not impact directly on any agricultural activities or other formal land use activities currently taking place. The PIC South Africa (Alzu) facility will be demolished and relocated to another property by Alzu as per the lease agreement. The weighbridge and the Eskom substation will not be impacted as indicated in the Alternative Layout 2 (Figure 6.3a and 6.3b). The railway servitude and Eskom servitudes will also not be impacted as there areas were zoned Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b). The water pipeline extending across the site will also be accommodated within the zoned Public Open Space.						<b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> The utilization of services, roads and buildings will continue to impact predominantly on the Mispah soil type as well as Bainsvlei, Westleigh and Avalon soils. Mispah and Westleigh soils are not suitable for agricultural purposes since the effective soil depth is less than 300mm (Viljoen, 2017). Bainsvlei and Avalon soils both have a low dryland and low irrigation agricultural potential (Viljoen, 2017). Viljoen (2017) indicated the land capability of the said area to be mostly Wilderness (70%) followed by Grazing in northern and southern portions of site (19%). A very small area (1%) is indicated as arable. The change of land use from 'Agricultural' to mainly 'Residential' will therefore not impact on a high potential agricultural area or an area currently utilised for agricultural purposes. The development of the site will however assist in alleviating the housing backlog in the Middelburg area.	SITE	LONG	DEFINITE	MEDIUM POSITIVE	MEDIUM POSITIVE							
	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The development of subsequent phases will also impact predominantly on the Mispah soil type as well as Bainsvlei, Westleigh and Avalon soils. Mispah and Westleigh soils are not suitable for agricultural purposes since the effective soil depth is less than 300mm (Viljoen, 2017). Bainsvlei and Avalon soils both have a low dryland and low irrigation agricultural potential (Viljoen, 2017). Viljoen (2017) indicated the land capability of the said area to be mostly Wilderness (70%) followed by Grazing in northern and southern portions of the site (19%). A very small area (1%) is indicated as arable. The change of land use from 'Agricultural' to mainly 'Residential' will therefore not impact on a high potential agricultural area or an area currently utilised for agricultural purposes.	SITE	LONG	DEFINITE	LOW NEGATIVE	LOW NEGATIVE													



**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
<b>SENSE OF PLACE</b>	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> In the Steve Tshwete Spatial Development Framework (2014), the proposed site is earmarked for future Industrial Activities (Figure 5.26) since it is located adjacent to the existing industrial area comprising of Columbus Stainless (Pty) Ltd., etc. (Figure 5.2). It was thus not earmarked in the SDF for residential development. Preliminary discussions with the Local Municipality indicated that they would consider amending the SDF to accommodate residential development in the area due to the proximity of the Rockdale community (to the east of the N11). In addition, it is strategically situated along primary roads that provide good access for the purpose of residential development with connection to the centre of town, Middelburg Mall and other amenities and surrounding towns. The proposed development site is still within the urban edge where the necessary infrastructure exists that can be upgraded to accommodate the development rather than providing it outside the urban edge where no infrastructure is available. In addition, the proposed area will contribute to the densification of the Rockdale area around the identified secondary node which will further strengthen this node. The proposed development area is earmarked for densification that includes, residential, industrial and business land uses within the urban edge. The proposed development can be viewed as a natural extension of the existing Rockdale residential areas. The development of the said site would therefore not impact on the sense of place and immediate surroundings. The development of the said site would assist in alleviating the current housing backlog in the Middelburg area.</p>	SITE	LONG	DEFINITE	MEDIUM POSITIVE	MEDIUM POSITIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> In the Steve Tshwete Spatial Development Framework (2014), the proposed site is earmarked for future Industrial Activities (Figure 5.26) since it is located adjacent to the existing industrial area comprising of Columbus Stainless (Pty) Ltd., etc. (Figure 5.2). It was thus not earmarked in the SDF for residential development. Preliminary discussions with the Local Municipality indicated that they would consider amending the SDF to accommodate residential development in the area due to the proximity of the Rockdale community (to the east of the N11). In addition, it is strategically situated along primary roads that provide good access for the purpose of residential development with connection to the centre of town, Middelburg Mall and other amenities and surrounding towns. The proposed development site is still within the urban edge where the necessary infrastructure exists that can be upgraded to accommodate the development rather than providing it outside the urban edge where no infrastructure is available. In addition, the proposed area will contribute to the densification of the Rockdale area around the identified secondary node which will further strengthen this node. The proposed development area (figure 6.1) is earmarked for densification that includes, residential, industrial and business land uses within the urban edge. The proposed development can be viewed as a natural extension of the existing Rockdale residential areas. The development of the said site would therefore not impact on the sense of place and immediate surroundings. The development of the said site would assist in alleviating the current housing backlog in the Middelburg area.</p>	SITE	LONG	DEFINITE	MEDIUM POSITIVE	MEDIUM POSITIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> The decommissioning of the buildings and associated infrastructure and rehabilitation of the site would allow for a different land use on site. The impact will depend on the existing land use in the area.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEUTRAL	MEDIUM NEUTRAL

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
NATURAL VEGETATION/ ANIMAL LIFE	<p><b>Phase 1 (Installation of services, roads and buildings) - Loss of rocky grassland, habitat and loss/displacement of indigenous species:</b> The construction of buildings/infrastructure within the Phase 1 area would impact on approximately 9 ha of Rocky Grassland and 6 ha of Seep Wetland vegetation. Venter and Niemand (2017) indicated the rocky grassland and the seep wetland as Areas of High Sensitivity (i.e. for vegetation and fauna). Approximately 1ha of Rocky Grassland would be conserved in the Public Open Space accommodating the Eskom powerline adjacent to the N11 road. The Rocky Grassland falls within the Vulnerable Rand Highveld Grassland vegetation type and has the potential to support a high fauna and flora richness, which will become lost or displaced due to the proposed development. It should be noted that this vegetation has been impacted in terms of the dumping of waste (including the slaughtering of animals), trampling (footpaths), construction of Eskom powerlines and the N11 road since it is located adjacent to the N11 road and is in close proximity to the existing Rockdale residential area. Mitigation measures proposed by Venter and Niemand (2017) should be implemented in order to try and reduce the said impact.</p>	SITE	PERMANENT	DEFINITE	HIGH NEGATIVE	MEDIUM TO HIGH NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> No further direct impact on vegetation or animal life since no further construction activities will take place.  Invasive plant species tend to establish in and around disturbed areas if not rehabilitated. In addition, if alien plants are utilized in the gardens, they could spread and impact on the surrounding vegetation.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> During the decommissioning phase, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be rehabilitated in order to establish a vegetation cover and prevent soil erosion. This could result in the creation of artificial habitats for animal life within the rehabilitated area.  Alien plants could be introduced into areas rehabilitated as part of the decommissioning phase. This could impact on the vegetation of the surrounding area and especially the Rockdale tributary and the Vaalbankspruit and associated wetlands.</p>	SITE	LONG	PROBABLE	MEDIUM POSITIVE	MEDIUM POSITIVE
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings) - Loss of rocky grassland, habitat and loss/displacement of indigenous species:</b> Venter and Niemand (2017) indicated that the development of the subsequent phases would mainly impact on the Rocky Grassland vegetation unit (Vulnerable Rand Highveld Grassland) in the central and western portions of the site. The Rocky Grassland vegetation unit is considered an Area of High sensitivity (i.e. for vegetation and fauna) and supports a high richness of fauna including specialised taxa with high affinities towards the presence of outcrops/rock cover. In addition, the rocky outcrops are the only habitat unit that provide habitat for a number of threatened and near threatened fauna. A small and localised subpopulation of the globally near threatened Melodious Lark (<i>Mirafra cheniana</i>) resides in the rocky grassland. Species will thus become lost or displaced due to the proposed development. Mitigation measures proposed by Venter and Niemand (2017) should be implemented in order to try and reduce the said impact.</p>	SITE	PERMANENT	DEFINITE	HIGH NEGATIVE	MEDIUM TO HIGH NEGATIVE								LOCAL	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
NATURAL VEGETATION/ ANIMAL LIFE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> It should be noted that the rocky outcrops located in the south western corner of the site have been included as part of the Public Open Space system as indicated in Alternative layout 2 (Figure 6.3a and 6.3b) and will thus be protected. Buffer zones as determined by Venter and Niemand (2017) have been included around this area. This area may potentially provide habitat for the endangered <i>Frithia humulis</i> and the vulnerable <i>Anacampseros subnuda ssp. lubersii</i>, but no individuals were observed. These species could have been dormant at the time of the site visit and presence can only be confirmed during a summer site visit. Venter and Niemand (2017) indicated that the rocky grassland bordering the Channelled Valley Bottom Wetland and Seep Wetland is considered important bird habitat (when compared to other habitat types on site). Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area must be implemented in order to ensure the long term integrity of these areas.</p>	SITE	LONG	DEFINITE	HIGH POSITIVE	HIGH POSITIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> No further direct impact on vegetation or animal life since no further construction activities will take place. Invasive plant species tend to establish in and round disturbed areas. A few alien and invasive species were observed on site, with a large stand of invasive species in the south western portion of the site, adjacent to the wetland unit (Venter and Niemand, 2017). These species may become established in disturbed areas on site and may spread from the site. Several invasive species may become established on site during the construction and operational phases of the project. These species are most likely to become established in disturbed areas that are not rehabilitated. In addition, if alien plants are utilized in the gardens, they could spread and impact on the surrounding vegetation. Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area (alien plant control) must be implemented in order to ensure the long term integrity of these areas.</p>	LOCAL	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> During the decommissioning phase, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be rehabilitated in order to establish a vegetation cover and prevent soil erosion. This could result in the creation of artificial habitats for animal life within the rehabilitated area.  Alien plants could be introduced into areas rehabilitated as part of the decommissioning phase. This could impact on the vegetation of the surrounding area and especially the Rockdale tributary and the Vaalbankspruit and associated wetlands.</p>	SITE	LONG	PROBABLE	MEDIUM POSITIVE	MEDIUM POSITIVE
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings) - Loss of rocky grassland, habitat and loss/displacement of indigenous species:</b> The <i>Hyparrhenia hirta</i> grassland vegetation unit (a modified grassland as a result of long term overgrazing and historical overgrazing) would be impacted in the southeastern and northern portions of the site (Venter and Niemand, 2017). This vegetation unit is seen as an Area of Low ecological sensitivity (i.e. for vegetation and fauna) that is not considered to be pristine. The <i>Hyparrhenia hirta</i> grassland is regarded to be structurally monotonous and although supporting high mammal richness, the dominant composition is unspecialised and consists of widespread taxa.</p>	SITE	PERMANENT	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> No further direct impact on vegetation or animal life since no further construction activities will take place.  Invasive plant species tend to establish in and round disturbed areas. A few alien and invasive species were observed on site, with a large stand of invasive species in the south western portion of the site, adjacent to the wetland unit (Venter and Niemand, 2017). These species may become established in disturbed areas on site and may spread from the site. Several invasive species may become established on site during the construction and operational phases of the project. These species are most likely to become established in disturbed areas that are not rehabilitated. In addition, if alien plants are utilized in the gardens, they could spread and impact on the surrounding vegetation.</p>	LOCAL	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE		LOCAL	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE



**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
NATURAL VEGETATION/ ANIMAL LIFE	<p><b>Phases 2 to 11 (Installation of services, roads and buildings) - Loss of rocky grassland, habitat and loss/displacement of indigenous species:</b></p> <p>The following wetland vegetation units together with their identified buffer zones will be included and protected as part of the Open Space System as indicated in Alternative layout 2 (Figure 6.3a and 6.3b):</p> <ul style="list-style-type: none"> <li>Channelled Valley Bottom Wetland and Seep Wetland in the south western corner of the site;</li> <li>Northern Seep located in the northern portion of the site.</li> </ul> <p>Venter and Niemand (2017) indicated that part of the Channelled Valley Bottom Wetland (including part of the northern seep on adjacent land) provided suitable breeding and roosting habitat for the vulnerable African Grass Owl (<i>Tyto capensis</i>).</p> <p>Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area must be implemented in order to ensure the long term integrity of these areas.</p>	SITE	LONG	DEFINITE	HIGH POSITIVE	HIG H POSITIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b></p> <p>No further direct impact on vegetation or animal life since no further construction activities will take place.</p> <p>However, the vegetation and animal life associated with the Rockdale tributary and the Vaalbankspruit could be indirectly impacted upon during the operational phase in terms of surface/storm water runoff, sediment transport or soil erosion if proper erosion control measures are not implemented.</p> <p>Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area (including Alien Plant Control) must be implemented in order to ensure the long term integrity of these areas and reduce the potential impact on downstream areas. If left unmanaged, these areas are expected to lose integrity over time, mostly because of anthropogenic impacts (e.g. trampling, vehicle wheel track entrenchment, uncontrolled burns, littering and encroachment of alien and invasive species).</p>	LOCAL	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b></p> <p>During the decommissioning phase, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be rehabilitated in order to establish a vegetation cover and prevent soil erosion. This could result in the creation of artificial habitats for animal life within the rehabilitated area.</p> <p>Alien plants could be introduced into areas rehabilitated as part of the decommissioning phase. This could impact on the vegetation of the surrounding area and especially the Rockdale tributary and the Vaalbankspruit and associated wetlands.</p>	SITE	LONG	PROBABLE	MEDIUM POSITIVE	MEDIUM POSITIVE
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings) - Loss of ecological corridors and ecological function:</b></p> <p>Venter and Niemand (2017) indicated that the wetland units represent ecological corridors for the movement of various species. In addition, the rocky grassland units are also ecologically connected with natural 'late-successional' habitat located west of the study site. Therefore, it is possible that mobile taxa could disperse westwards and colonise these areas during unfavourable conditions. Furthermore, the Channelled Valley Bottom wetlands and the Northern Seep function as important dispersal corridors for many small mammal and bird taxa, thereby ensuring genetic cohesion between sub-population species, especially taxa with specialised habitat requirements. Such isolation will result in the genetic deterioration and even local extinction of local populations (Venter and Niemand, 2017).</p> <p>The following wetland vegetation units together with their identified buffer zones will be included and protected as part of the Open Space System as indicated in Alternative layout 2 (Figure 6.3a and 6.3b):</p> <ul style="list-style-type: none"> <li>Channelled Valley Bottom Wetland and Seep in the south western corner of the site;</li> <li>Northern Seep located in the northern portion of the site.</li> </ul> <p>Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area must be implemented in order to ensure the long term integrity of these areas and the ecological corridors.</p>	SITE	LONG	DEFINITE	HIGH POSITIVE	HIGH POSITIVE								LOCAL	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
SURFACE WATER/ SENSITIVE LANDSCAPES	<p><b>Phase 1 (Installation of services, roads and buildings):</b> The development of the Phase 1 area will impact directly on the Eastern Seep (area of approximately 6 ha) and will result in the loss of a Seep Wetland as identified by Venter and Niemand (2017). It should however be taken into account that this is a marginal wetland unit with very shallow soils and limited hydrological function (Venter, 2017). Viljoen (2017) indicated that the soils associated with the Eastern Seep include Mispah and Westleigh soils. Mispah soils are not associated with wetlands and Westleigh soils are sometimes associated with wetlands. During the assessment there were no signs of wetness and gley mottling occurring in the diagnostic horizons of the Mispah and Westleigh soils to classify it as wetland soils. The soil profiles opened with a TLB and the soil auger holes showed all the profiles to be dry. From this perspective, Viljoen (2017) did not classify the area as a wetland zone.</p>	SITE	PERMANENT	DEFINITE	MEDIUM NEGATIVE	MEDIUM NEGATIVE	<p><b>Phase 1 (Utilization of services, roads and buildings):</b> NONE. No further construction will take place.</p>						<p><b>Phase 1 (Decommissioning of the services, roads and buildings):</b> NONE.</p>					
	<p><b>Phase 1 (Installation of services, roads and buildings) - Altered hydrological regimes:</b> NONE. The development of the Phase 1 area will not impact directly or indirectly on any surface water environment (stream/river) in terms of altered hydrological regime, water quality alteration or habitat deterioration. It will thus not impact on any aquatic life.</p>						<p><b>Phase 1 (Utilization of services, roads and buildings) - Altered hydrological regimes:</b> NONE. No further construction will take place.</p>						<p><b>Phase 1 (Decommissioning of the services, roads and buildings) - Altered hydrological regimes:</b> NONE.</p>					
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The following wetland vegetation units together with their identified buffer zones will be included and protected as part of the Open Space System as indicated in Alternative layout 2 (Figure 6.3a and 6.3b):</p> <ul style="list-style-type: none"> <li>Channelled Valley Bottom Wetland and Seep in the south western corner of the site;</li> <li>Northern Seep located in the northern portion of the site.</li> </ul> <p>These areas must be indicated as NO-GO AREAS to all construction workers in order to reduce potential loss of wetland habitat and functioning of these systems as a result of construction related impacts (e.g. construction within wetland areas, vehicle movement, roads through wetland areas, dumping and temporary storage of materials in wetlands, clearing of vegetation and removal of soil). Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area must be implemented in order to ensure the long term integrity of these areas.</p>	SITE	LONG	DEFINITE	HIGH POSITIVE	HIGH POSITIVE	<p><b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> These areas must be indicated as NO-GO AREAS to all residents in order to reduce potential loss of wetland habitat and functioning of these systems as a result of operational related impacts (e.g. vehicle movement, roads through wetland areas, dumping of waste in wetlands, clearing of vegetation and removal of soil). Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area must be implemented in order to ensure the long term integrity of these areas.</p>	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 2 to 11 (Decommissioning of the services, roads and buildings):</b> Decommissioning activities could impact on the wetland areas if these areas are not demarcated as NO-GO AREAS. Mitigation measures proposed by Venter and Niemand (2017) regarding the management of the Public Open Space area must be implemented in order to ensure the long term integrity of these areas.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
<b>SURFACE WATER/ SENSITIVE LANDSCAPES</b>	<p><b>Phases 1 to 11 (Installation of services, roads and buildings) - Erosion and sedimentation (habitat deterioration):</b> Clearing of vegetation from the site (especially in the southern and northern portions of the site) and increased runoff on site may result in erosion on site. This may potentially cause damage to the wetland systems on site (Channelled Valley Bottom Wetland and Seep Wetland; Northern Seep) and downstream of the site (Rockdale tributary and Vaalbankspruit) as well as the adjacent property (belonging to Mr. Visser (JV Ranch)). An increased sediment load in the water on site may result in excess sedimentation in downstream areas or depression wetlands, which will result in a change in the vegetation composition of the wetland. Erosion may take place at any areas cleared of vegetation for any reason, including around storm water infrastructure and areas cleared of invasive plant species (Venter and Niemand, 2017). Removal of vegetation in close proximity of the upper catchment (headwaters) of the Rockdale tributary (i.e. the southern and southwestern corner of the site) may result in erosion. This is especially of concern close to aquatic ecosystems (Kotze, 2017). Eroded soil may reach the receiving water bodies especially as a result of rain events. Sedimentation of rocky areas will result in the loss of interstitial spaces between rocks, an important habitat requirement for some invertebrate and fish species. Increased turbidity due to these events may also impact negatively on some aquatic biota. Sedimentation may also reduce breeding success in some fish species (smothering of eggs). Mitigation measures proposed by Venter and Niemand (2017) and Kotze (2017) regarding vegetation clearing and storm water management must be implemented in order to reduce this potential impact.</p>	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings) - habitat deterioration:</b> During the operational phase, increased yields could be expected due to increased paved areas and buildings, which would facilitate increased run-off quantities due to quicker run-off and less infiltration into the soil. This could lead to soil erosion if proper storm water control measures are not implemented. This may potentially cause damage to the wetland systems on site (Channelled Valley Bottom Wetland and Seep Wetland; Northern Seep) and downstream of the site (including the Rockdale tributary and Vaalbankspruit) as well as the adjacent property (belonging to Mr. Visser (JV Ranch)). These systems and adjacent property (belonging to Mr. Visser (JV Ranch)) could also be indirectly impacted in terms of surface water runoff if the sewage system does not have sufficient capacity, is not maintained on a regular basis and proper waste management measures (littering takes place) are not implemented on site. Algae tend to proliferate where nutrient levels have become elevated, especially contamination arising from sewage spills. Where algal mats develop, they smother benthic and marginal habitats and cause invertebrates and fish to become entangled. Algae also tend to decrease oxygen levels during daylight hours while increasing oxygen levels at night, resulting in large fluctuations in oxygen availability that may be limiting to fish, particularly under low flow conditions (Kotze, 2017). Mitigation measures would have to be implemented.</p>	REGIONAL	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> During the decommissioning phase, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be rehabilitated in order to establish a vegetation cover and prevent soil erosion. This would result in clean runoff from the site entering the wetland systems associated with the Rockdale tributary and the Vaalbankspruit.</p>	LOCAL	LONG	HIGHLY PROBABLE	MEDIUM POSITIVE	MEDIUM POSITIVE



**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
<b>SURFACE WATER/ SENSITIVE LANDSCAPES</b>	<p><b>Phases 2 to 11 (Installation of services, roads and buildings) – Altered hydrological regimes:</b> The increase of impermeable surfaces on site, with the associated increase in runoff from the site is likely to alter the hydrology and geomorphology of the site. Increased flow may result in erosion in the wetland or wetland catchment, with associated sedimentation in the downstream wetland areas (Venter and Niemand, 2017). Kotze (2017) indicated that the development of the area in close proximity of the upper catchment (headwaters) of the Rockdale tributary (i.e. the southern and south western corner of the site) will impact on the natural runoff of this stream, and hence the downstream receiving water bodies. Runoff from paved areas (residential) and storm water systems will be different (higher velocities, shorter duration, higher volume) than natural runoff. This may result in incisions of the receiving wetland ecosystems, aggravate bank erosion in the Rockdale tributary and Vaalbankspruit, and also alter the natural habitat composition. The adjacent downstream property belonging to Mr. Visser (JV Ranch) could also be impacted if mitigation measures are not implemented.</p>	REGIONAL	PERMANENT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 2 to 11 (Utilization of services, roads and buildings) – Altered hydrological regimes:</b> Alterations to the hydrology and geomorphology of the wetland and wetland catchment may result in changes to the wetland habitat as well as species composition (Venter and Niemand, 2017). This includes increased areas of bare vegetation and sealed surfaces, resulting in increased runoff from the catchment area. Unless the runoff from the development is controlled in a sufficient stormwater management plan for the site, the development is likely to result in increased erosion on site and sedimentation in the downstream areas. In addition, tramping of the wetland unit during the operational phase may also result in the loss of wetland habitat. Kotze (2017) indicated that the development of the area in close proximity of the upper catchment (headwaters) of the Rockdale tributary (i.e. the southern and south western corner of the site) will impact on the natural runoff of this stream, and hence the downstream receiving water bodies. Runoff from paved areas (residential) and storm water systems will be different (higher velocities, shorter duration, higher volume) than natural runoff. This may result in incisions of the receiving wetland ecosystems, aggravate bank erosion in the Rockdale tributary and Vaalbankspruit, and also alter the natural habitat composition. The adjacent downstream property belonging to Mr. Visser (JV Ranch) could also be impacted if mitigation measures are not implemented.</p>	REGIONAL	PERMANENT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings) – Altered hydrological regimes:</b> Decommissioning activities in close proximity of the upper catchment (headwaters) of the Rockdale tributary (i.e. the southern and south western corner of the site) will impact on the natural runoff of this stream, and hence the downstream receiving water bodies. This may result in incisions of the receiving wetland ecosystems, aggravate bank erosion in the Rockdale tributary and Vaalbankspruit, and also alter the natural habitat composition</p>	REGIONAL	PERMANENT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
<b>SURFACE WATER/ SENSITIVE LANDSCAPES</b>	<p><b>Phases 1 to 11 (Installation of services, roads and buildings) – Water quality deterioration (accidental spills):</b> Accidental spills of fuels and other materials (e.g. chemicals) may occur during construction activities. The spatial extent will depend on the type and volume of the impact (spill/release) (Kotze, 2017). During the construction phase, a sewage system will not be in place. Temporary ablution facilities will therefore be a requirement. Additional potential sources of pollution include littering, spillage of chemicals, etc. (Venter and Niemand, 2017).</p>	REGIONAL	SHORT	PROBABLE	MEDIUM/HIGH NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings) – Water quality deterioration (accidental spills/urban runoff, etc.):</b> Kotze (2017) indicated that urban runoff, accidental spills, leaking of sewage system may occur that could lead to a decline in the water quality of the receiving watercourses (i.e. Rockdale tributary, (including section extending through the adjacent property belonging to Mr. Visser [JV Ranch]) and Vaalbankspruit). Additional potential sources of pollution include littering, spillage of chemicals, etc. (Venter and Niemand, 2017). Deteriorated water quality will impact negatively on especially those aquatic fauna that are intolerant and moderately tolerant to water quality alterations and lead to a loss in biodiversity and natural ecosystem functioning. The spatial extent of the impact will depend on the quality and volume of the spills.</p>	REGIONAL	SHORT	HIGHLY PROBABLE	MEDIUM TO HIGH NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings) – Water quality deterioration (accidental spills):</b> Accidental spills of fuels and other materials (e.g. chemicals) may occur during decommissioning activities. The spatial extent will depend on the type and volume of the impact (spill/release) (Kotze, 2017). During the decommissioning phase, a sewage system will not be in place. Temporary ablution facilities will therefore be a requirement. Additional potential sources of pollution include littering, spillage of chemicals, etc. (Venter and Niemand, 2017).</p>	REGIONAL	SHORT	PROBABLE	MEDIUM/HIGH NEGATIVE	LOW NEGATIVE
<b>GROUNDWATER</b>	<p><b>Phase 1 (Installation of services, roads and buildings):</b> The geotechnical study identified subsurface drainage associated with a portion of the Phase 1 development area due to a fluctuating seasonal water table and sub-surface seepage (i.e. Geotechnical zone 2A). The structures could be impacted if the geotechnical mitigation measures (provision of subsurface and surface drainage, cut-off drains, etc.) with regards to the above-mentioned are not implemented as part of the construction phase.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phase 1 (Utilization of services, roads and buildings):</b> The structures will continue to be impacted upon through the operational phase if the geotechnical mitigation measures were not implemented.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> • NONE. No further impact since no further construction would take place.</p>					
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> Cilliers and Meyer (2017) indicated that an area of 83.47 ha was susceptible to sub-surface seepage (Geotechnical zone 2A; Figure 5.5). A fluctuating seasonal perched water table is expected in most of the southern parts of the site as well as the portion situated north of the weigh bridge and PIC South Africa (Alzu) facility towards the northwestern boundary (Figure 5.5). Groundwater seepage can also be expected to cover large areas during high rainfall periods as was observed during the investigation, especially adjacent to the drainage feature and specifically in areas underlain by shallow, low permeable bedrock and well cemented hardpan ferricrete (Figure 5.5). Any structures constructed within these areas could be impacted if the geotechnical mitigation measures (cut-off drains, provision of sub-surface and good surface drainage control, etc.) with regards to the above-mentioned are not implemented as part of the construction phase.</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 2 to 11 (Utilization of services, roads and buildings):</b> The structures will continue to be impacted upon through the operational phase if the geotechnical mitigation measures were not implemented.</p>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE						

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
GROUNDWATER	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> Cilliers and Meyer (2017) indicated that permeabilities are expected to be high in the overburden material due to the high sand fraction and fine gravel content. Any contamination is therefore likely to move fairly rapidly within the transported cover soils while the residuum is less permeable. Groundwater (quality) could be indirectly impacted upon if proper sanitation facilities and waste management measures are not put in place and maintained during the construction phase.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Groundwater (quality) could continue to be indirectly impacted upon if proper sanitation facilities and waste management measures are not put in place and maintained during the operational phase.	SITE	LONG	IMPROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further impact since no further construction would take place.					
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> NONE. The development of this area will not impact on any boreholes since no boreholes were identified on site.						<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> NONE. During the operational phase, the development will obtain water from the Steve Tshwete Local Municipality by connecting to the existing 200mm diameter water pipe in Rockdale Extension 2. Groundwater will thus not be abstracted for use by the overall development.											
SITES OF ARCHAEOLOGICAL /CULTURAL INTEREST	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> NONE. Van Vollenhoven (2017) indicated that no sites of cultural heritage significance were identified within the proposed development area. The construction of buildings/infrastructure will thus not impact on any sites of archaeological and/or cultural interest.						<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> NONE. No further construction will take place.						<b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further construction will take place.					
SITES OF PALAEOLOGICAL INTEREST	<b>Phase 1 (Installation of services, roads and buildings):</b> The Vryheid Formation that has a Very High Palaeontological Sensitivity underlies the Phase 1 development area. Fourie (2017) indicated that no fossils were found during the site walkover and therefore there is no objection in terms of the proposed development. Mitigation measures included in Section 9 (EMP) must however be implemented during the construction phase.	SITE	SHORT	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> NONE. No further construction will take place.						<b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> NONE. No further construction will take place.					
	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The Vryheid Formation that has a Very High Palaeontological Sensitivity underlies the eastern half of the proposed development area. Fourie (2017) indicated that no fossils were found during the site walkover and therefore there is no objection in terms of the proposed development. Mitigation measures included in Section 9 (EMP) must however be implemented during the construction phase.	SITE	SHORT	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE												
	<b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The Selonsrivier Formation underlies the western half of the proposed development area. According to Fourie (2017), the impact of the development on fossil heritage is Low. No fossils were found during the site walkover. No mitigation or conservation measures need to be implemented	SITE	SHORT	IMPROBABLE	LOW NEGATIVE	LOW NEGATIVE												





**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
AIR QUALITY	<p><b>Phase 1 (Installation of services, roads and buildings):</b> The construction of buildings/infrastructure within the Phase 1 area could impact on the site workers, general public utilising the N11 national road and the weighbridge area and the residents of the existing Rockdale area located to the east of the site in terms of dust generation and vehicle emissions (use of heavy machinery). In addition, the air quality of the site could be impacted if the onsite sanitation system does not have sufficient capacity resulting in spills. The extent of the impact would depend on the time of year, wind direction and velocity and portion of the property being developed. Mitigation measures would have to be implemented. It should however be noted that the ambient air quality is already impacted by various industries, mining and other activities taking place in the Middelburg area.</p>	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> During the operational phase, no direct impact on the air quality is anticipated due to the development being supplied with electricity. In addition, no noxious (scheduled processes) industries would be permitted on the business stands.  The roads within the development would also be paved, reducing the potential for dust creation.  The air quality of the site and surroundings could however, be impacted in terms of odours if:  <ul style="list-style-type: none"> <li>• The sewer system does not have capacity and is not maintained;</li> <li>• Proper waste management measures are not implemented.</li> </ul>                     It should however be noted that the ambient air quality is already impacted by various industries, mining and other activities taking place in the Middelburg area. This already impacts on residents of the Middelburg area and will impact on the residents of the new residential area.</p>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> Dust generation and vehicle emissions due to decommissioning activities and use of heavy machinery could impact on site workers and the residents of the surrounding area. The extent of the impact would depend on the time of year, wind direction, wind velocity and portion of property.  Once rehabilitated, the impact on air quality is expected to be positive in terms of reduced dust generation as the area will then be revegetated.</p>	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE
	<p><b>Phases 2 to 11 (Installation of services, roads and buildings):</b> The development of the Phase 2 to 11 phases would be done in phases resulting in small areas cleared for development purposes. No mass clearing of the 202 ha area would be allowed. This would result in dust generation and vehicle emissions (use of heavy machinery) which could impact on the site workers, general public utilising the N11 national road (and possibly N4 national road) and the weighbridge area and the residents of the existing Rockdale area located to the east of the site. In addition, the air quality of the site could be impacted if the onsite sanitation system does not have sufficient capacity and is allowed to overflow on a continuous basis. The extent of the impact would depend on the time of year, wind direction and velocity and portion of the property being developed. Mitigation measures would have to be implemented. It should however be noted that the ambient air quality is already impacted by various industries, mining and other activities taking place in the Middelburg area.</p>	SITE	SHORT	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE			SITE	LONG	DEFINITE	MEDIUM POSITIVE		MEDIUM POSITIVE				
	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> The Columbus PM10 monitoring station located at the Eskom Substation to the north of the proposed site and adjacent to the gravel road could be impacted in terms of dust generation during the construction phase. The extent of the impact would depend on the time of year, wind direction and velocity and portion of the property being developed. Mitigation measures would have to be implemented.</p>	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> NONE. During the operational phase, the Columbus PM10 monitoring station located at the Eskom Substation to the north of the proposed site and adjacent to the gravel road, should not be impacted since the internal roads will be paved.</p>						<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> The Columbus PM10 monitoring station located at the Eskom Substation to the north of the proposed site and adjacent to the gravel road could be impacted in terms of dust generation during decommissioning. The extent of the impact would depend on the time of year, wind direction and velocity and portion of the property being developed. Mitigation measures would have to be implemented.</p>	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
AIR QUALITY	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> It is possible that at certain times of the year (especially when the north westerly wind blows) site workers could be impacted by dust generated by the nearby Calmasil plant (Figure 5.3b) if proper dust control measures are not implemented at the said plant. It is also possible that at certain times of the year (especially when the south easterly wind blows) the Calmasil plant and Eskom Substation areas could be impacted by dust generated by the onsite construction activities if dust control measures are not implemented. The extent of the impact would depend on the time of year, wind direction and velocity and portion of the property being developed. Mitigation measures would have to be implemented.</p>	SITE	SHORT	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> It is possible that at certain times of the year (especially when the north westerly wind blows), residents could be impacted by dust generated by the nearby Calmasil plant and slag dumps (Figure 5.3b) if dust control measures are not implemented by Columbus Stainless/PBD-Lime and the relevant air quality standards are exceeded.</p>	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> <b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> Dust generation and vehicle emissions due to decommissioning activities and use of heavy machinery could impact on Calmasil plant and Eskom Substation areas if still present. The extent of the impact would depend on the time of year, wind direction, wind velocity and portion of property.  Once rehabilitated, the impact on air quality is expected to be positive in terms of reduced dust generation as the area will then be revegetated</p>	SITE	SHORT	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE
VISUAL	<p><b>Phase 1 (Installation of services, roads and buildings):</b> The construction of buildings/infrastructure within the Phase 1 area would be highly visible from the N11 national road, the N4 national road, the existing Rockdale residential area, the weighbridge area as well as the surrounding area. The development site will not be visible from the main Columbus offices/plant area located 3 km from the site. The construction site would have to be kept neat and tidy at all times.</p>	SITE	SHORT	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> The developed residential area and associated onsite activities will be highly visible from the N11 national road, the N4 national road, the existing Rockdale residential area, the weighbridge area, the Eskom substation as well as the surrounding area (including the adjacent property belonging to Mr. Visser (JV Ranch)). The development site will not be visible from the main Columbus offices/plant area located 3 km from the site. It would thus be very important to keep the development neat and tidy at all times and ensure that the site (including buildings) is well maintained.</p>	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> During the decommissioning phase, building rubble and any polluted soil will be removed from the site and disposed of accordingly. The said area will then be topsoiled, shaped to conform to the original slope of the area and revegetated with indigenous grass species. Over time, the vegetation should revert back to natural grassland if continuous monitoring and rehabilitation takes place. If the site is rehabilitated properly it could have a positive impact in terms of visual aspects.</p>	SITE	SHORT	PROBABLE	MEDIUM NEUTRAL	LOW NEUTRAL
	<p><b>Phase 2 to 11 (Installation of services, roads and buildings):</b> The construction of buildings/infrastructure within the subsequent phases would be highly visible from the developed Phase 1 area, the N11 national road, the N4 national road, the existing Rockdale residential area, the weighbridge area, Eskom substation as well as the surrounding area (including the adjacent property belonging to Mr. Visser (JV Ranch)). The development site will not be visible from the main Columbus offices/plant area located 3 km from the site. The extent of the impact would depend on the portion of the property being developed. The construction site would have to be kept neat and tidy at all times. Mitigation measures would have to be implemented</p>																	
NOISE	<p><b>Phase 1 (Installation of services, roads and buildings):</b> Noise generated as a result of the construction (including use of heavy machinery) of buildings/infrastructure within the Phase 1 area would impact on site workers, general public utilising the N11 national road, the weighbridge area and the residents of the existing Rockdale residential area. The ambient noise level is however, already impacted in terms of existing industrial activities (e.g. Columbus Stainless) and traffic along the N4 and N11 national roads.</p>	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Noise generation would be due to noise associated with the residential and business activities and increased traffic. This could impact on the residents of the existing Rockdale residential area located to the east of the site as well as those working at the weighbridge area. The ambient noise level is already impacted in</p>	SITE	LONG	HIGHLY PROBABLE	LOW NEGATIVE	LOW NEGATIVE	<p><b>Phases 1 to 3 (Decommissioning of the services, roads and buildings):</b> In general, the use of heavy machinery for decommissioning activities would impact on the surrounding area in terms of noise. Once rehabilitated, the impact on the ambient noise level is expected to be positive (depending on the end</p>	REGIONAL	SHORT	PROBABLE	MEDIUM/HIGH NEGATIVE	LOW NEGATIVE

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)			
																			EXTENT	DURATION	PROBABILITY
NOISE	<b>Phase 2 to 11 (Installation of services, roads and buildings):</b> Noise generated as a result of the construction of buildings/infrastructure within the subsequent phases would impact on site workers, general public utilising the N11 national road, the weighbridge area and the residents of the existing Rockdale residential area. The ambient noise level is already impacted in terms of existing industrial activities (e.g. Columbus Stainless) and traffic along the N4 and N11 national roads. The extent of the impact would depend on the portion of the property being developed. Mitigation measures would have to be implemented.	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	terms of existing industrial activities (e.g. Columbus Stainless) and traffic along the N4 and N11 national roads.							use of the site).							
	<b>Phase 2 to 11 (Installation of services, roads and buildings):</b> The ambient noise level is already impacted in terms of existing industrial activities (e.g. Columbus Stainless) and traffic along the N4 and N11 national roads. At certain times of the day, site workers could be impacted by noise generated by adjacent industries such as Columbus Stainless in terms of the dumping of slag on the slag dumps, etc. This impact is usually of short duration and is not a persistent noise.	SITE	SHORT	PROBABLE	LOW NEGATIVE	LOW NEGATIVE	<b>Phase 2 to 11 (Installation of services, roads and buildings):</b> The ambient noise level is already impacted in terms of existing industrial activities (e.g. Columbus Stainless) and traffic along the N4 and N11 national roads. At certain times of the day and night, residents could be impacted by noise generated by adjacent industries such as Columbus Stainless in terms of the dumping of slag on the slag dumps, etc. This impact is usually of short duration and is not a persistent noise.	SITE	SHORT	PROBABLE	LOW NEGATIVE	LOW NEGATIVE									
TRAFFIC	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> In general, the construction activities would not directly impact on the traffic utilizing the N11 national road since all activities will be limited to the said site. The delivery of building material during the construction period could however, lead to a slight increase in traffic on the N11 national road. The deliveries would however, not occur on a continuous basis.	SITE	SHORT	PROBABLE	LOW NEGATIVE	LOW NEGATIVE	<b>Phase 1 to 11 (Utilization of services, roads and buildings):</b> According to Roberts (2017), the traffic volumes on the N11 are in general fairly low (Table 5.34) and the link traffic flow of all the roads operate at a satisfactory level (Table 5.35). As indicated in Table 5.35, the highest one way traffic link flow was 32% of capacity (Table 5.35) which is still satisfactory. According to Roberts (2017), the analysis over time periods 2017, 2019 and 2024 showed that many intersections are still expected to operate at satisfactory levels of service and are not required to be upgraded. However, the proposed development will generate additional traffic during the operational phase, which could impact on the traffic volumes in the area if the mitigation measures (upgrading of intersections) as recommended by Roberts (2017) are not implemented as indicated in Table 5.42 (e.g. signalisation of intersections).	SITE	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE		<b>Phases 1 to 3 (Decommissioning of the services, roads and buildings):</b> In general, the decommissioning of services, roads and buildings would not directly impact on traffic utilising the N11 as all activities would be limited to the said site.  Building rubble and other waste would have to be removed from site. This could lead to a slight increase in traffic on the road network (i.e. on site and the N11).  Impact on traffic after decommissioning will however, depend on the intended end land use.	SITE	SHORT	PROBABLE	LOW NEGATIVE	LOW NEGATIVE		



**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	
																			EXTENT
TRAFFIC	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> Access to the proposed development site will be obtained from the N11 national road using new access roads. The construction and connection of the proposed access roads from the N11 national road could impact on the traffic utilizing this road. The impact should however, be of short duration. Mitigation measures in terms of road safety would have to be implemented, especially during peak hours and at night time.	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> Access to the proposed development site will be obtained from the N11 national road using the new access roads. The general road users and residents could be impacted upon if the proposed access roads to the site were not constructed according to approved designs.	LOCAL	LONG	DEFINITE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> Access to the proposed development site will be obtained from the N11 national road using new access roads. The decommissioning of the access roads from the N11 national road could impact on the traffic utilizing this road. The impact should however, be of short duration. Mitigation measures in terms of road safety would have to be implemented, especially during peak hours and at night time.	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	
	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> NONE.						<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> It is expected that many of the residents will rely on public transport during the operational phase. Pedestrians and road users could be impacted upon if the required lay byes for buses and minibus taxis were not provided as recommended by Roberts (2017).	SITE	LONG	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phase 1 to 11 (Installation of services, roads and buildings):</b> NONE.						
INTERESTED AND AFFECTED PARTIES	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> Possible impacts (e.g. dust, noise, groundwater, etc.) on the surrounding landowners/users (including the adjacent property belonging to Mr. Visser (RV Ranch)) as well as road users are indicated above.						<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Possible impacts (e.g. dust, noise, groundwater, etc.) on the surrounding landowners/users (including the adjacent property belonging to Mr. Visser (RV Ranch)) as well as road users are indicated above.						<b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> The impact of the decommissioning of the development in terms of interested and affected parties will depend on the character of the area at that time as well as the intended end land use.	SITE	LONG	HIGHLY PROBABLE	LOW NEUTRAL	LOW NEUTRAL	
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> The connection of the services (water, electricity, sewage) to the municipal infrastructure could impact on the residents of the existing Rockdale residential area in terms of service interruptions. The residents could also be impacted upon if the existing services do not have sufficient capacity for the proposed development.	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> The residents could be impacted upon if the existing services do not have sufficient capacity for the proposed development.	SITE	LONG	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE							
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> Contractors working on site could be directly impacted upon if the necessary safety and occupational health measures are not adhered to.	SITE	SHORT	HIGHLY PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> NONE.												
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> Site workers could be impacted if the deep trench extending across the site (old railway line servitude) is not properly demarcated resulting in site workers falling into this excavation. This could result in injury or even death.	SITE	SHORT	HIGHLY PROBABLE	HIGH NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Residents (especially children) could be impacted if the deep trench extending across the site (old railway line servitude) is not properly demarcated or rehabilitated resulting in residents falling into this excavation. This could result in injury or even death.	SITE	LONG	HIGHLY PROBABLE	HIGH NEGATIVE	LOW NEGATIVE							

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	
																			EXTENT
<b>INTERESTED AND AFFECTED PARTIES</b>	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> More people in the area during the construction phase could lead to increased theft and burglaries in the surrounding Rockdale area.	SITE	SHORT	PROBABLE	LOW NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Once fully developed, the site will no longer be open to vagrants, which could have a positive impact in terms of security.	SITE	SHORT	PROBABLE	LOW POSITIVE	LOW POSITIVE	<b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> The impact of the decommissioning of the development in terms of interested and affected parties will depend on the character of the area at that time as well as the intended end land use.	SITE	LONG	HIGHLY PROBABLE	LOW NEUTRAL	LOW NEUTRAL	
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> Job opportunities would be provided during the construction phase.	SITE	SHORT	DEFINITE	MEDIUM POSITIVE	MEDIUM POSITIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Job opportunities could be provided during the operational phase by the businesses to be developed as part of the main business area.	SITE	LONG	DEFINITE	MEDIUM POSITIVE	MEDIUM POSITIVE							
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> Eskom powerlines are located on site. Eskom and its clients could be impacted if the powerlines are damaged in any way by the construction and the stipulated conditions are not adhered to. In addition, Eskom could be impacted if registered servitude areas are not taken into account and these areas are developed without obtaining the necessary permission.	LOCAL	SHORT	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE	<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> Eskom and its clients could be impacted if the powerlines are damaged in any way during the operational phase and the stipulated conditions are not adhered to.	LOCAL	SHORT	PROBABLE	MEDIUM NEGATIVE	LOW NEGATIVE							
	<b>Phases 1 to 11 (Installation of services, roads and buildings):</b> NONE.						<b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> The proposed development will assist in alleviating the housing backlog experienced by the Steve Tshwete Local Municipality. This would have a positive impact on residents of Middelburg and surrounding area. In addition it will increase access to land tenure rights for individuals within the previously disadvantaged community that will contribute to spatial justice with regards to access to land for the surrounding community. The proposed development would also have a positive impact on the residents of the existing Rockdale area in terms of providing amenities in close proximity to this residential area such as schools, community facilities, shops, taxi rank, etc. Also possible job opportunities.	LOCAL	LONG	HIGHLY PROBABLE	MEDIUM POSITIVE	MEDIUM POSITIVE							

**7.1 DIRECT AND INDIRECT IMPACTS – DEVELOPMENT OF THE ROCKDALE WEST RESIDENTIAL AREA CONSISTING OF VARIOUS STANDS AND ASSOCIATED SERVICES  
(ALTERNATIVE LAYOUT NO. 2a; FIGURE 6.3a; AND ALTERNATIVE LAYOUT NO. 2b; FIGURE 6.3b)**

ENVIRONMENTAL FEATURE(S)	PREDICTED IMPACT CONSTRUCTION PHASE (PHASE 1, PHASES 2 to 11) TIME PERIOD: 12 - 24 MONTHS ONWARDS (DEPENDS ON FUNDING) AREA: PHASE 1 = 16 HA; PHASE 2 TO 11 = 202 HA	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT OPERATIONAL PHASE TIME PERIOD: UNKNOWN AREA: 218 ha	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)	PREDICTED IMPACT PHASE: DECOMMISSIONING PHASE TIME PERIOD: UNKNOWN AREA: 218 ha (will depend on what area would be decommissioned)	EXTENT	DURATION	PROBABILITY	SIGNIFICANCE (PRE-MITIGATION)	SIGNIFICANCE (POST MITIGATION)
<b>INTERESTED AND AFFECTED PARTIES</b>	<p><b>Phases 1 to 11 (Installation of services, roads and buildings):</b> The potential impact on the adjacent property belonging to Mr. Visser (JV Ranch) is indicated under Surface Water/Sensitive Landscapes, Visual, etc.</p>						<p><b>Phases 1 to 11 (Utilization of services, roads and buildings):</b> The proposed development site and the adjacent property (belonging to Mr. Visser (JV Ranch)) are earmarked by the Steve Tshwete Local Municipality for densification that includes residential, industrial and business land uses as it is located within the urban edge. As indicated in Alternative layout 2 (Figure 6.3a and 6.3b), provision was made to access the adjacent property from the proposed development in order to possibly extend the residential area in future in a westerly direction. This would unlock the development potential of the adjacent property as municipal services would be available. This could therefore result in an increase in property value and thus a positive impact on Mr. Visser (JV Ranch).</p>	SITE	LONG	HIGHLY PROBABLE	MEDIUM POSITIVE	MEDIUM POSITIVE	<p><b>Phases 1 to 11 (Decommissioning of the services, roads and buildings):</b> The impact of the decommissioning of the development in terms of interested and affected parties will depend on the character of the area at that time as well as the intended end land use.</p>	SITE	LONG	HIGHLY PROBABLE	LOW NEUTRAL	LOW NEUTRAL



## 7.6 Cumulative impacts

The development of the proposed site (218 ha) will contribute to the cumulative impact that development in Mpumalanga has on the Mispah, Bainsvlei, Westleigh and Avalon soil types (as identified by Viljoen, 2017). Mispah and Westleigh soils are not suitable for agricultural purposes since the effective soil depth is less than 300mm (Viljoen, 2017). Bainsvlei and Avalon soils both have a low dryland and low irrigation agricultural potential (Viljoen, 2017).

Viljoen (2017) indicated the land capability of the said area to be mostly Wilderness (70%) followed by Grazing in the northern and southern portions of the site (19%). A very small area (1%) is indicated as arable. The development of the said area will thus contribute to the overall cumulative impact that development in Mpumalanga has on these land capabilities.

Although the change of land use from 'Agricultural' to mainly 'Residential' will contribute to the overall cumulative impact that development in Mpumalanga has on agricultural land in general, it will not impact on a high potential agricultural area or an area currently utilised for agricultural purposes.

The proposed development would contribute to the overall cumulative impact that development in Mpumalanga has on the Rocky Grassland vegetation unit and associated animal habitats. This will lead to an overall loss of this vegetation type, which has been classified as Vulnerable, and associated animal life. The Rocky Grassland vegetation unit is considered an Area of High sensitivity (i.e. for vegetation and fauna) and supports a high richness of fauna including specialised taxa with high affinities towards the presence of outcrops/rock cover.

The proposed development would make a small contribution towards the cumulative impact that development in Mpumalanga has on wetlands since an identified Seep Wetland (Eastern Seep) will be impacted by the development of the Phase 1 area. This wetland (6 ha in extent) is seen as a marginal wetland unit with shallow soils and limited hydrological function (Venter, 2017). Based on the soil investigation, Viljoen (2017) did not classify the area as a wetland zone.

The other wetlands identified on site - Channelled Valley Bottom Wetland and Seep Wetland (located in the south western corner of the site, associated with the Rockdale tributary) and the Northern Seep (located in the northern portion of the site) - will not be directly impacted as these systems together with the identified buffer zones will be conserved as part of the Open Space System.

However, the proposed development is expected to contribute towards water quality deterioration of the downstream receiving water body (Rockdale tributary and Vaalbankspruit, and potentially also that of the Klein Olifants River; Kotze, 2017). This could also impact on the wetlands and aquatic life associated with these systems.

In addition, the proposed development is expected to alter the natural hydrological regime of especially the Rockdale tributary, with slight impacts on the receiving Vaalbankspruit and Klein Olifants River (Kotze, 2017).





This could also impact on the wetlands and aquatic life associated with these systems.

The proposed development will generate additional traffic during the operational phase, which could impact on the traffic volumes in the area if the mitigation measures (upgrading of intersections) as recommended by Roberts (2017) are not implemented. The proposed development would thus add to the cumulative impact of traffic on the existing road network (i.e. N11 national road, etc.) as well as pedestrians if the required lay byes for buses and minibus taxis as recommended by Roberts (2017) are not provided.

The proposed development can be viewed as a natural extension of the existing Rockdale residential areas. The development of the said site would therefore not impact on the sense of place and immediate surroundings.

The proposed development together with all other developments in Middelburg would impact on the services (water and sewage) provided by the local municipality. The Steve Tshwete Local Municipality must ensure that the required services can be provided and that there is sufficient capacity at the sewage works to cater for the additional development.

The proposed development will assist in alleviating the housing backlog experienced by the Steve Tshwete Local Municipality. This would have a positive impact on residents of Middelburg and surrounding area. In addition it will increase access to land tenure rights for individuals within the previously disadvantaged community that will contribute to spatial justice with regards to access to land for the surrounding community.

The proposed development would also have a positive impact on the residents of the existing Rockdale area in terms of providing amenities in close proximity to this residential area such as schools, community facilities, shops, taxi rank, etc as well as possible job opportunities.



## **8. ENVIRONMENTAL IMPACT STATEMENT**

### **8.1 Introduction**

The project applicant, Rockdale Industrial (Pty) Ltd, intends to develop a residential area on the Remaining Extent of the farm Rockdale 442 JS, Middelburg. The proposed development would be approximately 230 hectares in extent. The site is bordered on the south by the N4 national road, on the east by the N11 national road/Hendrina Road and the Rockdale residential areas and to the north by Columbus Stainless.

Section 6 provides an overview of the various alternatives investigated in terms of this project.

As indicated in Section 6.1.1, only one site was investigated since the proposed site belongs to the project applicant and is not suitable for cultivation purposes due to the rocky nature thereof.

Based on the findings of the specialist studies commissioned as part of the EIA, Alternative Layout 1 (Figure 6.2) was discarded. Alternative layout 2a (Figure 6.3a), the preferred option, was drafted based on the outcome of the specialist studies conducted as part of the EIA process.

A second layout, Alternative layout 2b (Figure 6.3b), was drafted in order to take into account an Eskom servitude (EPL servitude SG no. A9097/723; Figure 6.3b) located in the south eastern corner of the site as it is currently not known if Eskom will approve the cancellation of this servitude.

Urban Dynamics (2017b) indicated that the first phase of the development (Alternative layout 2a; Figure 6.3a and Alternative layout 2b; Figure 6.3b) will be situated around the business sites and adjacent residential properties along the N11 highway (Figure 6.5) and would involve the following land uses to kick-start the development: 193 Residential 1 stands ( $\pm 300\text{m}^2/\text{erf}$ ); 2 "Business 2" stands; 2 "Business 3" stands.

Strydom and Malan (2017) confirmed that bulk and link services (water, sewage, electricity, etc.) are available for the proposed Phase 1 development as indicated in Section 6.5.

The development of the other phases will be determined based on the installation of civil engineering services and link services that conform to the level of services as required by the Steve Tshwete Local Municipality. A small number of stands will be serviced in each phase depending on the demand in the market at the time of implementation.

### **8.2 Potential impacts identified**

Based on the above-mentioned, the impact assessment (Section 7) was based on Alternative layout 2a (Figure 6.3a) and Alternative layout 2b (Figure 6.3b), the provision of municipal services and the phasing of the said project.

The proposed development site belongs to the project applicant and the development of the said site will thus not impact directly on any other interested and affected party.



The Phase 1 area is currently vacant with no agricultural activities or other formal land use activities taking place. Eskom powerlines, located adjacent to the N11 road, are present but will be accommodated within an area zoned as Public Open Space. However, the development of this area could impact on an Eskom servitude if Eskom does not agree to cancel the said servitude. If this is the case, Alternative layout 2b (Figure 6.3b) would have to be implemented.

The development of the subsequent phases will also not impact directly on any agricultural activities or other formal land use activities currently taking place. The PIC South Africa (Alzu) facility will be demolished and relocated to another property by Alzu as per the lease agreement. The weighbridge and the Eskom substation will not be impacted as indicated in the Alternative Layout 2 (Figure 6.3a and 6.3b). The railway servitude, Eskom servitudes and water pipeline extending across the site will also not be impacted as these areas were zoned Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b).

From a topographical point of view, the proposed site is suitable for development purposes as most of the site has a gentle to moderate slope towards the western boundary of the site. The central and northern portions slope toward the northwestern corner while the southern portion of the site slopes towards the southwestern corner of the site (Cilliers and Meyer, 2017).

The proposed Phase 1 area is located more or less on a local watershed with drainage occurring from the said site towards the east (i.e. towards the N11 national road and the existing Rockdale residential area). The presence of local watersheds will have to be taken into account when designing and installing the services (water, sewage, storm water, etc.) in order to reduce the potential impact on service provision, residents, adjacent land owners/users and surface water environments during the operational phase.

From a geotechnical point of view, the development of Phase 1 and the subsequent phases would impact on Geotechnical zone 1A (relatively shallow bedrock with scattered outcrop), 1B (low to moderately compressible soils) and 1C (moderately compressible soils). Mitigation measures as recommended by Cilliers and Meyer (2017) must be implemented as part of the construction phase in order to reduce the potential impact on structures during the operational phase.

The proposed cemetery site (Alternative layout 1, Figure 6.2) was located within Geotechnical zone 1A (relatively shallow bedrock with scattered outcrop). Cilliers and Meyer (2017) indicated that the proposed cemetery site was not suitable for a cemetery. In view of the geotechnical findings, the cemetery was excluded from the overall development plan.

Cilliers and Meyer (2017) indicated that an area of 83.47 ha was susceptible to sub-surface seepage (Geotechnical zone 2A; Figure 5.5). A fluctuating seasonal perched water table is expected in most of the southern parts of the site as well as the portion situated north of the weigh bridge and PIC South Africa (Alzu) facility towards the northwestern boundary (Figure 5.5). Groundwater seepage can also be expected to cover large areas during high rainfall periods as was observed during the investigation, especially adjacent to the drainage feature and specifically in areas underlain by shallow, low permeable bedrock and well cemented hardpan ferricrete (Figure 5.5). Any structures constructed within these areas could be impacted if the geotechnical mitigation measures (cut-off drains, provision of sub-surface



and good surface drainage control, etc.) with regards to the above-mentioned are not implemented as part of the construction phase.

Permeabilities are expected to be high in the overburden material due to the high sand fraction and fine gravel content. Any contamination is therefore likely to move fairly rapidly within the transported cover soils while the residuum is less permeable (Cilliers and Meyer, 2017). Groundwater (quality) could be indirectly impacted upon if proper sanitation facilities and waste management measures are not put in place and maintained during both the construction and operational phases.

Most of Geotechnical zone 2A (susceptible to sub-surface seepage) and 2B (susceptible to surface ponding and seepage) were incorporated into the Public Open Space (Alternative layout 2; Figure 6.3a & 6.3b) corresponding to the identified wetland (Channelled Valley Bottom Wetland and Seep Wetland, Northern Seep) and its delineated wetland buffer zones. No development will thus take place within these areas. However, where Geotechnical zone 2A and 2B extend outside these areas (e.g. small area within Phase 1 area and near N11 off ramp; adjacent to the N11 road, etc.) mitigation measures recommended by Cilliers and Meyer (2017) need to be implemented to avoid impact on the structures during the operational phase.

Most of Geotechnical zone 3A (Remediation) will be incorporated into the Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b) and will thus not be developed. However, where Geotechnical zone 3A extends outside these areas, mitigation measures recommended by Cilliers and Meyer (2017) need to be implemented to avoid impact on the structures during the operational phase.

No development will take place in the following Geotechnical zones as recommended by Cilliers and Meyer (2017) - Zone 4A (small earth embankment dam); Zone 4B (railway servitude); Zone 4C (Eskom substation); Zone 4D (Eskom servitude). These areas were zoned Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b). No impact on these Geotechnical zones is thus anticipated.

The development of the Phase 1 area and the subsequent phases will impact predominantly on the Mispah soil type as well as Bainsvlei, Westleigh and Avalon soils as identified by Viljoen (2017).

The development of the site would not impact on any wetland soils. The area where the Katspruit soils (wetland soils) were identified coincides with the Channelled Valley Bottom Wetland and Seep Wetland (southern and south western portion of the site) that has been zoned Public Open Space (Figure 6.3a & 6.3b) and will not be developed.

Mispah and Westleigh soils are not suitable for agricultural purposes since the effective soil depth is less than 300mm (Viljoen, 2017). Bainsvlei and Avalon soils both have a low dryland and low irrigation agricultural potential (Viljoen, 2017).

Viljoen (2017) indicated the land capability of the said area to be mostly Wilderness (70%) followed by Grazing in the northern and southern portions of the site (19%). A very small area (1%) is indicated as arable.





The change of land use from 'Agricultural' to mainly 'Residential' will therefore not impact on a high potential agricultural area or an area currently utilised for agricultural purposes.

Within the proposed development site, Venter and Niemand (2017) indicated the rocky grassland and the wetland-associated habitat (i.e. Channelled Valley Bottom Wetlands and Seeps) as Areas of High Sensitivity (Table 5.30 and Figure 5.24). These habitat types support a high richness of fauna including specialised taxa with high affinities towards the presence of outcrops/rock cover or moist and inundated biotypes. In addition, the rocky outcrops and wetland types are the only habitat units that provide habitat within the study site for a number of threatened and near threatened fauna, which include the African Grass Owl (*Tyto capensis*). A small and localised subpopulation of the globally near threatened Melodious Lark (*Mirafra cheniana*) resides in the rocky grassland. These habitat types also display a high ecological connectivity with habitat of high plant species richness adjacent to the study site, thereby contributing towards faunal dispersal which is critical for taxa with large home ranges (e.g. large terrestrial mammals and bird taxa).

Areas of Low Sensitivity were indicated as transformed habitats (Alien Trees, Vegetation clearing, Excavations; *Hyparrhenia hirta* grassland; Table 5.30; Figure 5.24). These habitat types are not considered to be pristine, and occur in areas where historical and current disturbances took place. Many of these areas are composed of typical pioneer species or taxa with annual life histories, thus contributing little towards local biodiversity. In addition, the *Hyparrhenia hirta* grassland (located in the southeastern and northern portions of the site) is regarded to be structurally monotonous and although supporting high mammal richness, the dominant composition was unspecialised and consisted of widespread taxa (Venter and Niemand, 2017).

Based on Alternative layout 2 (Figure 6.3a & 6.3b), the proposed development would mainly impact on the Rocky Grassland vegetation unit (Vulnerable Rand Highveld Grassland) in the Phase 1 area as well as in the central and western portions of the site. The Rocky Grassland vegetation unit is considered an Area of High sensitivity (i.e. for vegetation and fauna) and supports a high richness of fauna including specialised taxa with high affinities towards the presence of outcrops/rock cover. In addition, the rocky outcrops are the only habitat unit that provides habitat for a number of threatened and near threatened fauna. The Rocky Grassland also provides foraging habitat for the vulnerable Southern Bald Ibis (*Geronticus calvus*). A small and localised subpopulation of the globally near threatened Melodious Lark (*Mirafra cheniana*) resides in the Rocky Grassland. Species will thus become lost or displaced due to the proposed development.

The rocky outcrops located in the south western corner of the site were included as part of the Public Open Space system as indicated in Alternative layout 2 (Figure 6.3a and 6.3b). Habitat for *Anacampteros subnuda* and *Frithia humilis* is present here. A 200m buffer area (Figure 5.24) was thus recommended by Venter and Niemand (2017) for this area and included as part of this Public Open Space.

Venter and Niemand (2017) indicated that all wetland units are of high conservation importance.

The development of the Phase 1 area will however, directly impact on the Eastern Seep (area of approximately 6 ha) and will result in the loss of a



Seep Wetland. Venter (2017) indicated this Seep Wetland as a marginal wetland unit with very shallow soils and limited hydrological function. Viljoen (2017) indicated that the soils associated with the Eastern Seep include Mispah and Westleigh soils. Mispah soils are not associated with wetlands while Westleigh soils are sometimes associated with wetlands. During the assessment there were no signs of wetness and gley mottling occurring in the diagnostic horizons of the Mispah and Westleigh soils to classify it as wetland soils. The soil profiles opened with a TLB and the soil auger holes showed all the profiles to be dry. From this perspective, Viljoen (2017) did not classify the area as a wetland zone.

The overall PES of the Eastern Seep was indicated as moderately modified (C). The most significant modifications to the wetland are as a result of the development of the existing Rockdale residential area and the N11 road that impacted directly on this wetland. According to Venter (2017), few disturbances are present on the remaining extent of the wetland, although the vegetation has been partially modified to have a higher dominance of *Hyparrhenia hirta*. Venter (2017) noted minor erosion adjacent to the N11 road.

This Seep Wetland is not directly connected to the stream network. It appears unlikely that the system was directly linked to the stream network in the past. The wetland is however expected to have an indirect connection to the stream network (Venter, 2017).

In view of the above-mentioned and the location of this wetland directly adjacent to the N11 national road, conserving this marginal wetland as part of the overall Public Open Space was not considered. This area would quickly be used by the residents for dumping of waste (already taking place), a taxi rank, soccer field, etc. It was felt that more emphasis should be placed on conserving and rehabilitating the other wetland identified on site that form part of a larger system as indicated below.

The following wetland vegetation units together with their identified buffer zones will be included and protected as part of the Open Space System as indicated in Alternative layout 2 (Figure 6.3a and 6.3b):

- Channelled Valley Bottom Wetland and Seep Wetland in the south western corner of the site: PES of B (largely natural); EIS of High; hydrofunctional importance of Moderate; forms part of the abovementioned Public Open Space conserving the rocky outcrops;
- Northern Seep located in the northern portion of the site (PES of B/C (largely natural and moderately modified); EIS of high; hydrofunctional importance of moderate.

Venter and Niemand (2017) indicated that the Channelled Valley Bottom Wetland and Northern Seep have a high sensitivity to changes in the wetland habitat and flow.

The Channelled Valley Bottom Wetland and part of the Northern Seep provide suitable breeding and roosting habitat for the vulnerable African Grass Owl (*Tyto capensis*). A buffer of 170m (Figure 5.24) was thus allocated for this wetland unit and included as part of the Public Open Space System.

In addition, Venter and Niemand (2017) indicated that the Rocky Grassland bordering the Channelled Valley Bottom Wetland and Seep Wetland is considered an important bird habitat (when compared to other habitat types on site). The moist grassland bordering the Seeps and Channelled Valley



Bottom Wetlands provide daily dispersal corridors for foraging mammal species (Venter and Niemand, 2017).

The proposed Municipal stand and Residential 1 stands in the south western corner of the site (Alternative layout 1, Figure 6.2) were removed as indicated in Figure 6.3a in order to reduce the potential impact on the sensitive ecological area located in the south western portion of the site. No development will be allowed beyond the delineated watershed in the south western portion of the site as indicated in Figure 6.3a. This also eliminates the need for a sewage pump station (was to be built on the Municipal stand; Figure 6.2) and thus the potential pollution of the Channelled Valley Bottom Wetland and Seep associated with the tributary of the Vaalbankspruit. As indicated in Figure 6.3a, this sensitive ecological area will be zoned as a Public Open Space where no development will be allowed.

The proposed access road in the northern part of the site (Figure 6.3a) was rerouted to avoid impact on the buffer zone delineated around the Northern Seep.

The above-mentioned areas must be indicated as NO-GO AREAS to all construction workers as well as residents in order to reduce potential loss of wetland habitat and functioning of these systems as a result of construction and operation related impacts (e.g. construction within wetland areas, vehicle movement, roads through wetland areas, dumping and temporary storage of materials in wetlands, clearing of vegetation and removal of soil). If these systems are impacted, it could result in impacts on the downstream surface water environments (Rockdale tributary, Vaalbankspruit).

According to Kotze (2017), the instream and riparian zone habitat integrity of the upper Rockdale tributary (within the proposed development zone) (site RD1) is currently in a relatively good condition, being classified in a category B (slightly modified). The instream and riparian zone habitat integrity of the lower reach of the Rockdale tributary (site RD2) was also found to be in a very good condition (category A/B). The receiving Vaalbankspruit reach (site RD3) was however observed to be in a deteriorated state due to current activities i.e. instream habitat integrity fell in a category D/E (largely to seriously modified) while the riparian zone fell in a category C (moderately modified).

As indicated in Section 7, the proposed development is expected to contribute towards water quality deterioration of the downstream receiving water body (Rockdale tributary and Vaalbankspruit, and potentially also that of the Klein Olifants River; Kotze, 2017). In addition, the proposed development is expected to alter the natural hydrological regime of especially the Rockdale tributary, with slight impacts on the receiving Vaalbankspruit and Klein Olifants River (Kotze, 2017). The above-mentioned would also result in habitat deterioration impacting on the wetlands and aquatic life associated with these systems. Of great importance is storm water management and ensuring that there are no spills from the sewage system during the operational phase.

Mitigation measures recommended by Kotze (2017) and Venter and Niemand (2017) regarding the management of the Public Open Space areas must be implemented in order to ensure the long term integrity of these areas.

From a landscape perspective, Venter and Niemand (2017) indicated that habitat types with high ecological sensitivities showed high ecological



connectivity to similar habitat types located to the west of the proposed development site (Venter and Niemand, 2017). In addition, the rocky grassland units are ecologically connected with natural 'late-successional' habitat located west of the study site. Therefore, it is possible that mobile taxa could disperse westwards and colonise these areas during unfavourable conditions. Furthermore, the Channelled Valley Bottom wetlands and the Northern Seep function as important dispersal corridors for many small mammal and bird taxa, thereby ensuring genetic cohesion between sub-population species, especially taxa with specialised habitat requirements. Such isolation will result in the genetic deterioration and even local extinction of local populations (Venter and Niemand, 2017).

Venter and Niemand (2017) indicated that the ecological connectivity for most of the habitat types east and south of the study site appears to be constrained by road and housing infrastructure (e.g. the N4 and N11 highways, and existing Rockdale settlement located to the east of the N11 road). Such infrastructure will not only disrupt the natural dispersal contemporary ecological processes within ecological time frames, but will also handicap long term (and often invisible) processes (such as speciation due to climate change) over evolutionary time frames. Habitat types on the eastern and southern parts of the study site conform to an ecological "cul-de-sac" contributing little to animal/floral dispersal and the genetic integrity of sub-populations (mitigation which focused on dispersal and ecological processes was only possible by means of intervention such as the provision of underpasses etc.).

In terms of sites of archaeological and/or cultural interest, Van Vollenhoven (2017) indicated that no sites of cultural heritage significance are present within the proposed development area. In terms of Palaeontological Sensitivity, Fourie (2017) indicated no objection to the proposed development of the said site and that the development may go ahead. Mitigation measures included in Section 9 (EMP) must however be implemented during the construction phase.

The proposed development will generate additional traffic during the operational phase, which could impact on the traffic volumes in the area. The analysis over time periods 2017, 2019 and 2024 showed that many intersections are still expected to operate at satisfactory levels of service. From a traffic point of view, the proposed access roads from the N11 national road as indicated in Alternative layout 2 (Figure 6.3a and 6.3b) are satisfactory but must be constructed according to approved designs. Mitigation measures (upgrading of intersections; required lay byes for buses and taxis) as recommended by Roberts (2017) must however be implemented.

An industrial area (Industria) is located towards the north north-west of the site comprising of Columbus Stainless, Middelburg Ferrochrome, etc. (Figure 3.5a). It should be noted that the area located directly adjacent to the site is mostly vacant as indicated in Figure 5.3a. In view of the nearby industries, the ambient noise level and ambient air quality of the area are already impacted.

It is known that the proposed site (together with the rest of Middelburg) is located within the Steve Tshwete Municipal area hot spot, which extends across the Steve Tshwete Local Municipality from its border with eMalahleni to Arnot in the east. This is an area where measured or modelled concentrations exceed, or are predicted to exceed, ambient air quality





standards as identified in the Air Quality Management Plan for the Highveld Priority Area (HPA; Republic of South Africa, 2011). This Priority Area was declared in terms of Section 18(1) of the National Environmental Management: Air Quality Act 2004 (Act 39 of 2004) due to poor air quality and associated health risks. Residents living within this area are thus impacted in terms of this poor air quality. The residents of the proposed residential area will thus also be impacted in this regard.

It should however be noted that industries operating within this area must comply with the above-mentioned Air Quality Management Plan for the Highveld Priority Area as well as the relevant environmental legislation (National Environmental Management: Air Quality Act 2004 (Act 39 of 2004), Dust Control Regulations, etc.) and ensure a gradual reduction in emissions over time.

An Ammonia installation (which is registered as a Major Hazard Installation (MHI)) is present within the Columbus Stainless site (Figure 5.3a; no 1). This installation is located approximately 3km from the proposed Rockdale residential area. This MHI facility must be operated and management in accordance with the Major Hazard Installations Regulations (GN R96 of 16 January 1998) in order to reduce the potential risk on surrounding residential areas as well as the proposed residential area.

A company (PBD-Lime - Calmasil Plant) that produces agricultural lime (consists of calcium, magnesium and silica) from slag produced by Columbus Stainless operates on a small portion of the Columbus Stainless property near the Eskom substation (Figure 5.3a and Figure 5.3b; no 5). This plant is located approximately 1km from the proposed residential development. At certain times of the year (when the north westerly wind blows), this plant could impact on the proposed residential development if dust control measures in accordance with environmental legislation (National Environmental Management: Air Quality Act 2004 (Act 39 of 2004), National Dust Control Regulations (GN R827 of 1 November 2013), etc.) are not implemented.

During the construction of the proposed residential area, dust control measures will have to be implemented in order to reduce any possible impact on nearby residential and industrial areas.

In the Steve Tshwete Spatial Development Framework (2014), the proposed site is earmarked for future Industrial Activities (Figure 5.25) since it is located adjacent to the existing industrial area comprising of Columbus Stainless (Pty) Ltd., etc. (Figure 5.2). It was thus not earmarked in the SDF for residential development.

Preliminary discussions with the Local Municipality indicated that they would consider amending the SDF to accommodate residential development in the area due to the proximity of the Rockdale community (to the east of the N11). In addition, it is strategically situated along primary roads that provide good access for the purpose of residential development with connection to the centre of town, Middelburg Mall and other amenities and surrounding towns.

The proposed development site is still within the urban edge where the necessary infrastructure exists that can be upgraded to accommodate the development rather than providing it outside the urban edge where no infrastructure is available. In addition, the proposed area will contribute to



the densification of the Rockdale area around the identified secondary node which will further strengthen this node.

The proposed development site and the adjacent property (belonging to Mr. Visser (JV Ranch)) are earmarked by the Steve Tshwete Local Municipality for densification that includes residential, industrial and business land uses as it is located within the urban edge. As indicated in Alternative layout 2 (Figure 6.3a and 6.3b), provision was made to access the adjacent property from the proposed development in order to possibly extend the residential area in future in a westerly direction. This would unlock the development potential of the adjacent property as municipal services would be available. This could therefore result in an increase in property value and thus a positive impact on Mr. Visser (JV Ranch).

The proposed development can be viewed as a natural extension of the existing Rockdale residential areas. The development of the said site would therefore not impact on the sense of place and immediate surroundings.

The development of the said site would assist in alleviating the current housing backlog in the Middelburg area. This would have a positive impact on residents of Middelburg and surrounding area. In addition it will increase access to land tenure rights for individuals within the previously disadvantaged community that will contribute to spatial justice with regards to access to land for the surrounding community. The proposed development would also have a positive impact on the residents of the existing Rockdale area in terms of providing amenities in close proximity to this residential area such as schools, community facilities, shops, taxi rank, etc as well as possible job opportunities.

The proposed development together with all other developments in Middelburg will impact on the services (water and sewage) provided by the local municipality. The Steve Tshwete Local Municipality must ensure that the required services can be provided and that there is sufficient capacity at the sewage works to cater for the additional development. The development must be phased accordingly in order to reduce the potential impact on municipal services.

### **8.3 Public participation**

Section 4 provides an overview of the public participation process followed in terms of compiling this EIR.

Through the public participation process followed to date, only three objections were received namely from:

- the South African National Roads Agency (SANRAL) - potential impact on the N4 national route;
- Jaap Visser and Annerie Visser (adjacent landowner – JV Ranch cc) – potential impact on adjacent property.

These objections were addressed as indicated in Table 4.4.

Table 4.4 also provides a summary of all the issues of concern and/or objections received through this public participation process and the way in which the said issues of concern and/or objections were addressed.



## 8.4 Conclusion

The proposed site is suitable for residential purposes and would have a positive impact on alleviating the housing backlog within the Steve Tshwete Local Municipal area.

As indicated above, Alternative layout 2a (Figure 6.3a) was drafted based on the outcome of the specialist studies and public participation conducted as part of the EIA process.

As far as possible, this layout plan takes into account the following:

- Findings of the geotechnical study (i.e. where no development should take place and that the site is not suitable for a cemetery);
- Wetland buffers: buffer zones delineated around the identified wetlands;
- Grass Owl buffer: buffer zone delineated around the Grass Owl habitat;
- *Anacampseros* buffer: buffer zone delineated around the *Anacampseros* habitat;

These areas have been incorporated and will be conserved and managed as part of the overall Public Open Space System.

Alternative layout 2a (Figure 6.3a) is the preferred option for this residential development. However, this is subject to obtaining approval from Eskom in terms of the cancellation of the Eskom servitude. Mitigation measures as detailed in Section 9 (EMP) of this EIR must also be implemented. In addition, the necessary water use licence in terms of the National Water Act, 1998 will also have to be obtained.



## **9. ENVIRONMENTAL MANAGEMENT PROGRAMME**

### **9.1 Definition and objectives**

The Environmental Management Programme (EMPr) was compiled in accordance with Appendix 4 of the Environmental Impact Assessment (EIA) Regulations, 2014 as well as the Western Cape Guideline for Environmental Management Plans (Lochner, 2005).

According to the Western Cape Guideline, an Environmental Management Programme (EMPr) can be defined as:

*An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced.*

*According to the EIA Regulations, 2014, an EMPr must include-*

- (d) A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed or mitigated as identified through the environmental impact assessment process for all phases of the development including -*
- (i) planning and design;*
  - (ii) pre-construction and construction activities;*
  - (iii) operation or undertaking of the activity;*
  - (iv) rehabilitation of the environment; and*
  - (v) closure, where relevant.*

This section therefore provides an indication of the mitigation measures to be implemented by the site operator (and site workers) in order to reduce the potential impacts identified (see Section 7).

### **9.2 Contact details**

*An EMPr must include -*

- (a) details of-*
- (i) the EAP who prepared the environmental management programme; and*
  - (ii) the expertise of that person to prepare an environmental management programme, including a curriculum vitae.*

The contact details and expertise of the environmental consultant are provided in Section 2 of this report.

The applicant will be responsible for the implementation of the EMPr. The contact details are provided in Section 2.





### 9.3 Description of the proposed project and sensitivity

*An EMPr must provide -*

- (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.*
- (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers.*

A detailed description of the proposed development and aspects covered by the EMPr is provided in Section 2 of this report. Section 5 provides a description of the biophysical environment of the proposed development site.

Section 5.14 and Figure 5.24 provides an indication of the sensitive landscapes identified within the proposed development site.

Alternative layout 2 (Figure 6.3a & 6.3b) takes into account the following:

- Findings of the geotechnical study (i.e. where no development should take place and that the site is not suitable for a cemetery);
- Wetland buffers: buffer zones delineated around the identified wetlands;
- Grass Owl buffer: buffer zone delineated around the Grass Owl habitat;
- *Anacampseros* buffer: buffer zone delineated around the *Anacampseros* habitat;

These areas have been zoned Public Open Space and will be conserved and managed as part of the overall Public Open Space System.

### 9.4 Phases of the development and timeframe

#### 9.4.1 Planning and design phase

The planning and design phase involved mostly office work and site surveys with regards to the design of the sewer line, the Environmental Impact Assessment and the specialist studies. It also involves obtaining the necessary authorisations for the said project.

***No actual construction took place on site.***

#### 9.4.2 Pre-construction phase

This phase leads up to the construction phase, but does not include site establishment. It typically involves obtaining the necessary permissions (authorisations/licences/etc.), identification of construction site office, demarcation of sensitive areas as NO-GO AREAs, etc.

#### 9.4.3 Construction phase

Urban Dynamics (2017b) indicated that the first phase of the development (Alternative layout 2a; Figure 6.3a and Alternative layout 2b; Figure 6.3b) will be situated around the business sites and adjacent residential properties along the N11 highway (Figure 6.5) and would involve the following land uses to kick-start the development:

- 193 Residential 1 stands ( $\pm 300\text{m}^2/\text{erf}$ ) = 5.79ha;
- 2 "Business 2" stands = 3.78ha;
- 2 "Business 3" stands = 1.04ha.
- Roads (access roads and internal roads as indicated in Figure 6.5)

The Phase 1 area will thus entail an area of approximately 16 ha.



Strydom and Malan (2017) confirmed that bulk and link services (water, sewage, electricity, etc.) are available for the proposed Phase 1 development as indicated in Section 6.5.

The development of the other phases (Phases 2 to 11) will be determined based on the installation of civil engineering services and link services that conform to the level of services as required by the Steve Tshwete Local Municipality. A small number of stands will be serviced in each phase depending on the demand in the market at the time of implementation.

For each of the above-mentioned phases, the construction phase will involve the pegging of the stands, installation of services and construction of the buildings and associated infrastructure. This will involve the following:

- Clearing of vegetation;
- Levelling of the site;
- Excavation of trenches;
- Installation and connection of services;
- Construction of access road and parking area;
- Laying of the required foundations;
- Building of the outer structure;
- Installation of the required internal fittings;
- Rehabilitation of the disturbed areas (i.e. landscaping).

Table 7.1 provides a summary of the main environmental impacts identified in terms of the construction of the proposed residential area.

**Construction timeframe:**

Construction will commence as soon as the relevant approvals are obtained.

**9.4.4 Operational phase**

The operational phase would involve the utilisation of the various buildings and facilities associated with the residential area (including the various services installed).

Table 7.1 provides further details with regards to potential impacts identified as a result of the utilisation of the facilities provided.

**Operational timeframe:**

Unknown.

**9.4.5 Decommissioning and rehabilitation phase**

The decommissioning phase will not be discussed. It is recommended that at the time of decommissioning, a specific Environmental Management Programme (EMPr) be compiled which specifically addresses this phase. This EMPr would have to address issues such as the removal of building rubble and the rehabilitation of the site. Soil conservation measures would also have to be implemented.

**9.5 Permissions/licences required**

Before any construction can commence, the following permissions will be required.



### **9.5.1 Construction of Phase 1**

- Environmental Authorisation in terms of the Environmental Impact Assessment Regulations, 2014;
- Water Use Licence in terms of the National Water Act, 1998 (Act 36 of 1998);
- Should indigenous or endangered species have to be removed and transported to nurseries or green houses, a permit would be required in terms of the National Biodiversity Act (Act 10 of 2004).
- The proposed project must adhere to the regulations as stipulated in the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983).

### **9.5.2 Construction of the subsequent phases**

- Environmental Authorisation in terms of the Environmental Impact Assessment Regulations, 2014;
- Water Use Licence in terms of the National Water Act, 1998 (Act 36 of 1998).
- The proposed project must adhere to the regulations as stipulated in the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983).

## **9.6 Mitigation and management measures to be implemented**

*An EMPr must include -*

*(f) a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -*

- (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;*
- (ii) comply with any prescribed environmental management standards or practices;*
- (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and*
- (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable.*

### **9.6.1 Pre-construction phase**

- a. All relevant authorizations must be obtained before construction commences.
- b. A water use licence in terms of the National Water Act, 1998 (Act 36 of 1998) to be obtained before any construction activities within the marginal wetland or within 500m from any watercourse (including identified wetlands).
- c. The applicant/contractor must appoint a Safety Officer and Environmental Control Officer (ECO) in order to ensure compliance with the relevant legislation.
- d. A suitable site must be identified for the construction site office. The construction site office must be demarcated and fenced.
- e. Sensitive landscapes demarcated as Public Open Space in Alternative layout 2 (Figure 6.3a & Figure 6.3b) must be clearly demarcated and protected as 'No-Go Areas'. No construction or activities may take place within these areas.



- f. All site workers/contractors to be informed of these NO-GO AREAS through the environmental awareness programme and to be made aware of penalties (fines to be paid) to be imposed due to infringements.
- g. For each construction area, an area must be selected and demarcated for the stockpiling of spoil (e.g. rocks, soil, etc.).

### 9.6.2 Construction site office

Impact management objective:

- 1) *To ensure that an appropriate site is selected for the construction site office and that the site office is managed in an environmentally responsible manner with the least impact on the natural environment, site workers and persons residing near the proposed route.*

Mitigation and management measures:

- a. The construction camp and associated facilities (including temporary storage) must be located outside of identified wetland areas and their associated wetland buffers as well as outside of all Public Open Space areas.
- b. Clearly indicate which activities are to take place within which areas using demarcation and/or signage.
- c. Demarcate an area for food storage, preparation and consumption.
- d. Keep the camp and material storage areas secure and employ appropriate access control.
- e. Proper ablution and sanitation facilities must be provided if onsite accommodation is to be provided.
- f. Chemical toilets must be provided for use by the site workers. These must be serviced on a regular basis. No long drop toilets may be allowed.
- g. Potable water must be made available to site workers.
- h. The waste management measures as indicated in Section 9.6.6 must be implemented.
- i. An area for the parking of construction vehicles and other vehicles should be clearly demarcated within or in close proximity to the construction site office. When not in use, all vehicles should be parked within this area.
- j. As far as practically possible, vehicles must not be serviced/repaired on site. However, should it not be possible to take the vehicle to a service centre in town for repair, the contractor must ensure that the vehicles are serviced/repaired on a cement slab and that drip trays are utilized. Waste oil, filters, etc. must be properly disposed of (see Section 9.6.6).
- k. If an aboveground diesel tank is provided, it must be properly bunded to contain 110% of the volume of the tank and provided with a sump and pump. A concrete slab should be provided for refuelling purposes.
- l. Do not store gas and liquid fuel in the same storage area.
- m. No loud music to be permitted on site.





### 9.6.3 General construction principles

Impact management objective:

- 1) *To ensure that the activities that occur during the construction phase have the least impact on the surrounding natural environment, site workers and landowners/users.*

Mitigation and management measures:

- a. No members of the general public should be allowed at the construction site or to set up camp in the area surrounding the construction sites.
- b. Do not permit vehicular or pedestrian access into natural areas beyond the demarcated construction area.
- c. Contractors to be informed to keep to low speeds along the gravel roads to reduce the amount of dust.
- d. Dust suppression measures must be implemented during dry and windy periods to prevent air-borne dust deposition on the remaining natural vegetation and the streams/wetlands.
- e. Construction activities to be restricted to normal working hours.
- f. All machinery used during the construction phase must be properly muffled and maintained so as to reduce noise generation to a minimum.
- g. Ensure that the construction site is equipped with firefighting equipment. A minimum requirement is a water truck or cart, with a minimum capacity of 5 000 litres, equipped with pump and hose (minimum length 30 m), which must be permanently on site.
- h. Take adequate precautions to ensure that fires are not started as a results of the construction activities (e.g. during welding). The contractor will be held liable for any damage to surrounding property.
- i. Do not allow smoking within 3 m or any fuel or chemical storage area or refuelling area.
- j. No open fires to be permitted on site.
- k. If archaeological remains are exposed during the construction phase, the construction must be terminated immediately and the Provincial Heritage Resources Authority (SAHRA) must be notified in this regard. A qualified archaeologist must be requested to investigate the occurrence. The applicant must take note of the requirements in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999).
- l. If any graves are discovered during construction, the discovery must be reported to the SA Police Service and/or SAHRA or an archaeologist must be called in to handle the matter.
- m. If any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All construction activities must be stopped and a palaeontologist must be called to determine proper mitigation measures.
- n. All pollution incidents must be reported to the Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation within 24 hours of occurrence.

#### 9.6.4 Rehabilitation of the environment after construction

Impact management objective:

- 1) To ensure that the areas disturbed due to construction activities are properly rehabilitated and maintained.
- 2) To control the growth of declared weeds and/or invader plants.

Mitigation and management measures:

- a. Before construction, topsoil must be removed and stockpiled in a demarcated area for rehabilitation purposes.
- b. Strip and stockpile the vegetation and other organic matter with the topsoil. The topsoil layer generally has a high organic content and carries the seed bank. It is invaluable for post-development rehabilitation.
- c. Once construction has been completed, all temporary structures, excess materials, equipment and waste must be removed from site.
- d. Rip and/or scarify compacted areas.
- e. All residual stockpiles must be removed to spoil or spread on site as directed by the ECO.
- f. The disturbed areas must be top soiled, shaped and re-vegetated (i.e. rehabilitated) as soon as possible in order to prevent soil erosion and the establishment of alien vegetation.
- g. Spread available strip vegetation by hand over the area.
- h. Replant the trees/shrubs/bulbs, etc removed from the site before construction.
- i. For rehabilitation purposes, use an appropriate seed mix comprising species indigenous to the area (Venter and Niemand, 2017). The planting of any alien plant species as part of landscaping/rehabilitation should be prohibited.
- j. Kikuyu grass (*Pennisetum clandestinum*) is a proposed declared Invader that is highly invasive. It is therefore recommended that this species is not used for rehabilitation of the area.
- k. Proper stormwater control measures and erosion control must be implemented to prevent erosion of the newly rehabilitated areas during heavy rainfall.
- l. Temporary erosion control measures (e.g. geo-textile silt fences, diversion ditches, sediment traps) and temporary seeding with fast growing annuals to be kept in place to control erosion until the long-term erosion control methods are established and functioning (Venter and Niemand, 2017).
- m. If soil erosion is noted, appropriate remediation measures must be implemented.
- n. Monitor the rehabilitated area regularly.
- o. The regulations in terms of Alien Invasive Species, the Conservation of Agricultural Resources Act, 1983 and the Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) with regards to declared alien species must be noted and complied with.
- p. Regular site inspections to be conducted to identify any declared weeds and/or invader plants. If identified, the plants to be eradicated using appropriate methods.



#### 9.6.4 Rehabilitation of the environment after construction

- q. It is advisable to consult the latest edition of 'A guide to the use of herbicides' or contact the National Department of Agriculture, Forestry and Fisheries with regards to the latest information pertaining to the application of herbicides. If pesticides or herbicides are to be used, the product should be chosen responsibly. Storage, administering and disposal must be done according to the prescribed methods.
- r. A post-construction audit must be conducted to ensure that any shortcomings are identified and addressed.

#### 9.6.5 Soil management

Impact management objective:

- 1) *To ensure that the activities that occur during the construction phase have the least impact on the soils in terms of soil quality, structure and erosion potential.*
- 2) *To reduce the potential impact of storm water drainage from the site on the surrounding area and nearby drainage areas in terms of flooding and soil erosion during the construction and operational phases.*

Mitigation and management measures:

- a. Construction should take place during the dry season to prevent soil erosion.
- b. Movement of construction vehicles should be restricted on planned access roads as to minimise compaction of surrounding soils.
- c. Stripping of vegetation for construction must occur in a phased manner and must be restricted to the construction footprint to reduce the risk of erosion during precipitation.
- d. Topsoil to be removed from all areas where physical disturbance of the surface might occur.
- e. The topsoil must not be stored to a height exceeding 1.5m and should not be compacted.
- f. Topsoil must be returned to where it was originally removed from (if possible) for rehabilitation purposes.
- g. Strip all usable soil, irrespective of soil depth – see Table 14 of Appendix 12 (Viljoen, 2017).
- h. During site preparation for the residential development, implement live placement of soil during cut and fill and landscaping to prevent stockpiling where possible, improve organic status of soils, maintain fertility levels and curb topsoil loss (Viljoen, 2017).
- i. Implement surface digital terrain mapping prior, during and after cut & fill and landscaping of the site preparation of the residential development to ensure surface water control measures are implemented to ensure free draining system with minimal soil erosion (Viljoen, 2017).
- j. In order to provide sufficient topsoil material for cut & fill and landscaping purposes and to optimise soil recovery, Viljoen (2017) recommended the following:



### 9.6.5 Soil management

- Stockpiles to be located outside proposed disturbance area(s);
  - Construction of stockpiles by dozers rather than scrapers to minimise structural degradation;
  - Construction with water control measures to reduce erosion, improve drainage and promote re-vegetation;
  - Re-vegetation of stockpiles with appropriate fertiliser (based on soil analyses) and seed in order to minimise weed infestation, maintain soil organic content, soil structure and microbial activity and maximise vegetative cover of the stockpile; and
  - Disturbance areas to be stripped progressively as required to reduce erosion and sediment generation, to reduce the extent of topsoil and utilise stripped topsoil as soon as possible for landscaping.
- k. Maintain all roads and stormwater control mechanisms.
- l. Position spoil/soil stockpiles in such a way that it does not cause the damming of water or erosion gullies.
- m. Rocks, etc. removed must also be stockpiled separately within the footprint area. The deep trench (old railway line servitude) could be filled with this material in order to assist in rehabilitating this area and making it safe.
- n. Co-ordinate works to limit the prolonged exposure of stripped areas and stockpiles.
- o. Any stockpile, which is likely to remain for an extended period, must be vegetated or covered with protective material such as hessian mats.
- p. All residual stockpiles must be removed to spoil or spread on site as directed by the ECO.
- q. Monitor for erosion and intervene and/or rehabilitate where necessary.

Impact management objective:

- 3) *To reduce potential soil pollution as a result of construction and operational activities.*

Mitigation and management measures:

- a. The waste management measures as indicated in Section 9.6.6 must be implemented during both the construction and operational phases.
- b. If any soil or surface water contamination is noted, appropriate remediation measures must be implemented immediately. An environmental incident report must be completed indicating the date of the incident, description of incident and action taken. The Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation must be informed of the event within 24 hours. A copy of the environmental incident report must be kept on file at the site office.

Impact management objective:

- 4) *To ensure that the geotechnical recommendations are taken into account during the construction phase in order to prevent an impact on structures during the operational phase.*





### 9.6.5 Soil management

#### Mitigation and management measures:

- a. Mitigation measures recommended by Cilliers and Meyer (2017) must be implemented with regards to Geotechnical zone 1A (relatively shallow bedrock with scattered outcrop), 1B (low to moderately compressible soils) and 1C (moderately compressible soils).
- b. Most of Geotechnical zone 2A (susceptible to sub-surface seepage) and 2B (susceptible to surface ponding and seepage) were incorporated into the Public Open Space (Alternative layout 2; Figure 6.3a & 6.3b) corresponding to the identified wetland (Channelled Valley Bottom Wetland and Seep Wetland, Northern Seep) and its delineated wetland buffer zones. No development will thus take place within these areas. However, where Geotechnical zone 2A and 2B extend outside these areas (e.g. small area within Phase 1 area and near N11 off ramp; adjacent to the N11 road, etc.) mitigation measures recommended by Cilliers and Meyer (2017) need to be implemented.
- c. Most of Geotechnical zone 3A (Remediation) will be incorporated into the Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b) and will thus not be developed. However, where Geotechnical zone 3A extends outside these areas, mitigation measures recommended by Cilliers and Meyer (2017) need to be implemented.
- d. No development to take place in the following Geotechnical zones as recommended by Cilliers and Meyer (2017) - Zone 4A (small earth embankment dam); Zone 4B (railway servitude); Zone 4C (Eskom substation); Zone 4D (Eskom servitude). These areas were zoned Public Open Space as indicated in Alternative layout 2 (Figure 6.3a & 6.3b).

### 9.6.6 Waste management

#### Impact management objective:

- 1) *To ensure the proper storage, management and disposal of waste during the construction phase.*
- 2) *To reduce potential soil, surface water and groundwater pollution as a result of waste management activities during construction.*

#### Mitigation and management measures:

##### **General/building waste**

- a. Proper waste management measures must be implemented at the site.
- b. No waste may be burnt, buried or dumped on site or the surrounding area.
- c. Waste skips to be provided for placement of general waste, building rubble, etc.
- d. Continually reduce resource waste by applying the waste hierarchy (i.e. waste avoidance, reduction, reuse, recycling and disposal).
- e. Promote source separation through the provision of waste bins clearly marked for recycling and general waste. These bins should be emptied on a regular basis and disposed of accordingly (i.e. sent for recycling,

### 9.6.6 Waste management

taken to licensed waste disposal site, etc.).

- f. Waste and building rubble not to be placed on the soil stockpiles resulting in the contamination of the soil.
- g. Building rubble must be disposed of at a site specifically earmarked for that purpose. No building rubble is to be disposed of in a haphazard way in the area surrounding the development site.
- h. During the construction phase, cement/concrete should be mixed in either demarcated areas or on metal sheeting or conveyor belts. If mixed in demarcated areas, these areas to be ripped and the cement/concrete removed on completion of construction activities. The applicant will have to ensure that the contractor removes the rubble and any domestic waste to a licensed waste disposal site.
- i. Solid waste concrete may be treated as inert construction rubble and disposed of along with the other construction rubble. However, liquid slurry, wet cement and cement powder must be treated as hazardous waste.
- j. Site workers must be instructed to collect windblown rubbish which may collect in the surrounding area, on the said site or along the route. This will assist with the overall visual appearance of the site.
- k. The applicant/contractor must ensure that all site workers receive appropriate training with regards to the overall waste management measures to be implemented for the said site.
- l. Site workers must be aware of the importance of the implementation of the waste management measures.

#### **Hazardous waste management**

- a. Proper bunded storage facilities must be provided for the storage of oils, grease, fuels, etc. to be used during the construction or operational phases.
- b. Workers to be trained to contain equipment spills and leaks.
- c. Refuel well away from the river.
- d. Wash-down water from the equipment not to enter the river.
- e. Keep fresh concrete out of the river.
- f. Collection containers (e.g. drip trays) must be placed under all dispensing mechanisms for hydrocarbons or hazardous liquid substances to ensure that potential contamination from leaks/spillage is reduced.
- g. No hazardous substance is to be disposed of on site.
- h. No bins containing organic solvents, paint tins or bins containing thinning agents may be cleaned on site, unless containers for liquid disposal are provided. The tins must be collected and rinsed at a central waste collection point, where it poses no threat to surface or ground water.
- i. All spills of chemicals or hydrocarbons (oil, grease, diesel, petrol, etc.) should be cleaned with the use of suitable absorbent materials such as drizit or oclanzorb. Appropriate soil remediation measures should be implemented where soil has been contaminated with oil.
- j. Contaminated soil generated as a result of fuel, oil, etc. spills to be disposed of in a specially marked drum located at the site office. An approved waste contracting firm (e.g. Enviroserv) to collect the drum



### 9.6.6 Waste management

- and dispose of the contaminated soil at an appropriate waste disposal site.
- k. Contaminated soil/fuel that cannot be removed to be treated in situ with an appropriate remedial agent. In this instance, the services of an expert may be required.
  - l. Waste oils collected on site should be stored in drums in a designated, bunded area and removed by an approved recycling contractor and disposed of at an appropriate licensed waste disposal facility.
  - m. In all instances where a firm is contracted to collect waste (e.g. Enviroserv, Wastetech, Oilkol, etc.), the site operator will ensure that the correct documentation is completed and filed for future reference.
  - n. Certificates of hazardous waste disposal (waybills) are to be kept for auditing purposes.
  - o. Records of environmental related incidents should be maintained.
  - p. The applicant must ensure that all workers receive relevant training with regards to the handling of hazardous substances and the potential health risks thereof.
  - q. The contractor and/or applicant will be responsible for establishing an emergency procedure for dealing with spills.

### 9.6.7 Water management

Impact management objective:

- 1) *To ensure that construction and operational activities do not impact on the surface water environments (wetlands, Rockdale tributary, Vaalbankspruit) in terms of water quality.*

Mitigation and management measures:

- a. Waste management measures as indicated in Section 9.6.6 must be implemented in order to reduce the potential impact on the downstream drainage areas and wetlands.
- b. All equipment should be parked overnight at the construction site office.
- c. Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours and generators used within watercourse habitat. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised.
- d. Drip trays must be utilised during repairs and maintenance of all machinery. The depth of the drip tray must be determined considering the total amount/volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle.
- e. No construction vehicles should be serviced/repaired within the river or within 100m thereof.
- f. Portable toilets should be located outside of river areas and not within 100m thereof.
- g. Engineering measures must be in place to limit the risk of spillages into rivers.

### 9.6.7 Water management

- h. If any soil or surface water contamination is noted, appropriate remediation measures must be implemented immediately. An environmental incident report must be completed indicating the date of the incident, description of incident and action taken. The Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation must be informed of the event within 24 hours. A copy of the environmental incident report must be kept on file at the site office.

Impact management objective:

- 2) *To reduce the potential impact on the surface water and associated aquatic environment of the Rockdale tributary, Vaalbankspruit and Klein Olifants River during both the construction and operational phases in terms of altered hydrological regimes, water quality deterioration and habitat deterioration.*

Mitigation and management measures:

- a. A biomonitoring programme should be implemented as soon as possible in the study area. This programme should be implemented before the development takes place to expand the baseline information (ensure adequate seasonal coverage) (Kotze, 2017). The baseline information is critical in enabling detection of future changes associated with the proposed development.
- b. The following is proposed:

c. SITES	d. BIOMONITORING PROTOCOL	e. FREQUENCY
f. RD2 and RD3	g. Habitat assessment (photographic, IHI), SASS5 and fish survey	h. Bi-annually (wet and dry season surveys)

**Reduce impact on hydrological regime (Kotze, 2017):**

- a. An adequate storm water system should be implemented.
- b. Existing dams should be removed and rehabilitated as part of the wetland rehabilitation plan.
- c. Stabilisation of banks in downstream receiving water body (Rockdale tributary and Vaalbankspruit) may be required.

**Reduce impact on water quality alteration (Kotze, 2017):**

- a. Ensure that adequate risk assessments are done, safety measures are in place and preventative measures are taken to limit potential spills (fuel, sewage, etc.).
- b. An ECO should regularly visit the site to ensure that all protocols are followed and there are no risks of spills.
- c. Hazardous waste should be appropriately stored and disposed of.
- d. Regular inspection and maintenance of sewage system is critical.
- e. Residents should be educated on their potential contribution to water pollution.
- f. Adequate pollution control facilities should be implemented at any facilities that may generate water of poor quality.



### 9.6.7 Water management

#### **Reduce habitat deterioration (Kotze, 2017):**

- a. Removal of vegetation should be limited as far as possible.
- b. Construction should ideally take place during the dry season.
- c. Erosion control measures should be implemented on site during and after construction (including storm water management).
- d. Regular inspection and maintenance of sewage system is critical.
- e. Ensure continued monitoring of water quality and follow up action stemming from monitoring and biomonitoring surveys.

#### Impact management objective:

- 3) *To reduce the potential damage to wetland habitat on site and downstream of the site during both the construction and operational phases.*

Venter (2017) indicated that the following mitigation measures should be implemented:

- a. The wetland and wetland buffer zone must be clearly demarcated on site and no construction activities may take place in these areas, including the temporary storage of materials, location of the construction camp and location of temporary ablution facilities.
- b. No vehicle movement or clearing of vegetation may take place in these areas.
- c. The wetland areas and their buffer zones must be included in the open space system for the site and no construction activities may take place in these areas.
- d. An Alien and Invasive Species Management Plan must be developed and implemented in order to manage and control all exotic and alien vegetation (see Section 9.6.8 for further details).
- e. Stabilise and revegetate all areas bare of vegetation as soon as possible.
- f. Monitor the entire site for signs of erosion throughout the construction and operational phases of the project.
- g. Monitoring during the operation phases may take place as part of the inspection and maintenance of stormwater system.
- h. All erosion features must be rehabilitated as soon as possible.
- i. Implement erosion control measures where necessary.
- j. Implement sediment fences around erosion prone areas.
- k. Implement a sufficient storm water management plan.

#### Impact management objective:

- 4) *To reduce the potential damage of storm water to wetland habitat on site and downstream of the site during both the construction and operational phases.*

Venter (2017) indicated that the following mitigation measures should be implemented:

#### **Construction phase:**

- a. Ensure that no sediment-laden stormwater enters the wetlands

### 9.6.7 Water management

directly.

- b. Stabilise and revegetate all areas bare of vegetation as soon as possible.
- c. Monitor the entire site for signs of erosion throughout the construction and operational phases of the project. This may take place as part of the regular inspections for maintenance on site.
- d. All erosion features must be rehabilitated as soon as possible.
- e. Implement erosion control measures where necessary.
- f. Implement sediment fences around erosion prone areas.

#### **Operational phase:**

- g. Permeable surfaces should be used as far as possible for parking areas, pavements, driveways and walkways. Total sealing of the surface must be avoided.
- h. The crossing of watercourses must be avoided.
- i. An appropriate storm water management plan must be implemented on site.
- j. Storm water may not enter the watercourses directly, it must be attenuated before exiting the storm water system.
- k. Storm water may not be concentrated into any of the wetland areas, but must be released over a dispersed area.

#### Impact management objective:

- 5) *To reduce the potential damage of erosion and sediment control to wetland habitat on site and downstream of the site during both the construction and operational phases.*

Venter (2017) indicated that the following mitigation measures should be implemented:

- a. Stabilise and revegetate all areas bare of vegetation as soon as possible.
- b. Monitor the entire site for signs of erosion throughout the construction and operational phases of the project.
- c. All erosion features must be rehabilitated as soon as possible.
- d. Implement erosion control measures where necessary.
- e. Stabilise any bare soil not used for cultivation as soon as possible.
- f. Implement sediment fences around erosion prone areas.
- g. Implement a sufficient storm water management plan.

### 9.6.8 Vegetation and animal life management

#### Impact management objective:

- 1) *To reduce the potential impact on the vegetation and animal life during the construction phase;*
- 2) *To minimize loss of habitat and the displacement of threatened and near threatened fauna during the construction phase.*

#### Mitigation and management measures:

Venter and Niemand (2017) indicated that the following mitigation



### 9.6.8 Vegetation and animal life management

measures should be implemented:

- a. All proposed open space areas must be fenced prior to construction but should be perforated to allow for the movement of indigenous species (mainly small mammal taxa).
- b. The open space plan and the layout plan should acknowledge all suitable foraging habitat (especially for owls and near threatened mammal taxa) located on the various wetland units.
- c. No vehicle movement may take place in the open space area during the construction and operational phase. Only recreational activities should be allowed in the open space area.
- d. Plant species indigenous to the area should be used in the landscaping of the communal areas. Indigenous species removed during construction as part of the development should preferably be used as well, especially geophytes.
- e. Trees indigenous to the area should be used as far as possible in the planning and planting of the development.
- f. Intentional killing of any faunal species (in particular invertebrates and snakes) should be avoided by means of awareness programmes presented to the labour force during construction. The labour force should be made aware of the conservation issues pertaining to the taxa occurring on the study site. Any person found deliberately harassing any animal in any way should face disciplinary measures, following the possible dismissal from the site.
- g. Where possible, implement a grazing and fire management plan to maintain and enhance the ecological condition (e.g. floristic structure and composition) of retained natural habitat of high ecological function. The grazing and fire management plan should also address adjacent grassland units.

Impact management objective:

- 3) *To reduce the potential impact on ecological corridors as a result of the construction and operational phases.*

Mitigation and management measures:

Venter and Niemand (2017) indicated that the following mitigation measures should be implemented:

- a. Include links to adjacent natural habitat (to the west of the site) in the open space system for the site.
- b. The open space plan and the layout plan should acknowledge suitable foraging habitat located to the west of the study site. Where possible, the grasslands (or at least part of it) to the immediate west of the study site should be included into the open space plan to avoid fragmentation and disruption of natural dispersal.
- c. Implement an alien plant monitoring and eradication program to ensure the long-term viability of the open space network and ecological function.
- d. Implement a grazing and fire management plan to maintain and enhance the ecological condition (e.g. floristic structure and composition) of habitat units considered to be of high ecological function.



### 9.6.8 Vegetation and animal life management

- e. Limit construction activities to daytime.

Impact management objective:

- 4) *To reduce the potential impact on the Public Open Space areas as a result of the construction and operational phases and ensure their long term integrity.*

Venter and Niemand (2017) indicated that the following mitigation measures should be implemented:

- a. An appropriate management authority must be appointed to implement to EMP and ROD for the project and must contractually be held responsible for the implementation.
- b. All sensitive areas must be included into an open space area with and appropriate ecological management plan.
- c. The open space area must be fenced off prior to construction and should allow for the movement of indigenous species.
- d. No movement of vehicles or people are allowed in the fenced area during constructing.
- e. No construction related activities, such as the site camp, storage of materials, temporary roads or ablution facilities may be in the fenced in high sensitivity areas.
- f. No vehicle movement may take place in the open space area during the operation phase. Low impact recreational activities are allowed in the open space area, such as hiking and birding.
- g. Information boards on the identification, conservation status and importance, biology, habitat requirements and management requirements of species of conservation importance must be placed in the development.
- h. Species indigenous to the area should be used in the landscaping of the communal areas. Alien plants such as kikuyu (*Pennisetum clandestinum*), must be avoided. Please note that *Pennisetum clandestinum* is classified as an invasive species in wetland areas where it has not been present prior to Aug 2014, and must be controlled.
- i. Trees indigenous to the site should be used as far as possible in the planning and planting of the development.

Impact management objective:

- 5) *To reduce the potential impact on the surrounding vegetation and animal life during the construction and operational phases.*

Mitigation and management measures:

Venter and Niemand (2017) indicated that the following mitigation measures should be implemented:

- a. Compile an alien and invasive species control and monitoring plan as required in the Alien and Invasive Species Regulations under the National Environmental Management Biodiversity Act (Act 10 of 2004).
- b. Populations of invasive species on site must be controlled.





### 9.6.8 Vegetation and animal life management

- c. The spread of invasive and weedy species from the site must be prevented.
- d. Several alien and invasive species resemble indigenous species, especially as seedlings. Care must be taken not to control indigenous species during the control of invasive species.
- e. No vehicles should drive through clumps of invasive species, since seeds get stuck in the tires and radiators of the vehicles. The vehicles can spread the seeds along all routes taken by the vehicles. If vehicles are used for the removal of invasive vegetation, the tyres, etc. must be cleaned of all seeds when leaving the site and before driving around the area.
- f. Erosion and sediment control measures must be in place at all areas cleared of invasive species. Areas bare of vegetation must be revegetated with indigenous vegetation as soon as possible.
- g. The establishment of informal settlements in the surrounding area to be monitored and removed as soon as possible in order to prevent any impact on the animal life.
- h. No uncontrolled development to be allowed in the surrounding area.

### 9.6.9 Sites of Palaeontological Sensitivity

Impact management objective:

- 1) *To reduce the potential impact on palaeontological material as a result of the excavation activities during the construction phase.*

Mitigation and management measures:

Fourie (2017) recommended that the following mitigation measures be implemented:

- a. The Vryheid Formation that has a Very High Palaeontological Sensitivity underlies the eastern half of the proposed development area.
- b. The appointed Environmental Control Officer must familiarise him- or herself with the Vryheid Formation and its fossils.
- c. A palaeontologist should be appointed during the digging and excavation phase (i.e. within the eastern half of the site) to train the ECO or to visit the site once a month to survey the area for fossils.
- d. The ECO must survey for fossils before or after blasting/excavating within the area where the Vryheid Formation is present (i.e. eastern half of the site).
- e. If any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All construction activities must be stopped and a palaeontologist must be called to determine proper mitigation measures.

### 9.6.10 Interested and affected parties

#### Impact management outcome:

- 1) *To ensure that site workers and the general public are not impacted upon in terms of the construction work being performed.*
- 2) *To reduce the potential visual impact as a result of the constructional and operational activities.*

#### Mitigation and management measures:

- a. The applicant/contractors must ensure that the necessary protective gear (PPE) is worn at all times and that signs are erected to warn workers to use hearing protection as well as any other hazards.
- b. The applicant/contractor must adhere (at all times) to the requirements of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), the Construction Regulations, 2003 and any other applicable legislation.
- c. For safety purposes, excavations must not be undertaken until such time as all required materials are available and services can be laid.
- d. Excavations should be closed as soon as is practically possible.
- e. If blasting is required, the requirements of the Explosives Act, 2003 (Act 15 of 2003) must be put in place in order to prevent any impact on site workers, etc.
- f. The waste management measures as indicated in Section 9.6.6 must be implemented during the construction and operational phase in order to keep the site neat and tidy at all times.
- g. All machinery used on site must be properly muffled and maintained so as to reduce noise generation to a minimum.
- h. Construction activities must be limited to daylight hours.
- i. The adjacent landowners/users must be provided with contact numbers with whom complaints or concerns can be discussed.
- j. All construction and operational management principles as indicated in this EMP must be implemented.

#### Impact management outcome:

- 3) *To ensure that general road users utilizing the N11 national road are not impacted as a result of the construction and operation of the proposed residential development.*

#### Mitigation and management measures:

- a. The general construction principles indicated in Section 9.6.3 to be implemented.
- b. Proper signage, warning signals, etc. (i.e. required safety measures) must be provided to warn road users that the proposed roundabout is being constructed. These signs must be visible at night.
- c. Only the approved access roads from the N11 national road to be used by contractors and delivery vehicles.

### 9.6.10 Interested and affected parties

Impact management outcome:

- 4) *To ensure good relations with all interested and affected parties by creating open channels of communication to address matters of concern that may arise.*

Mitigation and management measures:

- a. Communication between the site operator and the various interested and affected parties will be established and maintained.
- b. In order to provide feedback with regards to complaints/concerns received, a complaints register will be kept at the site office.
- c. The complaints register will record the following: Date when complaint/concern was received; Name of person to whom the complaint/concern was reported; Nature of the complaint/concern reported; the way in which the complaint/concern was addressed (date to be included).
- d. Any complaints regarding the construction activities to be brought to the attention of the Department of Agriculture, Rural Development, Land and Environmental Affairs within 24 hours after receiving the complaint.
- e. The complaints register will be kept up to date for inspection by members of the Department of Agriculture, Rural Development, Land and Environmental Affairs.

## 9.7 Implementation and monitoring of the EMPr

*An EMPr must include -*

- (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);*
- (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);*
- (i) an indication of the persons who will be responsible for the implementation of the impact management actions;*
- (j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;*
- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);*
- (l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;*

The implementation of the Environmental Management Programme (EMPr) as part of the daily construction and operational activities is crucial and requires commitment from all levels of management and the on-site workers. The successful implementation of an EMPr has the following advantages:

- Meeting legal obligations;
- Contributes to environmental awareness;
- Can facilitate the prevention of environmental degradation;
- Can minimize impacts when they are unavoidable;
- Can ensure good environmental performance and improve community relations.

An approved contractor should be appointed to do the necessary construction on the said site. The contractor and site workers must be aware of their environmental responsibilities. Penalty clauses, in terms of the environment, must be built into the contracts and must be implemented. Monitoring of the environmental management programme must take place on a regular basis in order to ensure compliance.

The contractor must inform all site workers of their environmental responsibility during the construction phase. Measures to protect the environment and mitigation measures formulated in this EMPr must be implemented by the contractor and the site workers. The contractor must thus ensure that the site workers are aware of the Environmental Authorisation and this EMPr and understand the contents thereof.

In order to achieve the above-mentioned, the contractor and site workers should undergo basic environmental awareness training with regards to the contents of this EMPr. Environmental awareness training is critical for the contractor and site workers to understand how they can play a role in achieving the objectives specified in the EMPr. The contractor must ensure that the site workers undergo the necessary environmental awareness training (see Section 9.7.1) before commencing with activities on the site.



This section must be completed on acceptance of the appointment.

<b>MANAGEMENT ACCOUNTABILITY</b>		
<b>Accountability</b>	<b>Title</b>	<b>Name</b>

**MANAGEMENT DECLARATION**

I, the undersigned in my capacity as designated above hereby undertake to ensure that the conditions and recommendations in terms of the Environmental Authorisation and Environmental Management Plan (EMPr) are implemented and assume responsibility and accountability in this respect.

I further understand that officials from the Steve Tshwete Local Municipality, Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) and Department of Water and Sanitation (DWS) may (at any time) conduct an inspection of the project in order to ensure compliance with the conditions and recommendations in the EMPr.

<b>CONTRACTOR</b>
..... Name and Designation
..... Signature:
..... Date:
<b>EMPLOYER</b>
..... Name and Designation:
..... Signature:
..... Date:

### 9.7.1 Environmental Awareness Plan (EAP)

*An EMPr must include -*

*(m) An environmental awareness plan describing the manner in which-*  
*(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and*  
*(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.*

It is recommended that the employees receive basic environmental awareness training. In order to ensure proper training, the applicant must develop and implement an Environmental Awareness Plan (EAP). This section provides an overview of what the proposed EAP will contain and how it will be implemented.

The following components would form an essential part of an Environmental Awareness Plan (EAP): -

- + Development of an environmental policy;
- + Identification of environmental impacts/risks and mitigation measures;
- + Environmental training, awareness and competence;
- + Environmental communication and reporting.

#### **Development of an environmental policy**

The applicant would have to compile an Environmental Policy (if they do not have one already), which is a one page statement setting out certain principles in terms of their environmental performance.

The environmental policy should indicate the following:

- The applicant's commitments in terms of the environment;
- Identify environmental impacts as a result of the activities taking place on site;
- Actions to be taken to minimize/mitigate the environmental impacts.
- Signature of management.

In order to ensure effective environmental management, it is important that the Environmental Policy is known and understood by all employees. It should thus be displayed at the construction site office.

An Environmental Policy Template is provided to assist the applicant in the compilation of their Environmental Policy. A number of templates are also available on the internet.

Environmental Policy Template (taken from Richmond upon Thames, 2012)

*[Insert company name here] believe that we have a responsibility to care for and protect the environment in which we operate. We are fully committed to improving environmental performance across all of our business activities, and will encourage our business partners and members of the wider community to join us in this effort.*

*[Insert company name here] recognises our key impacts to be in the areas of [for example]:*

- *energy use*
- *raw material use*
- *waste generation*
- *emissions to air/water*
- *water use*
- *transport*
- *procurement*

*We will strive to:*

- *Adopt the highest environmental standards in all areas of operation, meeting and exceeding all relevant legislative requirements.*
- *Assess our organisational activities and identify areas where we can minimise impacts.*
- *Minimise waste through careful and efficient use of all materials and energy.*
- *Purchase sustainable products wherever feasible [e.g. recycled, FSC or low environmental impact products and energy from renewable sources].*
- *Train employees in good environmental practice and encourage employee involvement in environmental action.*
- *Reduce risks from environmental, health or safety hazards for employees and others in the vicinity of our operations.*
- *Adopt an environmentally sound transport strategy.*
- *Aim to include environmental and ethical considerations in investment decisions where appropriate.*
- *Assist in developing solutions to environmental problems.*
- *Continually assess the environmental impact of all our operations.*

*[Insert company name here] have developed a series of action plans to supplement each of our environmental policy objectives. These can be found [in an appropriate place].*

*[Insert company name here] will periodically review performance and publish these results [in an appropriate manner].*

*Signed \_\_\_\_\_*

**Identification of environmental impacts / risks and mitigation measures**

Environmental impacts/risks in terms of the development are indicated in Section 7 of this document while mitigation measures to be implemented are provided in Section 9.

Activities or work procedures that could have a significant impact on the environment have thus been identified and mitigation measures proposed in order to avoid pollution or the degradation of the environment.

This information must be communicated to the employees and thus forms the basis for developing an Environmental Awareness Plan (EAP) in order to ensure effective environmental management.

### **Environmental training, awareness and competence**

Training is necessary in order to advance the competency of employees in implementing the Environmental Policy and the EMPr and to ensure effective overall environmental management.

The applicant (including appointed contractor) must inform all his employees of their environmental responsibilities in terms of this Environmental Management Programme (EMPr). Measures to protect the environment and mitigation measures formulated in this EMPr must thus be implemented by the applicant and employees (including appointed contractor).

In addition, job specific training must be conducted that will be appropriate to the activity and the responsibility of the individual employees. Ad-hoc training will be undertaken as required.

Through training/awareness, the applicant will also make his employees aware of:

- ✚ the importance of conformance with the environmental policy and the requirements of the EMPr;
- ✚ the significant environmental impacts, actual or potential, of their work activities and the environmental benefits of improved personal performance;
- ✚ their roles and responsibilities in achieving conformance with the environmental policy and the requirements of the EMPr, including emergency preparedness and response requirements; and
- ✚ the potential consequences of departure from the specific operating procedures and/or mitigation measures specified in the EMPr.

Environmental training and development needs of employees will be identified on a regular basis through:

- Identification of significant environmental impacts;
- Analysis of non-conformance and incident reports;
- Audit reports.

### **Environmental communication and reporting**

Environmental communication and reporting form an integral part of an Environmental Awareness Plan. It is important to maintain effective communication internally and to ensure that external communication (e.g. with government departments or adjacent landowners) is maintained.

In general, environmental communication and reporting will aim to:

- ✚ Ensure that employees understand the environmental policy and objectives;
- ✚ Ensure that information is communicated and readily accessible to the relevant parties;
- ✚ Improve feedback of operational and environmental performance to management;
- ✚ Ensure effective and constructive communication with relevant government departments and adjacent landowners (if applicable);
- ✚ Ensure that records are kept of environmental communication and interaction.

The following are some of the topics that should be discussed with new employees:

- ④ Time of commencement and completion of duties;
- ④ Cleaning of workplace and the importance thereof;
- ④ Safety clothing and its importance and correct use;
- ④ Procedure to follow in case of illness and injury;
- ④ Annual leave and when due;
- ④ Importance of instructions;
- ④ Late for work and leaving workplace without permission;
- ④ Emergency procedures;
- ④ Environmental awareness;
- ④ Training and its importance;
- ④ Alcohol and drug abuse;
- ④ Medical fitness;
- ④ Disciplinary procedures.

The following topics should form part of the environmental awareness discussions to be held with the employees:

- ④ NO-GO areas;
- ④ Water;
- ④ Fauna and flora;
- ④ Smoking and fires;
- ④ Dust;
- ④ Noise;
- ④ Waste management.

Various signs (including the Environmental Policy) should be displayed on site to remind site workers of the basic environmental principles and inform them of the 'DO'S' and 'DON'TS'.

The applicant must conduct regular inspections to check on site conditions and to provide training when necessary to ensure that the mitigation measures are being implemented and that the environment is carefully looked after.

### **9.7.2 Site documentation and record keeping**

The following documentation must be available (at all times) at the site office:

- A copy of the Environmental Impact Assessment Report (EIAR) and Environmental Management Programme;
- A copy of the Environmental Authorisation;
- A copy of the Environmental Policy;
- A copy of site audit reports;
- A copy of any other permits/approvals and/or service agreements from other authorities/landowners/etc.

The documents should be kept as hard copies as well as in electronic format.

### **Complaints Register**

A complaints register must be kept at the site office. Any complaints received with regards to the project must be recorded in the complaints register. The following information must be recorded:

- Date complaint recorded;
- Nature of complaint;
- Details of complainant (name, address, telephone number, etc.);
- Manner in which complaint was dealt with;



- Date when complaint was reported to the Department of Agriculture, Rural Development, Land and Environmental Affairs and the Department of Water and Sanitation.

### **Emergency numbers**

Emergency numbers (e.g. manager, police, fire department, ambulance, etc.) must be prominently displayed at the site office.

Contact details of affected landowners/users must also be kept on file.

### **Other legislation**

The following should also be displayed at the site office:

- Occupational Health and Safety Act, 1993 (Act 85 of 1993) as amended;
- Basic Conditions of Employment Act, 1997;
- Summary of the Employment Equity Act.

### **Supplementary documentation**

The following supplementary documentation should be kept at the site office:

- Site instructions;
- Emergency preparedness and response procedures;
- Incident reports;
- Training records;
- Site inspection, monitoring and auditing reports.

During the course of the development, the applicant and employees must also comply with all other relevant legislation.

### **9.7.3 Auditing and corrective action**

Environmental audits identify existing and potential environmental problems and determine what action is needed to comply with legal requirements and the Environmental Management Programme (EMPr). Subsequent audits then confirm that corrective actions have been taken and assess the effectiveness of such actions.

#### **Construction phase:**

The applicant must appoint an Environmental Control Officer (ECO) who will have the responsibility of monitoring and reporting on compliance with the conditions of the Environmental Authorisation as well as monitoring and reporting on the implementation of the EMPr.

The ECO must be appointed before the commencement of construction and must remain employed until all rehabilitation measures as well as site clean-up are completed.

The ECO will be responsible to:

- Attend site meetings;
- Ensure that a copy of the Environmental Authorisation and EMPr are available on site;
- Arrange or present the environmental awareness training course;
- Monitor and audit the construction activities on a weekly basis;
- Keep a record of each site inspection and the findings thereof;
- Make a register of the environmental monitoring and auditing results available for inspection at the construction site office;
- Keep records relating to the compliance and non-compliance with the conditions of the Environmental Authorization;

- Make these records available to the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) within seven (7) working days of the date of the written request by the Department for such records.
- Advise on the rectification of any pollution, contamination or damage to the site.

A good approach to facilitate legal enforceability of the EMPr during the construction phase is to integrate the EMPr into the tender and contract document (i.e. between the project applicant and the contractors) as a set of environmental specifications. The contractor will thus be informed prior to being appointed of his environmental responsibilities.

Penalties in terms of the environment should be implemented upon non-compliance. This will ensure that the project applicant does not sit with an environmental liability at the end of the contract.

A post-construction audit should be conducted prior to the contractors leaving site.

There are several levels at which corrective action can be affected, namely verbal instructions, written instructions and contract notices.

Level 1: The problem is discussed with the contractor and a solution is worked out together. The discussion is minuted for record purposes and the solution implemented.

Level 2: When a more serious infringement is observed, the contractor is notified in writing and given a deadline by which the issue must be rectified. Costs to be borne by the contractor.

Level 3: The contractor will be ordered to suspend all or part of the work until such time as the problem is rectified or remedial measures put in place. Costs to be borne by the contractor and no extension of time will be granted.

Level 4: Breach of contract and/or termination of employment. The applicant may also institute legal proceedings against the contractor.

An example of a penalty schedule is provided below.

<b>PENALTY SCHEDULE</b>			
<b>Level</b>	<b>Description</b>	<b>Penalty</b>	<b>Offences</b>
1	Minor offence	R1000 first offence R2000 second offence And R1000/per day that offence continues beyond notification of offence	<ul style="list-style-type: none"> <li>Littering; inadequate or inappropriate on-site waste management or sanitation</li> <li>Uncontrolled noise and dust nuisance</li> <li>Poaching on site</li> <li>Inadequate soil / water protection controls for fuel storage &amp; dispensing areas, vehicle parking areas</li> </ul>
2	Moderate offence	R5000 first offence R10 000 second offence And R5000 per day that the offence continues beyond notification of offence	<ul style="list-style-type: none"> <li>Trespassing onto neighbours properties</li> <li>Removal of indigenous trees marked for conservation purposes without the permission of the ECO, or trees in demarcated sensitive environmental zones</li> <li>Disposal of any form of waste to a non-approved dump site</li> <li>Any illegal / non-permitted abstraction or use of water from a natural resource</li> <li>The withholding of pertinent information or provision of false information to the ECO or Project Manager</li> </ul>
3	Significant offence	R30 000 first offence R50 000 second offence And R30 000 per day that the offence continues beyond notification of offence	<ul style="list-style-type: none"> <li>Non-compliance with any risk or safety management requirements</li> <li>Significant spillage of hazardous materials</li> <li>Use of natural materials not sourced from a legally permitted source</li> <li>Construction or use of roads/access across rivers, streams or wetlands that has not been authorized by the Project Manager and ECO</li> </ul>
4	Serious offence	Up to R500 000 or total cost of rehabilitating damaged environment	<ul style="list-style-type: none"> <li>Any serious pollution event or accident</li> <li>Any serious encroachment into demarcated sensitive environmental zones, by accident or on purpose</li> <li>Any serious stormwater damage that could have been avoided through appropriate management interventions</li> </ul>

In addition to the schedule of penalties, a portion of the Retention on all contracts could be apportioned to compliance with the EMPr.

Operational phase:

The applicant will be responsible for auditing and corrective action during the operational phase of the development.

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