

# LAPALALA STAFF HOUSING

## BASELINE TERRESTRIAL ECOLOGY STUDY & BIODIVERSITY VALUE ASSESSMENT



**MAY 2018**

Prepared for: Peter Velcich  
NuLeaf Planning and Environmental  
PostNet Suite 168  
Private Bag X 844  
Silverton 0127

Prepared by: ECOREX Consulting Ecologists CC  
PO Box 57  
White River  
1240

Author: Duncan McKenzie

Reviewer: Warren McClelland (Ecorex)



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## EIA REGULATIONS SPECIALISTS REPORT CHECKLIST

(1) A specialist report prepared in terms of the 2014 Environmental Impact Assessment Regulations must contain-

(a) details of-

✓	(i) the specialist who prepared the report; and	page 07
✓	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	page 54
✓	(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	page 55
✓	(c) an indication of the scope of, and the purpose for which, the report was prepared;	page 07
✓	(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	page 11
✓	(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	page 11
✓	(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	page 29
✓	(g) an identification of any areas to be avoided, including buffers;	page 33
✓	(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	page 31
✓	(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	page 15
✓	(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	page 29
✓	(k) any mitigation measures for inclusion in the EMPr;	page 33
✓	(l) any conditions for inclusion in the environmental authorisation;	page 33
✓	(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	page 33
(n) a reasoned opinion-		
✓	(i) as to whether the proposed activity or portions thereof should be authorised; and	page 34
✓	(ii) if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	page 34
X	(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
X	(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
✓	(q) any other information requested by the competent authority.	none

## ABBREVIATIONS

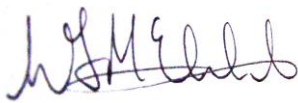
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
LEMA	Limpopo Environmental Management Act (No. 7 of 2003)
LPBCA	Limpopo Province Biodiversity Conservation Assessment
mamsl	Metres Above Mean Sea Level
NEMBA ToPS	National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004)
NFA	National Forest Act (No. 30 of 1998)
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
QDS	Quarter Degree Square, for example 2328 CD
SABAP2	Southern African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute

## TERMINOLOGY

Alien	Introduced from elsewhere: neither endemic nor indigenous.
Biodiversity	The structural, functional and compositional attributes of an area, ranging from genes to landscapes.
Degraded	An ecosystem that is a poor ecological state, usually through impacts such as invasion by alien plants, severe overgrazing, poor burning regimes, etc. These systems still contain a moderate proportion of indigenous flora.
Geophyte	Plants that produce their growth points from organs stored below the ground, an adaption to survive frost, drought and / or fire.
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.
Ungulate	Hoofed animal.

## Declaration of Independence

We declare that we have been appointed as independent consulting ecologists with no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2010. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. Remuneration for our services by the proponent is not linked to approval by any decision-making authority responsible for authorising this development.



*W.L. McClelland*

*18 May 2018*



*D.R. McKenzie*

*18 May 2018*

## 1. INTRODUCTION

ECOREX Consulting Ecologists CC was appointed by Peter Velcich of NuLeaf Planning & Environmental to conduct the terrestrial ecology study for a Basic Assessment Report (BAR) for a proposed staff housing complex in the Lapalala Wilderness, Limpopo Province, which would provide a basis for assessing potential impacts of the project on terrestrial ecology and guide the design and location of additional planned infrastructure. The study comprised flora and vertebrate fauna (mammals, birds, reptiles, frogs). The two key deliverables were a baseline terrestrial ecology survey and an integrated Biodiversity Value Assessment.

The study team was as follows:

**Duncan McKenzie** – Terrestrial Ecologist. He has been involved in biodiversity assessments for ECOREX for ten years and countries of work experience include Lesotho, Swaziland, Mali, Mozambique, Guinea, Sierra Leone, South Africa, Tanzania and Democratic Republic of the Congo. Duncan has previously worked as a Regional Coordinator for the Mondi Wetlands Project and lectures on many aspects of conservation in Nelspruit and the Kruger National Park. He is currently the Regional Co-ordinator for the South African Bird Atlas Project, a position he has held for eight years, formerly sat on the KZN Bird Rarities Committee and is a co-author on the Wildflowers of the Kruger National Park project. A more detailed CV is presented in Appendix 6.

**Linda McKenzie (GIS Specialist)**. Linda is a GIS Specialist/GIS Analyst with over 13 years' experience in the industry. For the last four years she has operated her own GIS Consultancy called Digital Earth. She has extensive experience in both the private and public sector, as has worked on a wide variety of projects and GIS applications. These include, most recently, vegetation and sensitivity mapping, landcover data capture, municipal roads master planning, hydroelectric scheme and wind farm feasibility mapping and town planning, land surveyor and engineering support services. Linda currently serves as Vice Chairperson and Treasurer for GISSA Mpumalanga and is a registered Professional GISc Practitioner (PGP0170).

## 2. TERMS OF REFERENCE

The objectives of the Ecology Survey will be to:

- Provide a brief baseline ecological assessment of the terrestrial ecosystems that are likely to be impacted by the proposed development;
- Provide an assessment of the biodiversity value of potentially affected ecosystems; this would incorporate an assessment of the conservation value of the ecosystems;
- Make recommendations regarding infrastructure layout, where appropriate.

The primary deliverable will be a report on Terrestrial Ecosystems, including:

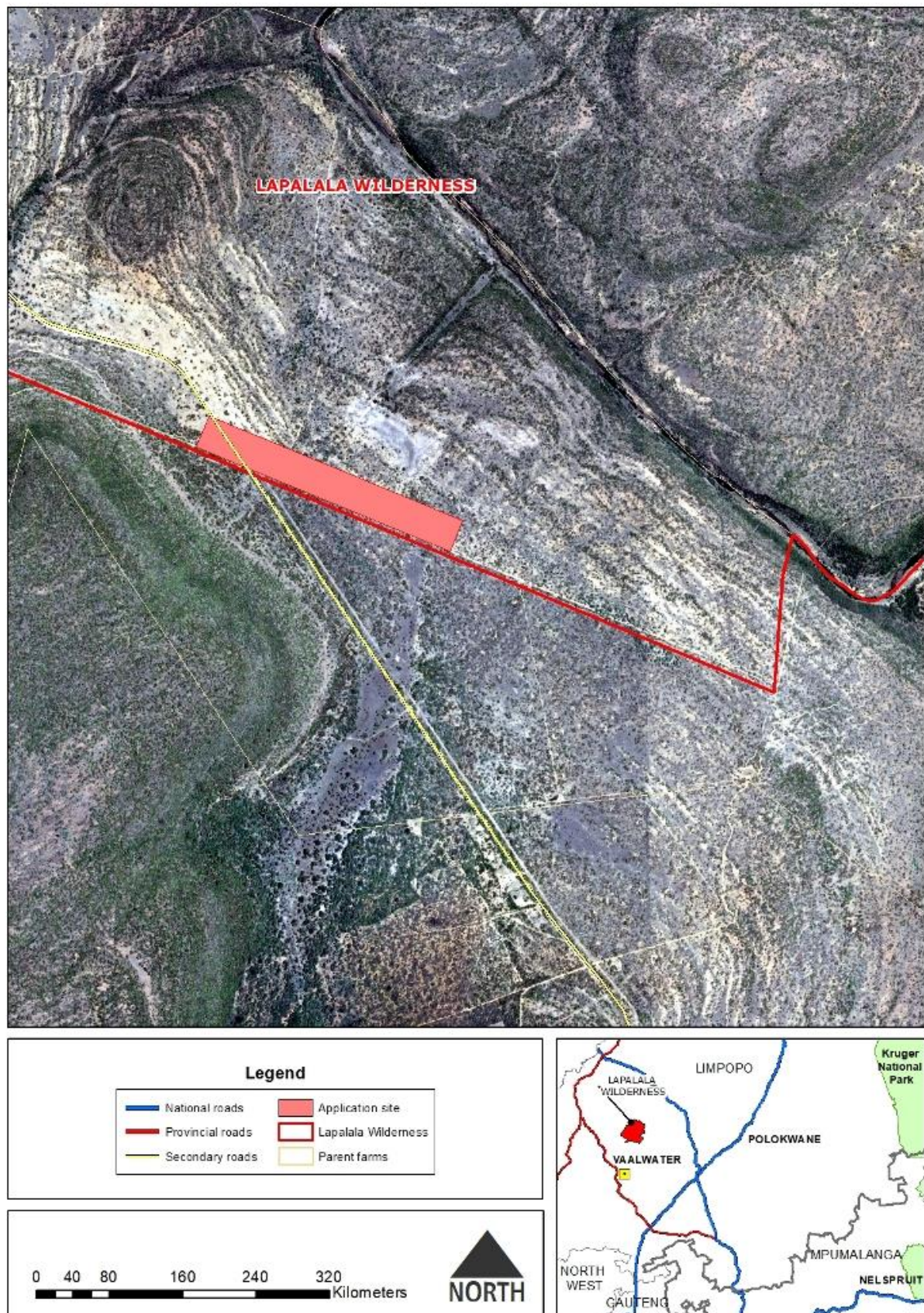
- Biodiversity baseline description;
- Biodiversity Value Assessment;
- Broad-scale Vegetation Map;
- Biodiversity Value Map;
- Recommendations regarding infrastructure layout, where relevant.



### 3. STUDY AREA

The proposed development is situated on Welgelegen 647-LR, either side of the South Gate of Lapalala Wilderness and approximately 50 km north of Vaalwater and 80 km west of Mokopane, Lephalale Local Municipality, Limpopo Province (Figure 1). The study area covers an area of approximately 12 hectares.

The study area is within the quarter-degree grid 2328 CD at an elevation of approximately 1150 mamsl. The topography of the general area is flat to undulating with shallowly incised drainage lines. Most of the study area contains untransformed vegetation, but existing infrastructure is present around the gate itself as well as in the eastern part where a small staff village is currently found. The perimeter fence of Lapalala Wilderness forms the southern border of the study area.



**Figure 1. Location of proposed developments of the Lapalala Wilderness School**



## 4. METHODS

### 4.1 Flora

#### *Desktop*

Vegetation communities were identified prior to fieldwork using satellite imagery supplied by Digital Earth. Red Data plant species listed for the quarter-degree grid 2328 CD, in which the study area is situated in, and surrounding grids in the PRECIS database from the South African National Biodiversity Institute (SANBI), were used to produce a list of the most likely threatened species, which were searched for during fieldwork.

#### *Fieldwork*

Fieldwork was conducted over one day on the 8<sup>th</sup> May 2018. The boundary of the proposed staff housing site was supplied by NuLeaf and was pre-loaded onto a Samsung S7 phone using LocusMap Pro<sup>TM</sup> software. Representative meandering transects were surveyed on foot in each vegetation community and species lists compiled for each community. Plants were listed according to each of the vegetation communities identified during the desktop phase. Plants not identified to species level were collected and dried in a plant press for identification at a later stage. Specific attention was paid to search for any conservation-important species of flora and fauna as listed under the Limpopo Environmental Management Act (No. 7 of 2003), National Forests Act (No. 30 of 1998), National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015) and the various national Red Data Lists. The location of any conservation-important species found was recorded using the GPS. Plants were listed according to each of the vegetation communities identified during the desktop phase.

### 4.2 Fauna

#### *Desktop*

Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within the project area were prepared using data from Swanepoel *et al.* (2016), the Southern African Bird Atlas Project 2 <http://sabap2.adu.org.za/>, Taylor *et al.* (2016), Minter *et al.* (2004), Bates *et al.* (2014) and from the Lapalala Management Plan (2016 update). The above data were captured mostly at a quarter-degree spatial resolution, but were refined by excluding species unlikely to occur within the study area, due to unsuitable habitat characteristics (e.g. altitude and land-use). Potential occurrence of fauna in the study area

was predicted based on knowledge of known habitat requirements of each species, as well as from former ecological studies performed in Lapalala by Ecorex.

#### *Fieldwork*

Birds were identified audially and visually using Bushnell 10x42 binoculars. Observations were made incidentally during the time that the vegetation survey was conducted, and limited to birds seen and heard within the study area and immediate surrounds. Mammals, reptiles and frogs were recorded incidentally as they were encountered during the survey through direct evidence (sightings) and indirect evidence (spoor, dung).

### **4.3 Biodiversity Value Assessment**

The biodiversity value of each vegetation community was based on a combination of Conservation Importance and Functional Importance, each of which were rated on a five-point scale, from Very Low to Very High, as indicated in Table 1. This method was based on Biodiversity Action Plan guidelines developed by Anglo American (Coombes, 2004).

#### ***Conservation Importance***

The method of calculating conservation importance was based on six key parameters, which were each allocated a score that ranged between zero (Not Important) and twenty (Very Important) (Table 2). The overall conservation importance was based on the median value of the six parameters, namely:

1. *Protection Status*. The extent to which the vegetation community is currently formally protected (e.g. World Heritage Site; RAMSAR, National Park; Provincial Game Reserve; Private Conservancy etc.);
2. *Size*. The extent to which the larger vegetation type of which the defined area is a representative sample, still exists; this incorporates the conservation status of threatened vegetation types in that vegetation types with the highest threat status are assumed to have the lowest extent of habitat remaining;
3. *Species Diversity*. The extent to which the vegetation community supports a high diversity of plants or animals;
4. *Species of Conservation Concern*. The extent to which the vegetation community supports threatened species and other species of conservation concern;

5. *Unique Habitat or Taxa.* Presence of range-restricted plants or animals or unusual natural feature;
6. *Present Ecological State.* The extent to which the vegetation community is modified from natural conditions.

### ***Functional Importance***

The method of calculating functional importance was based on four ecosystem service categories, which were each allocated a score that ranged between zero (Not Important) and twenty (Very Important) (Table 3). The overall functional importance was based on the median value of the four ecosystem service categories, namely:

1. *Provisioning Services.* The extent and frequency that the vegetation community provides consumable goods (e.g. food, freshwater, timber, fibre, medicinal plants, etc.);
2. *Regulating Services.* The extent to which the vegetation community provides regulating services (e.g. flood attenuation, water purification, storage, climate regulation, carbon sequestration, etc.);
3. *Cultural Services.* The extent to which the vegetation community provides cultural services (e.g. tourism attraction, spiritual attraction, aesthetic value, etc.), and;
4. *Supporting Services.* The extent to which the vegetation community provides supporting ecological services, either positive (e.g. migration corridor, refuge area, primary production, pollination, pest control, nutrient cycling, soil formation), or negative (e.g. disease sources, pest outbreaks).

By integrating assessments of the conservation importance and functional importance of the different vegetation communities, an assessment of Biodiversity Value was made. This is indicated spatially in Figure 5.

Table 1. Method of calculating Biodiversity Value of vegetation communities

Conservation Importance	Functional Importance				
	Very High	High	Moderate	Low	Very Low
Very High	Very High	Very High	High	High	Moderate
High	Very High	High	High	Moderate	Moderate
Moderate	High	High	Moderate	Moderate	Low
Low	High	Moderate	Moderate	Low	Low
Very Low	Moderate	Moderate	Low	Low	Very Low

Table 2. Method of calculating Conservation Importance of vegetation communities

Parameter	Very High	High	Moderate	Low	Very Low
Protection Status	International	National	Regional	Local	None
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length	Very small	Small	Moderate	Large	Very Large
	(<500km <sup>2</sup> )	(500 to 1,000km <sup>2</sup> )	(1,000 to 20,000km <sup>2</sup> )	(20,000 to 50,000km <sup>2</sup> )	(> 50,000km <sup>2</sup> )
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species of Conservation Concern	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa	Noticeably High		Moderate		Noticeably Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State	Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

**Table 3. Method of calculating Functional Importance of vegetation communities**

Parameter	Very High	High	Moderate	Low	Very Low
Provisioning Services	Constant	Regular	Frequent	Occasional	Intermittent
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services	Very High	High	Moderate	Low	Very Low
	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

## 4.4 Assumptions, Limitations and Knowledge Gaps

### 4.4.1 Seasonality

The assessment was based on a single day field visit at the start of the dry season. It is possible that plants which flower at other times of the year are underrepresented although this is not seen as a limitation that could affect the Record of Decision as the specialist has extensive experience in the area and has assessed habitat suitability for potentially occurring Threatened plant species.

### 4.4.2 Overlooked Species

Certain plant species, particularly geophytes, will only flower in seasons when conditions are optimal and may thus remain undetected, even over a survey that encompasses several seasons. Other plant species may be overlooked because of very small size and / or extreme rarity. A sampling strategy will always represent merely a subset of the true diversity of the study area. However, the level of sampling effort for this study was appropriate for the objectives of the study.

## 5. BIODIVERSITY BASELINE DESCRIPTION

### 5.1 Flora

#### 5.1.1 National Vegetation Types

According to Mucina & Rutherford (2006), the study area is situated within the Waterberg Mountain Bushveld vegetation type, which is in the Central Bushveld Bioregion of the Savanna Biome. This vegetation type is described briefly below, based on the account in Mucina & Rutherford (2006).

##### *Waterberg Mountain Bushveld*

Waterberg Mountain Bushveld is located in the foothills, escarpment and tablelands of the Waterberg Mountains between Lephalale, Marken and Bela-Bela in the north-western region of Limpopo Province, South Africa. Vegetation structure comprises low to mid-high woodland that is dominated by deciduous, broad-leaved tree species, and has a grass-dominated herbaceous layer. Soils are mostly sandstone, subordinate conglomerate, siltstones and shale of the Kransberg Subgroup. Dominant canopy species within this vegetation type include *Burkea africana*, *Combretum apiculatum*, *Acacia caffra* and *Acacia robusta*. Other commonly recorded tree species include *Heteropyxis natalensis*, *Combretum molle*, *Pseudolachnostylis maprouneifolia* and *Terminalia sericea*. Common shrubs include *Dichrostachys cinerea*, *Euclea crispa* and *Olea capensis*. Waterberg Mountain Bushveld was assessed by Mucina & Rutherford (2006) as **Least Threatened** because of a low level of transformation (3%) and because 9% of the protection target of 24% is conserved in Marakele National Park and Moepel Nature Reserve.

The study area is not situated in any floristic centres of endemism, which are areas that have an unusually high number of plants unique to that area (Van Wyk & Smith, 2001) and is not within any listed Threatened Ecosystem (Notice 1002 of Government Gazette 34809, 9 December 2011).

#### 5.1.2 Limpopo Province Biodiversity Conservation Assessment

While the Terrestrial Ecosystem Status of the vegetation types in the study area is **Not Currently Threatened**, the Limpopo Province Biodiversity Conservation Assessment (LPBCA) classifies most of the study area and general surroundings as a **Critical**



**Biodiversity Area 1 (CBA1)** (Desmet *et al.*, 2013). CBA1's are described as **Irreplaceable** Sites that are required to meet biodiversity pattern and/or ecological processes targets. The primary land management objective for CBA1's is to maintain them in a natural state with limited or no biodiversity loss and to rehabilitate degraded areas to a natural or near natural state. Compatible land uses for these areas include conservation activities such as eco-tourism and extensive game farming (Desmet *et al.*, 2013).

### 5.1.3 Local Vegetation Communities

Two untransformed vegetation communities were identified within the proposed development site on the basis of distinctive vegetation structure (grassland, woodland, thicket, etc.), floristic composition (dominant and diagnostic species) and position in the landscape (mid-slopes, terrace, crest, etc.). The untransformed vegetation communities are described below (alien plant species are indicated by an asterisk).

#### 5.1.2.1 *Combretum apiculatum* – *Terminalia sericea* Closed Woodland

*Combretum apiculatum* – *Terminalia sericea* Closed Woodland occurs over most of the study area, particularly the central and eastern (Figure 4). Closed Woodland covers just under 10 ha which equates to just less than 83 % of the area surveyed. Vegetation structure is mainly Short Closed Woodland (*sensu* Edwards, 1983) (Figure 2). A few small rocky outcrops are found within this community which otherwise contains mostly sandy soils.

The dominant canopy trees found are *Combretum apiculatum* subsp. *apiculatum* and *Terminalia sericea*. A number of additional canopy trees occur, including *Ziziphus mucronata*, *Combretum molle*, *Burkea africana*, *Peltophorum africanum*, *Pterocarpus rotundifolius* subsp. *rotundifolius*, *Heteropyxis natalensis* and *Pseudolachnostylis maprouneifolia*. The shrub layer is reasonably diverse, with *Grewia bicolor* var. *bicolor*, *G. flava*, *Rhoicissus revoilii*, *Combretum nelsonii*, *Coddia rudis*, *Dichrostachys cinerea* subsp. *africana*, *Euclea natalensis* subsp. *angustifolia* and *Gymnosporia buxifolia* being the most frequently encountered. Grasses are dominated by *Loudetia simplex* and various *Aristida* species. Herbaceous species are thinly distributed within this community, but include *Harpagophytum zeyheri* subsp. *zeyheri*, *Kyphocarpa angustifolia*, *Agathisanthemum bojeri* subsp. *bojeri* and *Zornia glochidiata*.

A total of 80 species (76 % of the entire list) was recorded from Closed Woodland (Appendix 1) during fieldwork, the higher of the two communities present. Species fidelity, which is

closely linked to community uniqueness, is high, with 40 species (50 % of the community list) occurring nowhere else in the study area.

Only one conservation-important species were recorded, namely *Boscia albitrunca*, which is protected under the National Forests Act (No. 30 of 1998).



Figure 2. Photographs of Closed Woodland

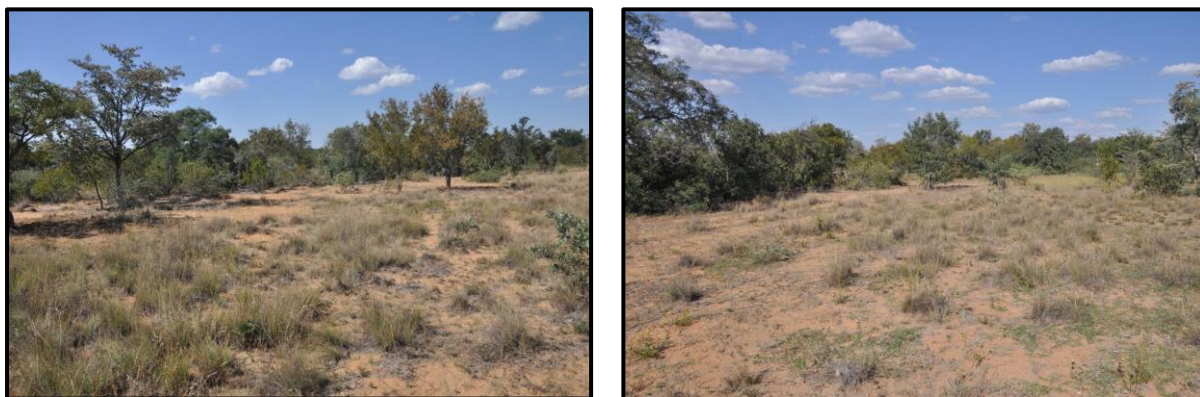
#### 5.1.2.2 *Peltophorum africanum* – *Sida cordifolia* Disturbed Open Woodland

This vegetation community occurs in the western portion of the study area, in the region of the gate (Figure 4). The area has a moderate degree of disturbance through overgrazing. Open Woodland covers 1.4 ha which equates to approximately 11 % of the area surveyed. Vegetation structure is mainly Short Open Woodland (*sensu* Edwards, 1983) (Figure 2). Soils are generally sandy and a few small rocky outcrops are present along the border with the previous community.

Trees are sparse but include *Peltophorum africanum*, *Gardenia volkensii* subsp. *volkensii* var. *volkensii*, *Strychnos madagascariensis*, *Terminalia sericea* and *Combretum molle*. Dwarf shrubs dominate the ground level and are represented by *Sida cordifolia*, *Waltheria indica*, *Melhania acuminata* var. *acuminata* and *Lippia javanica*. The most common grasses found are typical of disturbed areas and include *Melinis repens*, *Cynodon dactylon*, *Aristida adscensionis* and *Heteropogon contortus*. The herb layer is reasonably diverse and includes *Agathisanthemum bojeri* subsp. *bojeri*, *Dicerocaryum senecioides*, *Felicia muricata* subsp. *muricata*, *Geigeria ornativa* subsp. *ornativa*, *Ruellia patula*, \* *Gomphrena celosioides*, *Emilia transvaalensis*, *Zornia milneana* and *Stylosanthes fruticosa*.

A total of 64 species (61 % of the entire list) was recorded from Open Woodland (Appendix 1) during fieldwork, the lower of the two communities present. Species fidelity is high, with 25 species (39 % of the community list) occurring nowhere else in the study area.

No conservation-important species were recorded from this community.



**Figure 3. Photographs of Open Woodland**

Transformed areas make up the remaining 6 % of the study area and include the gate complex, roads and staff houses.

#### **5.1.4 Confirmed Conservation-Important Flora**

A total of 105 plant species in 42 families was recorded during fieldwork (Appendix 1). None of these are regarded as threatened (i.e. Vulnerable, Endangered or Critically Endangered) or as additional species of conservation concern (i.e. Near Threatened, Critically Rare, Rare, Declining or Data Deficient<sup>1</sup>). The tree *Boscia albitrunca* is protected under the National Forests Act (No. 30 of 1998).

#### **5.1.5 Potentially Occurring Plant Species of Conservation Concern**

Eight plant species of conservation concern potentially occur within the study area (Appendix 2). These plants have either been recorded from similar habitat within the quarter-degree grid 2328 CD and surrounding grids or are widespread in Waterberg Mountain Bushveld and are likely to occur within the study area. Three of these have a moderate chance of occurring within the study area, and these are discussed below

<sup>1</sup> Raimondo *et al.* (2009)

**Transvaal Saffron *Elaeodendron transvaalense*** (Burtt Davy) R.H.Archer

Transvaal Saffron is a small to medium-sized evergreen tree occurring in northern and eastern South Africa, and further afield through Namibia, Botswana, Zimbabwe, Mozambique and Zambia. The species is heavily harvested in South Africa for traditional medicine and some sub-populations have declined as a result; as such it has been assessed as Near Threatened (Williams *et al.*, 2008a). Although none were located during fieldwork, this species is confirmed to occur within the Lapalala Wilderness<sup>1</sup>.

**Snake-root *Drimia sanguinea*** (Schinz) Jessop

This bulbous species is confined to southern Africa, occurring from western Free State and Northern Cape through northern South Africa to Namibia, Botswana and Zimbabwe. Snake-root is a well-known, highly poisonous species which has resulted in large-scale mortality in livestock in the past. It is also one of the most widely traded species in traditional medicine markets and populations have declined by 20-25% as a result; the species has therefore been assessed as Near Threatened (Williams *et al.*, 2008b). This is an inconspicuous plant when not in flower and may have been overlooked during fieldwork. It is confirmed to occur within Lapalala<sup>2</sup>.

**Olifants River Bushwillow *Combretum petrophilum*** Retief

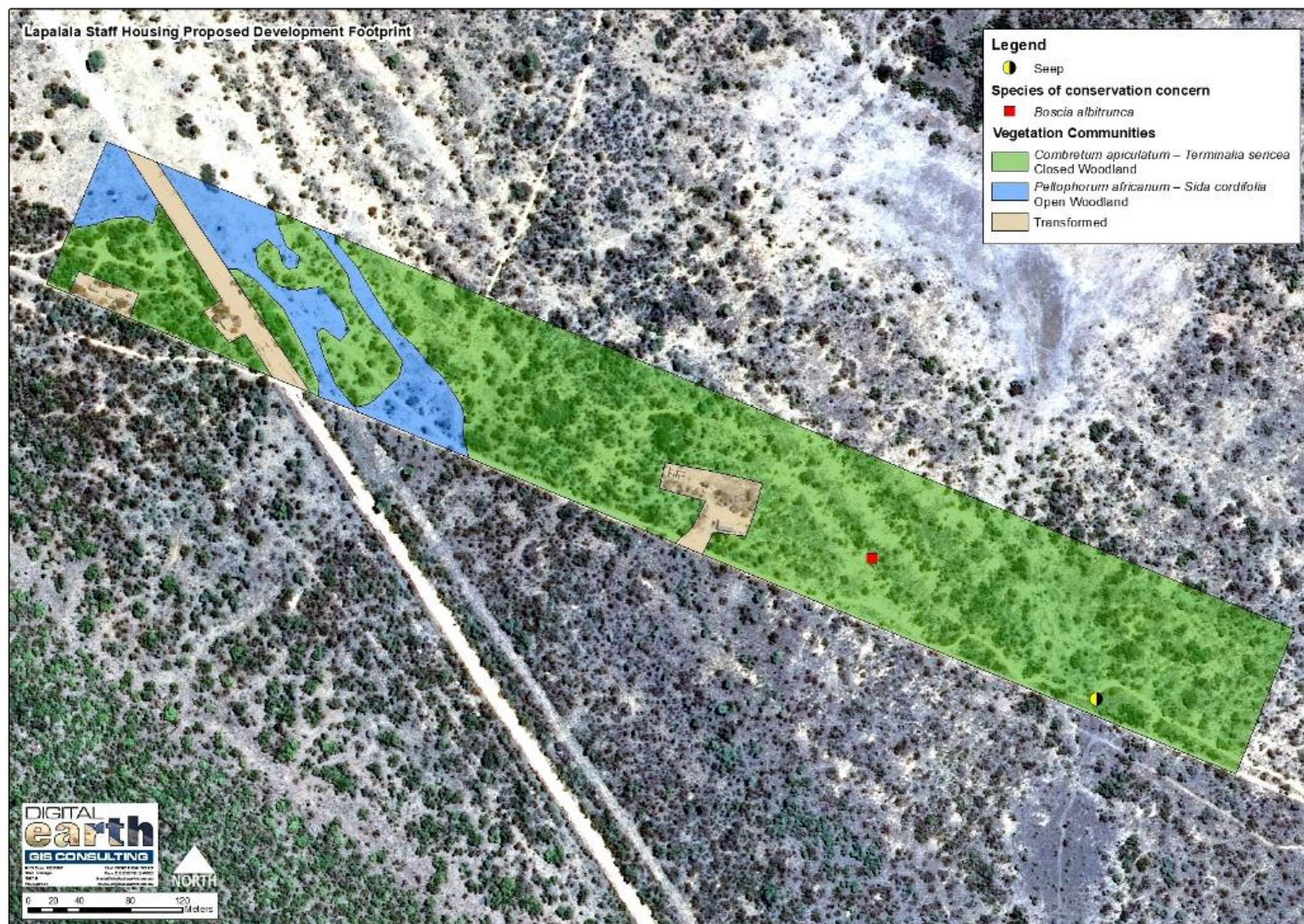
This small shrub is endemic to South Africa, occurring from the Waterberg in the west to Mariepskop in the east. It prefers rocky outcrops in mountainous areas and may occur on the rocky shelves within the study area. It has been assessed as Rare (Lötter *et al.*, 2006).

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<sup>1</sup> McKenzie, 2016

<sup>2</sup> McKenzie, 2016





**Figure 4. Vegetation communities identified within the Study Area**

## 5.2 Terrestrial Fauna

### 5.2.1 Mammals

#### 5.2.1.1 Regional Overview

The wider Waterberg region is well protected with a high number of state, provincial and private reserves present such as Marakele National Park, Mokolo Dam Nature Reserve, Moepel Nature Reserve, Vier-en-Twintig Riviere Game Reserve and many more. The study area is situated within the savanna biome within the c. 45 000 ha Lapalala Wilderness which is home to a wide diversity of naturally occurring and re-introduced mammal species, including many threatened species such as Black Rhinoceros (*Diceros bicornis minor*) and Hippopotamus (*Hippopotamus amphibius*)<sup>1</sup>. The mammal diversity for the reserve is high, although this includes small mammals such as rodents, insectivores and bats, most of which would not be located through active searching methods employed during daylight. A total of 82 mammal species have been confirmed for the degree grid 2328 to date as reflected in the Animal Demography Unit's Virtual Museum's database, although true diversity in Lapalala would be higher as many mammals are either small, cryptic or nocturnal in habit and therefore difficult to photograph<sup>2</sup>.

#### 5.2.1.2 Conservation-Important Species

Thirty-one mammal species were recorded during fieldwork within the Lapalala Wilderness during a previous Ecorex survey, including a number of Vulnerable-listed species (McKenzie, 2016). A total of 35 conservation-important mammals potentially occur within the general vicinity of the proposed development footprint (Appendix 4). Of these, 19 species are considered to be of conservation concern<sup>3</sup>. Although none of these were confirmed during fieldwork, six species have a moderate or higher likelihood of occurrence and could potentially occur anywhere in natural habitat within the study area but due to the small size of the development footprint probably only as occasional visitors. These six are described below:

<sup>1</sup> Masterplan for Lapalala Wilderness, 2016

<sup>2</sup> All virtual museum submissions require the inclusion of at least one photograph of the organism

<sup>3</sup> The same approach as Raimondo *et al.* (2009) has been followed here regarding species of conservation concern (i.e. those with a status of Declining, Near Threatened and Data Deficient, and threatened species with a status of Vulnerable, Endangered and Critically Endangered)

### **Black Rhinoceros**

Black Rhino numbers in Africa have declined by more than 90 % since 1960; mainly due to poaching. Due to this decline the local subspecies (*D. b. minor*) has been assessed as Vulnerable<sup>1</sup>. This species is resident in Lapalala (*pers. obs.*) and may occasionally forage within the study area but will not remain for long periods of time.

### **Hippopotamus**

This large even-toed ungulate is listed as Vulnerable by the International Union for Conservation of Nature (IUCN) due to habitat loss, range contraction, conflict from farmers and a decline in water quality<sup>2</sup>. This species is resident in the Lapalala River (*pers. obs.*) which is situated only 700m from the survey area. Animals probably regularly graze in the area at night but would not be resident.

### **Leopard (*Panthera pardus*)**

This large cat is listed as Vulnerable due to hunting and habitat loss<sup>3</sup> although the local population is probably stable due to the amount of protection afforded. These territorial animals are likely to regularly occur within the study area, but only for short periods of time.

### **White Rhinoceros (*Ceratotherium simum*)**

A continued and increased threat from poaching and increasing illegal demand for rhino horn has resulted in this species being assessed as Near Threatened<sup>4</sup>. This species probably regularly grazes in and around the more open areas within the study area and was observed deeper within Lapalala on the day of the survey.

**Honey Badger (*Mellivora capensis*)** is a small carnivore in the Mustelidae family which includes otters, badgers and weasels. It is assessed as Near Threatened due to direct persecution from honey farmers and for the muthi trade, indirect poisoning, poor recruitment and habitat loss<sup>5</sup>. Animals could regularly forage anywhere in natural habitat in the study area but are unlikely to be resident.

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<sup>1</sup> Swanepoel *et al.*, 2016

<sup>2</sup> <http://www.iucnredlist.org/details/10103/0>

<sup>3</sup> Swanepoel *et al.*, 2016

<sup>4</sup> Swanepoel *et al.*, 2016

<sup>5</sup> Swanepoel *et al.*, 2016

**Brown Hyaena (*Parahyaena brunnea*)**

Brown Hyaena is listed as Near Threatened in South Africa mainly due to persecution from stock farmers<sup>1</sup>. It was confirmed during previous Ecorex surveys from Lapalala and probably forages within the study area regularly.

Thirty-three potentially occurring species are protected either under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015) or the Limpopo Environmental Management Act (No. 7 of 2003) (Appendix 6). Three of these were confirmed during fieldwork (Appendix 3), and it is very likely that a number of other protected species will utilise the study area for brief periods.

Ten mammal species were confirmed to occur during fieldwork (Appendix 3).

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<sup>1</sup> Swanepoel *et al.*, 2016



## 5.2.2 Birds

### 5.2.2.1 Regional Overview

Of the nine biomes in Southern Africa, the savannah biome supports the highest diversity of bird species within the sub-region. The study area, situated within the quarter-degree grid 2328 CD, has had 216 species recorded to date by the second Southern African Bird Atlas Projects (SABAP2)<sup>1</sup>. This total is reliant on the number of checklists submitted to the project and the remoteness of the area has resulted in very few submissions. At a finer scale, data from SABAP2 indicate that 149 bird species from 9 full protocol lists<sup>2</sup> have already been recorded from the pentad (mapping unit) in which the study area is situated (2355\_2820)<sup>3</sup>.

### 5.2.2.2 Conservation-Important Species

Fifteen threatened<sup>4</sup> or Near Threatened bird species potentially occur within the general vicinity of the study area (Appendix 4). None of these were recorded during fieldwork. Two of the potentially occurring species with a moderate or high likelihood of occurring in the vicinity of the study area are threatened species (Appendix 4), and these two are discussed below:

#### **Martial Eagle (*Polemaetus bellicosus*)**

Africa's largest eagle is assessed as Endangered due a wide variety of threats including habitat loss, persecution from livestock farmers, electrocution, drowning in reservoirs, reduction of natural prey and nest disturbances<sup>5</sup>. Birds may regularly forage over the study area but no nests were located.

<sup>1</sup> [http://sabap1.adu.org.za/sabap\\_site\\_summary.php?autoSite=SABAP&QDGC=2328CD](http://sabap1.adu.org.za/sabap_site_summary.php?autoSite=SABAP&QDGC=2328CD) accessed 14/05/2018

<sup>2</sup> A submitted list is considered full protocol when at least two hours of birding has taken place over a five day period

<sup>3</sup> Data accessed from [http://sabap2.adu.org.za/pentad\\_info.php?pentad=2355\\_2820#menu\\_top](http://sabap2.adu.org.za/pentad_info.php?pentad=2355_2820#menu_top) on 14/05/2018

<sup>4</sup> Threatened species are those with a status of Critically Endangered, Endangered or Vulnerable

<sup>5</sup> Taylor *et al.*, 2015

**Lanner Falcon (*Falco biarmicus*)**

This, the largest falcon in South Africa, is listed as Vulnerable due to habitat loss, reduction of prey, direct persecution and electrocution<sup>1</sup>. It may occasionally forage over the study area although no breeding habitat (cliff ledges) is present for this species.

The remaining potentially occurring species are either wetland or grassland species and little habitat is present within the study area for them or they have very low reporting rate in the QDS or are unrecorded from the area and therefore unlikely to occur.

**5.2.2.3 Local Avifaunal Assemblages**

Forty-nine bird species were confirmed to occur within or immediately adjacent to the actual habitats represented in the study area during fieldwork and these are listed in Appendix 3. While true species richness is likely to be higher, sufficient sampling was undertaken for assessing habitat suitability for potentially occurring threatened species and to describe broad bird assemblages. One broad assemblage or species-habitat association was identified, which is briefly described below.

**Woodland Assemblage**

This is by far the largest and most diverse bird assemblage in the general Lapalala area. Common bird species found include White-bellied Sunbird (*Cinnyris talatala*), Grey Go-away-bird (*Corythaixoides concolor*), White-browed Scrub Robin (*Erythropygia leucophrys*), Golden-breasted Bunting (*Emberiza flaviventris*), Blue Waxbill (*Uraeginthus angolensis*) and Arrow-marked Babbler (*Turdoides jardineii*). Less common species recorded include Bearded Woodpecker (*Dendropicos namaquus*), Grey-headed Bushshrike (*Malaconotus blanchoti*), Grey Tit-Flycatcher (*Myioparus plumbeus*) and Bushveld Pipit (*Anthus caffer*) (Appendix 4).

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<sup>1</sup> Taylor *et al.*, 2015

## 5.2.3 Reptiles

### 5.2.3.1 Regional Overview

The Waterberg supports a very high diversity of reptile species, with diversity levels ranking in the top 10% of all areas in South Africa<sup>1</sup>. The two reptile groups showing the highest diversity include the lizards (20-41 species per QDS) and snakes (13-19 species per QDS) (Bates *et al.*, 2014). Reptile endemism is moderate, with at least five endemic species present in the general area (Bates *et al.*, 2014). Seventy-one species of reptiles have been recorded from the entire degree grid 2328, as listed on the Reptile Atlas of Southern Africa website ([http://vmus.adu.org.za/vm\\_sp\\_list.php](http://vmus.adu.org.za/vm_sp_list.php)), in Bates *et al.* (2014).

### 5.2.3.2 Conservation-Important Species

Three of the potentially occurring reptiles are species of conservation concern (Appendix 4). These include Orange-throated Flat Lizard (*Platysaurus monotropis*) which is classified as Endangered, Nile Crocodile (*Crocodylus niloticus*) which is classified as Vulnerable and is protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015) and Southern African Python (*Python natalensis*) which is listed as Protected under the National Environmental Management: Biodiversity Act (No. 10 of 2004) Threatened and Protected Species Lists (GG Notice 256, 2015, Appendix 6). Nile Crocodile has a Very Low likelihood of occurring within the study area due to lack of suitable open water habitat. Orange-throated Flat Lizard has a Low likelihood of occurrence due to the closest known population occurring further to the north of Lapalala and Southern African Python has a High likelihood of occurring anywhere within the study area although due to the small size of the area, it is likely to only occur irregularly. Only one reptile species was recorded during fieldwork, namely Bushveld Lizard (*Heliobolus lugubris*), a common and widespread species<sup>2</sup> (Appendix 3). A dedicated reptile survey using pitfall traps and drift fences, as well as additional nocturnal surveys, would be needed to adequately sample this fauna group.

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<sup>1</sup> Bates *et al.*, 2014

<sup>2</sup> Bates *et al.*, 2014

## 5.2.4 Frogs

### 5.2.4.1 Regional Overview

The Lapalala area supports a moderately high diversity of frog species, with levels of 11-20 species per QDS<sup>1</sup>. Frog endemism, however, is very low with no potentially occurring endemic species present in the area (Minter *et. al*, 2004). Twenty-five frog species have been recorded from the degree grid 2328<sup>2</sup> and, on a finer scale, 14 have been recorded from the QDS 2328 CD<sup>3</sup>, within which the study area is situated.

### 5.2.4.2 Conservation-Important Species

None of the potentially occurring frog species have a conservation-important status. No frog species were recorded during fieldwork. Dedicated trapping and nocturnal surveys in the wet season would result in confirmation of at least one species although the lack of open water habitat limits the number of species potentially occurring.

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<sup>1</sup> Minter *et. al.*, 2004

<sup>2</sup> [http://vmus.adu.org.za/vm\\_sp\\_list.php](http://vmus.adu.org.za/vm_sp_list.php) accessed 14/05/2018

<sup>3</sup> [http://vmus.adu.org.za/vm\\_sp\\_list.php](http://vmus.adu.org.za/vm_sp_list.php) accessed 14/05/2018

## 6. BIODIVERSITY VALUE ASSESSMENT

A qualitative integration of conservation importance and functional importance values for the two vegetation communities represented in the study area provides an indication of the biodiversity values of these communities. The data sheets for conservation importance and functional importance calculations for each community are presented in Appendix 5, and are dealt with in more detail under each vegetation community description. The integrated biodiversity values are summarised in Table 4 and presented spatially Figure 5.

Closed Woodland was assessed as having **Moderate** Biodiversity Value through integration of Moderate Conservation Importance and Moderate Functional Importance scores (Table 4) (Appendix 5). Only one conservation-important plant species was recorded during fieldwork, namely *Boscia albitrunca*, which is protected under the National Forests Act (No. 30 of 1998). Three species of conservation concern potentially occur, namely *Elaeodendron transvaalense* and *Drimia sanguinea* (both Near Threatened) and *Combretum petrophilum* (Rare). No Threatened or Near Threatened mammal, bird, reptile or frog species were confirmed, but three Vulnerable-listed mammal species (Hippopotamus, Black Rhinoceros and Leopard) and three Near Threatened species (Honey Badger, White Rhinoceros and Brown Hyaena) potentially occur. Martial Eagle (Endangered) and Lanner Falcon (Vulnerable) are two Threatened bird species that potentially occur as a foraging species.

Open Woodland was assessed as having **Moderate** Biodiversity Value through integration of Moderate Conservation Importance and Moderate Functional Importance scores (Table 4) (Appendix 5). No conservation-important plant species were recorded during fieldwork, but one species of conservation concern potentially occurs, namely *Drimia sanguinea* (Near Threatened). No Threatened or Near Threatened mammal, bird, reptile or frog species were confirmed, but three Vulnerable-listed mammal species (Hippopotamus, Black Rhinoceros and Leopard) and three Near Threatened species (Honey Badger, White Rhinoceros and Brown Hyaena) potentially occur. Martial Eagle (Endangered) and Lanner Falcon (Vulnerable) are two Threatened bird species that potentially occur as a foraging species.

Transformed areas are assessed as having **Low** Biodiversity Value resulting from Low Conservation Value and Low Functional Value scores. As these areas are already developed no additional comment is necessary.

**Table 4. Conservation Importance, Functional Importance and Biodiversity Values for vegetation communities in the Study Area**

<b>Vegetation Communities</b>	<b>Conservation Importance</b>	<b>Functional Importance</b>	<b>Biodiversity Value</b>
Closed Woodland	Moderate	Moderate	Moderate
Open Woodland	Moderate	Moderate	Moderate
Transformed	Low	Low	Low



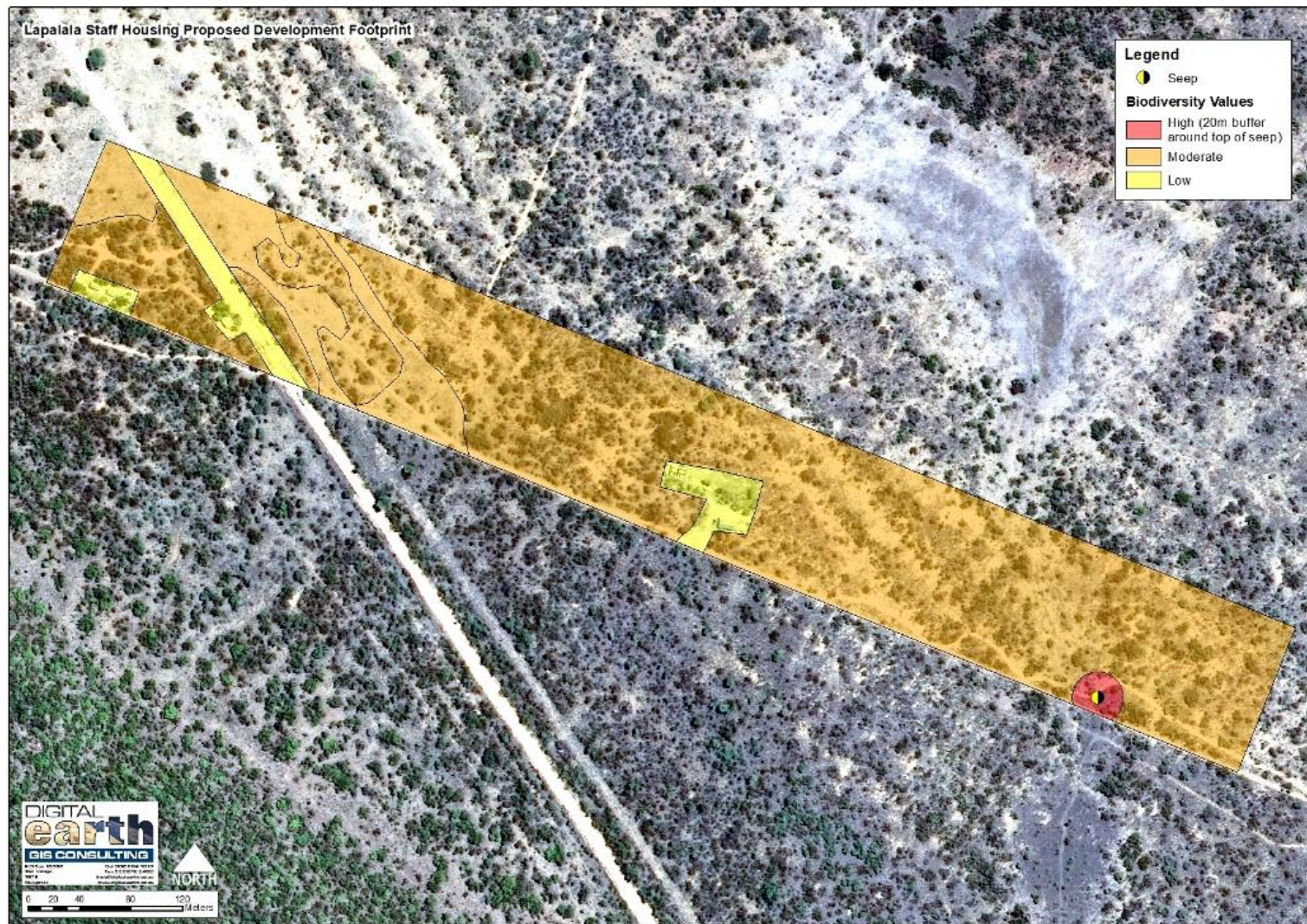


Figure 5. Biodiversity Values of Vegetation Communities in the Study Area

## 7. KEY POTENTIAL IMPACTS

This section details the expected environmental impacts of the proposed housing developments on terrestrial ecosystems. Impacts are not arranged in any order of overall significance, and this not a detailed impact assessment as this was not part of the terms of reference for this report. The following are potentially significant impacts on untransformed vegetation communities:

- **Loss of a portion of Critical Biodiversity Area 1** – The proposed housing site has been assessed as a Critical Biodiversity Area 1 by the LPBCA.
- **Loss or damage of plant species of conservation importance** – The Nationally protected tree species *Boscia albitrunca* is confirmed to occur within the study area;
- **Degradation of wetland** – the far upper portion of a large wetland system is found in the eastern portion of the study area. Any construction in this area could impact water and habitat quality. Long-term changes in surface and subsurface runoff could also negatively affect the structure and function of this system, particularly with respect to channel erosion caused by construction work damaging adjacent habitat;
- **Invasion of natural habitat by alien plants** – although only one alien plant species was located during fieldwork, additional invasion is possible as construction activities expose bare soil providing a base for alien seedlings to establish;
- **Loss of habitat for conservation-important fauna** – Three Vulnerable and three Near Threatened-listed mammals one Endangered and one Vulnerable-listed bird species have a moderate or higher likelihood of regularly occurring within the study area, and any construction would permanently destroy the available habitat;
- **Increase in poaching activities** – unsupervised construction workers may participate in small-scale poaching of small mammals. Medicinal plants such as *Drimys sanguinea* may also be harvested for muthi.



## 8. CONCLUSIONS AND RECOMMENDATIONS

Although two vegetation communities are assessed as having Moderate Biodiversity Values, the proposed housing development occupies a small area adjacent to the boundary of a very large, formally-protected conservation area. The site potentially supports very few Threatened plant species and none were confirmed during fieldwork. Although the study area can be considered typical Waterberg Mountain Bushveld, this vegetation type is not threatened. The Limpopo Province Biodiversity Conservation Assessment classifies the study area and general surroundings as a **Critical Biodiversity Area 1** (CBA1), an area deemed to be **Irreplaceable**. However, due to the small size of the proposed development and considering that existing infrastructure is already present, it is deemed that this development will not significantly negatively affect the biodiversity of the Lapalala area in the sub-regional context.

Some preliminary suggestions and mitigation measures regarding the proposed construction activities on Lapalala are recommended below. Table 5 summarises the potential Biodiversity / Development Conflict within the identified vegetation communities and makes recommendations for development options.

- All development to be situated outside of the small wetland in the eastern part of the study area, where a 20 m conservation buffer should be implemented.
- Prior to any construction at any of the sites, an experienced botanist should conduct a walk-through of these sites during the wet season (Dec-Apr), marking each plant species of conservation concern to be avoided or that may need to be relocated prior to any site clearance activity taking place.
- All proposed roads to contain adequate stormwater drainage and erosion control measures.
- Wherever possible, trees taller than 5 m or with a diameter at breast height of 30 cm should be left unharmed, whether protected by law or not.
- Poaching could be a significant threat. If any external labour teams are used during construction, then these teams should preferably be accommodated off site; if this is not possible then teams should be carefully monitored to ensure that no unsupervised access to plant and animal resources takes place.

**Table 5. Potential Biodiversity / Development Conflict within the identified vegetation communities**

<b>Vegetation Communities</b>	<b>Biodiversity / Development Conflict</b>	<b>Development Recommendations</b>
Closed Woodland	Moderate	Develop with mitigation
Riparian Forest	Moderate	Develop with mitigation
Transformed	Low	Develop

Provided the recommendations suggested in this report are followed, there is no objection to the proposed developments on Lapalala in terms of the terrestrial ecosystems of the study area. However, if construction was to proceed without the implementation of the mitigation measures given in Section 8 above and development recommendations in Table 5 then we would object to the development application.

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## 10. APPENDICES

### Appendix 1. Checklist of Flora recorded during fieldwork

Taxa	Growth Form	Red data	Protected	Vegetation Communities	
				Closed Woodland	Open Woodland
<b>Family Acanthaceae</b> <i>Blepharis integrifolia</i> (L.f.) E.Mey. ex Schinz <i>Ruellia patula</i> Jacq.	herb herb			r	r
<b>Family Aizoaceae</b> <i>Sesuvium sesuvioides</i> (Fenzl) Verdc.	herb				u
<b>Family Anacardiaceae</b> <i>Lannea discolor</i> (Sond.) Engl. <i>Ozoroa paniculosa</i> (Sond.) R.& A.Fern. var. <i>paniculosa</i>	tree tree			r r	
<b>Family Annonaceae</b> <i>Annona senegalensis</i> Pers. subsp. <i>senegalensis</i>	tree			r	
<b>Family Amaranthaceae</b> * <i>Gomphrena celosioides</i> Mart. <i>Kyphocarpa angustifolia</i> (Moq.) Lopr.	herb herb			r	u r
<b>Family Apocynaceae</b> <i>Diplorhynchus condylocarpon</i> (Möll.Arg.) Pichon	tree			r	
<b>Family Araceae</b> <i>Stylochaeton natalensis</i> Schott	herb			r	
<b>Family Araliaceae</b> <i>Cussonia transvaalensis</i> Reyneke	tree				r
<b>Family Asparagaceae</b>					

<i>Asparagus suaveolens</i> Burch.	dwarf shrub			r	
<b>Family Asteraceae</b>					
<i>Agathisanthemum bojeri</i> Klotzsch subsp. <i>bojeri</i>	herb			r	f
<i>Brachylaena huillensis</i> O.Hoffm.	tree			r	
<i>Emilia transvaalensis</i> (Bolus) C.Jeffrey	herb			r	u
<i>Felicia muricata</i> (Thunb.) Nees subsp. <i>muricata</i>	herb				f
<i>Geigeria ornativa</i> O.Hoffm. subsp. <i>ornativa</i>	herb				f
<i>Polydora poskeana</i> (Vatke & Hildebr.) H.Rob.	herb				r
<b>Family Burseraceae</b>					
<i>Commiphora mollis</i> (Oliv.) Engl.	tree			r	
<b>Family Capparaceae</b>					
<i>Boscia albitrunca</i> (Burch.) Gilg & Gilg-Ben.	tree		NFA	r	
<b>Family Celastraceae</b>					
<i>Gymnosporia buxifolia</i> (L.) Szyszyl.	shrub			f	r
<i>Gymnosporia maranguensis</i> (Loes.) Loes.	shrub			u	
<b>Family Combretaceae</b>					
<i>Combretum apiculatum</i> Sond. subsp. <i>apiculatum</i>	tree			d	r
<i>Combretum hereroense</i> Schinz	tree			r	
<i>Combretum molle</i> R.Br. ex G.Don	tree			f	u
<i>Combretum nelsonii</i> Dummer	tree			u	
<i>Combretum zeyheri</i> Sond.	tree			u	
<i>Terminalia sericea</i> Burch. ex DC.	tree			d	u
<b>Family Commelinaceae</b>					
<i>Commelina</i> sp. (no flowers)	herb				r
<b>Family Convolvulaceae</b>					
<i>Evolvulus alsinoides</i> (L.) L.	herb				r
<i>Xenostegia tridentata</i> (L.) D.F.Austin & Staples	herb				r
<b>Family Crassulaceae</b>					
<i>Kalanchoe paniculata</i> Harv.	succulent			r	r
<i>Kalanchoe rotundifolia</i> (Haw.) Haw.	succulent			r	
<b>Family Cucurbitaceae</b>					
<i>Cucurbitaceae</i> sp. (no flowers)	climber				r
<b>Family Dichapetalaceae</b>					
<i>Dichapetalum cymosum</i> (Hook.) Engl.	dwarf shrub			u	r
<b>Family Dracaenaceae</b>					

<i>Sansevieria hyacinthoides</i>	succulent			r	
<b>Family Ebenaceae</b>					
<i>Euclea crispa</i> (Thunb.) Gürke subsp. <i>crispa</i>	tree			r	r
<i>Euclea linearis</i> Zeyh. ex Hiern	dwarf shrub			r	
<i>Euclea natalensis</i> A.DC. subsp. <i>angustifolia</i> F.White	shrub			f	r
<b>Family Euphorbiaceae</b>					
<i>Acalypha villicaulis</i> Hochst.	herb				r
<b>Family Fabaceae</b>					
<i>Acacia caffra</i> (Thunb.) Willd.	tree			r	
<i>Burkea africana</i> Hook.	tree			f	r
<i>Chamaecrista mimosoides</i> (L.) Greene	herb				r
<i>Dichrostachys cinerea</i> (L.) Wight & Arn. subsp. <i>africana</i> Brenan & Brummitt	tree			u	r
<i>Elephantorrhiza burkei</i> Benth.	dwarf shrub			r	
<i>Indigofera</i> sp. (no flowers)	herb			r	u
<i>Mundulea sericea</i> (Willd.) A.Chev. subsp. <i>sericea</i>	shrub			r	r
<i>Peltophorum africanum</i> Sond.	tree			f	d
<i>Pterocarpus rotundifolius</i> (Sond.) Druce subsp. <i>rotundifolius</i>	tree			f	
<i>Schotia brachypetala</i> Sond.	tree			r	
<i>Stylosanthes fruticosa</i> (Retz.) Alston	herb				r
<i>Tylosema fassoglense</i> (Schweinf.) Torre & Hillc.	creeper			r	
<i>Zornia glochidiata</i> Rchb. ex DC.	herb			r	
<i>Zornia milneana</i> Mohlenbr.	herb			r	u
<b>Family Heteropxyidaceae</b>					
<i>Heteropyxis natalensis</i> Harv.	tree			f	u
<b>Family Malvaceae</b>					
<i>Abutilon</i> sp.	herb				r
<i>Dombeya rotundifolia</i> (Hochst.) Planch. var. <i>rotundifolia</i>	tree			u	r
<i>Grewia bicolor</i> Juss. var. <i>bicolor</i>	shrub			d	r
<i>Grewia flava</i> DC.	shrub			f	r
<i>Grewia flavescens</i> Juss.	shrub			r	
<i>Hermannia boraginiflora</i> Hook.	herb				r
<i>Hibiscus</i> sp. (no flowers)	herb			r	
<i>Melhania acuminata</i> Mast. var. <i>acuminata</i>	dwarf shrub			r	f
<i>Sida cordifolia</i> L. subsp. <i>cordifolia</i>	dwarf shrub			r	d
<i>Waltheria indica</i> L.	dwarf shrub			r	f

40



<b>Family Rubiaceae</b> <i>Cordia rudis</i> (E.Mey. ex Harv.) Verdc. <i>Gardenia volkensii</i> K.Schum. subsp. <i>volkensii</i> var. <i>volkensii</i> <i>Oldenlandia herbacea</i> (L.) Roxb.	shrub tree herb			u r r	r f
<b>Family Sapindaceae</b> <i>Papaya capensis</i> Eckl. & Zeyh.	tree			r	
<b>Family Sapotaceae</b> <i>Englerophytum magalismontanum</i> (Sond.) T.D.Penn.	tree			r	
<b>Family Selaginellaceae</b> <i>Selaginella dregei</i> (C.Presl) Hieron.	fern			r	
<b>Family Strychnaceae</b> <i>Strychnos madagascariensis</i> Poir.	tree			u	u
<b>Family Velloziaceae</b> <i>Xerophyta retinervis</i> Baker	dwarf shrub			r	
<b>Family Verbenaceae</b> <i>Lippia javanica</i> (Burm.f.) Spreng. <i>Vitex pooara</i> Corbishley	dwarf shrub shrub			r	r
<b>Family Viscaceae</b> <i>Viscum combreticola</i> Engl.	parasite			r	
<b>Family Vitaceae</b> <i>Cyphostemma</i> sp. <i>Rhoicissus revoilii</i> Planch.	succulent climber			u	r
<b>TOTAL</b>	<b>105</b>	<b>0</b>	<b>1</b>	<b>80</b>	<b>64</b>

NFA = National Forests Act	d = dominant f = frequent u = uncommon r = rare
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## Appendix 2. Potentially occurring plant species of conservation concern

Species	Family	Red Data Status	Habitat	Likelihood	Reason
<i>Justicia minima</i>	Acanthaceae	Rare	Rocky riverbeds	Very Low	No suitable habitat present
<i>Brachystelma inconspicuum</i>	Apocynaceae	Rare	Open quartzitic grassland	Very Low	No suitable habitat present
<i>Elaeodendron transvaalensis</i>	Celastraceae	Near Threatened	Woodland, often on rocky slopes	Moderate	Suitable habitat present
<i>Combretum petrophilum</i>	Combretaceae	Rare	Rocky outcrops in mountain bushveld	Moderate	Suitable habitat present
<i>Euphorbia louwii</i>	Euphorbiaceae	Rare	Sandstone ridges	Low	Suitable habitat present but plant is conspicuous and none located despite intensive searching
<i>Euphorbia waterbergensis</i>	Euphorbiaceae	Rare	Quartzitic ridges in bushveld	Low	No suitable habitat present
<i>Drimia sanguinea</i>	Hyacinthaceae	Near Threatened	Wide habitat tolerance	Moderate	Suitable habitat present, plants are inconspicuous when not flowering
<i>Freylinia tropica</i>	Scrophulareaceae	Rare	Streambanks	Very Low	No suitable habitat present

## Appendix 3. Checklist of fauna confirmed during fieldwork

Common Name	Scientific Name	Red Data	Endemic	Protected: National	Protected: Provincial	Woodland Assemblage
<b>Mammals</b>						
<b>ORDER: PRIMATES</b> <b>Family Cercopithecidae (Old World monkeys)</b> Chacma Baboon	<i>Papio ursinus</i>					x
<b>ORDER: LAGOMORPHA</b> <b>Family Leporidae (rabbits and hares)</b> Scrub Hare	<i>Lepus saxatilis</i>					x
<b>Family Bathyergidae (mole-rats)</b> Common Molerat	<i>Cryptomys hottentotus</i>		E			x
<b>ORDER: CARNIVORA</b> <b>Family Canidae (dogs, jackals &amp; allies)</b> Black-backed Jackal	<i>Canis mesomelas</i>					x
<b>ORDER: TUBULIDENTATA</b> <b>Family Orycteropodidae (Aardvark)</b> Aardvark	<i>Orycteropus afer</i>			NEMBA (PR)	LEMA	x
<b>ORDER: PERRISODACTYLA</b> <b>Family Equidae (horses)</b> Plains / Burchell's Zebra	<i>Equus quagga burchellii</i>			NEMBA (PR)		x
<b>ORDER: CETARTIODACTYLA</b> <b>Family Suidae (pigs)</b> Common Warthog	<i>Phacochoerus africanus</i>					x
<b>Family Bovidae (cattle &amp; antilopes)</b> Kudu	<i>Tragelaphus strepsiceros</i>					x
Blue Wildebeest	<i>Connochaetes taurinus</i>			NEMBA		x

Impala	<i>Aepyceros melampus</i>			(PR)		x
Subtotal	10	0	1	3	1	10
<b>Birds</b>						
<b>ORDER: GALLIFORMES</b>						
<b>Family Phasianidae (pheasants, fowl and allies)</b>						
Natal Spurfowl	<i>Pternistis natalensis</i>					x
<b>ORDER: COLUMBIFORMES</b>						
<b>Family Columbidae (pigeons and doves)</b>						
Red-eyed Dove	<i>Streptopelia semitorquata</i>					x
Cape Turtle Dove	<i>Streptopelia capicola</i>					x
Laughing Dove	<i>Spilopelia senegalensis</i>					x
Emerald-spotted Wood Dove	<i>Turtur chalcospilos</i>					x
<b>ORDER: MUSOPHAGIFORMES</b>						
<b>Family Musophagidae (turacos)</b>						
Grey Go-away-bird	<i>Corythaixoides concolor</i>					x
<b>ORDER: COLIIFORMES</b>						
<b>Family Coliidae (mousebirds)</b>						
Red-faced Mousebird	<i>Urocolius indicus</i>					x
<b>ORDER: CORACIIFORMES</b>						
<b>Family Coraciidae (rollers)</b>						
Lilac-breasted Roller	<i>Coracias caudatus</i>					x
<b>Family Alcedinidae (kingfishers)</b>						
Brown-hooded Kingfisher	<i>Halcyon albiventris</i>					x
<b>ORDER: BUCEROTIFORMES</b>						
<b>Family Upupidae (hoopoes)</b>						
African Hoopoe	<i>Upupa africana</i>					x
<b>Family Phoeniculidae (wood-hoopoes)</b>						
Green Wood-hoopoe	<i>Phoeniculus purpureus</i>					x
<b>Family Bucerotidae (hornbills)</b>						
African Grey Hornbill	<i>Tockus nasutus</i>					x
<b>ORDER: PICIFORMES</b>						
<b>Family Lybiidae (African barbets)</b>						
Yellow-fronted Tinkerbird	<i>Pogoniulus chrysoconus</i>					x
Black-collared Barbet	<i>Lybius torquatus</i>					x

<b>Family Picidae (woodpeckers)</b>						
Cardinal Woodpecker	<i>Dendropicos fuscescens</i>					x
Bearded Woodpecker	<i>Dendropicos namaquus</i>					x
<b>ORDER: PASSERIFORMES</b>						
<b>Family Platysteiridae (wattle-eyes and batises)</b>						
Chinspot Batis	<i>Batis molitor</i>					x
<b>Family Prionopidae (helmetshrikes)</b>						
White-crested Helmetshrike	<i>Prionops plumatus</i>					x
<b>Family Malaconotidae (bushshrikes)</b>						
Grey-headed Bushshrike	<i>Malaconotus blanchoti</i>					x
Orange-breasted Bushshrike	<i>Chlorophoneus sulfureopectus</i>					x
Black-crowned Tchagra	<i>Tchagra senegalus</i>					x
Black-backed Puffback	<i>Dryoscopus cubla</i>					x
Brubru	<i>Nilaus afer</i>					x
<b>Family Oriolidae (figbirds and orioles)</b>						
Black-headed Oriole	<i>Oriolus larvatus</i>					x
<b>Family Dicuridae (drongos)</b>						
Fork-tailed Drongo	<i>Dicrurus adsimilis</i>					x
<b>Family Paridae (tits and chickadees)</b>						
Southern Black Tit	<i>Parus niger</i>					x
<b>Family Alaudidae (larks)</b>						
Sabota Lark	<i>Calendulauda sabota</i>					x
<b>Family Pycnonotidae (bulbuls)</b>						
Dark-capped Bulbul	<i>Pycnonotus tricolor</i>					x
Yellow-bellied Greenbul	<i>Chlorocichla flaviventris</i>					x
<b>Family Macrosphenidae (crombecs and African warblers)</b>						
Long-billed Crombec	<i>Sylvietta rufescens</i>					x
<b>Family Cisticolidae (cisticolas and allies)</b>						
Rattling Cisticola	<i>Cisticola chiniana</i>					x
<b>Family Leiothrichidae (laughingthrushes)</b>						
Arrow-marked Babbler	<i>Turdoides jardineii</i>					x
<b>Family Sturnidae (starlings)</b>						
Cape Glossy Starling	<i>Lamprotornis nitens</i>					x
Red-winged Starling	<i>Onychognathus morio</i>					x
<b>Family Buphagidae (oxpeckers)</b>						

Red-billed Oxpecker	<i>Buphagus erythrorhynchus</i>					x
<b>Family Turdidae (thrushes)</b>						
Kurrichane Thrush	<i>Turdus libonyanus</i>					x
<b>Family Muscicapidae (chats and Old World flycatchers)</b>						
White-browed Scrub Robin	<i>Erythropygia leucophrys</i>					x
Grey Tit-Flycatcher	<i>Myioparus plumbeus</i>					x
Southern Black Flycatcher	<i>Melaenornis pammelaina</i>					x
Familiar Chat	<i>Oenanthe familiaris</i>					x
<b>Family Nectariniidae (sunbirds)</b>						
Amethyst Sunbird	<i>Chalcomitra amethystina</i>					x
White-bellied Sunbird	<i>Cinnyris talatala</i>					x
<b>Family Passeridae (Old World sparrows)</b>						
Southern Grey-headed Sparrow	<i>Passer diffusus</i>					x
Yellow-throated Petronia	<i>Gymnoris superciliaris</i>					x
<b>Family Estrildidae (waxbills, munias and allies)</b>						
Blue Waxbill	<i>Uraeginthus angolensis</i>					x
<b>Family Motacillidae (wagtails and pipits)</b>						
Bushveld Pipit	<i>Anthus caffer</i>					x
<b>Family Fringillidae (finches and canaries)</b>						
Yellow-fronted Canary	<i>Crithagra mozambica</i>					x
Streaky-headed Seedeater	<i>Crithagra gularis</i>					x
<b>Family Emberizidae (buntings and New World sparrows)</b>						
Golden-breasted Bunting	<i>Emberiza flaviventris</i>					x
Subtotal	49	0	0	0	0	49
<b>Reptiles</b>						
<b>ORDER: SQUAMATA</b>						
<b>Family Lacertidae (true lizards)</b>						
Bushveld Lizard	<i>Heliobolus lugubris</i>					x
Subtotal	1	0	0	0	0	1
<b>Total</b>	<b>60</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>60</b>

E = Endemic

NEMBA = National Environmental Management: Biodiversity Act

LEMA = Limpopo Environmental Management Act

## Appendix 4. Potentially occurring fauna of conservation concern

Common Name	Scientific Name	Red Data	Protected	Habitat	Likelihood	Reason
<b>Mammals</b>						
Cheetah	<i>Acinonyx jubatus</i>	VU	NEMBA (VU)	Wide variety of habitats	Very Low	Very rare in the Waterberg, may occasionally wander through
African Clawless Otter	<i>Aonyx capensis</i>	NT	LEMA	Rivers and streams	Very Low	No suitable habitat present
South African Hedgehog	<i>Atelerix frontalis</i>	NT	LEMA	Arid grassland and savanna	Low	Limited suitable habitat present, very rare in the Waterberg
White Rhinoceros	<i>Ceratotherium simum</i>	NT	NEMBA (PR)	Wide variety of habitats	High	Resident in Lapalala
African Civet	<i>Civettictis civetta</i>		LEMA	Wide variety of habitats	High	Suitable habitat present
Blue Wildebeest	<i>Connochaetes taurinus</i>		NEMBA (PR)	Wide variety of habitats	Confirmed	
Swamp Musk Shrew	<i>Crocidura mariquensis</i>	NT		Wetlands	Very Low	No suitable habitat present
Spotted Hyaena	<i>Crocuta crocuta</i>	NT	NEMBA (PR)	Wide variety of habitats	Low	Rare in the Waterberg
African Marsh Rat	<i>Dasymys robertsii</i>	VU		Wetland habitats	Low	No suitable habitat present
Black Rhinoceros	<i>Diceros bicornis minor</i>	VU	NEMBA (VU)	Thickets, savanna	Moderate	Suitable habitat present
Burchell's Zebra	<i>Equus quagga burchelli</i>		NEMBA (PR)	Wide variety of habitats	Confirmed	
African Wild Cat	<i>Felis silvestris</i>		LEMA	Wide variety of habitats	High	Suitable habitat present
Southern Lesser Galago	<i>Galago moholi</i>		LEMA	Savanna	High	Suitable habitat present
Giraffe	<i>Giraffa camelopardalis</i>		LEMA	Savanna	High	Suitable habitat present
Yellow-spotted Rock Hyrax	<i>Heterohyrax brucei</i>		LEMA	Rocky woodland	Low	Rocky shelves too small
Hippopotamus	<i>Hippopotamus amphibius</i>	VU*	LEMA	Wetlands	Moderate	Resident in the Lapalala River, 700m from the survey area



Roan	<i>Hippotragus equinus</i>	EN	NEMBA (EN)	Open tall-grass savanna	Very Low	Confined to small camps within the reserve
Serval	<i>Leptailurus serval</i>	NT	NEMBA (PR)	Grassland, wetlands	Low	Limited suitable habitat present
African Elephant	<i>Loxodonta africana</i>	VU*	NEMBA (PR)	Wide variety of habitats	Low	Small population in Lapalala and frequent an area far to the north of the study area
African Wild Dog	<i>Lycaon pictus</i>	EN	NEMBA (EN)	Wide variety of habitats	Very Low	Very rare in the Waterberg, may occasionally wander through
Honey Badger	<i>Mellivora capensis</i>	NT	LEMA	Wide variety of habitats	Moderate	Suitable habitat present
Klipspringer	<i>Oreotragus oreotragus</i>		LEMA	Rocky woodland	Moderate	Suitable habitat present
Aardvark	<i>Otycteropus afer</i>		NEMBA (PR)	Wide variety of habitats	Confirmed	
Bat-eared Fox	<i>Otocyon megalotis</i>		LEMA	Semi-desert, arid woodland and grassland	Moderate	Suitable habitat present
Thick-tailed Greater Galago	<i>Otolemur crassicaudatus</i>		LEMA	Moist woodland and forest	Low	No suitable habitat present
Leopard	<i>Panthera pardus</i>	VU	NEMBA (PR)	Wide variety of habitats	Moderate	Suitable habitat present
Brown Hyaena	<i>Parahyaena brunnea</i>	NT	NEMBA (PR)	Wide variety of habitats	Moderate	Suitable habitat present
African Weasel	<i>Poecilogale albinucha</i>	NT		Wide variety of habitats	Low	No recent records from the area
Jameson's Red Rock Rabbit	<i>Pronolagus randensis</i>		LEMA	Rocky slopes in savanna	Moderate	Suitable habitat present
Aardwolf	<i>Proteles cristatus</i>		LEMA	Wide variety of habitats	Moderate	Suitable habitat present
Steenbok	<i>Raphicerus campestris</i>		LEMA	Wide variety of habitats	Moderate	Suitable habitat present
Sharpe's Grysbok	<i>Raphicerus sharpei</i>		NEMBA (PR)	Broad-leaved Woodland	Moderate	Suitable habitat present
Mountain Reedbuck	<i>Redunca fulvorufula</i>	EN	LEMA	Grassland and open woodland on slopes	Low	Limited suitable habitat present
Ground Pangolin	<i>Smutsia temminckii</i>	VU	NEMBA (VU)	Wide variety of habitats	Low	Increasingly rare species
Buffalo	<i>Syncerus caffer</i>		LEMA	Wide variety of habitats	Moderate	Suitable habitat present
<b>Subtotal</b>	<b>35</b>	<b>19</b>	<b>33</b>			

Birds						
Tawny Eagle	<i>Aquila rapax</i>	EN	NEMBA (EN)	Savanna	Low	Very rare in the area
Verreauxs' Eagle	<i>Aquila verreauxii</i>	VU		Mountains and surrounding vegetation	Low	No suitable habitat present
Abdim's Stork	<i>Ciconia abdimii</i>	NT		Open arid woodland and grassland	Low	No suitable habitat present
Black Stork	<i>Ciconia nigra</i>	VU		Forages in wetlands and breeds on cliffs	Very Low	No suitable habitat present
European Roller	<i>Coracias garrulus</i>	NT		Savanna	High	Suitable habitat present
Lanner Falcon	<i>Falco biarmicus</i>	VU		Wide variety of habitats	Moderate	Suitable foraging habitat present only
Lesser Kestrel	<i>Falco naumanni</i>			Grassland, semi-desert	Low	No suitable habitat present
Red-footed Falcon	<i>Falco vespertinus</i>	NT		Arid savanna and grasslands	Low	No suitable habitat present
White-backed Vulture	<i>Gyps africanus</i>	EN	NEMBA (EN)	Savanna	Low	Low density in the area, disturbance
Cape Vulture	<i>Gyps coprotheres</i>	EN	NEMBA (EN)	Mountains and surrounding vegetation	Low	Low density in the area, disturbance
Marabou Stork	<i>Leptoptilos crumeniferus</i>	NT		Wetlands, savanna	Low	Limited suitable habitat present, disturbance
Denham's Bustard	<i>Neotis denhami</i>	VU	NEMBA (VU)	Grassland	Low	No suitable habitat present
Martial Eagle	<i>Polemaetus bellicosus</i>	EN	NEMBA (EN)	Wide variety of habitats	Moderate	Suitable habitat present
African Finfoot	<i>Podica senegalensis</i>	VU		Rivers with over-hanging vegetation	Very Low	No suitable habitat present
Secretarybird	<i>Sagittarius serpentarius</i>	VU		Open savanna and grassland	Low	Limited suitable habitat present
Lappet-faced Vulture	<i>Torgos tracheliotos</i>	EN	NEMBA (EN)	Savanna	Low	Low density in the area, disturbance
<b>Subtotal</b>	<b>16</b>	<b>15</b>	<b>6</b>			
Reptiles						
Nile Crocodile	<i>Crocodylus niloticus</i>	VU	NEMBA (VU)	Waterbodies	Very Low	No suitable habitat present

Orange-throated Flat Lizard	<i>Platysaurus monotropis</i>	EN		Sandstone outcrops	Low	Only known from a very small area to the NE of the study area
Southern African Python	<i>Python natalensis</i>		NEMBA (PR)	Wide variety of habitats, but usually near water or rocky outcrops	High	Suitable habitat present
<i>Subtotal</i>	3	2	2			
<b>TOTAL</b>	<b>54</b>	<b>36</b>	<b>41</b>			

EN = Endangered

VU = Vulnerable

NT = Near-threatened

\* = IUCN Assessment

PR = Protected

LEMA = Limpopo Environmental Management Act

NEMBA = National Environmental Management: Biodiversity Act

## Appendix 5. Biodiversity Values of Vegetation Communities

### Closed Woodland

#### Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small (<500km <sup>2</sup> )	Small (500 to 1,000km <sup>2</sup> )	Moderate (1,000 to 20,000km <sup>2</sup> )	Large (20,000 to 50,000km <sup>2</sup> )	Very Large (> 50,000km <sup>2</sup> )
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Threatened Species		Noticeably High		Moderate		Noticeably Low
	11	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
<b>MEDIAN Score</b>	<b>11,5</b>	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

*EVR Species = Endangered, Vulnerable or Rare*

#### Functional Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
<b>MEDIAN Score</b>	<b>12,0</b>	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

**Open Woodland****Conservation Importance**

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small ( $<500\text{km}^2$ )	Small (500 to $1,000\text{km}^2$ )	Moderate (1,000 to $20,000\text{km}^2$ )	Large (20,000 to $50,000\text{km}^2$ )	Very Large ( $> 50,000\text{km}^2$ )
	11	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Threatened Species		Noticeably High		Moderate		Noticeably Low
	11	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	10	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
<b>MEDIAN Score</b>	<b>10,5</b>	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

*EVR Species = Endangered, Vulnerable or Rare***Functional Importance**

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	12	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
<b>MEDIAN Score</b>	<b>12,0</b>	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

**Transformed Areas****Conservation Importance**

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Size / Length		Very small ( $<500\text{km}^2$ )	Small (500 to $1,000\text{km}^2$ )	Moderate (1,000 to $20,000\text{km}^2$ )	Large (20,000 to $50,000\text{km}^2$ )	Very Large ( $>50,000\text{km}^2$ )
	14	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Species Diversity		Noticeably High		Moderate		Noticeably Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Threatened Species		Noticeably High		Moderate		Noticeably Low
	0	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Unique Habitat or Taxa		Noticeably High		Moderate		Noticeably Low
	0	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Present Ecological State		Natural, largely Unmodified	Slightly modified	Moderately Modified	Considerably Modified	Severely Modified
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
<b>MEDIAN Score</b>	<b>5,0</b>	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

*EVR Species = Endangered, Vulnerable or Rare***Functional Importance**

Parameter	Score	Very High	High	Moderate	Low	Very Low
Provisioning Services		Constant	Regular	Frequent	Occassional	Intermittent
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Regulating Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Cultural Services		Very High	High	Moderate	Low	Very Low
	4	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
Supporting Services		Very High	High	Moderate	Low	Very Low
	5	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
<b>MEDIAN Score</b>	<b>5,0</b>	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

## Appendix 6. Duncan McKenzie CV

**Name:** Duncan Robert McKenzie  
**Profession:** Terrestrial Ecologist  
**Date of Birth:** 9 Nov 1977  
**Name of Firm:** ECOREX Consulting Ecologists cc  
**Position in Firm:** Ecologist  
**Years with firm:** 10  
**Nationality:** South African



### Qualifications :

- |                                |                       |      |
|--------------------------------|-----------------------|------|
| • N.Dip. [Nature Conservation] | UNISA, RSA            | 2007 |
| • N.Cert. [Nature Guiding]     | Drumbeat Academy, RSA | 2004 |

### Membership in Professional Societies:

- BirdLife South Africa
- Animal Demography Unit, University of Cape Town
- Botanical Society of South Africa

### Languages :

	<u>Speaking</u>	<u>Reading</u>	<u>Writing</u>
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair

**Countries of Work Experience** : Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe (Guiding). South Africa, Mozambique, DRC, Mali, Lesotho, Tanzania, Swaziland, Sierra Leone (Consulting Ecologist)

### OVERVIEW OF EXPERIENCE

- 10 years' experience in specialist species identification, conducting baseline surveys, data analysis and report writing in various biomes in southern Africa, particularly savannah, forest and grassland biomes
- 2 years experience game reserve management (KwaZulu-Natal)
- 5 years' experience (part time) of wetland delineation and management
- 2 years experience of plant propagation and use for rehabilitation
- Specialist knowledge of identification of vascular plants
- Specialist knowledge of identification of mammals, birds, reptiles and amphibians
- SABAP2 Regional Co-ordinator: Mpumalanga
- Member of the Kwa-Zulu-Natal Bird Rarities Committee

### Employment Record:

2007 - present	ECOREX	Ecologist
2005 - 2006	Iglu (London, UK)	Specialist Travel Agent
1997 - 2005	Duncan McKenzie Bird Tours	Owner, Specialist Guide
2001	KZN Wildlife	District Conservation Officer, Reserve Manager
1999 - 2001	Institute of Natural Resources	Part-time Horticulturalist and Rehabilitation Officer
1997-2001	Mondi Wetlands Project	Part-time Field Assistant and Regional Co-ordinator
1996-1997	Natal Parks Board	Ranger



## Appendix 7. Specialist Declaration Form

### 10.4 The Specialist

**Note:** Duplicate this section where there is more than one specialist.

I ...Duncan McKenzie..., as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

X	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
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	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
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- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
- will take into account, to the extent possible, the matters listed in regulation 18 of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

ECOREX Consulting Ecologists CC

Name of company  
18/05/2018

Date