

**HAMMANSKRAAL BUSINESS PROCESS OUTSOURCING AND  
TECHNOLOGY PARK  
ECOLOGICAL ASSESSMENT**

**SEF Reference No. 505597**

**Prepared for:**

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**S · E · F**

**S T R A T E G I C   E N V I R O N M E N T A L   F O C U S**

**FEBRUARY 2014**

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## Declaration of Independence

I, **Karin van der Walt**, in my capacity as a specialist consultant, hereby declare that I -

- Conducted the faunal and floral field survey and report;
- Act as an independent consultant;
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- Have and will not have vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- Will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not;
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement;
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field; and
- Undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered.

---

**Karin van der Walt** *Cert. Sci. Nat.*  
Terrestrial Ecologist  
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Date

## EXECUTIVE SUMMARY

Strategic Environmental Focus (Pty) Ltd (SEF), as independent environmental consultants and ecological specialists, was appointed by the Economic Creation for Development Centre (ECD) of the Council for Scientific and Industrial Research (CSIR) to undertake the ecological studies for the proposed Hammanskraal Business process outsourcing and Technology Park.

The proponent, City of Tshwane Metropolitan Municipality proposes to develop a Business Process Outsourcing and Technology (BPO&T) Park on portion R/17 of farm Hammanskraal 112JR. The development will first utilise the existing infrastructure on site (which was previously used by the University of Pretoria as an educational campus) and thereafter construct additional buildings and associated infrastructure in three (3) phases. Approximately 4.6 hectares of land will be disturbed for the development (excluding the present infrastructure) and further land will be disturbed for the construction of internal roads and the installation of infrastructure for the provision of bulk service. The total portion of land anticipated to be disturbed is 5 hectares.

The study area falls within the Savanna Biome which is further divided into smaller units known as vegetation types. According to Mucina & Rutherford (2006), the study area is situated within the Central Sandy Bushveld vegetation type (currently listed as Vulnerable) with a small section in the north eastern portion falling within the Springbokvlakte Thornveld vegetation type (currently listed as Endangered).

The study area also falls within the Springbokvlakte Thornveld ecosystem (reference nr: SVcb15) which is currently listed as Vulnerable in terms of Section 52 of NEMBA (Government Gazette, 2011). The original extent of the ecosystem is 880 000ha with 57% of this remaining in a natural state and less than 1% protected in the Nkombo Nature Reserve.

The study area was small (22ha) with three vegetation structures discernable, namely natural *Combretum* veld, disturbed *Combretum* veld and modified areas. The study area mostly consisted of natural vegetation representative of the Central Sandy Bushveld vegetation type, with the southern portion of the study area considered to be relatively undisturbed. One nationally protected tree species, *Sclerocarya birrea* was recorded throughout the study area. Although no faunal species of conservation concern were confirmed at the time of the survey, suitable habitat exists for one avifaunal species, *Coracias garrulus* (European Roller, currently listed as Near Threatened) and four mammal species, *Rhinolophus darlingi* (Darling's Horseshoe Bat, currently listed as Near Threatened), *Aethomys ineptus* (Tete Veld Aethomys, currently listed as Near Threatened), *Atelerix frontalis* (South African Hedgehog, currently listed as Data Deficient) and *Genetta genetta* (Common Genet, currently listed as Data Deficient).

The proposed development will make use of existing infrastructure with possible additional impacts confined to less than 5ha of natural vegetation. It is therefore not considered that the proposed development will have a significant impact on the biodiversity or ecological processes within the study area.

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## LIST OF ABBREVIATIONS

<b>ADU</b>	Animal Demographical Unit
<b>CBA</b>	Critical Biodiversity Area
<b>CR</b>	Critically Endangered
<b>CWAC</b>	Coordinated Waterbird Counts
<b>DDD</b>	Data Deficient Distribution
<b>DDT</b>	Data Deficient Taxonomic
<b>EIA</b>	Environmental Impact Assessment
<b>EN</b>	Endangered
<b>ESA</b>	Ecological Support Area
<b>IBA</b>	Important Bird Area
<b>IFC</b>	International Finance Corporation
<b>IUCN</b>	International Union for the Conservation of Nature
<b>NEMBA</b>	National Environmental Management: Biodiversity Act
<b>NT</b>	Near Threatened
<b>PA</b>	Protected Area
<b>POSA</b>	Plants of Southern Africa
<b>SABAP</b>	South African Bird Atlas Project
<b>SACNASP</b>	South African Council for Natural Scientific Professions
<b>SEF</b>	Strategic Environmental Focus
<b>VM</b>	Virtual Museum
<b>VU</b>	Vulnerable
<b>WMM</b>	With Mitigation Measures
<b>WOMM</b>	Without Mitigation Measures



# 1. INTRODUCTION

## 1.1 Project Description

Strategic Environmental Focus (Pty) Ltd (SEF), as independent environmental consultants and ecological specialists, was appointed by the Economic Creation for Development Centre (ECD) of the Council for Scientific and Industrial Research (CSIR) to undertake the ecological studies for the proposed Hammanskraal Business process outsourcing and Technology Park.

The proponent, City of Tshwane Metropolitan Municipality proposes to development a Business Process Outsourcing and Technology (BPO&T) Park on portion R/17 of farm Hammanskraal 112JR. The development will first utilise the existing infrastructure on site (which was previously used by the University of Pretoria as and educational campus) and thereafter construct additional buildings and associated infrastructure in three (3) phases. Approximately 0.46 hectares of land will be disturbed for the development (excluding the present infrastructure) and further land will be disturbed for the construction of internal roads and the installation of infrastructure for the provision of bulk service. The total portion of land anticipated to be disturbed is 0.5 hectares.

## 1.2 Terms of Reference

The terms of reference for the floral and faunal assessments were as follows:

- *Status quo* report comparing the faunal and floral assemblages that are expected to occur on the site to the actual communities present within the study site;
- Description and mapping of the broad vegetation communities identified during the field survey and their ecological connectivity;
- Mapping of the sensitivity of the vegetation communities and faunal habitat;
- List of plant and animal species identified during the field survey;
- List of threatened, rare or protected plant and animal species that could occur on the site as well as those confirmed to occur;
- Map(s) indicating the locality of confirmed populations and/or suitable habitat of threatened, rare or protected plants and animals; and
- Mitigation measures to aid the conservation of these species and to minimise the impacts on the natural environment during construction.

## 1.3 Methodology

The field survey was undertaken on the 29<sup>th</sup> of January 2014. The methodology entailed the following:

### **Flora**

The desktop studies entailed a literature survey of all plant species occurring in the Quarter Degree Grid Cell (QDGC) 2528AD according to the Plants of Southern Africa

online checklist (SANBI, 2009). Additional data such as habitat preference and species descriptions were gathered for all plants of conservation concern which were included in the list. Background information on the regional vegetation was gathered using GIS and Mucina & Rutherford (2006).

The description of the regional vegetation relied on literature from Mucina & Rutherford (2006). Plant names follow Van Wyk & Malan (1997), Van Wyk & Van Wyk (1997), Van Wyk & Smith (2005) Pooley (1998), Henderson (2001), Schmidt *et al.*, (2002), Van Oudtshoorn (2004) and Manning (2009). The South African National Red List status follows the latest update of <http://redlist.sanbi.org> (2012).

## **Fauna**

### **Avifauna**

A list was compiled of the avifaunal species which are likely to occur within QDGC 2528AD by combining data generated from Roberts' Birds of Southern Africa version 7 (2011) and the South African Bird Atlas Project 2 (SABAP2). Barnes (2000), Hockey *et al.* (2005), Cillié *et al.* (2004), Tarboton and Erasmus (1998) and Chittenden (2007) were consulted for identification. Birds were recorded by sight (with 32 x 10 Lynx binoculars) and calls.

### **Mammals**

Mammal surveys were limited to diurnal surveys with the presence of mammals within the study area noted by sightings, sounds and signs (tracks, dung, diggings and burrows). For the identification of species and observation of diagnostic characteristics Smithers (1986), Skinner and Chimimba (2005), Cillié *et al.* (2004), Apps (2000), Walker (1996), Stuart and Stuart (2000) and Liebenberg (1990) were consulted.

### **Reptiles**

A list of reptiles which have been recorded from QDGC 2528AD was obtained from ReptileMAP which is a continuation of the Southern African Reptile Conservation Assessment (SARCA) (ADU, 2012).

During the field survey, different habitat types across the study area were surveyed. The reptile surveys used a combination of the following two techniques:

- Visual searches were conducted by slowly walking through different habitat types while scanning the area with 32 x10 Lynx binoculars. Exposed areas rocky areas were monitored since reptiles often bask on top of these structures;
- Refugia such as rocks, crevices and fallen branches within the study area were inspected by carefully lifting objects to determine if any reptiles were sheltering underneath it.

Branch (1998), Marais (2004), Alexander and Marais (2007) and Cillié *et al.* (2004) were used as identification guides.

### Amphibians

A list of amphibian species which are likely to occur in QDGC 2528AD was obtained from FrogMAP (ADU, 2012) which is a continuation of the Southern African Frog Atlas Project and the study area was inspected for suitable amphibian habitat.

## **1.4 Limitations**

It should also be noted that in order to obtain a comprehensive understanding of the dynamics of the biota on the site, studies should include investigations through different seasons, over a number of years and should include extensive sampling. The results presented in this report are based on a single one day survey.

## **2. BACKGROUND**

### **2.1 Location**

The study area is located on portion R/17 of farm Hamanskraal 112JR in the Tshwane Local Municipality. The area falls within QDGC 2528AD between 25°24'12.4" – 25°24'28.8" south and 28°15'48.2" – 28°15'46.4" east (Figure 1).

### **2.2 Climate**

The study area experiences a strong seasonal summer rainfall with dry winters with the mean annual precipitation between 550mm and 600mm. Frost is experienced fairly frequently with maximum temperatures in January up to 36°C while the minimum in July drops to -0.4°C (Mucina and Rutherford, 2006).

### **2.3 Regional Vegetation**

The study area is situated within the Savanna Biome (Rutherford & Westfall, 1994). The Savanna Biome is the largest Biome in southern Africa, occupying over one-third of the surface area of South Africa (Mucina & Rutherford, 2006). It is characterised by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground the vegetation may be referred to as Shrubveld, where it is dense, as Woodland, and the intermediate stages are locally known as Bushveld (Mucina & Rutherford, 2006).

The Savanna Biome is further divided into smaller units known as vegetation types. According to Mucina & Rutherford (2006), the study area is situated within the Central Sandy Bushveld vegetation type with a small section in the north eastern portion falling

within the Springbokvlakte Thornveld vegetation type (Figure 2). Central Sandy Bushveld occurs in Limpopo, Mpumalanga, Gauteng and North West Provinces. The landscape is low and undulating with catenas and sandy plains supporting tall trees such as *Terminalia sericea* and *Burkea africana* while *Combretum* woodland dominates shallow soils. *Acacia*, *Ziziphus* and *Euclea* are found on eutrophic sands and less sandy soils (Mucina & Rutherford, 2006). The Nationally Protected tree, *Sclerocarya birrea* subsp. *caffra* (Marula) is common in this vegetation type while endemic species include *Mosdenia leptostachys* and *Oxygonum dregeanum* subsp. *canescens* var. *dissectum*. According to Mucina & Rutherford (2006), Central Sandy Bushveld is classified as Vulnerable with less than 5% conserved and 24% transformed.

Springbokvlakte Thornveld is characterised as open to dense thorn savanna dominated by *Acacia* species or shrubby grassland with a low shrub layer. The vegetation of the vegetation type grows on black, vertic clay soils that experience prolonged swelling and shrinking during wet and dry periods. The Springbokvlakte Thornveld is considered an endangered vegetation type (Mucina & Rutherford, 2006). Approximately only 1% of the vegetation unit is statutorily conserved in the Mkombo nature Reserve. It is further estimated that at least 50% of this vegetation unit has been transformed by cultivation and urban sprawl (Mucina & Rutherford, 2006).



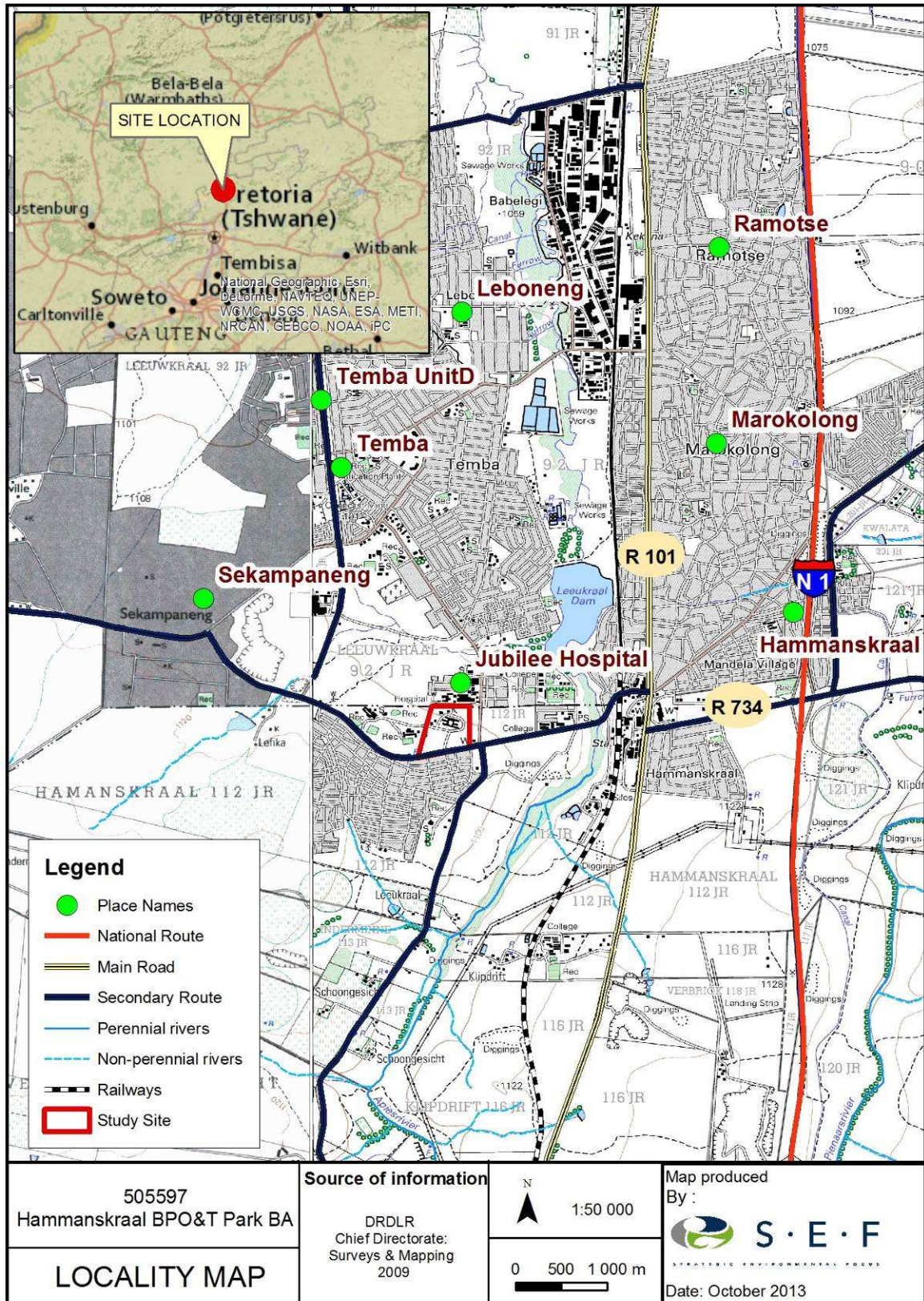


Figure 1: Location of the study site

Strategic Environmental Focus (Pty) Ltd



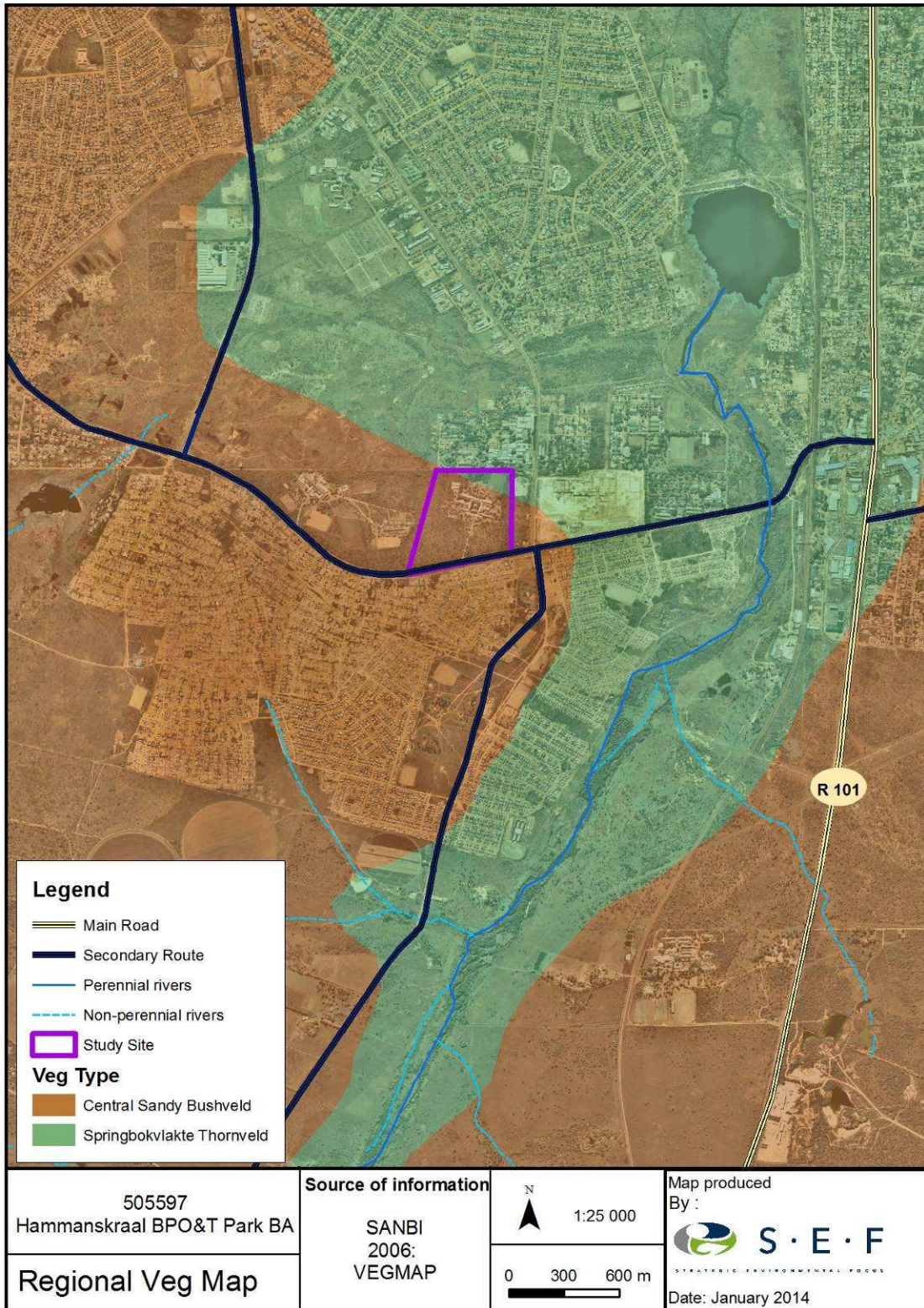


Figure 2: Regional vegetation in relation to the study area

## 2.4 Listed Ecosystems

The National Environmental Management: Biodiversity Act (Act 10 of 2004) provides for listing threatened or protected ecosystems, in one of four categories: Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Protected (Government Gazette, 2011). The main purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction and includes the prevention of further degradation and loss of structure, function and composition of threatened ecosystems.

Threatened terrestrial ecosystems have been delineated based on the following:

- The South African Vegetation Map;
- National forest types;
- Priority areas identified in a provincial systematic biodiversity plan (in this case the Mpumalanga Conservation Plan); or

High irreplaceability forest patches and clusters. The criteria used for identifying threatened terrestrial ecosystems was done through extensive stakeholder engagement and based on the best available science. The criteria for thresholds for critically endangered, endangered and vulnerable ecosystems are summarized in Table 1.

**Table 1: Criteria used to identify threatened terrestrial ecosystems**

Criterion	Critically Endangered	Endangered	Vulnerable
A1: Irreversible loss of natural habitat	Remaining natural habitat $\leq$ biodiversity target	Remaining natural habitat $\leq$ biodiversity target + 15%	Remaining natural habitat $\leq$ 60% of original area
A2: Ecosystem degradation and loss of integrity	$\geq$ 60% of ecosystem significantly degraded	$\geq$ 40% of ecosystem significantly degraded	$\geq$ 20% of ecosystem significantly degraded
C: Limited extent and imminent threat	-	Ecosystem extent $\leq$ 3000ha and imminent threat	Ecosystem extent $\leq$ 6000ha and imminent threat
D1: Threatened plant species associations	$\geq$ 80 threatened Red List plant species	$\geq$ 60 threatened Red List plant species	$\geq$ 40 threatened Red List plant species
F: Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan	Very high irreplaceability and high threat	Very high irreplaceability and medium threat	Very high biodiversity and low threat

There are four main types of implications of listed ecosystems on development:

- Planning related implications, linked to the requirement in the National Environmental Management Biodiversity Act (NEMBA) for listed ecosystems to be taken into account in municipal Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs);
- Environmental authorisation implications, especially in terms of NEMA and EIA regulations;
- Proactive management implications, in terms of the Biodiversity Act; and

- Monitoring and reporting implications, in terms of the Biodiversity Act.

The Environmental Impact Assessment (EIA) Regulations include three lists of activities that require environmental authorisation:

- Listing Notice 1: activities that require a basic assessment (R544 of 2010);
- Listing Notice 2: activities that require scoping and environmental impact report (EIR)(R545 of 2010);
- Listing Notice 3: activities that require a basic assessment in specific identified geographical areas only (R546 of 2010).

Activity 12 in Listing Notice 3 relates to the clearance of 300m<sup>2</sup> of more of vegetation, which will trigger a basic assessment within any critically endangered or endangered ecosystem listed in terms of S52 of the Biodiversity Act. This means any development that involves loss of natural habitat in a listed critically endangered or endangered ecosystem is likely to require at least a basic assessment in terms of the EIA regulations. It is important to note that while the original extent of each listed ecosystem has been mapped, a basic assessment report in terms of the EIA regulations is triggered only in remaining natural habitat within each ecosystem and not in portions of the ecosystem where natural habitat has already been irreversibly lost.

The study area falls within the Springbokvlakte Thornveld ecosystem (reference nr: SVcb15) which is currently listed as Vulnerable in terms of Section 52 of NEMBA (Government Gazette, 2011). The original extend of the ecosystem is 880 000ha with 57% of this remaining in a natural state and less than 1% protected in the Nkombo Nature Reserve.

## **2.5 Gauteng Biodiversity Conservation Plan**

The Gauteng Biodiversity Conservation Plan (C-Plan) was started in 2000 and the aim was to revise this plan at least every five years. The small size of Gauteng province made it feasible to conduct extensive biodiversity surveys which aimed to provide the information on spatial occurrence of biodiversity which was necessary for conservation planning. C-Plan 3 is based on the principles of complementarity, efficiency, defensibility and flexibility, irreplaceability, retention, persistence and accountability (GDARD, 2012).

Knowledge of the distribution of biodiversity, the conservation status of species, approaches for dealing with aspects such as climate change, methods of data analysis, and the nature of threats to biodiversity within the planning region, are constantly changing, especially in Gauteng province where development is taking place at a rapid rate. The main purposes of the C-Plan 3 are:

- To serve as the primary decision support tool for the biodiversity component of the Environmental Impact Assessment (EIA) process;



- To inform protected area expansion and biodiversity stewardship programmes within the province; and
- To serve as a basis for development of Bioregional Plans in municipalities within the province.

The C-Plan 3 considers the following biodiversity features:

- Plants (Including priority ranking of species of conservation concern in Gauteng);
- Bird habitat models;
- Invertebrates;
- Fish;
- Herpetofauna;
- Pan clusters;
- Near pristine quaternary catchments;
- Bioclimatic zones;
- Carbon sequestration; and
- Primary vegetation.

The C-Plan also makes provision for Critical Biodiversity Areas (CBA's) and Ecological Support Areas (ESA's). According to the C-Plan, the study area does not fall within a CBA or ESA (Figure 3).

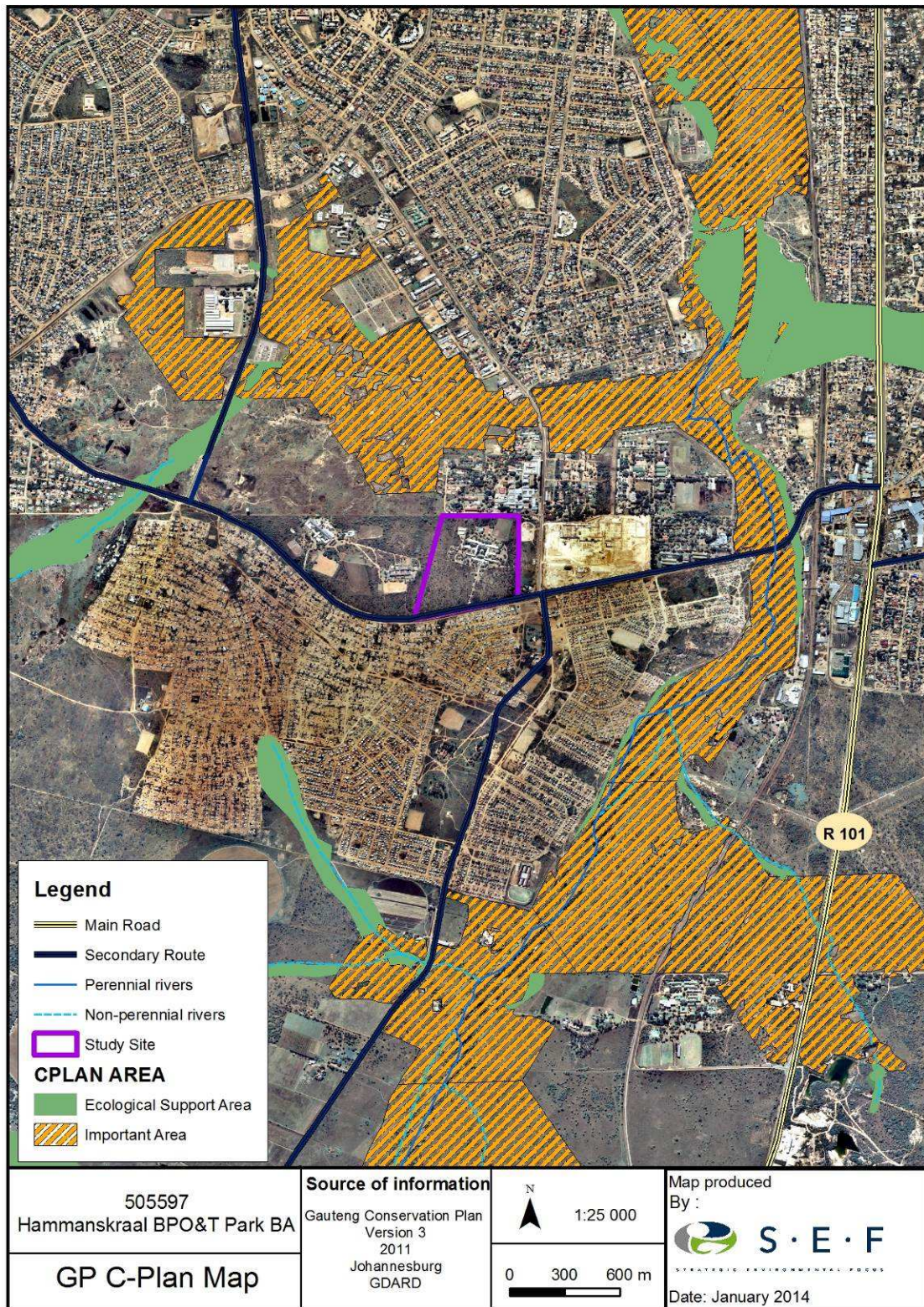


Figure 3: Gauteng Conservation Plan in relation to the study area



### 3. RESULTS: FLORA

#### 3.1 Overview

The study area was very small and covered approximately 22ha of which 11ha was classified as natural *Combretum veld*, 4.86ha consisted of disturbed *Combretum veld* with the remaining 6.16ha classified as modified. The nationally protected tree *Sclerocarya birrea* was recorded throughout the study area (Figure 4). Appendix A lists all the plant species recorded within the study area.

#### Natural *Combretum veld*

The majority of the study area consisted of natural *Combretum veld* and was representative of the Central Sandy Bushveld vegetation type (Photograph 1). Woody species recorded included *Ozoroa sphaerocarpa*, *Searsia leptodictya*, *Combretum apiculatum*, *C.hereroense*, *C.molle*, *C.zeyheri*, *Dichrostachys cinerea* and *Mandulea sericea*. *Sclerocary birrea* which is nationally protected was also frequently recorded. The herbaceous layer consisted of species such as *Aloe greatheadii* var. *davyana*, *Bulbine narcissifolia*, *Felicia muricata*, *Lippia javanica*, *Bonatea* sp. and *Lantana rugosa*. The grass layer was well developed at the time of the survey and included species such as *Aristida congesta*, *Cymbopogon pospischilii*, *Digitaria diagonalis*, *D.eriantha*, *Elionurus muticus*, various *Eragrostis* species, *Melinis repens* and *Panicum coloratum*.

Rocky areas were sporadically encountered within the *Combretum veld* but since these rocky areas were very small it was not considered a separate vegetation structure (Photograph 1). Species recorded in these areas included *Anacampseros subnuda* and *Xerophyta retinervis*. Table 2 summarizes the species recorded within the natural *Combretum veld*.



**Photograph 1: Undisturbed *Combretum veld* in the southern portion of the study area (left) with small rocky areas sporadically recorded (right)**

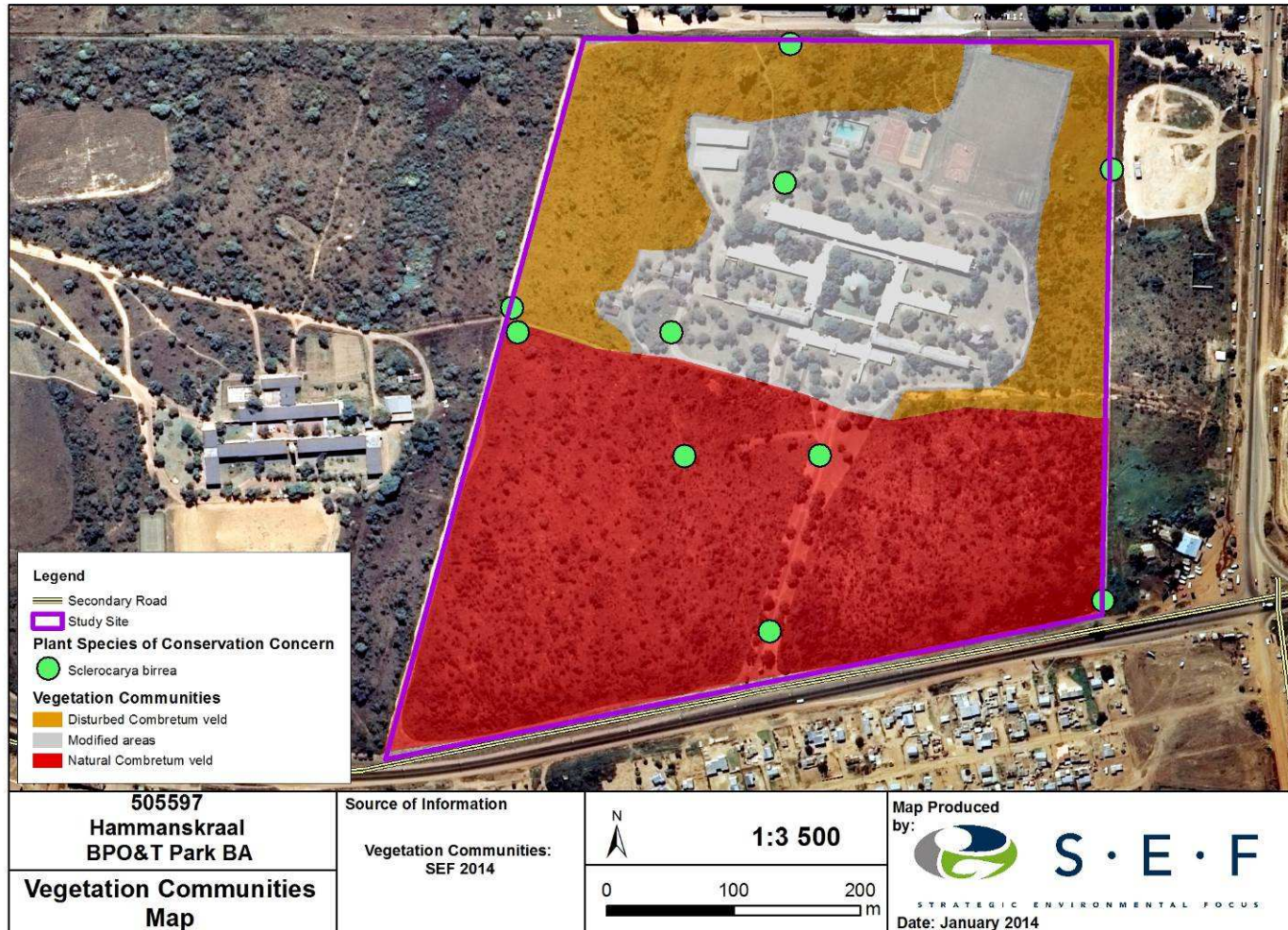


Figure 4: Vegetation communities recorded in the study area



**Table 2: Summary of the floral species recorded in the natural *Combretum veld***

<b>Dominant species at the time of the survey:</b>	<p><u>Trees and shrubs</u>  <i>Ozoroa sphaerocarpa</i>  <i>Searsia leptodictya</i>  <i>Combretum apiculatum</i>  <i>Combretum hereroense</i>  <i>Combretum molle</i>  <i>Combretum zeyheri</i>  <i>Dichrostachys cinerea</i></p> <p><u>Herbs:</u>  <i>Anacampseros subnuda</i>  <i>Xerophyta retinervis</i>  <i>Ledebouria</i> sp.  <i>Scadoxus puniceus</i>  <i>Lantana rugosa</i>  <i>Crassula lanceolata</i></p> <p><u>Grass:</u>  <i>Aristida congesta</i>  <i>Cymbopogon pospischilii</i>  <i>Digitaria diagonalis</i>  <i>Digitaria eriantha</i>  <i>Elionurus muticus</i>  <i>Eragrostis heteromera</i>  <i>Eragrostis superba</i>  <i>Loudetia flavida</i>  <i>Melinis repens</i></p>
<b>Plants of conservation concern confirmed to occur:</b>	None
<b>Plants of conservation concern for which suitable habitat was observed:</b>	None
<b>Provincially protected plants confirmed to occur:</b>	None
<b>Provincially protected plants for which suitable habitat was found:</b>	None
<b>Nationally protected tree species confirmed:</b>	<i>Sclerocarya birrea</i>
<b>Alien species:</b>	<i>Zinnia peruviana</i> <i>Verbena bonariensis</i> <i>Opuntia ficus-indica</i> <i>Melia azedarach</i>

*Disturbed Combretum veld*

The northern portion of the study area also consisted of *Combretum veld* and although it supported similar species than the natural *Combretum veld*, these areas were disturbed

and invaded by various alien plant species (Photograph 2). Additional species recorded in the disturbed *Combretum* veld included alien species such as *Melia azedarach*, *Eucalyptus* sp., *Verbena bonariensis*, *Agave sisalana*, *Portulaca quadrifida*, *Opuntia ficus-indica*, *Campuloclinium macrocephalum* and *Bidens* spp. Despite the large number of alien plant species, the nationally protected tree, *Sclerocarya birrea* was also frequently recorded. Table 3 summarizes the species recorded in the disturbed *Combretum* veld.



Photograph 2: Disturbed *Combretum* veld in the study area

Table 3: Summary of the floral species recorded on the disturbed woodland

<p><b>Dominant species at the time of the survey:</b></p>	<p><u>Trees and shrubs</u>  <i>Ozoroa sphaerocarpa</i>  <i>Searsia leptodictya</i>  <i>Combretum apiculatum</i>  <i>Combretum hereroense</i>  <i>Combretum molle</i>  <i>Combretum zeyheri</i>  <i>Dichrostachys cinerea</i></p> <p><u>Herbs:</u>  <i>Anacampseros subnuda</i>  <i>Xerophyta retinervis</i>  <i>Ledebouria</i> sp.  <i>Scadoxus puniceus</i>  <i>Lantana rugosa</i>  <i>Crassula lanceolata</i></p> <p><u>Grass:</u>  <i>Aristida congesta</i>  <i>Cymbopogon pospischilii</i>  <i>Digitaria diagonalis</i></p>
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	<i>Digitaria eriantha</i> <i>Elionurus muticus</i> <i>Eragrostis heteromera</i> <i>Eragrostis superba</i> <i>Loudetia flavida</i> <i>Melinis repens</i>
<b>Plants of conservation concern confirmed to occur:</b>	None
<b>Plants of conservation concern for which suitable habitat was observed:</b>	None
<b>Provincially protected plants confirmed to occur:</b>	None
<b>Provincially protected plants for which suitable habitat was found:</b>	None
<b>Nationally protected tree species confirmed:</b>	<i>Sclerocarya birrea</i>
<b>Alien species:</b>	<i>Melia azedarach</i> <i>Opuntia ficus-indica</i> <i>Opuntia humifusa</i> <i>Morus alba</i> <i>Verbena bonariensis</i> <i>Verbena aristigera</i> <i>Agave sisalana</i> <i>Agave potatorum</i> <i>Campuloclinium macrocephalum</i>

### Modified areas

According to the International Finance Corporations guidance to Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012), modified habitats are defined as “Areas that may contain a large proportion of plant and / or animal species of non-native origin, and / or where human activity has substantially modified an area’s primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands”.

The remainder of the study area was classified as modified and consisted of landscaped gardens around the buildings as well as sports fields. Landscaped areas were planted with indigenous species such as *Bolusanthus speciosus*, *Acacia sieberiana*, *Searsia leptodictya* and *Acacia caffra* as well as exotic garden species such as *Bryophyllum delagoense*, *Catharanthus roseus* and *Opuntia humifusa*. The sports fields were planted with *Pennisetum clandestinum* (Photograph 3). Table 4 summarizes the species recorded in the modified areas.



**Photograph 3: Modified areas in the study area included landscaped parking areas and gardens around buildings**

**Table 4: Summary of the floral species recorded on the modified areas**

<b>Dominant species at the time of the survey:</b>	<u>Trees and shrubs</u> <i>Searsia leptodictya</i> <i>Ozoroa sphaerocarpa</i> <i>Acacia caffra</i> <i>Acacia sieberiana</i>
<b>Plants of conservation concern confirmed to occur:</b>	None
<b>Plants of conservation concern for which suitable habitat was observed:</b>	None
<b>Provincially protected plants confirmed to occur:</b>	None
<b>Provincially protected plants for which suitable habitat was found:</b>	None
<b>Nationally protected tree species confirmed:</b>	<i>Sclerocarya birrea</i>
<b>Alien species:</b>	<i>Opuntia humifusa</i> <i>Bryophyllum delagoense</i> <i>Catharanthus roseus</i> <i>Pennisetum clandestinum</i>

### 3.2 Plants of Conservation Concern

Plants of conservation concern are those plants that are important for South Africa’s conservation decision making processes. A plant taxon is of conservation concern when it is considered to be threatened, or close to becoming threatened with extinction and therefore classified as Critically Endangered, Endangered, Vulnerable or Near Threatened. These plants are nationally protected by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). Within the context of this



report, plants that are Declining, Rare and Data Deficient (Taxonomic and Distribution) are also referenced under this heading.

Rare and Endangered species are mostly small, very localized and visible for only a few weeks in the year when they flower (Ferrar and Lötter, 2007). As these plants might not have been visible at the time of the field survey, the probabilities of occurrence for these plants were based on distribution data and information gathered concerning the area.

The Plants of Southern Africa (POSA) website provides taxonomic information which is drawn from the National Herbarium Pretoria Computerised Information System (PRECIS) for plant species occurring in South Africa. Although this database can be used as a guide to establish if any species of conservation concern have been recorded in the QDGC, it is not a comprehensive list of all species occurring in the QDGC. According to Raimondo *et al.* (2009) and the Plants of Southern Africa (POSA, 2011), only four plant species of conservation concern, *Commelina bella* (currently listed as Data Deficient - Taxonomic), *Acalypha caperonoides* var. *caperonioides* (currently listed as Data Deficient – Taxonomic), *Acacia erioloba* (currently listed as Declining) and *Myrothamnus flabellifolius* (currently listed as Data Deficient – Taxonomic) have been recorded in QDGC 2528AD. Due to a lack of suitable habitat, none of these species are considered likely to occur within the study area.

### 3.3 Provincially Protected Plants

A number of plant species have been classified as Orange and Red List species by the Department: Agriculture and Rural Development for Gauteng Province (GDARD, 2012). Most of these species occur in specialized habitats such as wetlands, marshes, ridges and pristine grassland and since these habitats are not represented within the study area it is unlikely that any of these Orange or Red List species will be present within the area.

### 3.4 Nationally Protected Trees

The National Forest Act, 1998 (Act No. 84 of 1998) enforces the protection of a number of indigenous trees. This national list of protected trees was developed through the application of objective scientific criteria which was supported by a computerised scoring system. Criteria for listing the trees as protected included:

- The rarity of the species;
- Importance of the species in the maintenance of an ecosystem, also known as keystone species;
- The utilization pressure on a species;
- Cultural or spiritual value (including landscaping) of the species; and
- The degree to which a species is already protected under provincial legislation.

The removal, thinning or relocation of protected trees will require a permit from the Department of Agriculture, Forestry and Fisheries (DAFF). One nationally protected tree species, *Sclerocarya birrea* was common throughout the study area (Figure 4).

### 3.5 Alien and Invasive Plants

Declared weeds and invaders have the tendency to dominate or replace the herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that all these transformers (as defined above) be eradicated and controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

The amended Regulations (Regulation 15) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) identifies three categories of problem plants:

- **Category 1** plants may not occur on any land other than a biological control reserve and must be controlled or eradicated. Therefore, no person shall establish, plant, maintain, propagate or sell/import any category 1 plant species;
- **Category 2** plants are plants with commercial application and may only be cultivated in demarcated areas (such as biological control reserves) otherwise they must be controlled; and
- **Category 3** plants are ornamentally used plants and may no longer be planted, except those species already in existence at the time of the commencement of the regulations (30 March 2001), unless they occur within 30m of a 1:50 year flood line and must be prevented from spreading.

The following categories are proposed on the revised Conservation of Agriculture Resource act (CARA) and the National Environmental Management Biodiversity Act (NEMBA), and are thus included within the present assessment:

- **Category 1a** plants are high-priority emerging species requiring compulsory control. All breeding, growing, moving and selling are banned.
- **Category 1b** plants are widespread invasive species controlled by a management programme;
- **Category 2** plants are invasive species controlled by area. Can be grown under permit conditions in demarcated areas. All breeding, growing, moving, and selling are banned without a permit;
- **Category 3** plants are ornamental and other species that are permitted on a property but may no longer be planted or sold; and
- **Category X** plants which are proposed weeds or invaders are marked with an X followed by the category (example: X3).

Numerous alien plant species were recorded in the study area and included dense infestations of species such as *Melia azedarach*, *Opuntia humifusa* and *Campuloclinium macrocephalum* (Photograph 4). These, together with their CARA and proposed NEMBA status, are listed in Table 5.



**Photograph 4: Dense infestations of alien plant species such as *Opuntia humifusa* (left) and *Melia azedarach* (right) in the study area**

**Table 5: Alien plant species recorded in the study area**

Scientific name	Common name	Category	Proposed CARA/NEMBA
<i>Agave potatorum</i>		Weed: X2	1b
<i>Agave sisalana</i>		Invader: 2	2
<i>Bryophyllum delagoense</i>		Weed: 1	1b
<i>Campuloclinium macrocephalum</i>	Pom Pom Weed	Weed: 1	1b
<i>Catharanthus roseus</i>	Madagascar Periwinkle	None	3
<i>Cereus jamacara</i>	Queen of the night	Weed: 1	1b
<i>Eucalyptus</i> sp.		Invader: 2	1b
<i>Melia azedarach</i>	Syringa	Invader: 3	1b in Mpumalanga
<i>Morus alba</i>	Mulberry	None	None
<i>Opuntia ficus-indica</i>	Prickly Pear	Weed: Category 1	None
<i>Opuntia humifusa</i>	Large Flowered Prickly Pear	Weed: 1	1b
<i>Pennisetum clandestinum</i>		X2	None
<i>Portulaca quadrifida</i>		None	None
<i>Verbena aristigera</i>	Wild Verbena	No	None
<i>Verbena bonariensis</i>	Fine-leaved Verbena	No	1b
<i>Zinnia peruviana</i>		Weed	None

### 3.6 Medicinal plants

The demand for medicinal plants is on the increase while the frequently used species and the communal land that it is harvested from, are on the decline. With an increase in the country's population and the high rate of infectious diseases, this will put an even higher strain on the already scarce natural medicinal resources (Emery *et al.*, 2002). Areas of high biodiversity are thus important for the conservation and sustainable use of these resources and should be protected. Plant species with known medicinal properties which were recorded in the study area are listed in Table 6.

**Table 6: Medicinal plant species recorded in the study area**

Scientific Name	Conservation Status	Locality in study area
<i>Aloe greatheadii</i> var. <i>davyana</i>	None	Combretum veld
<i>Bidens</i> sp.	Not indigenous	Throughout the study area
<i>Bulbine narcissifolia</i>	None	Combretum veld
<i>Eucalyptus</i> sp.	Not indigenous	Modified areas
<i>Gardeni volkensii</i>	None	Throughout the study area
<i>Lantana rugosa</i>	None	Disturbed woodland
<i>Ledebouria</i> sp.	None	Common throughout the study area
<i>Scadoxus puniceus</i>	None	Combretum veld
<i>Sclerocarya birrea</i>	Nationally protected	Throughout the study area
<i>Xerophyta retinervis</i>	None	Rocky areas

## 4. RESULTS: FAUNA

### 4.1 Mammals

The region displays a moderate diversity of mammals with approximately 84 species expected to occur within the geographical area associated with the study area (IUCN, 2011). These species are listed in Appendix B along with the probability of each species occurring in the study area as well as their national conservation status (Friedmann & Daly, 2004). Although only one species, *Hesperstes sanguineus* (Slender Mongoose) was confirmed during the field survey, an additional, 31 species were given a high or medium probability of occurring in the study area based on the presence of suitable habitat. This included four species of conservation concern namely *Rhinolophus darling* (Darling's Horseshoe Bat, currently listed as Near Threatened), *Aethomys ineptus* (Tete Veld Aethomys, currently listed as Near Threatened), *Atelerix frontalis* (South African Hedgehog, currently listed as Data Deficient) and *Genetta genetta* (Common Genet, currently listed as Data Deficient).

#### Chiroptera (Bats)

Bats are highly adaptable to their environment with 116 species recorded throughout South Africa. Of these 116 species, five species are globally listed as Vulnerable, 17 Near Threatened, 14 Data Deficient and 3 have not been evaluated (Monadjem *et al.*,

2010). Bats can be divided into three groups based on their foraging ecology which includes:

- **Frugivores:** Also referred to as pteropids, these species feed on fruits, leaves, flowers and nectar of a wide range of indigenous trees such as *Ficus* and *Podocarpus* as well as cultivated trees such as papayas, avocados, litchis, bananas and dates;
- **Carnivores:** Only a small number of species are carnivorous and feed on smaller vertebrates such as frogs, fish, mice, birds and other bats; and
- **Insectivores:** More than 70% of bats world wide are insectivores and feed on a wide range of insects with different species usually specializing in certain insect groups. The aerial hunters such as the families Vespertilionidae, Emballonuridae and Molossidae, hunt flying insects exclusively on the wing while families such as Hipposideridae and Rhinolophidae capture stationary prey from branches or on the ground and these species are capable of slow, manoeuvrable flight.

Different species of bats roosts in various places during the day, a short summary of which is provided below:

- **Foliage-roosting species:** Most Pteropodidae, which includes fruit bats hang or cling onto surfaces in trees or shrubs;
- **Hollow-roosting and Crevice-roosting species:** These species occupy underground caves, hollows in trees, and anthropogenic hollows such as roofs and basements of houses, tunnels or other cavities such as abandoned mine shafts; and
- **Specialised roost sites:** Night roosts or feeding stations which provide temporary shelter are often used by cave-dwelling bats and this usually includes open structures such as garages, outhouses, thatched game hides, culverts under roads and eaves of buildings.

Six chiroptera species have been confirmed to occur within the geographical area associated with the study area (IUCN, 2011) but since the field survey was conducted during daylight hours, the presence of these species within the study area could not be confirmed. The study area does however provide suitable roosting sites for at least five of these species (Photograph 5). Table 7 lists the chiroptera species which have been recorded within the geographical area, their preferred roosting sites and presence of these suitable roosting areas within the study area.





**Photograph 5: Suitable roosting sites for various chiroptera species within the study area**

**Table 7: Chiroptera species which have been recorded in the geographical area, their preferred roosting sites and the presence of these roosting sites within the study area**

Scientific Name	Roosting site preference	Present within the study area
<i>Neoromicia capensis</i>	Roosts singly or in small groups under bark of trees, at the base of <i>Aloe</i> leaves or under roofs of houses	Yes
<i>Scotophilus dinganii</i>	Roosts in a variety of shelters including holes in trees and under roofs	Yes
<i>Tadarida aegyptiaca</i>	Roosts communally in caves, rock crevices, under exfoliating rocks, in hollow trees and behind bark of dead trees	Yes
<i>Nycteris thebaica</i>	Variety of shelters such as caves, aardvark burrows, culverts under roads and in trunks of dead trees	Yes
<i>Rhinolophus darlingi</i>	Caves and mine audits. Smaller groups will roost in culverts or in piles of boulders	Limited
<i>Eptesicus hottentotus</i>	Rocky outcrops	No

## 4.2 Avifauna

The area has a high avifaunal diversity with approximately 412 bird species confirmed within QDGC 2528AD and in the region of the study area according to Roberts Multimedia version 7 (2011) and the South African Bird Atlas Project (SABAP) 1 and 2. During the field survey, 26 bird species were confirmed to occur within the study area and immediate surroundings, none of these were of conservation concern (Appendix C).

Thirty two species of conservation concern have been recorded from the QDGC, none of which were recorded during the survey period. One species of conservation concern, namely *Coracias garrulous* (European Roller, currently listed as Near Threatened), was given a high probability of occurring in the study area based on the presence of suitable

habitat. Most of the other species of conservation concern have a low likelihood of occurring in the study area (Appendix D).

### 4.3 Reptiles

According to ReptileMAP, a continuation of the Southern African Reptile Conservation Assessment (SARCA) (ADU, 2012), 45 reptile species have been confirmed to occur within QDGC 2528AD (Appendix E). Although no reptile species were observed at the time of the survey, nine species were given a high probability of occurring within the study area based on the presence of suitable habitat. None of these species are of conservation concern.

### 4.4 Amphibians

According to Minter et al. (2004), 12 amphibian species have been confirmed to occur within QDGC 2528AD, none of which area of conservation concern (Appendix F). No amphibian species were recorded at the time of the survey and due to the small size of the study area as well as the lack of surface water, only four species were given a medium probability of occurring in the study area.

### 4.5 Lepidoptera

South Africa is home to approximately 666 species of butterflies (Woodhall, 2005). Butterflies, like most invertebrates are highly sensitive to environmental change making them more Vulnerable to the presence of toxins in the ecosystem. The most significant causes of habitat loss for butterflies include invasive alien vegetation, changing fire regimes, agricultural activities, urbanisation, plantation forestry, increased grazing and road construction (Henning *et al.*, 2009).

According to Henning *et al.* (2009), 211 Lepidoptera species have been recorded in the Gauteng Province, of which six are proposed species of conservation concern but due to a lack of suitable habitat, none of these are likely to occur in the study area (Table 8).

**Table 8: Threatened butterflies recorded in the Gauteng Province, habitat requirements and likelihood of occurring in the study area**

Scientific Name	Conservation Status	Habitat requirements	Likelihood of occurring in study area
<i>Aloeides dentatis dentatis</i>	Vulnerable	Known only from Roodepoort and Heidelberg and found in Carletonville Dolomite Grassland	Highly Unlikely
<i>Chrysothrix aureus</i>	Vulnerable	Near Heidelberg. Species require a very stable environment consisting of south facing well-drained slopes	Highly Unlikely
<i>Lepidochrysops praeterita</i>	Endangered	Only found in a few koppies and rocky areas between Potchefstroom and the North West Province	Highly Unlikely

<i>Orachrysops mijburghii</i>	Vulnerable	Occurs in Central Free State Grassland and Dry Highveld Grassland Bioregions where it is restricted to a few south-facing grassy slopes	Highly Unlikely
<i>Metisella meninx</i>	Rare	Species inhabits marshes in wetlands located in open grasslands. The presence of the host plant, <i>Leersia hexandra</i> is essential	Highly Unlikely
<i>Platylesches dolomitica</i>	Vulnerable	In Gauteng recorded from Carletonville and Hillshaven and is a habitat specialist of dolomite ridges in bushveld	Highly Unlikely

## 5. ECOLOGICAL SENSITIVITY AND CONSERVATION IMPORTANCE

Figure 5 illustrates the ecological sensitivities. Ecological sensitivity and conservation importance of the site was assessed and based on the following criteria:

**Ecological Function:** The ecological function describes the intactness of the structure and function of the vegetation communities which in turn support faunal communities. It also refers to the degree of ecological connectivity between the identified vegetation communities and other systems within the landscape. Therefore, systems with a high degree of landscape connectivity among each other are perceived to be more sensitive.

**High** – Sensitive vegetation communities with either low inherent resistance or resilience towards disturbance factors or vegetation that are considered important for the maintenance of ecosystem integrity. Most of these vegetation communities represent late succession ecosystems with high connectivity with other important ecological systems.

**Medium** – Vegetation communities that occur at disturbances of low-medium intensity and representative of secondary succession stages with some degree of connectivity with other ecological systems.

**Low** – Degraded and highly disturbed vegetation with little ecological function.

**Conservation Importance:** The conservation importance of the site gives an indication of the necessity to conserve areas based on factors such as the importance of the site on a national and/or provincial scale and on the ecological state of the area (degraded or pristine). This is determined by the presence of a high diversity, rare or endemic species and areas that are protected by legislation.



**High** – Ecosystems with high species diversity and usually provide suitable habitat for a number of threatened species. These areas should be protected.

**Medium** – Ecosystems with intermediate levels of species diversity without any threatened species.

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

### 5.1 Areas of Medium to High Sensitivity and Conservation Importance

The southern portion of the study area supported natural *Combretum* veld consisting of natural vegetation representative of the Central Sandy Bushveld vegetation type which is currently listed as Vulnerable. Floral species diversity within this portion of the study area was considered relatively high, with limited infestations by alien invasive species recorded. From a faunal perspective, this portion of the study area provided suitable habitat for at least five chiroptera (bat) species as well as one bird species of conservation concern, *Coracias garrulus* (European Roller, currently listed as Near Threatened). Four mammal species of conservation concern, *Rhinolophus darling* (Darling's Horseshoe Bat, currently listed as Near Threatened), *Aethomys ineptus* (Tete Veld Aethomys, currently listed as Near Threatened), *Atelerix frontalis* (South African Hedgehog, currently listed as Data Deficient) and *Genetta genetta* (Common Genet, currently listed as Data Deficient) were considered likely to occur within this portion of the study area.

### 5.2 Areas of Medium Sensitivity and Conservation Importance

Dense infestations of alien plant species were sporadically recorded in the disturbed *Combretum* veld located in the northern portion of the study area. Despite this, the area still supported indigenous vegetation including the nationally protected tree, *Sclerocarya birrea*. Human developments such as shopping malls, roads, shops and houses on the northern and eastern border of the study area resulted in high noise levels which will influence the presence of faunal species within this portion of the study area.

### 5.3 Areas of Low Sensitivity and Conservation Importance

The infrastructure, landscaped gardens and sports fields were considered to be of low ecological sensitivity and conservation importance.

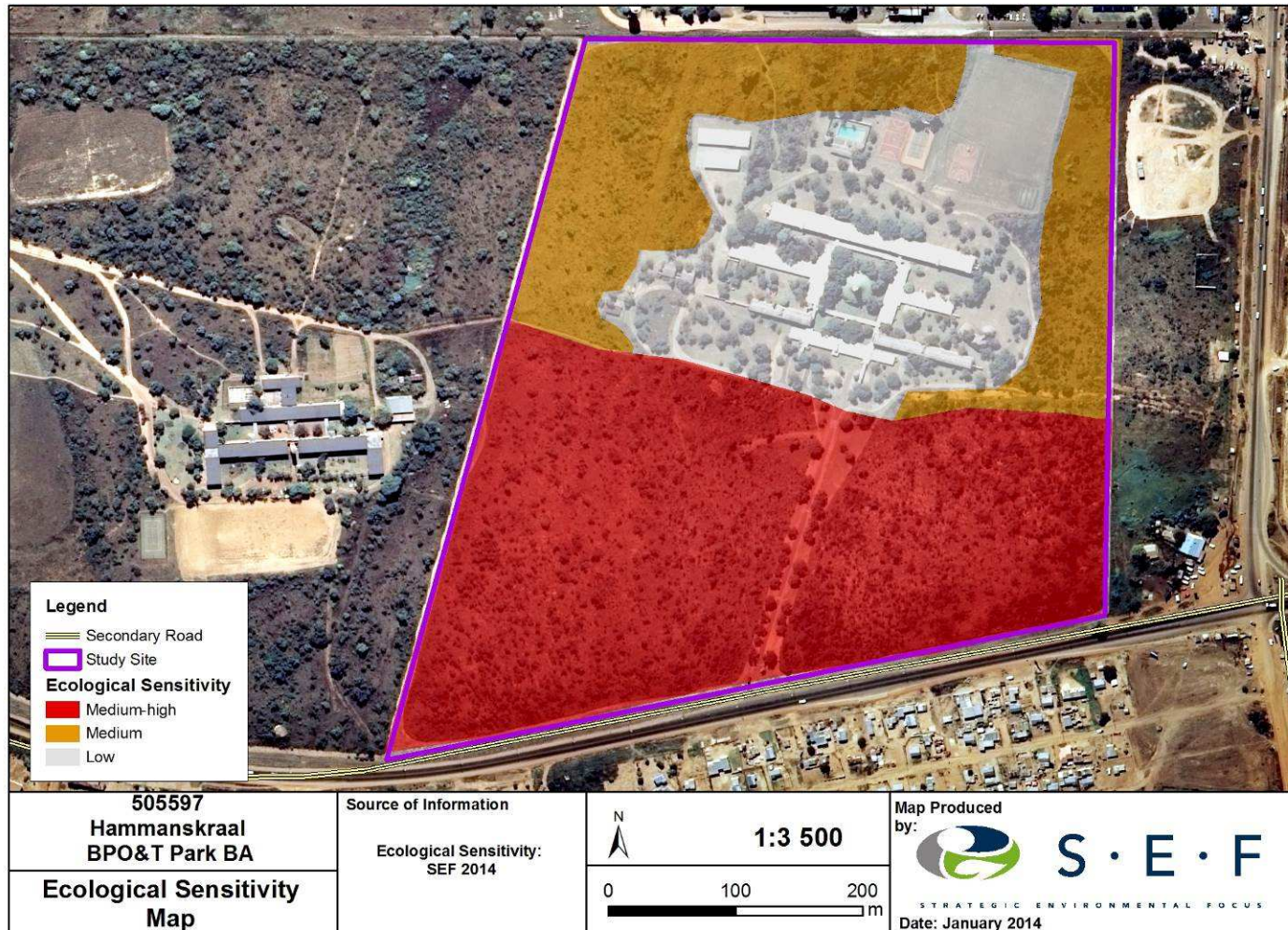


Figure 5: Ecological sensitivity and conservation importance in relation to the study area

## 6. IMPACT ASSESSMENT AND MITIGATION

Any developmental activities in a natural system will impact on the surrounding environment, usually in a negative way. The purpose of this phase of the study was to identify and assess the significance of the impacts caused by the proposed activity and to provide a description of the mitigation required so as to limit the perceived impacts on the natural environment.

There are various impacts on fauna which results from the proposed development and these can be divided into the following two categories:

- **Direct Impacts:** These impacts are directly as a result of the construction of the development and include habitat destruction, destruction of species of conservation concern and displacement; and
- **Indirect Impacts:** These impacts are not directly associated with this proposed development but affects the species recorded within the area and include impacts resulting due to a change in the hydrology and effecting species on a population level especially for species of conservation concern;

Once the risk levels of the proposed development on the biodiversity within the area are deemed acceptable, then the mitigation hierarchy of avoidance, minimisation/mitigation and rehabilitation/restoration and offset where residual impacts remain should be adhered to. This hierarchy is described below:

Mitigation measures should aim to achieve “no net loss” of biodiversity which is defined by the International Finance Corporation (IFC) as *“the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimise the project’s impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale”*.

Mitigation is a broad term and involves the following steps of the mitigation hierarchy:

1. Avoid or prevent loss to biodiversity and ecosystem services: This is the first option and refers to project location and layout of the project, phasing to avoid impacts on biodiversity. These areas need to be identified early in the development’s lifecycle so that impacts can be avoided;
2. Minimise impacts on biodiversity and ecosystem services: The location, layout, technology and phasing of the project should minimise the impacts on biodiversity. This should be considered even in areas where the environmental constraints are not particularly high and every effort should be made to minimise these impacts;
3. Rehabilitate concurrently or progressively with the activity and on cessation of the activity: This refers to the rehabilitation of areas where impacts were unavoidable and impacted areas should be returned to a condition ecologically

- similar to their “pre-development natural state”. Unfortunately, rehabilitation is a limited process that usually falls short of replicating the diversity of natural systems. Rehabilitation should occur progressively; and
4. Offset significant residual negative impacts on biodiversity or ecosystem services: This refers to the compensation for the remaining and unavoidable negative impacts on biodiversity.

### 6.1 Assessment Criteria

The environmental impacts are assessed with mitigation measures (WMM) and without mitigation measures (WOMM) and the results presented in impact tables which summarise the assessment. Mitigation and management actions are also recommended with the aim of enhancing positive impacts and minimising negative impacts.

The following risk assessment was used to determine the significance of impacts.

$$\text{Significance} = (\text{Magnitude} + \text{Duration} + \text{Scale}) \times \text{Probability}$$

The maximum potential value for significance of an impact is 100 points. Environmental impacts can thus be rated as high, medium or low significance on the following basis:

- High environmental significance 60 – 100 points
- Medium environmental significance 30 – 59 points
- Low environmental significance 0 – 29 points

Table 9 illustrates the scale used to determine the overall ranking:

**Table 9: Scale used to determine significance ranking**

Magnitude (M)		Duration (D)	
Description	Numerical value	Description	Numerical value
Very high	10	Permanent	5
High	8	Long-term (ceases at end of operation)	4
Moderate	6	Medium-term	3
Low	4	Short-term	2
Minor	2	Immediate	1
Scale (S)		Probability (P)	
Description	Numerical value	Description	Numerical value
International	5	Definite (or unknown)	5
National	4	High	4
Regional	3	Medium	3
Local	2	Low	2
Site	1	Improbable	1
None	0	None	0

The criteria against which these activities were assessed are discussed below.

#### Nature of the Impact

This is an appraisal of the type of effect the project would have on the environment. This description includes what would be affected and how and whether the impact is expected to be positive or negative.

#### Scale of the Impact

A description of whether the impact will be local, limited to the study area and its immediate surroundings, regional, national or international scale.

#### Duration of the Impact

This provides an indication of whether the lifespan of the impact would be immediate, short term (0-5 years), medium term (6-15 years), long term (cesses at end of operational phase) or permanent.

#### Probability of Occurrence

This describes the probability of the impact actually occurring. This is rated as none, improbable (low likelihood), low, medium, high and definite.

#### Significance

This describes the degree of significance for the predicted impact based on the available information and level of knowledge and expertise. It has been divided into low, medium or high.

## **6.2 Impact Assessment**

The proponent, City of Tshwane Metropolitan Municipality proposes to development a Business Process Outsourcing and Technology (BPO&T) Park on portion R/17 of farm Hamanskraal 112JR. The development will first utilise the existing infrastructure on site (which was previously used by the University of Pretoria as and educational campus) and thereafter construct additional buildings and associated infrastructure in three (3) phases. Approximately 0.46 hectares of land will be disturbed for the development (excluding the present infrastructure) and further land will be disturbed for the construction of internal roads and the installation of infrastructure for the provision of bulk service. The total portion of land anticipated to be disturbed is 0.5 hectares.

Impacts described below are based on a single ecological survey which was conducted in January 2014. Possible impacts and their sources are provided in Table 10 and discussed below.

**Table 10: Impacts likely to occur during the construction and operation of the proposed business process outsourcing and Technology Park**

Impact description	Source of impact	Areas to be affected	Relevant Phase
Destruction of natural vegetation including nationally protected tree species	Ground clearing for infrastructure	Study area	Construction phase
Disturbance of faunal species	Ground clearing activities, construction crew, contractors and disruptions caused during the operational phase	Study area	Construction and operational phases
Spread of alien invasive plant species	Ground clearing activities and introduction of alien species by vehicles and people	Study area	Construction and operational phases

**6.2.1 Impacts relevant during the developmental phase**

**6.2.1a Destruction of natural vegetation including nationally protected tree species**

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
<b>WOMM</b>	Site (1)	Permanent (5)	Low (4)	Low (2)	Low (20)	High
<b>WMM</b>	None (0)	Short term (2)	Minor (2)	Improbable (1)	Low (5)	High

Description of impact

The study area was very small and covered approximately 22ha of which 11ha was classified as natural *Combretum veld*, 4.86ha consisted of disturbed *Combretum veld* with the remaining 6.16ha classified as modified. Since the proposed development will first utilize existing infrastructure which was classified as low ecological sensitivity and conservation importance, it is anticipated that less than 0.5ha of natural vegetation will be disturbed or transformed. In order to minimise the impact of the development on the natural vegetation and nationally protected tree species the following mitigation measures are recommended:

Mitigation measures

- The development should be confined to the northern portion of the study area which was classified as medium ecological sensitivity and conservation importance since these areas are already affected by infestations of alien plant



species and the close proximity of development and the northern and eastern border of the study area;

- As far as possible, large specimens of the protected tree species, *Sclerocarya birrea* should be preserved and incorporated into the landscaping around the proposed infrastructure. Where this proves not to be possible, a permit will be required from the Department of Agriculture, Forestry and Fisheries to destroy or damage the trees;
- Landscaping of the proposed infrastructure should be done with species occurring naturally within the study area. The use of non-indigenous plant species should be strictly prohibited. Should any *Aloe* species be used for landscaping, it should be propagated from *Aloe greatheadii* var. *davyana* which occurs naturally within the study area;
- The area which will be impacted on by the proposed development should be fenced off and no people or vehicles should be allowed into the natural areas surrounding the construction area; and
- Building material, ablution facilities or construction vehicles should not be stored in areas containing natural vegetation.

#### 6.2.1b Disturbance of faunal species

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
<b>WOMM</b>	Site (1)	Permanent (5)	Moderate (4)	Medium (3)	Medium (30)	High
<b>WMM</b>	Site (1)	Short term (2)	Low (4)	Low (2)	Low (14)	High

#### Description of impact

The construction of the proposed Business process outsourcing and Technology Park is likely to disturb faunal species within the study area as well as the immediate surroundings. Although mammal activity was considered very low, higher avifaunal (bird) activity was recorded. The destruction of the natural vegetation within the study area will therefore destroy important avifaunal foraging habitat. Although no chiroptera (bat) species were recorded at the time of the survey, it is highly likely that they will use the study area for foraging and roosting. In order to minimize the impacts on faunal species the following mitigation measures are recommended:

#### Mitigation Measures:

- The disturbance of natural vegetation should be minimized and areas which are not located directly within the development's footprint should be fenced off to prevent the disturbance of these areas;
- Areas which have been disturbed during the construction phase should be rehabilitated with indigenous vegetation recorded within the study area. Species

such as *Aloe greatheadii* var. *davyana* is not only an important food source for various avifaunal and invertebrate species but can also be used as an effective soil binder during the rehabilitation process; and

- It is recommended that artificial roosting and nesting sites such as bat boxes and owl nesting boxes are erected within the natural areas surrounding the development.

#### 6.2.1c Potential increase in invasive vegetation

	Scale	Duration	Magnitude	Probability of occurrence	Significance	Confidence
<b>WOMM</b>	Local (2)	Permanent (5)	Moderate (6)	Medium (3)	Medium (45)	High
<b>WMM</b>	Site (1)	Short term (2)	Low (4)	Low (2)	Low (14)	High

#### Description of impact

Alien plant species such as *Melia azedarach*, *Opuntia ficus-indica* and *Campuloclinium macrocephalum* which were recorded within the study area have the potential to spread rapidly and form dense infestations especially when natural vegetation is disturbed. It is therefore recommended that these species are eradicated from the study area as well as the surrounding natural vegetation. It should also be noted that *Melia azedarach* produces copious amounts of seed and follow-up control will be essential in the successful eradication of this species

#### Mitigation measures

- During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation;
- Surrounding natural vegetation should not be disturbed to minimize chances of invasion by alien vegetation;
- All alien seedlings and saplings must be removed as they become evident for the duration of construction and operational phase;
- Manual / mechanical removal is preferred to chemical control;
- All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction site. This should be verified by the ECO;
- An alien invasive eradication and monitoring plan must be compiled and implemented whereby all emergent invasive species are removed during construction. The monitoring plan must also ensure that the re-emergence of invasive species is monitored continuously during the operational and decommissioning phases and that monitoring and eradication continues post decommissioning.



## 7. CONCLUSION

The proponent, City of Tshwane Metropolitan Municipality proposes to development a Business Process Outsourcing and Technology (BPO&T) Park on portion R/17 of farm Hammanskraal 112JR. The development will first utilise the existing infrastructure on site (which was previously used by the University of Pretoria as and educational campus) and thereafter construct additional buildings and associated infrastructure in three (3) phases. Approximately 0.46 hectares of land will be disturbed for the development (excluding the present infrastructure) and further land will be disturbed for the construction of internal roads and the installation of infrastructure for the provision of bulk service. The total portion of land anticipated to be disturbed is 0.5 hectares.

The study area falls within the Savanna Biome which is further divided into smaller units known as vegetation types. According to Mucina & Rutherford (2006), the study area is situated within the Central Sandy Bushveld vegetation type (currently listed as Vulnerable) with a small section in the north eastern portion falling within the Springbokvlakte Thornveld vegetation type (currently listed as Endangered).

The study area also falls within the Springbokvlakte Thornveld ecosystem (reference nr: SVcb15) which is currently listed as Vulnerable in terms of Section 52 of NEMBA (Government Gazette, 2011). The original extend of the ecosystem is 880 000ha with 57% of this remaining in a natural state and less than 1% protected in the Nkombo Nature Reserve.

The study area was small (22ha) with three vegetation structures discernable, namely natural *Combretum* veld, disturbed *Combretum* veld and modified areas. The study area mostly consisted of natural vegetation representative of the Central Sandy Bushveld vegetation type, with the southern portion of the study area considered to be relatively undisturbed. One nationally protected tree species, *Sclerocarya birrea* was recorded throughout the study area. Although no faunal species of conservation concern were confirmed at the time of the survey, suitable habitat exists for one avifaunal species, *Coracias garrulus* (European Roller, currently listed as Near Threatened) and four mammal species, *Rhinolophus darling* (Darling's Horseshoe Bat, currently listed as Near Threatened), *Aethomys ineptus* (Tete Veld Aethomys, currently listed as Near Threatened), *Atelerix frontalis* (South African Hedgehog, currently listed as Data Deficient) and *Genetta genetta* (Common Genet, currently listed as Data Deficient).

The proposed development will make use of existing infrastructure with possible additional impacts confined to less than 0.5ha of natural vegetation. It is therefore not considered that the proposed development will have a significant impact on the biodiversity or ecological processes within the study area.

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## GLOSSARY

<b>Alien species</b>	Plant taxa in a given area, whose presence there, is due to the intentional or accidental introduction as a result of human activity.
<b>Biodiversity</b>	Biodiversity is the variability among living organisms from all sources including <i>inter alia</i> terrestrial, marine and other aquatic ecosystems and ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.
<b>Biome</b>	A major biotic unit consisting of plant and animal communities having similarities in form and environmental conditions, but not including the abiotic portion of the environment.
<b>Buffer zone</b>	A collar of land that filters edge effects.
<b>Climax community</b>	<p>The presumed end point of successional sequence; a community that has reached a steady state, the most mature and fully developed vegetation that an ecosystem can achieve under the prevailing conditions. It is reached after a sequence of changes in the ecosystem, known as succession. Once climax vegetation develops, the changes are at a minimum and the vegetation is in dynamic equilibrium with its environment.</p> <p>Very few places show a true climax because physical environments are constantly changing so that ecosystems are always seeking to adjust to the new conditions through the process of succession.</p>
<b>Conservation</b>	The management of the biosphere so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations. The wise use of natural resources to prevent loss of ecosystems function and integrity.
<b>Conservation concern</b>	Plants of conservation concern are those plants that are important for South Africa's conservation decision making processes and include all plants that are Threatened (see <b>Threatened</b> ), Extinct in the wild, Data deficient, <b>Near threatened</b> , Critically rare, Rare and <b>Declining</b> . These plants are nationally protected by the National Environmental Management: Biodiversity Act. Within the context of these reports, plants that are Declining are also discussed under this heading.
<b>Conservation status</b>	An indicator of the likelihood of that species remaining extant either in the present day or the near future. Many factors are taken into account when assessing the conservation status of a species: not simply the number remaining, but the overall increase or decrease in the population over time, breeding success rates, known threats, and so on.
<b>Community</b>	Assemblage of populations living in a prescribed area or physical habitat, inhabiting some common environment.
<b>Correspondence Analysis</b>	Correspondence Analysis simultaneously ordines species and samples.

<b>Critically Endangered</b>	A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
<b>Data Deficient</b>	There is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. However, “data deficient” is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
<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 Threatened or Near Threatened, but there are threatening processes causing a continuous decline in the population (Raimondo <i>et al.</i> , 2009).
<b>Ecological Corridors</b>	Corridors are roadways of natural habitat providing connectivity of various patches of native habitats along or through which faunal species may travel without any obstructions where other solutions are not feasible.
<b>Edge effect</b>	Inappropriate influences from surrounding activities, which physically degrade habitat, endanger resident biota and reduce the functional size of remnant fragments including, for example, the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution.
<b>Endangered</b>	A taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.
<b>Fauna</b>	The animal life of a region.
<b>Flora</b>	The plant life of a region.
<b>Forb</b>	A herbaceous plant other than grasses.
<b>Habitat</b>	Type of environment in which plants and animals live.
<b>Indigenous</b>	Any species of plant, shrub or tree that occurs naturally in South Africa.
<b>Invasive species</b>	Naturalised alien plants that have the ability to reproduce, often in large numbers. Aggressive invaders can spread and invade large areas.
<b>Least Concern</b>	A taxon is Least Concern when it has been evaluated against five IUCN criteria and does not qualify for the Threatened or Near threatened Categories (Raimondo <i>et al.</i> , 2009).
<b>Mitigation</b>	The implementation of practical measures to reduce adverse impacts.

<b>Near Threatened</b>	A Taxon is Near Threatened when available evidence indicates that 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 (Raimondo <i>et al.</i> , 2009).
<b>Plant community</b>	A collection of plant species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighbouring patches of different vegetation types. The components of each plant community are influenced by soil type, topography, climate and human disturbance.
<b>Protected Plant</b>	According to Provincial Nature Conservation Ordinances, no one is allowed to sell, buy, transport, or remove this plant without a permit from the responsible authority. These plants are protected by provincial legislation.
<b>Threatened</b>	Species that have naturally small populations and species which have been reduced to small (often unsustainable) population by man's activities.
<b>Red Data</b>	A list of species, fauna and flora that require environmental protection - based on the IUCN definitions. Now termed Plants of Conservation Concern.
<b>Species diversity</b>	A measure of the number and relative abundance of species.
<b>Species richness</b>	The number of species in an area or habitat.
<b>Succession</b>	Progressive change in the composition of a community of plants, e.g. from the initial colonisation of a bare area, or of an already established community towards a largely stable climax. The complete process of succession may take hundreds or thousands of years and entails a number of intermediate communities - each called a seral community. The replacement of one seral community by another in most cases leads to the eventual formation of a climax community, a relatively stable community of plants and animals.
<b>Vegetation Unit</b>	A complex of plant communities ecologically and historically (both in spatial and temporal terms) occupying habitat complexes at the landscape scale. Mucina and Rutherford (2006) state: "Our vegetation units are the obvious vegetation complexes that share some general ecological properties such as position on major ecological gradients and nutrient levels, and appear similar in vegetation structure and especially floristic composition".
<b>Threatened</b>	Threatened Species are those that are facing a high risk of extinction, indicated by placing in the categories Critically Endangered (CR), Endangered (E) and Vulnerable (VU) (Raimondo <i>et al.</i> , 2009).
<b>Vulnerable</b>	A taxon is Vulnerable when it is not Critically Endangered or Endangered but meets any of the five IUCN criteria for Vulnerable and is therefore facing a high risk of extinction in the wild in the future (Raimondo <i>et al.</i> , 2009).

## APPENDICES

<b>APPENDIX A</b>	<b>Plant species identified within the study area</b>
<b>APPENDIX B</b>	<b>Mammal species occurring within QDGC 2528AD, with provincial, national and global conservation status, and probability of occurring on site and habitat preference</b>
<b>APPENDIX C</b>	<b>Bird species observed in the study area</b>
<b>APPENDIX D</b>	<b>Bird species of conservation concern occurring within QDGC 2528AD, national and global conservation status, habitat preference and probability of occurring on site</b>
<b>APPENDIX E</b>	<b>Reptile species occurring within QDGC 2528AD, provincial, national and global conservation status, probability of occurring within the study area and habitat preference</b>
<b>APPENDIX F</b>	<b>Amphibian species occurring within QDGC 2528AD, national conservation status, habitat preference and probability of occurring within the study area</b>



**APPENDIX A: PLANTS IDENTIFIED WITHIN THE STUDY AREA**

**APPENDIX B:**

Plants in **RED** = Species of conservation concern and/or nationally or provincially protected species

Scientific Name	Notes	Common Name	Locality in the study area		
			Natural <i>Combretum</i> veld	Disturbed <i>Combretum</i> veld	Modified Areas
<b>Herbaceous species</b>					
<i>Aloe greatheadii</i> var. <i>davyana</i>			X	X	
<i>Anacampseros subnuda</i>			X	X	X
<i>Asparagus cooperi</i>			X		
<i>Bonatea</i> sp.			X	X	
<i>Bulbine narcissifolia</i>			X		
<i>Ceratotheca triloba</i>			X	X	
<i>Commelina africana</i>			X		
<i>Crassula capitella</i>			X		
<i>Crassula lanceolata</i>			X		
<i>Cyperus rupestris</i>			X	X	X
<i>Felicia muricata</i>			X	X	
<i>Geigeria burkei</i> subsp. <i>burkei</i>			X		
<i>Indigofera</i> sp.			X		
<i>Lantana rugosa</i>			X	X	
<i>Ledebouria</i> sp.			X	X	
<i>Lippia javanica</i>			X	X	
<i>Ornithogalum</i> sp.			X	X	
<i>Pellaea calomelanos</i>			X	X	
<i>Sarcostemma viminale</i>			X	X	
<i>Scadoxus puniceus</i>			X	X	

<i>Solanum panduriforme</i>			X	X	X
<i>Xerophyta retinervis</i>		Baboon's Tail	X	X	
<b>Trees</b>					
<i>Acacia caffra</i>			X	X	
<i>Acacia grandicornuta</i>			X	X	
<i>Acacia robusta</i>			X	X	
<i>Acacia sieberiana</i>					X
<i>Acacia tortillis</i>			X	X	
<i>Bolusanthus speciosus</i>					X
<i>Combretum apiculatum</i>			X	X	
<i>Combretum hereroense</i>			X	X	
<i>Combretum molle</i>			X	X	
<i>Combretum zeyheri</i>			X	X	
<i>Dichrostachys cinerea</i>			X	X	
<i>Dombeya rotundifolia</i>		Wild Pear	X	X	
<i>Gardenia volkensii</i>			X	X	
<i>Grewia flava</i>			X	X	
<i>Grewia subspathulata</i>			X	X	
<i>Gymnosporia tenuispina</i>			X	X	
<i>Mundulea sericea</i>			X	X	
<i>Ozoroa sphaerocarpa</i>			X	X	
<i>Pappea capensis</i>		Jacket Plum	X	X	
<i>Peltophorum africanum</i>			X	X	
<b><i>Sclerocarya birrea</i> (NP)</b>	<b>Nationally Protected</b>		X	X	X
<i>Searsia leptodictya</i>			X	X	X
<i>Vangueria infausta</i>			X	X	
<b>Grass</b>					
<i>Aristida congesta</i>			X	X	
<i>Cymbopogon pospischilii</i>			X	X	

<i>Digitaria diagonalis</i>		Brown-seed Finger Grass	X	X	
<i>Digitaria eriantha</i>		Common Finger Grass	X	X	
<i>Elionurus muticus</i>		Wire Grass	X	X	
<i>Eragrostis barrelieri</i>			X	X	
<i>Eragrostis capensis</i>		Heart-seed Love Grass	X	X	
<i>Eragrostis heteromera</i>		Bronze Love Grass	X	X	
<i>Eragrostis nindensis</i>		Wether Love Grass	X	X	
<i>Eragrostis superba</i>		Saw-tooth Love Grass	X	X	
<i>Loudetia flavida</i>			X	X	
<i>Melinis repens</i> subsp. <i>Repens</i>			X	X	
<i>Panicum coloratum</i>		Small Buffalo Grass	X	X	
<i>Phragmites mauritianus</i>		Common Reed	X	X	
<i>Schmidtia pappophoroides</i>		Sand Quick Grass	X	X	
<b>Alien species</b>					
<i>Agave potatorum</i>				X	X
<i>Agave sisalana</i>				X	X
<i>Bryophyllum delagoense</i>					X
<i>Campuloclinium macrocephalum</i>		Pom Pom Weed		X	X
<i>Catharanthus roseus</i>				X	X
<i>Cereus jamacara</i>		Queen of the night		X	
<i>Eucalyptus</i> sp.				X	X
<i>Melia azedarach</i>		Syringa	X	X	X
<i>Morus alba</i>		Mulberry		X	
<i>Opuntia ficus-indica</i>		Prickly Pear	X	X	X
<i>Opuntia humifusa</i>				X	X

<i>Pennisetum clandestinum</i>		Kikuyu Grass			X
<i>Portulaca quadrifida</i>				X	X
<i>Verbena aristigera</i>		Fine-leaved Verbena		X	
<i>Verbena bonariensis</i>		Wild Verbena		X	
<i>Zinnia peruviana</i>			X	X	X

**APPENDIX B: MAMMAL SPECIES OCCURRING IN QDGC 2528AD, WITH PROVINCIAL, NATIONAL AND GLOBAL CONSERVATION STATUS, WITH THEIR HABITAT PREFERENCE AND LIKELIHOOD OF OCCURRING IN THE STUDY AREA**

CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; LC = Least Concern; DD = Data Deficient; Pr = Protected; En = Endemic; NBM = Non-breeding Migrant

\* Species recorded in areas surrounding the study area

Scientific Name	Common name	SA	IUCN	Habitat	Likelihood of occurring in the study area
<i>Herpestes sanguineus</i>	Slender Mongoose	DD	LC	Savanna, desert, urban areas, invertebrates and small vertebrates	Confirmed
<i>Pipistrellus capensis</i>	Cape Serotine	LC	LC	Urban areas, aerial insectivore, roosts in man-made structures, crevices of plants	High
<i>Rhodomys pumilio</i>	Four-striped Grass Mouse	LC	LC	Temperate, grassland with good cover, diurnal	High
<i>Scotophilus dinganii</i>	African Yellow Bat	LC	LC	Urban areas, savanna, mixed bushland, aerial insectivore, roosts in roofs/crevices	High
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC	Savanna, urban areas, all vegetation types,	High
<i>Thallomys paedulus</i>	Acacia Rat	LC	LC	Widespread	High
<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat	LC	LC	Caves and subterranean habitats, savanna, fynbos, aerial, man-made structures, insectivore	High
<i>Felis silvestris</i>	Wild Cat, Wildcat	LC	LC	Savanna, shrubland, desert, broad habitat, small mammals, reptiles, birds and invertebrates	High
<i>Genetta genetta</i>	Common Genet	DD	LC	This species occurs in montane forest, savanna, bush, grassland and coastal forest. It appears to tolerate a wide range of habitats.	High
<i>Lepus microtis</i>	African Savanna Hare	LC	LC	Grazer, savanna, arable land, desert	High
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	NT	LC	Grassland, caves and subterranean habitats, savanna, woodland savanna, aerial insectivore.	Medium
<i>Eptesicus hottentotus</i>	Long-tailed House Bat	LC	LC	Savanna, nama karoo, riverine forest, aerial insectivore, roosts in rock crevices, caves and mine tunnels	Medium

Scientific Name	Common name	SA	IUCN	Habitat	Likelihood of occurring in the study area
<i>Acomys spinosissimus</i>	Spiny Mouse	LC	LC	Dry woodland in rocky areas, nocturnal	Medium
<i>Aethomys ineptus</i>	Tete Veld Aethomys	NT	LC	Rocky crevices and piles of boulders	Medium
<i>Atelerix frontalis</i>	Southern African Hedgehog	DD	LC	Dry habitats with groundcover for nesting, nocturnal	Medium
<i>Crocidura silacea</i>	Lesser Gray-brown Musk Shrew	DD	LC	Coastal forest, grassland and rocky areas, woodland, terrestrial, nocturnal	Medium
<i>Crocidura cyanea</i>	Reddish-gray Musk Shrew	LC	LC	Broad habitat tolerance, terrestrial, nocturnal	Medium
<i>Lemniscomys rosalia</i>	Single-striped Grass Rat	LC	LC	Savanna, grassland, good cover, fallow fields	Medium
<i>Mastomys coucha</i>	Southern African Mastomys	LC	LC	Widespread, nocturnal	Medium
<i>Saccostomus campestris</i>	Pouched Mouse	LC	LC	Savanna, shrubland, grassland, temperate, nocturnal seed eater	Medium
<i>Steatomys krebsii</i>	Kreb's Fat Mouse	LC	LC	Temperate, sandy substrates, wide tolerance	Medium
<i>Steatomys pratensis</i>	Fat Mouse	LC	LC	Grassland, temperate, savanna, sandy substrate, river fringes	Medium
<i>Canis mesomelas</i>	Black-backed Jackal	LC	LC	Savanna, shrubland, grassland, drier areas, omnivore, extreme generalist	Medium
<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC	Sandy soils	Medium
<i>Gerbillurus paebea</i>	Hairy-footed Gerbil	NT	NT	Arid areas including desert, sandy soils with cover	Medium
<i>Hystrix africae australis</i>	Cape Porcupine	LC	LC	Widespread, only absent from dune deserts. Seems to be absent from the Free State	Medium
<i>Ichneumia albicauda</i>	White-tailed Mongoose	LC	LC	Shows an affinity for Afromontane forests and seldom strays from this. Widespread in all types of evergreen forests, primary and secondary to riverine areas.	Medium
<i>Ictonyx striatus</i>	Zorilla, Striped Pole Cat	NT	LC	This species occurs mainly in grassland and grassland savanna but it also found in gardens.	Medium
<i>Leptailurus serval</i>	Serval	LC	LC	Savanna, desert, urban areas, invertebrates and small vertebrates	Medium
<i>Mungos mungo</i>	Banded Mongoose	LC	LC	Savanna, social, termites and beetle larvae, other invertebrates	Medium
<i>Orycteropus afer</i>	Aardvark, Antbear	LC	LC	Occur in Nama-Karoo, Succulent Karoo,	Medium

Scientific Name	Common name	SA	IUCN	Habitat	Likelihood of occurring in the study area
				Grassland and Savanna biomes. Associated with diverse habitats.	
<i>Poecilogle albinucha</i>	African Striped Weasel	LC	LC	This species is found in grassland, savanna and bush savanna. The Nambian subspecies <i>Crocidura hirta deserti</i> occurs in arid areas	Medium
<i>Xerus inauris</i>	Ground Squirrel	LC	LC	Grassland, savanna, desert, sparse bush cover on hard substrate in arid and semi-arid areas	Low
<i>Aethomys namaquensis</i>	Namaqua Rock Rat	LC	LC	Confined to moist, densely vegetated habitat, usually associated with damp areas fringing mountain streams.	Low
<i>Aonyx capensis</i>	African Clawless Otter	LC	LC	This species occurs in a wide variety of montane grasslands and temperate and subtropical forests. In Namibia, a population has been found inhabiting a cave, where they feed on cave invertebrates and possibly dead bats (Marais and Irish 1990).	Low
<i>Atilax paludinosus</i>		LC	LC	Coastline, rocky shores, intertidal, estuarine, brackish, bogs, marshes, swamps, freshwater and saltwater, eats invertebrates and small vertebrates	Low
<i>Caracal caracal</i>	Caracal, African Caracal	LC	LC	Favours vleis and montane forests. Subsurface runs are about 30mm below the surface, burrows are 500mm deep.	Low
<i>Civettictis civetta</i>	African Civet	NT	LC	Forest, savanna, omnivorous, mainly roots, shoots and fruits	Low
<i>Crocuta crocuta</i>	Spotted Hyaena	LC	LC	Savanna, semi-desert shrubs, predator/scavenger	Low
<i>Dendromus melanotis</i>		LC	LC	Tall grass and bushes in bogs, marshes, swamps, fens, peatlands	Low
<i>Desmodillus auricularis</i>	Cape Short-eared Gerbil	DD	LC	Moist densely vegetated habitat, usually close to streams or dams.	Low
<i>Elephantulus</i>		DD	LC	Heavy cover in grass and scrubs	Low

Scientific Name	Common name	SA	IUCN	Habitat	Likelihood of occurring in the study area
<i>brachyrhynchus</i>					
<i>Elephantulus intufi</i>	Bushveld Elephant Shrew	LC	LC	Shrubland, grassland, sandy soils sparse grass cover	Low
<i>Elephantulus myurus</i>		LC	VU	Shrubland, grassland, crevices and crannies	Low
<i>Felis nigripes</i>	Black-footed Cat	LC	LC	Savanna, shrubland, desert, short-grass specialist feeding on small mammals, reptiles, birds and invertebrates	Low
<i>Hyaena brunnea</i>	Brown Hyaena	LC	LC	Savanna, grasslands, urban areas, scavenger	Low
<i>Lepus capensis</i>	Cape Hare, Arabian Hare	0	LC	Grazer, savanna, arable land, desert	Low
<i>Mellivora capensis</i>	Honey Badger	LC	LC	In southern part of its range, this species tends to prefer drier regions and occurs in dry savanna, grasslands and the Kalahari. In the eastern part of its range it is found in woodland and moist bush savanna.	Low
<i>Mus indutus</i>	Desert Pygmy Mouse	LC	LC	Grassland species occurring in submontane as well as coastal areas.	Low
<i>Otocyon megalotis</i>	Bat-eared Fox	LC	NT	Savanna, shrubland, grassland, cold grassland, invertebrates	Low
<i>Panthera pardus</i>	Leopard	LC	LC	Forest, savanna, desert, predated small to medium mammals	Low
<i>Papio ursinus</i>	Baboon	LC	LC	Savanna and grassland, forest edges, omnivore	Low
<i>Paraxerus cepapi</i>		LC	LC	Savanna woodland including a wide variety of woodland types	Low
<i>Pedetes capensis</i>	Springhaas, Springhare	DD	LC	Sandy, hard soils, cultivated areas or open shrublands, deserts	Low
<i>Procavia capensis</i>	Rock Hyrax, Rock Dassie	LC	LC	Krantzes and rocky outcrops throughout the fynbos, karroid habitats, generalist herbivore	Low
<i>Proteles cristata</i>	Aardwolf	LC	LC	Savanna, shrubland, grassland, eats termites	Low
<i>Sauromys petrophilus</i>	Roberts's Flat-headed Bat	LC	LC	Savanna, shrubland, aerial insectivore, roosts in rock fissures and exfoliated rock	Low



Scientific Name	Common name	SA	IUCN	Habitat	Likelihood of occurring in the study area
<i>Suricata suricatta</i>	Meerkat, Slender-tail	LC	LC	Grassland, preferring dry, sandy ground on the fringes of marshes and vleis. Also in gardens and golf courses	Low
<i>Vulpes chama</i>	Cape Fox, Silver Fox	LC	LC	Savanna, shrubland, grassland, desert, omnivorous, small vertebrates and invertebrates	Low
<i>Aepyceros melampus</i>	Common Impala	LC	LC	Light woodlands and savanna, open acacia savannas with nutrient rich soils, water-dependent	Zero
<i>Alcelaphus buselaphus</i>	Lichtenstein's Hartebeest	LC	NT	Grassland, temperate areas, shrublands, karroid semi arid areas and coastal shrubland.	Zero
<i>Ceratotherium simum</i>	Southern White Rhino	LC	LC	Temperate grasslands, short rass areas in savanna and busgveld, prefers woody cover, water, bulk grazer	Zero
<i>Connochaetes taurinus</i>	Common Wildebeest	VU	CR	Savanna, short grass grazer, prefers open savanna woodlands/bushveld	Zero
<i>Diceros bicornis</i>	Southern Black Rhino	0	LC	Savanna, bushveld habitats of Limpopo, Mpumalanga and KZN, prefers dense cover and permanent water, browser	Zero
<i>Equus quagga</i>	Plain's Zebra	LC	LC	Wide distribution range but restricted by habitat requirements. Proximity to water essential as well as availability of adequate cover	Zero
<i>Giraffa camelopardalis</i>	Giraffe	LC	LC	Savanna woodlands, high level browser	Zero
<i>Kobus ellipsiprymnus</i>	Common Waterbuck	LC	LC	Savanna, riverine ecotones, savanna grasslands and open woodlands	Zero
<i>Oreotragus oreotragus</i>	Klipspringer	LC	LC	Associated with rank vegetation but have also been recorded in suburban gardens	Zero
<i>Oryx gazella</i>	Gemsbok	LC	LC	Savanna, grassland, temperate, semi arid and arid bushveld and grassland of the Kalahari Karoo	Zero
<i>Phacochoerus africanus</i>	Common Warthog	LC	LC	Savanna areas with water, short-grass grazer	Zero

Scientific Name	Common name	SA	IUCN	Habitat	Likelihood of occurring in the study area
<i>Raphicerus campestris</i>	Steenbok	LC	LC	Savanna, shrubland, grassland, drier areas	Zero
<i>Redunca arundinum</i>	Southern Reedbuck	LC	LC	Savannas with tall grasses, some herbaceous cover and woody species, reedbeds close to water, grazer	Zero
<i>Redunca arundinum</i>	Southern Reedbuck	VU	LC	Temperate grassland habitats, selective grazer	Zero
<i>Smutsia temminckii</i>	Cape Pangolin	LC	LC	Grassland, shrubland, savanna, dry, woody, scrub, associated with termites and ants	Zero
<i>Sylvicapra grimmia</i>	Common duiker	LC	LC	Widespread, thickets, savanna, widespread, karroid, forest and savanna	Zero
<i>Syncerus caffer</i>	African Buffalo	LC	LC	Savanna, temperate shrublands, bulk feeder occurring throughout savannas lowveld and Eastern Cape thickets	Zero
<i>Tragelaphus oryx</i>	Common Eland, Eland	LC	LC	Woodlands and woodland mosaics, grasslands and thickets	Zero
<i>Tragelaphus scriptus</i>	Bushbuck	LC	LC	Closed canopy forests, thickets and woodlands, coastal sand forests	Zero
<i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC	Savanna woodlands with high shrub/tree density, grasslands, desert	Zero

**APPENDIX C: BIRD SPECIES RECORDED IN THE STUDY AREA**

Scientific name	Common Name
<i>Lybius torquatus</i>	Barbet Black-collared
<i>Batis molitor</i>	Batis Chinspot
<i>Merops apiaster</i>	Bee-eater European
<i>Pycnonotus nigricans</i>	Bulbul African Red-eyed
<i>Crithagra mozambica</i>	Canary Yellow-fronted
<i>Cisticola chiniana</i>	Cisticola Rattling
<i>Sylvietta rufescens</i>	Crombec Long-billed
<i>Chrysococcyx caprius</i>	Cuckoo Diderick
<i>Chrysococcyx klaas</i>	Cuckoo Klaas's
<i>Spilopelia senegalensis</i>	Dove Laughing
<i>Oena capensis</i>	Dove Namaqua
<i>Bradornis mariquensis</i>	Flycatcher Marico
<i>Tockus nasutus</i>	Hornbill African Grey
<i>Halcyon senegalensis</i>	Kingfisher Woodland
<i>Vanellus coronatus</i>	Lapwing Crowned
<i>Mirafra africana</i>	Lark Rufous-naped
<i>Urocolius indicus</i>	Mousebird Red-faced
<i>Colius striatus</i>	Mousebird Speckled
<i>Acridotheres tristis</i>	Myna Common
<i>Prinia subflava</i>	Prinia Tawny-flanked
<i>Dryoscopus cubla</i>	Puffback Black-backed
<i>Erythropygia leucophrys</i>	Robin White-browed Scrub-
<i>Passer domesticus</i>	Sparrow House
<i>Cecropis cucullata</i>	Swallow Greater Striped
<i>Uraeginthus angolensis</i>	Waxbill Blue
<i>Ploceus cucullatus</i>	Weaver Village

**APPENDIX D: BIRD SPECIES OF CONSERVATION CONCERN RECORDED IN 2528AD, THEIR CONSERVATION STATUS, HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRING IN THE STUDY AREA**

Scientific Name	Common Name	Regional	IUCN	Habitat	Likelihood of occurring in the study area
<i>Coracias garrulus</i>	Roller European	LC; NBM	NT	Open, broadleaved and Acacia woodlands with grassy clearings	High
<i>Neotis denhami</i>	Bustard Denham's	VU	NT	High-lying, open, sour grassland, often in rocky areas and on plateau grassland; occasionally uses cultivated fields, especially in winter and during droughts; attracted to burnt ground, especially in winter; avoids heavily grazed grassland	Medium
<i>Hieraaetus ayresii</i>	Eagle Ayres's Hawk-	NT	LC	Dense woodland and forest edge, often in hilly country <sup>6,15,18,26</sup> . In Zimbabwe, frequently in treed suburbia outside br season <sup>15,20</sup> . Often roosts in Eucalyptus stands <sup>10</sup>	Medium
<i>Polemaetus bellicosus</i>	Eagle Martial	VU	NT	Open woodland, arid and mesic savanna, forest edges	Medium
<i>Falco biarmicus</i>	Falcon Lanner	NT	LC	Most frequent in open grassland, open or cleared woodland, and agricultural areas. Breeding pairs favour habitats where cliffs available as nest and roost sites, but will use alternative sites (eg trees, electricity pylons, buildings) if cliffs absent	Medium
<i>Falco naumanni</i>	Kestrel Lesser	VU; NBM	LC	Warm, dry, open or lightly wooded environments; concentrated in grassy Karoo, w fringes of grassland biome and se Kalahari; generally avoids foraging in transformed habitats but occurs in some agricultural areas, incl croplands in fynbos and renosterveld of W Cape	Medium
<i>Buphagus erythrorhynchus</i>	Oxpecker Red-billed	NT	LC	Open savanna, up to 3 000 m; dependent on presence of host ungulates	Medium

<i>Sagittarius serpentarius</i>	Secretarybird Secretarybird	VU	VU	Open grassland (< 0.5 m) with scattered trees, shrubland, open Acacia and bushwillow ( <i>Combretum</i> spp) savanna; absent from dense woodland and rocky hills	Medium
<i>Gyps coprotheres</i>	Vulture Cape	VU; En	VU	Wide habitat range; cliffs	Medium
<i>Torgos tracheliotus</i>	Vulture Lappet-faced	VU	VU	Open woodland in arid- and semi-arid regions, incl Acacia spp, Shepherds-tree <i>Boscia albitrunca</i> , Purple-pod Cluster-leaf <i>Terminalia prunioides</i> and Mopane <i>Colophospermum mopane</i>	Medium
<i>Gyps africanus</i>	Vulture White-backed	VU	EN	Lightly wooded arid savanna, including Mopane <i>Colophospermum mopane</i> woodland	Medium
<i>Ciconia nigra</i>	Stork Black	NT	LC	Dams, pans, floodplains, flooded grassland, associated with mountainous areas	Low
<i>Leptoptilos crumeniferus</i>	Stork Marabou	NT	LC	Both aquatic and terrestrial habitats, favouring open and semi-arid areas; largely absent from forest areas and true desert; common at wetlands, incl dams, pans and rivers, and in wildlife reserves and ranching areas	Low
<i>Botaurus stellaris</i>	Bittern Eurasian	CR	LC	Tall, dense emergent vegetation in interior of seasonal and permanent large wetlands	Zero
<i>Crex crex</i>	Crake Corn	VU; NBM	LC	Rank grassland and savanna, grassland bordering marshes and streams incl long grass areas of seasonally flooded grassland and occasionally wet clay patches and soft mud fringing ponds	Zero
<i>Anthropoides paradiseus</i>	Crane Blue	VU; En	VU	Open grassland and grassland/Karoo ecotone; wetlands, cultivated pastures and crop lands; tolerant of intensively grazed and burnt grassland	Zero



<i>Oxyura maccoa</i>	Duck Maccoa	Rare	DD	Prefers permanent wetlands in open grassland and semi-arid country (incl fynbos, succulent Karoo, Nama Karoo) that support rich concentrations of benthic invertebrates. Breeding habitat usually contains stands of young, emergent vegetation, mainly rushes and sedges <sup>48</sup> . In KwaZulu-Natal, br recorded only at farm dams <sup>15</sup> .	Zero
<i>Podica senegalensis</i>	Finfoot African	VU	LC	Mostly quiet, wooded streams and rivers flanked by thick riparian vegetation and overhanging trees. Also dam verges, especially with sufficient overhanging vegetation and reed cover	Zero
<i>Phoenicopterus roseus</i>	Flamingo Greater	NT	LC	Large, shallow, eutrophic wetlands, slat pans, saline lakes, coastal mudflats	Zero
<i>Phoeniconaias minor</i>	Flamingo Lesser	NT	NT	Primarily open, eutrophic, shallow wetlands; breeds on saline lakes and salt pans	Zero
<i>Nettapus auritus</i>	Goose African Pygmy-	NT	LC	Prefers inland wetlands, mainly in savanna, with clear water and floating and emergent vegetation, especially water lilies ( <i>Nymphaea</i> spp)	Zero
<i>Circus ranivorus</i>	Harrier African Marsh-	VU	LC	Almost exclusively inland and coastal wetlands	Zero
<i>Circus macrourus</i>	Harrier Pallid	NT; NBM	NT	Grasslands associated with pans or floodplains; also croplands	Zero
<i>Alcedo semitorquata</i>	Kingfisher Half-collared	NT	LC	Clear, fast-flowing perennial streams, rivers and estuaries, usually narrow and secluded, with dense marginal vegetation; often near rapids	Zero
<i>Mirafra cheniana</i>	Lark Melodious	NT; En	NT	Grassland dominated by <i>Themeda triandra</i> ; avoids wet lowlands, favouring fairly short grassland (< 0.5 m), with open spaces between tussocks, at 550-1 750 m altitude, with annual rainfall 400-800 mm	Zero

<i>Tyto capensis</i>	Owl African Grass-	VU	LC	Treeless areas associated with damp substrata, mainly marshes and vleis. Favours patches of tall, rank grass, sedges or weeds. Also areas with dense ground cover in scattered thorn scrub, low fynbos and renosterveld, usually close to water and among thick stands of grass ( <i>Stenotaphrum</i> sp) and sedge ( <i>Juncus</i> sp)	Zero
<i>Pelecanus onocrotalus</i>	Pelican Great White	NT	LC	Shallow lakes, flood plain pans, estuaries and dams; sheltered coastal bays and lagoons; roosts on dry land in open areas, usually on islands or peninsulas where access by terrestrial predators limited	Zero
<i>Pelecanus rufescens</i>	Pelican Pink-backed	VU	LC	Wide range of wetlands, incl lakes, dams and slow-flowing rivers, saline pools, lagoons, estuaries and sheltered bays	Zero
<i>Glareola nordmanni</i>	Pratincole Black-winged	NT; NBM	NT	Open grassland, edges of pans and cultivated fields, but most common in seasonally wet grasslands and pan systems	Zero
<i>Rostratula benghalensis</i>	Snipe Greater Painted-	NT	LC	Waterside habitats with substantial cover	Zero
<i>Mycteria ibis</i>	Stork Yellow-billed	NT; NBM	LC	Wetlands, incl alkaline and freshwater lakes, rivers, dams, pans, flood plains, marshes, flooded grassland and small pools or streams	Zero
<i>Hydroprogne caspia</i>	Tern Caspian	NT	LC	Along coast, mostly in sheltered bays and estuaries; inland, at large water bodies, both natural and man-made, with preference for saline pans and large impoundments	Zero

**APPENDIX E: REPTILE SPECIES RECORDED IN QDGC 2528AD, THEIR CONSERVATION STATUS, HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRING IN THE STUDY AREA**

Scientific Name	Common name	Red list category	Habitat Requirements	Likelihood of occurring in the study area
<i>Acanthocercus atricollis atricollis</i>	Southern Tree Agama	LC	Open savanna	High
<i>Chamaeleo dilepis dilepis</i>	Common Flap-neck Chameleon	LC	Prefers savanna	High
<i>Boaedon capensis</i>	Brown House Snake	LC	Wide range of habitats and tolerant to human activities	High
<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	LC	Savanna and open woodland	High
<i>Philothamnus semivariiegatus</i>	Spotted Bush Snake	LC	Open forest or savanna, arid regions	High
<i>Telescopus semiannulatus semiannulatus</i>	Eastern Tiger Snake	LC	Savanna and sandveld	High
<i>Trachylepis capensis</i>	Cape Skink	LC	Habitat generalist	High
<i>Trachylepis</i> sp. (Transvaal varia)	Skink sp. 1	Not listed	Habitat generalist, widespread and common throughout SA	High
<i>Trachylepis varia</i>	Variable Skink	LC	Varied, grassland to arid and mesic savanna	High
<i>Agama aculeate distanti</i>	Distant's Ground Agama	LC	Semi-desert and sanded savanna	Medium
<i>Amblyodipsas polylepis polylepis</i>	Common Purple-glossed Snake	LC	Savannas	Medium
<i>Python natalensis</i>	Southern African Python	LC	Open savanna, rocky areas and riverine scrub	Medium
<i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC	Absent only from closed canopy and desert areas	Medium
<i>Dispholidus typus typus</i>	Boomslang	LC	Widely distributed throughout much of southern Africa excluding the central Highveld and drier western half of South Africa	Medium

<i>Gonionotophis capensis capensis</i>	Common File Snake	LC	Occurs in lowland forests and moist savanna in the eastern half of southern africa	Medium
<i>Gonionotophis nyassae</i>	Black File Snake	LC	Savanna and coastal forests	Medium
<i>Lycophidion capense capense</i>	Cape Wolf Snake	LC	Variety of habitats including lowland forest, fynbos, moist savanna, grassland and karoo scrub	Medium
<i>Philothamnus hoplogaster</i>	South Eastern Green Snake	LC	Varied, coastal bush, fynbos, arid and mesic savanna	Medium
<i>Prosymna bivittata</i>	Two-striped Shovel-snout	LC	Widely distributed over much of southern Africa	Medium
<i>Psammophis angolensis</i>	Dwarf Sand Snake	LC	Dry and wet open savanna	Medium
<i>Psammophis brevirostris</i>	Short-snouted Grass Snake	LC	Habitat generalist, widespread and common throughout SA	Medium
<i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC	Kalahari thornveld	Medium
<i>Psammophylax tritaeniatus</i>	Striped Grass Snake	LC	Open grassland and savanna	Medium
<i>Thelotornis capensis capensis</i>	Southern Twig Snake	LC	Savanna, coastal thicket and forest fringe	Medium
<i>Naja annulifera</i>	Snouted Cobra	LC	Very common in bushveld and Lowveld areas	Medium
<i>Naja mossambica</i>	Mozambique Spitting Cobra	LC	Savanna, cleared areas in former forest	Medium
<i>Lygodactylus capensis capensis</i>	Common Dwarf Gecko	LC	Prefers well wooded savanna	Medium
<i>Pachydactylus capensis</i>	Cape Gecko	LC	Varied, karroid veld, grassland	Medium
<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	LC	Varied, montane and highveld grassland, savanna, bushveld and coastal forest	Medium
<i>Nucras holubi</i>	Holub's Sandveld Lizard	LC	Broken rocky ground in mesic savanna	Medium
<i>Nucras intertexta</i>	Spotted Sandveld Lizard	LC	Arid, sandy areas with many species limited to the western part of SA while some occur in the grasslands in southeastern sa	Medium
<i>Leptotyphlops distanti</i>	Distant's Thread Snake	LC	Occur throughout most of SA	Medium

<i>Leptotyphlops scutifrons scutifrons</i>	Peters' Thread Snake	Not listed	Varied, grassland, coastal bush, mesic and arid savanna	Medium
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC	Prefers rocky areas	Medium
<i>Stigmochelys pardalis</i>	Leopard Tortoise	LC	Wide range of habitats throughout SA	Medium
<i>Afrotyphlops bibronii</i>	Bibron's Blind Snake	LC	Found mainly in the eastern half of southern Africa	Medium
<i>Bitis arietans arietans</i>	Puff Adder	LC	Absent only from desert, dense forest and mountain tops	Medium
<i>Pachydactylus affinis</i>	Transvaal Gecko	LC	Rocky outcrops and termite mounds in grassland	Low
<i>Nucras ornata</i>	Ornate Sandveld Lizard	LC	Broken montane grassland and mesic savanna on sandy soils	Low
<i>Pedioplanis lineoocellata lineoocellata</i>	Spotted Sand Lizard	LC	Very varied, karroid veld, mesic thicket and arid savanna	Low
<i>Afroablepharus wahlbergii</i>	Wahlberg's Snake-eyed Skink	LC	Restricted to the northern and eastern parts of southern Africa (Limpopo)	Low
<i>Mochlus sundevallii sundevalii</i>	Sundevall's Writhing Skink	LC	Arid sandy areas	Low
<i>Varanus niloticus</i>	Water Monitor	LC	Rivers, pans and major lakes	Low
<i>Crocodylus niloticus</i>	Nile Crocodile	Vulnerable (SARCA 2014)	Large, rivers, lakes and swamps, river mouths, estuaries and mangrove swamps	Zero
<i>Pelusios sinuatus</i>	Serrated Hinged Terrapin	LC	Limited primarily to the northern and eastern parts of southern Africa. All species of aquatic and found in temporary and permanent water bodies	Zero



**APPENDIX F: AMPHIBIAN SPECIES RECORDED IN QDGC 2528AD, THEIR CONSERVATION STATUS, HABITAT REQUIREMENTS AND LIKELIHOOD OF OCCURRING IN THE STUDY AREA**

Scientific Name	Common Name	Habitat requirements	Likelihood of occurring in the study area
<i>Amietophrynus garmani</i>	Olive Toad	Vleis and pans in bushveld savanna with relatively high rainfall > 600mm pa; suburban gardens	Medium
<i>Amietophrynus gutturalis</i>	Guttural Toad	Around open pools, dams, vleis and other semi-permanent bodies of water in grassland, thicket and savanna; suburban gardens and farmland	Medium
<i>Poyntonophrynus fenoulheti</i>	Northern Pygmy Toad	Variety of bushveld vegetation in the savanna biome and occasionally adjacent grassland	Medium
<i>Schismaderma carens</i>	Red Toad	Widespread in savanna and woodland, readily adapts to human habitation	Medium
<i>Kassina senegalensis</i>	Bubbling Kassina	Grassland around vleis and pans; breeds in temporary and permanent water bodies including vleis, marshes, pans, ponds and dams	Low
<i>Phrynomantis bifasciatus</i>	Banded Rubber Frog	Hot, semi-arid to subtropical environments; savanna woodland, grassland and wide variety of bushveld vegetation types; also agriculturally developed areas	Low
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	Margins of permanent and temporary water bodies including shallow marshes, lakes, rivers, streams and pools; also semi-desert scrub, arid and humid savanna, agricultural land and forest clearings	Low
<i>Xenopus laevis</i>	Common Platanna	Restricted to aquatic habitats but opportunistic and can be found in any form of wetland	Low
<i>Amietia quecketti</i>	Common or Angola River Frog	Banks of slow-moving streams or other permanent bodies of water in a wide variety of wetland habitats in grassland, savanna and forest edge	Low

<i>Cacosternum boettgeri</i>	Common Caco	Variety of habitats in Nama Karoo, succulent Karoo, grassland and thicket favouring open areas and especially abundant in grassland areas; occasionally forest clearings	Low
<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	Variety of habitats in savanna and grassland	Low
<i>Tomopterna natalensis</i>	Natal Sand Frog	Variety of habitats in savanna and grassland; breeds in shallow permanent furrows, canals or streams in grassland and agricultural land	Low

