NGWENYA LODGE

BASELINE TERRESTRIAL ECOLOGY STUDY & BIODIVERSITY VALUE ASSESSMENT



DECEMBER 2017

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

Prepared by: ECOREX Consulting Ecologists CC
Postnet Suite #192,
Private Bag X2
Raslouw 0109

Author: Duncan McKenzie

Reviewer: Warren McCleland (ECOREX)

ECOREX

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ECOREX Consulting Ecologists CC
PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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 7
✓	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	page 68
✓	(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	page 69
✓	(c) an indication of the scope of, and the purpose for which, the report was prepared;	page 8
✓	(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 37
✓	(g) an identification of any areas to be avoided, including buffers;	page 37
✓	(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 39
✓	(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 40
✓	(k) any mitigation measures for inclusion in the EMPr;	page 41
X	(l) any conditions for inclusion in the environmental authorisation;	n/a
✓	(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	n/a
	(n) a reasoned opinion-	
✓	(i) as to whether the proposed activity or portions thereof should be authorised; and	page 41
✓	(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 41
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.	n/a

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

Abbreviations

IUCN	International Union for Conservation of Nature
KNP	Kruger National Park
mamsl	Metres Above Mean Sea Level
MBSP	Mpumalanga Biodiversity Sector Plan
MNCA	Mpumalanga Nature Conservation Act (No. 10 of 1998)
MTPA	Mpumalanga Tourism and Parks Agency
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 2531 BD
SANParks	South African National Park0073

Terminology

Alien	Introduced from elsewhere: neither endemic nor indigenous.
Artiodactyl	Even-toed, hoofed animal.
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.
Moribund	An accumulation of dead plant matter that suppresses growth and vigour of the vegetation.
Palaearctic	Ecozone consisting of North Africa, Europe and Asia north of the Himalayan foothills.
Transformed	Transformed ecosystems are no longer natural and contain little or no indigenous flora. Examples include agricultural lands, plantations, urban areas, etc.

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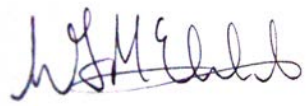
PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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. McCleland *01 December 2017*

D.R. McKenzie *01 December 2017*

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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 the proposed Ngwenya Lodge expansion and sewage treatment works projects north-west of Komatipoort, Ehlanzeni District, Mpumalanga (Figure 1). This study will provide a basis for assessing potential impacts of the proposed project on terrestrial ecology and guide the design and location of planned infrastructure. The study comprised flora and key vertebrate fauna (mammals, birds, reptiles, frogs). The two key deliverables for this study 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, sits on the KZN Bird Rarities Committee and is a co-author on the Wildflowers of the Kruger National Park project.

Linda McKenzie (GIS Specialist). Linda is a GIS Specialist/GIS Analyst with over 13 years' experience in the industry. For the last 5 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).

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

2. TERMS OF REFERENCE

The objectives of the Ecology Survey were to:

- Provide an 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 was 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.

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

3. STUDY AREA

The proposed development is situated on Portions 68, 77, 78, 79, 80 & 82 and Remainder Portion 109 of the farm Tenbosch No. 162-JU, approximately 11 km north-west of the town of Komatipoort, Ehlanzeni District, Mpumalanga (Figure 1). Two developments are planned on Tenbosch, both of which are covered by this report:

- Expansion of Ngwenya Lodge, including guest accommodation and associated facilities
- Upgrade of existing sewage system, including additional piping and the construction of a new wastewater treatment plant.

The Ngwenya Lodge portion lies on the southern bank of the Crocodile River adjacent to the Kruger National Park (KNP) and the proposed wastewater treatment plant will be constructed on Remainder Portion 109 to the south-west of Ngwenya Lodge. Both portions lie adjacent to the tarred D1870 road, between the town of Marloth Park to the west and the Crocodile Bridge Gate to the east. Most of the study area is developed and includes the tourist resort of Ngwenya Lodge as well as old agricultural lands. The area surveyed covers approximately 75 ha, of which 40 ha (57 %) are transformed. The remaining 35 ha comprise natural vegetation in varying degrees of disturbance or degradation. Surrounding land uses include agriculture, tourism, a fruit packhouse and residential developments. The study area is situated within the quarter-degree grid 2531 BD at an altitude between 180 and 200 mamsl.

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

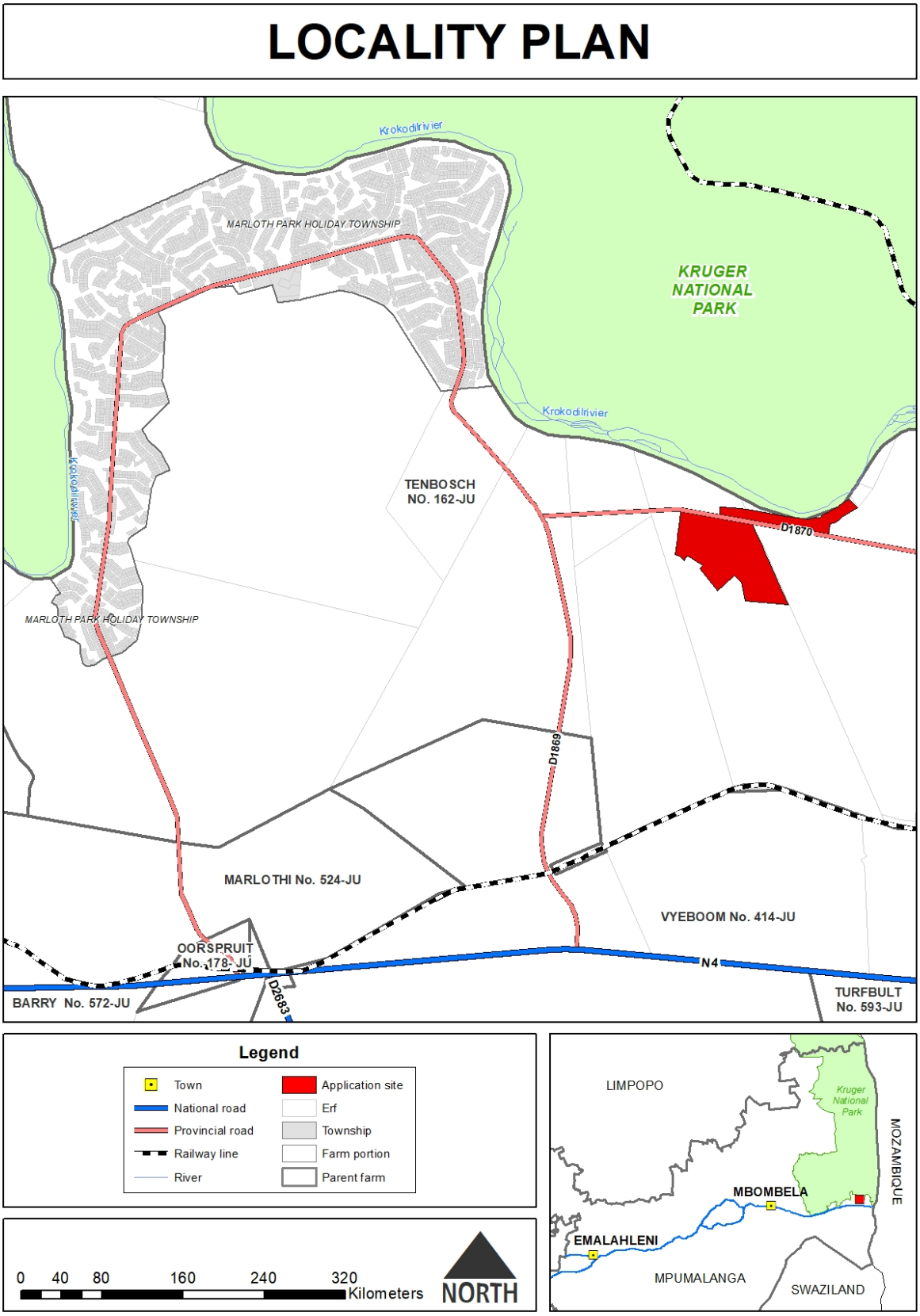

Figure 1. Location of Study Area

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(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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 2531 BD in the Mpumalanga Tourism & Parks Agency's threatened species database, as well as PRECIS data 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

Vegetation communities identified in the desktop phase were ground-truthed during a single day field trip on the 8th November 2017. 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.

4.2 Fauna

Desktop

Lists of conservation-important mammals, birds, reptiles and frogs potentially occurring within the proposed agricultural development were prepared using data from the MTPA's threatened species database, Swanepoel *et al*. (2016), the Southern African Bird Atlas Project 2 http://sabap2.adu.org.za/, Taylor *et al.* (2016), Minter *et al*. (2004) and Bates *et al*. (2014). 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). Bat species thought to only forage over the study area (i.e. mostly cave-roosting species) were not included in the assessment due to the lack of roosting sites within the study area. Potential occurrence of fauna in the study area was predicted based on knowledge of known habitat requirements of local fauna species.

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,

ECOREX Consulting Ecologists CC
PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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.

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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 8.

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

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^2)	(500 to 1,000km^2)	(1,000 to 20,000km^2)	(20,000 to 50,000km^2)	(> 50,000km^2)
	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

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PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

Table 3. Method of calculating Functional Importance of vegetation communities

Parameter	Very High	High	Moderate	Low	Very Low
Provisioning Services	Constant	Regular	Frequent	Occassional	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 field survey at the start of the growing season only. It is possible that plants which flower at other times of the year are underrepresented, including most of the potentially occurring threatened plants such as *Adenium swazicum* (Critically Endangered) and *Aloe komatiensis* (Endangered). Additional summer fieldwork is recommended to search for these and other species, particularly in the woodland vegetation communities.

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.

4.4.3 Sampling Areas

None of the proposed new infrastructure around Ngwenya Lodge is planned within riparian areas and therefore limited time was spent surveying them. Focus was placed on the terrestrial ecosystems away from these zones.

ECOREX Consulting Ecologists CC
PO Box 57 White River 1240
(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

5. BIODIVERSITY BASELINE DESCRIPTION

5.1 Flora

5.1.1 Regional Context

According to Mucina & Rutherford (2006), the study area is situated in Delagoa Lowveld within the Lowveld Bioregion in the Savanna Biome. This vegetation type occurs in a narrow strip on Karoo Supergroup shale and sandstones from the Satara area in the KNP down to the Strydom Block area, and then through Swaziland and marginally into KwaZulu-Natal in the south. In Mpumalanga, Delagoa Lowveld originally covered 69 854 ha, of which 15 % has been transformed, mostly through sugarcane and settlements. This vegetation type is considered well protected and has a conservation status of **Least Concern** (Lötter *et al.,* 2014). This is largely due to much of this community occurring within the KNP. It is not listed as a Threatened Ecosystem (Notice 1002 of Government Gazette 34809, 9 December 2011).

Typical Delagoa Lowveld is characterised by a dense tree or tall shrub layer, dominated by *Acacia welwitschii*, and a reasonably diverse herb layer covered mostly by grasses and forbs. Additional canopy species include *Acacia senegal* var. *rostrata*, *Albizia petersiana*, *Schotia capitata* and *Spirostachys africana*. Shrubs are dominated by *Euclea divinorum* and *Maerua parvifolia*. The most frequently recorded grasses are *Chloris virgata, Panicum coloratum, P. maximum* and *Sporobolus nitens*. Herbs found include *Blepharis integrifolia, Kyphocarpa angustifolia* and *Ruellia patula*. *Aloe parvibracteata* is a common succulent[1].

Most of the terrestrial ecosystems within the study area are classified as **Heavily Modified** or **Moderately Modified Areas** by the Mpumalanga Biodiversity Sector Plan (MBSP). The scattered untransformed sections are classified as **Other Natural Areas**[2]. Other Natural Areas refer to areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character, while performing a range of biodiversity and ecological functions. Other Natural Areas offer much more flexibility in terms of permissible land uses, but the desired management objective should be to minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning.

[1] Mucina & Rutherford, 2006
[2] Lötter *et al.,* 2014

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The entire study area is also situated within the **Ecological Support Areas (ESA): Protected Area Buffers** unit. ESA's are "areas that are not essential for meeting (conservation) targets, but play an important role in supporting the functioning of CBA's and that deliver important ecosystem services" (Lötter *et al.*, 2014). Protected Area Buffers are areas that surround proclaimed protected areas that moderate the negative impacts of land-uses that may affect the ecological functioning of those protected areas[1].

The study area is not situated in any of southern Africa's floristic centres of endemism, which are areas that have an unusually high number of plants unique to that area (Van Wyk & Smith, 2001).

5.1.2 Local Vegetation Communities

Three untransformed vegetation communities were identified within the study area 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.). Transformed areas make up approximately 40 ha (57 %) of the study area. The untransformed vegetation communities are described in detail below:

5.1.2.1 *Ficus sycomorus – Trichilia emetica* Disturbed Riparian Forest / Thicket

This vegetation community occurs in narrow, scattered portions within the study area along a few small tributaries of the Crocodile River. The largest tracts are located on Remainder of Portion 109 south of the D1870 (Figure 7). Vegetation structure is mostly Low to Tall Forest but also Thicket in places (*sensu* Edwards, 1983) where strata are absent (Figure 2). Riparian Forest / Thicket covers approximately 8 ha which equates to 11 % of the study area. Evergreen trees and woody shrubs dominate this vegetation community, with the dominant canopy species being *Ficus sycomorus* and *Trichilia emetica*. Other common canopy species include *Diospyros mespiliformis, Schotia brachypetala, Bridelia micrantha, Rauvolfia caffra* and *Acacia robusta* subsp*. clavigera.* Dominant shrubs found include *Flueggea virosa* subsp. *virosa*, *Phyllanthus reticulatus, Gymnosporia senegalensis, Lantana camara* and *Gymnanthemum coloratum*. The climbers *Acacia schweinfurthii* var. *schweinfurthii*, *Combretum microphyllum, C. mossambicense* and *Capparis tomentosa* are frequently observed. Herbs and dwarf shrubs located include *Barleria elegans*, *Pluchea dioscoridis, Hypoestes forskaolii, Euphorbia cyathophora* and *Ageratum conyzoides.*

[1] Lötter *et al*., 2014

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(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

Grasses are generally sparse except at forest edge and include *Setaria megaphylla* and *Panicum maximum*.

A total of 59 species (41 % of the entire list) was recorded from Riparian Forest / Thicket, the second highest of all the vegetation communities (Appendix 1). Species fidelity, which is closely linked to community uniqueness, is very high, with 42 species (71 % of the community list) occurring nowhere else in the study area.

Only one conservation-important plant species was recorded during fieldwork, namely *Philenoptera violacea,* which is protected under the National Forests Act (No. 30 of 1998) (Table 4).

Figure 2. Photographs of Disturbed Riparian Forest / Thicket

5.1.2.2 *Acacia nigrescens – Eragrostis superba* Closed Woodland

Acacia nigrescens – Eragrostis superba Closed Woodland covers 21 ha or 28 % of the study area (Figure 7). Vegetation structure can best be described as Short to Tall Closed Woodland as described by Edwards (1983) (Figure 3). Part of this community has been degraded through historical farming activities which included small camps for the breeding of Southern Savannah Buffalo (*Syncerus caffer* subsp*. caffer*).

A low diversity of trees is present in the canopy with *Acacia nigrescens* dominating. Other trees located include *Combretum hereroense, Ziziphus mucronata, Dichrostachys cinerea* subsp*. africana* and *Peltophorum africanum. S*hrubs and dwarf shrubs are present in low abundance but include *Euclea divinorum, Grewia flavescens*, *Barleria elegans, Asparagus cooperi, Solanum campylacanthum* subsp*. panduriforme* and *Maerua parvifolia.* The succulents *Kalanchoe rotundifolia, Cissus rotundifolia* var*. rotundifolia, C. quadrangularis*

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PO Box 57 White River 1240
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var. *quadrangularis* and *Aloe marlothii* are scattered throughout the community. The dominant grasses found include *Eragrostis superba*, *Brachiaria serrata*, *Panicum maximum, Cenchrus ciliaris* and *Urochloa mosambicensis.*

A total of 43 species was recorded in *Acacia nigrescens – Eragrostis superba* Closed Woodland, representing 30 % of the entire species list (Appendix 1) and the lowest of the three untransformed vegetation communities. Species fidelity is moderate, with 14 species (35 % of the community list) occurring nowhere else in the study area. One plant species protected under the Mpumalanga Nature Conservation Act (No.10 of 1998) was recorded, namely *Aloe marlothii* subsp. *marlothii* (Table 4).

Figure 3. Photographs of Closed Woodland

5.1.2.3 *Acacia nigrescens - Dichrostachys cinerea* Degraded Woodland / Thicket

This vegetation community is restricted to the Ngwenya Lodge grounds in the northern part of the study area (Figure 7). Vegetation structure is mostly Low to Short Closed Woodland grading into Thicket in places (*sensu* Edwards, 1983) (Figure 4). Degraded Woodland / Thicket covers just under 7 ha or almost 10 % of the entire study area.

This community has been degraded through a variety of anthropogenic factors including dumping of building rubble and garden refuse, lack of a burning policy leading to moribund vegetation and invasion by alien plants. The canopy is dominated by various tree species, including *Acacia nigrescens, A. tortilis* subsp. *heteracantha, A. xanthophloea, Ziziphus mucronata* subsp. *mucronata, Peltophorum africanum* and *Sclerocarya birrea* subsp. *caffra*. The most frequently recorded shrubs include *Dichrostachys cinerea* subsp. *africana, Lantana camara, Tecoma stans, Grewia bicolor* var. *bicolor, Maerua parvifolia* and *Schotia capitata*. Plants recorded in the herb layer include *Sansevieria hyacinthoides, Talinum*

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caffrum, Stylochaeton natalensis and *Ledebouria revoluta*. The succulents *Aloe parvibracteata, A. marlothii* subsp*. marlothii, A. chabaudii* var*. chabaudii* and *Opuntia stricta* occur in scattered colonies. Grasses are patchily distributed but when found are dominated by *Heteropogon contortus*.

A total of 77 species (53 % of the entire list) was recorded from the Degraded Woodland / Thicket community, the highest species richness of the three untransformed vegetation communities in the study area (Appendix 1). Species fidelity, which is closely linked to community uniqueness, is high, with 32 species (42 % of the community list) occurring nowhere else in the study area.

Eight conservation-important species were recorded within this vegetation community (Table 4). *Elaeodendron transvaalense* and *Dalbergia melanoxylon* have been assessed as Near Threatened. The trees *Sclerocarya birrea* subsp. *caffra*, *Elaeodendron transvaalense, Combretum imberbe* and *Philenoptera violacea* are protected under the National Forests Act (No. 30 of 1998) and the succulents *Aloe chabaudii* var*. chabaudii, A. parvibracteata* and *A. marlothii* subsp*. marlothii* are protected under the Mpumalanga Nature Conservation Act (No.10 of 1998).

Figure 4. Photographs of Degraded Woodland / Thicket

5.1.2.4 Transformed

Approximately 40 ha, or 57 % of the study area, is transformed through former agricultural activities (Figure 5). While most of these old lands were lying fallow during the survey, they were in the process of being planted to sugarcane. One conservation-important plant species was recorded from Transformed areas namely *Sclerocarya birrea* subsp*. caffra* which is protected under the National Forests Act (No. 30 of 1998).

ECOREX Consulting Ecologists CC
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(013) 750-1893 (083) 231-5632 warren@ecorex.co.za

Figure 5. Photographs of Transformed Areas

5.1.3 Conservation-Important Flora

One hundred and forty-five plant species were recorded within the study area during fieldwork (Appendix 1). Two of these are classified as Near Threatened, namely the trees *Elaeodendron transvaalense* (rare) and *Dalbergia melanoxylon* (rare) (Figure 6). Four plants are protected under the National Forests Act (No. 30 of 1998), namely the trees *Philenoptera violacea* (rare), *Combretum imberbe* (rare), *Sclerocarya birrea* subsp*. caffra* (uncommon) and *Elaeodendron transvaalense* (rare). Three plant species recorded are protected under the Mpumalanga Nature Conservation Act (No.10 of 1998), namely the succulents *Aloe marlothii* subsp. *marlothii* (uncommon), *A. parvibracteata* (rare) and *A. chabaudii* var*. chabaudii* (rare). Table 4 presents a list of the conservation-important species located during fieldwork. The two Near Threatened species are discussed below:

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

This 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). A few scattered individuals were located within the Ngwenya Lodge grounds.

***Dalbergia melanoxylon* Guill. & Perr.** Zebra Wood

This species usually grows as a small to medium-sized tree and is found throughout the Lowveld and as far north and west as Senegal. Although not locally listed, it is assessed by the IUCN as Near Threatened due to over-collection for the wood carving industry and in the

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manufacturing of musical instruments[1]. A few small colonies were located within the Ngwenya Lodge grounds (Figure 6).

Elaeodendron transvaalense (from file)

Dalbergia melanoxylon

Figure 6. Photographs of plants of Conservation Concern located during fieldwork

Thirteen plant species of conservation concern have been recorded from similar habitat within the quarter-degree grid 2531 BD and surrounding grids with similar vegetation communities. Two of these are confirmed and are discussed in above. Four potentially occurring species of conservation concern have a moderate chance of being found within the untransformed vegetation communities (Appendix 2). Of these, two species are listed as **Endangered,** namely *Aloe komatiensis* and *Pavetta zeyheri* subsp. *microlancea*. Individuals of the former species have been recorded on Tenbosch (*pers. obs*.) and due to their small size may have been overlooked. One additional species is listed as Near Threatened, namely *Drimia sanguinea*. The last potentially occurring species with a moderate likelihood of occurrence is listed as Rare, namely *Barleria oxyphylla*. These five species are discussed in greater detail below:

***Aloe komatiensis* Reynolds** Komatipoort Aloe

This succulent is listed as Endangered due to significant habitat loss within its small local distribution[2] and may occur within the Closed Woodland or Degraded Woodland / Thicket vegetation communities. This species flowers in February and March and would not yet have flowered at the time of the survey. When sterile, this taxon looks very similar to the winter-flowering *A. parvibracteata*, which was confirmed during fieldwork, and is best separated when in flower.

[1] World Conservation Monitoring Centre. 1998. Dalbergia melanoxylon. The IUCN Red List of Threatened Species 1998: e.T32504A9710439. http://dx.doi.org/10.2305/IUCN.UK.1998.RLTS.T32504A9710439.en. Downloaded on 27 May 2017.

[2] von Staden, L. & McKenzie, D. 2015

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***Pavetta zeyheri* Sond. subsp*. microlancea* (K.Schum.) P.P.J.Herman** Komatipoort Grey-leaved Brides-bush

This dwarf shrub is listed as Endangered due to the very low number of individuals known, as well as significant habitat loss[1], and may occur within the Closed Woodland or Degraded Woodland / Thicket vegetation communities.

***Drimia sanguinea* (Schinz) Jessop** Red Drimia

This small bulb is invisible for most of the year either through dormancy or being inconspicuous due to its grass-like leaves. It is only in the flowering season (early spring) that they are visible and may occur in any of the woodland communities. This plant is listed as Near Threatened due to over-collection for the medicinal plant trade[2].

***Barleria oxyphylla* Lindau**

This small herb is very rare in Mpumalanga but can be overlooked due to its relatively small flowers. It is assessed as Rare due to the small known population and small world distribution.[3] It has a moderate chance of occurring within the two woodland communities.

The remaining seven species have a low likelihood of occurrence due to regional scarcity or lack of suitable habitat within the study area.

The co-ordinates of the conservation-important plants located during fieldwork are presenting in Appendix 3. These localities represent the larger or main clusters of plants and should not be seen as a complete inventory of all species present as some may have been missed during fieldwork and for others a general point was placed at the centre of a large copse or grove of plants. These localities are meant to guide the developers during the planning and construction phases. These points are spatially presented in Figure 7.

[1] von Staden, L., Lötter, M. & McCleland, W. 2013
[2] Williams et al, 2008
[3] Victor, 2006

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Table 4. Conservation-important plant species confirmed during fieldwork

Taxa	Growth Form	Red Data	Protected	Vegetation Communities			
				Riparian Forest / Thicket	Acacia Woodland	Degraded Woodland / Thicket	Transformed
Family Anacardiaceae							
Sclerocarya birrea (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	tree		NFA			u	r
Family Asphodelaceae							
Aloe chabaudii Schönland var. *chabaudii*	succulent		MNCA			r	
Aloe marlothii A.Berger subsp. *marlothii*	succulent		MNCA		r	u	
Aloe parvibracteata Schönland	succulent		MNCA			r	
Family Celastraceae							
Elaeodendron transvaalense (Burtt Davy) R.H.Archer	tree	NT	NFA			r	
Family Combretaceae							
Combretum imberbe Wawra	tree		NFA			r	
Family Fabaceae							
Dalbergia melanoxylon Guill. & Perr.	tree	NT‡				r	
Philenoptera violacea (Klotzsch) Schrire	tree		NFA	r		r	
TOTAL	**8**	**2**	**7**	**1**	**1**	**8**	**1**

NFA = National Forests Act	d = dominant
MNCA = Mpumalanga Nature Conservation Act	f = frequent
NT = Near Threatened	u = uncommon
‡ = IUCN assessment	r = rare

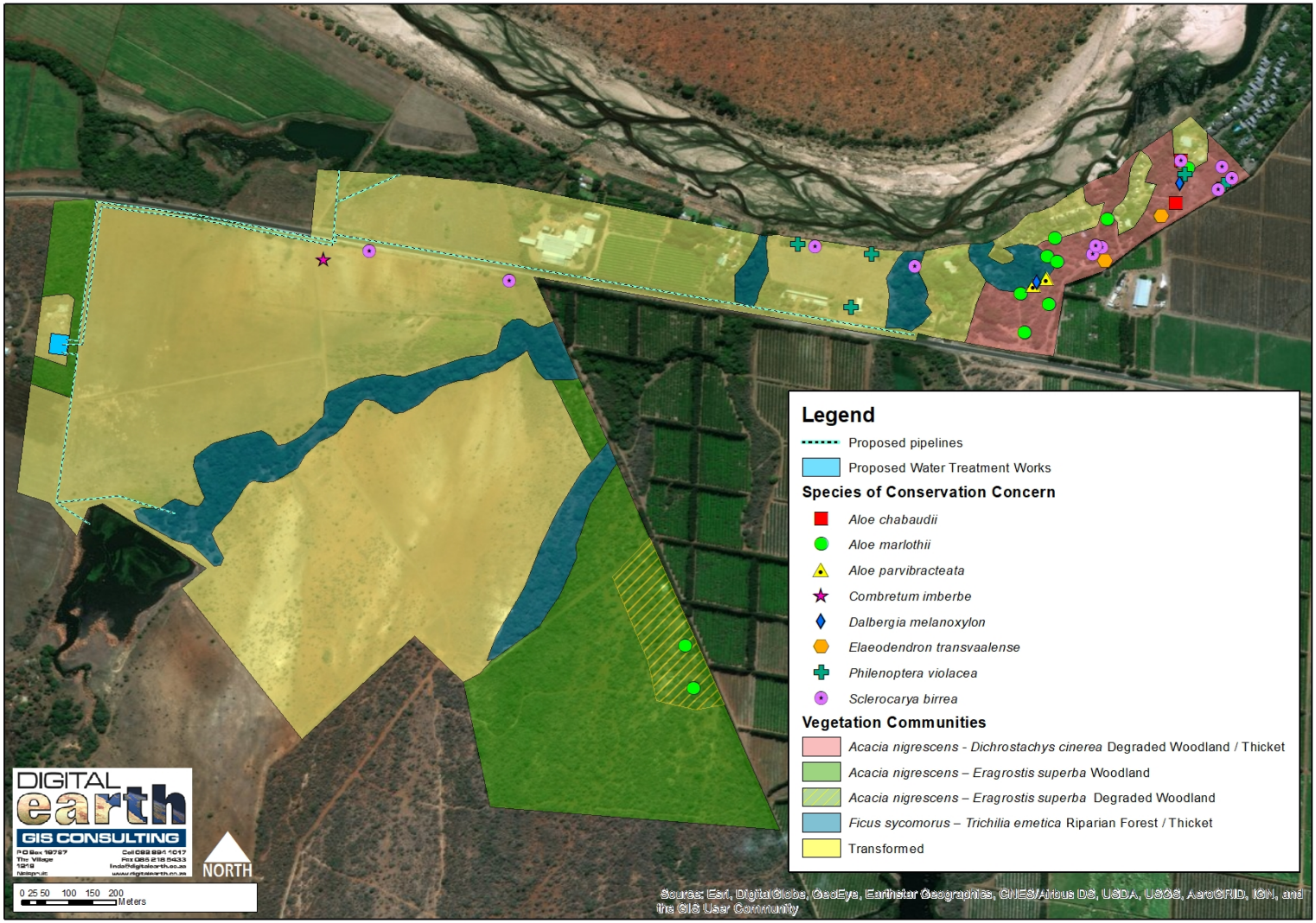

Figure 7. Vegetation communities identified within the Study Area

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5.2 Terrestrial Fauna

5.2.1 Mammals

5.1.2.1 Regional Overview

The Komatipoort district, situated in the savanna biome immediately south of KNP, has very high mammal diversity, relatively low numbers of endemics and a moderate number of Red Data species[1]. Most of the area around Tenbosch has been transformed for agriculture (mainly citrus, sugarcane and bananas) but also lodge developments, fruit packhouses and townships such as Marloth Park and Komatipoort itself. Large tracts of untransformed land are present to the north of the study area within the KNP but scattered small patches are present on Tenbosch and surrounding farms, including the municipal reserve Lionspruit situated *c*. 3.5 km to the west of the study area. Most of the study area is transformed (57 %) but much of the Remainder Portion 109 section contains natural woodland and currently supports a number of indigenous larger mammals bred for the game trade and hunting industries. In addition, the study area is located on the boundary fence of the KNP and animals such as African Elephant (*Loxodonta africana*) and Common Warthog (*Phacochoerus africanus*) are confirmed to enter in through the poorly maintained boundary fence to forage, presumably at night. Evidence of this was found in the extreme western portion of the study area, adjacent to the Crocodile River. According to the Animal Demography Unit's Virtual Museum, 150 mammal species have been recorded from the degree grid 2531[2]. However, 65 mammal species are confirmed for 2531 BD[3], within which the study area is situated.

[1] Skinner & Chimimba, 2013, Swanepoel *et al*., 2016
[2] http://vmus.adu.org.za/vm_sp_list.php accessed 29/11/2017
[3] http://vmus.adu.org.za/vm_sp_list.php accessed 29/11/2017

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5.1.2.2 Conservation-Important Species

An estimated 24 conservation-important mammals potentially occur within the project area (Appendix 5), although most of these are more likely in adjacent conservation land than in the project area itself. Several bat species are highly likely to occur overhead, such as Short-eared Trident Bat (*Cloeotis percivali*, Endangered), but these species are only likely to feed over the site because of the shortage of suitable roosting sites. Of the 24 potentially occurring species, 15 are considered to be of conservation concern[1] with six considered threatened (Appendix 5). Two of these are listed as Vulnerable and were **confirmed** during fieldwork, namely Hippopotamus (*Hippopotamus amphibius*) and African Elephant. These two are discussed below.

Hippopotamus

This large artiodactyl is listed as Vulnerable due to habitat loss, range contraction, conflict with farmers and a decline in water quality[2]. Evidence of this species was found in the grassy plain in the extreme west of the study area, adjacent to the Crocodile River. It is assumed that individuals enter this area through the poorly maintained fence at night to forage. It may also occur within the dams on Ngwenya Lodge. This species is resident in the adjacent Crocodile River (*pers.obs*.).

African Elephant

Despite South Africa only having 4% of Africa's elephant population, they are the best protected and most intensely managed[3]. Elephants, classified as Vulnerable in the latest Red Data assessment[4], are now mostly restricted to conservation areas in South Africa and the KNP area supports an estimated 13 750 animals[5]. The world's largest land mammal is threatened due to poaching for ivory and meat, loss and fragmentation of habitat and conflict with humans in agricultural areas[6]. Dung was located in the grassy plain in the extreme west of the study area, adjacent to the Crocodile River. It is assumed that individuals enter this area through the poorly maintained fence at night to forage but are only likely to do so irregularly.

[1] 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 (Vulnerable, Endangered and Critically Endangered)
[2] Friedmann & Daly, 2004
[3] Blanc *et al*., 2007
[4] Swanepoel *et al*., 2016
[5] Ferreira *et al*., 2012
[6] Blanc, J. 2008

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The remaining four potentially occurring threatened species, namely African Wild Dog (*Lycaon pictus*), which is Endangered, and Lion (*Panthera leo)*, Leopard (*Panthera pardus*) and Ground Pangolin (*Smutsia temminckii*), all of which are Vulnerable, have a low likelihood of occurrence due to human disturbance, lack of prey or general scarcity. Both Lion and African Wild Dog regularly escape from the KNP (*pers. obs*.) but tend to wander widely before being persecuted, captured or returning to the Park and tend not to remain in any one area for extended periods of time.

Eight potentially occurring species are classified as Near Threatened, which are species close to or likely to soon qualify for the status of Vulnerable. None were confirmed from within the study area during fieldwork but three of these have a moderate likelihood of occurring due to the presence of suitable habitat. These three are discussed below.

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 farmers and for the muthi trade, indirect poisoning, poor recruitment and habitat loss[1]. Animals could regularly forage anywhere in natural habitat in the study area but are unlikely to be resident due to the small size of natural habitat remaining.

Side-striped Jackal (*Canis adustus*) is another small carnivore but in the Canidae family which includes dogs and wolves. A habitat specialist found primarily in deciduous broad-leaved woodland but also utilises other woodland types. It is listed as Near Threatened to persecution from livestock farmers as well as from people due to a perceived rabies threat[2]. This species could forage anywhere in natural habitat in the study area but is unlikely to be resident due to the small area of suitable habitat present.

Natal Red Duiker (*Cephalophus natalensis*)

This small antelope is listed as Near Threatened due to ongoing habitat loss due to agriculture and bush-clearing as well as losses through bushmeat hunting[3]. It is fairly common in dense riparian thickets in the Komatipoort area (*pers. obs*.) and they are likely to be resident within the study area in small numbers.

The rest of the potentially occurring Near Threatened species have a low likelihood of occurrence due to human disturbance, lack of prey or general scarcity.

[1] Swanepoel *et al*., 2016
[2] Hoffman, 2014
[3] Swanepoel *et al*. (2016)

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Twenty potentially occurring species are protected under either the Mpumalanga Nature Conservation Act (No. 10 of 1998) or the National Environmental Management: Biodiversity Act Threatened or Protected Species (No. 10 of 2004). Four of these were confirmed during fieldwork: Hippopotamus, African Elephant, Nyala (*Tragelaphus angasii*) and Southern Savannah Buffalo. Nine mammal species were confirmed to occur during fieldwork, one of which was a new record for the QDS 2531 BD in the Virtual Museum Database, namely Single-striped Mouse (*Lemniscomys rosalia*) (Appendix 4).

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5.2.2 Birds

5.2.2.1 Regional Overview

The savanna biome supports the highest diversity of bird species within the Southern African sub-region and the KNP supports the largest birdlist of all conservation areas in South Africa with an estimated 57 % of the birds found within the entire southern African sub-region[1]. The study area, situated within the quarter degree square (QDS) 2531 BD, is especially diverse with a total of 375 species recorded during the second Southern African Bird Atlas Project (SABAP2)[2], which is currently in progress. This is the second highest total for a QDS in Mpumalanga and the fourth highest within the KNP. At a finer scale, data from SABAP2 indicate that 353 bird species have already been recorded from the pentad (mapping unit) in which the study area is situated (2520_3150)[3], also the second highest of all the 1015 pentads situated within Mpumalanga. A pentad covers an area of approximately 77 km^2, which is considerably smaller than a quarter-degree grid and thus a better indication of which species occur in the study area.

5.2.2.2 Conservation-Important Species

Twenty-nine of the bird species potentially occurring within the study area, either species that have been confirmed to occur in 2531 BD during SABAP2 or species that potentially occur due to presence of suitable habitat, have Red Data status (Appendix 5). One of these was **confirmed** to occur during fieldwork:

White-backed Vulture (*Gyps africanus*)

Like all the other vulture species in South Africa, the White-backed Vulture's population has declined in the last few decades due to various factors including persecution for the medicinal trade, poisoning, power line electrocutions and collisions and drowning in concrete reservoirs[4]. This has resulted in this species being assessed as Critically Endangered in the latest conservation assessment (Taylor *et. al*., 2016) Two birds were observed flying over the Ngwenya Lodge site but would potentially forage within the Remaining Portion 109 area to the south-west of the lodge, although only irregularly. This species is still fairly common within the adjacent KNP (SABAP2 reporting rate of 62 % for the pentad 2520_3150).

[1] Taylor *et. al*., 2015
[2] http://sabap2.adu.org.za/pentad_info.php?pentad=2555_3030#menu_top accessed 27/05/2017
[3] Data accessed from http://sabap2.adu.org.za/pentad_info.php?pentad=2555_3030#menu_top on 27/05/2017
[4] Taylor *et. al*., 2015

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Suitable nesting sites (tall trees such as *Diospyros mespiliformis* and *Acacia nigrescens*) are present in this area but no nests were located during fieldwork.

Nineteen additional species of conservation-concern[1] have a low likelihood of occurring within the study area (Appendix 5). This is primarily due to regional rarity, a lack of suitable prey items available, human disturbance from farming and recreational activities and insufficient habitat area available due to habitat transformation. Many of these species, though, will be visible from the study area in the adjacent KNP including vultures, eagles and storks. Some breeding habitat (tall trees) for larger birds is present in the Riparian Forest / Thicket vegetation community but the disturbance levels there are high due to agricultural activities and probably only suitable for species with high tolerance for humans such as the raptors Yellow-billed Kite (*Milvus aegyptius*) or Wahlberg's Eagle (*Hieraaetus wahlbergi*), or Egyptian Goose (*Alopochen aegyptiaca*).

Six potentially occurring species have been assessed as Threatened (Appendix 5). These three species are discussed below:

Bateleur (*Terathopius ecaudatus*)

The Bateleur is listed as Endangered in South Africa primarily due to habitat loss and is now mostly restricted to larger conservation areas, at least as a breeding species[2]. An estimated 550 – 650 breeding pairs are found within the KNP[3]. Birds may occasionally forage over the natural vegetation within the study area and, although suitable nesting sites (tall trees such as *Diospyros mespiliformis* and *Acacia nigrescens*) are present, no nests were located during fieldwork.

Tawny Eagle (*Aquila rapax*)

This large eagle is listed as Endangered due to continuing decline in the local population through habitat transformation, direct persecution, indirect poisoning and drowning in concrete reservoirs[4]. It is largely restricted to conservation areas in South Africa and the KNP area supports an estimated 500 – 700 pairs (Barnes, 1998). Birds will probably regularly utilise the study area to forage in and although suitable breeding habitat is present, no nests were located.

[1] 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 (Vulnerable, Endangered and Critically Endangered)
[2] Taylor *et. al*., 2015
[3] Barnes, 1998
[4] Taylor *et. al*., 2015

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Martial Eagle (*Polemaetus bellicosus*)

Africa's largest eagle is listed as Endangered due to many factors including habitat loss, direct persecution from small-stock farmers and indirect persecution from electrocution and reservoir drownings[1]. This species was confirmed on Tenbosch during a previous ECOREX ecological survey (McKenzie, 2016) and may occasionally hunt over the study area. No nests were located during fieldwork although suitable tall trees are present.

Hooded Vulture (*Necrosyrtes monachus*) – Critically Endangered, Lappet-faced Vulture (*Torgos tracheliotos*) – Endangered and **White-headed Vulture (*Trigonoceps occipitalis*) – Critically Endangered**

These three vultures are all threatened due to similar anthropogenic impacts such as habitat loss, poisoning, electrocution and collision with powerlines, drowning in concrete farm reservoirs and collection for the medicinal trade[2]. All could potentially forage within the study area although only irregularly. Hooded Vulture is confirmed to breed on Tenbosch (G. Batchelor, *pers. comm*.) but the proposed wastewater treatment facility would have little effect on the birds as it will be situated close to areas of high human disturbance and the vultures would likely avoid these sites.

Two bird species listed as Near Threatened have a moderate or high likelihood of occurring within the habitats within the study area (Appendix 5). The remaining Near Threatened species all have a low likelihood of occurrence. These two are elaborated on below.

European Roller (*Coracias garrulous*)

This Palaearctic migrant prefers open, grassy areas within savanna and could potentially occur in any of the more open areas within the study area, including transformed areas. It is listed as Near Threatened due to habitat loss over some of its breeding grounds, particularly in Europe[3].

Marabou Stork (*Leptoptilos crumeniferus*)

The largest of all Africa's storks, the Marabou favours a wide diversity of habitats and will readily scavenge around humans. It has a moderate likelihood of occasionally foraging within refuse or dump sites within the study area, as it does in nearby Marloth Park

[1] Taylor *et. al*., 2015
[2] Taylor *et. al*., 2015
[3] Taylor *et. al*., 2015

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(*pers.obs*.). This species does not regularly breed in South Africa but a few pairs breed in central Swaziland[1].

Ten potentially occurring species are protected under the National Environmental Management: Biodiversity Act (No.10 of 2004, Appendix 3), one of which was confirmed to occur, namely White-backed Vulture.

Ninety bird species were confirmed to occur in the study area during fieldwork. Thirty-two species were recorded from Riparian Forest, 34 from Woodland, 20 from Wetland and 15 from Transformed (Appendix 4). Sufficient sampling was undertaken for assessing habitat suitability for potentially occurring threatened species, the primary objective of the ornithological component of this study, and to describe broad bird assemblages. Further fieldwork is likely to increase the species richness of each assemblage but is unlikely to identify additional assemblages.

5.2.2.3 Local Avifaunal Assemblages

Four broad assemblages or species-habitat associations were identified, each of which is briefly described below:

I. Riparian Forest / Thicket Assemblage

This assemblage occurs in the riparian forest / thicket patches, best represented in the south-western portion of the study area but also around the existing Ngwenya Lodge. Bird species present includes those species not commonly found in the adjacent K.N.P. due to habitat transformation by large herbivores. These include Red-backed Mannikin (*Lonchura nigriceps*), Purple-banded Sunbird (*Cinnyris bifasciatus*), Yellow-bellied Greenbul (*Chlorocichla flaviventris*), Tambourine Dove (*Turtur tympanistria*), Yellow-rumped Tinkerbird (*Pogoniulus bilineatus*) and African Goshawk (*Accipiter tachiro*). Thirty-two species (36 %) were recorded from the Riparian Forest / Thicket assemblage, the second highest of the four assemblages (Appendix 4).

II. Woodland Assemblage

The drier woodlands across the study area provide refuge for a number of species that will utilise any type of wooded habitat. These include Blue Waxbill (*Uraeginthus angolensis*), Red-billed Firefinch (*Lagonosticta senegala*), White-bellied Sunbird (*Cinnyris talatala*),

[1] Taylor *et. al*., 2015

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White-browed Scrub Robin (*Erythropygia leucophrys*) and Arrow-marked Babbler (*Turdoides jardineii*). Less common species recorded include Jacobin Cuckoo (*Clamator jacobinus*), Violet-backed Starling (*Cinnyricinclus leucogaster*), Red-headed Weaver (*Anaplectes rubriceps*) and Cut-throat Finch (*Amadina fasciata*). Thirty-four species (38 % of the entire species list) were recorded from the Woodland assemblage, the highest of the four assemblages.

III. Wetland Assemblage

The few scatted artificial dams and irrigation canals within the study area support an assemblage of birds that is restricted to wetland environments. Birds strongly associated with reeds and rushes found include Lesser Swamp Warbler (*Acrocephalus gracilirostris*), African Reed Warbler (*Acrocephalus baeticatus*), Thick-billed Weaver (*Amblyospiza albifrons*) and Common Waxbill (*Estrilda astrild*). Birds recorded on open water include Egyptian Goose (*Alopochen aegyptiaca*), African Darter (*Anhinga rufa*), African Fish Eagle (*Haliaeetus vocifer*) and Reed Cormorant (*Microcarbo africanus*). An interesting record from this assemblage was that of a single Green Sandpiper (*Tringa ochropus*) which is a rare non-breeding Palearctic migrant to South Africa. Twenty species were recorded in this assemblage, representing 22 % of the total species list (Appendix 4).

IV. Degraded Grassland Assemblage

This assemblage is restricted to transformed areas that are currently covered in pioneer plant species such as grasses and shrubs. It supports a low total of 19 species (21 % of the total list), most of which are well adapted to degraded environments. These include habitat generalists such as Helmeted Guineafowl (*Numida meleagris*), Pied Crow (*Corvus albus*), Southern Grey-headed Sparrow (*Passer diffuses*), Bronze Mannikin (*Lonchura cucullata*) and Pin-tailed Whydah (*Vidua macroura*).

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5.2.3 Reptiles

5.2.3.1 Regional Overview

The Lowveld of far eastern Mpumalanga supports a very high diversity of reptile species, with levels ranking in the top 10 % of all areas in South Africa[1]. The two reptile groups showing the highest diversity include the lizards (20-41 species recorded) and snakes (20-44 species recorded) (Bates *et. al*, 2014). However, reptile endemicity is very low, which is to be expected in an area that lies in close proximity to Mozambique and is situated within the widespread savannah biome (Bates *et. al,* 2014). One hundred and two species have been recorded from the degree grid 2531[2] and, on a finer scale, 42 reptiles have been recorded from the QDS 2531 BD[3].

5.2.3.2 Conservation-Important Species

Of the potentially occurring reptiles, only two conservation-important species potentially occur (Appendix 5). One of these has been assessed as Vulnerable, namely Nile Crocodile, which is also protected under NEMBA ToPS. This species was **confirmed** during fieldwork and is discussed below:

Nile Crocodile (*Crocodylus niloticus*)

Africa's largest reptile is listed as Vulnerable due to a number of factors including habitat transformation, water pollution, direct persecution from landowners and harvesting for the medicinal market (Bates *et. al*., 2014). The Kruger National Park supports an estimated 3000 individuals which constitutes the largest population in South Africa (Thorbjarnarson, 1992). The adjacent Crocodile River supports a resident population of crocodiles (*pers.obs*.) and smaller individuals are able to enter the study area through the small drainage lines in the north-eastern portion. In communication with a resident farm manager (Mr. Sieg of Ngwenya Royale Farm), a few Nile Crocodiles are **confirmed** to occur in the irrigation dams on Remainder Portion 109. No breeding habitat (sandy river banks) is available around the dams though.

Southern African Python (*Python natalensis*) is protected under the National Environmental Management: Biodiversity Act (No.10 of 2004) and was **confirmed** to occur on Tenbosch by

[1] Bates *et. al*., 2014
[2] http://vmus.adu.org.za/vm_sp_list.php accessed 29/11/2017
[3] http://vmus.adu.org.za/vm_sp_list.php accessed 29/11/2017

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the same farm manager as mention above. This species was also confirmed from Tenbosch during a previous ECOREX ecological survey (McKenzie, 2016). Only three reptile species were recorded during fieldwork (Appendix 4); however, a dedicated reptile survey, including pitfall traps, would add at least a few additional species, although it is unlikely to have changed the assessment of biodiversity value of habitats represented.

5.2.4 Frogs

5.2.3.1 Regional Overview

The Lowveld of far eastern Mpumalanga supports a relatively high diversity of frog species, with levels exceeding 20 species per QDS[1]. Frog endemicity, however, is very low with no potentially occurring endemic species present in the Komatipoort area (Minter *et. al,* 2004) for the same reasons given in the reptile section above. Forty-four species have been recorded from the degree grid 2531[2] and, on a finer scale, 30 reptiles have been recorded from the QDS 2531 BD[3], within which the study area is situated.

5.2.3.2 Conservation-Important Species

One species of frog has a Red Data or protected status, namely Whistling Rain Frog (*Breviceps sopranus*) which is classified as Data Deficient due to a lack of information regarding this little-known forest species. This frog has a low likelihood of occurrence due to the small size and disturbed nature of the Riparian Forest / Thicket vegetation type present within the study area. No frogs were recorded during the assessment although additional fieldwork with nocturnal surveys will result in a fair number of species confirmed.

[1] Minter *et. al*., 2004
[2] http://vmus.adu.org.za/vm_sp_list.php accessed 29/11/2017
[3] http://vmus.adu.org.za/vm_sp_list.php accessed 29/11/2017

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6. BIODIVERSITY VALUE ASSESSMENT

A qualitative integration of conservation importance and functional importance values for the three untransformed and one transformed 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 6, and are dealt with in more detail under each vegetation community description. The integrated biodiversity values are summarised in Table 5 and presented spatially in Figure 8.

The Riparian Forest vegetation community has **High** Biodiversity Value (Table 5) due to a combination of Moderate Conservation Importance and High Functional Value scores. Riparian Forest was rated as having High Functional Importance (Appendix 5) because of a high rating in the following components:

- Provisioning Services – fibres, medicinal plants;
- Regulating Services - flood attenuation;
- Supporting Services – nutrient cycling, migration corridors.

One Nationally protected plant species was confirmed to occur, namely *Philenoptera violacea* and Two **Near Threatened** mammal potentially occur (Natal Red Duiker and Honey Badger).

The Closed Woodland vegetation community has **Moderate** Biodiversity Value (Table 5) resulting from Moderate Conservation Value and Moderate Functional Value scores. One plant species protected under the Mpumalanga Nature Conservation Act (No.10 of 1998) was recorded, namely *Aloe marlothii.* Two Endangered plant species potentially occur, namely *Aloe komatiensis* and *Pavetta zeyheri* subsp*. microlancea,* in addition to one species classified as Rare, namely *Barleria oxyphylla*. Two Near Threatened mammal species potentially occur, namely Honey Badger and Side-striped Jackal. One Critically Endangered bird species was recorded during fieldwork, namely White-backed Vulture. This species is also protected under the National Environmental Management: Biodiversity Act (No.10 of 2004, Appendix 3). One additional bird species assessed as Critically Endangered potentially forages within this community, namely Hooded Vulture. Three Endangered birds (Bateleur, Martial Eagle and Tawny Eagle) have a moderate likelihood of hunting over the

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property. Two additional Near Threatened bird species potentially occur, namely Marabou Stork and European Roller.

The Degraded Woodland / Thicket vegetation community has **Moderate** Biodiversity Value (Table 5) resulting from Moderate Conservation Value and Moderate Functional Value scores. Despite the degradation, two Near Threatened plants were confirmed to occur, namely *Elaeodendron transvaalense* and *Dalbergia melanoxylon.* Seven plant species that are protected under either the National Forests Act (No. 30 of 1998) or the Mpumalanga Nature Conservation Act (No.10 of 1998), namely *Aloe chabaudii* var*. chabaudii, A. parvibracteata* and *A. marlothii* subsp*. marlothii, Combretum imberbe, Elaeodendron transvaalense* and *Sclerocarya birrea* subsp. *caffra,* were confirmed to occur*.* Two Endangered plant species potentially occur, namely *Aloe komatiensis* and *Pavetta zeyheri* subsp. *microlancea*, in addition to one species classified as Rare, namely *Barleria oxyphylla*.

Transformed / Degraded Grassland areas are assessed as having **Low** Biodiversity Value resulting from Low Conservation Value and Low Functional Value scores, despite the confirmed occurrence of African Elephant and Hippopotamus. These are itinerant species that will occasionally forage on the pioneer grasses present in this community.

Table 5. Conservation Importance, Functional Importance and Biodiversity Values for vegetation communities in the Study Area

Vegetation Communities	Conservation Importance	Functional Importance	Biodiversity Value
Riparian Forest / Thicket	Moderate	High	High
Closed Woodland	Moderate	Moderate	Moderate
Degraded Woodland / Thicket	Moderate	Moderate	Moderate
Transformed	Low	Low	Low

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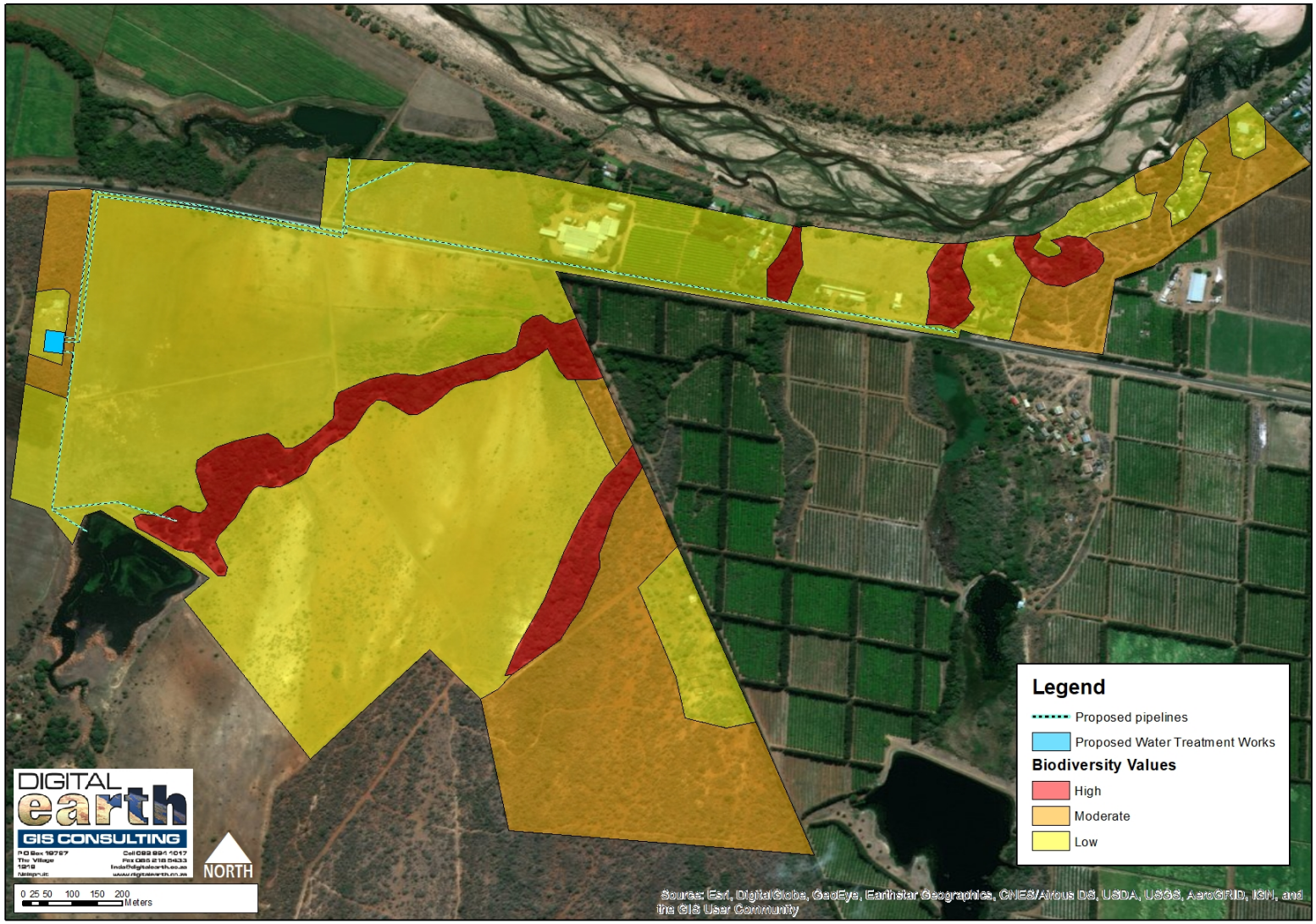

Figure 8. Biodiversity Values of Vegetation Communities in the Study Area

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7. KEY POTENTIAL IMPACTS

While a detailed impact assessment was not part of the terms of reference for this report, key potential impacts associated with the proposed development can be described. The following are potentially significant impacts on untransformed vegetation communities:

- **Loss of plant species of conservation importance** – eight species could be impacted during the construction phase. The trees *Elaeodendron transvaalense* and *Dalbergia melanoxylon* are assessed as Near Threatened. *Sclerocarya birrea* subsp*. caffra, Elaeodendron transvaalense, Combretum imberbe* and *Philenoptera violacea* are nationally protected and *Aloe marlothii subsp. marlothii, A. chabaudii subsp. chabaudii* and *A. parvibracteata* are protected under provincial legislation. In addition, two species assessed as Endangered potentially occur within the two woodland vegetation communities (*Aloe komatiensis* and *Pavetta zeyheri* subsp. *microlancea).*
- **Degradation of riparian habitat** – construction activities could result in degradation of this sensitive habitat if not carefully managed, e.g. dumping of soil, building rubble, etc.; long-term changes in surface and subsurface runoff could negatively affect riparian structure and function, particularly with respect to channel erosion caused by increased stormwater runoff;
- **Invasion of natural habitat by alien plants** – a large seed-base of invasive alien species is already present within the study area, and invasion by these species could increase as bare soil is exposed; if well managed, this is likely to only have moderate significance;
- **Loss of habitat for conservation-important fauna** – all three untransformed vegetation communities are potentially key habitats and migration corridors for fauna that would be sensitive to impacts including lodge expansion and wastewater treatment facilities;
- **Increase in poaching activities** – unsupervised construction workers may participate in small-scale poaching through setting snares or traps for bushmeat. Medicinal plants may also be harvested for muthi.

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8. RECOMMENDATIONS

While this is not a detailed impact assessment, some preliminary recommendations and mitigation measures are listed below. Table 6 summarises the potential Biodiversity / Development Conflict within the identified vegetation communities.

- Where possible, all future development to take place over existing Transformed areas to preserve the remaining natural vegetation on the site;
- All nationally and provincially protected plant species would require a permit to destroy them. It is recommended that plants that can be translocated, such as *Aloe* species, be rescued and relocated to adjacent suitable habitat if they are found to be within the development footprint;
- All areas that are to be developed should be checked by a suitably experienced botanist to locate all conservation-important species. These plants should be marked, and the relevant permits applied for before removal, and translocated to nearby suitable habitat prior to vegetation being cleared;
- New infrastructure should not impact any large indigenous trees, wherever possible;
- A follow-up survey in late summer (February / March) should take place to search for the succulent *Aloe komatiensis* and the dwarf shrub *Pavetta zeyheri* subsp. *microlancea.* These two species are listed as Endangered and are confirmed from just outside the study area;
- According to the National Environmental Management: Biodiversity Act 2004 (Act 10 of 2004) Alien and Invasive Species Lists, 2014 all declared alien invasive plant species need to be removed from wetland areas. It is therefore recommended that the developers implement an alien plant control program to combat the infestation present. This program should include regular inspections and follow-ups.
- All existing and proposed roads to contain adequate stormwater drainage and erosion control measures.
- The proposed wastewater treatment plant should preferably be built on Transformed land and at least 30 m from the riparian zone.

Provided all the recommendations suggested in this report are followed, there is no objection to the proposed development in terms of the terrestrial ecosystems of the study area.

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Table 6. Potential Biodiversity / Development Conflict within the identified vegetation communities

Vegetation Communities	Biodiversity / Development Conflict	Development Recommendations
Riparian Forest / Thicket	High	Exclude from development footprint
Closed Woodland	Moderate	Develop with mitigation
Degraded Woodland / Thicket	Moderate	Develop with mitigation
Transformed	Low	Can be included within development footprint

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10. APPENDICES

Appendix 1. Checklist of Flora recorded during fieldwork

Taxa	Growth Form	Red Data	Protected	Vegetation Communities			
				Riparian Forest / Thicket	Closed Woodland	Degraded Woodland / Thicket	Transformed
Family Acanthaceae							
Barleria elegans S.Moore ex C.B.Clarke	dwarf shrub			f	r	u	
Hypoestes forskaolii (Vahl) R.Br.	herb			u			
Justicia flava (Vahl) Vahl	herb				u	r	
Family Amaranthaceae							
* *Achyranthes aspera* L. var. *aspera*	herb			r		r	r
* *Alternanthera pungens* Kunth	herb						r
* *Gomphrena celosioides* Mart.	herb						r
Family Anacardiaceae							
Lannea schweinfurthii var. *stuhlmannii* (Engl.) Kokwaro	tree					r	
Sclerocarya birrea (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	tree		NFA			u	r
Family Apocynaceae							
Gomphocarpus physocarpus E.Mey.	dwarf shrub			r			
* *Nerium oleander* L.	tree			r			
Rauvolfia caffra Sond.	tree			f			
Cynanchum viminale (L.) L.	succulent					r	
Tabernaemontana elegans Stapf	tree			r			
Family Araceae							
Stylochaeton natalensis Schott	herb				r	r	
Family Asparagaceae							
Asparagus buchananii Baker	climber					r	

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Asparagus cooperi Baker	shrub				r	r	
Family Asphodelaceae							
Aloe chabaudii Schönland var. *chabaudii*	succulent		MNCA			r	
Aloe marlothii A.Berger subsp. *marlothii*	succulent		MNCA		r	u	
Aloe parvibracteata Schönland	succulent		MNCA			r	
Family Asteraceae							
* *Ageratum conyzoides* L.	herb			r			r
* *Bidens pilosa* L.	herb			r		r	r
* *Chromolaena odorata* (L.) R.M.King & H.Rob.	herb			f		f	
* *Conyza sumatrensis* (Retz.) E.Walker var. *sumatrensis*	herb						r
Dicoma tomentosa Cass.	herb				f		
Gymnanthemum coloratum (Willd.) H.Rob. & B.Kahn sens.lat.	shrub			u		r	
* *Parthenium hysterophorus* L.	herb					r	u
Pluchea dioscoridis (L.) DC.	dwarf shrub			f			
* *Tridax procumbens* L.	herb						r
Vernonia fastigiata Oliv. & Hiern	herb				u		
Family Bignoniaceae							
Kigelia africana (Lam.) Benth.	tree			u			
* *Spathodea campanulata* P.Beauv.	tree			r			
* *Tecoma stans* (L.) Juss. ex Kunth var. *stans*	shrub			r	r	u	f
Family Boraginaceae							
Ehretia amoena Klotzsch	shrub				r	r	
Family Cactaceae							
* *Opuntia ficus-indica* (L.) Mill.	succulent					r	
* *Opuntia stricta* Haw.	succulent					r	
Family Capparaceae							
Capparis tomentosa Lam.	climber			u			
*Cleome monophyll*a L.	herb					r	
Maerua juncea Pax subsp. *crustata* (Wild) Wild	climber					r	
Maerua parvifolia Pax	dwarf shrub				u	u	
Family Celastraceae							
Elaeodendron transvaalense (Burtt Davy) R.H.Archer	tree	NT	NFA			r	
Gymnosporia senegalensis (Lam.) Loes.	shrub			f	r	r	
Family Celtidaceae							
Trema orientalis (L.) Blume	tree			r			
Family Combretaceae							

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Combretum apiculatum Sond. subsp. *apiculatum*	tree				r		
Combretum hereroense Schinz	tree				f	r	
Combretum imberbe Wawra	tree		NFA			r	
Combretum microphyllum Klotzsch	climber			f		r	
Combretum mossambicense (Klotzsch) Engl.	climber			f		r	
Combretum zeyheri Sond.	tree				r	r	
Terminalia sericea Burch. ex DC.	tree			r			
Family Commelinaceae							
Commelina diffusa Burm.f. subsp. *scandens* (Welw. ex C.B.Clarke) Oberm.	herb			r			
Commelina sp. (no flowers)	herb					r	
Family Convolvulaceae							
Cuscuta sp.	climber			r		r	
* *Ipomoea alba L.*	climber			u			
Family Crassulaceae							
Kalanchoe paniculata Harv.	succulent					r	
Kalanchoe rotundifolia (Haw.) Haw.	succulent				r	r	
Family Cucurbitaceae							
Cucumis zeyheri Sond.	creeper			r			
Family Cyperaceae							
Cyperus dives Delile	sedge			r			
Cyperus sexangularis Nees	sedge			r			
Family Dracenaceae							
Sansevieria hyacinthoides (L.) Druce	herb				r	u	
Family Ebenaceae							
Diospyros mespiliformis Hochst. ex A.DC.	tree			f	r		
Euclea divinorum Hiern	shrub				r	r	
Family Euphorbiaceae							
* *Euphorbia cyathophora* Murray	herb			u			
* *Euphorbia hirta* L.	herb						r
Euphorbia ingens E.Mey. ex Boiss.	succulent					r	
Euphorbia schinzii Pax	succulent					r	
Family Fabaceae							
Acacia nigrescens Oliv.	tree				d	d	
Acacia nilotica (L.) Willd. ex Delile subsp. *kraussiana* (Benth.) Brenan	tree				r	r	
Acacia robusta Burch. subsp. *clavigera* (E.Mey.) Brenan	tree			u			
Acacia schweinfurthii Brenan & Exell var. *schweinfurthii*	climber			f			

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Acacia tortilis (Forssk.) Hayne subsp. *heteracantha* (Burch.) Brenan	tree				r	f	
Acacia xanthophloea Benth.	tree			r		u	
Albizia anthelmintica (A.Rich.) Brongn.	shrub					r	
Cordyla africana Lour.	tree			r			
Dalbergia melanoxylon Guill. & Perr.	tree	NT‡				r	
Dichrostachys cinerea (L.) Wight & Arn. subsp. *africana* Brenan & Brummitt	tree				r	d	r
Erythrina lysistemon Hutch.	tree					r	
Peltophorum africanum Sond.	tree				r	u	
Philenoptera violacea (Klotzsch) Schrire	tree		NFA	r		r	
*Rhynchosia minima (*L.) DC. var. *minima*	climber			r			
Schotia brachypetala Sond.	tree			u		r	
Schotia capitata Bolle	shrub					u	
Family Hyacinthaceae							
Ledebouria revoluta (L.f.) Jessop	geophyte					r	
Family Lamiaceae							
Leucas sexdentata Skan	herb				r		
Ocimum americanum L. var. *americanum*	herb				r	r	r
Family Loranthaceae							
Erianthemum dregei (Eckl. & Zeyh.) Tiegh.	parasite			r			
Family Malvaceae							
Abutilon austro-africanum Hochr.	dwarf shrub				u		
Grewia bicolor Juss. var. *bicolor*	shrub				r	u	
Grewia flavescens Juss.	shrub				r	r	
Sida cordifolia L. subsp. *cordifolia*	dwarf shrub				r		
Sterculia rogersii N.E. Br.	tree					u	
Family Meliaceae							
* *Melia azedarach* L.	tree			r			
Trichilia emetica Vahl subsp. *emetica*	tree			d			
Family Menispermaceae							
Cissampelos torulosa E.Mey. ex Harv.	climber			r			
* *Cocculus hirsutus* (L.) Diels	climber			r			
Family Moraceae							
Ficus sycomorus L. subsp. *sycomorus*	tree			d			
* *Morus alba* L. var. *alba*	tree			r			
Family Nyctaginaceae							
* *Boerhavia diffusa* L. var. *diffusa*	herb					r	r

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Commicarpus plumbagineus (Cav.) Standl. var. *plumbagineus*	herb					r	
Family Olacaceae							
Ximenia americana L. var. *microphylla* Welw. ex Oliv.	shrub				r	r	
Family Oleaceae							
Jasminum fluminense Vell. subsp. *fluminense*	climber			u			
Family Onagraceae							
Ludwigia octovalvis (Jacq.) P.H.Raven	dwarf shrub			r			
Family Pedaliaceae							
Ceratotheca triloba (Bernh.) Hook.f.	herb					r	
Family Phyllanthaceae							
Bridelia cathartica G.Bertol*. subsp. melanthesoides* (Baill.) J.Leonard	tree			u			
Bridelia micrantha (Hochst.) Baill.	tree			f			
Flueggea virosa (Roxb. ex Willd.) Voigt subsp. *virosa*	shrub			f		r	
Phyllanthus reticulatus Poir. var. *reticulatus*	shrub			f			
Family Plumbaginaceae							
Plumbago zeylanica L.	shrub					r	
Family Poaceae							
Aristida adscensionis L.	grass						u
Aristida congesta Roem. & Schult. subsp. *congesta*	grass					r	u
Bothriochloa insculpta (Hochst. ex A.Rich.) A.Camus	grass				r		
Brachiaria serrata (Thunb.) Stapf	grass				f		
Cenchrus ciliaris L.	grass				f		
Cynodon dactylon (L.) Pers.	grass						r
Digitaria eriantha Steud.	grass				u	u	
Eleusine coracana (L.) Gaertn. subsp. *africana* (Kenn.-O'Byrne) Hilu & de Wet	grass						r
Eragrostis curvula (Schrad.) Nees	grass						r
Eragrostis superba Peyr.	grass				d		
Heteropogon contortus (L.) Roem. & Schult.	grass					f	d
Melinis repens (Willd.) Zizka subsp. *repens*	grass					r	r
Panicum maximum Jacq.	grass			r	f	f	r
Phragmites australis (Cav.) Steud.	reed			r			
Pogonarthria squarrosa (Roem. & Schult.) Pilg.	grass						r
Setaria megaphylla (Steud.) T.Durand & Schinz	grass			r			
Setaria sphacelata (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss	grass				r	r	
Sporobolus africanus (Poir.) Robyns & Tournay	grass						r
Sporobolus pyramidalis P.Beauv.	grass				r		

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Urochloa mosambicensis (Hack.) Dandy	grass				f		
Family Polygonaceae							
Persicaria decipiens (R.Br.) K.L.Wilson	herb			r			
Family Portulacaceae							
Talinum caffrum (Thunb.) Eckl. & Zeyh.	succulent					r	
Family Rhamnaceae							
Ziziphus mucronata Willd. subsp. *mucronata*	tree				u	u	
Family Rubiaceae							
Gardenia volkensii K.Schum. subsp. *volkensii* var. *volkensii*	tree					r	
* *Richardia brasiliensis* Gomes	herb					r	r
Family Sapindaceae							
* *Cardiospermum grandiflorum* Sw.	climber			r			
Family Sapotaceae							
Manilkara mochisia (Baker) Dubard	tree					r	
Family Sinopteridaceae							
Cheilanthes viridis (Forssk.) Sw. var. *viridis*	fern					r	
Family Solanaceae							
Solanum campylacanthum A. Rich.subsp. *panduriforme*	herb				u	u	r
* *Solanum mauritianum* Scop.	shrub			r			
* *Solanum seaforthianum* Andrews var. *disjunctum* O.E.Schulz	climber			r			
Family Thelypteridaceae							
Thelypteris confluens (Thunb.) C.V.Morton	fern			r			
Family Typhaceae							
Typha capensis (Rohrb.) N.E.Br.	rush			r			
Family Vitaceae							
Cissus quadrangularis L. *var. quadrangularis*	succulent				u		
Cissus rotundifolia (Forssk.) Vahl var. *rotundifolia*	succulent				u	r	
Family Verbenaceae							
* *Lantana camara* L.	shrub			u		f	
Lippia javanica (Burm.f.) Spreng.	dwarf shrub					r	
* *Verbena bonariensis* L.	herb						r
TOTAL	**145**	**2**	**7**	**59**	**43**	**77**	**27**

NFA = National Forests Act	d = dominant
MNCA = Mpumalanga Nature Conservation Act	f = frequent
* = exotic species	u =

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NT = Near Threatened ‡ = IUCN assessment	uncommon r = rare

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Appendix 2. Potentially occurring plant species of conservation concern

Species	Family	Red Data Status	Habitat	Likelihood	Reason
Adenium swazicum	Apocynaceae	CR	Lowveld savanna, often on sodic soils	Low	All suitable habitat searched
Aloe komatiensis	Asphodelaceae	EN	Lowveld savanna	Moderate	All suitable habitat searched but plants could have been overlooked. This species is confirmed to occur within 1 km of the study area
Barleria oxyphylla	Acanthaceae	Rare	Savanna, thickets	Moderate	Suitable habitat present
Blepharis laevifolia	Acanthaceae	Rare	Low altitude savanna, including sodic areas	Low	Only known from within the KNP
Bowiea volubilis subsp. *volubilis*	Hyacinthaceae	VU	Thickets with rock scree	Low	No suitable habitat present
Caesalpinia rostrata	Fabaceae	VU	Drainage lines in savanna	Low	Degraded habitat present, very rare in Mpumalanga
Cleome schlechteri	Capparaceae	DD	Heavy clay soils in savanna	Low	No suitable habitat present
Dalbergia melanoxylon	Fabaceae	NT#	Savanna	Confirmed	
Drimia sanguinea	Hyacinthaceae	NT	Open savanna and scrubby woodland	Moderate	Suitable habitat present
Elaeodendron transvaalense	Celastraceae	NT	Savanna	Confirmed	
Nesaea alata	Lythraceae	Rare	Edges of shallow pans in low-lying areas	Low	No suitable habitat present
Pavetta zeyheri subsp. *microlancea*	Rubiaceae	EN	Rocky slopes or loamy flats	Moderate	Suitable habitat present, small plant that may have been overlooked
Woodia singularis	Apocynaceae	Rare	Grassland, Savanna	Low	Only known from three small, disjunct subpopulations

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Appendix 3. Co-ordinates of plants of conservation-importance recorded during fieldwork

Species	Protected Status	Red Data	No. of Plants	GPS Co-ordinates	
				Lat	Long
Aloe chabaudii	MNCA		30	-25.379247	31.856927
Aloe chabaudii	MNCA		2	-25.378442	31.857032
Aloe marlothii	MNCA		2	-25.380976	31.853975
Aloe marlothii	MNCA		10	-25.381706	31.854048
Aloe marlothii	MNCA		5	-25.381168	31.854512
Aloe marlothii	MNCA		8	-25.379921	31.854626
Aloe marlothii	MNCA		1	-25.380259	31.854480
Aloe marlothii	MNCA		1	-25.380356	31.854674
Aloe marlothii	MNCA		1	-25.379546	31.855630
Aloe marlothii	MNCA		1	-25.378582	31.857160
Aloe marlothii	MNCA		1	-25.379499	31.856645
Aloe parvibracteata	MNCA		5	-25.380680	31.854469
Aloe parvibracteata	MNCA		1	-25.380805	31.854228
Combretum imberbe	NFA		1	-25.380313	31.840730
Dalbergia melanoxylon		NT	5	-25.380752	31.854291
Dalbergia melanoxylon		NT	7	-25.378867	31.857011
Elaeodendron transvaalense	NFA	NT	1	-25.380347	31.855586
Elaeodendron transvaalense	NFA	NT	1	-25.379490	31.856651
Philenoptera violacea	NFA		1	-25.378698	31.857107
Philenoptera violacea	NFA		1	-25.378906	31.857834
Philenoptera violacea	NFA		2	-25.381226	31.850750
Philenoptera violacea	NFA		1	-25.380219	31.851145
Philenoptera violacea	NFA		1	-25.380029	31.849740
Sclerocarya birrea	NFA		1	-25.380214	31.855358
Sclerocarya birrea	NFA		1	-25.380083	31.855525
Sclerocarya birrea	NFA		1	-25.380060	31.855405
Sclerocarya birrea	NFA		1	-25.378993	31.857734
Sclerocarya birrea	NFA		3	-25.378776	31.857996
Sclerocarya birrea	NFA		2	-25.378562	31.857813
Sclerocarya birrea	NFA		1	-25.378444	31.857037
Sclerocarya birrea	NFA		1	-25.380070	31.850078
Sclerocarya birrea	NFA		1	-25.380451	31.851967
Sclerocarya birrea	NFA		3	-25.380727	31.844266
Sclerocarya birrea	NFA		1	-25.380157	31.841598

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Appendix 4. Checklist of fauna recorded during fieldwork

Common Name	Scientific Name	Red Data	Endemic	Protected	Assemblages			
					Riparian Forest / Thicket	Woodland	Wetland	Degraded Grassland
Mammals								
ORDER: PRIMATES								
Family Cercopithecidae (Old World monkeys)								
Vervet Monkey	*Chlorocebus pygerythrus*				x			
ORDER: RODENTIA								
Family Sciuridae (squirrels)								
Tree Squirrel	*Paraxerus cepapi*					x		
Family Muridae (rats & mice)								
Single-striped Mouse	*Lemniscomys rosalia*					x		
ORDER: CARNIVORA								
Family Herpestidae (mongooses)								
Slender Mongoose	*Herpestes sanguineus*					x		
ORDER: PROBOSCIDEA								
Family Elephantidae (elephants)								
African Elephant	*Loxodonta africana*	VU‡		NEMBA (PR)				x
ORDER: CETARTIODACTYLA								
Family Hippopotamidae (hippopotamus)								
Hippopotamus	*Hippopotamus amphibius*	VU‡		MNCA				x
Family Suidae (pigs)								
Common Warthog	*Phacochoerus africanus*							x
Family Bovidae (cattle & antilopes)								
Southern Savannah Buffalo	*Syncerus caffer caffer*			MNCA		x		
Nyala	*Tragelaphus angasii*			MNCA	x	x		
Subtotal	9	2	0	4	2	5	0	3
Birds								

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ORDER: ANSERIFORMES								
Family Anatidae (ducks, geese and swans)								
Egyptian Goose	*Alopochen aegyptiaca*						x	
ORDER: GALLIFORMES								
Family Numididae (guineafowl)								
Helmeted Guineafowl	*Numida meleagris*							x
Family Phasianidae (pheasants, fowl and allies)								
Natal Spurfowl	*Pternistis natalensis*				x			
ORDER: PELECANIFORMES								
Family Threskiornithidae (ibises and spoonbills)								
Hadeda Ibis	*Bostrychia hagedash*						x	
Family Ardeidae (herons and bitterns)								
Western Cattle Egret	*Bubulcus ibis*						x	
ORDER: SULIFORMES								
Family Phalacrocoracidae (cormorants and shags)								
Reed Cormorant	*Microcarbo africanus*						x	
Family Anhingidae (anhingas and darters)								
African Darter	*Anhinga rufa*						x	
ORDER: ACCIPITRIFORMES								
Family Accipitridae (kites, hawks and eagles)								
White-backed Vulture	*Gyps africanus*	CR		NEMBA (EN)		over		
African Goshawk	*Accipiter tachiro*				x			
African Fish Eagle	*Haliaeetus vocifer*						x	
ORDER: CHARADRIIFORMES								
Family Charadriidae (plovers)								
Blacksmith Lapwing	*Vanellus armatus*						x	
Family Scolopacidae (sandpipers and snipes)								
Green Sandpiper	*Tringa ochropus*						x	
ORDER: COLUMBIFORMES								
Family Columbidae (pigeons and doves)								
Red-eyed Dove	*Streptopelia semitorquata*				x			
Laughing Dove	*Spilopelia senegalensis*							x
Emerald-spotted Wood Dove	*Turtur chalcospilos*					x		
Tambourine Dove	*Turtur tympanistria*				x			
African Green Pigeon	*Treron calvus*				x			

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ORDER: MUSOPHAGIFORMES								
Family Musophagidae (turacos)								
Purple-crested Turaco	*Tauraco porphyreolophus*				x			
ORDER: CUCULIFORMES								
Family Cuculidae (cuckoos)								
Burchell's Coucal	*Centropus burchelli*						x	
Jacobin Cuckoo	*Clamator jacobinus*					x		
Diederik Cuckoo	*Chrysococcyx caprius*							x
Klaas's Cuckoo	*Chrysococcyx klaas*					x		
Red-chested Cuckoo	*Cuculus solitarius*				x			
ORDER: APODIFORMES								
Family Apodidae (swifts)								
African Palm Swift	*Cypsiurus parvus*							over
ORDER: COLIIFORMES								
Family Coliidae (mousebirds)								
Speckled Mousebird	*Colius striatus*				x			
Red-faced Mousebird	*Urocolius indicus*					x		
ORDER: CORACIIFORMES								
Family Alcedinidae (kingfishers)								
Brown-hooded Kingfisher	*Halcyon albiventris*					x		
Family Meropidae (bee-eaters)								
European Bee-eater	*Merops apiaster*					x		x
White-fronted Bee-eater	*Merops bullockoides*					x		x
ORDER: PICIFORMES								
Family Lybiidae (African barbets)								
Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*				x			
Black-collared Barbet	*Lybius torquatus*				x			
Crested Barbet	*Trachyphonus vaillantii*					x		
Family Picidae (woodpeckers)								
Golden-tailed Woodpecker	*Campethera abingoni*				x			
Cardinal Woodpecker	*Dendropicos fuscescens*					x		
ORDER: PASSERIFORMES								
Family Platysteiridae (wattle-eyes and batises)								
Chinspot Batis	*Batis molitor*					x		
Family Malaconotidae (bushshrikes)								
Orange-breasted Bushshrike	*Chlorophoneus*					x		

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	sulfureopectus							
Black-backed Puffback	*Dryoscopus cubla*				x			
Southern Boubou	*Laniarius ferrugineus*				x			
Family Oriolidae (figbirds and orioles)								
Black-headed Oriole	*Oriolus larvatus*					x		
Family Dicruridae (drongos)								
Fork-tailed Drongo	*Dicrurus adsimilis*							x
Family Corvidae (crows and jays)								
Pied Crow	*Corvus albus*							x
Family Monarchidae (monarchs)								
African Paradise Flycatcher	*Terpsiphone viridis*				x			
Family Paridae (tits and chickadees)								
Southern Black Tit	*Parus niger*					x		
Family Pycnonotidae (bulbuls)								
Dark-capped Bulbul	*Pycnonotus tricolor*				x	x		
Sombre Greenbul	*Andropadus importunus*				x			
Yellow-bellied Greenbul	*Chlorocichla flaviventris*				x			
Terrestrial Brownbul	*Phyllastrephus terrestris*				x			
Family Hirundinidae (swallows and martins)								
Wire-tailed Swallow	*Hirundo smithii*						x	
Barn Swallow	*Hirundo rustica*					x		x
Lesser Striped Swallow	*Cecropis abyssinica*				x	x	x	x
Family Macrosphenidae (crombecs and African warblers)								
Long-billed Crombec	*Sylvietta rufescens*					x		
Family Acrocephalidae (reed warblers and allies)								
African Reed Warbler	*Acrocephalus baeticatus*						x	
Lesser Swamp Warbler	*Acrocephalus gracilirostris*						x	
Family Locustellidae (grassbirds and allies)								
Little Rush Warbler	*Bradypterus baboecala*						x	
Family Cisticolidae (cisticolas and allies)								
Red-faced Cisticola	*Cisticola erythrops*						x	
Rattling Cisticola	*Cisticola chiniana*					x		
Tawny-flanked Prinia	*Prinia subflava*						x	x
Yellow-breasted Apalis	*Apalis flavida*				x	x		
Green-backed Camaroptera	*Camaroptera brachyura*				x			
Family Leiothrichidae (laughingthrushes)								

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Arrow-marked Babbler	*Turdoides jardineii*					x			
Family Zosteropidae (white-eyes)									
Cape White-eye	*Zosterops virens*				x				
Family Sturnidae (starlings)									
Cape Glossy Starling	*Lamprotornis nitens*					x			
Violet-backed Starling	*Cinnyricinclus leucogaster*					x			
Family Turdidae (thrushes)									
Kurrichane Thrush	*Turdus libonyanus*				x				
Family Muscicapidae (chats and Old World flycatchers)									
White-browed Scrub Robin	*Erythropygia leucophrys*					x			
Bearded Scrub Robin	*Erythropygia quadrivirgata*				x				
Southern Black Flycatcher	*Melaenornis pammelaina*					x			
Ashy Flycatcher	*Muscicapa caerulescens*				x				
White-throated Robin-Chat	*Cossypha humeralis*				x				
White-browed Robin-Chat	*Cossypha heuglini*				x				
Family Nectariniidae (sunbirds)									
Collared Sunbird	*Hedydipna collaris*				x				
Scarlet-chested Sunbird	*Chalcomitra senegalensis*					x			
Purple-banded Sunbird	*Cinnyris bifasciatus*				x				
White-bellied Sunbird	*Cinnyris talatala*					x			
Family Passeridae (Old World sparrows)									
Southern Grey-headed Sparrow	*Passer diffusus*					x		x	
Family Ploceidae (weavers and widowbirds)									
Thick-billed Weaver	*Amblyospiza albifrons*						x		
Spectacled Weaver	*Ploceus ocularis*								
Village Weaver	*Ploceus cucullatus*				x				
Red-headed Weaver	*Anaplectes rubriceps*					x			
Southern Red Bishop	*Euplectes orix*						x		
Family Estrildidae (waxbills, munias and allies)									
Cut-throat Finch	*Amadina fasciata*					x			
Red-billed Firefinch	*Lagonosticta senegala*					x			
Jameson's Firefinch	*Lagonosticta rhodopareia*					x			
Blue Waxbill	*Uraeginthus angolensis*					x		x	
Common Waxbill	*Estrilda astrild*						x		
Bronze Mannikin	*Lonchura cucullata*							x	
Red-backed Mannikin	*Lonchura nigriceps*				x				

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Family Viduidae (indigobirds and whydahs)								
Pin-tailed Whydah	*Vidua macroura*							x
Family Motacillidae (wagtails and pipits)								
African Pied Wagtail	*Motacilla aguimp*						x	
Family Fringillidae (finches and canaries)								
Yellow-fronted Canary	*Crithagra mozambica*				x	x		
Subtotal	90	1	0	1	32	34	20	15
Reptiles								
ORDER: SQUAMATA								
Family Crocodylidae (crocodiles)								
Nile Crocodile$	*Crocodylus niloticus*	VU		NEMBA (VU)			x	
Family Pythonidae								
Southern African Python$	*Python natalensis*			NEMBA (PR)	x	x	x	x
Family Scincidae (skinks)								
Rainbow Skink	*Trachylepis margaritifer*					x		
Subtotal	3	1	0	2	1	2	2	1
TOTAL	**102**	**4**	**0**	**7**	**35**	**41**	**22**	**19**

PR = Protected
VU = Vulnerable
EN = Endangered
NEMBA = National Environmental Management: Biodiversity Act
MNCA = Mpumalanga Nature Conservation Act
$ = presence confirmed by farm staff
‡ = IUCN assessment

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Appendix 5. Potentially occurring fauna of conservation concern

Common Name	Scientific Name	Red Data	Protected	Habitat	Likelihood	Reason
Mammals						
African Clawless Otter	*Aonyx capensis*	NT	MNCA	Rivers and streams	Low	Limited suitable habitat present
Side-striped Jackal	*Canis adustus*	NT		Sour bushveld	Moderate	Suitable habitat present
Natal Red Duiker	*Cephalophus natalensis*	NT	MNCA	Forest and thicket	Moderate	Suitable habitat present
Spotted Hyaena	*Crocuta crocuta*	NT	NEMBA (PR)	Wide variety of habitats	Low	Disturbance, lack of prey
African Marsh Rat	*Dasymys incomtus*	NT		Wetlands	Low	Limited suitable habitat present
Southern Lesser Galago	*Galago moholi*		MNCA	Savanna	High	Suitable habitat present
South African Giraffe	*Giraffa camelopardalis* subsp. *giraffa*		MNCA	Savanna	High	Suitable habitat present
Hippopotamus	*Hippopotamus amphibius*	VU ‡	MNCA	Wetland	Confirmed	
Common Waterbuck	*Kobus ellipsiprymnus ellipsiprymnus*		MNCA	Drainage lines in savanna	High	Suitable habitat present
Serval	*Leptailurus serval*	NT	NEMBA (PR)	Grassland, wetlands	Low	Limited suitable habitat present
African Elephant	*Loxodonta africana*	VU ‡	NEMBA (PR)	Wide variety of habitats	Confirmed	
African Wild Dog	*Lycaon pictus*	EN	NEMBA (EN)	Wide variety of habitats	Low	Disturbance, lack of prey
Honey Badger	*Mellivora capensis*	NT		Wide variety of habitats	Moderate	Suitable habitat present
Aardvark	*Orycteropus afer*		MNCA	Wide variety of habitats	Low	Rare in the general area
Greater Galago	*Otolemur crassicaudatus*		MNCA	Thicket, closed woodland	High	Suitable habitat present
Southern Savannah Buffalo	*Syncerus caffer* subsp. *caffer*		MNCA	Wide variety of habitats	Confirmed	
Nyala	*Tragelaphus angasii*		MNCA	Thicket and closed woodland	Confirmed	
Thick-tailed Greater Galago	*Otolemur crassicaudatus*		MNCA	Moist woodland and forest	High	Suitable habitat present, common riparian species
Lion	*Panthera leo*	VU	NEMBA (VU)	Wide variety of habitats	Low	Disturbance, lack of prey
Leopard	*Panthera pardus*	VU	NEMBA	Wide variety of habitats	Low	Disturbance, lack of prey

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		‡	(PR)			
African Weasel	*Poecilogale albinucha*	NT		Wide variety of habitats	Low	Very rare in the Lowveld
Aardwolf	*Proteles cristatus*		MNCA	Wide variety of habitats	Low	Very rare in the Lowveld
Steenbok	*Raphicerus campestris*		MNCA	Wide variety of habitats	Low	Disturbance, lack of suitable habitat
Ground Pangolin	*Smutsia temminckii*	VU	NEMBA (VU)	Wide variety of habitats	Low	Disturbance, increasingly rare species
Subtotal	24	15	20			
Birds						
Half-collared Kingfisher	*Alcedo semitorquata*	NT		Streams with overhanging vegetation	Low	Some suitable habitat present but very rare in the Lowveld
Tawny Eagle	*Aquila rapax*	EN	NEMBA (EN)	Savanna	Moderate	Some suitable habitat present for foraging
Kori Bustard	*Ardeotis kori*	NT	NEMBA (PR)	Open savanna, semi-desert	Low	Disturbance, lack of suitable habitat
Southern Ground-Hornbill	*Bucorvus leadbeateri*	EN	NEMBA (EN)	Savanna	Low	Disturbance, lack of prey
Abdim's Stork	*Ciconia abdimii*	NT		Open arid woodland and grassland	Low	Some suitable habitat present but unrecorded from the area
Black Stork	*Ciconia nigra*	VU		Forages in wetlands and breeds on cliffs	Low	Some suitable habitat present but disturbance levels are high
Pallid Harrier	*Circus macrourus*	NT		Open grassland and semi-desert	Low	No suitable habitat present
African Marsh Harrier	*Circus ranivorus*	EN		Moist grassland and wetland	Low	Limited suitable habitat present, very rare in the Lowveld
European Roller	*Coracias garrulus*	NT		Savanna	High	Much suitable habitat present
Saddle-billed Stork	*Ephippiorhynchus senegalensis*	EN		Large rivers, dams and pans	Low	Some suitable habitat present but disturbance levels are high
Lanner Falcon	*Falco biarmicus*	VU		Wide variety of habitats	Low	Limited suitable habitat present, very rare in the Lowveld
White-backed Night-Heron	*Gorsachius leuconotus*	VU		Streams with overhanging vegetation	Low	Some suitable habitat present but disturbance levels are high and it has a very low reporting rate from grid
White-backed Vulture	*Gyps africanus*	CR	NEMBA	Savanna	Confirmed	

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			(EN)			
Cape Vulture	*Gyps coprotheres*	EN	NEMBA (EN)	Mountains and surrounding vegetation, savanna	Low	Disturbance, lack of prey, very rare in the area
Marabou Stork	*Leptoptilos crumeniferus*	NT		Wide variety of habitats	Moderate	May occasionally forage within study area
Bat Hawk	*Macheiramphus alcinus*	EN		Tall woodland along rivers	Low	Disturbance, lack of suitable habitat
Lesser Jacana	*Microparra capensis*	VU		Floating vegetation on tropical wetlands	Low	Unrecorded from grid, very rare in Mpumalanga
Yellow-billed Stork	*Mycteria ibis*	EN		Wide variety of wetlands	Low	Some suitable habitat present but disturbance levels are high
Hooded Vulture	*Necrosyrtes monachus*	CR	NEMBA (EN)	Wide variety of wetlands	High	Confirmed breeding on Tenbosch
African Pygmy Goose	*Nettapus auritus*	VU		Tropical wetlands with floating vegetation	Low	Unrecorded from grid, very rare in Mpumalanga
African Finfoot	*Podica senegalensis*	VU		Rivers and streams with overhanging vegetation	Low	Disturbance, limited suitable habitat present
Martial Eagle	*Polemaetus bellicosus*	EN	NEMBA (EN)	Wide variety of habitats	Moderate	Some suitable habitat present for foraging
Greater Painted-snipe	*Rostratula benghalensis*	NT		Wetlands	Low	Little suitable habitat present
Secretarybird	*Sagittarius serpentarius*	VU		Open savanna and grassland	Low	Some suitable habitat present but disturbance levels are high and it is very rare in the area
Pel's Fishing Owl	*Scotopelia peli*	EN		Rivers and streams with overhanging vegetation	Low	Unrecorded from the area, very rare in Mpumalanga
Crowned Eagle	*Stephanoaetus coronatus*	VU		Forest	Low	No suitable habitat present, not a Lowveld species and more common on the Escarpment
Bateleur	*Terathopius ecaudatus*	EN	NEMBA (EN)	Savanna	Moderate	Some suitable habitat present for foraging
Lappet-faced Vulture	*Torgos tracheliotos*	EN	NEMBA (EN)	Savanna	Moderate	Some suitable habitat present for foraging
White-headed Vulture	*Trigonoceps occipitalis*	CR	NEMBA (EN)		Moderate	Some suitable habitat present for foraging
Subtotal	29	29	10			
Reptiles						

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Nile Crocodile	*Crocodylus niloticus*	VU	NEMBA (VU)	Wetlands	Confirmed	
Wilhelm's Flat Lizard	*Platysaurus intermedius wilhelmi*	NT		Rocky ridges in bushveld	Low	No suitable habitat present
Southern African Python	*Python natalensis*		NEMBA (PR)	Wide variety of habitats, but usually near water or rocky outcrops	Confirmed	
Subtotal	3	2	2			
Frogs						
Whistling Rain Frog	*Breviceps sopranus*	DD		Forest with dense understory	Low	Small size and poor state of habitat
Subtotal	1	1	0			
TOTAL	**57**	**47**	**32**			

CR = Critically Endangered
EN = Endangered
VU = Vulnerable
NT = Near-threatened
DD = Data Deficient
PR = Protected
NEMBA = National Environmental Management: Biodiversity Act
‡ = IUCN assessment
# = provincial assessment

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Appendix 6. Biodiversity Values of Vegetation Communities

Riparian Forest / Thicket

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	14	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^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^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
	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
	8	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
	12	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
	9	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**11,0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

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

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Closed Woodland

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 (<500km^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^2)
	12	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
	12	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
	11	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
	11	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**11,0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

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

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Degraded Woodland / Thicket

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 (<500km^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^2)
	12	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
	12	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
	12	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
	8	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**12,0**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

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
	8	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
	9	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
	13	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**10,5**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

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Transformed Areas

Conservation Importance

Parameter	Score	Very High	High	Moderate	Low	Very Low
Protection Status		International	National	Regional	Local	None
	4	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^2)	Small (500 to 1,000km^2)	Moderate (1,000 to 20,000km^2)	Large (20,000 to 50,000km^2)	Very Large (> 50,000km^2)
	8	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
	7	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
	15	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
	6	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
	4	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0
MEDIAN Score	**6,5**	20 19 18 17	16 15 14 13	12 11 10 9	8 7 6 5	4 3 2 1 0

Functional Importance

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

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Appendix 7. Curriculum Vitae of Duncan McKenzie

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 :

	Speaking	Reading	Writing
English (home):	Excellent	Excellent	Excellent
Afrikaans:	Good	Good	Good
isiZulu:	Good	Fair	Fair
Spanish:	Fair	Fair	Fair

Countries of Work Experience : Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zimbabwe (Guiding). South Africa, Mozambique, DRC, Guinea, 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 8. Specialists Declaration

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

	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);

- 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

07/12/2017

Date

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