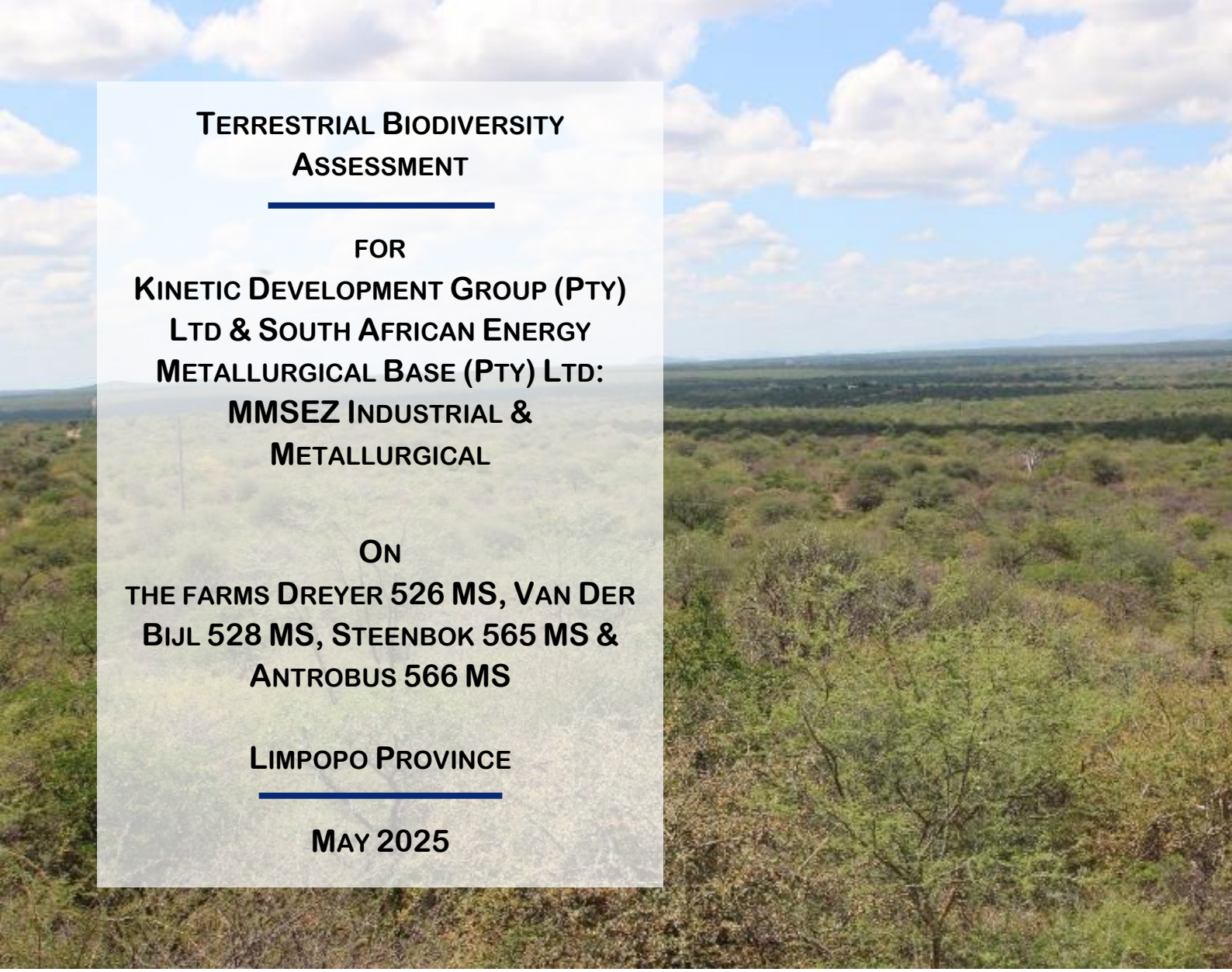


TERRESTRIAL BIODIVERSITY ASSESSMENT

FOR

KINETIC DEVELOPMENT GROUP (PTY) LTD & SOUTH AFRICAN ENERGY METALLURGICAL BASE (PTY) LTD: MMSEZ INDUSTRIAL & METALLURGICAL

ON

THE FARMS DREYER 526 MS, VAN DER BIJL 528 MS, STEENBOK 565 MS & ANTROBUS 566 MS

LIMPOPO PROVINCE

MAY 2025

Red Kite

Environmental Solutions

Red Kite Environmental Solutions (Pty) Ltd

Tel: 079 555 2433 | Email: nicole@redkiteconsulting.co.za | PostNet Suite 0111, Private Bag X37, Lynnwood Ridge, 0040

Client:

CLIENT:	Gudani Consulting (Pty) Ltd
Contact:	Setenane Nkopane
Email:	setenane@gudaniconsulting.co.za

Prepared By:

CONSULTANT:	Red Kite Environmental Solutions (Pty) Ltd
Contact:	Nicole Upton
Qualification:	B. Sc. (Hons) Animal, Plant and Environmental Sciences Pri.Sci.Nat
Contact Number:	079 555 2433
Email:	nicole@redkiteconsulting.co.za

Authors:

GJ Bredenkamp DSc PrSciNat

JCP van Wyk MSc, PrSciNat

Executive Summary

Red Kite Environmental Solutions (Pty) Ltd was appointed by Gudani Consulting (Pty) Ltd to conduct a Terrestrial Biodiversity Assessment for the proposed Kinetic Development Group (Pty) Ltd (KDG) and South African Energy Metallurgical Base (Pty) Ltd (SAEMB) industrial & metallurgical development in the Musina-Makhado Special Economic Zone (MMSEZ).

KDG and SAEMB are applying for an Environmental Authorisation for their industrial and metallurgical project on the farms Dreyer 526 MS, Van Der Bijl 528 MS, Steenbok 565 MS and Antrobus 566 MS. The proposed project footprint is located in the MMSEZ, in the Musina and Makhado Local Municipalities of the Vhembe District Municipality, about 33 km south of Musina.

The proposed industrial and metallurgical development includes the following:

- Ferrochrome and Alloys smelter plant (125 000 – 1000 000 tons/year)
- 10 million tons/year coal wash plant
- 3 million tons/year coke plant
- Heat recovery electricity power plant - 600 MW
- Office and staff living facilities for the factory

The proposed footprint of the above developments is approximately 893 ha in extent.

The study sites are located within Musina Mopane Bushveld (Vegetation Type SVmp 1) and a small part in Limpopo Ridge Bushveld (SVmp 2). According to The Revised National List of Ecosystems that are threatened and in need of protection, both the Musina Mopane Bushveld and the Limpopo Ridge Bushveld are not regarded as a threatened ecosystems, and are therefore regarded as a Least Threatened ecosystem.

The entire site fall within Ecological Support Area 1 (ESA 1). ESA1 areas are natural, near natural or degraded areas supporting CBA's by maintaining ecological processes. In this case the ESA area is very widely distributed and covers the Vhembe Biosphere Reserve.

The project site is located in the Vhembe Biosphere Reserve. However, the proposed project footprint does not fall within the core or buffer areas of the biosphere reserve, but is located within the transitional zone, where sustainable development may be supported.

No red data plant species occur, though three nationally protected trees *Adansonia digitata* (baobab) and *Sclerocarya birrea* (marula) and *Boscia albitrunca* and the provincially protected tree *Boscia foetida* occur on the site. *Adansonia digitata, Sclerocarya birrea* and *Boscia albitrunca* occur scattered over the site and it is not possible to exclude them from the development area.

Only the drainage lines have high ecological sensitivity but is very small and shallow.

The result of the Screening Tool for Plant Species Sensitivity indicates a Low Sensitivity. This is confirmed. However, the vegetation study resulted in the identification of six plant communities that could be mapped. This study indicates that the Mopane Woodland vegetation on the larger part of the site has medium to medium-low ecological sensitivity.

It is estimated that about 80 mammal species may from time to time occur on the site or in the vicinity of the site area. Of these species 13 are small rodents and 25 are bats. A total of 25 mammal species were observed on the site or on neighbouring farms. As is typical for Mopaneveld, the basal cover was relatively poor at the time of the site visit. Grasses and forbs were scanty but could, on a local scale, provide nourishment and cover for small terrestrial mammals. In general, the site area does not support presence of many species or high population densities for most of the larger or medium-sized mammal species.

The red data or protected species Aardvark, Brown hyaena, African Civet and Steenbok were observed on neighbouring farms (Bathusi Environmental Consulting 2018). The Southern African hedgehog, Honey badger and African weasel do occur in this quarter degree square and there is a possibility that these species may occasionally be found on the study site. Although generally rare, there is a small possibility that the Ground pangolin may from time to time occur on the site. Leopard, Serval and large Red Data antelopes such as Tsessebe, Roan antelope and Sable antelope may occur on nature reserves or game farms in the Mopaneveld region and may rarely visit the site area. It is also possible that South Africa galago, Aardwolf and Selous mongoose may rarely visit the study site. Due to the lack of rupicolous habitat on the study site, Mountain reedbuck and Grey rhebok do not occur on the site.

Roberts' marsh rat and Wild dog mentioned by the Screening Tool, do not occur on the site.

A conclusion is that the results of the Screening Tool for animals is disputed, the proposed development would not seriously affect the mammal populations of the Mopaneveld. The proposed development may be supported.

A total of 264 species are considered likely to occur at the site. However, according to SABAP 2 a total of only 70 species were recorded on this Pentad. A total of 28 Red-listed species potentially may occur at the site of proposed development – these are the species that have been recorded in the area considered for the desktop study. Many of these can be ruled out based on habitat characteristics, but several species of significant conservation concern could potentially be present at the site occasionally. These include the vultures and raptors like African White-backed Vulture (*Critically Endangered*), Cape Vulture (*Endangered*), Bateleur (*Endangered*), Martial Eagle (*Endangered*), Tawny Eagle (*Endangered*), Verreaux's eagle (Vulnerable) and Lanner Falcon (*Vulnerable*). Species like the Secretarybird (*Vulnerable*) and European Roller (*Near Threatened*) may also occur on or near the site from time to time. In addition, the presence of the *Endangered* Southern Ground-hornbill cannot be ruled out.

The development of site should not affect the Bateleur or Tawny Eagle species survival as a species. From an avifaunal perspective, the conservation status of this site is low. At a broader spatial scale, the site is located in widespread mopane bushveld, therefore the ultimate impact of the development on birds is considered to be low and the development can be supported.

A high number of 99 reptile species may occur in this bushveld type where the study site is located. The presence of six reptile species was confirmed, but 41 more species have a high possibility to occur in the area.

Five of the seven listed threatened reptile species may occur in the area of the site:
Muller's velvet gecko's (*Homopholis mulleri*) status is *Vulnerable.* A high possibly exists that this species may occur on the site. The status of the Soutpansberg rock lizard (*Vhembelacerta rupicola*) is *Near Threatened.* This species occurs on rocky outcrops, scree slopes and bedrock in wooded savannah on or near the Soutpansberg

Range and it is unlikely that this species occur on the study. The status of the Soutpansberg worm lizard (*Chirindia langi occidentalis*) is *Vulnerable*. This species is endemic to the low-lying areas of the Soutpansberg in northern Limpopo. A possibly exists that this species may occur on the sandy habitats on the site. The status of the Stripe-Bellied Legless Skink (*Acontias kgalagadi subtaeniatus*) is *Data Deficient,* and it is endemic to northern Limpopo Province in South Africa. A small possibly exists that this species may occur on the site

The Southern African python (*Python natalensis*) does occur in the area.

A total of 18 amphibia species may from time to time occur on or in the vicinity of the study site. Five of these species were observed on a neighbouring farm. It is unlikely that the African Bullfrog will occur on the site or in the vicinity of the site. No further red listed amphibia species are expected to occur on the site.

The proposed development will not affect amphibia species.

The result of the Animal Theme Sensitivity indicates a Medium Sensitivity. In the natural Mopaneveld surrounding Mopane, and particularly in the nature reserves to the south, the general animal species sensitivity is medium or probably even high. However, within the Mopane area *Lycaon pictus* (Wild dog) and Roberts' marsh rat have not been seen or recorded for several years. The medium sensitivity for animal species can be only partially confirmed, as the particular study site rather exhibits Low sensitivity for animal species in general but specifically for *Lycaon pictus* (Wild dog) and Roberts' marsh rat. The result of the Screening Tool for animal species sensitivity is therefore disputed.

The Screening Tool results indicate very high Terrestrial Biodiversity Sensitivity. This is caused by the Ecological Support Area 1, which is basically the entire area east and south off the Musina town and which forms part of the Vhembe Biosphere Reserve and is therefore disputed for the site. The medium animal species sensitivity is also disputed, as the two animal species mentioned by the screening tool, wild dog and leopard do not occur on or close to the site.

The low aquatic biodiversity sensitivity and low plant species sensitivity is confirmed.

It is suggested that the proposed development be supported.

Table of Contents

List of Figures

List of Tables

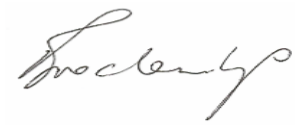
Abbreviations

AIP	Alien Invasive Plant
CBA	Critical Biodiversity Area
DFFE	Department of Forestry, Fisheries and the Environment
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
IUCN	International Union for Conservation of Nature and Natural Resources
LC	Least Concern
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NPAES	National Protected Area Expansion Strategy
POSA	Plants of Southern Africa
QDS	Quarter Degree Squares
SABAP2	South African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute

Declaration of Independence

We, George Johannes Bredenkamp, ID 4602105019086, SACNASP Reg No 400086/83 and Jacobus Casparus Petrus Van Wyk, ID 680804 5041084, SACNASP Reg No 400062/09 declare that we:

- Hold higher degrees (MSc and DSc) in the biological sciences, which allowed registration by South African Council for National Scientific Professions as Professional Ecologists that sanction us to function independently as specialist scientific consultants;
- Act as independent specialist consultants in the field of ecology, vegetation science, botany zoology and wetlands;
- Abide by the Code of Ethics of the SACNASP;
- Are committed to biodiversity conservation but concomitantly recognize the need for economic development;
- Declare that, as per prerequisites of the Natural Scientific Professions Act (Act No. 27 of 2003), as amended by the Science and Technology Laws Amendment Act (Act 7 of 2014), this investigation of vegetation exclusively reflects our own observations and unbiased scientific interpretations, and was executed to the best of our ability;
- Within our fields of expertise, we reserve the right to form and hold our own opinions within the constraints of our training and experience and therefore will not submit willingly to the interests of other parties or change our statements to appease or unduly benefit them;
- Do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work performed;
- Do not have, and will not have any vested or conflicting interests in the proposed development;
- Undertake to disclose to the client and the competent authority any material information that have or may have the potential to influence the decision of the competent authority regarding the Environmental Impact Assessment requirements;
- Will provide the client and competent authority with access to all information at our disposal, regarding this project, whether favourable or not;
- Reserve the right to only transfer our intellectual property contained in this report to the client(s), (party or company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognise that written consent from the client(s) will be required for us to release any part of this report to third parties;
- In addition, remuneration for services provided by us is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.



GJ Bredenkamp

JCP van Wyk

1. INTRODUCTION

Red Kite Environmental Solutions (Pty) Ltd was appointed by Gudani Consulting (Pty) Ltd to conduct a Terrestrial Biodiversity Assessment for the proposed Kinetic Development Group (Pty) Ltd (KDG) and South African Energy Metallurgical Base (Pty) Ltd (SAEMB) industrial & metallurgical development in the Musina-Makhado Special Economic Zone (MMSEZ).

KDG and SAEMB are applying for an Environmental Authorisation for their industrial and metallurgical project on the farms Dreyer 526 MS, Van Der Bijl 528 MS, Steenbok 565 MS and Antrobus 566 MS. The proposed project footprint is located in the MMSEZ, in the Musina and Makhado Local Municipalities of the Vhembe District Municipality, about 33 km south of Musina.

The proposed industrial and metallurgical development includes the following:

- Ferrochrome and Alloys smelter plant (125 000 – 1000 000 tons/year)
- 10 million tons/year coal wash plant
- 3 million tons/year coke plant
- Heat recovery electricity power plant - 600 MW
- Office and staff living facilities for the factory

The proposed footprint of the above developments is approximately 893 ha in extent.

1.1. The Scope and objectives

It is widely recognised that to conserve natural resources it is of the utmost importance to maintain ecological processes and life support systems for plants, animals and humans. To ensure that sustainable development takes place, it is therefore important that possible impacts on the environment are considered before relevant authorities approve any development.

All components of the ecosystems (physical environment, vegetation, animals) at a site are interrelated and interdependent. A holistic approach is therefore imperative to effectively include the development, utilisation and, where necessary, conservation of the given natural resources into an integrated development plan, which will address all the needs of the modern human population.

It is therefore necessary to make a thorough inventory of the plant communities, flora and fauna on the site, to evaluate the plant diversity and possible presence of plant and fauna species of conservation concern, red listed plant and fauna species and protected plant and fauna species, alien species, invader species and weedy species. From the results of this evaluation the sensitivity of the ecosystems (plant communities) on site and the conservation value of the different ecosystems can be determined.

The Scope of this study is to:

- Identify describe and map the vegetation (ecosystems) that occur on the site;
- Assess the ecological sensitivity of these ecosystems and comment on ecologically sensitive areas, in terms of their plant diversity and where needed ecosystem function;
- Provide a list of plant species that do occur on site and that may be affected by the development;
- Compile a list of fauna that occur on the site or may from time to time occur on the site;
- Identify fauna and flora species of conservation concern that may occur on the site;

- Confirm or dispute the environmental sensitivity as identified by the National web-based environmental screening tool;
- Provide management recommendations that might mitigate negative and enhance positive impacts, should the proposed development be approved.

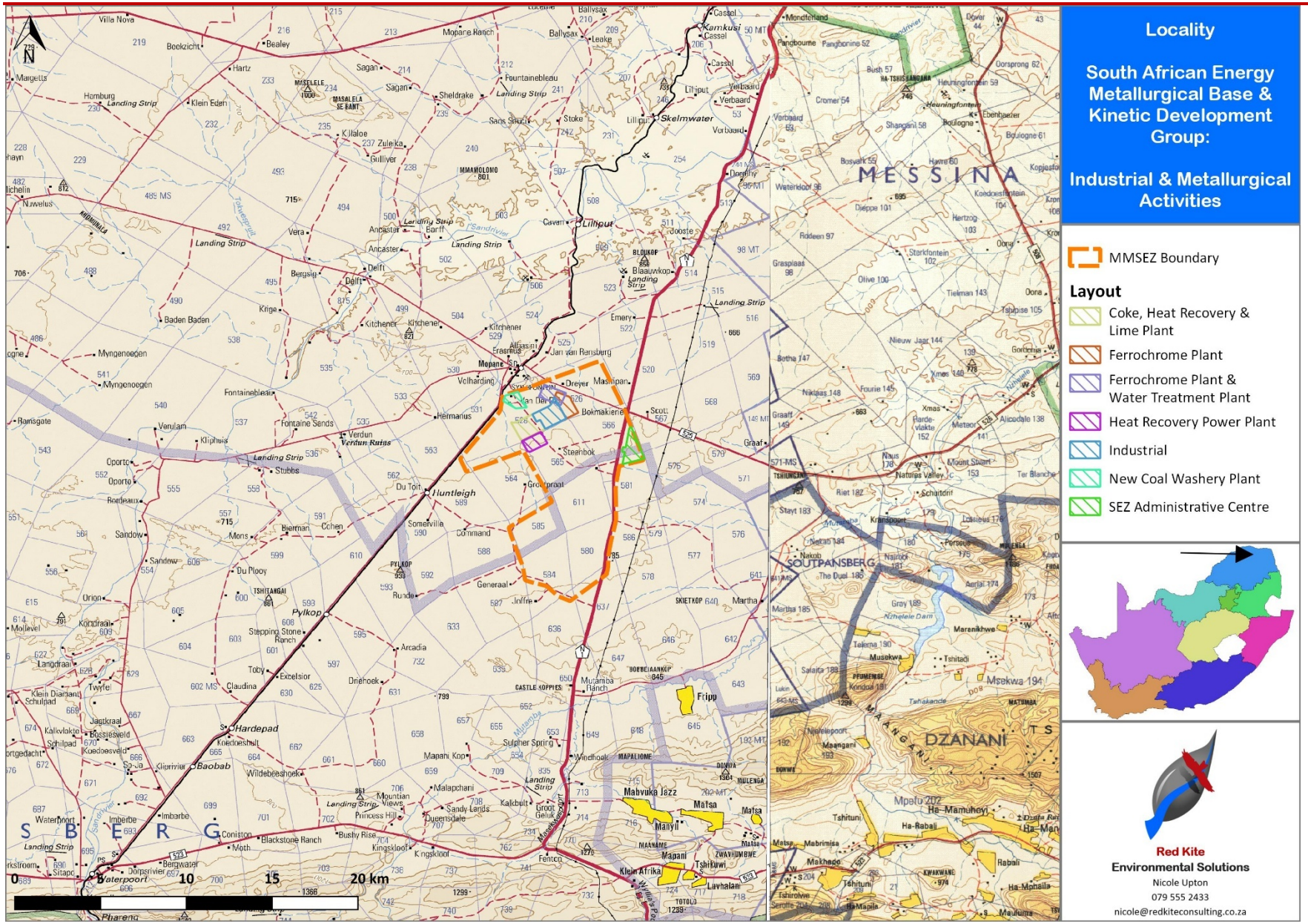


Figure 1: Locality of the industrial and metallurgical developments within the MMSEZ

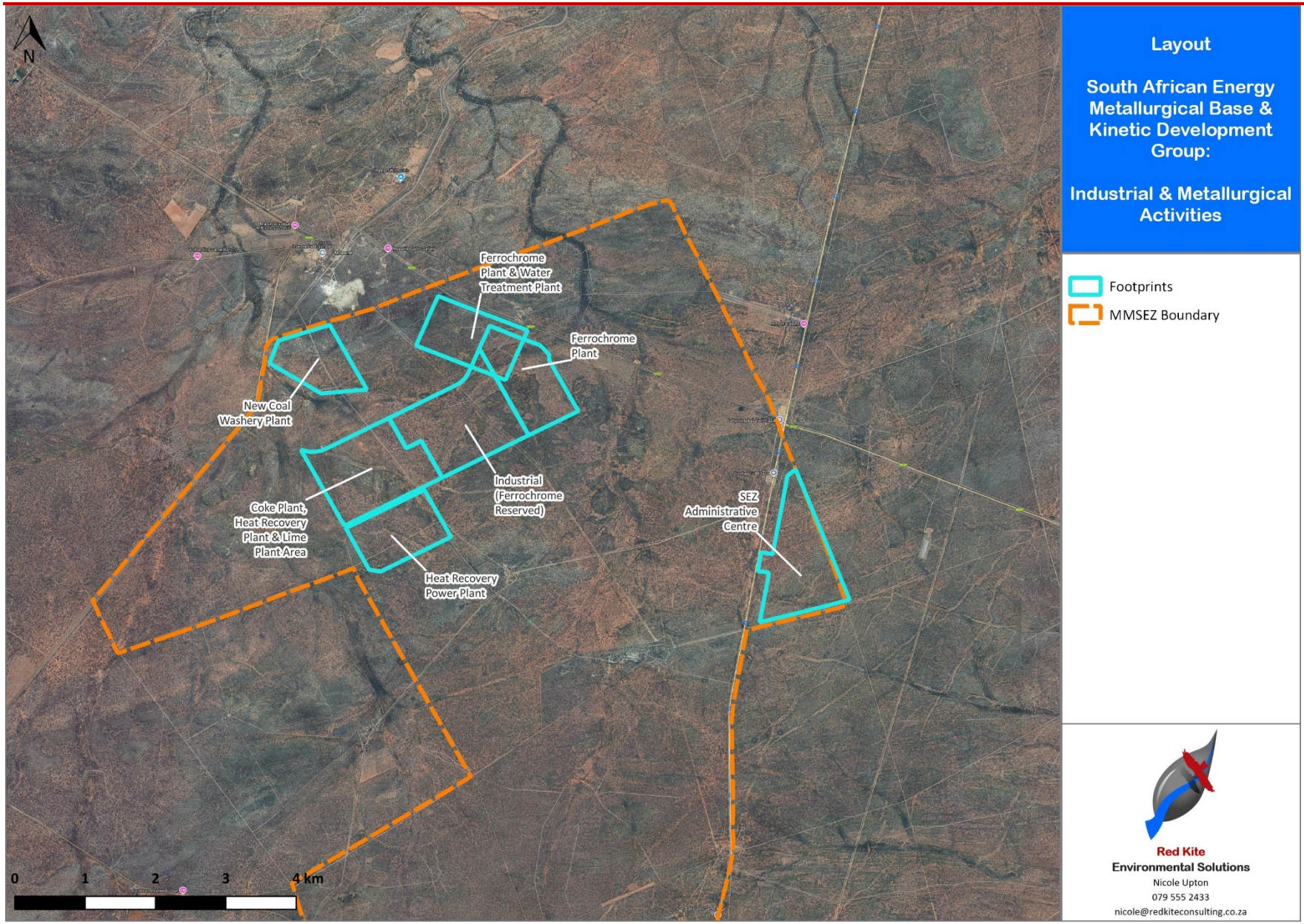


Figure 2: Satellite Image of the industrial and metallurgical developments in relation to the MMSEZ

2. ENVIRONMENTAL SCREENING TOOL RESULTS

According to the Department of Forestry, Fisheries and the Environment's (DFFE) National Web-based Environmental Screening Tool, the project area is categorised as Very High sensitivity for Terrestrial Biodiversity, Low for Plant Species sensitivity and Medium for Animal Species sensitivity.

Terrestrial Biodiversity Sensitivity

The result of the DFFE Environmental Screening Tool analysis for Terrestrial Biodiversity Sensitivity for the proposed Prospecting Right area is regarded as Very High.

Features that contribute to this Very High biodiversity sensitivity include:

- FEPA sub-catchment
- Ecological Support Area

The entire development site including large surrounding areas are classified as Ecological Support Area 1, (ESA 1) These areas are located within the Vhembe Biosphere Reserve and act as a buffer for conservation / protected nature reserve areas.

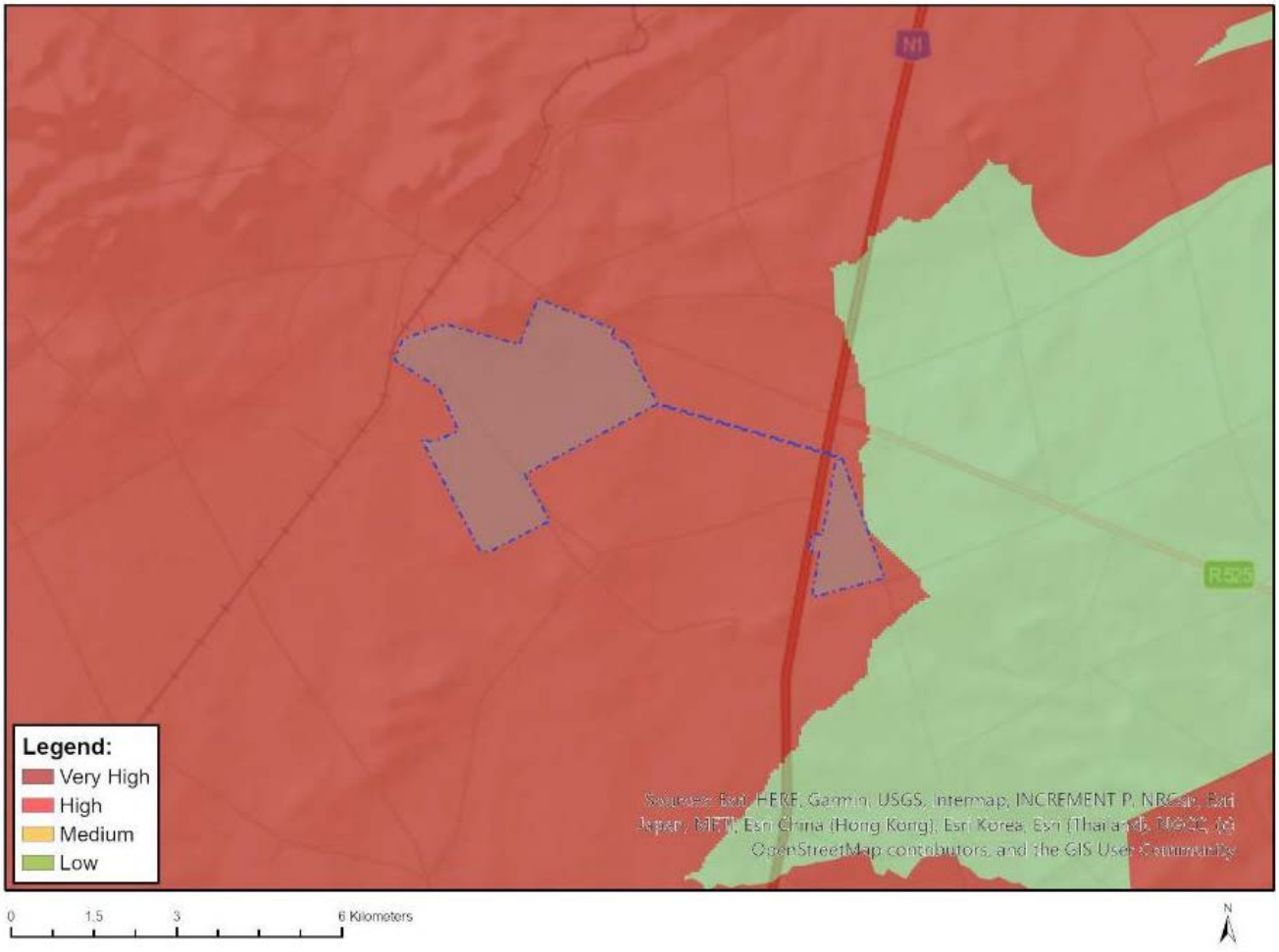


Figure 3: Environmental Screening Tool result for Terrestrial Biodiversity Sensitivity

Animal Species Sensitivity

The result of the DFFE Environmental Screening Tool analysis for Animal Species Sensitivity is regarded as Medium for two raptor bird species namely *Terathopius ecaudatus* (Bateleur) and *Aquila rapax* (Tawny Eagle) and two mammal species namely *Dasymys robertsii* (Roberts marsh rat) and *Lycaon pictus* (Wild dog).

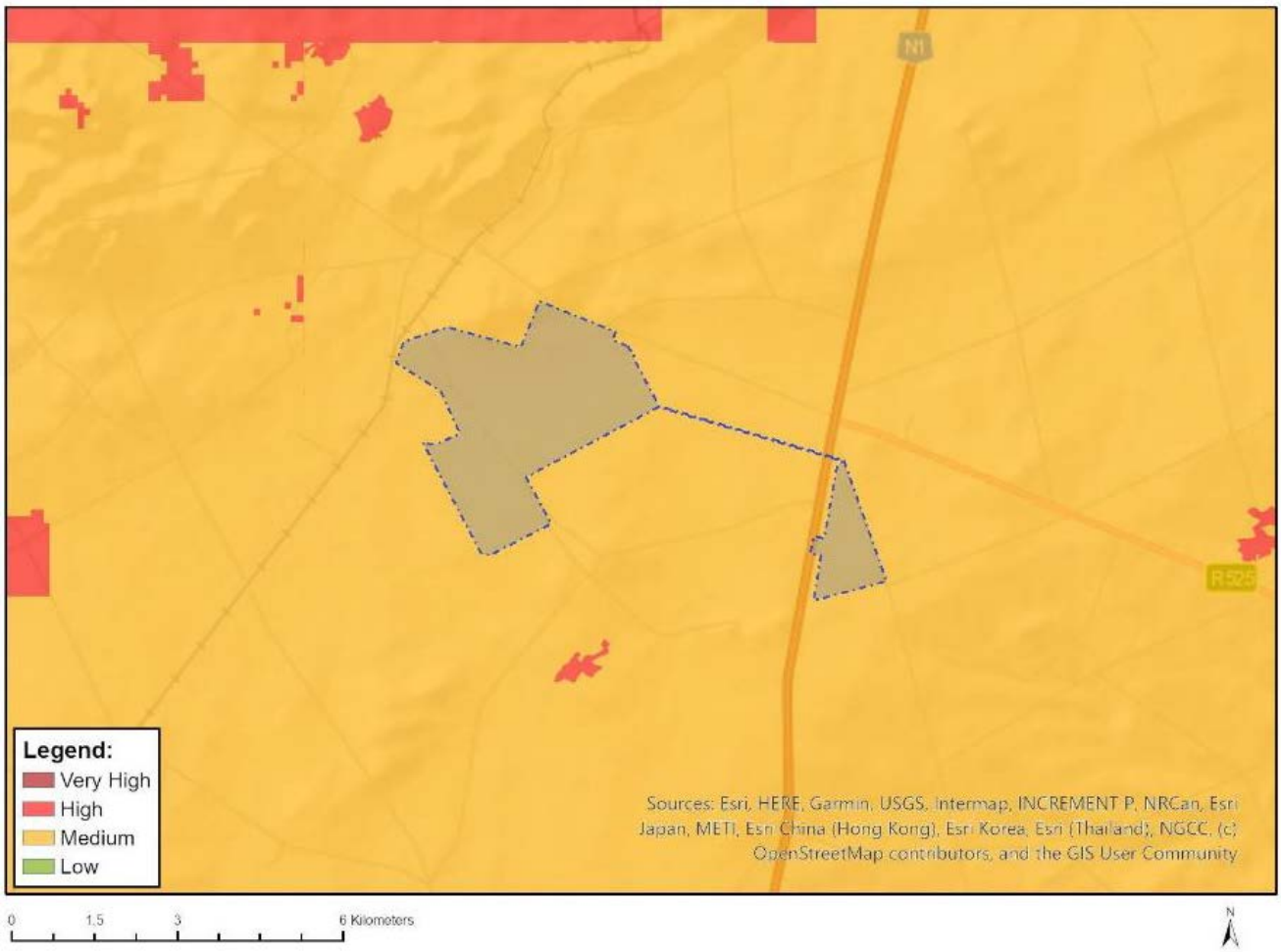


Figure 4: Environmental Screening Tool analysis for Animal Species Sensitivity

The sensitivity of the following animal species that may be found in the area is given in the table below:

Sensitivity	Species name	Common name
Medium	Aves-*Terathopius ecaudatus*	Bateleur
Medium	Aves-*Aquila rapax*	Tawny eagle
Medium	Mammalia-*Dasymys robertsii*	Roberts marsh rat
Medium	Mammalia-*Lycaon pictus*	Wild dog

Plant Species Sensitivity

The result of the DFFE Screening Tool analysis for Plant Species Sensitivity is regarded as Low.

The Screening Tool Report does not list any sensitive plant species for the proposed project footprint.

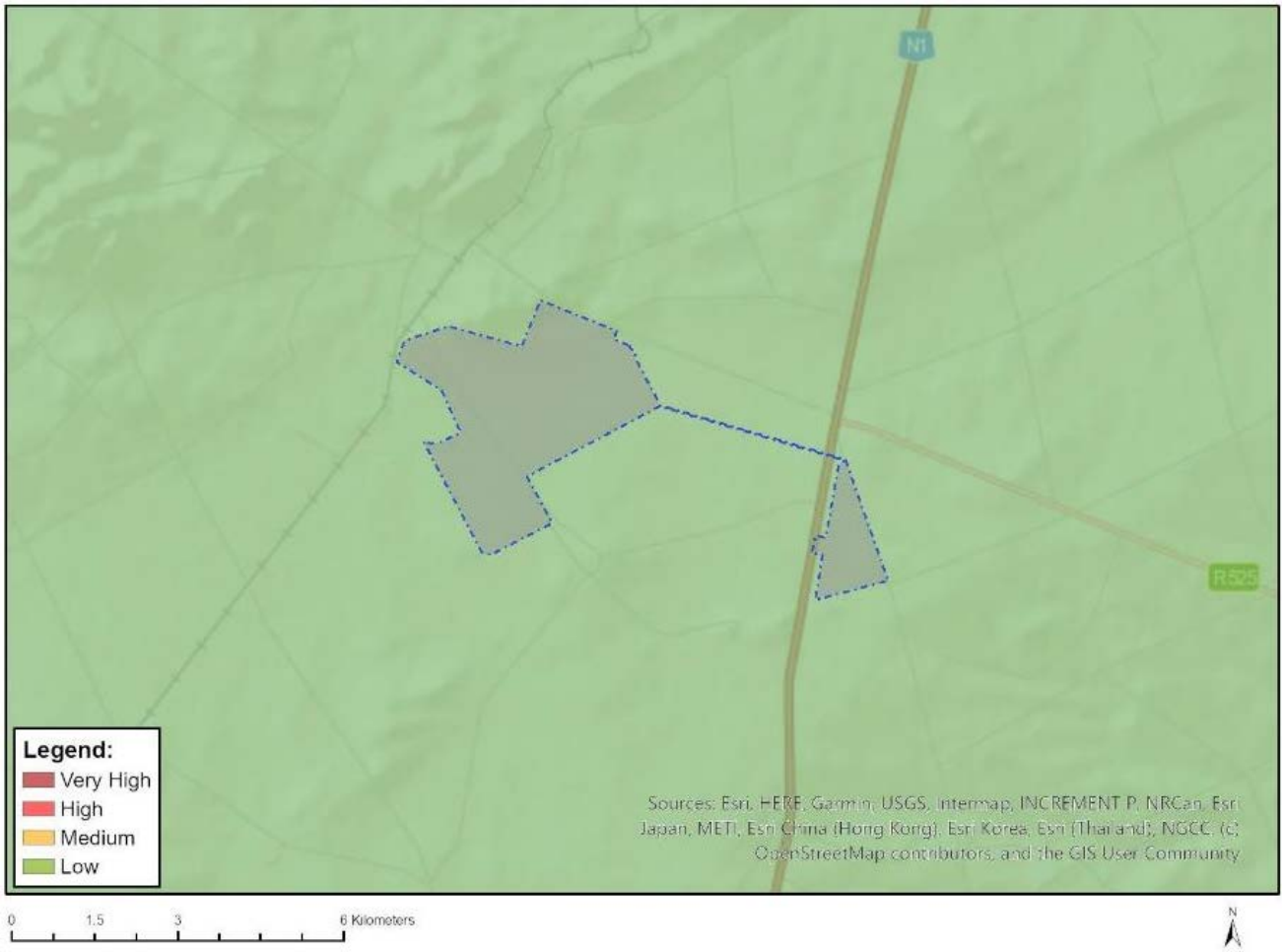


Figure 5: Environmental Screening Tool analysis for Plant Species Sensitivity

The results of the National Environmental Screening for the site indicate Very High sensitivity for Terrestrial Biodiversity, Low for Plant Species sensitivity and Medium for Animal Species sensitivity. The development will have a definite impact on the biodiversity of the area therefore a biodiversity assessment is regarded as essential.

3. LEGISLATION

The aim of this component of the report is to provide a brief overview of the pertinent policies, as well as legal and administrative requirements applicable to biodiversity aspects of the proposed development.

3.1. The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)

The NEMA is the statutory framework to enforce Section 24 of the Constitution of the Republic of South Africa. The Act aids in providing for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for co-ordinating environmental functions exercised by organs of state. The Act also provides for certain aspects of the administration and enforcement of other environmental management laws and matters connected therewith.

This Act embraces all three fields of environmental concern namely:

i) resource conservation and exploitation;
ii) pollution control and waste management; and
iii) land use planning and development.

3.1.1. National Environmental Management Biodiversity Act, 2004 (Act No. 10 0f 2004) (NEMBA)

The following aspects of the NEMBA are important to consider in the compilation of an ecological report:

- Lists of ecosystems that are threatened or in need of national protection;
- Links to Integrated Environmental Management processes;
- Must be taken into account in Environmental Management Plans (EMP) and Integrated Development Plans (IDPs);
- The Minister may make regulations to reduce the threats to listed ecosystems.

- ***Threatened or Protected Species List (ToPS List) – Government Gazette Notice No. 151 of 2007***
  "National Environmental Management: Biodiversity Act, 2004 (Act No. 10 Of 2004): Publication of Lists of Critically Endangered, Endangered, Vulnerable and Protected Species"

  The status provided by the Government Gazette in terms of Notice 151 implies:
  - Critically endangered: Section 56(1)(a) applies to the species awarded this status in terms of NEMBA, meaning: *"Critically endangered species, being any indigenous species facing an extremely high risk of extinction in the wild in the immediate future."*
  - Endangered species: Section 56(1)(b) applies to the species awarded this status in terms of NEMBA, meaning: *"Endangered species, being any indigenous species facing a high risk of extinction in the wild in the near future, although they are not a critically endangered species."*
  - Vulnerable species: Section 56(1)(c) applies to the species awarded this status in terms of NEMBA, meaning: *"Vulnerable species, being any indigenous species facing an extremely high risk of extinction*

in the wild in the medium-term future, although they are not a critically endangered species or an endangered species."

- Protected species: Section 56(1)(d) applies to the species awarded this status in terms of NEMBA, meaning: *"Protected species, being any species, which are of such high conservation value or national importance that they require national protection, although they are not listed in terms of paragraph (a), (b) or (c)."*

- ***Alien and Invasive Species List - Government Gazette Notice No. 598 of 2014 [as amended]***
  The Department of Forestry, Fisheries and Environment (DFFE) manages Invasive Alien Species (IAS) under the NEMBA.

  The four different categories that NEMBA classify AIPs under are:
  - Category 1a: A person in control of a Category 1a Listed Invasive Species must immediately take steps to combat or eradicate listed invasive species and officials from the DFFE must be allowed access to monitor or assist with control. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
  - Category 1b: A person in control of a Category 1b Listed Invasive Species must control the listed invasive species. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme. The Minister may require any person to develop a Category 1b Control Plan for one or more Category 1b species. Officials from the DFFE must be allowed access to monitor or assist with control.
  - Category 2: These are invasive species that can remain in your garden, but only with a permit. A person in control of a Category 2 Listed Invasive Species, or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area (permit) must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed accordingly.
  - Category 3: These are invasive species that can remain on your property. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all category 3 plants become category 1b plants.

- ***The Revised National List of Ecosystems that are threatened and in need of protection - Government Gazette Notice No. 2747 of 2022***
  The NEMBA provides for listing of threatened or protected ecosystems, in one of four categories:
  - Critically Endangered: these have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;
  - Endangered: these have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;
  - Vulnerable: these have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; or

- Protected: these have a high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

Threatened ecosystems are listed in order to reduce the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value (SANBI, BGIS).

3.1.2. Procedures For The Assessment and Minimum Criteria For Reporting On Identified Environmental Themes

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National web-based environmental screening tool. The potential biodiversity sensitivity of the site under consideration, as identified by the screening tool must be confirmed, or disputed, by undertaking a site sensitivity verification.

In accordance with the protocol for the specialist assessment and minimum report content requirements for Environmental Impacts on Terrestrial Biodiversity. (The National Environment Management Act, 1998 (Act No. 107 of 1998), Government Notice 320, Government Gazette 443110, 20 March 2020), the following information must be included in the specialist report:

1	General Information	Reference in report
1.1	An applicant, intending to undertake an activity as identified in the scope of this protocol on a site identified by the screening tool as being of “very high “sensitivity for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment	This report
1.2	An applicant, intending to undertake an activity as identified in the scope of this protocol on a site identified by the screening tool as being of “low” sensitivity for terrestrial biodiversity, must submit a “Terrestrial Biodiversity Compliance Statement.	N/A
1.3	However, where the information gathered from the site sensitivity verification differs from the designation of “very high”, terrestrial biodiversity sensitivity from the screening tool and it is found to be of a “low” sensitivity, then a Terrestrial Biodiversity Compliance Statement must be submitted.	Terrestrial Biodiversity Assessment undertaken
1.4	Similarly, where the information gathered from the site sensitivity verification differs from that identified as having a “low”, terrestrial biodiversity sensitivity from the screening tool a Terrestrial Biodiversity Specialist Assessment must be conducted.	N/A
1.5	If any part of the proposed development footprint falls within an area of “very high” sensitivity the assessment and reporting requirements prescribed for the “very high” sensitivity apply to the entire footprint. The footprint includes any area that will be disturbed.	This report

2	**Terrestrial Biodiversity Specialist Assessment** **VERY HIGH SENSITIVITY RATING FOR TERRESTRIAL BIODIVERSITY FEATURES**	**Reference in report**
2.1	The assessment must be prepared by a specialist registered with SACNASP with expertise in the field of biodiversity	Title page and Appendix A
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 5, 6 & 7
2.3	The assessment must provide a baseline description of the site which includes, as a minimum the following aspects:	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	Section 5 & 8
2.3.2	Ecological function and ecological processes (e.g., fire, migration pollination etc.) that operate in the preferred site;	Section 5 & 6
2.3.3	The ecological corridors that the proposed development would impede, including migration and movement of flora and fauna;	Section 5 & 6
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub-catchments;	Section 5, 6 & 7
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: (a) main vegetation types, (b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified, (c) ecological connectivity, habitat fragmentation ecological processes and fine-scale habitats, (d) species, distribution, important habitats, (e.g. feeding grounds, nesting sites etc.) and movement patterns identified;	Section 5, 6 & 7
2.3.6	The assessment must identify any alternative development footprints within the preferred site which could be of a “low” sensitivity as identified by the screening tool and verified by the sensitivity verification; and	Section 5 & 6
2.3.7	The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify;	
2.3.7.1	Terrestrial critical biodiversity areas (CBA,s) including: (a) The reasons why an area has been identified as a CBA, (b) An indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near-natural state or in achieving the goal of rehabilitation, (c) The impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s), (d) The impact on ecosystem threat status, (e)The impact on explicit subtypes in the vegetation, (f)) The impact on overall species and ecosystem diversity of the site,	Section 6 & 8

	(g) The impact on any changes that threat status of populations of species of conservation concern in the CBA	
2.3.7.2	Terrestrial Ecological support areas (ESAs) including: (a) The impact on the ecological processes that operate within or across the site, (b) The extent the proposed development will impact on the functionality of the ESA, (c) Loss of ecological connectivity (on site and in connection with the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna.	Section 6 & 8
2.3.7.3	Protected areas as defined by the National Environmental Protected Areas Act 2004 including: (a) An opinion on whether the proposed development aligns with the objectives or purpose of the protected area and zoning as per the protected area management plan.	Section 6
2.3.7.4	Priority areas for protected area expansion, including: (a) The way in which the proposed development will compromise or contribute to the expansion of the protected area network.	Section 6
2.3.7.5	SWSAs including: (a) The impacts on the terrestrial habitat of a SWSA, (b) The impacts of the proposed development on the SWSA water quantity and quality (e.g. describing potential increased runoff leading to increased sediment load in water courses).	Section 5
2.3.7.6	FEPA sub-catchments including: (a) The impacts of the proposed development on habitat condition and species in the FEPA sub-catchment.	Section 5
2.3.7.7	Indigenous forests including: (a) Impact on the ecological integrity of the forest, (b) Percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	N/A
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.	This Report
3.1	**This report must include as a minimum the following information:**	**Reference in report**
3.1.1	Contact details and curriculum vitae of the specialist including SACNASP registration number and fields of expertise;	Appendix A
3.1.2	A signed statement of independence by the specialist;	Page vii
3.1.3	Duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4
3.1.4	A description of the methodology used to undertake the verification impact assessment and site inspection, including equipment and modelling used where relevant;	Section 4
3.1.5	A description of the assumptions made and any uncertainties or gaps in	Section 4

	knowledge or data as well as a statement of the timing and intensity of site inspection observations;	
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation where relevant;	N/A
3.1.7	Additional environmental impacts expected from the proposed development;	Section 8
3.1.8	Any direct, indirect, and cumulative impacts of the proposed development	Section 8
3.1.9	The degree to which impacts, and risks can be mitigated	Section 8
3.1.10	The degree to which impacts, and risks can be reversed	Section 8
3.1.11	The degree to which impacts, and risks can cause loss to irreplaceable resources	Section 8
3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPR);	Section 8
3.1.13	A motivation must be provided if there were development footprints within the preferred site which would be as "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification	Section 6 & 8
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not, if it should receive approval, or not	Section 8
3.1.15	Any conditions to which this statement is subjected.	
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, which must be incorporated in the EMPr where relevant	EAP
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.	EAP

On 30 October 2020 "*Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the NEMA when applying for environmental authorization*" was published in GN 1150 (Government Gazette 43855). This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on terrestrial animal and plant species for activities requiring environmental authorisation.

The procedure was adhered to, where applicable, for the compilation of this report.

3.2. The National Forest Act, 1998 (Act No. 84 of 1998) (NFA)

The National Forests Act:

- Promotes the sustainable management and development of forests for the benefit of all;
- Creates the conditions necessary to restructure forestry in State Forests;
- Provide special measures for the protection of certain forests and protected trees;
- Promotes the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes; and
- Promotes community forestry.

In terms of the NFA, forest trees or protected tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold – except under license granted by the Department of Forestry, Fisheries and Environment (DFFE).

The list of protected trees has been published in terms of Section 12 (1) (d) of the NFA.

3.3. Focus Areas for Protected Area Expansion – NPAES (2018)

The National Protected Areas Expansion Strategy, first published in 2008, presents a 20-year strategy for the expansion of protected areas in South Africa.

The goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost effective protected area expansion for ecological sustainability and adaptation to climate change. The NPAES sets targets for protected area expansion, provides maps of the most important areas for protected area expansion, and makes recommendations on mechanisms for protected area expansion. It deals with land-based and marine protected areas across all of South Africa's territory (SANBI, BGIS).

3.4. National Biodiversity Assessment (NBA; 2018)

The National Biodiversity Assessment (NBA) is the primary tool for monitoring and reporting on the state of biodiversity in South Africa and is prepared as part of the SANBI mandate under the National Environmental Management: Biodiversity Act (Act 10 of 2004). It is used to inform policies, strategies and actions in a range of sectors for managing and conserving biodiversity more effectively.

The NBA focusses primarily on assessing biodiversity at the ecosystem and species level, and the two headline indicators of threat status and protection level are applied to both ecosystems and species in the four realms (terrestrial, inland aquatic, estuarine and marine) and in two cross-realm areas (the coast and South Africa's sub-Antarctic territory). These established headline indicators provide a way of comparing results meaningfully across the realms, and a standardised framework that links with policy and legislation in South Africa to facilitate an effective interface between science and policy. Underlying the headline indicators is a wealth of geographically detailed information that can be applied at the provincial and local level.

The latest NBA (NBA 2018) was released in October 2019 and builds on the National Spatial Biodiversity Assessment 2004 and the NBA 2011.

4. METHODS AND APPROACH

4.1. Vegetation and Flora

Literature studies and databases:

For background information, the relevant maps, aerial photographs, and other information on the natural environment of the area concerned were obtained through literature studies and databases. These *inter alia* include:

- Results of the National Environmental Screening Tool with relevance to biodiversity, plant species and animal species, and where relevant of aquatic systems (Government Notice 655 Government Gazette 42946, 10 January 2020 (Plants and Animals) (NEMA) and Government Notice 648 Government Gazette 45421, 10 May 2019 (Biodiversity)(NEMA)]. These results provide the starting point for this report.
- The relevant vegetation types in which the site is located using Mucina & Rutherford (2006, 2012).
- Threatened ecosystems are identified using Mucina & Rutherford (2006, 2012) SANBI & DEAT (2009) and NEMA Government Gazette 47526 (2022).
- Information (maps) about Critical Biodiversity Areas and Ecological Support Areas, and any other environmentally / ecologically sensitive areas in relation to the study site from the Limpopo Conservation Plan and Vhembe District Bioregional Plan
- Species of Conservation Concern, including:
    - Information on Red and Orange Data listed plant species data from SANBI databases.
    - Critically Endangered, Endangered, Vulnerable and Protected Species (NEMBA species, TOPS species) are evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007 (National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)).
    - Nationally Protected Trees as published in terms of Section 12 (1) (d) of the NFA.
    - Other plant species of conservation concern, particularly provincially protected species.

Field studies: Vegetation and Flora surveys

Prof GJ Bredenkamp and Dr CL Bredenkamp undertook the field survey 1-3 and 12 – 13 April 2025, to assess vegetation and flora. Mr JCP van Wyk assisted with habitat suitability and presence of fauna.

A Google Earth image was used to stratify and map different units representing differences in cover and vegetation. At several sampling plots and transects within each mapping unit a description of the dominant and characteristic plant species found was made. These descriptions were based on total floristic composition, following established vegetation survey techniques (Mueller-Dombois & Ellenberg 1974; Westhoff & Van der Maarel 1978). Data recorded resulted in a list of the plant species present, including trees, shrubs, grasses and forbs. A comprehensive species list was therefore derived for the site, but it is realised that some species could have been missed. These vegetation survey methods have been used as the basis of a national vegetation survey of South Africa (Mucina *et al*. 2000, Brown *et al.* 2013) and are considered an efficient method of describing vegetation and capturing species information. Within each mapping unit noted were made of relevant habitat features, with emphasis on topography and some soil properties Additional notes were made of any other features that might have had an ecological influence, e.g. previous utilization and disturbance.

The identified units are not only described in terms of their plant species composition but also evaluated in terms of the potential habitat for plant species of conservation concern and in terms of the status of the vegetation.

Data on Red data plant species for the area were obtained from the SANBI database, with updated threatened status, (Raimondo et al 2009). These lists were then evaluated in terms of habitat available on the site, and also in terms of the present development and presence of man in the area.

Alien invasive species, according to the Alien and Invasive Species List - Government Gazette Notice No. 598 of 2014 [as amended], are indicated.

Only medicinal plants listed by Van Wyk, Van Oudtshoorn & Gericke (2005), and rare medicinal plants as indicated by Williams, Victor & Crouch (2013) were indicated with the letter "M" in the list of species for each plant community.

The field observations were supplemented by literature studies from the area (Dekker & Van Rooyen 1995, Du Plessis 2001, Siebert *et al.* 2003, Bathusi Environmental Consulting 2018, Digby Wells Environmental 2019, EcoAgent CC 2021, EnviroXellence 2021).

From the floristic data an analysis of the presence of Alien and Invasive species on the site was made. Furthermore, the ecological sensitivity of each plant community was calculated by using plant species composition, plant species of conservation concern, habitat features and relevant legislation, including Critical Biodiversity Areas and the National Screening Tool. From this information an ecological sensitivity map was prepared.

Plant Species Status

Plant species recorded in each plant community with an indication of the status of the species by using the following symbols:

A Followed by Invasive category (1a, 1b, 2, 3) = Alien woody species
D = Dominant
d = subdominant
EG = Exotic Garden ornamental or Garden Escape
G = Indigenous Garden ornamental or Garden Escape
M= Medicinal plant species
N = Exotic, naturalized
P = Protected trees species
NP = nationally protected species (NEMBA)
p = provincially protected species
RD = Species of Conservation Concern, Red data listed plant
W = weed.

From the data obtained from the literature and the field data the following were calculated:

Species Richness

Species Richness is interpreted as follows: Number of indigenous species recorded in the sample plots representing the plant community. Alien woody species and weeds are not included.

Categories of plant species richness.

No of species	Category
1-24	Low
25-39	Medium
40-59	High
60+	Very High

Vegetation Status

Indigenous vegetation: According to NEMA (Act 107 of 1998, - Amendment of the Environmental Impact Assessment Regulations 2014, 7 April 2017 (GNR. 324, 325, 326 & 327: Listing Notices 1, 2, 3): Definitions) Indigenous vegetation refers to vegetation consisting of indigenous plant species occurring naturally in an area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.

The following criteria indicate vegetation status:

- Primary vegetation is the *original indigenous vegetation* that occurred in the area, in this case the Sekhukhune Plains Bushveld vegetation type (Mucina & Rutherford 2017). The vegetation is *relatively undisturbed, or slightly disturbed*, though the vegetation still consists of the original dominant, sub-dominant and associated plant species.
- Disturbed primary vegetation is where the *original indigenous vegetation* that occurred in the area is disturbed but can still be identified by the original dominant, sub-dominant and most associated plant species. Some of the species that were present may have disappeared, however, some other species (species of lower successional status or weedy species) increased in abundance or invaded into the original vegetation. Disturbed primary vegetation may recover when well- managed.
- Degraded vegetation is where the *original indigenous vegetation* is so severely disturbed by impacts (mostly man-induced) that the original dominant, sub-dominant and most associated plant species and vegetation structure are changed. Some of the originally occurring species are still sparsely present, but they are mostly replaced by other species of lower successional status, alien invasive species or weedy species. Degraded vegetation may not recover without active application of rehabilitation measures. Severely Degraded vegetation can be regarded as Transformed.
- Transformed vegetation is where the original indigenous vegetation was destroyed with no or very little of the original plant species remaining, e.g. cleared for development (construction, tilled for agriculture (e.g. maize), silviculture (e.g. pines, wattles, eucalypts), total cover by alien invasive plant species (e.g. black wattle), planted pasture (e.g. *Eragrostis*), sports fields (e.g. kikuyu grass). Transformed vegetation areas include areas where the topsoil has been disturbed during the preceding ten years. Recovery to the original indigenous vegetation is almost impossible though by active application of rehabilitation measures a vegetation cover (not representing or similar to the original indigenous vegetation!) can be established.

- Secondary (indigenous) vegetation is where the original indigenous vegetation was destroyed but the transformed area was left unused and fallow for several years. Vegetation, different from the original indigenous vegetation, can become (naturally) established and develop through successional processes to a specific plant community with a specific indigenous plant species composition and with good cover, hence secondary vegetation may fall within the definition of indigenous vegetation as provided for in NEMA, but it mostly represents Transformed vegetation, as the original vegetation has been destroyed. A good example is where species rich *Themeda triandra*-dominated indigenous grassland was transformed for agriculture, (e.g. maize production) and then left fallow. Through successional phases secondary *Hyparrhenia hirta* – dominated grassland can become established. By applying specific rehabilitation and management procedures, the development of secondary vegetation can be enhanced.

Ecological Sensitivity

In order to determine the sensitivity of the vegetation (ecosystem) on the site, weighting scores are calculated per plant community. The following six criteria are used, and each allocated a value of 0-3.

- Conservation status of a regional vegetation unit;
- Listed ecosystem (e.g. wetlands, hills and ridges etc)
- Legislative protection (e.g. threatened ecosystems, SANBI & DEAT 2009, Government Gazette NEMA 2011)
- Plant species of conservation concern (e.g. red listed, nationally or provincially protected plant species, habitat or potential habitat to plants species of conservation concern, protected plants or protected trees);
- Situated within ecologically functionally important features (e.g. wetlands or riparian areas; important habitat for rare fauna species);
- Conservation importance (e.g. untransformed and un-fragmented natural vegetation, high plant species richness, important habitat for rare fauna species, Critical Biodiversity Areas).

Sensitivity is calculated as the sum the values of the criteria. The vegetation with the lowest score represents the vegetation that has the least / limited sensitivity). A maximum score of 18 can be obtained, a score of 15-18 indicated high sensitivity. The sensitivity scores are as follows:

Scoring	15-18	12-14	9-11	6-8	0-5
Sensitivity	High	Medium-High	Medium	Medium-Low	Low

Development on vegetation that has High sensitivity will normally not be supported, except that specific circumstances may still lead to support of the proposed development. Portions of vegetation with Medium-High or Medium sensitivity should be conserved**.** Development may be supported on vegetation considered to have Medium-Low or Low sensitivity.

In terms of sensitivity the following criteria applies:

High: High and Medium-High conservation priority categories mentioned above are considered to have a High sensitivity and development should not be supported.

Low: Medium, Medium-Low and Low conservation priority categories mentioned above are considered to have a Low sensitivity and development may be supported. Portions of vegetation with a Medium conservation priority should be conserved**.**

Conservation Value

The following conservation value categories were used for each site:

High: Ecologically sensitive and valuable land with high species richness and/or sensitive or threatened ecosystems or red data species that should be conserved and no development allowed.

Medium-high: Land where sections are disturbed but which is in general ecologically sensitive to development/disturbances.

Medium: Land on which low impact development with limited impact on the vegetation / ecosystem could be considered for development. It is recommended that certain portions of the natural vegetation be maintained as open space.

Medium-low: Land of which small sections could be considered to conserve but where the area in general has little conservation value.

Low: Land that has little conservation value and that could be considered for developed with little to no impact on the vegetation.

4.2. Fauna Assessment

The field survey was conducted on 1 – 3 April 2025. The day was sunny, pleasant with almost no wind. The 500 meters of adjoining areas were scanned for possible additional fauna habitats. The veld was lush and green, after much rain.

The 500 meters of adjoining properties were scanned for possible additional fauna habitats.

Field Surveys

Within a particular Biome and/or Vegetation Type the local occurrences of fauna are closely dependent on broadly defined habitat types. These habitat types are defined by topography and vegetation cover:

- Terrestrial fauna that prefers grassland, the herbaceous layer in bushveld, old fields or agricultural fields,
- Arboreal, that is tree-living fauna,
- Rupicolous, that is rock-dwelling fauna and
- Wetland-associated fauna.

In summary: Three criteria were used to gauge the probability of occurrences of mammals and herpetofauna species on the study site. These include:

- Known distribution ranges,
- Habitat preferences,
- Qualitative and quantitative presences of suitable habitats.

It is thus possible to deduce the presence or absence of fauna species by evaluating the habitat types within the context of Biome or Vegetation Type distribution ranges.

The presence of mammals, birds, reptiles and amphibians were recorded by driving on the limited roads and tracks and extensive walking transects through each recognised habitat type. Mammals were also identified by means of spoor, droppings and burrows, birds by their calls and nests and where feasible frogs by their calls. This was done with due regard to the well-recorded global distributions of Southern African vertebrates, coupled with the qualitative nature of recognised habitats.

No trapping or mist netting was conducted as the terms of reference did not require such intensive work.

Desktop Surveys

The distributional ranges and habitat preferences of fauna species were determined by using scientific literature, field guides, atlases and other data bases.

The probability of the occurrence of mammal, reptile and amphibian species was based on their respective geographical distributional ranges and the suitability of on-site habitats:

- ***High*** probability would be applicable to a species with a distributional range overlying the study site as well as the presence of prime habitat occurring on the study site. Another consideration for inclusion in this category is the inclination of a species to be common to the area, i.e. normally occurring at high population densities.
- ***Medium*** probability pertains to a mammal and herpetofaunal species with its distributional range peripherally overlapping the study site, or its required habitat on the site being sub-optimal. The size of the site as it relates to its likelihood to sustain a viable breeding population, as well as its geographical isolation are taken into consideration. Species categorised as *medium* normally do not occur at high population numbers - but cannot be deemed as rare.
- ***Low*** probability of occurrence would imply that the species' distributional range is peripheral to the study site and habitat is sub-optimal. Furthermore, some mammals, reptiles and amphibians categorised as low are generally deemed to be rare.

Mammals

Drawing upon observations made during the site visit and informed by authoritative publications a list of species potentially present at the site was compiled. The most current taxonomic nomenclature has been employed, including:
The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005),
Smithers' Mammals of Southern Africa; A Field Guide (Apps, 2012), and
Stuarts' Field Guide to Mammals of Southern Africa* (Stuart & Stuart, 2015), as well as Child, Roxburgh, Do Linh San, Raimondo & Davies-Mostert (2016)

Specific requirements for mammals include the potential occurrence of the red data or threatened mammal species listed for the Limpopo Province and those species listed by the Screening Tool results for Animal species sensitivity.

Birds

Prior to the site visit, a desktop study was undertaken in which bird species that potentially occur at the site and in the surrounding areas were identified using data from the first and second South African Bird Atlas Projects (SABAP 1 and 2). SABAP 2 data are based on records for pentads, where SABAP 1 data were based on

quarter-degree grid cells. A list of species potentially occurring at the site was developed for the SABAP 2 pentads within which the site falls (2235_2945), as well as all eight adjacent pentads (i.e., nine pentads in total). This species list is thus based on an area much larger than the actual development site – approximately 700 square kilometres (28 km north-south X 25 km east-west). This approach is adopted to ensure that all species potentially occurring at the site, whether resident, nomadic, or migratory, are identified.

Based on an assessment of the habitats present at the site (field survey) , and on the best regional field guide for the area (Marais & Peacock 2008), the list was then reduced to those species that were judged as **'possible' or 'likely'** to occur within those habitats as residents or regular visitors. Due to the considerable aerial mobility of birds, a number of additional species might be expected to be infrequent nomads or vagrants, but these were not included on the list. It was judged that the **habitats available** would offer no significant material support or conservation assistance to these species, and that if they did occur it would be temporary, and insignificant numbers.

Special attention was paid to species considered as **internationally or nationally threatened** (Taylor, Peacock & Wanless, 2015). The category assigned to these species was raised to include infrequent visitors as 'likely', based on the precautionary principle. Further details of the extent and limits of various habitat types detected during the field survey and on adjacent properties were also obtained by study of satellite images from Google Earth.

Herpetofauna

A list of herpetofauna (reptile and amphibian) species that may occur on the site was compiled, based on the impressions gathered during the site visit, as well as publications such as FitzSimons' Snakes of Southern Africa (Broadley, 1990), Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998), A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007), Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates, Branch, Bauer, Burger, Marais, Alexander & De Villiers, 2014), Amphibians of Central and Southern Africa (Channing 2001), Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (Minter, Burger, Harrison, Braack, Bishop & Kloepfer, 2004, 2004), Tolley *et al.* (2023) and A Complete Guide to the Frogs of Southern Africa (Du Preez & Carruthers, 2009). The latest taxonomic nomenclature was used.

4.3. Impact Assessment Methodology

4.3.1. Assessment Criteria

The criteria for the description and assessment of environmental impacts were drawn from the EIA Guidelines, National Environmental Management Act (Act No. 107 of 1998): EIA Regulations (2014) and as amended from time to time.

The level of detail as depicted in the EIA Guidelines was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

An explanation of the impact assessment criteria is defined below.

Table 1: Impact Assessment Criteria

EXTENT	
Classification of the physical and spatial scale of the impact	
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site	The impact could affect the whole, or a significant portion of the site.
Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
National	The impact could have an effect that expands throughout the country (South Africa).
International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
DURATION	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
Short to Medium term	The impact will be relevant through to the end of a construction phase (1.5 years).
Medium term	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long term	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
INTENSITY	
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
PROBABILITY	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).

Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

The status of the impacts and degree of confidence with respect to the assessment of the significance must be stated as follows:

- **Status of the impact:** A description as to whether the impact would be positive (a benefit), negative (a cost), or neutral.
- **Degree of confidence in predictions:** The degree of confidence in the predictions, based on the availability of information and specialist knowledge.

Other aspects to take into consideration in the specialist studies are:

- Impacts should be described both before and after the proposed mitigation and management measures have been implemented.
- All impacts should be evaluated for the full-lifecycle of the proposed development, including construction, operation and decommissioning.
- The impact evaluation should take into consideration the cumulative effects associated with this and other facilities which are either developed or in the process of being developed in the region.
- The specialist studies must attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

4.3.2. Mitigation

The impacts that are generated by the development can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the development considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

4.3.2.1. Determination of Significance-Without Mitigation

Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact “without mitigation” is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as “positive”. Significance is rated on the following scale:

Table 2: Significance-Without Mitigation

NO SIGNIFICANCE	The impact is not substantial and does not require any mitigation action.
LOW	The impact is of little importance, but may require limited mitigation.
MEDIUM	The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
HIGH	The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

4.3.2.2. Determination of Significance- With Mitigation

Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation is rated on the following scale:

Table 3: Significance- With Mitigation

NO SIGNIFICANCE	The impact will be mitigated to the point where it is regarded as insubstantial.
LOW	The impact will be mitigated to the point where it is of limited importance.
LOW TO MEDIUM	The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels.
MEDIUM	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
MEDIUM TO HIGH	The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels.
HIGH	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

4.3.3. Assessment Weighting

Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision; it was necessary to weigh and rank all the criteria.

4.3.3.1. Ranking, Weighting and Scaling

For each impact under scrutiny, a scaled weighting factor is attached to each respective impact. The purpose of assigning weights serves to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a

means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance.

Table 4: Description of assessment parameters with its respective weighting

EXTENT		DURATION		INTENSITY		PROBABILITY		WEIGHTING FACTOR (WF)		SIGNIFICANCE RATING (SR)	
Footprint	1	Short term	1	Low	1	Probable	1	Low	1	Low	0-19
Site	2	Short to Medium	2			Possible	2	Low to Medium	2	Low to Medium	20-39
Regional	3	Medium term	3	Medium	3	Likely	3	Medium	3	Medium	40-59
National	4	Long term	4			Highly Likely	4	Medium to High	4	Medium to High	60-79
International	5	Permanent	5	High	5	Definite	5	High	5	High	80-100

MITIGATION EFFICIENCY (ME)		SIGNIFICANCE FOLLOWING MITIGATION (SFM)	
High	0.2	Low	0 - 19
Medium to High	0.4	Low to Medium	20 - 39
Medium	0.6	Medium	40 - 59
Low to Medium	0.8	Medium to High	60 - 79
Low	1.0	High	80 - 100

4.3.3.2. Identifying the Potential Impacts Without Mitigation Measures (WOM)

Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1:

Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

4.3.3.3. Identifying the Potential Impacts with Mitigation Measures (WM)

In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it was necessary to re-evaluate the impact.

4.3.3.4. Mitigation Efficiency (ME)

The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation efficiency (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2:

Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency

or WM = WOM x ME

4.3.3.5. Significance Following Mitigation (SFM)

The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact is therefore seen in its entirety with all considerations taken into account.

4.4. Limitations and Assumptions

It is assumed that all relevant project information provided by the applicant to the ecological specialist was correct and valid at the time that it was provided.

A site survey was conducted in April 2025 which is generally in the dry season for the region. However, the rain season was extended, and the timing of the site visits was thus optimal, and the seasonal constraints on the comprehensiveness of the botanical findings are considered to be low.

The vegetation is locally very dense, but in certain areas somewhat disturbed and degraded. The herbaceous layer is scanty and showed signs of long-term overgrazing. Access was limited due to the very limited road network and local very dense woody vegetation.

5. RESULTS OF THE LITERATURE AND DATABASE SURVEY

5.1.1. Vegetation Type

The study sites are located within Musina Mopane Bushveld (Vegetation Type SVmp 1) and a small part in Limpopo Ridge Bushveld (SVmp 2) (Mucina and Rutherford 2006, 2017). Within these vegetation types about 1-3% have been transformed by development or cultivated land and only 2% is statutorily conserved, though these vegetation types are extensively protected in many private nature reserves and cattle and game farms within the Vhembe Biosphere Reserve.

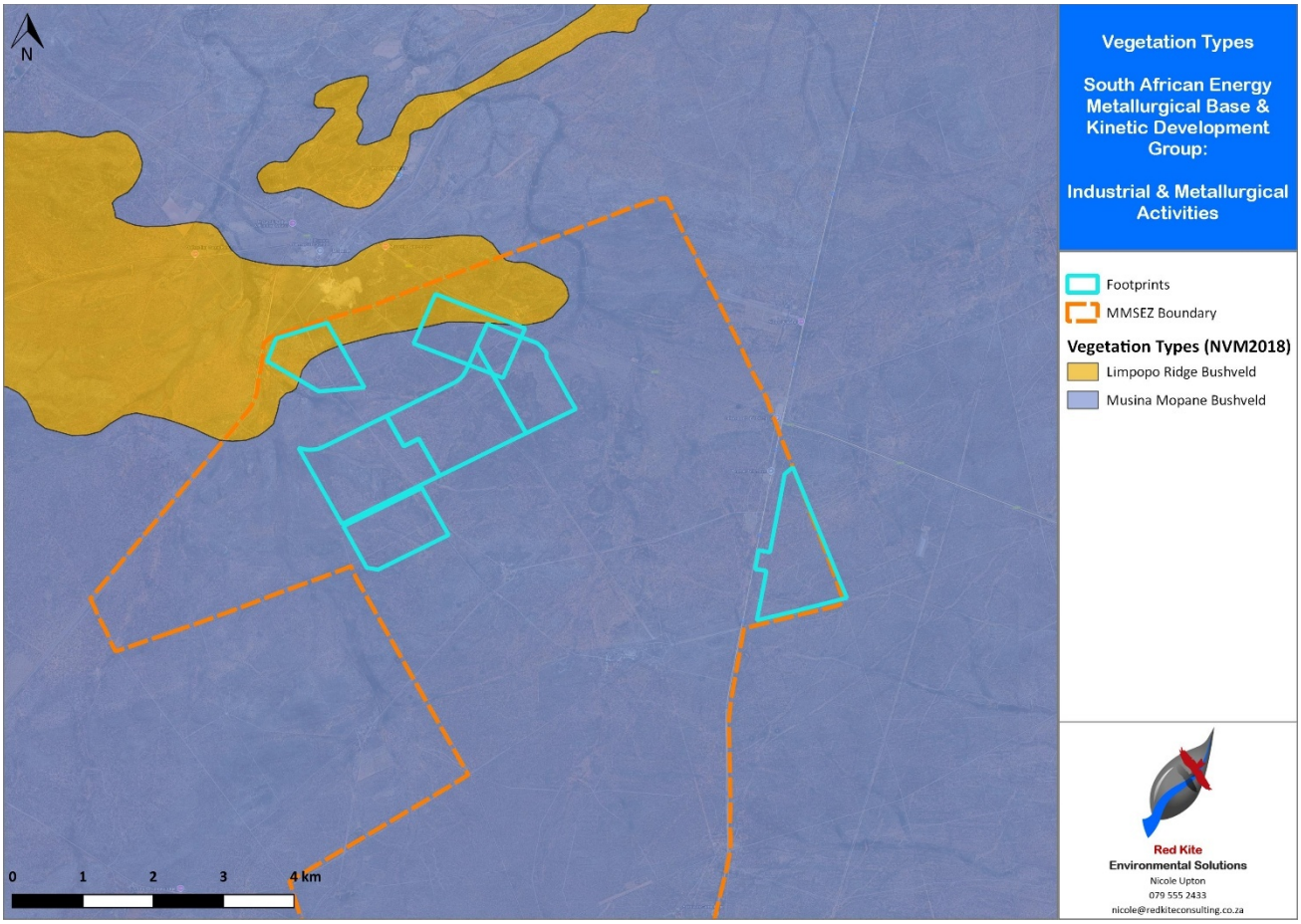


Figure 6: Vegetation type associated with the project footprint

5.1.2. Threatened Ecosystems

According to The Revised National List of Ecosystems that are threatened and in need of protection (Government Gazette Notice No. 2747 of 2022), both the Musina Mopane Bushveld and Limpopo Ridge Bushveld are not regarded as a threatened ecosystem, and are therefore regarded as a Least Threatened ecosystem.

5.1.3. Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)

All the sites fall within Ecological Support Area 1 (ESA 1). ESA1 areas are natural, near natural or degraded areas supporting CBA's by maintaining ecological processes (LEDET 2013). In this case the ESA area is very widely distributed and covers the Vhembe Biosphere Reserve.

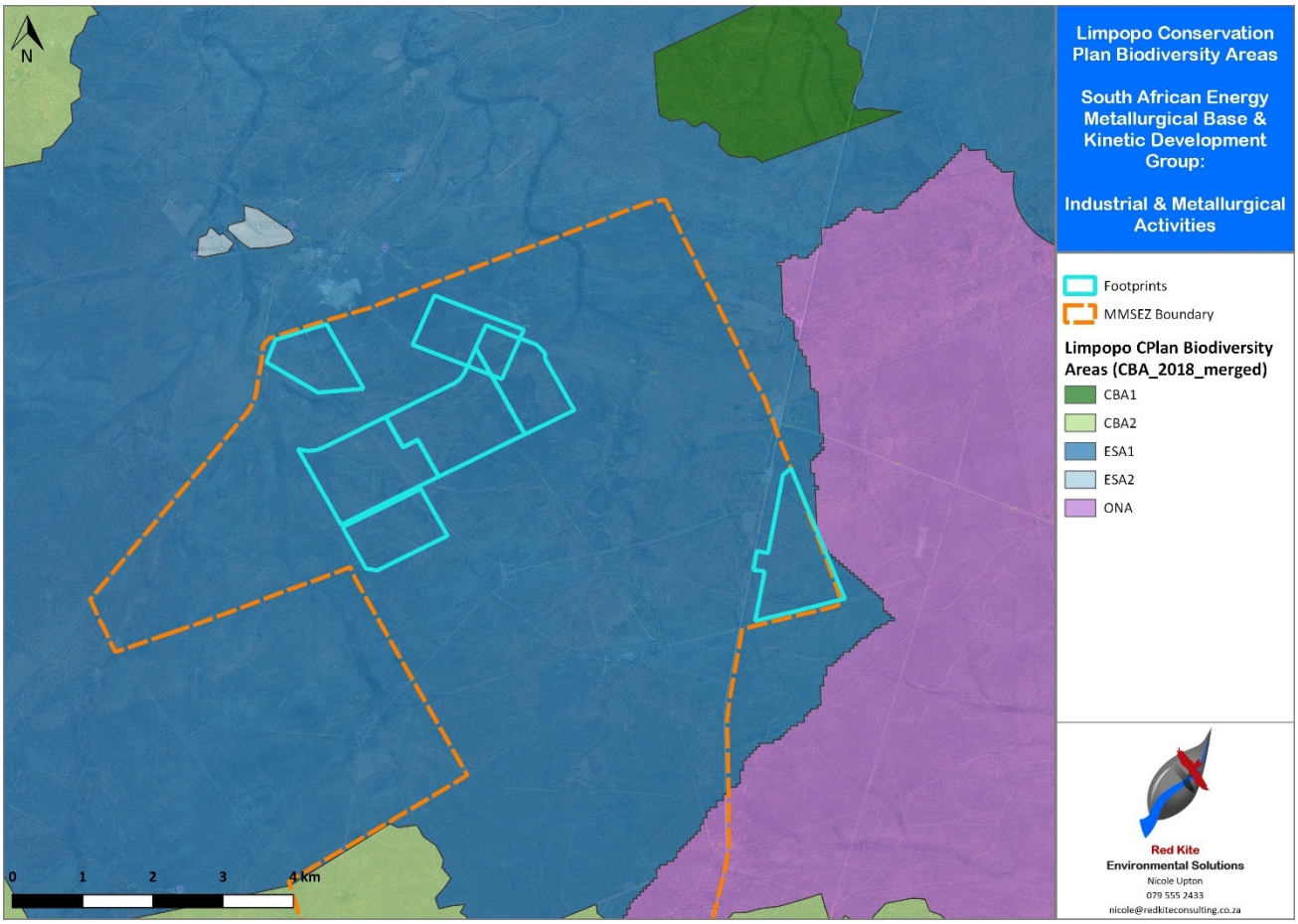


Figure 7: Limpopo Conservation Plan biodiversity areas associated with the project footprint

5.1.4. Protected and Conservation Areas

The project site is located in the Vhembe Biosphere Reserve. However, the proposed project footprint does not fall within the core or buffer areas of the biosphere reserve, but is located within the transitional zone, where sustainable development may be supported.

Apart from being located within the Vhembe Biosphere Reserve, and therefore also in Ecological Support Area 1, several private nature reserves occur in close vicinity of the proposed development sites, in particular the Boabab Private Nature Reserve and the Averel Private Nature Reserve. Several other private nature reserves occur in the region. The site is not located in any National Protected Expansion Area.

The site is not located in any National Protected Expansion Area.

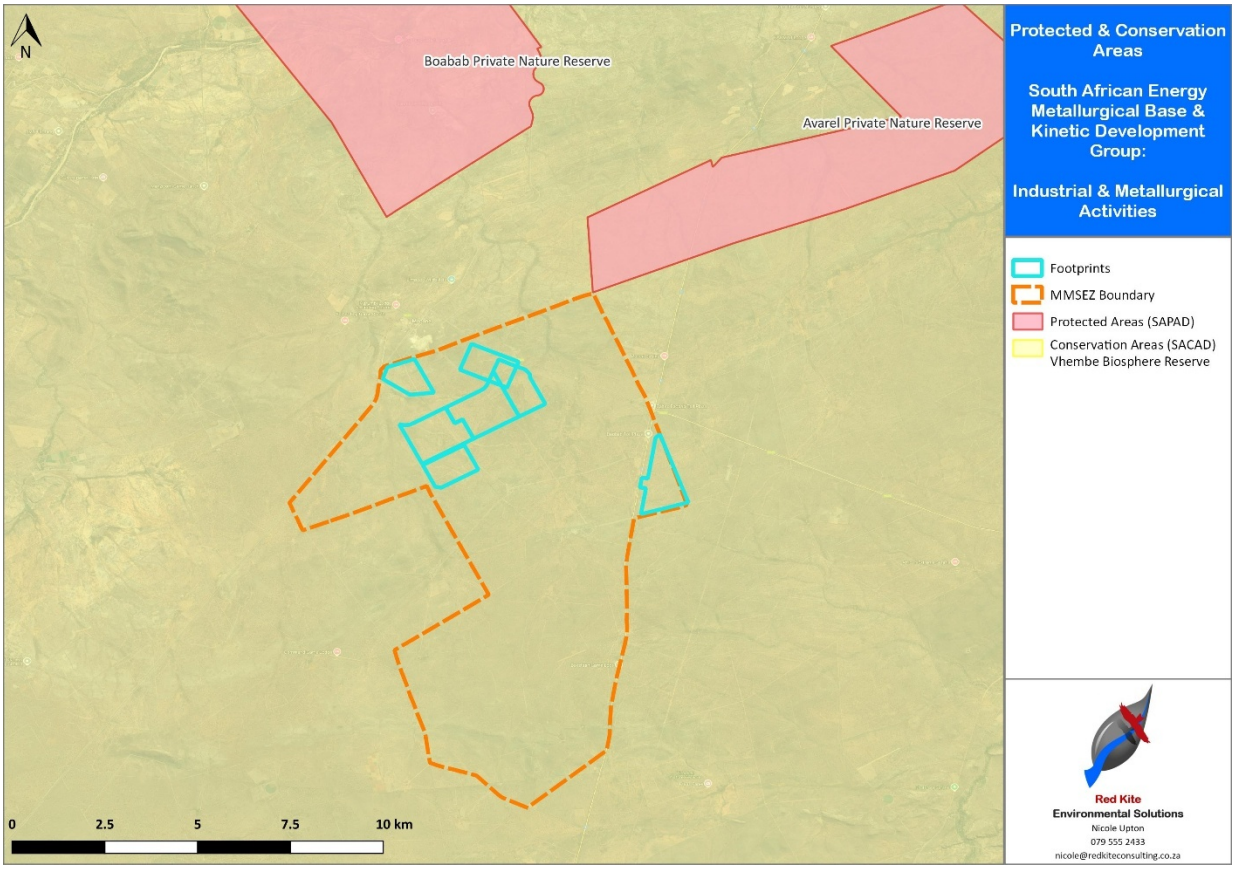


Figure 8: The location of the site in relation conservation and protected areas

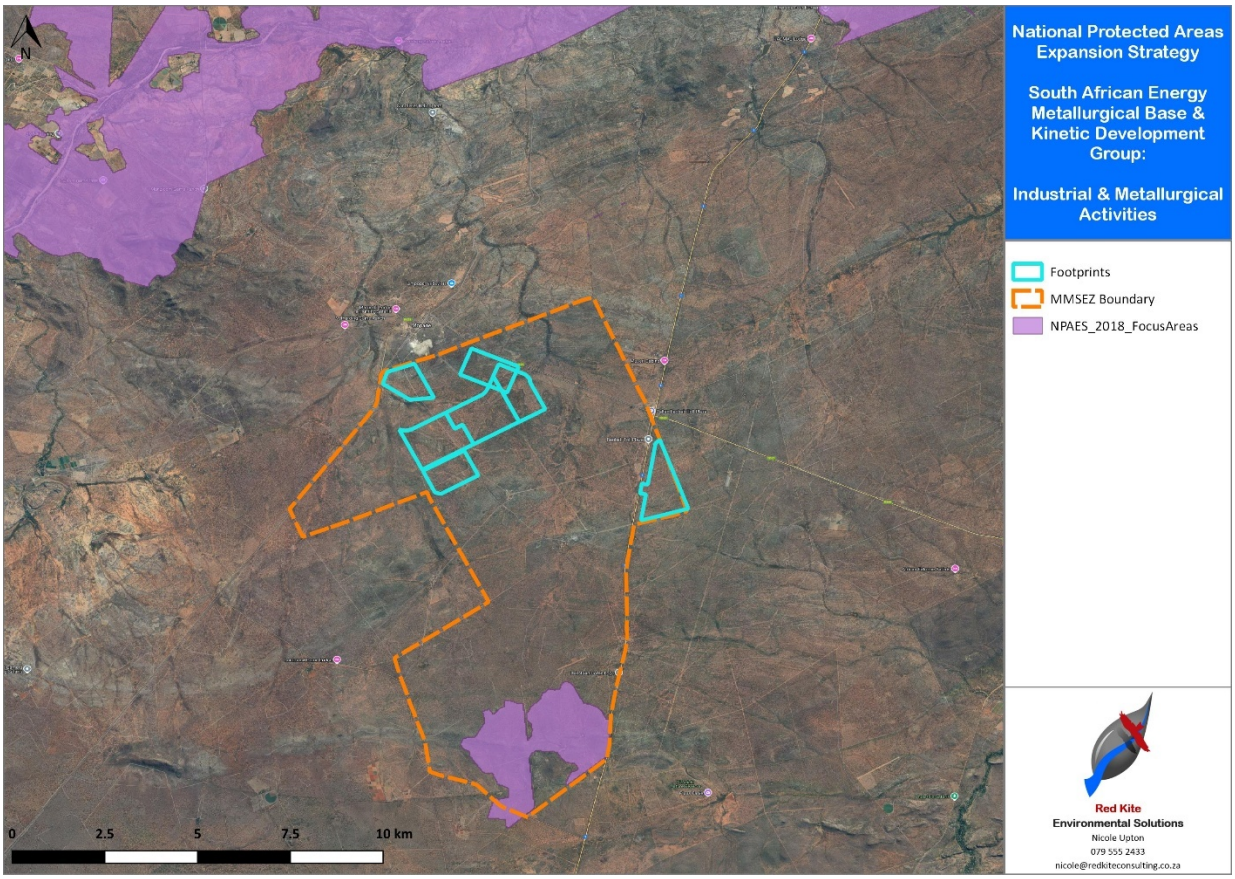


Figure 9: Propose project footprint in relation to NPAES areas

Important direct ecological drivers, which determine presence/absence and relative abundance of plant species on regional scale (biomes and major vegetation types, bioregions) and local scale (plant communities) include:

- Climate, particularly rainfall and temperature, including frost and wind, seasonality and on a more local scale microclimate, particularly within topographical complex areas.
- Geology (rock type), which by weathering processes determines topography (mountains, hills and ridges, plains, valleys, and ultimately in-situ soil type.
- Many different soil types develop on different rock types and different topographical landscapes. Some types were transported by wind or water and deposited.
- Rockiness of the soils and soil depth are important determinants of the distribution of plant species and plant communities.
- Many soil physical (soil structure and soil texture) and chemical properties (presence and availability of nutrients, pH, heavy metals etc, also strongly influence the distribution of plant species, resulting is habitat for different plant communities.
- Any factor that may influence water (and nutrients) availability for the plants, e.g. drainage, related to slope and slope steepness, soil texture (sandy vs clay).
- Biological related drivers (anthropogenic drivers) include pollution, land conversion leading to habitat change, overexploitation, grazing, invasive species, and diseases.

Aspects of some of the ecological drivers are mentioned below:

5.1.5. Regional Climate

Seasonal summer rainfall with dry winters and with a mean annual precipitation of about 300-400mm. The temperature during summer months is very high (Mean monthly maximum for November is 39.9^{o} C. (Mucina & Rutherford 2006). The winters are very dry and frost free.

5.1.6. Geology, Topography, Soil and Drainage

The larger area is underlain by old gneisses and metasediments of the Beit Bridge Complex. The geology map of the site shows that the northern and southern parts of the site consist of Marble, divided by a central part of Arenite. This difference in geology is also reflected in the soils and the vegetation, generally with shallow, rocky soils and dense vegetation in the north and south and sandy soils with more open vegetation in the central parts.

The study site area is flat to slightly undulating plain with local low ridges situated at an altitude of approximately 800-840 m above sea level. Water runoff is facilitated by small, seasonally dry non-perennial drainage lines, with no perennial streams or wetlands on the site. The Sandrivier is located 10 km north-west of the sites, flowing in a north-east direction.

The project area is located in the A71K quaternary catchment, which is designated as a Freshwater Ecosystem Priority Area (FEPA).

The project area is not located in a Strategic Water Source Area (SWSA).

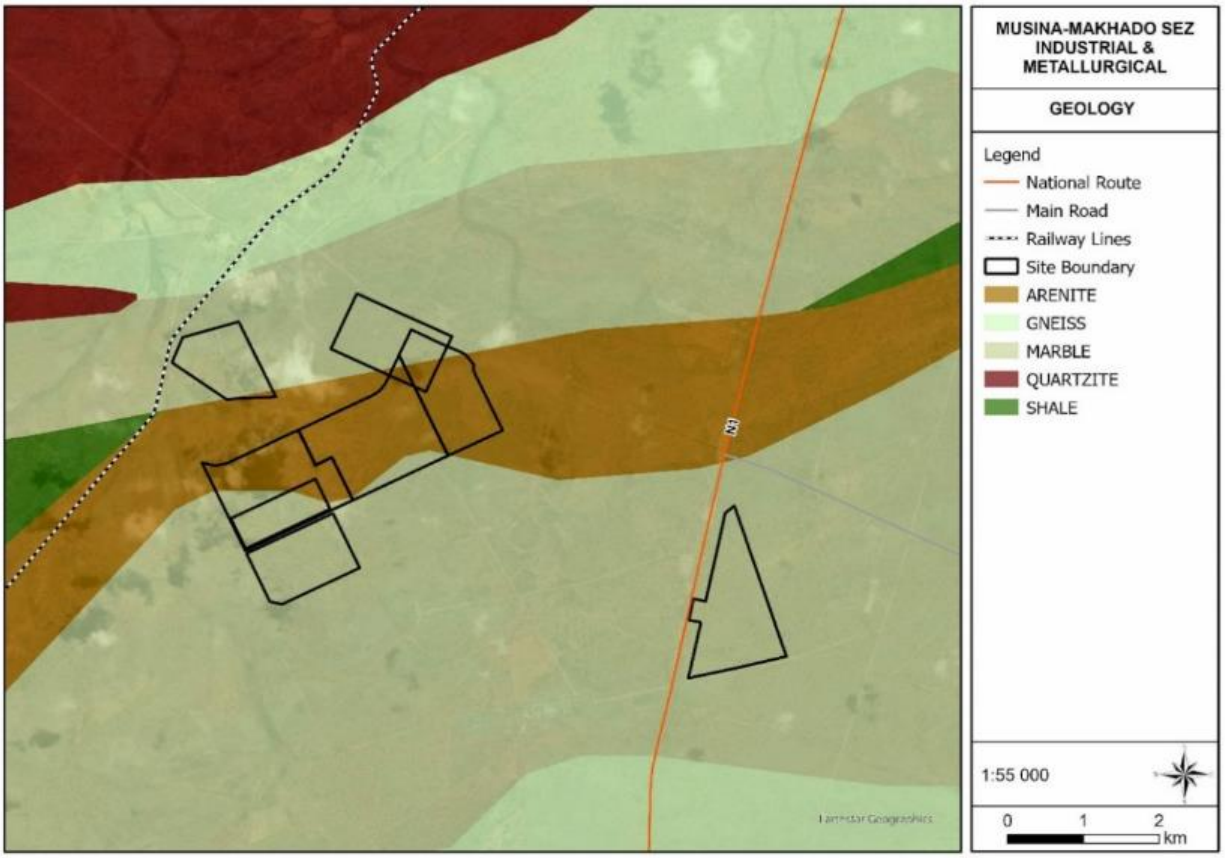


Figure 10: Geology in and around the development site

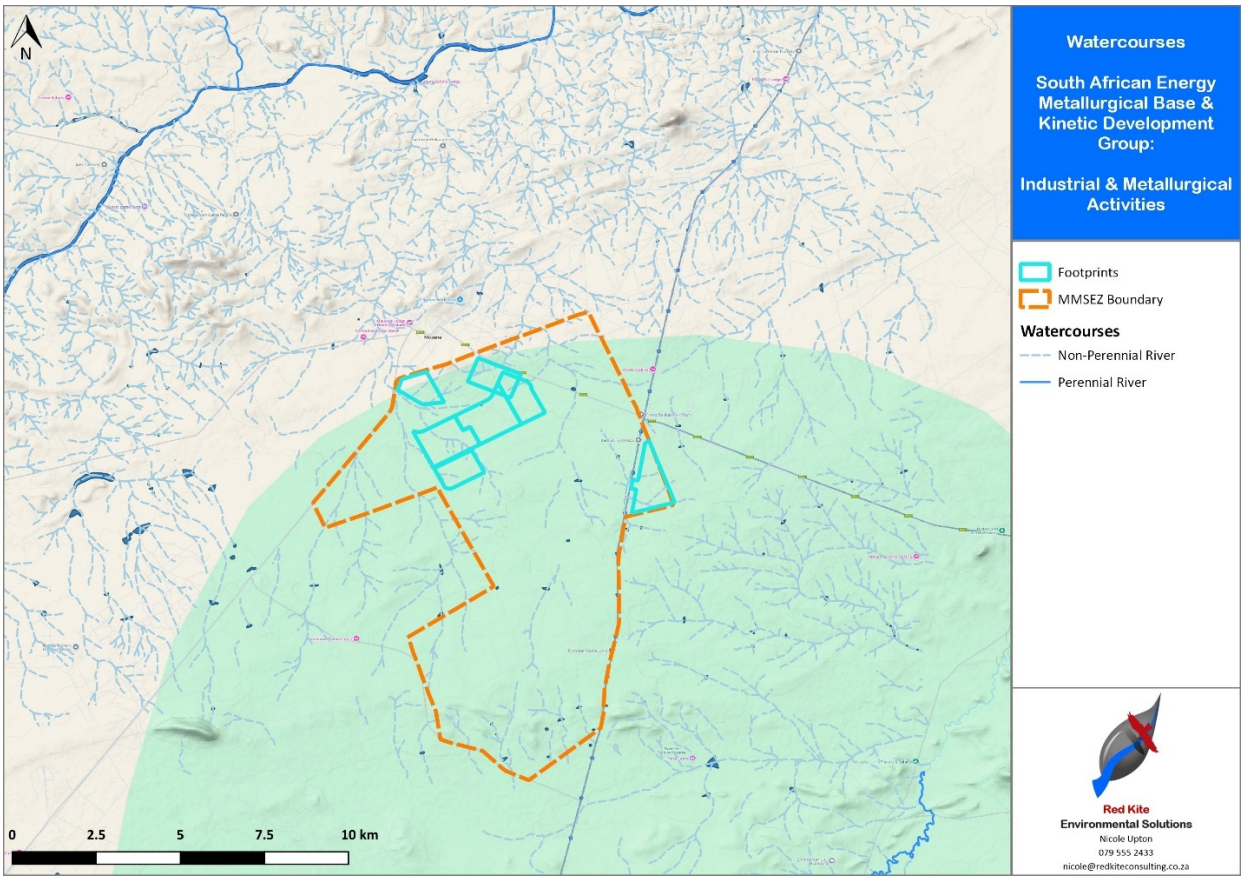


Figure 11: Hydrology in and around the development site

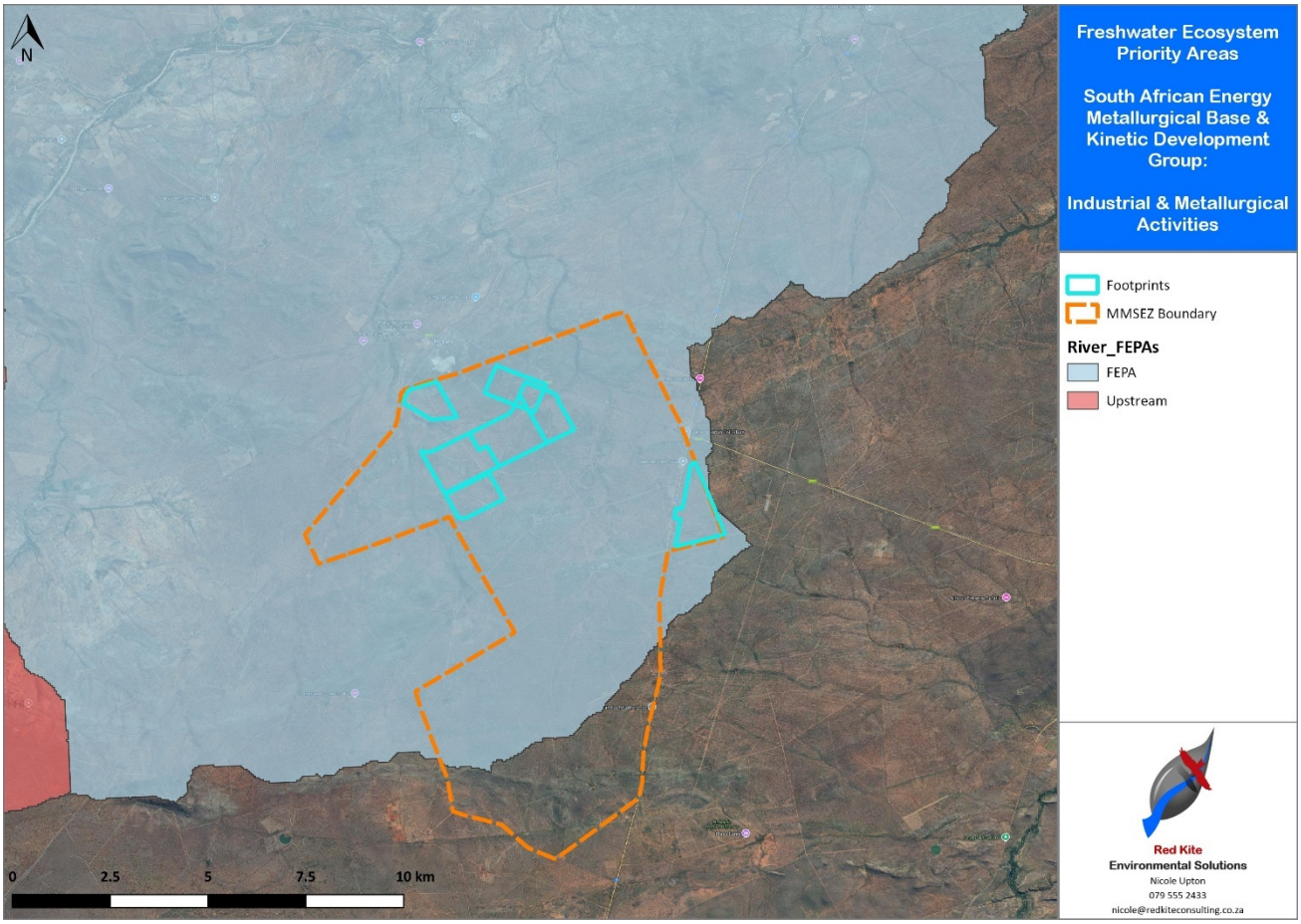


Figure 12: FEPA in and around the proposed project footprint

5.1.7. Land-use

The land-use has mostly been livestock or game farming including conservation orientated guest farms, safaris and hunting. There is limited mining in the area and the small-town Mopane. By examining satellite imagery and site observations indicate that this area remained rural with little, insignificant transformation of land. The vegetation is largely natural primary bushveld, though different intensities of grazing over many years could have caused differences in the vegetation, particularly the herbaceous layer.

6. RESULTS: VEGETATION AND FLORA

The vegetation on the site is broadleaf savanna located on irregular slightly undulating plains with a variety of soil types. The vegetation of the Musina Mopane Bushveld is mostly open to dense treeveld or dense shrubveld dominated by *Colophospermum mopane*. Dense thickets of *Terminalia prunioides* occur locally. A conspicuous feature is the presence of large (and young) individuals of *Adansonia digitata.*

Figure 13: A general view of the *Colophospermum mopane* Bushveld

A variety of trees and shrubs may occur scattered in the vegetation, for example *Combretum apiculatum, Sclerocarya caffra, Senegalia nigrescens, Senegalia erubescens, Dichrostachys cinerea,* several *Commiphora* species and *Grewia* species. Whilst it is possible to visually recognise different sub-communities based on the prominence of any of the above-mentioned woody species, these sub-communities are floristically very similar, and they occur in a mosaic distribution pattern. As the boundaries between the plant communities are often diffuse and gradual it is very difficult to map them at this scale. However, the major plant communities differ considerably in height and tree density, and structural types, can easily be mapped.

The herbaceous layer is often poorly developed probably due to over-utilization over a longer time-period. Widespread grass species include *Aristida congesta, Aristida adscendens, Schmidtia pappophoroides, Stipagrostis uniplumis, Eragrostis lehmanniana* and *Eragrostis pallens.* Forbs are sparse and never dominant. Widespread species include *Melhania acuminata, Ocimum americanum, Hibiscus micranthus*, *Blepharis subvolubilis* and *Evolvulus alsinoides.*

The vegetation on the hilly areas of the Limpopo Ridge Bushveld is also characterized by *Colophospermum mopane*, but species such as *Kirkia acuminata, Cataphractes alexandri, Combretum apiculatum* and *Terminalia prunioides* are also prominent (Du Plessis 2001). The grass and forb layers are often sparse with only few species present.

Five plant communities were identified and mapped. The ecological sensitivity, conservation value and sizes of the communities are given in the table below.

Table 5: List of plant communities (mapping units) with ecological sensitivity:

Plant Community	Sensitivity	Conservation value	Size (ha)
1.Colophospermum mopane Dense Bushveld on marble	Medium-Low	Medium	394
2. Colophospermum mopane Open Bushveld on arenite	Medium	Medium-High	353
3. Colophospermum mopane Plain Bushveld on shallow washes	Medium-High	Medium-High	55
4. Drainage Lines	High	High	52
5. *Colophospermum mopane* Ridge Bushveld	Medium-High	High	43
6. Disturbed Areas	Low	Low	4
Total hectares			**901**

The *Colophospermum mopane* Dense Bushveld is mainly located in the southern, eastern and western parts of the site, while the *Colophospermum mopane* Open Bushveld area is situated centrally in the northern parts. *Colophospermum mopane* Ridge Bushveld covers a very small area, limited to the far northern part of the sites. *Colophospermum mopane* Plain Bushveld is limited to small patches of shallow washes on plains, that may be regarded as shallow, surface drainage lines.

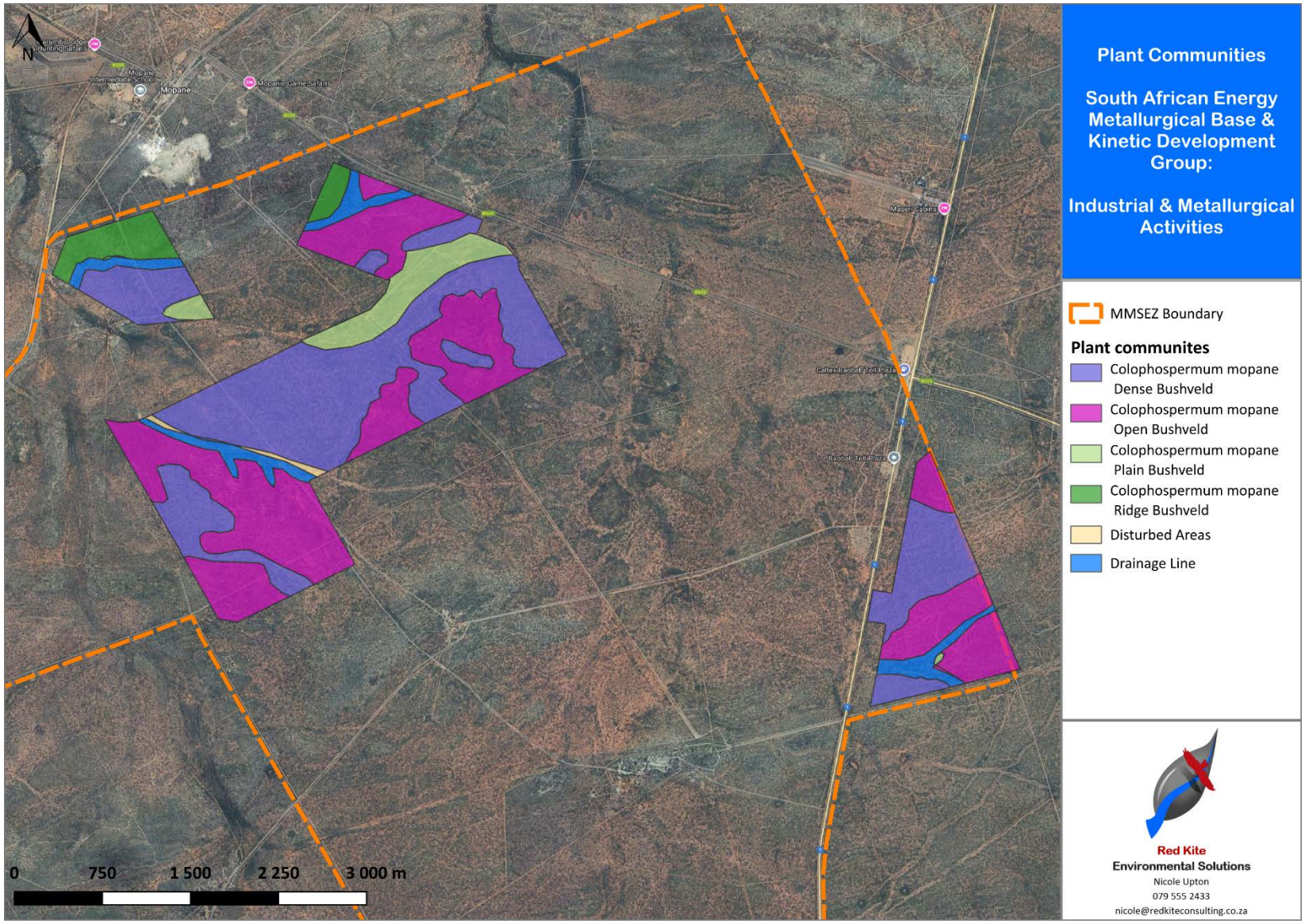


Figure 14: Vegetation types delineated for the project footprint

6.1. Description of plant communities

6.1.1. Colophospermum mopane Dense Bushveld on Marble

The *Colophospermum mopane* Dense Bushveld, an area of 394 hectares, is located on flat or slightly undulating terrain, on two east-west stretching bands of **marble gravel** in the northern and southern parts of the site, intersected by a band of arenite that stretches east-west through the centre of the site. The soils are mostly gravelly and shallow. The 4-6 m tall tree layer is very dense, covering up to 80%. *Colophospermum mopane* is totally dominant, leaving little room for other woody species, while the herbaceous layer is scanty and species-poor. Other woody species such as *Terminalia prunioides, Grewia bicolor, Grewia flavescens* and *Combretum apiculatum,* may occur in dense stands.

Under the dense trees the herbaceous layer is poorly develop, with a few scanty grasses, and limited forbs. This aspect limits the suitability of the habitat for larger grazing animals.

Table 6: The vegetation structure of the Colophospermum mopane Dense Bushveld

Vegetation structure		
Layer	**Height (m)**	**Cover (%)**
Trees	4-6	70-80
Shrubs	1-3	10-15
Grass	0.3	5
Forbs	0.3	1

Table 7: Summary of the Colophospermum mopane Dense Bushveld

Community 1: *Colophospermum mopane* Dense Bushveld			
Status	Primary, dense woodland, somewhat utilised		
Soil	Light brown to reddish, sandy loam	**Rockiness**	0-5%
Conservation Valu	Medium	**Sensitivity:**	Medium-Low
Species richness	Medium	**Need for rehabilitation**	Low
Dominant spp.	*Colophospermum mopane, Terminalia prunioides, Grewia bicolor, Grewia flavescens, Commiphora glandulosa*		

Figure 15: *Colophospermum mopane* Dense Bushveld

The following plant species were noted in the Dense Bushveld:

- **Trees and shrubs:**
  - *Adansonia digitata* P,M
  - *Cissus cornifolius*
  - *Colophospermum mopane* *D*
  - *Combretum apiculatum*
  - *Commiphora edulis*
  - *Commiphora glandulosa*
  - *Commiphora pyracanthoides*
  - *Cyphostemma sandersonii*
  - *Dichrostachys cinerea*
  - *Grewia bicolor*
  - *Grewia flavescens*
  - *Lannea schweinfurthii*
  - *Sclerocarya birrea* P,M
  - *Senegalia nigrescens*
  - *Terminalia prunioides* d
- **Grasses:**
  - *Aristida congesta*
  - *Enneapogon cenchroides*
  - *Eragrostis trichphora*
  - *Melinis repens*
  - *Panicum coloratum*
- **Forbs**
  - *Commelina africana*
  - *Barleria lancifolia*
  - *Dicoma tomentosa* d
  - *Evolvulus alsinoides*
  - *Heliotropium nelsonii*
  - *Hibiscus micranthus*
  - *Justicia protracta*
  - *Kyphocarpa angustifolia*
  - *Leucas sexdentata*
  - *Ocimum americanum*
  - *Pavonia burchellii*
  - *Phyllanthus maderaspatensis*
  - *Pergularia daemia*
  - *Waltheria indica*

Table 8: Number of species recorded

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	15	0	15	0	2	2
Grasses	5	0	5	0	0	0
Forbs	14	0	14	0	0	0
Total	34	0	34	0	1	1

Discussion

The species richness is Medium, with a rather limited individuals of the protected trees *Adansonia digitata* and *Sclerocarya birrea.* No other threatened or rare species were recorded. The Medium-Low ecological sensitivity is due to the poor development and low species richness of the herbaceous layer and consequently lower potential to carry large numbers of grazer animals.

6.1.2. Colophospermum mopane Open Bushveld on Arenite

The *Colophospermum mopane* Open Bushveld is mainly located on the east-west stretching band of arenite, on deep sandy soils, in the central part of the site. This area covers 353 hectares. The tree layer is 3-4 m tall and is fairly open, covering only 20-40%. *Colophospermum mopane* is dominant, and several other woody species occur, though the woody species composition is very similar to that of the *Colophospermum mopane* Dense Bushveld. The most prominent other woody species are *Terminalia prunioides, Grewia bicolor* and *Grewia flavescens.* The herbaceous layer is however better developed with higher grass cover and more forb species than in the *Colophospermum mopane* Dense Bushveld.

This Open Bushveld plant community is highly suitable for larger grazing animals and therefore has a higher conservation value.

Figure 16: The Colophospermum mopane Open Bushveld

Table 9: The vegetation structure of the Colophospermum mopane Open Bushveld

Vegetation structure		
Layer	**Height (m)**	**Cover (%)**
Trees	3-4	20-40
Shrubs	1-3	15-30
Grass	0.3	5-10
Forbs	0.3	1-2

Table 10: Summary of the Colophospermum mopane Open Bushveld

Community 2: *Colophospermum mopane* Open Bushveld			
Status	Primary, low-open to dense woodland, somewhat utilised		
Soil	Light brown to reddish, sandy loam sometimes with surface gravel	**Rockiness**	0-5%
Conservation Value	Medium-High	**Sensitivity:**	Medium
Species richness	High	**Need for rehabilitation**	Low
Dominant spp.	*Colophospermum mopane, Terminalia prunioides, Grewia bicolor, Grewia flavescens, Commiphora pyracanthoides*		

The following plant species were noted in the Open Bushveld:

- **Trees and shrubs**
  - *Adansonia digitata* P,M
  - *Asparagus cooperii*
  - *Boscia albitrunca* P,M
  - *Boscia foetida*
  - *Colophospermum mopane* D
  - *Commiphora neglecta*
  - *Commiphora glandulosa*
  - *Commiphora pyracanthoides*
  - *Dichrostachys cinerea*
  - *Grewia bicolor*
  - *Grewia flavescens*
  - *Grewia villosa*
  - *Kirkia acuminata*
  - *Lannea schweinfurthii*
  - *Maerua parvifolia*
  - *Sclerocarya birrea* P,M
  - *Senegalia nigrescens*

- *Senegalia senegal leiorachis*
- *Terminalia prunioides* d
- *Vachellia tortilis*

- **Grasses**
  - *Aristida adscendens*
  - *Aristida congesta*
  - *Enneapogon cenchroides* d
  - *Eragrostis lehmanniana*
  - *Eragrostis trichphora* d
  - *Melinis repens*
  - *Panicum coloratum*
  - *Stipagrostis uniplumis*
  - *Urochloa mosambicensis*
- **Forbs**
  - *Blepharis subvolubilis*
  - *Commelina africana*
  - *Ceratotheca triloba*
  - *Dicoma tomentosa* d
  - *Evolvulus alsinoides*
  - *Heliotropium nelsonii*
  - *Hibiscus micranthus*
  - *Indigastrum costatum*
  - *Indigofera heterotricha*
  - *Justicia protracta*
  - *Kyphocarpa angustifolia*
  - *Leucas sexdentata*
  - *Melhania acuminata*
  - *Ocimum americanum*
  - *Pavonia burchellii*
  - *Phyllanthus maderaspatensis*
  - *Pergularia daemia*
  - *Tephrosia purpurea*
  - *Waltheria indica*

Table 11: Number of species recorded

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	20	0	20	0	3	3
Grasses	9	0	9	0	0	0
Forbs	19	0	19	0	0	0
Total	48	0	48	0	2	2

Discussion

The species richness is High, with a scattered individuals of the protected trees *Adansonia digitata, Sclerocarya birrea* and *Boscia albitrunca.* No other threatened or rare species were recorded. The ecological sensitivity analysis indicates Medium sensitivity.

6.1.3. Colophospermum mopane Plains Bushveld on shallow Washes

The *Colophospermum mopane* Plains Bushveld is restricted to sandy washes in the central-eastern part of the study site, and a small patch in Administration office site. The area covers 55 hectares. This bushveld is up to 6 m tall dense, covering about 60%. It seems that these washes act as a shallow drainage line from the water shed towards larger drainage lines to the east and west.

Colophospermum mopane is dominant, with other woody species *Terminalia prunioides, Commiphora pyracanthoides, Grewia flavescens* and Senegalia nigrescens. Under the bushes the herbaceous layer is poorly develop, with a few scanty grasses, and limited forbs.

Table 12: Vegetation structure of the Colophospermum mopane Plains Bushveld

Vegetation structure		
Layer	**Height (m)**	**Cover (%)**
Trees	3-6	50-600
Shrubs	1-3	15-20
Grass	0.3	5
Forbs	0.3	1


Figure 17: Colophospermum mopane Plains Bushveld

Table 13: Summary of the Colophospermum mopane Plains Bushveld

Community 3: *Colophospermum mopane* Plains Bushveld			
Status	Primary, dense woodland, somewhat utilised washes on plain		
Soil	Light brown to grey deep, Sand	**Rockiness**	0%
Conservation Value	Medium-High	**Sensitivity:**	Medium-High
Species richness	Medium (close to High)	**Need for rehabilitation**	Low
Dominant spp.	*Colophospermum mopane, Terminalia prunioides, Vachellia tortilis, Grewia flavescens*		

The following plant species were noted in the Plains Bushveld:

- **Trees and shrubs**
  - *Adansonia digitata* P,M
  - *Boscia albitrunca* P,M
  - *Boscia foetida* p
  - *Colophospermum mopane* D
  - *Commiphora edulis*
  - *Commiphora glandulosa*
  - *Commiphora pyracanthoides*
  - *Dichrostachys cinerea*
  - *Grewia bicolor*
  - *Grewia flavescens*
  - *Sclerocarya birrea* P,M
  - *Senegalia erubescens*
  - *Senegalia nigrescens*
  - *Terminalia prunioides* d
  - *Senegalia senegal leiorachis*
  - *Vachellia tortilis* d
- **Grasses**
  - *Aristida adscendens*
  - *Aristida congesta*
  - *Enneapogon cenchroides*
  - *Eragrostis lehmanniana*
  - *Eragrostis trichophora*
  - *Melinis repens*

- *Panicum coloratum*

- **Forbs**
  - *Commelina africana*
  - *Barleria lancifolia*
  - *Evolvulus alsinoides*
  - *Heliotropium nelsonii*
  - *Hibiscus micranthus*
  - *Justicia protracta*
  - *Kyphocarpa angustifolia*
  - *Leucas sexdentata*
  - *Ocimum americanum*
  - *Pavonia burchellii*
  - *Phyllanthus maderaspatensis*
  - *Pergularia daemia*
  - *Waltheria indica*

Table 14: Number of species recorded

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	16	0	16	0	3	3
Grasses	7	0	7	0	0	0
Forbs	13	0	13	0	0	0
Total	36	0	36	0	3	3

Discussion

The species richness is Medium, with a limited individuals of the nationally protected trees *Adansonia digitata, Sclerocarya birrea* and *Boscia albitrunca* and the provincially protected *Boscia foetida* present in this plant community. No other threatened or rare species were recorded. The ecological sensitivity analysis indicates Medium-High sensitivity due to the washes being shallow drainage lines, connecting to the no-go areas.

6.1.4. Drainage Lines

Dense mixed bushveld occurs in and along the shallow, seasonally dry Drainage Lines that flow in an easterly direction towards a larger drainage line. The area covers 52 hectares. The plant species composition of the Drainage Line watercourses is not much different from that of the *Colophospermum mopane* Dense Bushveld but is somewhat taller. This dense mixed bushveld is up to 6-7 m tall and covers 60-80%.

Table 15: The vegetation structure of the Drainage Lines

Vegetation structure		
Layer	**Height (m)**	**Cover (%)**
Trees and shrubs	6-7	60-80
Grass	0.3	5-10
Forbs	0.3	1

Table 16: Summary of the Drainage Lines

Community 3: Drainage lines			
Status	Primary riparian bush in and along dry watercourses		
Soil	Light brown sandy loam	**Rockiness**	0-10%
Conservation Value	High	**Sensitivity:**	High
Species richness	High	**Need for rehabilitation**	Low
Dominant spp.	*Colophospermum mopane*		

The following plant species were noted in the Drainage Lines:

- **Trees and shrubs**
  - *Cissus cornifolius*
  - *Colophospermum mopane* D
  - *Combretum apiculatum*
  - *Commiphora edulis*
  - *Commiphora glandulosa*
  - *Cyphostemma sandersonii*
  - *Dichrostachys cinerea*
  - *Grewia bicolor*
  - *Grewia flava*
  - *Grewia flavescens*
  - *Lannea schweinfurthii*
  - *Sclerocarya birrea* P,M
  - *Senegalia nigrescens*
  - *Terminalia prunioides* d
  - *Vachellia tortilis* d
- **Grasses**
  - *Aristida congesta*
  - *Enneapogon cenchroides*
  - *Eragrostis trichophora*
  - *Melinis repens*
  - *Panicum coloratum*
  - *Sporobolus africanus*
- **Forbs**
  - *Commelina africana*
  - *Barleria lancifolia*
  - *Dicoma tomentosa* d
  - *Evolvulus alsinoides*
  - *Heliotropium nelsonii*
  - *Hibiscus micranthus*
  - *Justicia protracta*
  - *Kyphocarpa angustifolia*
  - *Leucas sexdentata*
  - *Ocimum americanum*
  - *Pavonia burchellii*
  - *Phyllanthus maderaspatensis*
  - *Pergularia daemia*
  - *Waltheria indica*

Table 17: Number of species recorded

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	15	0	15	0	1	1
Grasses	6	0	6	0	0	0
Forbs	14	0	14	0	0	0
Total	35	0	35	0	1	1

Discussion

The species richness is Medium, with no red data species, but the sensitivity High. There is a possibility that a few individuals of the protected tree *Sclerocarya birrea* are locally present. No other threatened or rare species were recorded. The ecological sensitivity analysis indicates High sensitivity, as all watercourses are protected by law.

Figure 18: The taller and denser vegetation of a drainage line in the background

6.1.5. Musina Ridge Bushveld

Two small patches of Musina Ridge Bushveld are present on foot-slopes of low ridges in the far northern part of the study site. The total area covered is only 43 hectares. This vegetation is up to 4 m tall dense, bush, with a cover of about 70%. The soil surface is covered by small stones and gravel.

Colophospermum mopane, with other woody species such as *Terminalia prunioides, Commiphora mollis, Combretum apiculatum Commiphora pyracanthoides* and *Grewia flavescens,* are prominent. Under the bushes the herbaceous layer is poorly develop, with a few scanty grasses, and limited forbs.

Table 18: The vegetation structure of the Musina Ridge Bushveld

Vegetation structure		
Layer	**Height (m)**	**Cover (%)**
Trees	4	70
Shrubs	1-3	30
Grass	0.3	5-10
Forbs	0.3	1

Figure 19: Dense shrubby vegetation on the foot-slope in Musina Ridge Bushveld: A view from the top of the hill.

Figure 20: The rocky nature of the Musina Ridge Bushveld

Table 5.16: Summary of the Musina Ridge Bushveld

Community 4: Musina Ridge Bushveld			
Status	Primary, dense woodland on the foot-slope of a small hill		
Soil	Light brown to grey, Sandy loam	**Rockiness**	20-30%
Conservation Value	High	**Sensitivity:**	Medium-High
Species richness	High	**Need for rehabilitation**	Low
Dominant spp.	*Colophospermum mopane, Terminalia prunioides, Vachellia tortilis, Grewia flavescens,*		

The following plant species were noted in the Plains Bushveld:

- **Trees and shrubs**
  - *Cataphractes alexandri*
  - *Colophospermum mopane* d
  - *Combretum apiculatum d*
  - *Commiphora mollis*
  - *Commiphora glandulosa*
  - *Commiphora pyracanthoides*
  - *Dichrostachys cinerea*
  - *Grewia bicolor*
  - *Grewia flavescens*
  - *Grewia villosa*
  - *Senegalia erubescens*
  - *Terminalia prunioides* d
  - *Vachellia tortilis* d
  - *Ximenia americana*
- **Grasses**
  - *Aristida adscendens*
  - *Aristida congesta*

- *Enneapogon cenchroides*
- *Eragrostis trichophora*
- *Setaria verticillata*

- **Forbs**
  - *Barleria lancifolia*
  - *Barleria subvolubilis*
  - *Commelina africana*
  - *Evolvulus alsinoides*
  - *Heliotropium nelsonii*
  - *Hibiscus micranthus*
  - *Kyphocarpa angustifolia*
  - *Ocimum americanum*
  - *Phyllanthus maderaspatensis*
  - *Waltheria indica*

Table 19: Number of species recorded

	Indigenous	Aliens / Weeds	Total	Red Data	Protected	Medicinal
Trees and shrubs	14	0	14	0	0	0
Grasses	5	0	5	0	0	0
Forbs	10	0	10	0	0	0
Total	29	0	29	0	0	0

Discussion

The species richness is Medium. No threatened or rare species were recorded on the relatively small site. The ecological sensitivity analysis indicates Medium-High sensitivity for the Limpopo Ridge Bushveld.

6.1.6. Disturbed Area

A mappable disturbed area (4 ha) where the vegetation was cleared long ago, occurs in the eastern part of the site. Other small patches, particularly roads, tracks or cleared area (firebreaks) along fence-lines occur scattered over the site, but these are not mappable on the scale used. Some cleared areas are currently covered by grass, while small shrubby individuals of some woody species, particularly *Colophospermum mopane* and *Vachellia tortilis* became established in the area.

The ecological sensitivity is regarded to be Low.

6.2. Analysis

6.2.1. Alien and Invasive plants species

No woody alien and invasive species were recorded on the site.

6.2.2. Medicinal plants

Only medicinal plants listed by Van Wyk, Van Oudtshoorn & Gericke (2005), and rare medicinal plants as indicated by Williams, Victor & Crouch (2013) or other well-known species were indicated with the letter “M” in the list of species for each plant community.

6.2.3. Flora Species of Conservation Concern (SCC)

Red Data listed plant species and Orange listed plant species (= plant species of conservation concern) are those plants that are important for South Africa’s conservation decision making processes. These plants are nationally protected by the National Environmental Management: Biodiversity Act (Raimondo *et al*, 2009).

Threatened species (Red Data listed species) are those that are facing high risk of extinction, indicated by the categories Critically Endangered (CE), Endangered (EN) and Vulnerable (VU). Species of Conservation Concern include the Threatened Species (Raimondo *et al*, 2009).

Additionally, the Orange listed categories are Near Threatened (NT), Data Deficient (DD), (DDT = lack of taxonomic data), Critically Rare (CR), Rare (R) and Declining (D). This is in accordance with the new Red List for South African Plants (Raimondo *et al*. 2009 upgraded on SANBI website).

Table 20: The following plant species of conservation concern may possibly occur in the general broad Musina area

Family	Species	Status
Acanthaceae	*Peristrophe cliffordii*	Rare
Passifloraceae	*Adenia fruticosa* subsp. *simplicifolia*	DDD
Santalaceae	*Thesium mossii*	DDT
Poaceae	*Enneapogon spathaceus*	DDT

None of these species were found on the site.

The results of the DFFE Screening Tool indicated only Low sensitivity for plant species

NEMBA / TOPS plant species

These species are evaluated against the list published in Department of Environmental Affairs and Tourism Notice No. 2007, Government Gazette 574 of 2013 and Notice 256 of 2015 and National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act 10 of 2004).

No NEMBA/TOPS plant species occur on the site.

Nationally Protected Trees

The National Forest Act, 1998 (Act No. 84 of 1998) enforces the protection of several indigenous trees. The removal, thinning or relocation of protected trees will require a permit from the DFFE.

Protected trees do occur on the site, individuals of the nationally protected *Adansonia digitata* (Baobab), *Sclerocarya birrea* (Marula), *Boscia albitrunca* (Shepard's tree) were noted. A permit from the Dept Forestry will be needed if any of these trees should be removed or even pruned or cut. Fairly large Marula trees can be transplanted successfully, if needed.

Provincially Protected Plants

The provincially protected tree *Boscia foetida* occurs on the site.

7. RESULTS: FAUNA

7.1. Mammals

7.1.1. Mammal Habitat Assessment

Rautenbach (1978 & 1982) found that mammal assemblages can at best be correlated with botanically defined biomes, such as those by Low and Rebelo (1996 & 1998), and by Mucina and Rutherford (2006) as well as Knobel and Bredenkamp (2006). Hence, although the former's work has been superseded by the work of the latter two, the definitions of biomes are similar. They remain valid for mammals and are therefore recognised as a reasonable determinant of mammal distribution. It should be mentioned that Mucina and Rutherford (2006) recognise Mopaneveld, with its own specific plant species composition, as a Bioregion within the Savanna Biome.

Within the biome, the local occurrences of mammals are closely dependent on broadly defined habitat types: terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of global distribution ranges. From a mammal habitat perspective, it was established that three of the four major habitats are naturally present on the study site. The dense bushveld offers abundant arboreal habitat. The trees offer refuge for arboreal mammals. The open bushveld provides good terrestrial habitat. Natural rupicolous habitats are limited within the study site, with small stones and gravel limited to the small Limpopo Ridge Bushveld area. Rupicolous habitats could offer nooks and crannies as refuge for some small common rupicolous mammals. Permanently wet ecosystems do not occur on the study site, except maybe for very limited, small, man-made dams. No wetland-associated vegetation cover occurs on the study site. Only a few termitaria were recorded. These structures are good indicators of the occurrence of certain small mammals.

As is typical for Mopaneveld, the basal cover was relatively poor at the time of the site visit. Pioneer grasses and forbs were prominent but would, on a local scale, provide adequate nourishment and cover for small terrestrial mammals. In general, the site area does not support the presence of many species or high population densities for most of the larger or medium-sized mammal species.

The study site does not have caves suitable for cave-dwelling bats. The rock crevices on or near the site may act as substitute for daytime roosts. Baobab trees provide special habitat for many animal species, also certain bat species. It is likely that common bats commute from roosting sites elsewhere to hawk for insects on or near the study site.

Connectivity with areas around the study site is good, though interrupted by a limited road network.

The close-by nature reserves and game farms offer secure habitat for many mammal species, some of which may from time-to-time venture into the area of the study site. However, these reserves and farms are well fenced, limiting movement of larger mammals.

A list of mammals that may occur or maybe once occurred in the vicinity of the site was compiled from the existing mammal literature (Skinner & Chimimba 2006, Friedman 2005), based on the known habitat preference and distribution of these species. A detailed report of Bathusi Environmental Consulting (2018) on neighbouring properties contributed to the confirmation of presence for some fauna species.

7.1.2. Observed and Expected Mammal Species Richness

Small mammals are not obvious in the grassland, savanna or bush. Large and medium-sized mammals (such as buffalo, blue wildebeest, black wildebeest, red hartebeest, eland, waterbuck, plains zebra, white rhino, lion, cheetah and spotted hyena) have long ago been eradicated from the human-occupied areas and are now only seen in certain nature conservation areas and game farms. However, several small to medium-sized mammal species are expected in many Mopaneveld localities. These include several species of rodents, mongooses, porcupine, aardvark, common duiker, steenbok, kudu, impala, caracal, African wild cat and black-backed jackal and even cheetah and leopard.

Most of the species of the resident diversity are common and widespread (viz. aardvark, rock hyrax, scrub hare, African mole-rat, black-backed jackal, common duiker, Multimammate mouse and gerbils). Many of the species listed are robust, some with strong pioneering capabilities allowing them to invade and occupy new habitats. The reason for their survival success is predominantly seated in their remarkable reproduction potential (e.g. multimammate mice), and to a lesser extent their reticent and cryptic nature (e.g. scrub hares, genets and mongooses).

Exotic feral and domesticated mammal species are expected to occur on the study site (e.g. house mice, house rats, cats, dogs, goats, pigs and cattle) since these species are normally associated with humans.

The table below provides information on mammal species that may from time-to-time occur in the area of the site.

It is estimated that about 80 mammal species may from time to time occur on the site or in the vicinity of the site area. Of these species 13 are small rodents and 25 are bats.

Eleven mammal species were confirmed on or close to the site, namely Scrub hare, Tree squirrel, Bushveld gerbil, Chasma baboon, Vervet monkey, Slender mongoose, Black-backed jackal, Greater kudu, Impala and Common duiker. These are all common and widespread species. In a very detailed study by Bathusi Environmental Consulting (2018), presence of a further 14 mammal species were confirmed on a neighbouring farm, including five species of conservation concern.

The bats on or near the study site are mostly common wherever they can find daytime roosts. Many bat species commute over considerable distances in search of rich feeding patches with its swarms of insects during summer evenings

Exotic feral and domesticated mammal species are expected to occur on the study site (e.g. house mice, house rats, cats, dogs, goats, pigs and cattle) since these species are normally associated with humans.

Table 21: Mammal diversity. The species observed or deduced to occupy the site (Threatened species marked red)

English name	Scientific name	Probability to occur	Red data IUCN	NEMBA	Province	Habitat
	Order Macroscelididae					
Elephant-Shrews	**Family Macroscelididae**					
*Short-snouted elephant shrew	*Elephantulus brachyrhynchus*	High				Terr.
*Eastern rock shrew	*Elephantulus myurus*	High				
Bushveld elephant shrew	*Elephantulus intufi*	Medium				Terr.
	Order Tubulidentata					
	Family Orycteropodidae					
Aardvark	*Orycteropus afer*	High			SP	Terr.
	Order Lagomorpha					
Hares, Rabbits and Rock Rabbits	**Family Leporidae**					
Scrub hare	*Lepus saxatilis*	Observed				Terr.
	Order Rodentia					
Mole Rats	**Family Bathyergidae**					
African mole rat	*Cryptomys hottentotus*	High				Subter.
Porcupines	**Family Hystricidae**					
Cape porcupine	*Hystrix africaeaustralis*	Medium				Terr.
Springhare	**Family Pedetidae**					
Springhare	*Pedetes capensis*	Medium				Terr.
Squirrels	**Family Sciuridae**					
Tree squirrel	*Paraxerus cepapi*	Observed				Arbor.
Dormice	**Family Myoxidae**					
Woodland dormouse	*Graphiurus murinus*	Medium				Arbor.
Rats and Mice	**Family Muridae**					
Spiny mouse	*Acomys spinosissimus*	Medium				Terr.
Pygmy mouse	*Mus minutoides*	Medium				Terr.

English name	Scientific name	Probability to occur	Red data IUCN	NEMBA	Province	Habitat
Natal multimammate mouse	*Mastomys natalensis*	Medium				Terr.
Southern multimammate mouse	*Mastomys coucha*	High				Terr.
Acacia rat	*Thallomys paedulcus*	Low				Arbor.
Black-tailed tree rat	*Thallomys nigricauda*	Low				Arbor.
Red veld rat	*Aethomys chrysophilus*	Medium				Terr.
Namaqua rock mouse	*Aethomys namaquensis*	Medium				Rup.
Cape short-tailed gerbil	*Desmodillus auricularis*	Low				
Bushveld gerbil	*Gerbilliscus leucogaster*	Observed				Terr.
Pouched mouse	*Saccostomus campestris*	Medium				Terr.
Grey pygmy climbing mouse	*Dendromus melanotis*	Medium				Terr.
Fat mouse	*Steatomys pratensis*	Low				Terr.
	Order Primates					
Galagos	**Family Galagidae**					
South African galago	*Galago moholi*	High			P	Arbor.
Baboons and Monkeys	**Family Cercopithecidae**					
Chacma baboon	*Papio hamadryas*	Observed				Terr.
Vervet monkey	*Cercopithecus pygerythrus*	Observed				Terr. /Arbor.
	Order Eulipotypha					
Shrews	**Family Soricidae**					
Reddish-grey musk shrew	*Crocidura cyanea*	Medium				Terr.
Lesser red musk shrew	*Crocidura hirta*	Medium				Terr.
Hedgehog	**Family Erinaceidae**					
Southern African hedgehog	*Atelerix frontalis*	Low	NT	P	P	Terr.
Bats	**Order Chiroptera**					
Fruit-eating Bats	**Family Pteropidae**					

English name	Scientific name	Probability to occur	Red data IUCN	NEMBA	Province	Habitat
Wahlberg's epauletted fruit bat	*Epomophorus wahlbergi*	Medium				Aerial
Gambian epauletted fruit bat	*Epomophorus gambianus*	Low				Aerial
Straw-coloured fruit bat	*Eidolon helvum*	Low				Aerial
*Egyptian rousette	*Rousettus aegyptiacus*	High				Aerial
Sheath-tailed Bats	**Family Embalonuridae**					
Mauritian tomb bat	*Taphozous mauritianus*	Low				Aerial
Free-tailed Bats	**Family Molossidae**					
*Little free-tailed bat	*Chaerephon pumilus*	High				Aerial
Flat-headed free-tailed bat	*Sauromys petrophilus*	Low				Aerial
*Egyptian free-tailed bat	*Tadarida aegyptiaca*	High				Aerial
Vesper Bats	**Family Vespertilionidae**					
Schreibers' long-fingered bat	*Miniopterus schreibersii*	Low				Aerial
Rusty pipistrelle	*Pipistrellus rusticus*	Medium				Aerial
Banana bat	*Neoromicia nanus*	Low				Aerial
*Cape serotine bat	*Neoromicia capensis*	High				Aerial
Aloe bat	*Neoromicia zuluensis*	Low				Aerial
Welwitsch's hairy bat	*Myotis welwitchii*	Low				Aerial
African (Kuhl's) pipistrelle	*Pipistrellus hesperidus*	Low				Aerial
African yellow house bat	*Scotophilus dinganii*	High				Aerial
Schlieffen's bat	*Nycticeinops schlieffeni*	Low				Aerial
Slit-faced bats	**Family Nycteridae**					
Egyptian slit-faced bat	*Nycteris thebaica*	Low				Aerial
Wood's slit-faced bat	*Nycteris woodii*	Low	NT			Aerial
Horseshoe Bat	**Family Rhinolophidae**					
Hildebrandt's horseshoe bat	*Rhinolophus hildebrandtii*					Aerial
Geoffroy's horseshoe bat	*Rhinolophus clivosus*	Low				Aerial

English name	Scientific name	Probability to occur	Red data IUCN	NEMBA	Province	Habitat
Darling's horseshoe bat	*Rhinolophus darlingi*	Low				Aerial
Bushveld horseshoe bat	*Rhinolophus simulator*	Low				Aerial
*Smithers horseshoe bat	*Rhinolophus smithersi*	High	NT			Aerial
Trident Bats and Leaf-nosed Bats	**Family Hipposideridae**					
Sundevall's roundleaf bat	*Hipposideros caffer*	Low				Aerial
Pangolins	**Order Pholidota**					
	Family Manidae					
Ground pangolin	*Manis temminckii*	Low	Vu	Vu	SP	Terr.
	Order Carnivora					
Hyaenas	**Family Hyaenidae**					
Aardwolf	*Proteles cristatus*	Low			P	Terr.
*Brown Hyena	*Parahyaena brunnea*	High	NT	P	P	Terr.
Cats	**Family Felidae**					
Cheetah	*Acinonyx jubatus*	Reported by locals		Vu		
Leopard	*Panthera pardus*	Reported by locals	Vu	Vu	P	Terr.
*Caracal	*Caracal caracal*	High				Terr.
African wild cat	*Felis silvestris*	Medium			P	Terr.
Serval	*Leptailurus serval*	Low	NT		P	Terr.
Civets and Genets	**Family Viverridae**					
*African civet	*Civettictis civetta*	High			P	Terr.
Small-spotted genet	*Genetta genetta*	Medium				Terr.
SA large-spotted genet	*Genetta tigrina*	Medium				Terr.
Suricates and Mongooses	**Family Herpestidae**					
Selous mongoose	*Paracynictis selousi*	Low			P	Terr
Slender mongoose	*Galerella sanguinea*	Observed				Terr.
Banded mongoose	*Mungos mungo*	Observed				Terr.

English name	Scientific name	Probability to occur	Red data IUCN	NEMBA	Province	Habitat
Dwarf mongoose	*Helogale parvula*	Medium				Terr.
*Suricate	*Suricata suricatta*	High				Terr
Foxes, Wild dogs and Jackals	**Family Canidae**					
*Bat-eared fox	*Otocyon megalotis*	High				Terr.
Black-backed jackal	*Canis mesomelas*	Observed				Terr.
Otters, Honey Badgers, Weasels and Polecats	**Family Mustelidae**					
Honey badger	*Mellivora capensis*	Medium	NT	P	P	Terr.
African weasel	*Poecilogale albinucha*	Medium	NT			Terr.
Striped polecat	*Ictonyx striatus*	Medium				Terr.
	Order Perissodactyla					
Zebras	**Family Equidae**					
Equus quagga	Plains zebra	Low				A single individual
	Order Suiformes					
`	**Family Suidae**					
Bushpig	*Potamochoerus larvatus*	Low				Terr.
Common warthog	*Phacochoerus africanus*	High				Terr.
	Order Ruminanta					
Antelopes and Buffalo	**Family Bovidae**					
Common duiker	*Sylvicapra grimmia*	Observed				Terr.
*Steenbok	*Raphicerus campestris*	High			P	Terr.
Greater Kudu	*Tragelaphus strepsiceros*	Observed				Terr.
Impala	*Aepyceros melampus melampus*	Observed				Terr.

Red Data species rankings as defined in Friedmann and Daly's S.A. Red Data Book / IUCN (World Conservation Union) (2004): CR= Critically Endangered, En = Endangered, Vu = Vulnerable, LR/cd = Lower risk conservation dependent, LR/nt = Lower Risk near threatened, DD = Data Deficient. All other species are deemed of Least Concern.

The probability of a species to from time to time occur on the site is also indicated:

High - Present or have a *high* probability to occur;

Medium probability to occur based on ecological and distributional parameters;

Low probability to occur based on ecological and distributional parameters.

Probability of species to occur marked High were observed on adjacent Farms by Bathusi Environmental Consulting (2018).

7.1.3. Red Listed Mammal Species Identified

As is typical for Mopaneveld, the basal cover was relatively poor at the time of the site visit. Pioneer grasses and forbs were prominent but would, on a local scale, provide adequate nourishment and cover for small terrestrial mammals. In general, the site area does not support high population densities for most of the larger or medium-sized mammal species.

Aardvark, Brown hyaena, African Civet and Steenbok were observed on neighbouring farms (Bathusi Environmental Consulting 2018).

The Southern African hedgehog, Honey badger and African weasel do occur in this quarter degree square and there is a possibility that these species may occasionally be found on the study site. Although generally rare, there is a small possibility that the Ground pangolin may from time to time occur on the site.

Leopard, Serval and large Red Data antelopes such as Tsessebe, Roan antelope and Sable antelope may occur on nature reserves or game farms in the Mopaneveld region and may rarely visit the site area. It is also possible that South Africa galago, Aardwolf and Selous mongoose may rarely visit the study site.

Due to the lack of rupicolous habitat on the study site, Mountain reedbuck and Grey rhebok do not occur on the site.

The drainage lines on the site are too small, shallow and non-perennial, seldom with feeble flow of water, therefore the African clawless otter, the Spotted-necked otter and the Robert's Marsh Rat (African marsh rat) do not occur on or near the study site. Considering the absence of wetlands most Red Listed bats should not occur on or near the sites. The near-threatened Smither's horseshoe bat was recorded by Bathusi Environmental Consulting (2018) on a neighbouring farm. There is slim chance for the Wood's slit-faced bat may fly sporadically over the site.

None of the species claimed to be residents of the study site and surrounding areas are endemic to Limpopo.

No other Red Data or sensitive species are deemed present on the site, either since the site falls outside the distributional ranges of some species or does not offer suitable habitat(s). The site falls outside the natural distribution range of some Red Data mammal species, and they do not occur on the site. These include Juliana's golden mole, Yellow golden mole, Gunning's golden mole; Four-toed elephant-shrew; Samango or Sykes monkey, Swamp musk shrew, Maquassie musk shrew, Commerson's roundleaf bat; Peak-saddle horseshoe bat; Swinny's horseshoe bat; Damara woolly bat; Red duiker, Suni and Oribi.

7.1.4. NEMBA (TOPS) species

The following NEMBA species may occur in some nature reserve areas or game farms in the Mopaneveld area.

Table 22: Mammal species listed by NEMBA that may occur in the study site area (extracted from Table 16)

Species	Probability of Occurrence
Endangered species	
Wild dog	Not present
Vulnerable species	

Species	Probability of Occurrence
Cheetah	Low
Leopard	Medium
Pangolin	Low
Protected Species	
South African Hedgehog	Low
Honey badger	Medium
Brown Hyaena	High
Spotted Hyaena	Not present

Apart from mammal species listed as Red Data species above, Wild dog and Spotted hyaena are listed by NEMBA, but apart from possibly being present on certain nature reserves or game farms, these species do not occur in or close to the study site.

Brown hyaena may from time to time be found in the site area but the possibility of other NEMBA listed mammal species being present at or close to the site is mostly very small. The Honey badger may possibly occur from time to time, as these animals have a wide home range.

7.1.5. Provincially protected mammal species

The Provincial Limpopo Environmental Management Act (LEMA) lists Specially Protected and Protected mammal species.

Table 23: Mammal species listed by the LEMA that may occur in the study site area (extracted from Table 16)

Species	Probability of Occurrence
LEMA Specially Protected	
Aardvark	High
Pangolin	Low
Wild dog	Not present
LEMA Protected	
Aardwolf	Low
African civet	High
African wild cat	Medium
Brown hyaena	High
South African galago	High
Honey badger	Low
Leopard	Medium
Selous mongoose	Low
Serval	Low
South African Hedgehog	Low
Steenbok	High

The following provincially protected mammal species may from time to time be observed in the area of the site: Aardvark, African civet, Brown hyaena, Galago, Steenbok.

7.1.6. Screening Tool results Mammals

Table 24: Mammals mentioned by the Screening Tool

Sensitivity	Species name	Common name	Suitable habitat
Medium	Mammalia-Dasymys robertsii	Roberts' marsh rat	No
Medium	Mammalia-Lycaon pictus	Wild dog	Yes, but mostly limited to some nature reserves

African Wild Dog (*Lycaon pictus*)
According to the Screening Tool Report for the Proposed development Musina-Makhado Special Economic Zone (MMSEZ), Limpopo Province, the African Wild Dog (*Tycaon pictus)* has medium sensitivity.

A wild dog population occurs in the nearby Venetia Private Game Reserve. African wild dogs wander very widely and turn up from time to time, without settling, in areas where they have not been known for many years. Their existence anywhere depends on an adequate supply of their bovid prey (Skinner & Chimimba, 2005). Due to the scarcity of game and domesticated prey items, they should not occur on the site.

Robert's Marsh Rat (*Dasymus robertsii*)
According to the Screening Tool for Musina-Makhado Special Economic Zone (MMSEZ), Limpopo Province the Robert's marsh rat (*Dasymys robertsii)* has a medium sensitivity.

Two species have been split from the African Marsh Rat (*Dasymus incomtus*), namely Cape marsh rat (*D. capensis*) and Robert's marsh rat (*D. robertsii*) (Mullin et.al. 2004). The newly described *D. robertsii* is patchily distributed in the lowveld of northern South Africa and Zimbabwe (Mullin et al. 2005).

Marsh Rats are dependent on intact wetland ecosystems, as they have not been found in artificial or degraded wetlands and are thus patchily distributed in their distribution range (Pillay, et.al 2016). Marsh rats are opportunistic omnivores and good swimmers, adapted to living in very marshy habitats where they build runways and nests in dense ground cover (Monadjem et al. 2015). During the site visit, no such habitat was found on the site and therefore no Robert's marsh rats should occur on the site.

7.1.7. Discussion: Mammal species

It is estimated that about 80 mammal species may from time to time occur on the site or in the vicinity of the site area. Of these species 13 are small rodents and 25 are bats. A total of 25 mammal species were observed on the site or on neighbouring farms. As is typical for Mopaneveld, the basal cover was relatively poor at the time of the site visit. Grasses and forbs were scanty but could, on a local scale, provide nourishment and cover for small terrestrial mammals. In general, the site area does not support presence of many species or high population densities for most of the larger or medium-sized mammal species.

The red data or protected species Aardvark, Brown hyaena, African Civet and Steenbok were observed on neighbouring farms (Bathusi Environmental Consulting 2018). The Southern African hedgehog, Honey badger and African weasel do occur in this quarter degree square and there is a possibility that these species may occasionally be found on the study site. Although generally rare, there is a small possibility that the Ground pangolin may from time to time occur on the site. Leopard, Serval and large Red Data antelopes such as

Tsessebe, Roan antelope and Sable antelope may occur on nature reserves or game farms in the Mopaneveld region and may rarely visit the site area. It is also possible that South Africa galago, Aardwolf and Selous mongoose may rarely visit the study site. Due to the lack of rupicolous habitat on the study site, Mountain reedbuck and Grey rhebok do not occur on the site.

A conclusion is that the proposed development would not seriously affect the mammal populations of the Mopaneveld. The proposed development may be supported.

7.2. Avifauna

7.2.1. Bird Habitat Assessment

The site of the proposed development does not fall within an Important Bird and Biodiversity Area (IBA) (Marnewick *et al.* 2015).

The habitats occupied by flighted birds differ from those of most terrestrial vertebrates in being explicitly three-dimensional, especially for aerial-feeding species and in the airspace above landscapes with low relief and short vegetation. The avian habitat on the site is primarily low Mopane bushveld with varying tree and bush density, the ground cover being open, dry grassland. Due to the absence of aquatic habitat birds which are dependent on this particular habitat were omitted from the list in the table below.

The aerial mobility of birds also demands paying attention to the principal habitats surrounding the study site and their conservation status, not just those along the immediate borders but also more distant habitats that might provide sources for species visiting the site and sinks for those breeding on site.

Birds are also a relatively visible and audible group of homeothermic vertebrates, active throughout the year, and with habitat preferences that can be evaluated from experience, by reference to the comprehensive literature available and by the subset of species that can be detected by a field survey during a particular season and time of day.

7.2.2. Expected and Observed Bird Species Richness

The site can hold a bird community typical of mopane woodland habitats in the northern part of Limpopo Province. The surrounding area generally consists of game farms, and the avian habitats here are mostly in good condition. The Limpopo Valley is characterized by the presence of large raptors that require large areas of unbroken habitat. Due to the relatively homogeneous nature of the Mopaneveld, avifaunal conservation value of the site is also relatively low.

A total of 264 bird species are considered likely to, from time to time, occur at the site. However, according to SABAP 2 a total of only 65 species were recorded on this Pentad. Of these, 34 (52%) were recorded on the site during the site visit.

In this report attention is focussed on the 28 threatened or near-threatened species (Taylor, Peacock & Wanless, 2015) that may occur in the general area, as well as the species listed by the Screening Tool as sensitive for the area of the study site.

Table 25: Bird species diversity expected on and around the proposed site

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Acacia Pied Barbet	***Tricholaema leucomelas***				**H**		
African barred Owlet	*Glaucidium capense*						L
African Black Swift	*Apus barbatus*		**BM**			M	
African Cuckoo	*Cuculus gularis*		**BM**			M	
African Fish-Eagle	*Haliaeetus vocifer*						L
African Goshawk	*Accipiter tachiro*						L
African Green-Pigeon	*Treron calvus*						L
African Grey Hornbill	***Tockus nasutus***				**Confirmed**		
African Harrier-Hawk	*Polyboroides cypus*						L
African Hawk-Eagle	*Aquila spilgaster*						L
African Hoopoe	***Upupa africana***				**Confirmed**		
African Mourning Dove	*Streptopelia decipiens*						L
African Palm Swift	*Cypsiurus parvus*				Confirmed		
African Paradise-Flycatcher	*Terpsiphone viridis*				Confirmed		
African Pipit	*Anthus cinnamomeus*				H		
African Scops-Owl	*Otus senegalensis*						L
African Stone Chat	*Saxicola torquatus*						L
Alpine Swift	*Tachymarptis melba*		**BM**		Confirmed		
Amethyst Sunbird	*Chalcomitra amethystina*				H		
Amur Falcon	*Falco amurensis*		**NBM**				L
Arrow-marked Babbler	***Turdoides jardineii***				**Confirmed**		
Ashy Flycatcher	*Muscicapa*						L
Banded Martin	*Riparia cincta*						L
Barn Owl	*Tyto alba*						L
Barn Swallow	*Hirundo rustica*		**NBM**		H		
Barred Wren-Warbler	***Calamonastes fasciolatus***				**H**		
Bar-throated Apalis	*Apalis thoracica*					M	
Bateleur	*Terathopius ecaudatus*	**ED**					L
Bearded Scrub-Robin	*Cercotrichas quadribirgata*						L
Bearded Woodpecker	*Dendropicus namaquus*						L
Bennett's Woodpecker	*Campethera bennettii*						L
Black Cuckoo	*Cuculus clamosus*		**BM**			M	

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Black Cuckooshrike	*Campephaga flava*					M	
Black Kite	*Milvus migrans*						L
Black Sparrowhawk	*Accipiter melanoleucus*						L
Black-backed Puffback	***Dryoscopus cubla***				**H**		
Black-chested Prinia	*Prinia flavicans*						L
Black-chested Snake-Eagle	*Circaetus pectoralis*						L
Black-collared Barbet	*Lybius torquatus*				H		
Black-crowned Tchagra	*Tchagra senegalus*				H		
Black-faced Waxbill	***Estrilda erythronotos***				**H**		
Black-headed Heron	*Ardea melanocephala*				H		
Black-headed Oriole	***Oriolus larvatus***				**Confirmed**		
Black-shouldered Kite	*Elanus caeruleus*				H		
Blacksmith Lapwing	*Vanellus armatus*						L
Black-throated Canary	*Crithagra atrogularis*					H	
Blue Waxbill	***Uraeginthus angolensis***				**Confirmed**		
Booted Eagle	*Aquila pennatus*						L
Brad-billed Rollller	*Eurystomus glaucurus*						L
Bronze-winged Courser	*Rhinoptilus chalcopterus*						L
Brown Sanke-Eagle	*Circaetus cincrereus*				Confirmed		
Brown-back Honeybird	*Prodotiscus regulus*						L
Brown-crowned Tchagra	*Tchagra australis*				Confirmed		
Brown-headed Parrot	*Poicephalus cryptoxanthus*				Confirmed		
Brown-hooded Kingfisher	***Halcyon albiventris***				**H**		
Brown-throated Martin	*Riparia paludicola*						L
Brubru	*Nilaus afer*				H		
Buffy Pipit	*Anthus vaalensis*						L
Burchell's Coucal	*Centropus burchellii*						L
Burnt-necked Eremomela	*Eremomela usticollis*						L
Bushveld Pipit	*Anthus caffer*					M	
Cape Glossy Starling	*Lamprotornis nitens*				H		
Cape Penduline-Tit	*Anthoscopus minutus*						L
Cape Rock-Thrush	*Monticola rupestris*						L
Cape Sparrow	*Passer melanurus*				M		
Cape Turtle-Dove	***Streptopelia capicola***				**Confirmed**		
Cape Vulture	*Gyps coprotheres*	**ED**					

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Cape Wagtail	*Motacilla capensis*				**H**		
Capped Wheatear	*Oenanthe pileata*						L
Capped Wheatear	*Oenanthe pileata*						L
Cardinal Woodpecker	*Campethera fuscescens*				H		
Cattle Egret	*Bubulcus ibis*				H		
Chestnut-backed Sparrowlark	*Eremopterix leucotis*						L
Chestnut-vented Tit-Babbler	*Parisoma subcaeruleum*						L
Chimspot Batis	***Batis molitor***				**H**		
Cinnamon-breasted Bunting	***Emberiza tahapisi***				**H**		
Collared Sunbird	*Hedydipma collaris*						L
Common Fiscal	*Lanius collaris*						L
Common House-Martin	*Delichon urbicum*		**NBM**			M	
Common Myna	***Acridotheres tristis***		**I**		**H**		
Common Quail	*Coturnix coturnix*						L
Common Scimitarbill	***Rhinopomastus cyanomelas***				**Confirmed**		
Common Waxbill	*Estrilda astrild*				Confirmed		
Coqui Francolin	*Pteliperdix coqui*						L
Crested Barbet	***Trachyphonus vaillantii***				**Confirmed**		
Crested Francolin	*Dendroperdix sephaena*				**H**		
Crested Guineafowl	*Guttera edouardi*						L
Crimson-breasted shrike	***Laniarius atrococcineus***						**L**
Crowned Lapwing	*Vanellus coronatus*				H		
Cut-throat Finch	*Amadina fasciata*				M		
Dark Chanting Goshawk	*Melierax metabates*						L
Dark-capped Bulbul	***Pycnonotus tricolor***				**Confirmed**		
Desert Cisticola	*Cisticola aridulus*						L
Diderick Cuckoo	*Chrysococcyx caprius*		**BM**		H		
Double-banded sandgrouse	*Pterocles bicinctus*						L
Dusky Indigobird	*Vidua funerea*						L
Dusky Lark	*Pinarocorys nigricans*						L
Emerald-spotted Wood-Dove	*Turtur chalcospilos*				Confirmed		
European Bee-eater	*Merops apiaster*		**B/NBM**				L
European Nightjar	*Caprimulgus europaeus*						L

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
European Roller	*Caracias garrulus*	NT	NBM				L
Familiar Chat	***Cercomela familiaris***				**H**		
Fawn-coloured Lark	*Calendulauda africanoides*						L
Fiery-necked Nightjar	***Caprimulgus pectoralis***				**H**		
Flappet Lark	*Mirafra rufocinnamomea*						L
Fork-tailed Drongo	***Dicrurus adsimilis***				**Confirmed**		
Freckled Nightjar	*Caprimulgus tristigma*						L
Gabar Goshawk	*Melierax gabar*						L
Garden Warbler	*Sylvia borin*		NBM				L
Golden-breasted Bunting	***Embreriza flaviventris***				**H**		
Golden-tailed Woodpecker	***Campethera abingoni***				**H**		
Great Spotted Cuckoo	*Clamator glandarius*		BM				L
Greater Blue-eared starling	*Lamprotornis chalybaeus*				Confirmed	M	
Greater Honeyguide	*Indicator indicator*					M	
Greater Kestrel	*Falco rupicoloides*						L
Greater Striped Swallow	*Cecropis cucullata*		BM				L
Green Wood-hoopoe	*Phoeniculus purpureus*				H		
Green-winged Pytilia	***Pytilia melba***				**H**		
Grey Go-away-Bird	*Corythaixoides concolor*				Confirmed		
Grey Heron	*Ardea cinerea*				H		
Grey Penduline-Tit	*Anthoscopus caroli*						L
Grey Tit-flycatcher	*Myioparus plumbeus*						L
Grey-backed Camaroptera	***Camaroptera brevicaudata***				**H**		**L**
Grey-headed Bush-Shrike	***Malaconotus blanchoti***				**H**		
Grey-headed Kingfisher	*Halcyon leucocephala*		BM				L
Groundscraper Thrush	*Psophocichla litsitsirupa*				**H**		
Hadeda Ibis	*Bostrychia hagedash*				H		
Harlequin Quail	*Coturnix delegorguei*						L
Helmeted Guineafowl	*Numida meleagris*				Confirmed		
Horus Swift	*Apus horus*		BM				L
House Sparrow	***Passer domesticus***		I		**H**		
Icterine Warbler	*Hippolais icterina*		NBM				L
Jacobin Cuckoo	*Clamator jacobinus*		BM			M	

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Jameson's Firefinch	*Laginostricta rhodopareia*				**H**		
Kalahari Scrub-Robin	*Cerecotrichas paena*						L
Kittlitz's Plover	*Charadrius pecuarius*						L
Klaas's Cuckoo	***Chrysococcyx caprius***		**BM**		**H**		
Kori Bustard	*Ardeotis kori*						L
Kurrichane Buttonquail	*Turnix sylvaticus*						L
Kurrichane Thrush	***Turdus libonyanus***				**H**		
Lanner Falcon	*Falco biarmicus*	**VU**					L
Laughing Dove	***Streptopelia senegalensis***				**Confirmed**		
Lesser Grey Shrike	*Lanius minor*				H		
Lesser Honeyguide	*Indicator minor*					M	
Lesser Kestrel	*Falco naumanni*						L
Lesser masked-Weaver	*Ploce3us intermedius*					M	
Lesser Striped Swallow	*Hirundo abyssinica*		**BM**		Confirmed		
Lessser Spotted Eagle	*Aquila pomarina*						L
Levaillant's Cuckoo	*Clamator levaillantiis*		**BM**				L
Lilac-breasted Roller	*Coracias caudatus*				Confirmed		
Little Bee-eater	***Merops pusillus***				**H**		
Little Sparrowhawk	*Accipiter minullus*						L
Little Swift	*Apus affinis*		**BM**		H		
Lizard Buzzard	*Kaupifalco monogrammicus*						L
Long-billed Crombec	***Sylvietta rufescens***				**H**		
Long-tailed Paradise-Whydah	*Vidua paradisaea*					M	
Magpie Shrike	*Corvinella melanoleuca*				H		
Malachite Sunbird	*Nectarinia famosa*				H		
Marabou Stork	*Leptoptilos crumeniferus*						L
Marico Flycatcher	*Bradornis mariquensis*				H		
Marico Sunbird	*Cinnyris mariquensis*					M	
Martial Eagle	*Polemactus bellicosus*	**ED**					L
Meves's Starling	*Lamprotornis mevesii*						L
Meyer's Parrot	*Poicephalus meyeri*				H		
Monotonous Lark	*Mirafra passerina*					M	
Namaqua Dove	***Oena capensis***				**H**		
Natal Spurfowl	*Pternistis natalensis*				**H**		
Neddicky	***Cisticola fulvicapilla***				**H**		

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Olive-tree Warbler	*Hippolais olivetorum*		NBM				L
Orange-breasted Bush-Shrike	*Telophorus sulfureopectus*				H		
Ovambo Sparrowhawk	*Accipiter ovampensis*						L
Pale Flycatcher	*Bradornis pallidus*					M	
Pearl-breasted Swallow	*Hirundo dimidiata*		BM				L
Pearl-spotted Owlet	*Glaucidium perlatum*				H		
Peregrine Falcon	*Falco peregrinus*						L
Pied crow	***Corvus albus***				**Confirmed**		
Pin-tailed Whydah	*Vidua macroura*				H		
Plain-backed Pipit	*Anthus leucophrys*						L
Purple Roller	***Coracias naevius***				**H**		
Rattling Cisticola	*Cisticola chiniana*				Confirmed		L
Red-backed Shrike	*Lanius collurio*				H		
Red-billed Buffalo-Weaver	*Bubalornis niger*				Confirmed		L
Red-billed Firefinch	*Laginosticta senegala*				**H**		
Red-billed Hornbill	***Tockus erythrorhynchus***				**Confirmed**		
Red-billed Oxpecker	***Buphagus erythrorhynchus***				**H**		
Red-billed Quelea	***Quelea quelea***				**H**		
Red-breasted Swallow	*Cecropis semirufa*		BM			H	
Red-chested Cuckoo	*Cuculus solitarius*		BM		H		
Red-crested Korhaan	*Lophotis ruficrista*					M	
Red-eyed Dove	*Streptopelia semitorquata*				H		
Red-faced Mousebird	***Urocolius indicus***				**H**		
Red-headed Finch	*Amadina erythrocephala*						L
Red-headed Weaver	***Anaplectes melanotis***				**H**		
Red-winged Starling	*Onychognathus morio*						L
Retz's Helmet-Shrike	*Prionops retzii*					M	
Rock Dove	*Columba livia*						L
Rock Kestrel	*Falco rupicolus*						L
Rock Martin	*Hirundo fuligula*						L
Rufous-cheacked Nightjar	*Capromulgus rufigena*						L
Rufous-naped Lark	*Mirafra africana*				H		
Sabota Lark	*Calendulauda sabota*						L
Sand Martin	*Riparia riparia*						L

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Scaly-feathered Finch	*Sporopipes squamifrons*						L
Scarlet-chested Sunbird	*Chalcomitra senegalensis*						L
Secretary Bird	*Sagittarius serpentarius*	**VU**					L
Shaft-tailed Whydah	*Vidua regia*						L
Shikra	*Accipiter badius*						L
Sombre Greenbul	*Andropadus importunus*					M	
Soutern Pied Babbler	*Turdoides bicolor*						L
Southern Black Flycatcher	*Melaenornis pammelaina*					M	
Southern Black Tit	*Parus niger*				H		
Southern Boubou	*Laniarius ferrugineus*						L
Southern Carmine Bee-eater	*Merops nubicoides*					M	
Southern Grey-headed Sparrow	***Passer diffuses***						
Southern Ground-Hornbill	*Bucorvus leadbeateri*	**ED**					L
Southern Masked-Weaver	***Ploceus velatus***				**H**		
Southern White-crowned Shrike	***Eurocephalus anguitimens***				**H**		
Southern White-faced Scops-Owl	*Ptilopsis granti*						L
Southern Yellow-billed Hornbill	***Tockus leucomelas***				**Confirmed**		
Speckled Mousebird	***Colius striatus***				**H**		
Speckled Pigeon	*Columba guinea*						L
Spectacled Weaver	*Ploceus ocularis*					M	
Spotted Eagle-Owl	*Bubo afreicanus*				H		
Spotted flycatcher	*Muscicapa striata*		**NBM**		H		
Spotted Thick-knee	*Burginus capensis*						L
Square-tailed Nightjar	*Caprimulgus fossii*						L
Steppe Buzzard	*Buteo buteo*		**NBM**				L
Steppe Eagle	*Aquila nipalensis*						L
Streaky-headed Seedeater	*Crithagra gularis*						L
Striped Kingfisher	*Halcyon chelicuti*						L
Swainson's Spurfowl	*Pternistis swainsonii*				Confirmed		
Tawny Eagle	*Aquila rapax*	**ED**					L
Tawny-flanked Prinia	*Prinia subflava*				H		
Temminck's Courser	*Cursorius temminckii*						L
Terrestrial Brownbul	*Phyllastephus terrestris*					M	
Three-banded Plover	*Charadrius tricollaris*				H		

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low
Tropical Boubou (Ethioian)	***Laniarius aethiopicus***				**H**		
Verreauxs' Eagle	*Aquila verreauxii*	**VU**					L
Village Indigobird	*Vidua chalybeata*				Confirmed		
Village Weaver	*Ploceus cucullatus*				H		
Violet-backed Starling	*Cinnyricinclus leucogaster*		**BM**		Confirmed		
Violet-eared Waxbill	*Granatina granatina*						L
Wahlberg's Eagle	*Aquila wahlbergi*						L
Wattled Starling	*Creatophora cinerea*					M	
White-backed Vulture	*Gyps africanus*	**CE**					L
White-bellied Sunbird	*Cinnyris talatala*				Confirmed		
White-browed Robin-Chat	*Cossypha heuglini*				H		
White-brown Scrub-Robin	***Cercotrichas leucophrys***				**H**		
White-browned Sparrow-Weaver	*Plocepasser mahali*					M	
White-crested Helmet-Shrike	***Prionops plumatus***				**H**		
White-fronted Bee-eater	*Merops bullockoides*						L
White-rumped Swift	*Apus caffer*		**BM**		H		
White-throated Swallow	*Hirundo albigularis*		**BM**		H		
White-troated Robin-Chat	***Cossypha humeralis***				**H**		
Willow Warbler	*Phylloscopus trochilus*		**NBM**				L
Wire-tailed Swallow	*Hirundo smithii*						L
Woodland Kingfisher	*Halcyon senegalensis*		**BM**				L
Yellow-bellied Eremomela	*Eremomela icteropygialis*					M	
Yellow-bellied Greenbul	*Chlorocichla flaviventris*				H		
Yellow-breasted Apalis	*Apalis flavida*						L
Yellow-fronted Canary	***Crithagra mozambicus***				**Confirmed**		
Yellow-fronted Tinkerbird	*Pogoniulus chrysoconus*						L
Yellow-throated Petronia	*Petronia superciliaris*					M	
Zitting Cisticola	*Cisticola juncidis*						L

Red Status	Status in south Africa (S)	Endemism in South Africa (E)
NA = Not Assessed	BM = breeding migrant	Endemism in South Africa (E) (not southern Africa as in field guides)
LC = Least Concern	NBM = non-breeding migrant	

Common English Name	Scientific Name	Status			Probability of occurrence		
		RD	S	E	High	Medium	Low

NT = Near-Threatened	V = vagrant	* = endemic
VU = Vulnerable	I = introduced	
EN = Endangered	R = rare	(*) = near endemic (i.e. ~70% or more of population in RSA)
CR = Critically Endangered	PRB = probable rare breeder	B* = breeding endemic
EX = Extinct Regionally	RB = rare breeder	B(*) = breeding near endemic
NR = Not Recognised	RV = rare visitor	W* = winter endemic
Red Status is from *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland,* Taylor (2015).		

Table 26: Red-listed species whose possible presence at the site of the proposed development was evaluated during the assessment process

Species	Scientific name	Red Data	NEMBA	LEMA	Assessment of likelihood of presence at site
Vulture, White-Backed	*Gyps africanus*	CE			Possible but Unlikely. Ranges widely. Not recorded in this Pentad
Vulture, White-Headed	*Aegypius occipitalis*	CE			Unlikely. Ranges widely. Not recorded in this Pentad
Bateleur	*Terathopius ecaudatus*	EN			Possible but Unlikely. Ranges widely. It is possible that birds traverse the area from time to time. Not recorded in this Pentad
Eagle, Martial	*Polemaetus bellicosus*	EN			Possible but Unlikely - requires huge areas of suitable habitat and avoids disturbed landscapes. Not recorded in this
Eagle, Tawny	*Aquila rapax*	EN			Possible, but unlikely. Not recorded in this Pentad
Ground-Hornbill, Southern	*Bucorvus leadbeateri*	EN			Unlikely - requires huge areas of suitable habitat. Not recorded in this Pentad
Hawk, Bat	*Macheiramphus alcinus*	EN			Unlikely – although baobab may provide roosting site. Not recorded in this Pentad
Stork, Saddle Stork	*Ephippiorhynchus senegalensis*	EN			Extremely unlikely. Habitat not suitable. Not recorded in this Pentad
Stork, Yellow-billed	*Mycteria ibis*	EN			Extremely unlikely. Habitat not suitable. Not recorded in this Pentad
Vulture, Cape	*Gyps coprotheres*	EN			Possible but Unlikely. Ranges widely. However, occurs within 100 km of site, and therefore possible that birds traverse the area from time to time. Not recorded in this Pentad
Vulture, Lappet-Faced	*Torgos tracheliotos*	EN			Unlikely. Ranges widely, It is possible that birds traverse the area from time to time. Not recorded in this Pentad.
Eagle, Verreauxs'	*Aquila verreauxii*	VU			Possible but Unlikely. Largely confined to mountainous areas. Not recorded in this Pentad).
Falcon, Lanner	*Falco biarmicus*	VU			Occurrence possible, but the area is unlikely to be important hunting habitat. Not recorded in this Pentad.

Species	Scientific name	Red Data	NEMBA	LEMA	Assessment of likelihood of presence at site
Night Heron, White-backed	*Gorsachius leuconotus*	VU			Very unlikely. Requires clear, swift-or slow-flowing perennial rivers. Not recorded in this Pentad .
Pelican, Great White	*Pelecanus onocrotalus*	VU			Extremely unlikely. Habitat not suitable. Not recorded in this Pentad.
Pelican, Pink-backed	*Pelecanus rufescens*	VU			Extremely unlikely. Habitat not suitable. Not recorded in this Penta.
Secretarybird	*Sagittarius serpentarius*	VU			Possible, but unlikely. Typically occurs in more open grassland habitats but could venture into mopane veld on occasion. Not recorded in this Pentad.
Stork, Black	*Ciconia nigra*	VU			Unlikely. Habitat not suitable due to the lack of water bodies with fish. Not recorded in this Pentad.
Bustard, Kori	*Ardeotis kori*	NT			Possible, but unlikely. Not recorded in this Pentad
Flamingo, Greater	*Phoenicopterus ruber*	NT			Extremely unlikely – no suitable habitat on site. Not recorded in this Pentad.
Flamingo, Lesser	*Phoenicopterus minor*	NT			Extremely unlikely – no suitable habitat on site. Not recorded in this Pentad.
Harrier Pallied	*Circus macrourus*	NT			Unlikely. Habitat not suitable. Not recorded in this Pentad (SABAP 2).
Canary, Lemon-Breasted	*Crithagra citrinipectus*	NT			Unlikely. Habitat not suitable due to the lack of Lala Palms. Not recorded in this Pentad.
Painted-snipe, Greater	*Rostratula benghalensis*	NT			Unlikely. Habitat not suitable, prefers freshwater wetlands, where it prefers secluded muddy areas adjacent to concealing vegetation. Not recorded in this Pentad.
Plover, Chestnut-Banded	*Charadrius pallidus*	NT			Extremely unlikely – no suitable habitat on site. Not recorded in this Pentad
Roller, European	*Coracias garrulus*	NT			Possible, but unlikely. Recorded in this Pentad.
Stork, Abdim's	*Ciconia abdimii*	NT			Unlikely. Occurs in grasslands, woodlands and cultivated fields in rural areas. Not recorded in this Pentad.
Stork, Marabou	*Leptoptilos crumeniferus*	NT			Occurrence possible. Widespread in arid and mesic woodlands and savannas.

7.2.3. Red Listed Bird Species

A total of 28 threatened or near-threatened species (Taylor, Peacock & Wanless, 2015) were previously recorded for the region. The nature of the study site makes it unlikely that most of these species ever occur here. Many of these can be ruled out on the basis of habitat characteristics. Species typically inhabiting aquatic habitats should not occur on the site due to the absence of this habitat.

Several species of significant conservation concern could potentially occasionally be present at the site. These include the vultures and raptors like African White-backed Vulture (*Critically Endangered*), Cape Vulture (*Endangered*), Bateleur (*Endangered*), Martial Eagle (*Endangered*), Tawny Eagle (*Endangered*), Verreauxs' eagle (Vulnerable) and Lanner Falcon (*Vulnerable*). Species like the Secretarybird (*Vulnerable*) and European Roller (*Near Threatened*) may also from time to time occur on or near the site. In addition, the presence of the *Endangered* Southern Ground-hornbill cannot be ruled out. This species has been recorded with relatively high reporting rates in several pentads along the N1 between Musina and the Soutpansberg, and along the Limpopo Valley, although it is likely to avoid areas close to urbanization.

However, there are not many full protocols for the Pentad and for most Red Data species the nature of the site is such that their occurrence is extremely unlikely. Due to the limited extent and quality of the habitats, half the species are expected to be at best erratic visitors and the other half are only expected as infrequent vagrants, their inclusion being primarily due to the Precautionary Principle. As can be seen from the estimates of the habitats as support for the basic requirements of the species, they are considered at best as only mediocre for all the threatened species. The odd Red Data eagle and Red Data vulture use the airspace above by fly over the site, but the area is unlikely to be an important hunting or scavenging habitat.

7.2.4. Screening Tool Sensitive Bird Species

According to the Screening Tool Report on the Proposed development, the Bateleur (*Terathopius ecaudatus)* and the Tawny Eagle (*Aquila rapax)* have medium sensitivity.

Bataleur

In South Africa, the species has been largely extirpated outside of protected areas, with Kruger National Park now holding the majority of the regional population, followed by Kgalagadi Transfrontier Park and the northern KwaZulu Natal parks of Hluhluwe-iMfolozi Park and iSimangaliso Wetland Park. Bateleurs are scavengers and hunters. Juveniles and immatures in Kruger National Park scavenging up to 85% of prey items. Habitat transformation, which has led to a decrease in the available prey base, is most likely the leading reason for he Bateleur's demise outside of protected areas. Its tendency to scavenge puts this species at particular risk from indiscriminate poisoning, especially by small stock farmers. Illegal harvesting of this species for use in the muti trade is a recent trend.

Tawny Eagle

According to the Screening Tool Report the tawny eagle (*Aquilia rapax*) the has a medium sensitivity.

The study site falls in the distribution range of the tawny eagle according to Roberts Birds of Southern Africa VII (Hockey, Dean & Ryan, 2005).

The tawny eagle is mentioned in the 2015 Eskom Red Data Book of Birds of South African, Lesotho and Swaziland (Taylor, Peacock & Wanless, 2015) and has the status of Endangered.

The tawny eagle is one of the most threatened eagles in South Africa, with a high sensitivity to land transformation, making its largely depend on conservations areas to survive. Heavy losses have been documented for they outside of protected areas. Owing to its habitat of scavenging, Tawny eagles suffer the most from deliberate and inadvertent poisoning (Taylor, Peacock & Wanless, 2015).

Tawny eagles are also inadvertently killed or injured in gin traps set to capture mammalian predators. In some areas where there is a decrease in wildlife populations in cattle-farming regions, their numbers have also decrease. Drowning in sheer-walled reservoirs and electrocution have also contributed to their decline. A few individuals feeding on road-killed carrion are occasionally killed by motor vehicles. Outside protected areas declines have occurred due to mainly habitat loss, but also nest disturbance (Taylor, Peacock & Wanless, 2015).

The tawny eagle requires huge areas of suitable habitat and avoids disturbed landscapes. This species was also not recorded in these Pentads (SABAP 2). However, it is possible that tawny eagles traverse the area from time to time.

7.2.5. Discussion Bird Species

A total of 264 species are considered likely to occur at the site. However, according to SABAP 2 a total of only 70 species were recorded on this Pentad. A total of 28 Red-listed species potentially may occur at the site of proposed development – these are the species that have been recorded in the area considered for the desktop study. Many of these can be ruled out based on habitat characteristics, but several species of significant conservation concern could potentially be present at the site occasionally. These include the vultures and raptors like African White-backed Vulture (*Critically Endangered*), Cape Vulture (*Endangered*), Bateleur (*Endangered*), Martial Eagle (*Endangered*), Tawny Eagle (*Endangered*), Verreauxs eagle (Vulnerable) and Lanner Falcon (*Vulnerable*). Species like the Secretarybird (*Vulnerable*) and European Roller (*Near Threatened*) may also occur on or near the site from time to time. In addition, the presence of the *Endangered* Southern Ground-hornbill cannot be ruled out.

The development of site should not affect the Bateleur or Tawny Eagle species survival as a species. From an avifaunal perspective, the conservation status of this site is low. At a broader spatial scale, the site is located in widespread mopane bushveld, therefore the ultimate impact of the development on birds is considered to be low and the development can be supported.

7.3. Herpetofauna

7.3.1. Herpetofauna Habitat Assessment

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types: terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the context of global distribution ranges. From a herpetological habitat perspective, it was established that two of the four major habitats are naturally present on the study site, namely terrestrial and arboreal. Rupicolous habitats were scares on the site. These rupicolous habitats offer nooks and crannies as refuge for some small common rupicolous herpetofauna species.

A few termitaria were observed. These structures are good indicators of the occurrence of some herpetofauna species. At the time of the site visit the basal cover was poor in many places but could provide adequate cover for small herpetofauna species.

No wetland-associated vegetation cover occurs on the study site; therefore, Amphibia is scarce on the site.

Natural arboreal habitat is abundant on the study site. The larger trees may offer refuge for arboreal herpetofauna like tree agamas and flap-neck chameleons. Due to firewood collection, there are no dead logs, which could have provided shelter and food for herpetofauna. No important wetland-associated vegetation cover occurs on the site. Connectivity with areas around the study site is good but interrupted by roads.

7.3.2. Expected and Observed Reptile Species Richness

The species assemblage is typical of what can be expected in Mopaneveld, with sufficient terrestrial and arboreal habitat to sustain populations of some species. Most of the species of the resident diversity are common and widespread (viz. leopard tortoise, Turner's gecko, common dwarf gecko, rainbow skink, variable skink, common giant plated lizard, puff adder, Southern African python, western yellow-bellied sand snake, snouted cobra, Mozambique spitting cobra, southern twig snake.

The Arboreal habitat is typical of a savanna assemblage. Larger trees are interspersed with dense stands of scrub. The larger trees may offer refuge to tree-living reptiles like Bradfield's dwarf gecko, common dwarf gecko, tree agamas, boomslang, twig snakes and flap-neck chameleons. There are dead logs, which could provide shelter and food for some herpetofauna.

Due to the terrestrial sand habitat, four species of amphisbaenians or worm lizard were added to the species list.

Due to the absence wetland and of large natural rupicolous habitat on the study site certain species were omitted from the species list, which include tiger gecko, common girdled lizard, Zimbabwe flat lizard, common giant plated lizard and southern rock agama.

The American red-eared terrapin (*Trachemys scripta elegans*) and the Brahminy blind snake (*Ramphotyphlops braminus*) are the only two feral reptile or amphibian species known to occur in South Africa (De Moor and Bruton, 1988; Picker and Griffiths, 2011), but with only a few populations, they are not expected to occur on this site.

A list of reptile species expected to occur on the site, or in the vicinity of the site, is given in the table below. A high number of 99 reptile species may occur in this bushveld type where the study site is located. The presence of six reptile species was confirmed, but more species have a high possibility to occur in the area.

Table 27: Reptile diversity - species observed or expected to from time to time be present on or in the vicinity of the site.

Probability of occurrence	RD status	Scientific name	English name
		CLASS: REPTILIA	**REPTILES**
		Order: TESTUDINES	**TORTOISES & TERRAPINS**
		Family: Testudinidae	**Tortoises**
Medium		*Kinixys spekii*	Speke's Hinged-Back Tortoise
Low		*Psammobates oculifer*	Serrated Tent Tortoise
Observed on neighbouring farm		*Stigmochelys pardalis*	Leopard Tortoise
		Order: SQUAMATA	**SCALE-BEARING REPTILES**
		Suborder:LACERTILIA	**LIZARDS**
		Family: Gekkonidae	**Geckos**
High		*Afroedura transvaalica*	Zimbabwe Flat Gecko
Low		*Colopus wahlbergii wahlbergii*	Kalahari Ground Gecko
High		*Chondrodactylus turneri*	Turner's Gecko
High		*Hemidactylus mabouia*	Common Tropical House Gecko
High	Vu	*Homopholis mulleri*	Muller's Velvet Gecko
High		*Homopholis wahlbergi*	Wahlberg's Velvet Gecko
Medium		*Lygodactylus bradfieldi*	Bradfield's Dwarf Gecko
High		*Lygodactylus capensis capensis*	Common Dwarf Gecko
Low		*Lygodactylus stevensoni*	Stevenson's Dwarf Gecko
Medium		*Pachydactylus affinis*	Transvaal Gecko
Low		*Pachydactylus capensis*	Cape Gecko
High		*Pachydactylus punctatus*	Speckled Gecko
High		*Pachydactylus tigrinus*	
Medium		*Pachydactylus vansoni*	Van Son's Gecko
High		*Ptenopus garrulus garrulus*	Common Barking Gecko
		Family: Amphisbaenidae	Amphisbaenians
Medium	Vu	*Chirindia langi occidentalis*	Soutpansberg Worm Lizard
Medium		*Monopeltis infuscata*	Dusky Worm Lizard
Medium		*Monopeltis sphenorhynchus*	Slender Worm Lizard
Low		*Zygaspis quadrifrons*	Kalahari Dwarf Worm Lizard
		Family:Lacertidae	**Old World Lizards or Lacertids**
High		*Heliobolus lugubris*	Bushveld Lizard
High		*Meroles squamulosus*	Savanna Lizard
High		*Nucras holubi*	Holub's Sandveld Lizard
High		*Nucras intertexta*	Spotted Sandveld Lizard

Probability of occurrence	RD status	Scientific name	English name
Low		*Nucras lalandii*	Delalande's Sandveld Lizard
Low		*Nucras ornata*	Ornate Sandveld Lizard
High		*Pedioplanis lineoocellata lineoocellata*	Spotted Sand Lizard
Low	NT	*Vhembelacerta rupicola*	Soutpansberg rock lizard
		Family: Cordyidae	**Girdled Lizards**
High		*Cordylus jonesii*	Jones' Girdled Lizard
		Family: Gerrhosauridae	**Plated Lizards**
Low		*Broadleysaurus major*	Rough-Scaled Plated Lizard
High		*Gerhosaurus flavigularis*	Yellow-throated Plated Lizard
		Family: Scincidae	**Skinks**
Low		*Acontias cregoi*	Cregoi's Legless Skink
Medium		*Acontias occidentalis*	Savanna Legless Skink
Low	DD	*Acontias kgalagadi subtaeniatus*	Stripe-Bellied Legless Skink
Medium		*Acontias plumbeus*	Giant Legless Skink
High		*Afroablepharus maculicollis*	Spotted-Neck Snake–Eyed Skink
High		*Afroablepharus wahlbergii*	Wahlberg's Snake-Eyed Skink
High		*Mochlus sundevallii sundevallii*	Sundevall's Writhing Skink
Medium		*Trachylepis capensis*	Cape Skink
Low		*Trachylepis depressa*	Eastern Sand Skink
High		*Trachylepis margaritifer*	Rainbow Skink
Low		*Trachylepis punctatissima*	Speckled Rock Skink
High		*Trachylepis punctulata*	Speckled Sand Skink
High		*Trachylepis striata*	Striped Skink
High		*Trachylepis varia*	Variable Skink
High		*Scelotes limpopoensis limpopoensis*	Limpopo Dwarf Burrowing Skink
		Family: Varanidae	**Monitors**
High		*Varanus albigularis albigularis*	Southern Rock Monitor
		Family Chamaeleonidae	Chameleons
High		*Chamaeleo dilepis dilepis*	Common Flap-Neck Chameleon
		Family: Agamidae	**Agamas**
High		*Agama armata*	Northern Ground Agama
Medium		*Acanthocerus atricollis atricollis*	Southern Tree Agama
		Suborder: SERPENTES	**SNAKES**
		Family: Typhlopidae	**Blind Snakes**
Low		*Afrotyphlops bibronii*	Bibron's Blind Snake
Low		*Megatyphlops schlegelii*	Schlegel's Giant Blind Snake
Low		*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake

Probability of occurrence	RD status	Scientific name	English name
		Family: Leptotyphlopidae	**Thread Snakes**
Low		*Leptotyphlops distanti*	Distant's Thread Snake
Low		*Leptotyphlops incognitus*	Incognito Thread Snake
High		*Leptotyphlops scutifrons scutifrons*	Peter's Thread Snake
Low		*Myriopholis longicauda*	Long-Tailed Thread Snake
		Family: Pythonidae	**Pythons**
Observed on neighbouring farm		*Python natalensis*	Southern African Python
		Family: Viperidae	**Adders**
Observed on neighbouring farm		*Bitis arietans arietans*	Puff Adder
High		*Bitis caudalis*	Horned Adder
Medium		*Causus defilippii*	Snouted night Adder
Medium		*Causus rhombeatus*	Rhombic Night Adder
		Family: Lamprophiidae	
Low		*Amblyodipsas microphthalma nigra*	Soutpansberg Purple-Glossed Snake
Low		*Amblyodipsas polylepis polylepis*	Common Purple-Glossed Snake
High		*Aparallactus capensis*	Black-headed Centipede Eater
Low		*Atractapis bibronii*	Bibron's Stiletto Snake
Low		*Homoroselaps lacteus*	Spotted Harlequin Snake
Medium		*Xenocalamus bicolour lineatus*	Striped Quill-Snouted Snake
High		*Boaedon capensis*	Common House Snake
Medium		*Gonionotophis nyassae*	Black File Snake
Low		*Lamprophis guttatus*	Spotted Rock Snake
High		*Lycophidion capense capense*	Cape Wolf Snake
Low		*Lycophidion variegatum*	Variegatum Wolf Snake
Medium		*Hemirhagerrhis nototaenia*	Eastern Bark Snake
Low		*Psammophis angolensis*	Dwarf Sand Snake
Low		*Psammophis brevirostris*	Short-snouted Grass Snake
Low		*Psammophis crucifer*	Cross-Marked Grass Snake
Low		*Psammophis jallae*	Jalla's Sand Snake
Low		*Psammophis mossambicus*	Olive Grass Snake
High		*Psammophis subtaeniatus*	Western Yellow-Bellied Sand Snake
Low		*Psammophylax tritaeniatus*	Striped Grass Snake
High		*Rhamphiophis rostratus*	Rufous beaked Snake

Probability of occurrence	RD status	Scientific name	English name
Low		*Prosymna bivittata*	Two-Striped Shovel-Snout
High		*Prosymna lineata*	Lined Shovel-Snout
Medium		*Prosymna stuhlmannii*	East African Shovel-Snout
Low		*Pseudaspis cana*	Mole Snake
		Family: Elapidae	**Cobras, Mambas and Others**
High		*Aspidelaps scutatus scutatus*	Common Shield Cobra
Observed on neighbouring farm		*Dendroaspis polylepis*	Black Mamba
High		*Elapsoidea sunderwallii longicauda*	Sundevall's Garter Snake
High		*Naja annulifera*	Snouted Cobra
Observed on neighbouring farm		*Naja mossambica*	Mozambique Spitting Cobra
		Family: Colubridae	
Low		*Crotaphopeltis hotamboeia*	Red-Lipped Snake
Low		*Dasypeltis inornata*	Southern Brown Egg-Eater
High		*Dasypeltis scabra*	Rhombic Egg Eater
Observed on neighbouring farm		*Dispholidus typus*	Boomslang
High		*Philothamnus semivarietiegatus*	Spotted Bush Snake
Medium		*Telescopus semiannulatus semiannulatus*	Eastern Tiger Snake
High		*Thelotornis capensis capensis*	Southern Twig Snake

7.3.3. Threatened Reptile species

Seven Threatened Reptile species are listed for the area of the study site.

Table 28: Red Data, NEMBA and LEMA listed reptile species

Species	Scientific Name	Red Data IUCN	NEMBA	LEMA	Endemism	Likelihood of occurrence
Nile crocodile	*Crocodylus niloticus*	VU	PR	Specially protected	No	Unlikely
Muller's velvet gecko	*Homopholis mulleri*	VU			Yes	Likely
Soutpansberg rock lizard	*Vhembelacerta rupicola*	NT			Yes	Unlikely, – restricted to Soutpansberg
Soutpansberg worm lizard	*Chirindia langi occidentalis*)	VU			Yes	Small Possibility,

Species	Scientific Name	Red Data IUCN	NEMBA	LEMA	Endemism	Likelihood of occurrence
						restricted to Soutpansberg
Stripe-bellied legless skink	*Acontias kgalagadi subtaeniatus*	DD			Yes	Small possibility
Southern African python	*Python natalensis*	LC	PR	Protected	No	Present on neighbouring farm
Black file snake	*Gonionotophis nyassae*	LC		Protected	No	Possible

Five of the seven listed threatened reptile species may occur in the area of the site.

Muller's velvet gecko's (*Homopholis mulleri*) status is *Vulnerable* (Branch, 2014). It is endemic to the Limpopo Province and is mainly restricted to Mopane Veld around the Soutpansberg. This species is known to shelter in holes in trees (Branch, 2014a), which do occur on the study site. A high possibly exists that this species may occur on the site.

The status of the Soutpansberg rock lizard (*Vhembelacerta rupicola*) is *Near Threatened* (Turner 2014). This species occurs on rocky outcrops, scree slopes and bedrock in wooded savannah on or near the Soutpansberg Range. It is unlikely that this species could occur on the study site.

The status of the Soutpansberg worm lizard (*Chirindia langi occidentalis*) is *Vulnerable* (Measey, 2014). This species is endemic to the low-lying areas of the Soutpansberg in northern Limpopo. A possibly exists that this species may occur on the sandy habitats on the site.

The status of the Stripe-Bellied Legless Skink (*Acontias kgalagadi subtaeniatus*) is *Data Deficient* (Bauer, 2014) and it is endemic to northern Limpopo Province in South Africa. A small possibly exists that this species may occur on the site.

The Southern African python (*Python natalensis*) does occur in the area. According to Bradley (1990), Southern African pythons favour moist, rocky, well-wooded valleys, plantations or bush country, but seldom if ever stray far from permanent water. The study site itself does provide suitable habitat for the Southern African python, and the study site is large enough to support a viable population. It is often estimated that a single python needs at least 100 ha area to forage. Populations of Southern African pythons live on nearby properties and some individuals may migrate to and from the study site. The Southern African python's national status has changed from Vulnerable (Branch, 1988) to regional Least Concern (Alexander, 2014), although it is currently still a ToPS-listed species (Threatened or Protected Species).

The study site falls inside the natural range of the Nile crocodile (*Crocodylus niloticus*), but the drainage lines are only temporary and do not provide permanent water for crocodiles.

The study site falls outside the natural range of woodbush flat gecko (*Afroedura multiporis multiporis*), granite dwarf gecko (*Lygodactylus graniticolus*), Methuen's dwarf gecko (*Lygodactylus methueni)*, Makgabeng dwarf gecko (*Lygodactylus nigropunctatus montiscaeruli*), Waterberg Dwarf Gecko (*Lygodactylus waterbergensis)*, Coppery Grass Lizard (*Chamaeasaura aenea*), Large-scaled Grass Lizard (*Chamaesaura macrolepis*), unexpected flat lizard (*Platysaurus intermedius inopinus*), orange-throated flat lizard (*Platysaurus monotropis*), Fitzsimons' flat lizard (*Platysaurus orientalis fitzimonsi*), northern crag lizard (*Pseudocordylus transvaalensis*), Richard's legless skink (*Acontias richardi*), Woodbush legless skink (*Acontias rieppeli*), White-bellied dwarf burrowing skink (*Scelotes limpopoensis albiventris*), striped harlequin snake (*Homoroselaps dorsalis*) and giant bullfrogs (*Pyxicephalus adspersus*) and these species should not occur on the study site.

The cryptic dwarf gecko (*Lygodactylus nigropunctatus incognitus*) is restricted to the summit of the nearby Soutpansberg and would not occur on the study site.

The Soutpansberg dwarf gecko (*Lygodactylusocellatus soutpansbergensis*) is endemic to the summit of the nearby Soutpansberg and would not occur on the study site.

Eastwood's long-tailed seps (*Tetradactylus eastwoodae*) is extinct and the study site falls outside the original natural range of this species.

7.3.4. Discussion: Reptile species

A high number of 99 reptile species may occur in this bushveld type where the study site is located. The presence of six reptile species was confirmed, but 41 more species have a high possibility to occur in the area.

Five of the seven listed threatened reptile species may occur in the area of the site:
Muller's velvet gecko's (*Homopholis mulleri*) status is *Vulnerable.* A high possibly exists that this species may occur on the site. The status of the Soutpansberg rock lizard (*Vhembelacerta rupicola*) is *Near Threatened.* This species occurs on rocky outcrops, scree slopes and bedrock in wooded savannah on or near the Soutpansberg Range and it is unlikely that this species occur on the study. The status of the Soutpansberg worm lizard (*Chirindia langi occidentalis*) is *Vulnerable*. This species is endemic to the low-lying areas of the Soutpansberg in northern Limpopo. A possibly exists that this species may occur on the sandy habitats on the site. The status of the Stripe-Bellied Legless Skink (*Acontias kgalagadi subtaeniatus*) is *Data Deficient,* and it is endemic to northern Limpopo Province in South Africa. A small possibly exists that this species may occur on the site.

The Southern African python (*Python natalensis*) does occur in the area.

Should pythons be found during the development, they should be caught by a qualified snake handler, and be removed to a safe location, e.g. nature reserves in the area.

7.3.5. Expected and Observed Amphibia Species Richness

The species assemblage is typical of what can be expected in the area, with insufficient habitat to sustain populations of most amphibian species. Most of the species of the resident diversity are common and widespread. The current amphibia species richness is low on the site as there is only three of the four major habitats occur on the site, the important wetlands/aquatic habitats being absent. The drainage lines flow irregularly in late summer following heavy rains. Due to the shortage of natural surface water, most of the frog species listed have only small chance to occur on the site.

Table 29: Amphibian diversity. The species observed or deduced to occupy the site

Probability of occurrence	RD status	Scientific name	English name
		CLASS: AMPHIBIA	**AMPHIBIANS**
		Order: ANURA	**FROGS**
		Family: Pipidae	**Clawed Frogs**
Low		*Xenopus muelleri*	Muller's Platanna
		Family: Bufonidae	**Toads**
Low		*Poyntonophrynus fenoulheti*	Northern Pygmy Toad
Observed on neighbouring farm		*Amietaophrynus gutturalis*	Guttural Toad
Medium		*Amietaophrynus garmani*	Eastern Olive Toad
High		*Amietaophrynus maculatus*	Flat-backed Toad
Low		*Amietaophrynus rangeri*	Raucous Toad
Low		*Schismaderma carens*	Red Toad
		Family: Hemisotidae	**Shovel-snouted Frogs**
Observed on neighbouring farm		*Hemisus marmoratus*	Mottled Shovel-Nosed Frog
		Family: Hyperoliidae	**Reed Frogs**
Observed on neighbouring farm		*Kassina senegalesis*	Bubbling Kassina
		Family: Breviceptidae	**Rain Frogs**
High		*Breviceps adspersus*	Bushveld Rain Frog
		Family: Microhylidae	**Rubber Frogs**
Low		*Phrynomantis bifasciatus*	Banded Rubber Frog
		Family: Phrynobatrachidae	**Puddle Frog**
Low		*Phrynobatrachus natalensis*	Snoring Puddle Frog
		Family: Ptychadenidae	**Grass Frog**
Observed on neighbouring farm		*Ptychdena anchietae*	Plain Grass Frog
		Family: Pyxicephalidae	
Medium		*Cocosternum boettgeri*	Boettger's Caco
Medium		*Tomopterna cryptotis*	Tremolo Sand Frog
Medium		*Tomopterna marmorata*	Russet-backed Sand Frog
Low		*Tomopterna natalensis*	Natal Sand Frog
		Family: Rhacophoridae	Foam Nest Frogs
Observed on neighbouring farm		*Chiromantis xerampelina*	Southern Foam Nest Frog

A total of 18 amphibia species may from time to time occur on or in the vicinity of the study site. Five of these species were observed on a neighbouring farm (Bathusi Environmental Consulting 2018).

Table 30: Amphibian diversity. The threatened amphibia species for the area in the vicinity of the site

Species	Scientific Name	Red Data	NEMBA	LEMA	Endemism	Likelihood of occurrence
African bullfrog	*Pyxicephalus edulis*	LC	PR	Protected	No	Unlikely

It is unlikely that the African Bullfrog will occur on the site or in the vicinity of the site. No further red listed amphibia species are expected to occur on the site.

The northern forest rain frog (*Breviceps sylvestris taeniatus*) is endemic to the Limpopo Province where they occur on the nearby slopes and crest of the Blouberg and Soutpansberg and would not occur on the study site.

Eastwood's long-tailed seps (*Tetradactylus eastwoodae*) is extinct and the study site falls outside the natural range of this species.

7.3.6. Discussion: Amphibia species

A total of 18 amphibia species may from time to time occur on or in the vicinity of the study site. Five of these species were observed on a neighbouring farm. It is unlikely that the African Bullfrog will occur on the site or in the vicinity of the site. No further red listed amphibia species are expected to occur on the site.

The proposed development will not affect amphibia species.

8. ECOLOGICAL SENSITIVITY

It has been clearly demonstrated that vegetation not only forms the basis of the trophic pyramid in an ecosystem but also plays a crucial role in providing the physical habitat within which organisms complete their life cycles (Kent & Coker 1992). Therefore, the vegetation of an area will largely determine the ecological sensitivity thereof.

The vegetation sensitivity assessment aims to identify whether the vegetation within the study area is of conservation concern and thus sensitive to development.

Table 31: Scoring of vegetation that occurs within the study area

Vegetation	Conservation Status of regional Vegetation unit	Listed Ecosystem	Legislated Protection	Species of conservation concern	Ecological Function	Condition status	Total Score out of max of 18
1. *Colophospermum mopane* Dense Bushveld	0	0	0	3	3	2	8 - Medium-Low
2. *Colophospermum mopane* Open Bushveld	0	0	0	3	3	3	9 - Medium-
3.*Colophospermum mopane* Plains Bushveld washes	0	1	2	3	3	3	12 - Medium-High
4. Drainage Lines	0	3	3	3	3	3	15 - High
5. Limpopo Ridge Bushveld	1	2	0	3	3	3	12 - Medium-High
6. Disturbed Areas	0	0	0	0	0	0	1 - Low

The Limpopo Ridge Bushveld and the Plains, which act as washes, have Medium-High sensitivity. The *Colophospermum mopane* Open Bushveld has Medium sensitivity due to high plant species richness and suitable habitat for more fauna species, while the *Colophospermum mopane* Dense Bushveld has Medium-Low sensitivity due to lower plant species richness and less suitable habitat for fauna species.

The drainage lines are considered to be High sensitivity.

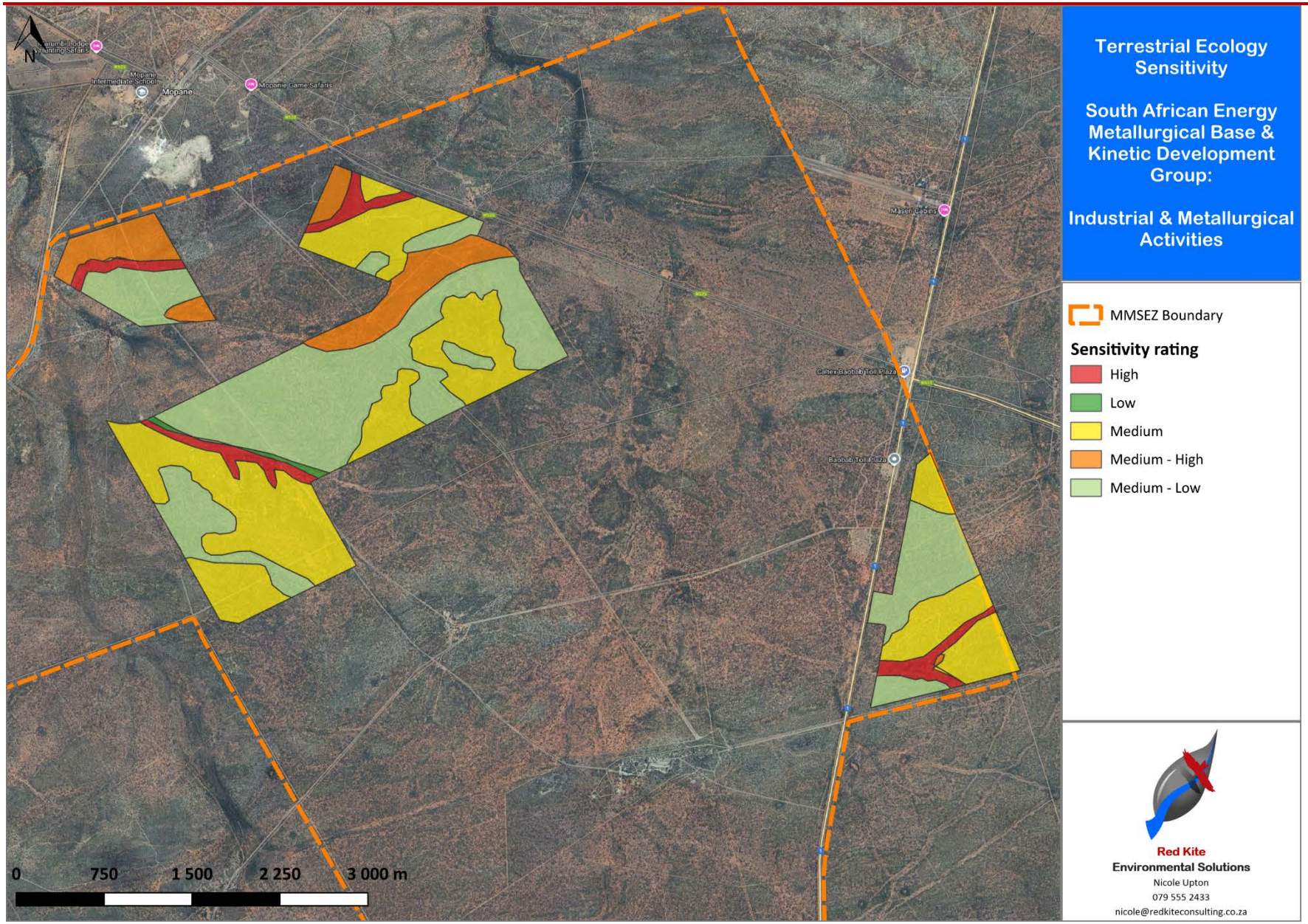


Figure 21: Terrestrial Ecology sensitivity map

9. IMPACT ASSESSMENT

The following section identifies the potential ecological impacts (both positive and negative) caused by the project on the surrounding environment. Potential impacts as a result of the proposed activities will be investigated for the construction and operational phase of the project.

Approximately 915 hectares is planned for the industrial and metallurgical developments. As no detailed development plans (footprints within each of the different development sites) were provided it is accepted that the vegetation and plant species that occur within all the proposed facility sites will be cleared and therefore be destroyed during the construction phase.

Table 32: Approximate sizes in hectares of the footprints of the different proposed facilities / infrastructure

Name	Hectare (approximate)
Administration Centre	157
Ferrochrome plant and Water treatment plant	200
Industrial (Ferrochrome reserved)	175
Coke plant & heat recovery plant	275
Coal washing plant	86
Total development area	**893**

Construction

- Most of the impacts on plant species will occur during the construction phase when removal of plant communities will take place on site.
- Vegetation clearance will likely destroy habitats and lead to possible invasive and/or exotic species establishing in the area and edge-effects occurring surrounding the development. Bare areas may become vulnerable to Alien and Invasive species, and these may compete with indigenous species, likely leading to the migration of sensitive species from the site to a more favourable habitat.
- The onset of construction activities will result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles may result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat.
- This activity could fragment ranges that certain animals may need to sustain adequate foraging area and breeding grounds. This is relevant since the current habitat has value as foraging grounds and corridors for movement between other natural areas.
- Possible impacts on Species of Conservation Concern (SCC) associated with the area. Endemic and/or vulnerable species could possibly occur within the area of construction and would then be destroyed without proper knowledge and/or mitigation measures.

Operational

- The continuous human activity over a longer-term period may further impact on the faunal communities within the area. Associated noise, waste, the smell of humans, physical penetration into sensitive zones and natural areas are problematic and may lead to ever declining populations (where the disturbance of habitat has caused habitat remaining to become unfavourable).

- Invasive plant species may increase during the operational phase of the project. This will mostly take place in the remaining natural areas. Removal of these species is an ongoing process and if not managed regularly could result in severe changes and competition in plant communities.
- Flora could be damaged by staff and contractors if they are allowed to access certain natural areas that should be indicated as no-go zones.
- Possible impacts on Species of Conservation Concern (SCC) if encountered by employees and/or contractors.
- Impacts to the wildlife as operations commence, restricting access to the natural areas and specialized niches.

Decommissioning:

- Once the operation has been decommissioned, final steps in the rehabilitation process will take place. It is, however, possible that the rehabilitation plans are not feasible or only implemented and planned at a late stage, hindering successful rehabilitation.
- Decommissioning and rehabilitation will have similar impacts as the construction phase, but thereafter positive impacts as the natural environment starts to recover, restoring balance.

Table 33: Summary of the significance of Impacts of the proposed industrial and metallurgical development on biodiversity

Plant Community/Fauna	Construction phase		Operational phase	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Colophospermum mopane Dense Bushveld	Medium -High	Medium	Low-Medium	Low-Medium
Colophospermum mopane Open Bushveld	Medium—High	Medium	Medium	Low-Medium
Colophospermum mopane Plains Bushveld	Medium-High	Low	Low	Low
Drainage Lines	Medium-High	Medium	Medium-High	Medium
Ridge Bushveld	Medium-High	Medium	Medium	Low-Medium
Removal of protected trees or threatened plant species	Medium	Low-Medium	Low-Medium	Low-Medium
Establishment of Aliens and Weeds	Low	Low	Low	Low
Dust	Low	Low	Low	Low
General for all vertebrate fauna	Medium	Low-Medium	Medium	Low-Medium
Mammals	Medium	Low-Medium	Low-Medium	Low-Medium
Birds	Low-Medium	Low	Low-Medium	Low
Herpetofauna	Medium	Medium	Medium	Medium

In terms of terrestrial ecology, the following points are emphasized:

- Messina Mopane Bushveld, located in Limpopo Province stretching over a very large area from the north of the Soutpansberg to the Limpopo River is a homogeneous bushveld type, totally dominated by

Colophospermum mopane, and with a relatively low plant species richness, as is confirmed by the Screening Tool results for this study site, as well as by the field study.

- The proposed photovoltaic power station site covers about 900 hectares, a very small fraction of the 23000 km^2 that Mopaneveld covers in in South Africa (Du Plessis 2001). A total of 550000 km^2 of this vegetation type occurs over eight southern African countries (Siebert *et al* . 2003). It is acknowledged that great biological and ecological variation occur the extent of Mopaneveld.
- The vegetation on the proposed sites is primary mopane bushveld, with little signs of disturbance, but with signs of some overutilization over many years, resulting in considerable densification of the woody layer and the associated exclusion of many other species by the very dense *Colophospermum mopane*. This also contributes to relatively low grazing capacity, and the scarcity and even absence of medium to large herbivore populations. Although there is adequate habitat for many smaller fauna species, they are secretive and confined to very specific habitat sites and are not easily observed.
- The field survey revealed five plant communities *Colophospermum mopane* Dense Bushveld, *Colophospermum mopane* Open Bushveld, *Colophospermum mopane* Plains Bushveld , Ridge Bushveld and Drainage Lines. The construction phase of the proposed development will have Medium-High significance, without mitigation, on the vegetation and flora of these plant communities. Proposed mitigation measures may reduce the significance to Medium. Mitigation during the operational phase my reduce the impact significance to Low-Medium.
- The drainage line are very shallow, almost not observable and the vegetation is continuous with the adjacent terrestrial vegetation, without a definite riparian area. It is therefore suggested that the drainage lines do not need to be excluded from the adjacent development, as it will not influence drainage significantly.
- An aspect that may need attention is the protection of the protected trees on the sire, particularly *Adansonia digitata* (baobab) but also *Sclerocarya birrea* (marula) and *Boscia albitrunca*. A permit is needed to cut or remove protected trees. Young individuals of baobab and marula may be successfully transplanted, but not *Boscia albitrunca*.
- It is suggested to protect these trees as far as possible (particularly in the southern part of the site, where several individuals occur). If not possible, apply for permits to remove or transplant. Develop a nursery to cultivate protected trees to plant at suitable habitats in Mopaneveld.
- Larger fauna and birds will generally move away, so there will be little, or no fauna left on the site during the construction and operational phases. The significance of the impacts on fauna is generally Medium to Low-Medium as they will ether move away, or killed in the case of smaller fauna species, e.g. snakes, lizards or mice etc.

Table 34: Potential impacts and significance rating of the proposed project on biodiversity aspects

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
Construction Phase									
Vegetation and Flora									
Removal of vegetation and plant species in the *Colophospermum mopane* Dense Bushveld. This area covers 394 ha	**2**	**3**	**5**	**5**	**4**	**60 Medium-High**	• A control of access should be implemented for all remaining natural areas, to prevent unnecessary destruction of habitats or disturbance of species. • No unnecessary fragmentation should occur. All roads should be clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads. • The vegetation removal during the construction phase should be controlled, very specific and the clearance area kept as small as possible. • Continuous rehabilitation of the areas impacted which are outside of the development footprint should occur during construction, where re-vegetation practices should be prioritised. • Damage to protected tree species should be avoided as far as possible. If any protected species will be disturbed the relevant permits must be obtained. The feasibility of relocation / replanting of	0,8	**48 Medium**
Removal of vegetation and plant species in in the *Colophospermum mopane* Open Bushveld. This area covers 353 ha	**2**	**3**	**5**	**5**	**5**	**75 Medium-High**		0,8	**60 Medium-High**
Removal of vegetation and plant species in in the Colophospermum mopane Plains Bushveld on washes. This area covers only 55 ha.	**2**	**3**	**5**	**5**	**5**	**75 Medium-High**		0.6	**45 Medium-Low**
Destruction of vegetation and plant species in Drainage Lines. Drainage lines cover 52 ha.	**2**	**3**	**5**	**4**	**5**	**70 Medium-High**		0,8	**56 Medium**
Destruction of vegetation and plant species on Ridge Bushveld . This area covers only 43 ha.	**2**	**3**	**5**	**4**	**5**	**70 Medium-High**		0.8	**56 Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
Removal of protected trees or other threatened plant species, i.e. *Adansonia digitata, Sclerocarya birrea, Boscia albitrunca, Boscia foetida*	**2**	**3**	**5**	**4**	**4**	**56 Medium**	protected trees in designated open spaces must be prioritised. • Develop nursery to cultivate protected trees to plant at suitable habitats in Mopaneveld • Alien and invasive plant species management plan for continued control of weed species • Control dust emissions via wetting of roads and material transfer points. • Development and disturbance in Ridge bushveld and drainage lines should be avoided as far as possible.	0,6	**34 Low-Medium**
Increase in encroacher and weed species in all disturbed areas	**2**	**4**	**1**	**5**	**1**	**12 Low**		0,4	**5 Low**
Dust settling on remaining vegetation	**2**	**4**	**1**	**3**	**1**	**10 Low**		0,4	**4 Low**
Fauna									
Clearing of land for mining activities, destruction of faunal habitats and potential pollution of the soil and water.	**3**	**2**	**5**	**5**	**3**	**45 Medium**	• A control of access should be implemented for all remaining natural areas, to prevent unnecessary destruction of habitats or disturbance of species. • No unnecessary fragmentation should occur. All roads should be clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads. • The vegetation removal during the construction phase should be controlled, very specific and the clearance area kept as small as possible.	0,6	**27 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
							• Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment.		
Mammal species can be encountered or exposed during the construction phase. Though larger species may escape to surrounding natural areas, smaller species will probably perish.	2	2	5	5	3	**42 Medium**	If any mammal species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity.	0,8	**34 Low-Medium**
Breeding birds can be disturbed during the construction phase. Most bird species will probably fly away to surrounding natural areas, but will be lost for the developing areas.	2	2	3	5	2	**24 Low-Medium**	Most birds will leave the development area due to anthropogenically factors. Allow enough time for them to fly to other areas.	0,8	**19 Low**
Herpetofauna species can be encountered or exposed during the construction phase. Most species will not be able to escape	2	2	3	3	4	**40 Medium**	Prevent the pollution of any water sources, because most amphibians and some reptiles are dependent on these habitats.	0,8	**32 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
and will perish in the developing areas.									
Movement of construction vehicles and machinery, staff presence and activities, noise, associated pollution of water or solid wastes, fires, excessive dust will be negative for almost all vertebrate's, long-term survival.	3	2	5	5	4	**60 Medium-High**	• Prevent spillage of construction material and other pollutants, contain and treat any spillages immediately. Strictly prohibit any pollution /littering. • Ensure there is a method statement in place to remedy any accidental spillages immediately. • Restrict waste to designated footprint areas • No open fires for any purposes, unless in specifically designated and secured areas. • Any outside lighting (e.g. for security) should be designed to minimise impacts on fauna. All outside lighting should be directed away from sensitive areas. Fluorescent and mercury vapour lighting should be avoided, and sodium vapour (yellow) lights should be used wherever possible. This will minimise the attraction of invertebrates that fly at night being attracted to and killed by light. These insects also attract insectivores and their predators.	0,8	**48 Medium**
Direct impact on fauna: hunting, poaching, snaring, killing of fauna species	2	2	5	5	3	**42 Medium**	• The development management and contractors must ensure that no animals are disturbed, trapped, hunted or killed during the construction phase. Conservation -orientated clauses should be built into	0,8	**34 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
							contracts for construction personnel, complete with penalty clauses for non-compliant. With education and awareness programs, the impact can be kept to a minimum. • Cordon off areas between the footprint areas where natural vegetation remains intact as no-go areas. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access where needed.		
Killing of snakes, lizards and frogs **Herpetofauna** species can be encountered or exposed during the construction phase. Most species will not be able to escape and will perish in the developing areas.	2	2	5	5	4	**56 Medium-High**	• If any herpetological species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. However, it is not required to employ a herpetologist to oversee the removal of any herpetofauna during the initial ground-clearing phase of construction (i.e. initial ground-breaking by earthmoving equipment).	0,8	**45 Medium**
Operational Phase									
Vegetation and Flora									
Removal of vegetation and plant species in the *Colophospermum mopane* Dense Bushveld. This area covers 125 ha	**2**	**5**	**3**	**5**	**2**	**30 Low-Medium**	• A control of access should be implemented for all remaining natural areas, to prevent unnecessary destruction of habitats or disturbance of species.	0,8	**24 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
Removal of vegetation and plant species in in the *Colophospermum mopane* Open Bushveld on arenite. This area covers 161 ha	**1**	**5**	**3**	**5**	**3**	**42 Medium**	• No unnecessary fragmentation should occur. All roads should be clearly demarcated and kept to without any exceptions. No vehicles or personnel are permitted outside of these demarcated roads. • Continuous rehabilitation of the areas impacted which are outside of the development footprint should occur, where re-vegetation practices should be prioritised. • Damage to protected tree species should be avoided as far as possible. If any protected species will be disturbed the relevant permits must be obtained. The feasibility of relocation / replanting of protected trees in designated open spaces must be prioritised. • Develop nursery to cultivate protected trees to plant at suitable habitats in Mopaneveld • Alien and invasive plant species management plan for continued control of weed species • Control dust emissions via wetting of roads and material transfer points. • Development and disturbance in Ridge bushveld and drainage lines should be avoided as far as possible.	0,8	**34 Low-Medium**
Removal of vegetation and plant species in in the *Colophospermum mopane* Plains Bushveld on washes. This area covers only 55 ha.	**2**	**5**	**1**	**1**	**1**	**9 Low**		1	**9 Low**
Destruction of vegetation and plant species in Drainage Lines. Drainage lines cover 27 ha.	**2**	**5**	**5**	**5**	**4**	**68 Medium-High**		0,8	**54 Medium**
Destruction of vegetation and plant species on Ridge Bushveld . This area covers only 43 ha.	**1**	**5**	**3**	**3**	**4**	**48 Low-Medium**		0,8	**38 Low-Medium**
Removal of protected trees or other threatened plant species. *Adansonia digitata Sclerocarya birrea, Boscia albitrunca, Boscia foetida* may occur on the development sites. These individuals may be killed and destroyed	**2**	**5**	**3**	**3**	**3**	**39 Low-Medium**		0,6	**23 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
Increase in encroacher and weed species in all disturbed areas	**2**	**4**	**1**	**5**	**1**	**12 Low**		0,4	**5 Low**
Dust settling on remaining vegetation	2	4	1	3	1	**10 Low**		0,6	**6 Low**
Fauna									
Movement of vehicles and machinery, staff presence and activities over the entire site area, noise, associated pollution of water or solid wastes, excessive dust. This will be negative for almost all vertebrate's, long-term survival over the entire area. Certain species become proportionally rare or even become locally extinct	2	5	4	5	3	**48 Medium**	• Prevent spillage of construction material and other pollutants, contain and treat any spillages immediately. Strictly prohibit any pollution /littering. • Ensure there is a method statement in place to remedy any accidental spillages immediately. • Restrict waste to designated footprint areas • No open fires for any purposes, unless in specifically designated and secured areas. • Any outside lighting (e.g. for security) should be designed to minimise impacts on fauna. All outside lighting should be directed away from sensitive areas. Fluorescent and mercury vapour lighting should be avoided, and sodium vapour (yellow) lights should be used wherever possible. This will minimise the attraction of invertebrates that fly at night being attracted to and killed by light. These insects also attract insectivores and their predators.	0,8	**38 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
Mammals This will be negative for any of the mammal species that may still occur in the possible natural areas that may remain intact between development areas,	2	5	4	5	2	**32 Low-Medium**	• The development management and contractors must ensure that no animals are disturbed, trapped, hunted or killed during the operational phase. Conservation -orientated clauses should be built into contracts for construction personnel, complete with penalty clauses for non-compliant. With education and awareness programs, the impact can be kept to a minimum. • Cordon off areas between the footprint areas where natural vegetation remains intact as no-go areas. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access where needed. • Any outside lighting (e.g. for security) should be designed to minimise impacts on fauna. All outside lighting should be directed away from sensitive areas. Fluorescent and mercury vapour lighting should be avoided, and sodium vapour (yellow) lights should be used wherever possible. This will minimise the attraction of invertebrates that fly at night being attracted to and killed by light. These insects also attract insectivores and their predators.	0,8	**26 Low-Medium**
Birds: Should natural vegetation that remained intact between developed areas, some bird species will remain. Most of the threatened species will not remain but rather move to surrounding areas,	2	2	3	5	2	**24 Low-Medium**		0,8	**19 Low**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
Herpetofauna Many herpetofauna species, particularly snakes will be negatively impacted on during the operational phase, some of the lizards may survive in patches of remaining natural vegetation.	2	2	5	5	4	**56 Medium**	• If any herpetological species are encountered or exposed during the construction phase, they should be removed and relocated to natural areas in the vicinity. However, it is not required to employ a herpetologist to oversee the removal of any herpetofauna during the initial ground-clearing phase of construction (i.e. initial ground-breaking by earthmoving equipment).	0,8	**45 Medium**
Decommission Phase									
Vegetation and Plant species									
Influence vegetation and plants on remaining natural vegetation due to demolishment and removal of infrastructure by heavy machinery, transport by heavy vehicles, presence of employees	1	3	3	4	2	**22 Low-Medium**	• A management plan for control of invasive/exotic plant species needs to be implemented. This will be ongoing until the end of the closure phase. • Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. • When closure is considered successful and rehabilitation complete, unnecessary fences should be lifted to restore larger foraging areas, especially for larger mammalian species within the area.	0,8	**18 Low**
Fauna									
Fauna (mammals, birds, herpetofauna) that may have remained on site will be	1	3	4	4	4	**48 Medium**	Fauna will normally move away from the demolishment activities. Take care that no fauna species be trapped caught or killed	0,8	**38 Low-Medium**

Potential Impact	Extent	Duration	Intensity	Probability	Weighting Factor	Significance Pre Mitigation	Mitigation measures	Mitigation Efficiency	Significance Post-Mitigation
negatively affected by the decommissioning of the mine due to the human disturbance, the presence and operation of vehicles and heavy machinery on the site and the noise generated.									

10. CONCLUSION

The results of this study indicate that the site area is not in a Critical Biodiversity Area but is located within an Ecological Support Area 1, which is basically the entire area east of the Musina town and which forms part of the Vhembe Biosphere Reserve.

No red data plant species occur, though three nationally protected trees *Adansonia digitata* (baobab) and *Sclerocarya birrea* (marula) and *Boscia albitrunca* and the provincially protected tree *Boscia foetida* occur on the site. *Adansonia digitata, Sclerocarya birrea* and *Boscia albitrunca* occur scattered over the site and it is not possible to exclude them from the development area.

Only the drainage lines have high ecological sensitivity but is very small and shallow and allocated High sensitivity.

The result of the Screening Tool for Plant Species Sensitivity indicates a Low Sensitivity. This is confirmed. However, the vegetation study resulted in the identification of six plant communities that could be mapped. This study indicates that the Mopane Woodland vegetation on the larger part of the site has medium to medium-low ecological sensitivity.

It is estimated that about 80 mammal species may from time to time occur on the site or in the vicinity of the site area. Of these species 13 are small rodents and 25 are bats. A total of 25 mammal species were observed on the site or on neighbouring farms. As is typical for Mopaneveld, the basal cover was relatively poor at the time of the site visit. Grasses and forbs were scanty but could, on a local scale, provide nourishment and cover for small terrestrial mammals. In general, the site area does not support presence of many species or high population densities for most of the larger or medium-sized mammal species.

The red data or protected species Aardvark, Brown hyaena, African Civet and Steenbok were observed on neighbouring farms (Bathusi Environmental Consulting 2018). The Southern African hedgehog, Honey badger and African weasel do occur in this quarter degree square and there is a possibility that these species may occasionally be found on the study site. Although generally rare, there is a small possibility that the Ground pangolin may from time to time occur on the site. Leopard, Serval and large Red Data antelopes such as Tsessebe, Roan antelope and Sable antelope may occur on nature reserves or game farms in the Mopaneveld region and may rarely visit the site area. It is also possible that South Africa galago, Aardwolf and Selous mongoose may rarely visit the study site. Due to the lack of rupicolous habitat on the study site, Mountain reedbuck and Grey rhebok do not occur on the site.

Roberts' marsh rat and Wild dog mentioned by the Screening Tool, do not occur on the site.

A conclusion is that the results of the Screening Tool for animals is disputed, the proposed development would not seriously affect the mammal populations of the Mopaneveld. The proposed development may be supported.

A total of 264 species are considered likely to occur at the site. However, according to SABAP 2 a total of only 70 species were recorded on this Pentad. A total of 28 Red-listed species potentially may occur at the site of

proposed development – these are the species that have been recorded in the area considered for the desktop study. Many of these can be ruled out based on habitat characteristics, but several species of significant conservation concern could potentially be present at the site occasionally. These include the vultures and raptors like African White-backed Vulture (*Critically Endangered*), Cape Vulture (*Endangered*), Bateleur (*Endangered*), Martial Eagle (*Endangered*), Tawny Eagle (*Endangered*), Verreauxs eagle (Vulnerable) and Lanner Falcon (*Vulnerable*). Species like the Secretarybird (*Vulnerable*) and European Roller (*Near Threatened*) may also occur on or near the site from time to time. In addition, the presence of the *Endangered* Southern Ground-hornbill cannot be ruled out.

The development of site should not affect the Bateleur or Tawny Eagle species survival as a species. From an avifaunal perspective, the conservation status of this site is low. At a broader spatial scale, the site is located in widespread mopane bushveld, therefore the ultimate impact of the development on birds is considered to be low and the development can be supported.

A high number of 99 reptile species may occur in this bushveld type where the study site is located. The presence of six reptile species was confirmed, but 41 more species have a high possibility to occur in the area.

Five of the seven listed threatened reptile species may occur in the area of the site:
Muller's velvet gecko's (*Homopholis mulleri*) status is *Vulnerable.* A high possibly exists that this species may occur on the site. The status of the Soutpansberg rock lizard (*Vhembelacerta rupicola*) is *Near Threatened.* This species occurs on rocky outcrops, scree slopes and bedrock in wooded savannah on or near the Soutpansberg Range and it is unlikely that this species occur on the study. The status of the Soutpansberg worm lizard (*Chirindia langi occidentalis*) is *Vulnerable*. This species is endemic to the low-lying areas of the Soutpansberg in northern Limpopo. A possibly exists that this species may occur on the sandy habitats on the site. The status of the Stripe-Bellied Legless Skink (*Acontias kgalagadi subtaeniatus*) is *Data Deficient,* and it is endemic to northern Limpopo Province in South Africa. A small possibly exists that this species may occur on the site

The Southern African python (*Python natalensis*) does occur in the area.

A total of 18 amphibia species may from time to time occur on or in the vicinity of the study site. Five of these species were observed on a neighbouring farm. It is unlikely that the African Bullfrog will occur on the site or in the vicinity of the site. No further red listed amphibia species are expected to occur on the site.

The proposed development will not affect amphibia species.

The result of the Animal Theme Sensitivity indicates a Medium Sensitivity. In the natural Mopaneveld surrounding Mopane, and particularly in the nature reserves to the south, the general animal species sensitivity is medium or probably even high. However, within the Mopane area *Lycaon pictus* (Wild dog) and Roberts' marsh rat have not been seen or recorded for several years. The medium sensitivity for animal species can be only partially confirmed, as the particular study site rather exhibits Low sensitivity for animal species in general but specifically for *Lycaon pictus* (Wild dog) and Roberts' marsh rat. The result of the Screening Tool for animal species sensitivity is therefore disputed.

The Screening Tool results indicate very high Terrestrial Biodiversity Sensitivity. This is caused by the Ecological Support Area 1, which is basically the entire area east and south off the Musina town and which forms part of

the Vhembe Biosphere Reserve and is therefore disputed for the site. The medium animal species sensitivity is also disputed, as the two animal species mentioned by the screening tool, wild dog and leopard do not occur on or close to the site.

The low aquatic biodiversity sensitivity and low plant species sensitivity is confirmed.

It is suggested that the proposed development be supported.

11. REFERENCES

Acocks, J.P.H. 1988. Veld types of South Africa, 3rd ed. *Memoirs of the Botanical Survey of South Africa.* **57**: 1–146.

Alexander, G. 2014. *Python natalensis* (A, Smith, 1840). In Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & De Villiers, M.S. (eds). 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. *Suricata* 1. South African National Biodiversity Institute, Pretoria.

Alexander, G. & Marais J. 2007. *A Guide to the Reptiles of Southern Africa*. Struik Publishers, Cape Town 408pp.

Apps, P. 2012. *Smithers Mammals of Southern Africa. A Field Guide*. Struik Nature, Cape Town.

Barnes, K.N. (ed.). 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J. & De Villiers, M.S. (eds). 2014. Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. *Suricata* 1. South African National Biodiversity Institute, Pretoria.

Bathusi Environmental Consulting CC. 2018. Terrestrial biodiversity impact assessment for the proposed Mutsho power project near Makhado, Limpopo Province. Reference Number SVE-MSP 2018/07

Boycott, R.C. & Bourquin, O. 2000. *The Southern African Tortoise Book: A guide to Southern African Tortoises, Terrapins and Turtles*.

Branch, W.R. (Editor), August 1988. *South African Red Data Book – Reptiles and Amphibians*. S.A. National Scientific Programmes, Report No. 151, 244 pp.

Branch, W.R. 1998. *Field Guide to the Snakes and other Reptiles of Southern Africa*. 3rd edition. Struik Publishers, Cape Town. 399 pp., maps, 112 plates.

Branch, W.R. 2002. 'The Conservation Status of South Africa's threatened Reptiles': 89 – 103..In:- G.H. Verdoorn & J. le Roux (editors), 'The State of Southern Africa's Species', Proceedings of a conference held at the Rosebank Hotel, 4 – 7 September 2001. World Wildlife Fund.

Bredenkamp, G.J. & Brown, L.R. 2001. Vegetation – A reliable ecological basis for environmental planning. *Urban Greenfile* Nov-Dec 2001: 38-39.

Broadley, D.G. 1990. *FitzSimons' Snakes of Southern Africa*. Jonathan Ball & Ad Donker Publishers. 387pp.

Bromilow, C, (2010): Problem Plants of Southern Africa. Third edition, first impression Briza Publications, Pretoria.

Carruthers, V. & Du Preez L. 2011. Frogs & Frogging. Struik Nature, Cape Town. p108.

Carstens, M. (pers.comm). Resident of Erf 352.

Cawthorn, R.G., Eales, H.V., Walraven, F. , Uken, R.& Watkeys, M.K. 2006. The Bushveld Complex. In Johnsom, M.R., An haeusser, C.R. & Thomas, R.j. The geology of South African Council of Geoscience, Pretoria

Channing, A. 2001. *Amphibians of Central and Southern Africa*. Protea Bookhouse Pretoria. 470pp.

Child, M.F., Roxburgh, L., Do Linh San, E., Raimondo D., & Davies-Mostert, H.T. (eds) 2016. *The Red List of Mammals of South Africa, Swaziland and Lesotho, South African* National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Dekker, B. & Van Rooyen, N. 1995. The physical environment and plant communities of the Messina Experimental Farm. *S. Afr, J, Bot.* 61(3): 158-167.

De Moor I.J. & Bruton M.N. 1988. *Atlas of alien and translocated indigenous aquatic animals in southern Africa*. S.A. National Scientific Programmes, Report No. 144, 310pp.

Department of Environmental Affairs and Tourism. 2007. National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): Publication of Lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Notices.

Department of Environmental Affairs 2018 National Protected Areas Expansion Strategy for South Africa 2018.Pretoria.

Digby Wells Environmental. 2019. Environmental Impact Reporting Process for the Musina-Makhado Energy and Metallurgy Special Economic Zone Development: Fauna and Flora Impact Assessment. Project Number LEA 5517.

Du Plessis, F. 2001. A phytosociological synthesis of Mopaneveld. MSc thesis, University of Pretoria, Pretoria.

Du Preez L. & Carruthers V. 2017. *Frogs of Southern Africa A Complete Guide.* Struik Publishers, Cape Town. A biodiversity assessment of a part of the Farm Tovey 154 MS Musina, Limpopo Province.

EcoAgent CC, 2021. A biodiversity assessment of a part of the Farm Tovey 154 MS Musina, Limpopo Province. Report to Pierre Joubert Landscape Architect and Environmental Planner, Pretoria.

EnviroXellence, 2021, Environmental Impact Assessment report: for the Musina-Makhado Special Economic Zone, South Site. EnviroXellence, Centurion.

Friedman, Y. and Daly, B. (editors). 2004. *Red Data Book of the Mammals of South Africa: A Conservation Assessment*: CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust. South Africa.

Gertenbach, W,P.D. 1983. 'Plantekologiese studie van die suidelikste Mopaneveld in die Nasionale Krugerwildtuin. DSc tesis, Universiteit van Pretoria.

Harrison, J.A., Allan, D.G., Underhill, L.G., Herremans, M., Tree, A.J., Parker, V. & Brown, C.J. (eds.). 1997. The Atlas of Southern African Birds. Vol. 1 & 2. BirdLife South Africa, Johannesburg.

Henderson, L. 2001: Alien Weeds and Invasive Plants. A complete guide to declared weeds and invaders in South Africa. Plant Protection Research Institute Handbook No. 12. Agricultural Research Council, South Africa.

Hockey, P.A.R., Dean, W.R.J. & Ryan, P. (eds) 2005. *Roberts – Birds of Southern Africa*, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

Knobel, J, & Bredenkamp, G. 2006. *The Magnificent Natural Heritage of South Africa*. Sunbird Publishers, Roggebaai.

Limpopo Conservation Plan vs2, Ecosol.gis, 2013.

Limpopo Environmental Management Act No 7 of 2003.

Low, A.B. & Rebelo, A.G. (eds) 1996. Vegetation of South Africa, Lesotho and Swaziland. Dept Environmental Affairs & Tourism, Pretoria.

Marais, E. & Peacock, F. 2008. *The Chamberlain Guide to Birding Gauteng.* Mirafra Publishing, Centurion.

Measey, G.J. (ed.) 2011. Ensuring a future for South Africa's frogs: a strategy for conservation research. *SANBI Biodiversity Series* 19. South African National Biodiversity Institute, Pretoria.84pp.

Meester, J.A.J., Rautenbach, I.L., Dippenaar, N.J.& Baker, C.M. 1986. *Classification of Southern African Mammals*. Transvaal Museum Monograph No. 5. Transvaal Museum, Pretoria, RSA.

Mills, G. & Hes, L. 1997. *The complete book of Southern African Mammals*. Struik Winchester, Cape Town, RSA.

Minter, L.R., Burger, M., Harrison, J.A., Braack, H.H., Bishop, P.J. and Kloepfer, D. eds. 2004. *Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland*.SI/MAB Series #9. Smithsonian Institution, Washington, DC.

Mucina, L, & Rutherford, M.C. (eds.). 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria. (update 2017)

Mucina, L., Bredenkamp, G.J., Hoare, D.B. & McDonald, D.J. 2000. A National vegetation database for South Africa. South Africa Journal of Science 96:497-498.

Mueller-Dombois, D. & Ellenberg, H. 1974. Aims and methods of vegetation ecology. Wiley, New York.

Picker M. & Griffiths C. 2011. *Alien & Invasive Animals. A South African Perspective*. Struik Nature, Cape Town. P240.

Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C. Kamundi, D.A. & Manyama, P.A. (Eds.). 2009. Red list of South African plants 2009. Strelitzia 25: 1-668.

Rautenbach, I.L. 1982. Mammals of the Transvaal. Ecoplan Monograph No. 1. Pretoria, RSA.

SANBI & DEAT. 2009. Threatened Ecosystems in South Africa: Descriptions and Maps. DRAFT for Comment. South African National Biodiversity Institute, Pretoria, South Africa.

Siebert, F, Bredenkamp, G.J. & Siebert, S.J. 2003 A comparison of mopaneveld in South Africa, Namibia and Zimbabwe. *Bothalia 33,1 121-134.*

Sinclair, I., Hockey, P., Tarboton, W. & Ryan P. 2011. Sasol Birds of Southern Africa. 4th edition. Struik, Cape Town.

Skinner, J.D. & Chimimba, T.C. 2005. *The Mammals of the Southern African Subregion*. 3rd edition. Cambridge University Press.

Smithers, R.H.N. 1086. *South African Red Data Book – Terrestrial Mammals*. South African National Scientific Programmes Report No 125. p216.

Stalmans, M, Robinson, E. R. & Balkwill, K. 1999.ordination and classification of the vegetation of Songimvelo Nature Reserve in the Barberton Mountainland, South Africa, for the assessment of wildlife habitat distribution and quality. *Bothalia* 29:305-325.

Stuart, C. & Stuart, M. 2013. *A Field Guide to the Tracks & Signs of Southern, Central & East African Wildlife*. 4th edition. Struik Nature, Cape Town.

Stuart, C. & Stuart, M. 2015. Stuarts' Field Guide to Mammals of Southern Africa 5th edition. Struik Nature, Cape Town.

Tarboton, W.R., Kemp, M.I. & Kemp, A.C. 1987. *Birds of the Transvaal.* Transvaal Museum, Pretoria.

Taylor, M.R., Peacock, F. & Wanless, R.M. (eds). 2015. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa. Johannesburg, South Africa.

Tolley, K.A., Conradie, W. Pietersen, D.W. Weeber, J., Burger, M. & Alexsnder, G.J. (eds) 2023. Conservation status of the reptiles of South Africa, Eswatini and Lesotho. Suricata 10. South African Biodiversity Institute, Pretoria.

The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

The Environmental Impact Assessment Regulations, 2014 (Gazette No 38282 – Regulation 982).

The National Environment Management Act, 1998 (Act No. 107 of 1998).

The National Environmental Management Act (Act 107 of 1998) Amendment of the Environmental Impact Assessment Regulations 2014, 7 April 2017. (GNR. 324, 325, 326 & 327: Listing Notices 1, 2, 3).

The National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004). Government Gazette RSA Vol. 467, 26436, Cape Town, June 2004 and several later additions.

The National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004). Government Gazette RSA Vol. 467, 26436, Cape Town, June 2004.

The National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004). Draft List of Threatened Ecosystems. Government Gazette RSA Vol. 1477, 32689, Cape Town, 6 Nov 2009.

The National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004); Publication of Lists of Critically Endangered, Endangered, Vulnerable and Protected Species.

The National Forests Act, 2006 (Act 84 of 1998 as amended). Government Gazette RSA Vol. 897, 29062 , Cape Town, 8 Sept 2006.

The National Water Act 1998 (Act 36 of 1998).

The Natural Scientific Professions Act 2003 (No. 27 of 2003).

The Science and Technology Laws Amendment Act (Act 7 of 2014).

Van Rooyen, N., Theron, G.K. & Grobbelaar, N. 1981. A floristic description and structural analysis of the plant communities of the Punda Milia, Pafuri Wanbiya area in the Kruger National Park, Republic of South Africa 3: the *Colophospermum mopane* communities*. J.S. Afr. Bot:* 47:585-626.

Van Wyk, A.E. & Smith G.F. 2001. Regions of Floristic Endemism in Southern Africa. Umdaus Press, Pretoria.

Van Wyk, B., Van Oudshoorn B., & Gericke N. 2005: Medicinal Plant of South Africa. Briza Publications, Pretoria.

Van Wyk, J.C.P. 1998, Under Siege. Timid South African hedgehogs face many threats. *Afr. Wild*. 52(3):6-8.

Westhoff, V. & Van der Maarel, E. 1978. The Braun-Blanquet approach. In: Whittaker, R.H. (ed.) Classification of plant communities. W. Junk, The Hague.

Williams, V.L., Victor, J.E. & Crouch, N.R. 2013. Red listed medicinal plants of South Africa: Status, trends and assessment challenges. *South African Journal of Botany* 86: 23-35.

.

APPENDIX A: SPECIALISTS' CURRICULUM VITAE

ABRIDGED CURRICULUM VITAE: GEORGE JOHANNES BREDENKAMP

Born: 10 February 1946 in Johannesburg, South Africa.
Citizenship: South African

Present work address
Department of Botany, University of Pretoria, Pretoria, 0002, South Africa
Tel:(27)(12)420-3121 Fax: (27)(12)362 5099
E-Mail: gbredenk@postino.up.ac.za
or
EcoAgent CC
PO Box 25533, Monument Park, 0105, South Africa
Tel: (27)(12) 346 3180
Fax: (27)(12) 460 2525
Cell 082 5767046
E-Mail: ecoagent@mweb.co.za

Qualifications:
1963 Matriculation Certificate, Kemptonpark High School
1967 B.Sc. University of Pretoria, Botany and Zoology as majors,
1968 B.Sc. Hons. (cum laude) University of Pretoria, Botany.
1969 T.H.E.D. (cum laude) Pretoria Teachers Training College.
1975 M.Sc. University of Pretoria, Plant Ecology .
1982 D.Sc. (Ph.D.) University of Pretoria, Plant Ecology.

Theses: (M.Sc. and D.Sc.) on plant community ecology and wildlife management in nature reserves in South African grassland and savanna.

Professional titles:
- MSAIE South African Institute of Ecologists and Environmental Scientists
  - 1989-1990 Council member
- MGSSA Grassland Society of Southern Africa
  - 1986 Elected as Sub-editor for the Journal
  - 1986-1989 Serve on the Editorial Board of the Journal
  - - 1990 Organising Committee: International Conference: Meeting Rangeland challenges in Southern Africa
  - 1993 Elected as professional member
- PrSciNat. South African Council for Natural Scientific Professions **Registration Number 400086/83**
  - 1993-1997 **Chairman** of the Professional Advisory Committee: Botanical Sciences
  - 1993-1997: **Council** Member
  - 1992-1994: Publicity Committee
  - 1994-1997: Professional Registration Committee

Professional career:

- Teacher in Biology 1970-1973 in Transvaal Schools
- Lecturer and senior lecturer in Botany 1974-1983 at University of the North
- Associate professor in Plant Ecology 1984-1988 at Potchefstroom University for CHE
- Professor in Plant Ecology 1988-2008 at University of Pretoria.
- 2009 – current Professor Extra-ordinary in the Dept of Plant Science, University of Pretoria
- • Founder and owner of the Professional Ecological Consultancy firms Ecotrust Environmental Services CC and Eco-Agent CC, 1988-present.

Academic career:

• Students:

- Completed post graduate students: M.Sc. 53; Ph.D. 14.
- Presently enrolled post-graduate students: M.Sc. 4; Ph.D. 2.

• Author of:

- 175 scientific papers in refereed journals
- >150 papers at national and international congresses
- >250 scientific (unpublished) reports on environment and natural resources
- 17 popular scientific papers.
- 39 contributions in books

• Editorial Committee of

- South African Journal of Botany,
- Journal Grassland Society of Southern Africa,
- Bulletin of the South African Institute of Ecologists.
- Journal of Applied Vegetation Science.(Sweden)
- Phytocoenologia (Germany)

• FRD evaluation category: C2 (=leader in South Africa in the field of Vegetation Science/Plant Ecology)

Membership:

• International Association of Vegetation Science.
• British Ecological Society
• International Society for Ecology (Intecol)
• Association for the Taxonomic study of the Flora of Tropical Africa (AETFAT).
• South African Association of Botanists (SAAB)

1988-1993 Elected to the **Council** of SAAB.
1989-1990 Elected as **Chairman** of the Northern Transvaal Branch
1990 Elected to the Executive Council as **Vice-President**
1990- Sub-editor Editorial Board of the Journal
1991-1992 Elected as **President** (2-year period)
1993 **Vice-President** and Outgoing President

• Wildlife Management Society of Southern Africa
• Suid-Afrikaanse Akademie vir Wetenskap en Kuns

(=South African Academy for Science and Art).

- Wildlife Society of Southern Africa
  - 1975 - 1988: Member
  - 1975 - 1983: Committee member, Pietersburg Centre
  - 1981 - 1982: **Chairman**, Pietersburg Centre
- Dendrological Society of Southern Africa
  - 1984 - present: Member
  - 1984 - 1988: Committee member, Western Transvaal Branch
  - 1986 - 1988: **Chairman**, Western Transvaal Branch
  - 1987 - 1989: Member, Central Committee (National level)
  - 1990 - 2000: Examination Committee
- Succulent Society of South Africa
  - 1987 - 2000
- Botanical Society of South Africa
  - 2000 – present: Member
  - 2001- 2008: Chairman, Pretoria Branch
  - 2002 – 2006: Chairman, Northern Region Conservation Committee
  - 2002- 2007: Member of Council

Special committees:

- Member of 10 special committees re ecology, botany, rangeland science in South Africa.
- Member of the International Code for Syntaxonomical Nomenclature 1993-present.

Merit awards and research grants:

1968 Post graduate merit bursary, CSIR, Pretoria.
1977-1979 Research Grant, Committee re Research Development, Dept. of Co-operation and Development, Pretoria.
1984-1989 Research Grant, Foundation for Research Development, CSIR, Pretoria.
1986-1987 Research Grant, Dept. of Agriculture and Water Supply, Potchefstroom.
1990-1997 Research Grant, Dept. of Environmental Affairs & Tourism, Pretoria.
1991-present Research Grant, National Research Foundation , Pretoria.
1991-1993 Research Grant, Water Research Commission.
1999-2003 Research Grant, Water Research Commission.
2006 South African Association of Botanists Silver Medal for outstanding contributions to South African Botany

Abroad:

1986 Travel Grant, Potchefstroom University for Christian Higher Education, Potchefstroom
Visits to Israel, Italy, Germany, United Kingdom, Portugal.
1987 Travel Grant, Potchefstroom University for Christian Higher Education, Potchefstroom.
Visits to Germany, Switzerland, Austria, The Netherlands, United Kingdom.
1990 Travel Grant, FRD.
Visit to Japan, Taiwan, Hong-Kong.
1991 Travel Grant, FRD.
Visits to Italy, Germany. Switzerland, Austria, France, The Netherlands, United Kingdom.

1993 Travel Grant, University of Pretoria.
Visits to the USA, Costa Rica, Czech Republic, Austria.
1994 Travel Grant FRD.
Visits to Switzerland, The Netherlands, Germany, Czech Republic.
1995 Travel Grant FRD, University of Pretoria
Visits to the USA
1996 Travel Grant, University of Pretoria
Visit to the UK.
1997 Travel Grant University of Pretoria, Visit Czech Republic, Bulgaria
1998 Travel Grant, University of Pretoria, Visit Czech Republic, Italy, Sweden
1999 Travel Grant, University of Pretoria, Visit Hungary, Spain, USA
2000 Travel Grant, University of Pretoria, Visit Poland, Italy, Greece.
2001 Travel Grant, NRF, Visit Brazil
2006 German Grant Invited lecture in Rinteln, Germany

Consultant

Founder and owner of Ecotrust Environmental Services CC and Eco-Agent CC
Since 1988 **>250** reports as consultant on environmental matters, including:

- Game Farm and Nature Reserve planning,
- Environmental Impact Assessments,
- Environmental Management Programme Reports,
- Vegetation Surveys,
- Wildlife Management,
- Veld Condition and Grazing Capacity Assessments,
- Red data analysis (plants and animals).

ABRIDGED CURRICULUM VITAE: JACOBUS CASPARUS PETRUS VAN WYK

Identity number 680804 5041 08 4
Date of birth 4 August 1968
Nationality South African
Postal address P.O. Box 25085, Monument Park, Pretoria, 0105.
Tel no +27 12 347 6502, Cell +27 82 410 8871
E-mail **jcpvanwyk@absamail.co.za**

Present position Co-Department Head, Environmental Education & Life Sciences, Hoërskool Waterkloof

Consultant Specialist Environmental Assessments, EIAs, writing, photo-recording

Qualifications **B.Sc**. (U.F.S.) **B.Sc. (Hon.)** (U.F.S.), **H.E.D** (U.O.F.S.), **M.Sc.** (U.F.S.)

Honours Foundation of Research Development bursary holder
Professional Natural Scientist (Zoology) – S.A Council for Natural Scientific Professions, Registration # 400062/09

Notable Research Contribution In-depth field study of the giant bullfrog

Formal Courses Attended Outcomes Based Education, University of the South Africa (2002)
Introductory Evolution, University of the Witwatersrand (2008)
OBE, GET & FET training, 2002-2008, Education Department

Employment history

Since 2009 I have been registered as a Professional Natural Scientist (Reg. no 400062/09) at the South African Council for Natural Scientific Professions in Zoological Science, specialising in Herpetology, Mammalogy and Vertebrates in general. To date I have completed approximately 210 impact assessments for various environmental practitioners

2000 – Present Co-Department Head for Environmental Education & Life Sciences, Hoërskool Waterkloof, Pretoria.

1995 - 1999 Teaching Biology (Grades 8 – 12) and Physics / Chemistry (Grades 8 – 9) at the Wilgerivier High School, Free State. Duties included teaching, mid-level management and administration.

July 1994 – Dec 1994 Teaching Botany practical tutorials to 1st year students at the Botany & Zoology Department of the Qwa-Qwa campus of the University of Free State, plant collecting, amphibian research

1993 - 1994 Mammal Research Institute (University of Pretoria) research associate on the Prince Edward Islands: topics field biology and population dynamics of invasive alien rodents, three indigenous seals, invertebrate assemblages, censussing king penguin chicks and lesser sheathbills, and marine pollution

1991 - 1993 Laboratory demonstrator for Zoological and Entomological practical tutorials, and caring for live research material, University of the Free State

1986 - 1990 Wildlife management and eco-guiding, Mt. Everest Game Farm, Harrismith

Professional Achievement Research: Author and co-author of 52 scientific publications in peer-reviewed and popular subject journals, and 210 contractual EIA research reports. Extensive field work and laboratory experience in Africa

Public Recognition: Public speaking *inter alia* radio talks, TV appearances