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**ECOLOGICAL IMPACT ASSESSMENT FOR THE PROPOSED TOWNSHIP  
ON FARMS HAAKDOORNBOOM 267 JR AND KRUISFONTEIN 259 JR,  
WITHIN CITY OF TSHWANE METROPOLITAN MUNICIPALITY IN  
GAUTENG PROVINCE**

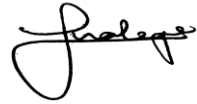




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## DOCUMENT CONTROL

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Submitted to	Nali Sustainability Solutions (Pty) Ltd	
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	Ramokone Mothwa (SAAB)	
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## EXECUTIVE SUMMARY

MATAVHA Environmental (Pty) Ltd was appointed by Nali Sustainability Solutions (Pty) Ltd to conduct an ecological impact assessment for the proposed township on Farms Haakdoornboom 267 JR and Kruisfontein 259 JR near Soshanguve within the City of Tshwane Metropolitan Municipality, Gauteng.

The site was investigated to determine the potential impacts on the immediate natural environment. The terms set by the consultants for this project are as follows.

- Field survey for vegetation survey, vegetation communities and habitats
- Terrestrial fauna report and red data listed species
- Verify threatened species
- Impact assessment and recommendations

Below are some of the potential impacts that have been identified.

- Local loss of plant species
- Loss of micro habitat
- Loss of foraging grounds
- Introduction of alien invasive plant species

No Floral species of conservation concern (SCC) were observed within the study area.

The study area has a large number of invasive plant species which require intervention through development and implementation of Invasive Alien Plant Species Control Program.

Sensitive areas that need to be conserved include wetland and associated riparian areas. Overall, Ecological Assessment revealed that the proposed township establishment will be located on habitats that have already been modified. As a result, the proposed development does not pose any high risk to the vegetation on site. The management of the impacts as well as recommendations were developed for the potential impacts identified.

It is therefore the opinion of the specialist that the proposed township be favourably considered. However, it is important that the mitigations and recommendations provided by this study are adhered to.

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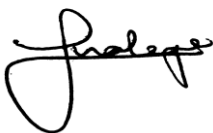
## DECLARATION OF INDEPENDENCE

I, Mokgatla Molepo, in my capacity as a lead specialist consultant, hereby declare that I:

- Act/acted as an independent specialist to Nali Sustainability Solutions (Pty) Ltd for this project.
- Do not have any personal, business or financial interest in the project except for financial remuneration for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments but aim to present facts and my best scientific and professional opinion regarding the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2017.

## INDEMNITY

- This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using available information and data related to the site to be affected, *in situ* fieldwork, surveys and assessments and the specialists best scientific and professional knowledge.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the specialist's best scientific and professional knowledge as well as information available at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information and recommendations in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgement of these terms and liabilities.



Mokgatla Molepo *Pr. Nat. Sci* (009509)

20 March 2020

## TERMS OF REFERENCES

It is required that the assessment provides technical advice on the following information, applicable to the proposed project on the site: a brief discussion on the vegetation types in which the study area is situated using available literature in order to place the study in context was summarized as follows;

- A broad-scale map of the vegetation of the proposed site.
- A description of the dominant and characteristic species within the broad-scale plant communities;
- A list of Red Data plant and animal species previously recorded within the site which the study area is situated, obtained from the relevant authorities and literature reviews;
- Identification of sensitive habitats and plant communities;
- Preliminary investigation of the impacts of the project and the provision of recommended mitigation measures;
- Identify and assess any cumulative impacts arising from the project where there is major uncertainty, low levels of confidence in predictions and poor data or information. Recommend practicable mitigation measures to minimize or eliminate negative impacts and or enhance potential project benefits; and
- Recommend appropriate monitoring measures.

### Project Team

Table 1: Project Team

Project Role	Name	Qualifications
Floral Specialist	Ramokone Mothwa	BSc. Botany & Microbiology (University of Venda), BSc. Hons. Botany (University of Limpopo) MSc. Botany (University of Pretoria – Current)
Ecologist & Faunal Specialist	Mokgatla Molepo	BSc. Botany & Zoology (University of Venda), BSc. Hons. Zoology (University of Limpopo) MSc. Zoology (Nelson Mandela University)
Environmental Geologist	Lutendo Ndou	Bachelor of Earth Sciences (Honors) in Mining, Environmental and Geology – University of Venda

## **INTRODUCTION AND PROJECT LOCATION AND DESCRIPTION**

MATAVHA (Pty) Ltd represented by Lutendo Ndou, Ramokone Mothwa and Mokgatla Molepo has been appointed as independent ecological specialist to undertake an ecological impact assessment for the proposed township establishment on Farms Haakdoornboom 267 JR and Krusifontein 259 JR in Pretoria North, Gauteng (Fig. 1). The study site is located 25 km North west of Pretoria, and it is accessed via R80. The ecological sensitivity of the entire study area was assessed, however, during the field survey, the ecological impacts from the proposed development were narrowed down to the receiving environment. The important aspect used during the study, was to determine areas where the development and activities around it will result in negative impacts. Each problem area was photographed and assessed in the report. The process included:

- The desktop study to gain background information of the physical habitat, as well as generating potential faunal and floral species lists for the study area;
- The site assessment to determine dominant faunal and floral species;
- Description of the sensitivity of the site;
- Impact assessment.

The investigation determined how several habitats and biota will be affected by the proposed activities on the site. The significance ratings of the anticipated impacts were evaluated, and recommendations and deductions were made.



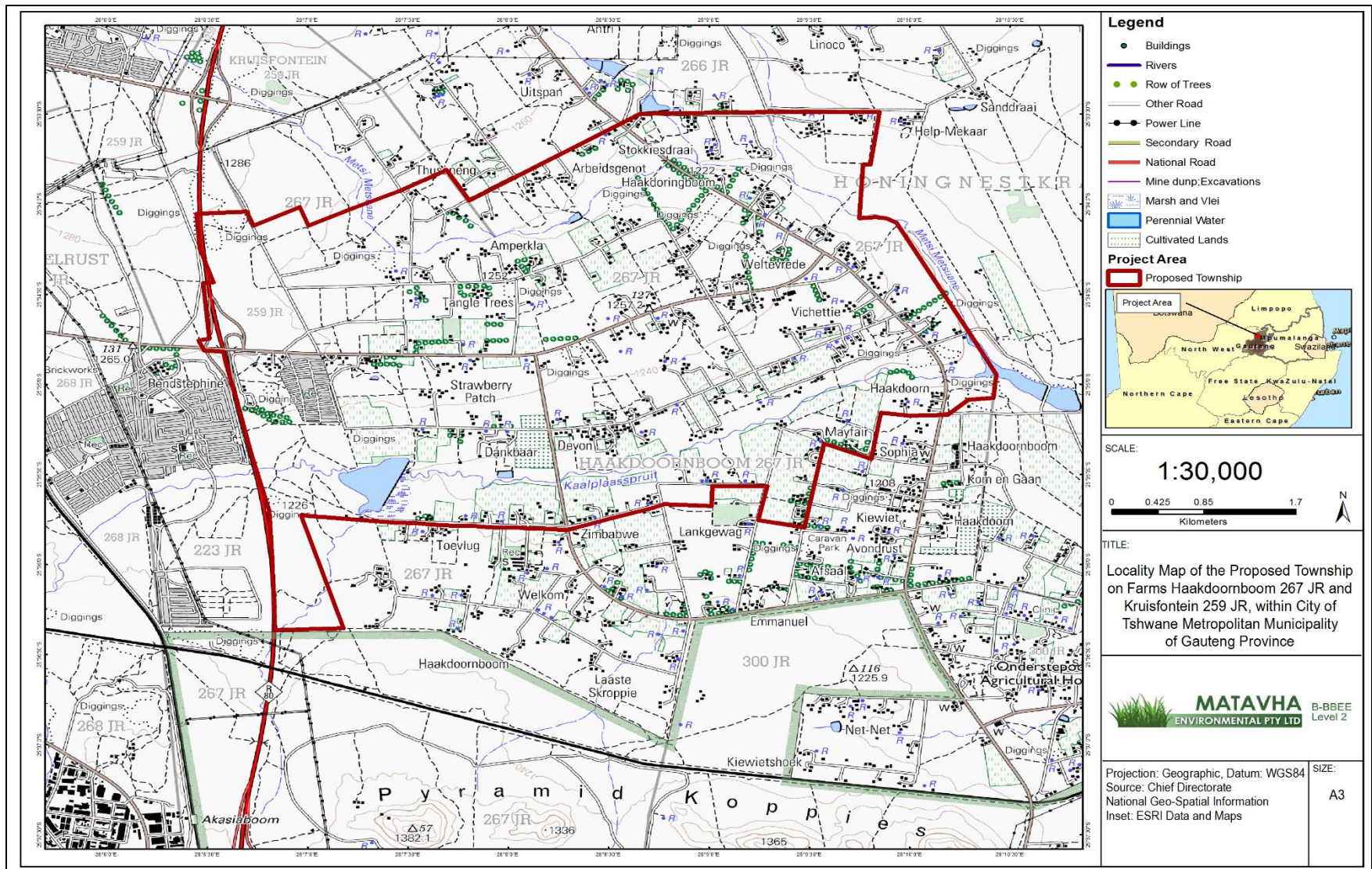


Figure 1: Location of the study site.

## **ASSUMPTIONS, LIMITATIONS, UNCERTAINTIES, AND GAP ANALYSIS**

The findings, results, observations, conclusions, and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as available information regarding the perceived impacts on wetland and terrestrial environment.

A description of vegetation was based on the physical field surveys and site walkthrough and investigations as performed on site. Limited time and access to other private properties was a constraint during field surveys.

The site assessment did not include the adjacent properties.

Results presented in this report are based on a snapshot investigation of the study site and not on detailed and long-term investigations of all environmental attributes and the varying degrees of biological diversity that may be present in the study site.

Once-off assessments such as this may potentially miss certain ecological information, thus limiting accuracy, detail and confidence.

The assessment of impacts and recommendation of mitigation measures were informed by the site-specific ecological issues arising from the field survey and based on the assessor's working knowledge and experience with similar projects.

## **SURVEY METHODS AND REPORTING**

### **General**

The report relies on aerial images and ortho photos to gather background information on a variety of features and vegetation communities occurring on the study site. On site data was collected through walkthrough transects in March 2020 that covered the whole study site. All literature used in this study is listed in the reference section.

### **Climate**

The climate is warm and temperate. In winter, there is much less rainfall than in summer. The average annual temperature around the area is 17.8 °C. In a year, the rainfall is 699 mm (Fig. 2).

According to Köppen -Geiger system (Kottek *et al.* 2006), the study site falls within the Cwa climatic region (Fig. 3).

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	22.5	22	20.7	17.8	13.8	10.8	11	13.5	17.3	20.5	21.1	22.1
Min. Temperature (°C)	16.1	15.6	14	10.4	5.5	1.9	1.8	4.3	8.6	12.7	14.2	15.4
Max. Temperature (°C)	28.9	28.5	27.4	25.2	22.2	19.7	20.2	22.8	28.1	28.3	28	28.8
Avg. Temperature (°F)	72.5	71.6	69.3	64.0	56.8	51.4	51.8	56.3	63.1	68.9	70.0	71.8
Min. Temperature (°F)	61.0	60.1	57.2	50.7	41.9	35.4	35.2	39.7	47.5	54.9	57.6	59.7
Max. Temperature (°F)	84.0	83.3	81.3	77.4	72.0	67.5	68.4	73.0	79.0	82.9	82.4	83.8
Precipitation / Rainfall (mm)	126	91	82	48	21	6	6	7	18	66	112	116

Figure 2: Climatic figures of the region.

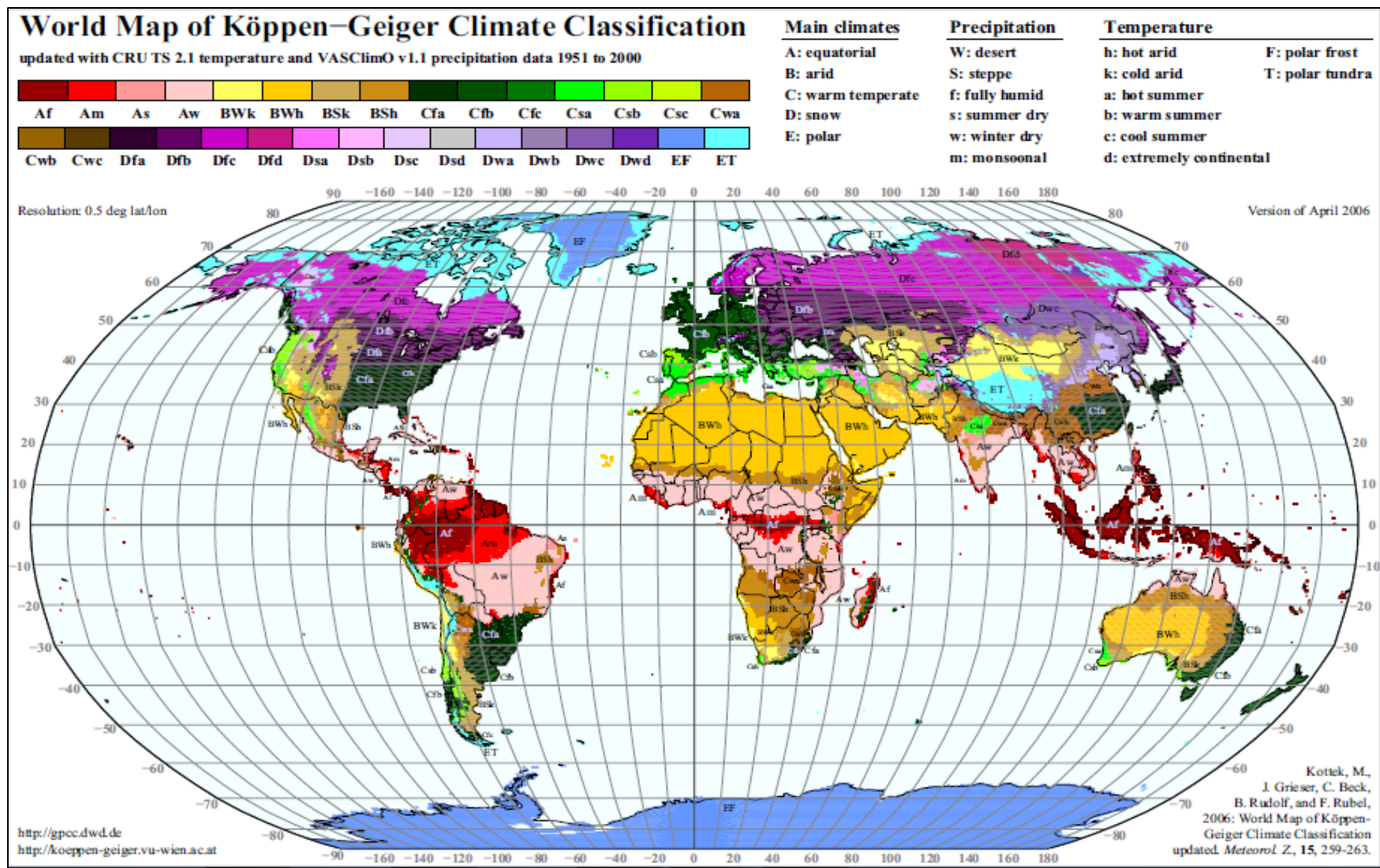


Figure 3: World map of Köppen -Geiger Climate Classification.

## **Vegetation of the study site**

Floral diversity was determined by completing survey transects and sample sites along all the different habitats within the physiographic zones represented in the affected areas. To attain scientifically reliable results, distinct vegetation communities were surveyed by selecting representative site in each homogenous unit. The vegetation units of Mucina and Rutherford (2006) were used as references but where necessary communities are named according to the recommendations of a standardised South African Syntaxonomic nomenclature system. By combining the available literature with the survey results, stratification of vegetation communities was possible.

The aim was to identify distinct vegetation types and to establish their integrity and representation in the study area. The veld types are described on a local level.

## **Vegetation types and biophysical descriptions**

Vegetation units are broadly classed and may include several distinct vegetation communities within a unit. The vegetation types found on the study site are Marikana Thornveld and Central Sandy Bushveld (Fig. 4).

### **Marikana Thornveld**

#### **Vegetation & Landscape Features**

Open *Vachellia karroo* woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitat protected from fire.

#### **Geology & Soils**

Most of the area is underlain by the mafic intrusive rocks of the Rustenburg Layered Suite of the Bushveld Igneous Complex. Rocks include gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria Group (Transvaal Supergroup) also contribute. Mainly vertic melanic clays with some dystrophic or mesotrophic plinthic catenas and some freely drained, deep soils. Land types mainly Ea, Ba and Ae.

#### **Distribution**

This vegetation type is found in North West and Gauteng. It occurs on plains from Rustenburg area in the west through Marikana and Brits to the Pretoria area in the east. It occurs on a varying altitude ranging between 1050 -1450 m a.s.l (Bredenkamp & van Rooyen, 1996).

## Occurrence of important flora

Tall Tree: *Senegalia burkei*. Small Trees: *Senegalia caffra* (d), *Vachellia gerrardii* (d), *V. karroo* (d), *Combretum molle* (d), *Rhus lancea* (d), *Ziziphus mucronata* (d), *V. nilotica*, *V. tortilis* subsp. *heteracantha*, *Celtis africana*, *Dombeya rotundifolia*, *Pappea capensis*, *Peltophorum africanum*, *Terminalia sericea*.

Tall Shrubs: *Euclea crispa* subsp. *crispa* (d), *Olea europaea* subsp. *africana* (d), *Rhus pyroides* var. *pyroides* (d), *Diospyros lycioides* subsp. *guerkei*, *Ehretia rigida* subsp. *rigida*, *Euclea undulata*, *Grewia flava*, *Pavetta gardeniifolia*.

Low Shrubs: *Asparagus cooperi* (d), *Rhynchosia nitens* (d), *Indigofera zeyheri*, *Justicia flava*.

Woody Climbers: *Clematis brachiata* (d), *Helinus integrifolius*.

Herbaceous Climbers: *Pentarrhinum insipidum* (d), *Cyphostemma cirrhosum*.

Graminoids: *Elionurus muticus* (d), *Eragrostis lehmanniana* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhuthia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis nerviglumis*, *Pogonarthria squarrosa*.

Herbs: *Hermannia depressa* (d), *Ipomoea obscura* (d), *Barleria macrostegia*, *Dianthus mooiensis* subsp. *mooiensis*, *Ipomoea oblongata*, *Vernonia oligocephala*.

Geophytic Herbs: *Ledebouria revoluta*, *Ornithogalum tenuifolium*, *Sansevieria aethiopica*.

## Conservation

This vegetation is Least Threatened. Conservation target is 24%, but around 22% is statutorily conserved mainly in the Magaliesberg Nature Area and much smaller proportions in the Rustenberg, Wonderboom and Suikerbosrand Nature Reserves. At least an additional 1% conserved in other reserves brings the total conserved very close to target. About 15% transformed mainly by cultivation and urban and built-up areas. Some areas with dense stands of the alien *Melia azedarach* but which is often associated with drainage lines or alluvia (i.e. azonal vegetation) embedded within this unit. Erosion is very low to low.

## Central Sandy Bushveld

### Vegetation & Landscape Features

Low undulating areas, sometimes between mountains, and sandy plains and catenas supporting tall, deciduous *Terminalia sericea* and *Burkea Africana* woodland on deep sandy soils (with the former often dominant on the lower slopes of sandy catenas) and low, broadleaved *Combretum* woodland on shallow rocky or gravelly soils. Species of

*Vachellia*, *Ziziphus* and *Euclea* are found on flats and lower slopes on eutrophic sands and some less sandy soils. *V. tortilis* may dominate some areas along valleys. Grass-dominated herbaceous layer with relatively low basal cover on dystrophic sands.

## Geology & Soils

The large southern and eastern parts of this area are underlain by granite of the Lebowa Granite Suite and some granophyre of the Rashoop Granophyre Suite (both Bushveld Complex, Vaalian). In the north, the sedimentary rocks of the Waterberg Group (Mokolian Erathem) are most important. Specifically, sandstone, conglomerate and siltstone of the Alma Formation and sandstone, siltstone and shale of the Vaalwater Formation. Well-drained, deep Hutton or Clovelly soils often with a catenary sequence from Hutton at the top to Clovelly on the lower slopes; shallow, skeletal Glenrosa soils also occur. Land types mainly Bb, Fa, Ba, Bd and Ac.

## Distribution

This vegetation type is found in Limpopo, Mpumalanga, Gauteng and North-West Provinces: Undulating terrain occurs mainly in a broad arc south of the Springbokvlakte from the Pilanesberg in the west through Hammanskraal and Groblersdal to Ga Masemola in the east. A generally narrow irregular band along the north western edge of the Springbokvlakte (including Modimolle) extending into a series of valleys and lower-altitude areas within the Waterberg including the upper Mokolo River Valley near Vaalwater, the corridor between Rankins Pass and the Doorndraai Dam, and the lowlands from the Mabula area to south of the Hoekberge. Some isolated sandy rises are found on the Springbokvlakte. It occurs on a varying altitude ranging between 850 -1450 m a.s.l (Bredenkamp & van Rooyen, 1996).

## Occurrence of important flora

Tall Trees: *Vachellia burkei* (d), *V. robusta*, *Sclerocarya birrea* subsp. *caffra*.

Small Trees: *Burkea africana* (d), *Combretum apiculatum* (d), *C. zeyheri* (d), *Terminalia sericea* (d), *Ochna pulchra*, *Peltophorum africanum*, *Rhus leptodictya*.

Tall Shrubs: *Combretum hereroense*, *Grewia bicolor*, *G. monticola*, *Strychnos pungens*.

Low Shrubs: *Agathisanthemum bojeri* (d), *Indigofera filipes* (d), *Felicia fascicularis*, *Gnidia sericocephala*.

Geoxylic Suffrutex: *Dichapetalum cymosum* (d).

Woody Climber: *Asparagus buchananii*.

Graminoids: *Brachiaria nigropedata* (d), *Eragrostis pallens* (d), *E. rigidior* (d), *Hyperthelia dissoluta* (d), *Panicum maximum* (d), *Perotis patens* (d), *Antheophora pubescens*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Brachiaria serrata*, *Elionurus muticus*, *Eragrostis*

*nindensis*, *Loudetia simplex*, *Schmidtia pappophoroides*, *Themeda triandra*, *Trachypogon spicatus*.

Herbs: *Dicerocaryum senecioides* (d), *Barleria macrostegia*, *Blepharis integrifolia*, *Crabbea angustifolia*, *Evolvulus alsinoides*, *Geigeria burkei*, *Hermannia lancifolia*, *Indigofera daleoides*, *Justicia anagalloides*, *Kyphocarpa angustifolia*, *Lophiocarpus tenuissimus*, *Waltheria indica*, *Xerophyta humilis*.

Geophytic Herb: *Hypoxis hemerocallidea*. Succulent Herb: *Aloe greatheadii* var. *davyana*.

### **Conservation**

This vegetation is Vulnerable. Conservation target is 19%, but less than 3% is statutorily conserved statutorily conserved spread thinly across many nature reserves including the Doorndraai Dam and Skuinsdraai Nature Reserves. An additional 2% conserved in other reserves including the Wallmansthal SANDF Property and a grouping of private reserves, which include most of the Nylsvlei freshwater wetlands. About 24% transformed, including about 19% cultivated and 4% urban and built-up areas. Much of the unit in the broad arc south of the Springbokvlakte is heavily populated by rural communities. Several alien plants are widely scattered but often at low densities; these include *Cereus jamaecaru*, *Eucalyptus* species, *Lantana camara*, *Melia azedarach*, *Opuntia ficus-indica* and *Sesbania punicea*. Erosion very low to high, especially in some places northeast of Groblersdal.



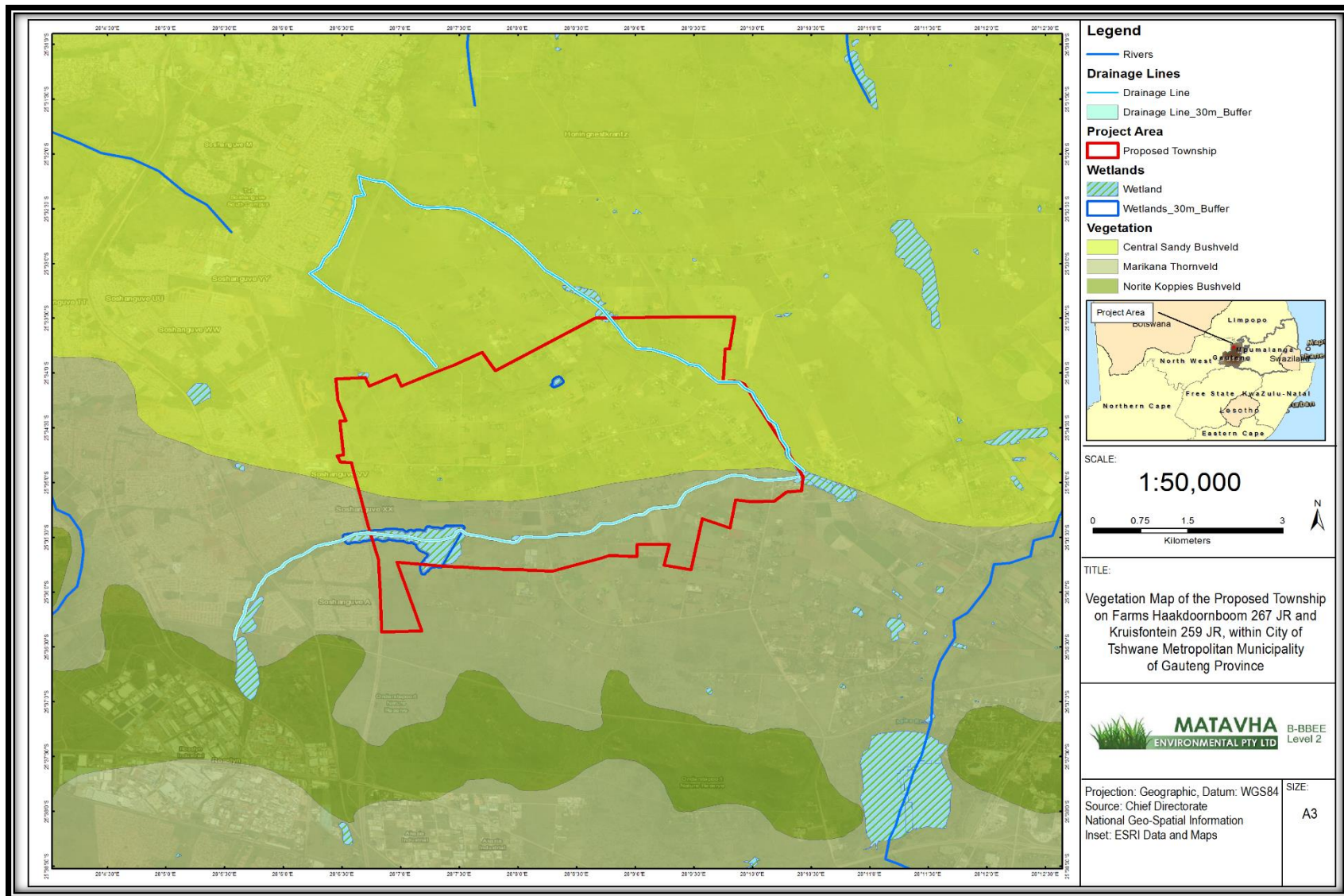


Figure 4: Vegetation map of the study site.

## **LEGAL REQUIREMENTS**

### **Provincial legislation**

In addition to national legislation, some of South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996).

### **Gauteng Conservation Plan**

Gauteng Department of Agriculture and Rural Development initiated a conservation plan which is called, Gauteng Conservation Plan (Gauteng C-Plan v3.3). This Gauteng C-Plan v3.3 delineates on a map, commonly known as a Critical Biodiversity Areas (CBA), biodiversity priority areas called Critical Biodiversity Areas, Ecological Support Areas and Protected Areas. The map is designed to be used at approximately 1:50 000 scale as the integrated biodiversity input into land use planning and decision making. It is highly recommended that this Gauteng C-Plan be a primary biodiversity consideration in Environmental Impact Assessments (GDARD 2014).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses.

Ecological Support Areas (ESAs) are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs.

### **Sensitivity Analysis**

In terms of Gauteng Conservation Plan, only small portion of the proposed project falls within Important Area and Ecological Support Area (see Fig 5). These areas are associated with wetland and drainage lines. The developer has incorporated the drainage lines and wetland area in their preliminary Site Development Plan (Fig. 6). The remaining majority of the portions have been severely transformed by historical and current farming activities and residential properties.

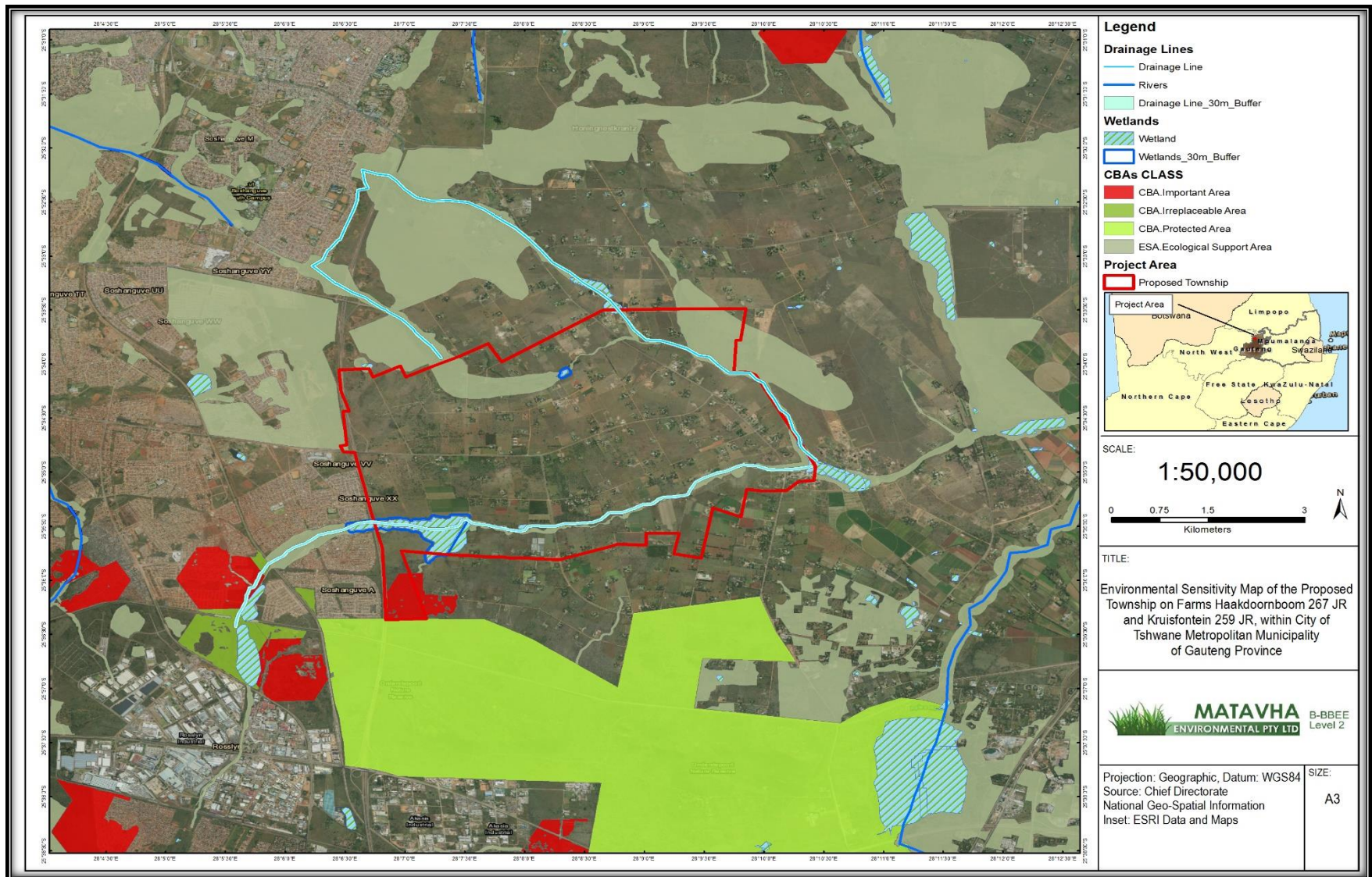


Figure 5: Gauteng Conservation Plan of the study site.

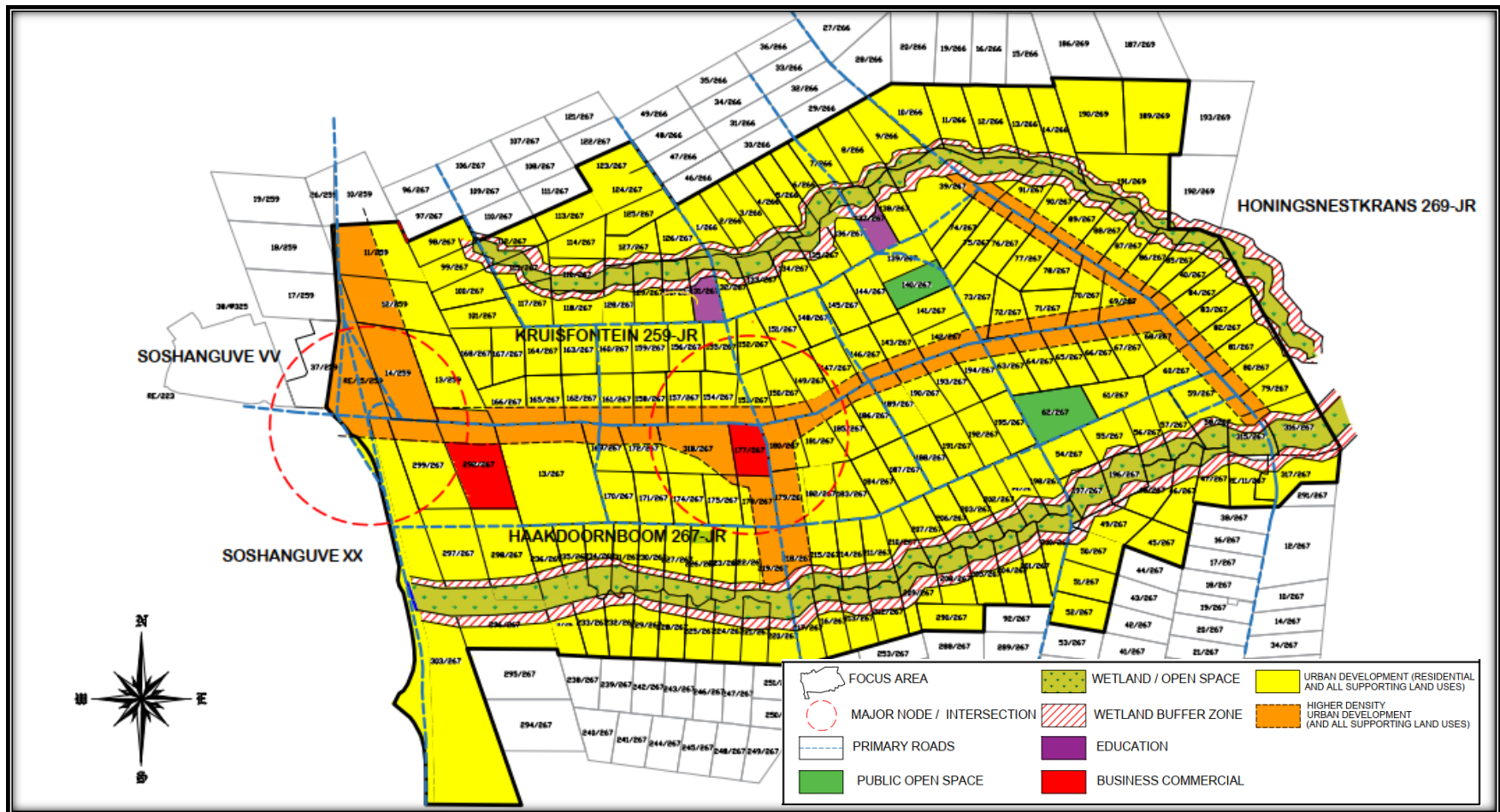


Figure 6: Side Development Plan of the study site.

## Red Data Analysis and Floral Assessment

South African National Biodiversity Institute (SANBI) RedList website was used to determine the conservation status of the species. This is done in order to conserve sensitive species and their immediate environment. The status is determined in Table 2 below.

Table 2: Red Data Status definitions (SANBI, 2010).

<b>p- protected Species</b>		
<b>M- Medicinal species</b>		
<b>EX</b>	<b>Extinct</b>	A taxon is Extinct when there is no reasonable doubt that the last individual has died. Taxa should be listed as extinct only once exhaustive surveys throughout the historic range have failed to record an individual.
<b>EW</b>	<b>Extinct in the Wild</b>	A taxon is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
<b>CR PE</b>	<b>Critically Endangered (Possibly Extinct)</b>	Critically Endangered (Possibly Extinct) taxa are those that are, on the balance of evidence, likely to be extinct, but for which there is a small chance that they may be extant. Hence, they should not be listed as Extinct until adequate surveys have failed to record the taxon.
<b>CR</b>	<b>Critically Endangered</b>	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the five IUCN criteria for Critically Endangered and is therefore facing an extremely high risk of extinction in the wild.
<b>EN</b>	<b>Endangered</b>	A taxon is Endangered when the best available evidence indicates that it meets any of the five IUCN criteria for Endangered and is therefore facing a very high risk of extinction in the wild.
<b>VU</b>	<b>Vulnerable</b>	A taxon is Vulnerable when the best available evidence indicates that it meets any of the five IUCN criteria for Vulnerable and is therefore facing a high risk of extinction in the wild.
<b>NT</b>	<b>Near Threatened</b>	A taxon is Near Threatened when available evidence indicates that it nearly meets any of the five IUCN criteria for Vulnerable and is therefore likely to qualify for a threatened category in the near future.
<b>CRITICALLY RARE</b>		A taxon is Critically Rare when it is known to occur only at a single site but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN criteria.

<b>RARE</b>		A taxon is Rare when it meets any of the four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN criteria.
<b>DECLINING</b>		A taxon is Declining when it does not meet any of the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline in the population.
<b>DDD</b>	<b>Data Deficient— Insufficient Information</b>	A taxon is DDD when there is inadequate information to make an assessment of its risk of extinction, but the taxon is well defined. Data Deficient is not a category of threat. However, listing of taxa in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
<b>LC</b>	<b>Least Concern</b>	A taxon is Least Concern when it has been evaluated against the five IUCN criteria and does not qualify for the categories Critically Endangered, Endangered, Vulnerable or Near Threatened, and it is not rare, and the population is not declining.

## **Ecological function**

Ecological function relates to the degree of ecological connectivity between systems within a landscape matrix. Therefore, systems with a high degree of landscape connectivity amongst one another are perceived to be more sensitive and will be those contributing to ecosystem service (for example wetlands) or overall preservation of biodiversity. Conservation importance relates to species diversity, endemism (unique species or unique processes) and the high occurrence of threatened and protected species or ecosystems protected by legislation.

## **Sensitivity scale**

- **High ecological function:** Sensitive ecosystems with either low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystems integrity for example pristine grasslands, pristine wetlands and pristine ridges.
- **Medium ecological function:** Relatively important ecosystems at gradients of intermediate disturbances. An area may be considered of medium ecological function if it is directly adjacent to sensitive/pristine ecosystem.
- **Low ecological function:** Degraded and highly disturbed systems with little or no ecological function.
- **No Go Areas:** Areas that have irreplaceable biodiversity or important ecosystem function values which may be lost permanently if these ecosystems are transformed, with a high potential of also affecting adjacent and/or downstream ecosystems negatively

## **Conservation status of the vegetation**

- **High conservation importance:** Ecosystems with high species richness which usually provide suitable habitat for several threatened species. Usually termed 'no-go' areas and unsuitable for development and should be conserved.
- **Medium conservation importance:** Ecosystems with intermediate levels of species diversity without any threatened species. Low-density development may be accommodated, provided the current species diversity is conserved.

- **Low conservation importance:** Areas with little or no conservation potential and usually species poor (most species are usually exotic).

***Cognizance was taken of the following environmental attributes and general information:***

- Regional and local vegetation
- Current status of habitats
- Red Data habitat suitability, and
- Digital photographs

***Phytosociological data accumulated include the following:***

- Plant species and growth forms
- Dominant plant species
- Cover abundance values, and
- Samples or digital images of unidentified plant species

The system ecological function is Low to Medium function.



## RESULTS

Biological diversity everywhere is at great risk as a direct result of an ever-expanding human population and its associated needs for energy, water, food and minerals. Landscape transformation that is needed to accommodate these activities inevitably leads to habitat loss and habitat fragmentation, resulting in the mosaical appearance of undisturbed habitat within a matrix of transformed areas. These remaining areas of natural habitat are frequently too small to support the biodiversity that previously occupied the area and the region loses its ecological integrity (Kamffer 2004).

The habitats within the proposed project sites have been disturbed and as a result they are categorized under **Low-Medium Sensitivity** and **Ecological Function**. Below are tables containing species recorded on site during the survey.

### Plants

Majority of the natural vegetation has been removed for agricultural activities. The riparian areas are invaded by woody species such as the *Vachellias*.

Table 3: Plant species observed at the study area.

Species	Common Name	Growth Form	IUCN Conservation Status
<i>Senegalia burkei</i>	Black Monkey Thorn	Tree	LC
<i>Combretum molle</i>	Velvet Bushwillow	Tree	LC
<i>Rhus lancea</i>	Karree	Tree	LC
<i>Dombeya rotundifolia</i>	Common Wild Pear	Tree	LC
<i>Peltophorum africanum</i>	Weeping Wattle	Tree	LC
<i>Vachellia sieberiana</i>	Paperbark Thorn	Tree	LC
<i>Vachellia karroo</i>	Sweet Thorn	Tree	LC
<i>Vangueria infausta</i>	Wild Medlar	Tree	
<i>Ziziphus mucronata</i>	Buffalo Thorn	Tree	LC
<i>Asparagus laricinus</i>	Bergkatbos	Shrub	LC
<i>Aloe greatheadii</i> var <i>davyana</i>	Spotted Aloe	Succulent	LC
<i>Setaria sphacelata</i>	Common Bristle Grass	Grass	LC
<i>Hyparrhenia hirta</i>	Common Thatching Grass	Grass	LC
<i>Aristida congesta</i>	Tassel Three-awn	Grass	LC
<i>Sporobolus pectinatus</i>	Kammetjiesgras	Grass	LC

<i>Themeda triandra</i>	Red Grass	Grass	LC
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Invasive alien plants are known to threaten three main components of the landscape: agricultural potential of the land, biodiversity value of the land, and water quality and quantity. Alien invasive plants impact water resources negatively by reducing surface water flow. Several studies have investigated the impact of these plants on water resources (see Blignaut et al. 2007). These studies concurred that invasive alien plants including forest plantations have a significant negative impact on stream flow. Le Maitre et al. (2016) reported that species such as *Acacia mearnsii* account for more than 30% of the total flow reductions, followed by pines (18.9%) and eucalyptus (15.0%). Eucalyptus also pose an increased fire risk.

Table 4: Weeds and invasive plant species observed at the study area.

Species	Common Name	Growth Form	Category (NEMBA)
<i>Melia azedarach</i>	Seringa	Tree	(Declared Category 1b) Category 3 in urban areas
<i>Lantana camara</i>	Lantana	Shrub	(Declared Category 1b)
<i>Pinus patula</i>	Patula Pine	Tree	(Declared Category 2)
<i>Jacaranda mimosifolia</i>	Jacaranda	Tree	(Declared Category 1b)
<i>Eucalyptus camaldulenis</i>	Red Gum	Tree	(Declared Category 1b)
<i>Cereus jamacaru</i>	Queen of the night	Succulent	(Declared Category 1)
<i>Agave sisalana</i>	Sisal Hemp	Succulent	(Declared Category 2)
<i>Opuntia ficus indica</i>	Sweet Prickly Pear	Succulent	(Declared Category 1)
<i>Ricinus communis</i>	Castor Oil Plant	Low Shrub	(Declared Category 2)
<i>Argemone mexicana</i>	Mexican Poppies	Herb	(Declared Category 1b)
<i>Datura ferox</i>	Large Thorn Apple	Herb	(Declared Category 1b)

## Birds

Birds are regarded as one of the most useful bioindicators, and they have been used extensively as models to determine ecosystem function (see review Koskimies 1989;

Potts et al. 2014; Bregman et al. 2016). Birds observed during the survey were mainly generalists that are not sensitive to habitat transformation.

Table 5: List of bird species observed at the study area

Species	Common Name	IUCN Conservation Status
<i>Bostrychia hagedash</i>	Hadedda Ibis	LC
<i>Threskiornis aethiopicus</i>	African Sacred Ibis	LC
<i>Corvus albus</i>	Pied Crow	LC
<i>Elanus caeruleus</i>	Black-shouldered Kite	LC
<i>Riparia cincta</i>	Banded Martin	LC
<i>Lagonosticta rubricata</i>	African Firefinch	LC
<i>Saxicola torquatus</i>	African Stonechat	LC
<i>Sigelus silens</i>	Fiscal Flycatcher	LC
<i>Uraeginthus angolensis</i>	Blue Waxbill	LC
<i>Vanellus armatus</i>	Blacksmith Lapwing	LC
<i>Cisticola fulvicapilla</i>	Neddicky	LC
<i>Lanius collaris</i>	Common Fiscal	LC
<i>Spilopelia senegalensis</i>	Laughing Dove	LC
<i>Corythaixoides concolor</i>	Grey Go-away Bird	LC
<i>Ploceus velatus</i>	Southern Masked Weaver	LC
<i>Vanellus coronatus</i>	Crowned Lapwing	LC
<i>Streptopelia capicola</i>	Cape Turtle Dove	LC
<i>Passer domesticus</i>	House Sparrow	LC
<i>Passer melanurus</i>	Cape Sparrow	LC

### Mammals

Local mammalian communities in Africa present the highest species richness in the world, only paralleled by some communities in the Oriental biogeographic region. Differences in mammalian species richness are especially outstanding when compared with South American communities, despite their similar latitudinal position and regional species richness. Recent study has shown that these differences are not only related to contemporary determinants but also to biogeographic-historic factors, which acted on the composition of the regional pool of species. One of the main differences in composition between the two regions relates to the high diversification of large mammals in Africa, which greatly contributes to the high values of local community richness in this region (Nieto et al. 2005). South Africa contains the majority of southern Africa's endemic mammals and hence is an important area for mammal conservation (Gelderblom & Bronner 1995). Very few mammal species were observed during the survey. This low diversity could be due to the presence of humans and clearance of vegetation.

Table 6: List of mammal species observed at the study area

Species	Common Name	IUCN Conservation Status
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC
<i>Galerella sanguinea</i>	Slender Mongoose	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC
<i>Rhabdomys pumilio</i>	Four Striped Grass Mouse	LC

## Reptiles

Herpetofauna are specialized in habitat requirements, are sensitive to habitat modification and face global extinction crises. While herpetofauna are important components of ecosystems they are little studied especially in human-modified landscapes. Herpetofauna do occur in human modified landscapes, so encouraging appropriate matrix land uses could contribute to their conservation.

Table 7: List of reptile species observed at the study area

Species	Common Name	IUCN Conservation Status
<i>Lamprophis capensis</i>	Brown House Snake	LC
<i>Bitis arietans arietans</i>	Puff Adder	LC
<i>Psammophylax tritaeniatus</i>	Striped Skaapsteker	LC

## The main impacts

- Local loss of plant species
- Loss of micro habitat
- Loss of foraging grounds
- Further introduction of alien species

## Impact Assessment methodology

To assess the significance of the identified impacts, the following characteristics of each potential impact will be identified:

- The severity (the disturbance of the impact);
- The extent (the spatial extent of the impact);
- The duration (the length of period);
- The probability (the likelihood of the impact occurring); and
- The significance (a synthesis of the above).

The impact rating process is designed to provide a numerical rating of the various environmental impacts identified for various project activities. The significance rating process follows the established impact/risk assessment formula:

$$\text{Significance} = \text{Consequence} \times \text{Probability}$$

$$\text{Where Consequence} = \text{Severity} + \text{Extent} + \text{Duration}$$

$$\text{And Probability} = \text{Likelihood of an impact occurring}$$

The matrix first calculates the rating out of 75 and then converts this into a percentage out of 100. The percentage is the figure quoted in the matrix. The weight assigned to the various parameters for positive and negative impacts in the formula is presented in Table 8 below.

Table 8: Impact Assessment Parameters.

Rating	Severity	Extent	Duration	Probability
5	Very significant impact/total destruction of a highly valued species, habitat or ecosystem or extremely positive impact over baseline environmental condition.	National/ International	Permanent/ Irreversible  (more than 50 years)	Certain/ Normally happens in cases of this nature (80-100% chance of happening)
4	Serious impairment of ecosystem function or very positive impact over baseline environmental condition.	Provincial/ Regional	Long Term (25 to 49 years or  Beyond closure)	Will more than likely Happen (60-79% chance)
3	Moderate negative alteration of ecosystem functioning or moderately positive impact over baseline environmental condition.	Regional (substantially beyond site boundary)	Medium Term (5-24 years)	Could happen and has happened here or elsewhere (40-59% chance)
2	Minor effects not affecting ecosystem functioning or Slightly positive impact over baseline environmental condition.	Local (beyond site boundary and affects neighbours)	Medium- Short Term (1-4 years)	Has not happened yet, but could happen (20-39% chance)

1	Insignificant effects on the biophysical environment or insignificantly positive impact over baseline environmental condition.	Site (does not extend beyond site boundary)	Short term (Less than a year)	Conceivable, but only in a set of very specific and extreme circumstances (0-19% chance)
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Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed for the Environmental Management Programme (EMPr). The significance of an impact is then determined and categorised into one of four categories, as indicated in Table 9.

Table 9: Significance threshold limits.

<b>Category</b>	<b>Description</b>	<b>Colour</b>
<i>High</i>	76%-100%	
<i>Medium – High</i>	51% - 75%	
<i>Low-Medium</i>	26% - 50%	
<i>Low</i>	0% - 25%	

## IMPACT SIGNIFICANCE

Table 10: Vegetation

<b>Parameter</b>	<b>Description (pre-mitigation)</b>	<b>Rating (pre-mitigation)</b>	<b>Description (post-mitigation)</b>	<b>Rating (post-mitigation)</b>
Duration	<i>Permanent</i>	6	<i>Permanent</i>	5
Extent	<i>Site</i>	1	<i>Site</i>	1
Severity	<i>Medium</i>	2	<i>Medium</i>	2
Probability	<i>Definite</i>	3	<i>Definite</i>	2
Significance	<i>Medium</i>	60%	<i>Low-Medium</i>	40%

Table 11: Birds

<b>Parameter</b>	<b>Description (pre- Mitigation)</b>	<b>Rating (Pre-Mitigation)</b>	<b>Description (post-mitigation)</b>	<b>Rating (post mitigation)</b>
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Duration	<i>Medium term</i>	3	<i>Short term</i>	2
Extent	<i>Site</i>	1	<i>Site</i>	1
Severity	<i>Medium</i>	2	<i>Low</i>	1
Probability	<i>Probable</i>	2	<i>Probable</i>	2
Significance	<i>Medium</i>	55%	<i>Low - Medium</i>	35%

Table 12: Mammals

<b>Parameter</b>	<b>Description (pre-Mitigation)</b>	<b>Rating (Pre-Mitigation)</b>	<b>Description (post-mitigation)</b>	<b>Rating (post mitigation)</b>
<i>Duration</i>	<i>Long term</i>	4	<i>Medium term</i>	3
<i>Extent</i>	<i>Site</i>	1	<i>Site</i>	1
<i>Severity</i>	<i>Medium</i>	2	<i>Low</i>	1
<i>Probability</i>	<i>Possible</i>	1	<i>Possible</i>	1
<i>Significance</i>	<i>Medium</i>	55%	<i>Low - Medium</i>	30%

Table 13: Reptiles and Amphibians

<b>Parameter</b>	<b>Description (pre-Mitigation)</b>	<b>Rating (Pre-Mitigation)</b>	<b>Description (post-mitigation)</b>	<b>Rating (post mitigation)</b>
<i>Duration</i>	<i>Medium term</i>	3	<i>Short term</i>	2
<i>Extent</i>	<i>Site</i>	1	<i>Site</i>	1
<i>Severity</i>	<i>Medium</i>	2	<i>Low</i>	1
<i>Probability</i>	<i>Probable</i>	1	<i>Probable</i>	1
<i>Significance</i>	<i>Medium</i>	50%	<i>Low-Medium</i>	40%

Table 14: General impacts and mitigations for the entire site.

Impact Description	Impact significance before mitigations	Recommendations and mitigations	Impact(s) significance after mitigations	Score
Vegetation clearance	High	Sparsely vegetated areas should be cleared first, with densely vegetated areas being cleared last. All vegetation not required to be removed should be protected against damage.	Medium	4
Animals and birds displacement	Medium	No animal may be hunted, trapped, snared or captured for any purpose whatsoever.  Speed of vehicles should be limited to allow for sufficient safety margins.	Low	2
Permanent disruption of ecological corridors and migration routes linking different ecosystems/habitat or across altitudinal gradients	Medium	Wherever possible, roads and tracks should be constructed so as to run along the contour.	Low	2
Possible introduction of alien species due to increased human related activities	Medium	Avoid translocating stockpiles of topsoil from one place to another in order to avoid translocating soil seed banks of alien species.  Any extensive cleared areas that are no longer or not required for construction activities should be re-seeded with locally sourced seed of suitable species. Bare areas can also be packed with brush removed from other parts of the site to encourage natural vegetation regeneration and limit erosion.  Invasive Alien Plant eradication and control program should be developed.	Low	2
<b>Total</b>				<b>10</b>



## RECOMMENDATIONS AND CONCLUSIONS

- The proposed township establishment and associated infrastructures will result in extensive vegetation clearance. There will also be an increase in human presence, which is likely to result in displacement of wildlife. Possible impacts to the receiving environment have been identified as being medium to low.
- Presence of several invasive alien species is of a major concern and requires intervention.
- Recommendations below will further help to lower the said impacts.

### *Recommendations:*

- No construction material should be dumped on site.
- No collection of firewood, protected species or medicinal floral species must be allowed by construction personnel.
- No painting or marking of vegetation to identify locality or other information shall be allowed, as it will disfigure the natural setting. Marking shall be done by steel stakes with tags, if required.
- Avoid translocating topsoil stockpiles from one place to another or importing topsoil from other sources that may contain alien plant propagules.
- A qualified ecologist should develop an invasive alien plant eradication and control program.
- Only necessary damage must be caused: for example, unnecessary driving around in the veld should not take place.
- Disturbance of the vegetation will not result in a net loss of species within this area.
- It is imperative that the mitigation measures outlined in this report are implemented during operational phases.

## REHABILITATION

The traditional definition of rehabilitation aims at returning the land in a given area to some degree of its former state after a particular process has resulted in its damage.

Rehabilitation requires that there is an attempt to imitate natural processes and reinstate natural ecological driving forces in such a way that it aids the recovery (or maintenance) of dynamic systems so that, although they are unlikely to be identical to their natural counterparts, they will be comparable in critical ways so as to function similarly (Jordan et al.1987). Rehabilitation should be based on an understanding of both the ecological starting point and on a defined goal endpoint and should accept that it is not possible to predict exactly how the wetland is likely to respond to the rehabilitation interventions.

Rehabilitation should be based on an understanding of both the ecological starting point and on a defined goal endpoint and should accept that it is not possible to predict exactly how the environment is likely to respond to the rehabilitation interventions. A rehabilitation plan should be compiled and implemented. This should be done using indigenous vegetation.

## **CONCLUSION**

- Ecological assessment revealed that the proposed township establishment will be located on habitats that have already been modified. As a result, the proposed development does not pose any high risk to the vegetation on site.
- It is therefore the opinion of the biodiversity specialist that the proposed township establishment be favourably considered. However, it is important that the mitigations and recommendations provided by this study are adhered to.

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## APPENDIX

### Appendix A: Site photos

Sisal hemp



Seringa



Gum trees on the northern portions



Lantana camara



Prickly Pear



Queen of the night



Lucern plantation



Spotted Aloe



Wetland on the Kaalplaasspruit



Flock of Egyptian Goose



Large Thorn Apple



Wild Medlar



Common Wild Pear



Velvet Bushwillow



## Appendix B: Sabap 2 species list

No	Common group	Common species	Genus	Species
1	Apalis	Bar-throated	<i>Apalis</i>	<i>thoracica</i>
2	Avocet	Pied	<i>Recurvirostra</i>	<i>avosetta</i>
3	Babbler	Arrow-marked	<i>Turdoides</i>	<i>jardineii</i>
4	Barbet	Acacia Pied	<i>Tricholaema</i>	<i>leucomelas</i>
5	Barbet	Black-collared	<i>Lybius</i>	<i>torquatus</i>
6	Barbet	Crested	<i>Trachyphonus</i>	<i>vaillantii</i>
7	Batis	Chinspot	<i>Batis</i>	<i>molitor</i>
8	Bee-eater	European	<i>Merops</i>	<i>apiaster</i>
9	Bee-eater	White-fronted	<i>Merops</i>	<i>bullockoides</i>
10	Bishop	Southern Red	<i>Euplectes</i>	<i>orix</i>
11	Bishop	Yellow	<i>Euplectes</i>	<i>capensis</i>
12	Bishop	Yellow-crowned	<i>Euplectes</i>	<i>afer</i>
13	Bittern	Little	<i>Ixobrychus</i>	<i>minutus</i>
14	Bokmakierie	Bokmakierie	<i>Telophorus</i>	<i>zeylonus</i>
15	Boubou	Southern	<i>Laniarius</i>	<i>ferrugineus</i>
16	Brubru	Brubru	<i>Nilaus</i>	<i>afer</i>
17	Bulbul	Dark-capped	<i>Pycnonotus</i>	<i>tricolor</i>
18	Bunting	Cinnamon-breasted	<i>Emberiza</i>	<i>tahapisi</i>
19	Bush-shrike	Grey-headed	<i>Malaconotus</i>	<i>blanchoti</i>
20	Bush-shrike	Orange-breasted	<i>Telophorus</i>	<i>sulfureopectus</i>

No	Common group	Common species	Genus	Species
21	Buzzard	Steppe	<i>Buteo</i>	<i>vulpinus</i>
22	Camaroptera	Grey-backed	<i>Camaroptera</i>	<i>brevicaudata</i>
23	Canary	Black-throated	<i>Crithagra</i>	<i>atrogularis</i>
24	Canary	Yellow	<i>Crithagra</i>	<i>flaviventris</i>
25	Canary	Yellow-fronted	<i>Crithagra</i>	<i>mozambicus</i>
26	Chat	Familiar	<i>Cercomela</i>	<i>familiaris</i>
27	Cisticola	Desert	<i>Cisticola</i>	<i>aridulus</i>
28	Cisticola	Lazy	<i>Cisticola</i>	<i>aberrans</i>
29	Cisticola	Levaillant's	<i>Cisticola</i>	<i>tinniens</i>
30	Cisticola	Rattling	<i>Cisticola</i>	<i>chiniana</i>
31	Cisticola	Zitting	<i>Cisticola</i>	<i>juncidis</i>
32	Cliff-chat	Mocking	<i>Thamnolaea</i>	<i>cinnamomeiventris</i>
33	Cliff-swallow	South African	<i>Hirundo</i>	<i>spilodera</i>
34	Coot	Red-knobbed	<i>Fulica</i>	<i>cristata</i>
35	Cormorant	Reed	<i>Phalacrocorax</i>	<i>africanus</i>
36	Cormorant	White-breasted	<i>Phalacrocorax</i>	<i>carbo</i>
37	Coucal	Burchell's	<i>Centropus</i>	<i>burchellii</i>
38	Crake	Black	<i>Amaurornis</i>	<i>flavirostris</i>
39	Crombec	Long-billed	<i>Sylvietta</i>	<i>rufescens</i>
40	Crow	Pied	<i>Corvus</i>	<i>albus</i>
41	Cuckoo	Black	<i>Cuculus</i>	<i>clamosus</i>
42	Cuckoo	Diderick	<i>Chrysococcyx</i>	<i>caprius</i>



No	Common group	Common species	Genus	Species
43	Cuckoo	Klaas's	<i>Chrysococcyx</i>	<i>klaas</i>
44	Cuckoo	Levaillant's	<i>Clamator</i>	<i>levaillantii</i>
45	Cuckoo	Red-chested	<i>Cuculus</i>	<i>solitarius</i>
46	Cuckoo-shrike	Black	<i>Campephaga</i>	<i>flava</i>
47	Darter	African	<i>Anhinga</i>	<i>rufa</i>
48	Dove	Laughing	<i>Streptopelia</i>	<i>senegalensis</i>
49	Dove	Namaqua	<i>Oena</i>	<i>capensis</i>
50	Dove	Red-eyed	<i>Streptopelia</i>	<i>semitorquata</i>
51	Dove	Rock	<i>Columba</i>	<i>livia</i>
52	Drongo	Fork-tailed	<i>Dicrurus</i>	<i>adsimilis</i>
53	Duck	African Black	<i>Anas</i>	<i>sparsa</i>
54	Duck	Fulvous	<i>Dendrocygna</i>	<i>bicolor</i>
55	Duck	Knob-billed	<i>Sarkidiornis</i>	<i>melanotos</i>
56	Duck	Mallard	<i>Anas</i>	<i>platyrhynchos</i>
57	Duck	White-backed	<i>Thalassornis</i>	<i>leuconotus</i>
58	Duck	White-faced	<i>Dendrocygna</i>	<i>viduata</i>
59	Duck	Yellow-billed	<i>Anas</i>	<i>undulata</i>
60	Eagle	Long-crested	<i>Lophaetus</i>	<i>occipitalis</i>
61	Eagle	Verreaux's	<i>Aquila</i>	<i>verreauxii</i>
62	Egret	Cattle	<i>Bubulcus</i>	<i>ibis</i>
63	Egret	Great	<i>Egretta</i>	<i>alba</i>
64	Egret	Little	<i>Egretta</i>	<i>garzetta</i>

No	Common group	Common species	Genus	Species
65	Egret	Yellow-billed	<i>Egretta</i>	<i>intermedia</i>
66	Eremomela	Burnt-necked	<i>Eremomela</i>	<i>usticollis</i>
67	Eremomela	Yellow-bellied	<i>Eremomela</i>	<i>icteropygialis</i>
68	Falcon	Amur	<i>Falco</i>	<i>amurensis</i>
69	Falcon	Lanner	<i>Falco</i>	<i>biarmicus</i>
70	Finch	Cut-throat	<i>Amadina</i>	<i>fasciata</i>
71	Finch	Red-headed	<i>Amadina</i>	<i>erythrocephala</i>
72	Finch	Scaly-feathered	<i>Sporopipes</i>	<i>squamifrons</i>
73	Firefinch	Jameson's	<i>Lagonosticta</i>	<i>rhodopareia</i>
74	Firefinch	Red-billed	<i>Lagonosticta</i>	<i>senegala</i>
75	Fiscal	Common (Southern)	<i>Lanius</i>	<i>collaris</i>
76	Fish-eagle	African	<i>Haliaeetus</i>	<i>vocifer</i>
77	Flycatcher	Fiscal	<i>Sigelus</i>	<i>silens</i>
78	Flycatcher	Marico	<i>Bradornis</i>	<i>mariquensis</i>
79	Flycatcher	Southern Black	<i>Melaenornis</i>	<i>pammelaina</i>
80	Flycatcher	Spotted	<i>Muscicapa</i>	<i>striata</i>
81	Francolin	Coqui	<i>Peliperdix</i>	<i>coqui</i>
82	Francolin	Crested	<i>Dendroperdix</i>	<i>sephaena</i>
83	Go-away-bird	Grey	<i>Corythaixoides</i>	<i>concolor</i>
84	Goose	Domestic	<i>Anser</i>	<i>anser</i>
85	Goose	Egyptian	<i>Alopochen</i>	<i>aegyptiacus</i>
86	Goose	Spur-winged	<i>Plectropterus</i>	<i>gambensis</i>

No	Common group	Common species	Genus	Species
87	Goshawk	Gabar	<i>Melierax</i>	<i>gabar</i>
88	Grebe	Great Crested	<i>Podiceps</i>	<i>cristatus</i>
89	Grebe	Little	<i>Tachybaptus</i>	<i>ruficollis</i>
90	Green-pigeon	African	<i>Treron</i>	<i>calvus</i>
91	Guineafowl	Helmeted	<i>Numida</i>	<i>meleagris</i>
92	Gull	Grey-headed	<i>Larus</i>	<i>cirrocephalus</i>
93	Hamerkop	Hamerkop	<i>Scopus</i>	<i>umbretta</i>
94	Harrier-Hawk	African	<i>Polyboroides</i>	<i>typus</i>
95	Hawk	African Cuckoo	<i>Aviceda</i>	<i>cuculoides</i>
96	Heron	Black	<i>Egretta</i>	<i>ardesiaca</i>
97	Heron	Black-headed	<i>Ardea</i>	<i>melanocephala</i>
98	Heron	Goliath	<i>Ardea</i>	<i>goliath</i>
99	Heron	Green-backed	<i>Butorides</i>	<i>striata</i>
100	Heron	Grey	<i>Ardea</i>	<i>cinerea</i>
101	Heron	Purple	<i>Ardea</i>	<i>purpurea</i>
102	Heron	Squacco	<i>Ardeola</i>	<i>ralloides</i>
103	Honeybird	Brown-backed	<i>Prodotiscus</i>	<i>regulus</i>
104	Honeyguide	Greater	<i>Indicator</i>	<i>indicator</i>
105	Honeyguide	Lesser	<i>Indicator</i>	<i>minor</i>
106	Hoopoe	African	<i>Upupa</i>	<i>africana</i>
107	Hornbill	African Grey	<i>Tockus</i>	<i>nasutus</i>
108	Hornbill	Southern Yellow-billed	<i>Tockus</i>	<i>leucomelas</i>

No	Common group	Common species	Genus	Species
109	House-martin	Common	<i>Delichon</i>	<i>urbicum</i>
110	Ibis	African Sacred	<i>Threskiornis</i>	<i>aethiopicus</i>
111	Ibis	Glossy	<i>Plegadis</i>	<i>falcinellus</i>
112	Ibis	Hadedda	<i>Bostrychia</i>	<i>hagedash</i>
113	Indigobird	Village	<i>Vidua</i>	<i>chalybeata</i>
114	Jacana	African	<i>Actophilornis</i>	<i>africanus</i>
115	Kingfisher	Brown-hooded	<i>Halcyon</i>	<i>albiventris</i>
116	Kingfisher	Giant	<i>Megaceryle</i>	<i>maximus</i>
117	Kingfisher	Malachite	<i>Alcedo</i>	<i>cristata</i>
118	Kingfisher	Pied	<i>Ceryle</i>	<i>rudis</i>
119	Kingfisher	Woodland	<i>Halcyon</i>	<i>senegalensis</i>
120	Kite	Black-shouldered	<i>Elanus</i>	<i>caeruleus</i>
121	Kite	Yellow-billed	<i>Milvus</i>	<i>aegyptius</i>
122	Korhaan	Northern Black	<i>Afrotis</i>	<i>afraoides</i>
123	Lapwing	African Wattled	<i>Vanellus</i>	<i>senegallus</i>
124	Lapwing	Blacksmith	<i>Vanellus</i>	<i>armatus</i>
125	Lapwing	Crowned	<i>Vanellus</i>	<i>coronatus</i>
126	Lark	Eastern Clapper	<i>Mirafr</i>	<i>fasciolata</i>
127	Lark	Rufous-naped	<i>Mirafr</i>	<i>africana</i>
128	Lark	Sabota	<i>Calendulauda</i>	<i>sabota</i>
129	Longclaw	Cape	<i>Macronyx</i>	<i>capensis</i>
130	Mannikin	Bronze	<i>Spermestes</i>	<i>cucullatus</i>

No	Common group	Common species	Genus	Species
131	Martin	Banded	<i>Riparia</i>	<i>cincta</i>
132	Martin	Brown-throated	<i>Riparia</i>	<i>paludicola</i>
133	Martin	Rock	<i>Hirundo</i>	<i>fuligula</i>
134	Masked-weaver	Lesser	<i>Ploceus</i>	<i>intermedius</i>
135	Masked-weaver	Southern	<i>Ploceus</i>	<i>velatus</i>
136	Moorhen	Common	<i>Gallinula</i>	<i>chloropus</i>
137	Mousebird	Red-faced	<i>Urocolius</i>	<i>indicus</i>
138	Mousebird	Speckled	<i>Colius</i>	<i>striatus</i>
139	Myna	Common	<i>Acridotheres</i>	<i>tristis</i>
140	Neddicky	Neddicky	<i>Cisticola</i>	<i>fulvicapilla</i>
141	Night-Heron	Black-crowned	<i>Nycticorax</i>	<i>nycticorax</i>
142	Nightjar	Fiery-necked	<i>Caprimulgus</i>	<i>pectoralis</i>
143	Oriole	Black-headed	<i>Oriolus</i>	<i>larvatus</i>
144	Ostrich	Common	<i>Struthio</i>	<i>camelus</i>
145	Owl	Barn	<i>Tyto</i>	<i>alba</i>
146	Owlet	Pearl-spotted	<i>Glaucidium</i>	<i>perlatum</i>
147	Palm-swift	African	<i>Cypsiurus</i>	<i>parvus</i>
148	Paradise-flycatcher	African	<i>Terpsiphone</i>	<i>viridis</i>
149	Paradise-whydah	Long-tailed	<i>Vidua</i>	<i>paradisaea</i>
150	Parakeet	Rose-ringed	<i>Psittacula</i>	<i>krameri</i>
151	Peacock	Common	<i>Pavo</i>	<i>cristatus</i>
152	Petronia	Yellow-throated	<i>Petronia</i>	<i>superciliaris</i>

No	Common group	Common species	Genus	Species
153	Pigeon	Speckled	<i>Columba</i>	<i>guinea</i>
154	Pipit	African	<i>Anthus</i>	<i>cinnamomeus</i>
155	Pipit	Nicholson's	<i>Anthus</i>	<i>nicholsoni</i>
156	Plover	Three-banded	<i>Charadrius</i>	<i>tricoloris</i>
157	Pochard	Southern	<i>Netta</i>	<i>erythrophthalma</i>
158	Prinia	Black-chested	<i>Prinia</i>	<i>flavicans</i>
159	Prinia	Tawny-flanked	<i>Prinia</i>	<i>subflava</i>
160	Puffback	Black-backed	<i>Dryoscopus</i>	<i>cubla</i>
161	Pytilia	Green-winged	<i>Pytilia</i>	<i>melba</i>
162	Quailfinch	African	<i>Ortygospiza</i>	<i>atricollis</i>
163	Quelea	Red-billed	<i>Quelea</i>	<i>quelea</i>
164	Rail	African	<i>Rallus</i>	<i>caerulescens</i>
165	Reed-warbler	African	<i>Acrocephalus</i>	<i>baeticatus</i>
166	Reed-warbler	Great	<i>Acrocephalus</i>	<i>arundinaceus</i>
167	Robin-chat	Cape	<i>Cossypha</i>	<i>caffra</i>
168	Robin-chat	White-throated	<i>Cossypha</i>	<i>humeralis</i>
169	Roller	Lilac-breasted	<i>Coracias</i>	<i>caudatus</i>
170	Ruff	Ruff	<i>Philomachus</i>	<i>pugnax</i>
171	Rush-warbler	Little	<i>Bradypterus</i>	<i>baboecala</i>
172	Sandpiper	Common	<i>Actitis</i>	<i>hypoleucos</i>
173	Sandpiper	Wood	<i>Tringa</i>	<i>glareola</i>
174	Scops-owl	Southern White-faced	<i>Ptilopsis</i>	<i>granti</i>

No	Common group	Common species	Genus	Species
175	Scrub-robin	Kalahari	<i>Cercotrichas</i>	<i>paena</i>
176	Scrub-robin	White-browed	<i>Cercotrichas</i>	<i>leucophrys</i>
177	Seedeater	Streaky-headed	<i>Crithagra</i>	<i>gularis</i>
178	Shelduck	South African	<i>Tadorna</i>	<i>cana</i>
179	Shoveler	Cape	<i>Anas</i>	<i>smithii</i>
180	Shrike	Crimson-breasted	<i>Laniarius</i>	<i>atrococcineus</i>
181	Shrike	Lesser Grey	<i>Lanius</i>	<i>minor</i>
182	Shrike	Magpie	<i>Urolestes</i>	<i>melanoleucus</i>
183	Shrike	Red-backed	<i>Lanius</i>	<i>collurio</i>
184	Shrike	Southern White-crowned	<i>Eurocephalus</i>	<i>anguitimens</i>
185	Snake-eagle	Black-chested	<i>Circaetus</i>	<i>pectoralis</i>
186	Snipe	African	<i>Gallinago</i>	<i>nigripennis</i>
187	Sparrow	Cape	<i>Passer</i>	<i>melanurus</i>
188	Sparrow	Great	<i>Passer</i>	<i>motitensis</i>
189	Sparrow	House	<i>Passer</i>	<i>domesticus</i>
190	Sparrow	Southern Grey-headed	<i>Passer</i>	<i>diffusus</i>
191	Sparrow-weaver	White-browed	<i>Plocepasser</i>	<i>mahali</i>
192	Sparrowhawk	Little	<i>Accipiter</i>	<i>minullus</i>
193	Sparrowhawk	Ovambo	<i>Accipiter</i>	<i>ovampensis</i>
194	Spoonbill	African	<i>Platalea</i>	<i>alba</i>
195	Spurfowl	Natal	<i>Pternistis</i>	<i>natalensis</i>
196	Spurfowl	Swainson's	<i>Pternistis</i>	<i>swainsonii</i>

No	Common group	Common species	Genus	Species
197	Starling	Cape Glossy	<i>Lamprotornis</i>	<i>nitens</i>
198	Starling	Pied	<i>Spreo</i>	<i>bicolor</i>
199	Starling	Red-winged	<i>Onychognathus</i>	<i>morio</i>
200	Starling	Wattled	<i>Creatophora</i>	<i>cinerea</i>
201	Stilt	Black-winged	<i>Himantopus</i>	<i>himantopus</i>
202	Stint	Little	<i>Calidris</i>	<i>minuta</i>
203	Stonechat	African	<i>Saxicola</i>	<i>torquatus</i>
204	Stork	Abdim's	<i>Ciconia</i>	<i>abdimii</i>
205	Stork	White	<i>Ciconia</i>	<i>ciconia</i>
206	Stork	Yellow-billed	<i>Mycteria</i>	<i>ibis</i>
207	Sunbird	Amethyst	<i>Chalcomitra</i>	<i>amethystina</i>
208	Sunbird	Marico	<i>Cinnyris</i>	<i>mariquensis</i>
209	Sunbird	White-bellied	<i>Cinnyris</i>	<i>talatala</i>
210	Swallow	Barn	<i>Hirundo</i>	<i>rustica</i>
211	Swallow	Greater Striped	<i>Hirundo</i>	<i>cucullata</i>
212	Swallow	Lesser Striped	<i>Hirundo</i>	<i>abyssinica</i>
213	Swallow	Pearl-breasted	<i>Hirundo</i>	<i>dimidiata</i>
214	Swallow	Red-breasted	<i>Hirundo</i>	<i>semirufa</i>
215	Swallow	White-throated	<i>Hirundo</i>	<i>albigularis</i>
216	Swamp-warbler	Lesser	<i>Acrocephalus</i>	<i>gracilirostris</i>
217	Swamphen	African Purple	<i>Porphyrio</i>	<i>madagascariensis</i>
218	Swift	African Black	<i>Apus</i>	<i>barbatus</i>



No	Common group	Common species	Genus	Species
219	Swift	Little	<i>Apus</i>	<i>affinis</i>
220	Swift	White-rumped	<i>Apus</i>	<i>caffer</i>
221	Tchagra	Black-crowned	<i>Tchagra</i>	<i>senegalus</i>
222	Tchagra	Brown-crowned	<i>Tchagra</i>	<i>australis</i>
223	Teal	Hottentot	<i>Anas</i>	<i>hottentota</i>
224	Teal	Red-billed	<i>Anas</i>	<i>erythrorhyncha</i>
225	Tern	Whiskered	<i>Chlidonias</i>	<i>hybrida</i>
226	Tern	White-winged	<i>Chlidonias</i>	<i>leucopterus</i>
227	Thick-knee	Spotted	<i>Burhinus</i>	<i>capensis</i>
228	Thrush	Groundscraper	<i>Psophocichla</i>	<i>litsipsirupa</i>
229	Thrush	Karoo	<i>Turdus</i>	<i>smithi</i>
230	Thrush	Kurrichane	<i>Turdus</i>	<i>libonyanus</i>
231	Tinkerbird	Yellow-fronted	<i>Pogoniulus</i>	<i>chrysoconus</i>
232	Tit	Southern Black	<i>Parus</i>	<i>niger</i>
233	Tit-babbler	Chestnut-vented	<i>Parisoma</i>	<i>subcaeruleum</i>
234	Turtle-dove	Cape	<i>Streptopelia</i>	<i>capicola</i>
235	Vulture	Cape	<i>Gyps</i>	<i>coprotheres</i>
236	Wagtail	Cape	<i>Motacilla</i>	<i>capensis</i>
237	Warbler	Marsh	<i>Acrocephalus</i>	<i>palustris</i>
238	Warbler	Willow	<i>Phylloscopus</i>	<i>trochilus</i>
239	Waxbill	Blue	<i>Uraeginthus</i>	<i>angolensis</i>
240	Waxbill	Common	<i>Estrilda</i>	<i>astrild</i>

No	Common group	Common species	Genus	Species
241	Waxbill	Orange-breasted	<i>Amandava</i>	<i>subflava</i>
242	Waxbill	Violet-eared	<i>Granatina</i>	<i>granatina</i>
243	Weaver	Cape	<i>Ploceus</i>	<i>capensis</i>
244	Weaver	Thick-billed	<i>Amblyospiza</i>	<i>albifrons</i>
245	Weaver	Village	<i>Ploceus</i>	<i>cucullatus</i>
246	Wheatear	Mountain	<i>Oenanthe</i>	<i>monticola</i>
247	White-eye	Cape	<i>Zosterops</i>	<i>virens</i>
248	Whydah	Pin-tailed	<i>Vidua</i>	<i>macroura</i>
249	Whydah	Shaft-tailed	<i>Vidua</i>	<i>regia</i>
250	Widowbird	Red-collared	<i>Euplectes</i>	<i>ardens</i>
251	Widowbird	White-winged	<i>Euplectes</i>	<i>albonotatus</i>
252	Wood-hoopoe	Green	<i>Phoeniculus</i>	<i>purpureus</i>
253	Woodpecker	Bennett's	<i>Campethera</i>	<i>bennettii</i>
254	Woodpecker	Cardinal	<i>Dendropicos</i>	<i>fuscescens</i>
255	Woodpecker	Golden-tailed	<i>Campethera</i>	<i>abingoni</i>
256	Wren-warbler	Barred	<i>Calamonastes</i>	<i>fasciolatus</i>
257	Wryneck	Red-throated	<i>Jynx</i>	<i>ruficollis</i>

Appendix C: Mammal list (based on known historical distribution data). Enviross CC, 2016.

Common species	Scientific name	IUCN Conservation Status
Impala	<i>Aepyceros melampus</i>	LC

Red Hartebeest	<i>Alcelaphus buselaphus</i>	LC
Springbok	<i>Antidorcas marsupialis</i>	LC
White Rhinoceros	<i>Ceratotherium simum</i>	LC
Black Wildebeest	<i>Connochaetes gnou</i>	LC
Blue Wildebeest	<i>Connochaetes taurinus taurinus</i>	LC
Tsessebe	<i>Damaliscus lunatus lunatus</i>	EN
Blesbok	<i>Damaliscus pygargus phillipsi</i>	LC
Plains Zebra	<i>Equus burchellii</i>	LC
Sable Antelope	<i>Hippotragus niger niger</i>	VU
Klipspringer	<i>Oreotragus oreotragus</i>	LC
Oribi	<i>Ourebia ourebi</i>	EN
Grey Rhebok	<i>Pelea capreolus</i>	LC
Warthog	<i>Phacochoerus africanus</i>	LC
Steenbok	<i>Raphicerus campestris</i>	LC
Reedbuck	<i>Redunca arundinum</i>	LC
Mountain Reedbuck	<i>Redunca fulvorufula</i>	LC
Common Duiker	<i>Sylvicapra grimmia</i>	LC
Eland	<i>Taurotragus oryx</i>	LC
Nyala	<i>Tragelaphus angasii</i>	LC
Bushbuck	<i>Tragelaphus scriptus</i>	LC
Kudu	<i>Tragelaphus strepsiceros</i>	LC
Rock Hyrax	<i>Procavia capensis</i>	LC
Cape Clawless Otter	<i>Aonyx capensis</i>	LC
Water Mongoose	<i>Atilax paludinosus</i>	LC
Black-backed Jackal	<i>Canis mesomelas</i>	LC
Caracal	<i>Caracal caracal</i>	LC

Yellow Mongoose	<i>Cynictis penicillata</i>	LC
Black-footed Cat	<i>Felis nigripes</i>	VU
African Wild Cat	<i>Felis silvestris</i>	LC
Slender Mongoose	<i>Galerella sanguinea</i>	LC
Small-spotted Genet	<i>Genetta genetta</i>	LC
Large-spotted Genet	<i>Genetta tigrina</i>	LC
Dwarf Mongoose	<i>Helogale parvula</i>	LC
Brown Hyaena	<i>Hyaena brunnea</i>	NT
White-tailed Mongoose	<i>Ichneumia albicauda</i>	LC
Striped Polecat	<i>Ictonyx striatus</i>	LC
Serval	<i>Leptailurus serval</i>	NT
Spotted-necked Otter	<i>Lutra maculicollis</i>	NT
African Wild Dog	<i>Lycaon pictus</i>	EN
Honey Badger	<i>Mellivora capensis</i>	NT
Banded Mongoose	<i>Mungos mungo</i>	LC
Leopard	<i>Panthera pardus</i>	LC
African Weasel	<i>Poecilogale albinucha</i>	DD
Aardwolf	<i>Proteles cristatus</i>	LC
Suricate	<i>Suricata suricatta</i>	LC
Cape Fox	<i>Vulpes chama</i>	LC
Short-eared Trident Bat	<i>Cloeotis percivali</i>	CE
Wahlberg's Epauletted Fruit Bat	<i>Epomophorus wahlbergi</i>	LC
Schreibers' Long-fingered Bat	<i>Miniopterus schreibersii</i>	NT
Temminck's Hairy Bat	<i>Myotis tricolor</i>	NT
Welwitsch's Hairy Bat	<i>Myotis welwitschii</i>	NT

Cape Serotine Bat	<i>Neoromicia capensis</i>	LC
Egyptian Slit-faced Bat	<i>Nycteris thebaica</i>	LC
Rusty Bat	<i>Pipistrellus rusticus</i>	NT
Peak-saddle Horseshoe Bat	<i>Rhinolophus blasii</i>	VU
Geoffroy's Horseshoe Bat	<i>Rhinolophus clivosus</i>	NT
Darling's Horseshoe Bat	<i>Rhinolophus darlingi</i>	NT
Bushveld Horseshoe Bat	<i>Rhinolophus simulator</i>	LC
Flat-headed Free-tail Bat	<i>Sauromys petrophilus</i>	LC
Yellow House Bat	<i>Scotophilus dinganii</i>	LC
Lesser Yellow House Bat	<i>Scotophilus viridis</i>	LC
Egyptian Free-tailed Bat	<i>Tadarida aegyptiaca</i>	LC
Mauritian Tomb Bat	<i>Taphozous mauritanus</i>	LC
South African Hedgehog	<i>Atelerix frontalis</i>	NT
Rough-haired Golden Mole	<i>Chrysospalax villosus subsp rufopallidus</i>	CE
Reddish-grey Musk Shrew	<i>Crocidura cyanea</i>	DD
Tiny Musk Shrew	<i>Crocidura fuscomurina</i>	DD
Lesser Red Musk Shrew	<i>Crocidura hirta</i>	DD
Maquassie Musk Shrew	<i>Crocidura maquassiensis</i>	VU
Swamp Musk Shrew	<i>Crocidura mariquensis</i>	DD
Lesser Grey-brown Musk Shrew	<i>Crocidura silacea</i>	DD
Forest Shrew	<i>Myosorex varius</i>	DD
Juliana's Golden Mole	<i>Neamblysomus julianae</i>	VU
Juliana's Golden Mole	<i>Neamblysomus julianae (Pretoria subpopulation)</i>	CE

Least Dwarf Shrew	<i>Suncus infinitesimus</i>	DD
Lesser Dwarf Shrew	<i>Suncus varilla</i>	DD
Scrub / Savannah Hare	<i>Lepus saxatilis</i>	LC
Jameson's Red Rock Rabbit	<i>Pronolagus randensis</i>	LC
Vervet Monkey	<i>Cercopithecus aethiops pygerythrus</i>	LC
Southern Lesser Galago	<i>Galago moholi</i>	LC
Chacma Baboon	<i>Papio ursinus</i>	LC
Tete Veld Rat	<i>Aethomys ineptus</i>	LC
Namaqua Rock Mouse	<i>Aethomys namaquensis</i>	LC
Common Mole-rat	<i>Cryptomys hottentotus</i>	LC
Water Rat	<i>Dasymys incomtus</i>	NT
Grey Climbing Mouse	<i>Dendromus melanotis</i>	LC
Chestnut Climbing Mouse	<i>Dendromus mystacalis</i>	LC
Woodland Dormouse	<i>Graphiurus murinus</i>	LC
Rock Dormouse	<i>Graphiurus platyops</i>	DD
Porcupine	<i>Hystrix africaeaustralis</i>	LC
Single-striped Mouse	<i>Lemniscomys rosalia</i>	DD
Multimammate Mouse	<i>Mastomys coucha</i>	LC
Natal Multimammate Mouse	<i>Mastomys natalensis</i>	LC
White-tailed Rat	<i>Mystromys albicaudatus</i>	EN
Angoni Vlei Rat	<i>Otomys angoniensis</i>	LC
Vlei Rat	<i>Otomys irroratus</i>	LC
Springhare	<i>Pedetes capensis</i>	LC
Striped Mouse	<i>Rhabdomys pumilio</i>	LC

Pouched Mouse	<i>Saccostomus campestris</i>	LC
Krebs' Fat Mouse	<i>Steatomys krebsii</i>	LC
Fat Mouse	<i>Steatomys pratensis</i>	LC
Highveld Gerbil	<i>Tatera brantsii</i>	LC
Bushveld Gerbil	<i>Tatera leucogaster</i>	DD
Tree Rat	<i>Thallomys paedulus</i>	LC
Greater Cane Rat	<i>Thryonomys swinderianus</i>	LC
Short-snouted Elephant-shrew	<i>Elephantulus brachyrhynchus</i>	DD
Rock Elephant-shrew	<i>Elephantulus myurus</i>	LC
Aardvark	<i>Orycteropus afer</i>	LC