FAUNAL, FLORAL, WETLAND AND AQUATIC ECOLOGICAL ASSESSMENT AS PART OF THE ENVIRONMENTAL ASSESSMENT AND AUTHORISATION PROCESS FOR A PROPOSED COAL MINE ON THE REMAINING EXTENT OF THE FARM THE DUEL 186 MT, LIMPOPO PROVINCE

Prepared for

Jacana Environmentals CC

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Section C: Faunal Assessment

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DOCUMENT GUIDE

The Document Guide below is for reference to the procedural requirements for environmental authorisation applications in accordance to GN267 of 24 March 2017, as it pertains to the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA);

No.	Requirement	Section in report
a)	Details of -	
(i)	The specialist who prepared the report	Section A: Appendix D
(ii)	The expertise of that specialist to compile a specialist report including a curriculum vitae	Section A: Appendix D
b)	A declaration that the specialist is independent	Section A: Appendix D
c)	An indication of the scope of, and the purpose for which, the report was prepared	Section 1
cA)	An indication of the quality and age of base data used for the specialist report	Section A
cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change	Section 5
d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment	Section 2.1
e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used	Appendix A and B
f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives	Section 3 and 4
g)	An identification of any areas to be avoided, including buffers	Section 4
h)	A map superimposing the activity including the associated structure and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Section 4
i)	A description of any assumption made and any uncertainties or gaps in knowledge	Section 1.2
j)	A description the findings and potential implication\s of such findings on the impact of the proposed activity, including identified alternatives on the environment or activities	Section 5
k)	Any mitigation measures for inclusion in the EMPr	Section 5
l)	Any conditions for inclusion in the environmental authorisation	Section 5
m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	Section 5
n)	A reasoned opinion -	
(i)	As to whether the proposed activity, activities or portions thereof should be authorised	Section 5
(iA)	Regarding the acceptability of the proposed activity or activities	Section 5
(ii)	If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	Section 5
o)	A description of any consultation process that was undertaken during the course of preparing the specialist report	N/A
p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q)	Any other information requested by the competent authority	N/A

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ACRONYMS

Ad mon	Additional Monitoring
EIS	Ecological Importance and Sensitivity
EN	Endangered
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information System
GPS	Global Positioning System
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
LC	Least Concern
NT	Near Threatened
NYBA	Not yet been assessed
PES	Present Ecological State
POC	Probability of Occurrence
QDS	Quarter Degree Squares
SABAP	Southern African Bird Atlas
SCC	Species of Conservation Concern
STS	Scientific Terrestrial Services
VU	Vulnerable

1. INTRODUCTION

1.1 Background

Scientific Terrestrial Services (STS) was appointed to update the findings from a faunal assessment undertaken in 2015 by Scientific Aquatic Services and conduct a faunal and floral ecological assessment as part of the Environmental Assessment and Authorisation process for a proposed coal mine on the remaining extent of the farm The Duel 186 MT, Limpopo Province, hereafter referred to as "study area" (Figure 1, Section A: Figures 1 and 2).

The N1 between Musina, located to the west the study area, meets the R525 regional road that reaches the village of Tshipise, north of the study area. The Nzhelele Nature Reserve is situated west of the study area. The land coverage in the vicinity and within the study area is mixed between rural settlement, hunting lodges and ecotourism. Some of the properties in the area are also focused on mixed farming, including livestock, game and irrigated agriculture. Hunting, game trading and eco-tourism is an established socio-economic driver in the area. There are a number of properties utilised for conventional and trophy hunting with ecotourism spin-off activities.

The purpose of this report is to define the faunal ecology of the study area, map and define areas of increased Ecological Importance and Sensitivity (EIS) and to define the Present Ecological State (PES) of the study area. The objective of this study:

- To provide inventories of faunal species as encountered within the study area;
- To determine and describe habitat types, communities and the ecological state of the study area and to rank each habitat type based on conservation importance and ecological sensitivity;
- To identify and consider all sensitive landscapes including rocky ridges, wetlands and/ or any other special features;
- To conduct a Red Data Listed (RDL) species assessment as well as an assessment of other Species of Conservation Concern (SCC), including potential for such species to occur within the study area;
- To provide detailed information to guide the activities associated with the proposed development activities associated within the study area; and
- To ensure the ongoing functioning of the ecosystem in such a way as to support local and regional conservation requirements and the provision of ecological services in the local area.

1.2 Project Description

Subiflex (Pty) Ltd holds a Prospecting Right on the farms Lotsieus 176 MT, Kranspoort 180 MT, Nairobi 181 MT and The Duel 186 MT within the Limpopo Province. It is proposed that mining of coal on the Remaining Extent of The Duel 186 MT (i.e. the study area) using a combination of underground (long-wall methodology[1]) and open cast (conventional drill and blast operation with truck and shovel, load and haul) mining methods. The expected life of mine (LoM) is 24 years.

Mining of the Open Pit (Figure 3) will form part of the first operations, whereas the underground mining is planned to commence from year 10, continuing for five years. Selected positions within the Open Pit will be used to gain access for underground mining areas and upon completion, all access points will be closed. After surface and underground mining activities have been completed, the underground areas will be closed followed by the final rehabilitation of the open pit.

The proposed infrastructure to be developed includes (Figure 1):

- A Coal Handling Processing Plant;
- An Overburden Waste Dump;
- A Temporary Discard Dump;
- Haul roads;
- Pollution Control Dams;
- Raw water storage facility and distribution systems;
- Access roads; and
- Auxiliary infrastructure including a workshop, store, office and change house, electrical power supply and security fencing.

The final discard material from the plant will be disposed of in the mined-out open pit. If the pit is unavailable due to existing mining activities, the discard material will be placed on an interim surface discard dump, from where it will be reclaimed and dumped into the mined-out open pit towards the end of the mine life as part of the rehabilitation of the mining site.

[1] "Long-wall mining recovers and extracts a high percentage of the coal and can be very costly. It involves the full extraction of coal from a section of the seam or face using mechanical shearers (WCI, 2009)." Shongwe Bonisile Nolwando Master's Thesis (2018): The Impact of Coal Mining on the Environment and Community Quality of Life: A Case Study Investigation of the Impacts and Conflicts Associated with Coal Mining in the Mpumalanga Province, South Africa.

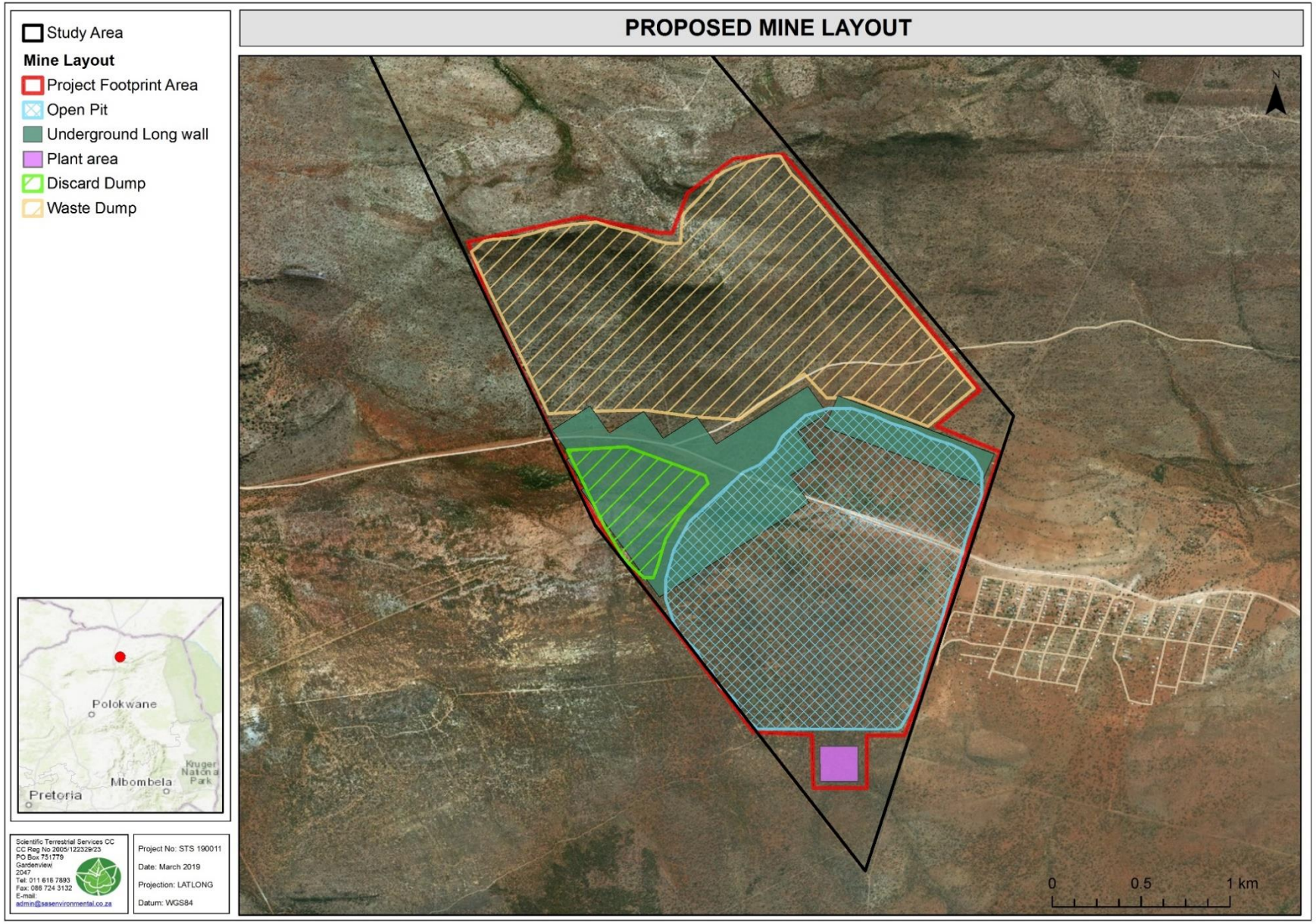


Figure 1: The proposed mine layout within the study area.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The faunal assessment is confined to the study area and does not include the neighboring and adjacent properties; these were however considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management;
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary;
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the study area may therefore have been missed during the assessment; and
- As part of the assessment update to the 2015 field investigations, a second field investigation was undertaken from the 26th to the 28th of February 2019, to determine the ecological status of the study area, and to “ground-truth” the results of the desktop assessment. Furthermore, to the findings from the 2015 investigation were verified and updated the results of previous work within the study area. A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was significantly augmented with all available data from desktop sources, previous work undertakenby SAS Environmental in the area and specialist experience in the area. The findings of this assessment are considered to be an accurate reflection of the ecological characteristics associated with the study area.

2 ASSESSMENT APPROACH

Initial field assessments were undertaken during February 2015 by Scientific Aquatic Services, in order to determine the ecological status of the study area. To provide updated information of the floral ecology associated with the study area, a second field assessment was undertaken from the 26th to the 28th of February 2019.

During the 2015 field assessment, a reconnaissance 'walkabout' was undertaken to determine the general habitat types found throughout the study area. Following this, specific study sites were selected that were considered to be representative of the habitats found within the area, with special emphasis being placed on areas that may potentially support faunal SCC – particularly within the areas where infrastructure is proposed. Sites were investigated on foot in order to identify the occurrence of the dominant faunal species and diversities. As part of the 2019 field assessment, a similar approach was undertaken where the habitat units identified during the 2015 assessment were reassessed on foot, with the focus on infrastructure areas and areas with potential gaps.

2.1 General approach

In order to accurately determine the PES of the focus area and capture comprehensive data with respect to faunal taxa, the following methodology was used:

- Maps and digital satellite images were consulted prior to the field assessment in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on-site assessment of the study area was made in order to confirm the assumptions made during consultation of the digital satellite images;
- A literature review with respect to habitats, vegetation types and species distribution was conducted;
- Relevant databases considered during the assessment of the focus area included the South African National Biodiversity Institute (SANBI) Threatened species programme (TSP), Threatened or Protected Species (TOPS) of NEMBA, Pretoria Computer Information Systems (PRECIS), South African Bird Atlas Project 2 (SABAP2), International Union for Conservation of Nature (IUCN), South Africa Protected Area Database (SAPAD), and National Biodiversity Assessment (NBA);
- Specific methodologies for the assessment, in terms of field work and data analysis of faunal ecological assemblages are presented in Appendix A of this report; and
- For the methodologies relating to the impact assessment and development of the mitigation measure, please refer to Section 5 of this report.

2.2 Sensitivity Mapping

All the ecological features associated with the focus area were considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of a Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto digital satellite imagery and/or topographic maps. The sensitivity map should guide the final design and layout of the proposed development activities.

3 FAUNAL FIELD ASSESSMENT RESULTS

3.1 Faunal Habitat

The Study Area is comprised of three faunal habitat units, namely the Soutpansberg Mountain Bushveld, Mopane Bushveld and the Freshwater habitat unit (Refer to Figure 5 below for visual representation) . These habitat units are discussed briefly in terms of faunal utilisation and importance below.

Soutpansberg Mountain Bushveld

The Soutpansberg Mountain bushveld is situated alond the central and southern extent of the study area. This habitat unit is generally comprised of mountainous regions, with grasses dominant and trees scattered throughout. Low levels of anthropogenic activities are associated with this habitat unit with ecotourism and game farming forming the main land uses. For a detailed description of this habitat unit refer to the report Section A: Background Information.

Figure 2: Visual representation of the Soutpansberg Mountain Bushveld habitat unit.

Mopane Bushveld

The Mopane Bushveld is situated in the northern extremes of the study area and a wide belt occurs in the southern sections of the study area. This habitat unit is mainly comprised of mopane thicket with very sparce undergrowth. Low levels of anthropogenic activities are associated with this habitat unit, with ecotourism and game farms forming the main surrounding land uses. For a detailed description of this habitat unit refer to the report Section A:Summary and Background Information .

Figure 3: Visual representation of the Mopane Bushveld Habitat Unit.

Freshwater Habitat Unit

The main feature of the freshwater habitat unit is in the form of the non-perennial Mutamba River which traverses the northern section of the study area. Multiple event driven episodic drainage lines are situated in the south of the study area which promote the movement of predatory faunal species. Anthropogenic activities associated with this habitat unit include low cost housing in the south of the study area and ecotourist,/game farming north of the study area. For a detailed descriptions of the freshwater resources refer to the report Section D: Freshwater Resource Assessment.

Figure 4: Visual Representation of the Freshwater Habitat Unit.

Tables one (1) through six (6) provide a summary of the findings for each of the faunal classes assessed, associated with the stud area with the aim of providing cogent summaries of all

relevant findings to assist the reader in formulating an opinion on the faunal ecology of the area.

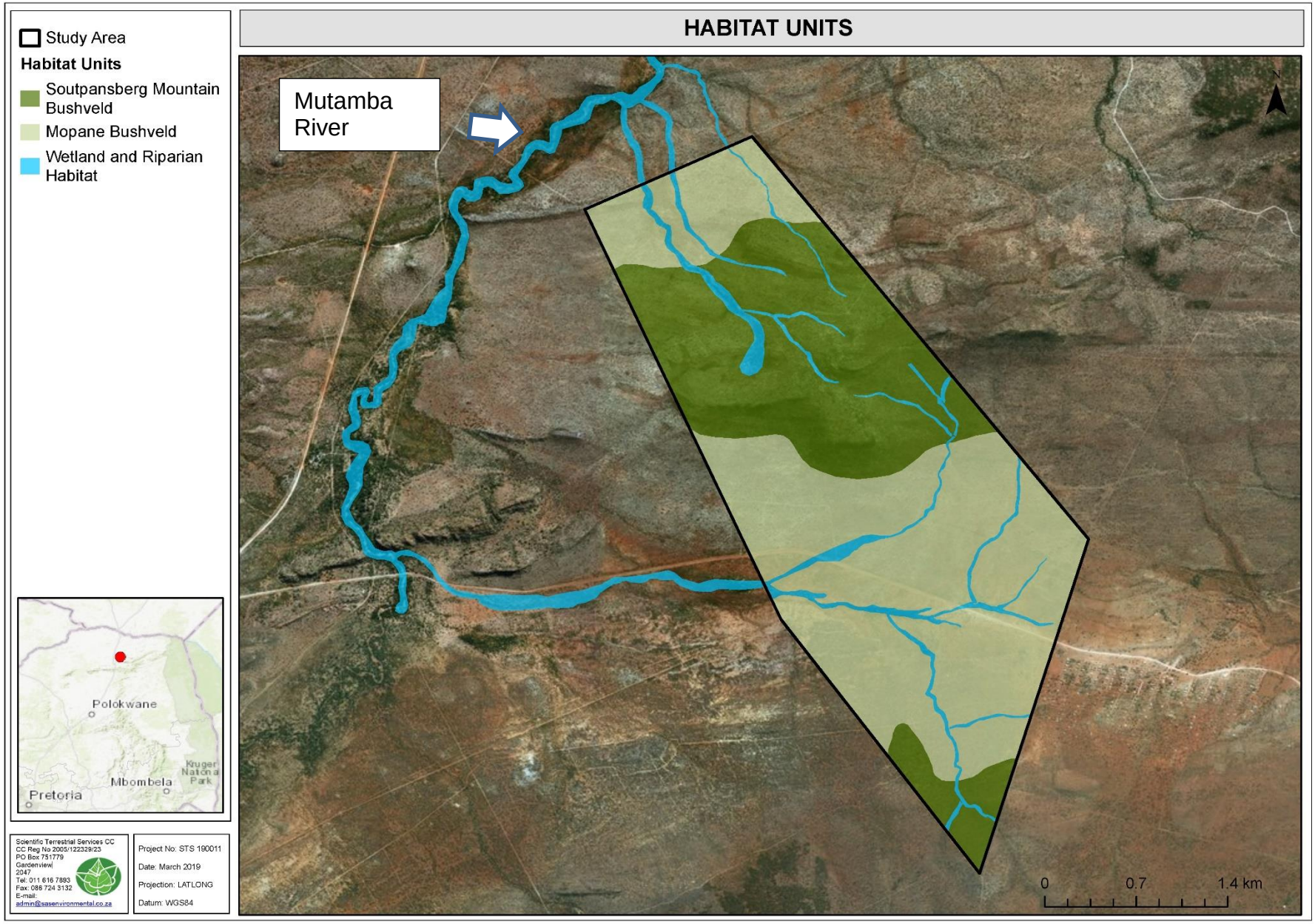


Figure 5: Habitat Units associated with the Study Area.

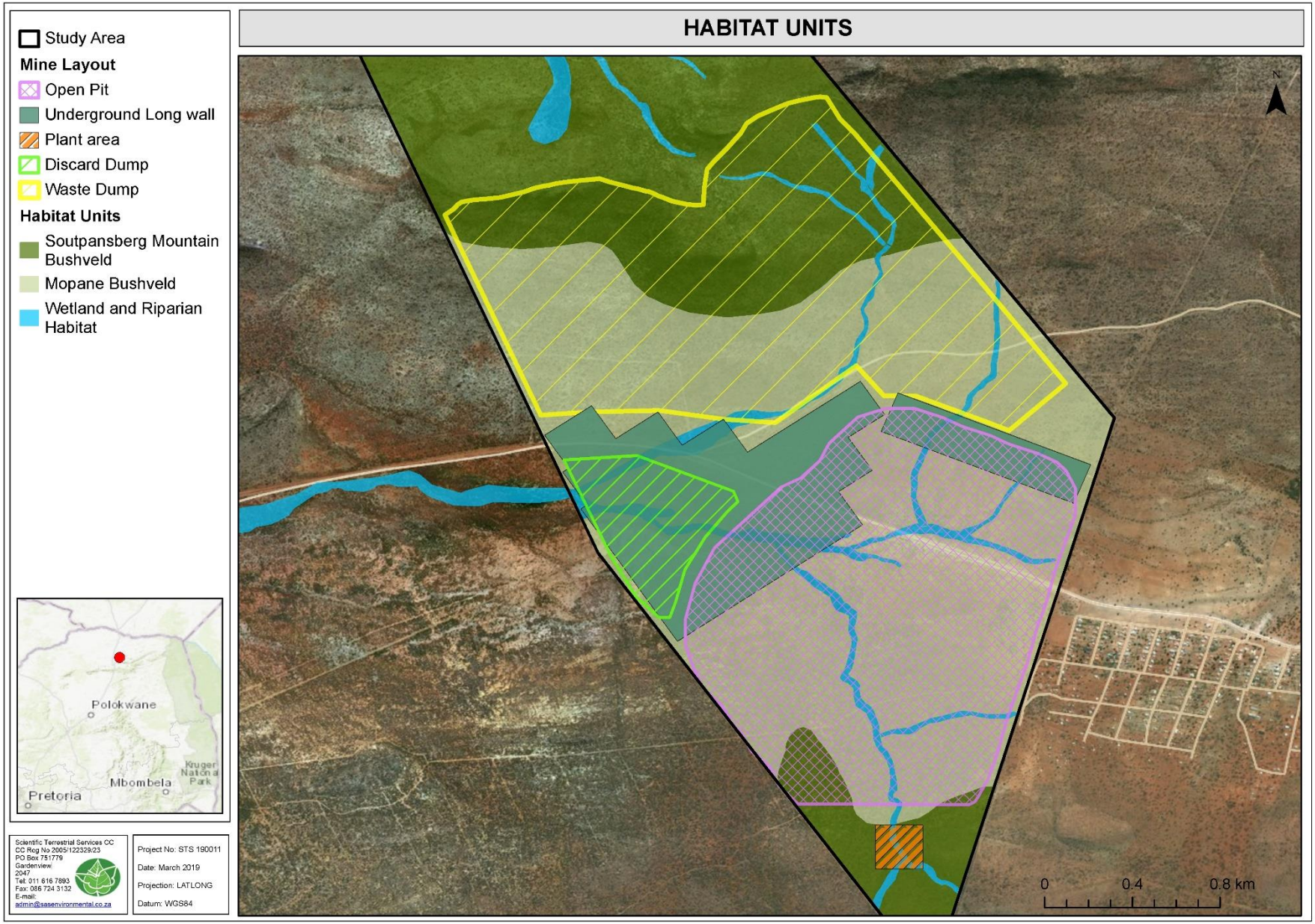
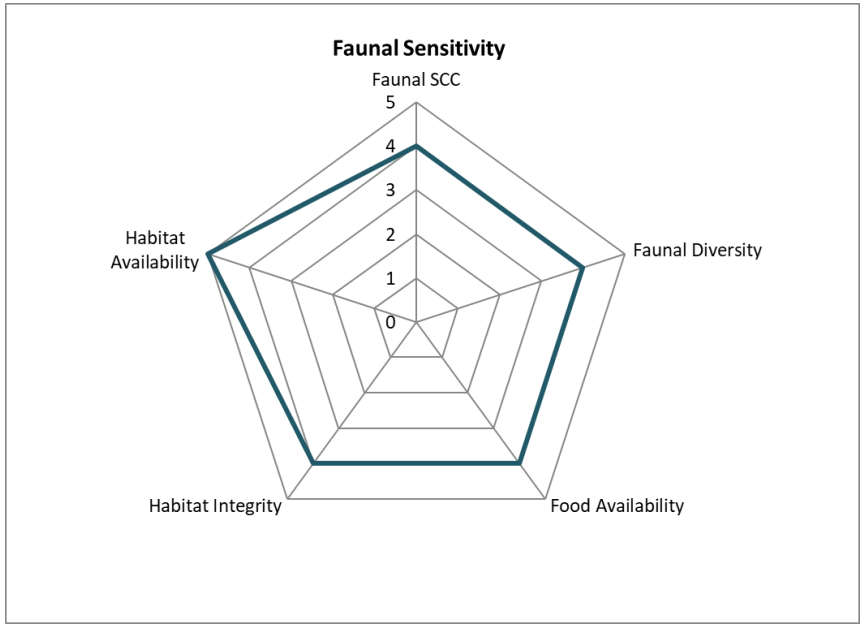


Figure 6: Habitat units associated with the study area and theproposed mining infrastructure.

3.2 Mammals

Table 1: Field assessment results pertaining to mammal species within the proposed Mining Right Area (MRA) .

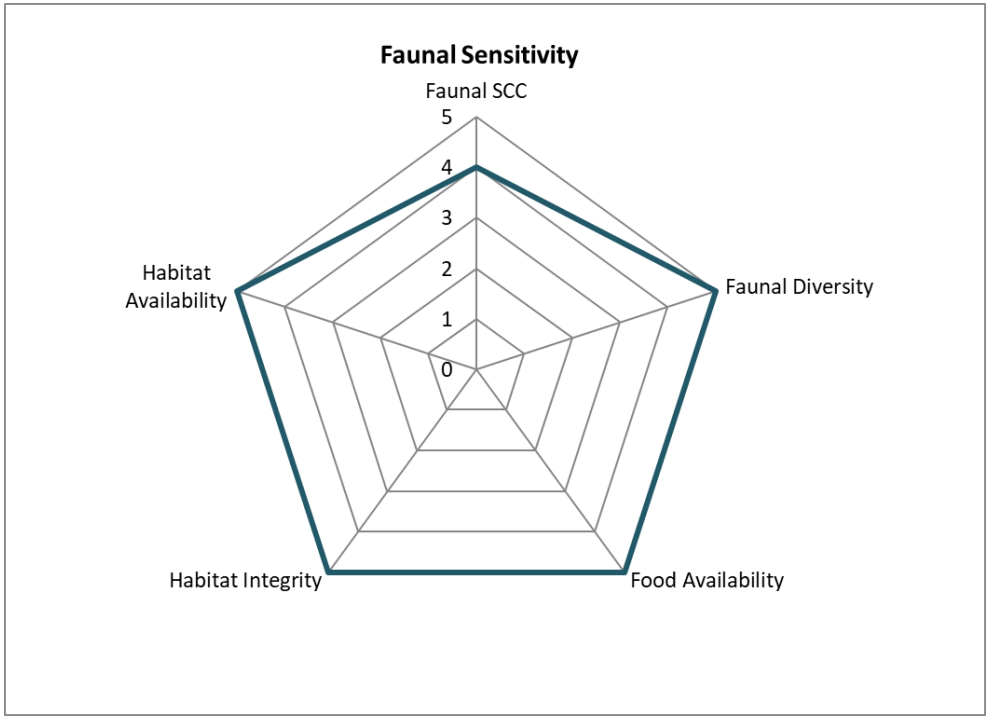
Faunal Class: Mammal	**Mammal Habitat Sensitivity**	**Moderately High**
	Notes on photograph: **Top:** *Panthera pardus* (Leopard) spoor on the left and *Hyaena brunnea* (Brown Hyaena) pasting on the right. **Middle:** *Kobus ellipsiprymnus* (Waterbuck) on the left and *Aepyceros melampus* (Impala) to the right captured on the camera traps. **Bottom:** *Tragelaphus angasii* (Nyala) on the left and *Sylvicapra grimmia* (Common Duiker) to the right captured on the camera traps.	
Mammal Sensitivity Graph:		**Photograph:**



Faunal SCC/Endemics/TOPS	The faunal SCC integrity for the study area has been rated as Moderately-High. Signs of *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena) were observed, both listed as Near Threatened by the IUCN (2019). *Panthera pardus* is also listed under Schedule 3 of the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA). as a protected wild animal. Both of these species are listed as Near Threatened by the IUCN due to decreasing habitat, habitat fragmentation and human- carnivore conflict. These threats may be significant enough that *Panthera pardus* may soon qualify for Vulnerable status. Furthermore, both *Hyaena brunnea* and *Panthera pardus* are listed as protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA).
Faunal Diversity	The faunal diversity for the study area was defined as Moderately-High. During the field survey basic monitoring techniques including a thorough walkabout along with the use of camera and Sherman traps were employed. Common mammal species observed during the survey with the use of camera traps, visual observations and the identification of spoor included*:* *Sylvicapra grimmia* (Common Duiker), *Aepyceros melampus* (Impala), *Kobus ellipsiprymnus* (Waterbuck), *Phacochoerus africanus* (Warthog), *Civettictis civetta* (African Civet), *Canis mesomelas* (Black-backed Jackal), *Otocyon megalotis* (Bat-eared Fox), *Tragelaphus strepsiceros* (Kudu), *Hystrix africaeaustralis* (Cape Porcupine), *Chlorocebus aithiops* (Vervet Monkey), *Papio ursinus* (Chacma Baboon), *Lepus saxatilis* (Scrub Hare), Procavia capensis (Rock Dassie), Galerella sanguinea (Slender Mongoose), *Gerbilliscus leucogaster* (Bushveld Gerbil), *Paraxerus cepapi* (Tree Squirrel), *Tragelaphus angasii* (Nyala), *Taphozous mauritianus* (Mauritian tomb bat) and *Connochaetes taurinus* (Blue Wildebeest)
Food Availability	The food availability associated with the study area was defined as Moderate. The habitat associated with the Mopane Bushveld habitat unit provides good habitat for small mammals and browsing species. The Soutpansberg Mountain bushveld mainly situated to the north of the study area provides sufficient habitat for grazing and browsing species, most of the common mammal species were observed in this northern section of the study area. Signs of predator species were mainly observed surrounding the freshwater habitat units which provides optimal foraging habitat as prey regularly come to the watercourses to drink.
Habitat Integrity	The habitat integrity associated with the study area was classed Moderately-High. The habitat associated with the Mopane Bushveld habitat unit has been largely impacted by livestock grazing from the nearby communities, which may reduce the diversity of common mammal species. The Soutpansberg Mountain Bushveld and freshwater habitat unit are largely intact, offering good foraging habitat to common mammal species and potential SCC.
Habitat Availability	The habitat availability associated with the study area was classed High, indicating diverse foraging for common mammal and faunal SCC ranging from browsing habitat found in the Mopane Bushveld along with good grazing habitat found in the Soutpansberg Mountain Bushveld. The freshwater habitat unit provides habitat for scavenging and predaceous species.
General comments (dominant faunal species/noteworthy records etc.):	The study area provides habitat for two observed faunal SCC namely *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena) both listed as Near Threatened by the IUCN (2019).
Business Case, Conclusion and Mitigation Requirements:	Due to the presence of mammal SCC within the study area, proposed mining activities may lead to the displacement of prey species leading to increased competition of predator species. Habitat destruction will result in loss in cover, providing refuge for smaller mammals, noise and vibrations associated with mining activities will also contribute to the migration of observed species on site. Other direct impacts associated with the proposed mining activities include the increased likelihood of road kill, hunting/trapping of species and the fragmentation of habitat limiting migration. Stringent mitigation measures are needed in order to minimize the impact to common and SCC fauna observed in the area, as listed in Section 7.

3.3 Avifauna

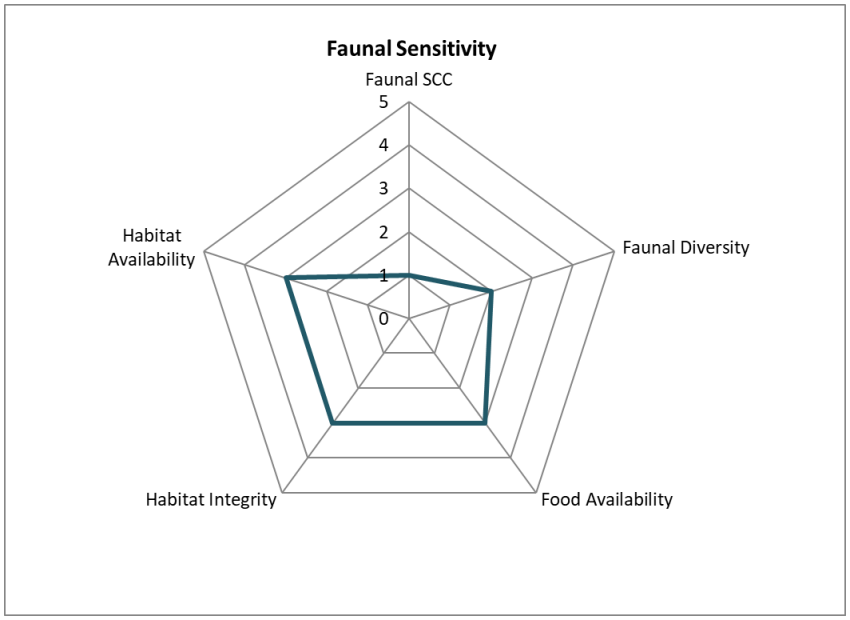
Table 2: Field assessment results pertaining to avifaunal species within the study area.

<table>
<tr><td rowspan="2">Faunal Class:
Avifaunal</td><td>Avifaunal Habitat Sensitivity</td><td>High</td><td rowspan="2">Photograph:
  </td></tr>
<tr><td colspan="2">Notes on photograph, top left and right:
Common avifaunal species observed during the field assessment.
Top Left: Prionops plumatus (White-crested Helmeted Shrike)
Top Right: Merops pusillus (Little Bee-eater)
Bottom: Circaetus cinerus (Brown Snake Eagle)</td></tr>
<tr><td colspan="4">Avifaunal Sensitivity Graph:
 
</td></tr>
</table>

Faunal SCC/Endemics/TOPS	No avifaunal SCC were observed during the survey. According to Birdlife South Africa, the study area falls within the Soutpansberg Important Bird Area (IBA). This IBA provides habitat to numerous listed bird species, with special focus on larger raptors that are known to inhabit the Soutpansberg. The study area is considered a Special Habitat Location for the Crested Guinea Fowl (*Guttera pucherani*), a protected species under the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA). Furthermore, the study area borders the Nzhelele Nature Reserve (NNR). Listed below are avifaunal SCC that have been observed within the NNR and are thereforeexpected to occur within the study area: *Terathopius ecaudatus* (Bateleur), *Gyps coprotheres* (Cape Vulture), *Ardeotis kori* (Kori Bustard), *Falco biarmicus* (Lanner Falcon), *Torgos tracheliotos* (Lappet-faced Vulture), *Polemaetus bellicosus* (Martial Eagle), *Sagittarius serpentarius* (Secretarybird), *Bucorvus leadbeateri* (Southern Ground-Hornbill), *Aquila rapax* (Tawny Eagle) and *Gyps africanus* (White-backed Vulture).
Faunal Diversity	The avifaunal diversity for the study area was classed High. During the field assessment a thorough walkthrough of the study area was conducted. Common avifaunal species observed during the February 2015 and February 2019 surveys included: *Streptopelia capicola* (Cape turtle-dove), *Eremomela usticollis* (Burnt-necked Eremomela), *Cossypha humeralis* (White-throated Robin-chat) *Petronia superciliaris* (Yellow-throated Sparrow), *Cuculus solitarius* (Red-chested Cuckoo), *Vidua regia* (Shaft tailed whydah), *Centropus superciliosus* (Burchell's Coucal), *Vidua paradisaea* (Paradise-whydah), *Melierax gabar* (Gabar Goshawk), *Vidua macroura* (Pin-tailed Whydah), *Bubalornis niger* (Red-billed Buffalo-weaver), *Lanius collaris* (Fiscal Shrike), *Hieraaetus spilogaster* (African Hawk Eagle), *Merops pusillus* (Little Bee-eater), *Prinia subflava* (Tawny flanked Prinia) and *Turtur chalcospilos* (Emerald-spotted Wood-dove). For the full list of species observed refer to Appendix D.
Food Availability	The food availability associated with the study area was defined as High. The Mopane Bushveld provides sufficient habitat for foraging avifauna due to the high diversity of reptile, invertebrate and small mammal species. The Soutpansberg Mountain bushveld provides habitat for seed eating avifauna and foraging raptor species. The freshwater habitat unit provides habitat for aquatic bird species.
Habitat Integrity	The habitat integrity associated with the study area was defined as High. The habitat associated with the Mopane Bushveld habitat unit has been largely impacted by livestock grazing from the nearby communities, which may reduce the diversity of common avifaunal species. The Soutpansberg Mountain Bushveld and freshwater habitat unit is largely intact offering good foraging habitat to common avifaunal species and potential SCC.
Habitat Availability	The habitat availability associated with the study area was defined as High, indicating diverse foraging for common avifaunal species and faunal SCC, ranging from scavenging habitat found in the Mopane Bushveld along with diverse habitat associated with the Soutpansberg Mountain Bushveld. The freshwater habitat unit provides habitat for scavenging and aquatic birdlife.
General comments (dominant faunal species/noteworthy records etc.):	Although only common avifaunal SCC were observed during the two surveys, according to Birdlife South Africa the study area falls within the Soutpansberg Important Bird Areas (IBA)). The study area is considered a Special Habitat Location for the Crested Guinea Fowl (*Guttera pucherani*), a protected species under the Limpopo Environmental Management Act, 2003 (Act 7 of 2003) (LEMA).
Business Case, Conclusion and Mitigation Requirements:	The proposed mining activities are situated in the southern portions of the study area, mainly affecting the Mopane Bushveld Habitat unit. Only common avifaunal species were observed within this habitat unit, although multiple SCC are expected to occur for foraging purposes from time to time within the greater study area. Operational activities and increased human activity may affect the presence of avifaunal SCC. Stringent mitigation measures as outlined in Section 7 should be adhered to in order to limit the possible impacts associated with the proposed activities.

3.4 Amphibians

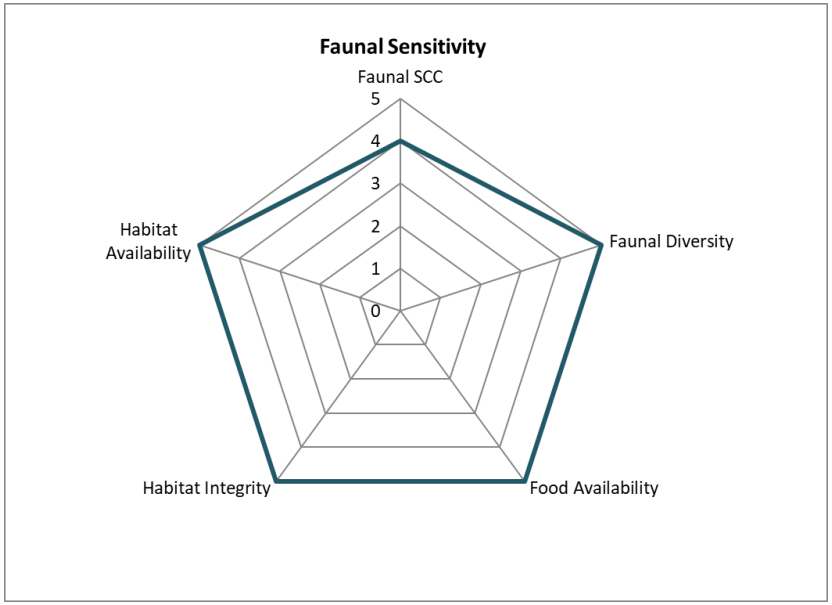
Table 3: Field assessment results pertaining to amphibian species within the MRA.

<table>
<tr><td rowspan="2">Faunal Class:
Amphibians</td><td>Amphibian Habitat Sensitivity</td><td>Moderately-Low</td><td rowspan="2">Photograph:
  </td></tr>
<tr><td colspan="2">Notes on Photograph:
Preferred amphibian habitat present within the Freshwater habitat unit.</td></tr>
<tr><td colspan="3">Amphibian Sensitivity Graph:
 
</td></tr>
<tr><td>Faunal SCC/Endemics/TOPS/</td><td colspan="3">Although no amphibian SCC were observed during the surveys there is a moderate likelihood that Pyxicephalus adspersus (Giant Bullfrog, NT as per the EWT) may occur around the Mutamba River, as this species remains buried within the soil up to 1m deep for the majority of the year, emerging during periods of high rainfall to breed. In the northern portion of the study area, small water filled depressions, sandy ephemeral drainage lines as well as larger drainage lines with a riparian zone were identified which chould house P. adspersus. This species is not listed in the Limpopo SoER (2004), however it is listed as a protected species in the LEMA (2003) under schedule 3 (Protected Wild Animals).</td></tr>
</table>

Faunal Diversity	A thorough walkthrough of the freshwater resources of the study area was conducted where frog calls were identified and visual observations were made. The faunal diversity associated with the study area was classed as Moderately-Low. Other than *Chiromantis xerampelina* (Southern Foam Nest Frog) no further species were observed during the February 2015 and February 2019 surveys, although common species are expected to occur within the study area including *Ptychadena anchietae (*Anchieta's Ridged Frog) and members from the Genus *Sclerophrys*.
Food Availability	The food availability associated with the Mutamba River situated to the north of the study area was defined as Intermediate. Limited marginal vegetation is associated with the section of reach, although a diversity of invertebrate communities were noted to be associated with the study area, which provide good foraging for toad species.
Habitat Integrity	The freshwater habitat unit associated with the study area are highly ephermal, providing habitat only within the wetter months of the year. the extent and diversity of marginal vegetation is limited for the Mutamba River due to the ephermal state of the system. A weir is established upstream which has changed the natural flow regimes, although the pooling effect of water upstream, could provide sufficient habitat for extended periods.
Habitat Availability	The Mutamba river situated to the north of the study area is the main freshwater resource associated with the study area. Smaller drainage lines located to the south of the study area are event driven, which would not provide habitat for sufficient periods in order to support amphibian life on a permanenbt basis although species may enter these areas for foraging.
General comments (dominant faunal species/noteworthy records etc.):	Although no amphibian SCC were observed at the time of the survey, there is a moderate likelihood that *Pyxicephalus adspersus* (Giant Bullfrog), may occur in the riparian zone of the Mutamba River. Only one common amphibian species, *Chiromantis xerampelina,* was observed during the survey.
Business Case, Conclusion and Mitigation Requirements:	The proposed activities are unlikely to have a high impact on amphibian species associated with the study area. Mitigation measures, as stipulated within Section D: Freshwater Assessment are deemed sufficient and must be implemented in order to minimize potential water contamination.

3.5 Reptiles

Table 4: Field assessment results pertaining to reptile species within the MRA

<table>
<tr><td rowspan="2">Faunal Class:
Reptiles</td><td>Reptile Habitat Sensitivity</td><td>High</td><td rowspan="2">Photograph:
  </td></tr>
<tr><td colspan="2">Notes on Photograph:
Top: Naja mossambica (Mozambique Spitting Cobra) on the left and Bitis caudalis (Horned Adder) on the right (Images and ID compliments of Frans Roodt and Son, Heritage specialists).
Bottom: Chondrodactylus turneri (Turner's Tubercled Gecko) on the left and Stigmochelys pardalis (Leopard tortoise) on the right.</td></tr>
<tr><td colspan="3">Reptile Sensitivity Graph:
 
</td></tr>
<tr><td>Faunal SCC/Endemics/TOPS/</td><td colspan="3">Reptile species of conservational interest to the Limpopo Province are presented in Appendix 4, (Limpopo SoER, 2004). No RDL reptile species, as indicated in Appendix 4, were encountered during the site visit. One RDL reptile species which may occur in the distribution range of the study area is Python natalensis (South African Python) which is considered Vulnerable in South Africa (Limpopo SoER, 2004). This species may occur throughout the study area and surrounding areas. The development of the mine will negatively impact on both the habitat availability as well as the prey availability for P. natalensis, further compounding conservation efforts for this species.</td></tr>
</table>

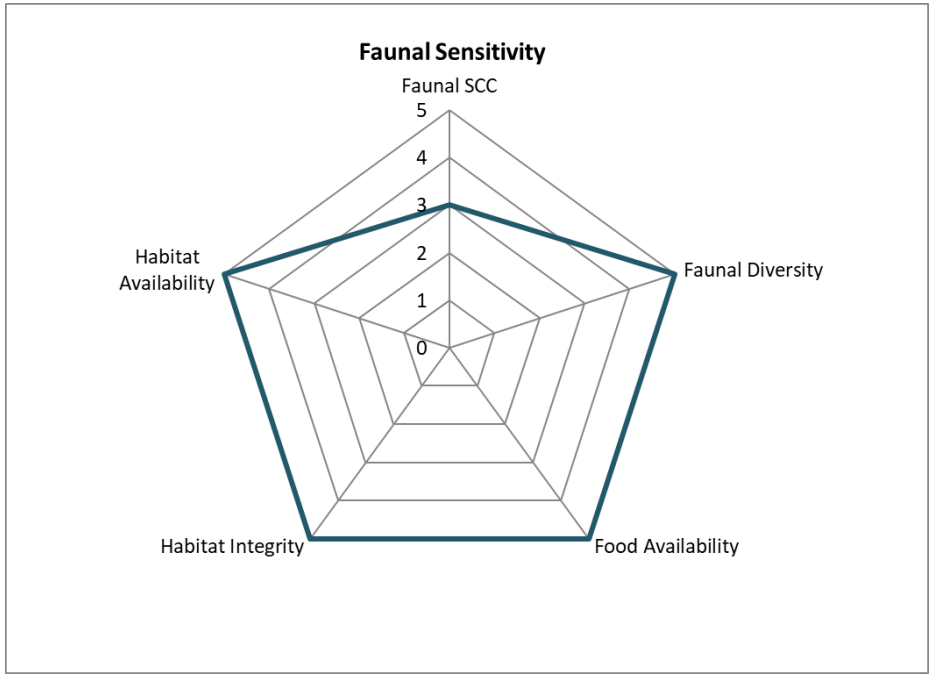
Faunal Diversity	A thorough walkthrough of the study area was conducted in February 2015 and February 2019. Only common reptile species were observed including: *Bitis caudalis* (Horned Adder), *Naja mossambica* (Mozambique Spitting Cobra), *Trachylepis varia* (Variable Skink), *Heliobolus lugubris* (Bushveld Lizard), *Pachydactylus vansoni* (Van Son's Gecko), *Chondrodactylus turneri* (Turner's Tubercled Gecko), *Trachylepis punctatissima* (Montane Speckled Skink), *Stigmochelys pardalis* (Leopard Tortoise), *Nucras tessellate* (Western Sandveld Lizard), *Ichnotropis squamulose* (Common Rough-scaled Lizard).
Food Availability	The food availability of the study area was defined as High. The habitat units associated with the study area cater for a wide variety of reptile species. Those preferring warmer open areas would favour the Mopane Bushveld Habitat unit. The Soutpansberg Mountain bushveld habitat unit offers good habitat for arboreal aspecies as well as species preferring thick undergrowth. A higher reptile species abundance is expected to occur within the freshwater habitat unit as it provides habitat for various food sourcesm such as a diversity of invertebrate species and small mammals.
Habitat Integrity	The habitat integrity associated with the study area was defined as High. The habitat associated with the Mopane Bushveld habitat unit has been largely impacted by livestock grazing from the nearby communities, which may reduce the diversity of common reptile species. The Soutpansberg Mountain Bushveld and freshwater habitat unit is largely intact offering good habitat to common species and potential SCC.
Habitat Availability	The habitat availability for the study area was classed High. The majority of the habitat units associated with the study area have undergone limited disturbance due to anthropogenic activities.
General comments (dominant faunal species/noteworthy records etc.):	Only common reptile species were observed at the time of the assessments, although the likelihood of *Python natalensis* (South African Python) occurring in the study area is considered to be high.
Business Case, Conclusion and Mitigation Requirements:	The proposed mining activities are likely to have a large impact on the common reptile species observed in the study area, causing displacement or increased competition due to habitat destruction. Stringent mitigation measures, as listed in Section 7 should be employed and adhered to if activities are to proceed.

3.6 Invertebrates

Table 5: Field assessment results pertaining to insect species within the MRA.

Faunal Class: Insects	**Insect Habitat Sensitivity**	**Moderately - High**
	Notes on Photograph: Top: *Psammodes virago* (Giant toktokkie) on the left and *Anachalcos convexus* (Plum Dung Beetle) on the left. Bottom: *Timesibasis lacerate* (Blotched Long-Horned Antlion)	

Insect Sensitivity Graph:



Photograph:

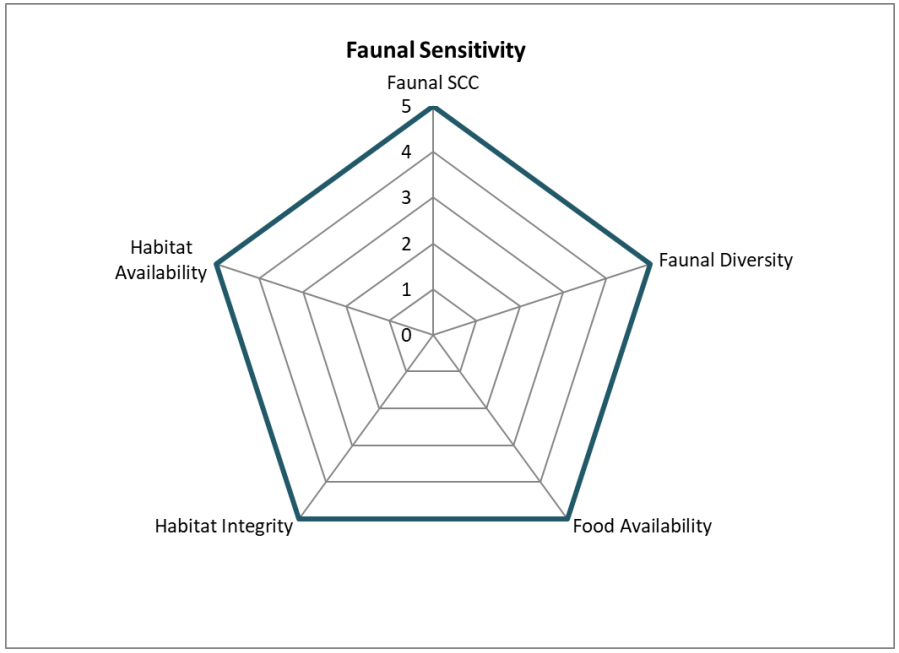
Faunal SCC/Endemics/TOPS/	No invertebrate SCC were observed in both surveys. Although several are expected to occur within the QDS including *Taurhina splendens* (Splendid fruit chafer), *Charaxes marieps* (Marieps Charaxes butterfly), *Trichostetha fasicularis* (Protea beetle) and *Ischnestoma ficqui* (Fruit eating beetles)
Faunal Diversity	Based on the thorough walkthrough conducted in both the 2015 and 2019 surveys, only common invertebrate species were observed. Some of the dominant common invertebrates included: *Belenois aurota* (Brown-veined White), *Eurema brigitta brigitta* (Broad-bordered Grass Yellow), *Pontia helice helice* (Meadow White), *Phalanta phalanta* (Common Leopard), *Byblia ilythia* (Spotted Joker), *Chilades trochylus* (Grass Jewel Blue), *Papilio demodocus* (Citrus Swallowtail), *Cannula gracilis* (Grass mimicking Grasshopper), *Conistica saucia* (Rock Grasshopper), *Pynca semiclara* (Giant Forest Cicada), *Anachalcos convexus* (Plum Dung Beetle), *Pachylomerus femoralis* (Flattened Giant Dung Beetle), *Psammodes virago* (Giant Toktokkie), *Ammophila ferrugineipes* (Thread-waisted Wasp) and *Apis mellifera* (Honey Bee).
Food Availability	The food availability of the study area was classed as High. The habitat units associated with the study area cater for a wide variety of invertebrate species. Those preferring warmer open areas would favour the Mopane Bushveld Habitat unit.. Higher species abundance is expected to occur within the freshwater habitat unit, with an increase in aquatic invertebrates.
Habitat Integrity	The habitat integrity associated with the study area was classed as High. The habitat associated with the Mopane Bushveld habitat unit has been largely impacted by livestock grazing from the nearby communities, which may reduce the diversity of common invertebrate species. The Soutpansberg Mountain Bushveld and freshwater habitat unit is largely intact offering good habitat to common species and potential SCC.
Habitat Availability	The habitat availability for the study area was defined as High. The majority of the habitat units associated with the study area have undergone limited disturbance due to anthropogenic activities and as such provide suitable forageing and bredding habitat for various invertebrate species.
General comments (dominant faunal species/noteworthy records etc.):	A good diversity of common invertebrate species were recorded during the assessments offering good food sources for avifaunal, reptile and small mammal species. The likelihood of invertebrate SCC occurring in the area is deemed to be moderate.
Business Case, Conclusion and Mitigation Requirements:	Invertebrates are widespread in the study area, although limited impacts are expected with proposed activities mainly situated in the Mopane Bushveld habitat unit. If mitigation measures, as outlined in Section 7 should be adhered to in order to limited impact to invertebrate communities are expected.

3.7 Arachnids

Table 6: Field assessment results pertaining to arachnid species within the MRA

Faunal Class: Arachnids	Arachnid Habitat Sensitivity	High
	Notes on Photograph: **Top:** *Ceratogyrus darlingi* (Horned Baboon spider) on the left and *Solifuge sp* (Red Roman Spider) on the right. **Middle:** *Hottentotta trilineatus* on the left and *Hadogenes troglodytes* (Black Rock Scorpion) on the right. **Bottom:** *Hadogenes troglodytes* (Black Rock Scorpion) under UV light at night.	

Arachnid Sensitivity Graph:



Photograph:

Faunal SCC/Endemics/TOPS	*Ceratogyrus darling* (Horned Baboon Spider) was identified within the study area , this species is restricted to the eastern regions of South Africa, Mozambique and Zimbabwe. It is recommended that consideration be given to a rescue and relocation program for this species prior to any mining activities taking place.
Faunal Diversity	A Thorough walkthrough were conducted during both the 2015 and 2019 surveys, where rocks were flipped and inspected for arachnid species. The common arachnid species that were encountered during the surveys included: *Hottentotta trilineatus*, *Parabuthus transvaalicus* (Transvaal Thick-tailed Scorpion), *Cheloctonus jonesii* (Burrowing Scorpion), *Hadogenes troglodytes* (Black Rock Scorpion), *Damon variegatus* (Whip Scorpion), *Selenopidae sp* (Wall Crab Spider), *Nephila senegalensis* (Banded-legged Orb Spider), *Nephila inaurata* (Red-legged Orb Spider), and *Soligfuge sp* (Red Roman Spider)
Food Availability	The food availability of the study area was classed as High. The habitat units associated with the study area cater for a wide variety of arachnid species. Those preferring open areas would favour the Mopane Bushveld Habitat unit. The Soutpansberg Mountain bushveld habitat unit offers good habitat for arboreal and species preferring thick undergrowth.
Habitat Integrity	The habitat integrity associated with the study area was classed as High. The habitat associated with the Mopane Bushveld habitat unit has been largely impacted by livestock grazing from the nearby communities, which may reduce the diversity of common arachnid species. The Soutpansberg Mountain Bushveld and freshwater habitat unit is largely intact offering good habitat to common species and potential SCC.
Habitat Availability	The habitat availability for the study area was classed High. The majority of the habitat units associated with the study area have undergone limited disturbance due to anthropogenic activities.
General comments (dominant faunal species/noteworthy records etc.):	A good diversity of common arachnid species were recorded during the assessments, offering good food sources for avifaunal, reptile and small mammal species. The likelihood of arachnid SCC occurring in the area is deemed to be moderate. *Ceratogyrus darling* (Horned Baboon Spider) was identified within the proposed mining area, this species is restricted to the eastern regions of South Africa, Mozambique and Zimbabwe. It is recommended that consideration be given to a rescue and relocation program for this species prior to any mining activities taking place.
Business Case, Conclusion and Mitigation Requirements:	*Ceratogyrus darling* (Horned Baboon Spider) was identified within the southern portions of the study area, although the likilhood that more individuals occur in the remaining extent of the study area is high, a relocation project is highly recommended if authorisation for the proposed activities are given. Stringent mitigation measures, as outlined in Section 7 should be adhered to in order to limit the impact to arachnid communities.

4 SPECIES OF CONSERVATION CONCERN

During the field assessment of the study area, the only Species of Conservational Concern (SCC) that were observed, either directly or by signs thereof, were that of *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena). The study area likely forms part of these species home ranges, which will extend well beyond that of the study area alone. The reduction in these species home ranges will result in a loss of both foraging and breeding potential, and will likely place further pressure on available territories resulting inincreased competition with neighbouring rivals as they try to compensate for the decrease in their own home range by extending into neighbouring home ranges. *Ceratogyrus darlingi* (Horned Baboon Spider) is not listed as threatened, however baboon spiders as a species are under threat as a result of habitat loss and collection for the pet trade. It is therefore recommended that the precautionary principal be applied, and consideration be given to rescue and relocation activities for *Ceratogyrus darlingi* as well as for any other individuals of this species within the study area.

The study area lies within the Soutpansberg IBA of which a large diversity of avifaunal species inhabit, notably large raptors. Although no avifaunal SCC were observed at the time of the site assessment, the neighbouring Nzhelele Game Reserve have recorded a number of avifaunal SCC over the years, and as such these species are presumed to also utilise and inhabit the neighbouring study area.

Overall the study area is considered to be of conservational value, as it provides suitable habitat for a variety of faunal species, and the large trees and hillslopes provide suitable nesting sites for large raptors. Furthermore, the abundance of prey species and intact vegetation composition enables medium to large predators to utilise the study area effectively, helping to support predator populations outside of large formally protected areas, and ensuring the genetic diversity of species overall is maintained.

Figure 7: Signs of *Ceratogyrus darlingi* (Horned Baboon Spider), *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena)

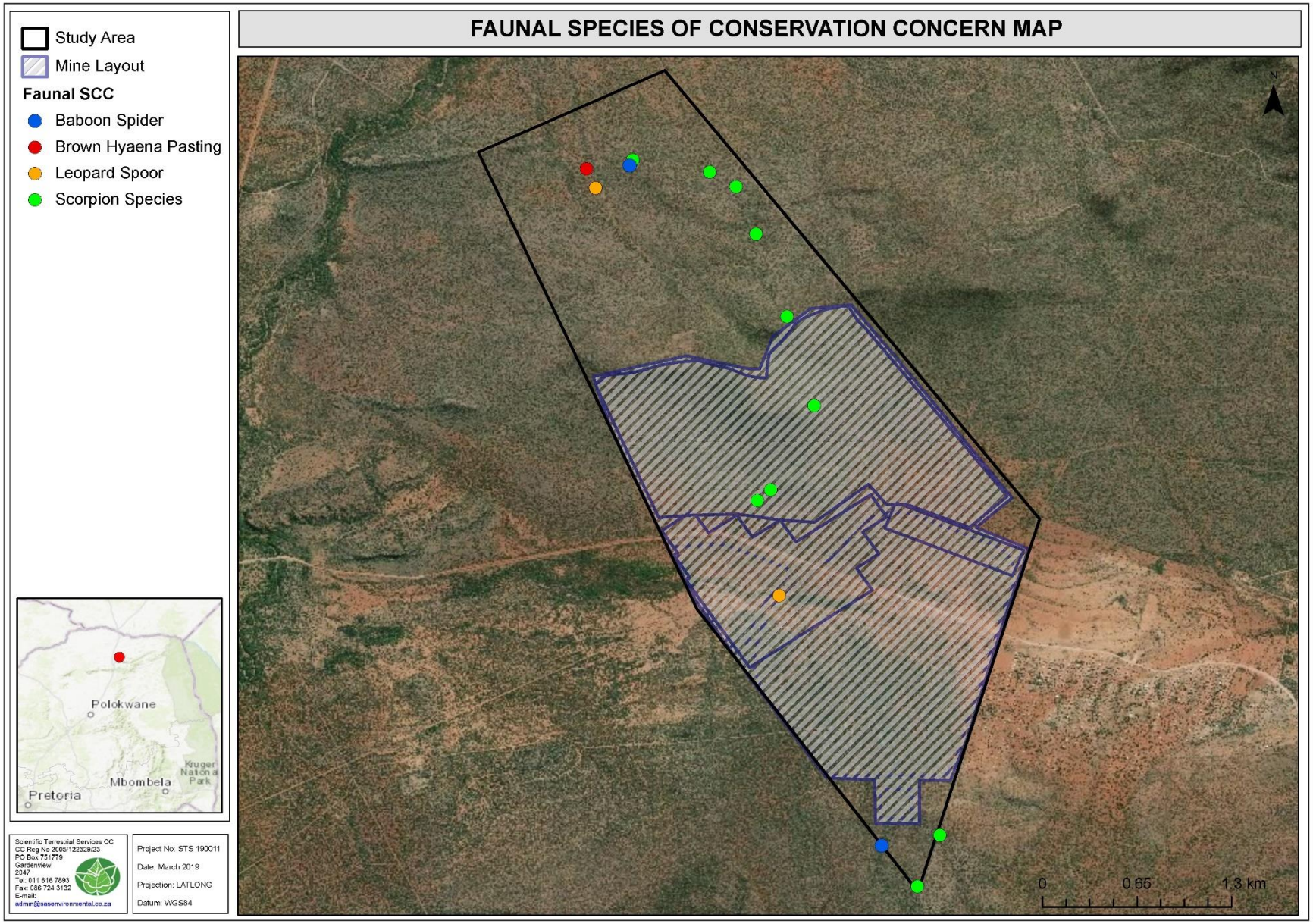


Figure 8: Localities of species observed that are considered to be of an increased conservational concern.

5 SENSITIVITY MAPPING

The figures below conceptually illustrate the areas considered to be of increased faunal ecological sensitivity. The areas are depicted according to their sensitivity in terms of the presence or potential for faunal SCC, habitat integrity, levels of disturbance and overall levels of diversity. The table below presents the sensitivity of each area along with an associated conservation objective and implications for development.

Table 7: A summary of the sensitivity of each habitat unit and implications for the proposed development.

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Soutpansberg Mountain Bushveld	**Moderately-High**	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	Any disturbance of sensitive faunal habitat must be actively avoided. In this regard, maintaining migratory corridors and connectivity along the Soutpansberg Mountain Bushveld Habitat unit is deemed essential. If development is to take place within a close proximity of this habitat unit, care must be taken to prevent any negative impacts on the vegetation. Moreover, all mitigation measures as stipulated in this report as well as the Botanical Assessment (Section B) must be correctly implemented as defined within this report.
Mopane Bushveld	**Moderately-Low**	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	Limited impacts are expected to occur in this habitat unit. If development is to take place within a close proximity of this habitat unit, care must be taken to prevent any negative impacts on vegetation. Moreover, all mitigation measures as stipulated in this report as well as the Botanical Assessment (Section B) must be orrectly implemented as setout within this report.
Freshwater Habitat Unit	**High**	Activities should be limited in this habitat unit.	Any disturbance of sensitive faunal habitat must be actively avoided. In this regard, maintaining migratory corridors and connectivity along the freshwater system is deemed essential. If mining is to take place within close proximity of this habitat unit, care must be taken to prevent any negative impacts on vegetation. Moreover, all mitigation measures as stipulated in this report as well as the Freshwater Assessment (Section D) must be correctly implemented as defined within this report.

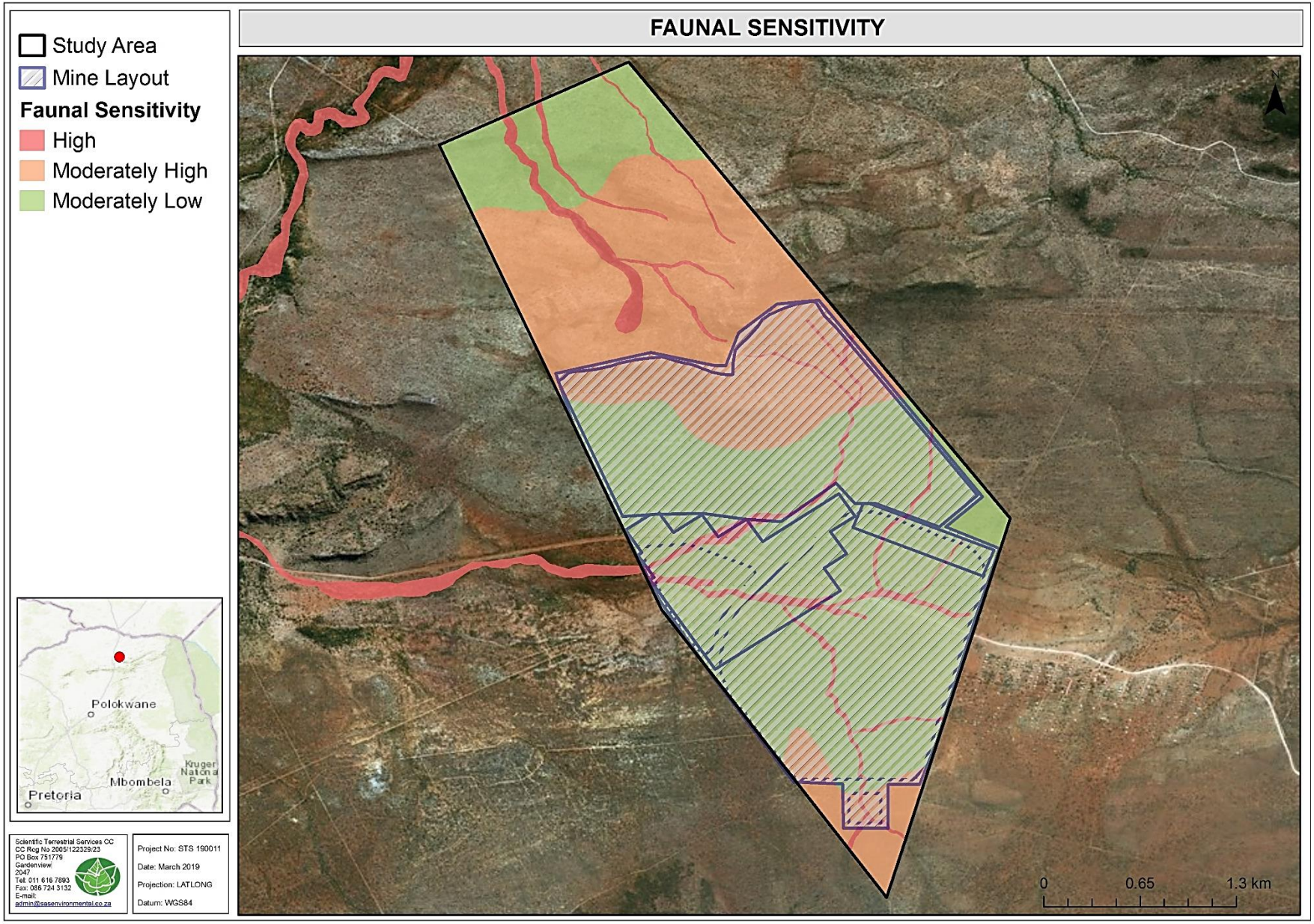


Figure 9: Sensitivity map for the study area.

6 FAUNAL IMPACT ASSESSMENT

The impact assessment was undertaken on all aspects of faunal ecology deemed likely to be affected by the proposed new mining area. The sections below present the results of the findings per identified risk/impact for the faunal ecology of the study area.

6.1 Impact 1: Impact on Faunal Habitat

Placement of infrastructure and mining activities within sensitive faunal habitat such as the Soutpansberg Mountain Bushveld and the Freshwate habitat unit is highly likely to have a detrimental impact on faunal habitat, migratory corridors and the overall carrying capacity of the study area. A high diversity of faunal species both within the study area, but also the surrounding areas rely on these habitat types for foraging, migratory and breeding purposes. Although the study area is largely fenced in, the fences are still relatively permeable to a large number of species, while some sections lack fences altogether.

Activities which are likely to negatively affect the faunal habitat integrity of the study area include, but are not limited to, the following:

- Placement of mining infrastructure within sensitive faunal habitat;
- Destruction of faunal habitat during construction and operational activities;
- Dust generated by mining activities;
- Alien floral invasion and erosion in disturbed areas; and
- Increased human populations in the surrounding area leading to greater pressure on natural faunal habitat.

The above activities are highly likely to have a significant impact on faunal habitat within and around the study area as the physical destruction of faunal habitat will be unavoidable within this sensitive area. The following tables provide an indication of the anticipated impact significance pre- and post-mitigation.

Activities and aspect registry

Pre-Construction	Construction	Operational	Decommissioning & Closure
Placement and design of mining infrastructure such as waste dumps and discard dumps in sensitive faunal habitat.	Site clearing and the removal of vegetation leading to a loss of sensitive faunal habitat.	On-going disturbance of soils due to operational activities leading to altered faunal habitat.	Ineffective rehabilitation of exposed and impacted areas leading to permanent losses of faunal habitat.
Failure to develop and initiate a well-conceived biodiversity action plan, rehabilitation plan and alien plant control plan during the pre-construction	Invasion of alien species in disturbed areas resulting in further habitat loss.	Increased introduction and proliferation of alien plant species and further transformation of natural habitat	On-going risk of contamination from mining facilities beyond closure leading to permanent impact on faunal habitat.
	Erosion as a result of mining development and storm water runoff leading to a loss of faunal habitat.	Risk of contamination from all operational facilities (I.e. tailling dams) may pollute receiving environment leading to altered faunal habitat.	On-going seepage and runoff may affect the ground/surface water regime beyond closure affecting amphibian and terrestrial species (consumption).
	Movement of construction vehicles and access road construction through sensitive faunal habitat.	Additional pressure on faunal habitat as a result of increased human populations associated with the proposed mine leading to a loss of faunal habitat.	Failure to implement a well-conceived biodiversity action plan, rehabilitation plan and alien plant control plan during the decommissioning and closure phase.
	Construction of open pits, topsoil stockpiles, overburden dumps and other surface infrastructure leading to a loss of sensitive faunal habitat.	Failure to implement a well-conceived biodiversity action plan, rehabilitation plan and alien floral control plan during the operational phase.	
	Failure to implement a well-conceived biodiversity action plan, rehabilitation plan and alien floral control plan during the construction phase.	Dust generation during operational activities leading to a loss of faunal habitat.	
	Increased fire frequency during construction leading to a loss of sensitive faunal habitat	Increased fire frequency during operation leading to a loss of sensitive faunal habitat.	
	Displacement of faunal communities	Displacement of faunal communities	

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	4	5	4	5	9	14	126 (Very High)
Operational phase	5	4	5	4	5	9	14	126 (Very High)
Decommissioning and closure phase	5	4	4	4	5	9	13	117 (High)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	4	4	3	4	9	11	99 (Medium High)
Operational phase	4	4	3	3	4	8	10	80 (Medium High)
Decommissioning and closure phase	3	4	2	3	4	7	9	63 (Medium Low)

6.2 Impact 2: Impact on Faunal Diversity

Mining construction and operational activities are likely to have a significant impact on the faunal diversity found within the study area, which was determined to be high during the baseline faunal assessments, especially within the Soutpansberg Mountain Bushveld, and freshwater habitat areas which are considered to be sensitive in terms of ecological functioning and faunal diversity. The varying topography and number of different habitat types in the study area give rise to a number of microhabitats being formed, each with a number of species that may only be found within that area, or as is often the case, can be found in a variety of habitat types but often select the most preferable in terms of their survival. This spectrum of habitat types, and associated ecotones between these habitat types gives rise to a higher diversity of faunal species when compared to a homogenous habitat unit.

Blasting activities will likely impact on avifaunal species, notably nesting species. This could result in a loss in avifaunal diversity, notably of the larger threatened raptors that may abandon their nests and thus decreasing breeding success rates. This is of increased concern given the proximity of the Nzhelele Nature Reserve to the study area, in which a number of large raptor species have been previously recorded, including *Terathopius ecaudatus*; *Gyps coprotheres*; *Torgos tracheliotos*; *Gyps africanus*.

Activities which are likely to negatively affect the faunal diversity within the study area include, but are not limited to, the following:

- Placement of mining infrastructure within sensitive faunal habitat;
- Destruction of faunal habitat during construction and operational activities;

- Collision of mining vehicles with faunal species;
- Blast related disturbances from air and ground vibration;
- Excessive and improper use of floodlights;
- Trapping and poaching of faunal species; and
- Alien floral invasion in disturbed and eroded areas.

The above activities are likely to have a significant impact on faunal diversity both within and around the study area. Many faunal species either occur permanently within the study area, or utilise the study area on a temporary basis for foraging or as a migratory/ movement corridor. The following tables provide an indication of the anticipated impact significance pre- and post-mitigation.

Activities and aspect registry

Pre-Construction	Construction	Operational	Decommissioning & Closure
Potential poor planning of infrastructure placement and design in sensitive faunal habitat	Site clearing and the removal of vegetation leading to a loss of faunal habitat and faunal diversity	On-going disturbance of soils due to operational activities leading to altered faunal diversity	Ineffective rehabilitation of exposed and impacted areas leading to permanent losses of faunal diversity
Failure to initiate a well-conceived biodiversity action plan, rehabilitation plan and alien floral control plan during the pre-construction phase.	Faunal habitat alteration through invasion of alien species in disturbed areas	Increased introduction and proliferation of alien plant species and further transformation of faunal diversity	On-going risk of contamination from mining facilities beyond closure leading to permanent impact on faunal diversity.
.	Erosion as a result of mining development and storm water runoff leading to a loss of faunal habitat and diversity.	Risk of contamination from all operational facilities may pollute receiving environment leading to altered faunal diversity	Potential failure to implement a biodiversity action plan, rehabilitation plan and alien floral control plan during the decommissioning and closure phase.
	Construction of open pits, topsoil stockpiles, overburden dumps and other surface infrastructure leading to a loss faunal diversity.	On-going disturbance may lead to erosion and sedimentation resulting in a loss of faunal diversity	
	Collision of faunal species with construction vehicles	Increased fire frequency during operation leading to a loss of faunal diversity	
	Potential failure to implement a biodiversity action plan, rehabilitation plan and alien floral control plan during the construction phase	Collision of faunal species with operational vehicles	
	Increased fire frequency during construction leading to a loss of faunal diversity	Potential failure to implement a biodiversity action plan, rehabilitation plan and alien floral control plan during the operational phase.	
	Poaching and trapping of faunal species	Poaching and trapping of faunal species	
	Displacement of faunal communities	Displacement of faunal communities	

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	5	4	5	4	5	9	14	126 (Very High)
Operational phase	5	4	5	4	5	9	14	126 (Very High)
Decommissioning and closure phase	5	4	4	4	5	9	13	113 (High)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	4	3	3	4	8	10	80 (Medium High)
Operational phase	4	4	3	3	4	8	10	80 (Medium High)
Decommissioning and closure phase	3	4	2	3	4	7	9	63 (Medium Low)

6.3 Impact 3: Impact on Faunal Species of Conservation Concern

Placement of infrastructure, construction and operational activities associated withthe mine are highly likely to have a detrimental impact on faunal SCC that were observed and are likely to occur within the study area. Species which are likely to be affected as a result of the mining are *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena) whose tracks were observed within the study area. Furthermore, the study area is located alongside the Nzhelele Game Reserve, and within the Soutpansberg IBA, which has over the years recorded a number of avifaunal SCC such as *Gyps coprotheres* (Cape Vulture), *Terathopius ecaudatus* (Bateleur), *Polemaetus bellicosus* (Martial Eagle) and *Gyps africanus* (White-backed Vulture).

Activities which are likely to negatively affect fauna of conservational concern within and around the study area include, but are not limited to, the following:

- Placement of mining infrastructure within sensitive faunal habitat;
- Destruction of faunal habitat during construction and operational activities;
- Blasting and vibrations from mining;
- Alien floral invasion and erosion in disturbed areas;
- Increased risk of poaching for skins of *Panthera pardus*;
- Increased risk of collision of faunal species with powerlines and mining vehicles; and
- Increased risk of poaching/trapping and persecution of faunal SCC within the area.

The above activities are likely to have a significant impact on species of conservation concern within and around the study area. The following tables provide an indication of the anticipated impact significance pre- and post-mitigation.

Activities and aspect registry

Pre-Construction	Construction	Operational	Decommissioning & Closure
Poor planning of infrastructure placement and design in sensitive faunal habitat.	Site clearing and the removal of vegetation leading to a loss of sensitive species.	On-going disturbance of habitat due to operational activities leading to a loss of sensitive species.	Ineffective rehabilitation of exposed and impacted areas leading to permanent losses of sensitive species.
Failure to develop and initiate a biodiversity action plan, rehabilitation plan and alien floral control plan during the pre-construction phase.	Collision of vehicles with faunal SCC..	Increased introduction and proliferation of alien plant species and further transformation of faunal diversity.	On-going risk of contamination from mining facilities beyond closure leading to permanent impact on sensitive species.
Placement of open pits, topsoil stockpiles, overburden dumps and other surface infrastructure in sensitive faunal habitat.	Increased risk of poaching and trapping of sensitive species.	Risk of contamination from operational facilities may pollute receiving environment leading to a loss of faunal SCC.	On-going seepage and runoff may affect the ground/surface water regime beyond closure affecting amphibian and terrestrial species (consumption).
	Movement of construction vehicles and access road construction through sensitive faunal habitat.	Increased risk of poaching and trapping of sensitive species.	Failure to implement a biodiversity action plan, rehabilitation plan and alien floral control plan during the decommissioning and closure phase.
	Construction of topsoil stockpiles, overburden dumps and other surface infrastructure leading to a loss of sensitive species.	Collision of vehicles with faunal species.	
	Increased fire frequency during construction leading to a loss of sensitive species	Additional pressure on sensitive species by increased human populations associated with the proposed mine.	
	Failure to implement a biodiversity action plan, rehabilitation plan and alien plant control plan during the construction phase.	Increased fire frequency during operation leading to a loss of sensitive species.	
	Displacement of faunal SCC	Displacement of faunal SCC	

Unmanaged								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	4	4	4	4	4	8	12	96 (Medium High)

Operational phase	4	4	4	4	4	8	12	96 (Medium High)
Decommissioning and closure phase	4	4	4	4	4	8	12	96 (Medium High)
Managed								
	Probability of Impact	Sensitivity of receiving environment	Severity	Spatial scale	Duration of impact	Likelihood	Consequence	Significance
Construction phase	3	4	4	3	4	7	11	77 (Medium High)
Operational phase	3	4	3	3	4	7	10	70 (Medium-Low)
Decommissioning and closure phase	3	4	2	3	4	7	9	63 (Medium-Low)

Impact assessment summary

From the results of the faunal impact assessment it is evident that prior to mitigation all impacts on the receiving faunal environment are high to very high in the construction, operational, decommissioning and closure phases. Mitigation measures as presented in Section 7.4 below will alleviate some of the impacts on the receiving faunal environment, however even with mitigation measures in place the impact significance remains medium high for the construction phase and medium high during the operational and closure phase after mitigation.

Table 8: Summary of impact significance on faunal resources.

Construction Phase		
Impact	**Unmanaged**	**Managed**
1: Impact on habitat for faunal species	Very High	High
2: Impact on faunal diversity	Very High	High
3: Impact on species of conservation concern	Medium High	Medium High
Operational Phase		
Impact	**Unmanaged**	**Managed**
1: Impact on habitat for faunal species	Very High	Medium High
2: Impact on faunal diversity	Very High	Medium High
3: Impact on species of conservation concern	Medium High	Medium Low
Decommissioning and Closure Phase		
Impact	**Unmanaged**	**Managed**
1: Impact on habitat for faunal species	Very High	Medium Low
2: Impact on faunal diversity	Very High	Medium Low
3: Impact on species of conservation concern	Medium High	Medium Low
Summary	**Very High**	**Medium High to high**

6.4 Faunal Impact Mitigation

Mitigation measures

Based on the findings of the faunal ecological assessment, several recommendations are made to minimise the impact on the faunal ecology of the area, should the proposed mining project proceed. Please note that many of the mitigation measures applicable to floral ecology are applicable to faunal ecology and to avoid repetition were omitted. However, all floral mitigation measures must be implemented in conjunction with faunal mitigation measures:

- No areas falling outside of the footprint area may be cleared for construction or mining purposes;
- As far as possible avoid placing any infrastructure within more sensitive areas such as the steeper rocky slopes on site and Freshwater habitat units;
- The footprint of the proposed mine, should it proceed, should be fenced off to minimize potential impacts to faunal species within the area;
- The footprint and daily operation of surface infrastructure must be strictly monitored to ensure that edge effects from the operational facilities do not affect the surrounding habitat units. The significance of the impact on the ecology of the area will be largely linked to the degree to which this can be implemented;
- No trapping, collecting or hunting of faunal species must be allowed during any phases of the proposed mining development;
- Implement an awareness program to inform mine personnel and local communities about the importance of faunal species and habitat conservation;
- All voids, or open pits must be fenced off in order to prevent faunal species falling into such features;

- Implement bird flappers or other bird deterrents on powerlines, especially where the lines cross sensitive habitat areas such as the Mutamba River and the Soutpansberg Mountain Bushveld;
- An active bird monitoring programme should be developed for the duration of the mine in order to ensure that population numbers are not signficicantly impacted. This EMP should allow for implementation of additional mitigation measures as and when needed.
- As far as possible the existing road network is to be used, limiting further impact as a result of the construction of new roads;
- Restrict vehicles to designated roadways to limit the ecological footprint of the construction and operational activities as well as to reduce the possibility of collisions with faunal species through the reduction of speed limit;
- Prohibit uncontrolled fires within the study area;
- Site clearing should occur in a phased manner, enabling faunal species to naturally move to surrounding natural areas. During this time of clearing it is recommended that grazing camp fences, which are no longer needed, are removed in the affected sections so as to enable easy movement of faunal species out of the areas being cleared;
- Smaller arachnids and species which are suitable for relocation, such as tortoises can be relocated to surrounding natural areas;
- Faunal SCC such as *Panthera pardus* (Leopard) and *Hyaena brunnea* (Brown Hyaena) were noted to utilise the northern portions of the study area (Soutpansberg Mountain Bushveld and Freshwater Habtat units), and as such it is recommended that these areas be excluded from the mining development and are left to function as a natural habitat refuge for faunal species that are displaced as a result of mining activities;
- Innovative blasting techniques must be investigated to minimise ground and air vibrations and disturbances so as to minimise the impacts on surrounding nesting avifaunal and roosting bat species;
- Where possible the removal of large established trees must be avoided, as these provide breeding and roosting sites for raptor and bat species occurring within the region; and
- Lighting pollution and its effect on fauna (with special mention of invertebrates, bats and avifauna) must be effectively mitigated with the following guidelines in mind with due cognizance take of health and safety requirements:
    - Downward facing lights must be installed and limited to absolutely essential areas; and

- Covers/light diffusers must be installed to lessen the intensity of illumination if at all possible.

Probable Latent Impacts

The study area is located in the Soutpansberg IBA, as well as bordering the Nzhelele Game Reserve, and is likely to provide primary, secondary and temporary habitat to a number of important faunal species. Large raptors known to occur in the region are likely to utilise the study area for both foraging and breeding, similarly for other faunal species. The latent impacts of the mining activities in the study area will likely result in a decrease of these species, as the overall regional carrying capacity and breeding habitat potential of the region will be decreased, compounded with increased threats from poaching and wood harvesting.

Even with extensive mitigation, significant latent impacts on the receiving faunal ecological environment are deemed highly likely. The following points highlight the key latent impacts that have been identified:

- Loss of ecologically important faunal habitat;
- Loss of faunal habitat diversity;
- Loss of and altered faunal species diversity; and
- Loss of SCC and associated suitable habitat.

Faunal Monitoring

A faunal monitoring plan must be designed and implemented throughout all phases of the mining development, should it be approved. It is recommended that monitoring activities be conducted on an annual basis. The following points aim to guide the design of the monitoring plan, and it must be noted that the monitoring plan must be continually updated and refined for site-specific requirements:

- It is recommended that monitoring points must be established in areas surrounding the mining area. These points must be designed to accurately monitor the following parameters:
  - Species diversity (mammal, invertebrate, amphibian, reptile and avifauna);
  - Species abundance; and
  - Faunal community structure including species composition and diversity which should be compared to pre-development conditions.
- The following methods aim to guide the monitoring plan, although more detailed, site specific methods must be employed during the development and implementation of the monitoring plan:
  - Monitoring activities must take place on an annual basis as a minimum;

- Pitfall traps can be installed to monitor invertebrate diversity;
- Sherman and camera traps can be installed to monitor small mammal diversity;
- Fixed and random points for bird counts to determine species composition and diversity trends (Should be conducted in the month of February due to the presence of migrants);

➢ Results of the monitoring activities must be taken into account during all phases of the proposed mining development and action must be taken to mitigate impacts as soon as negative effects (negative deviation from baseline conditions as determined by the baseline ecological assessments) from mining related activities become apparent.

➢ The method of monitoring must be designed to be subjective and repeatable in order to ensure consistent results.

7 CONCLUSION

Scientific Terrestrial Services (STS) was appointed to update the findings from a faunal assessment undertaken in 2015 by Scientific Aquatic Services and conduct a faunal and floral ecological assessment as part of the Environmental Assessment and Authorisation process for a proposed coal mine on the remaining extent of the farm The Duel 186 MT, Limpopo Province.

The results of the 2015 and 2019 field assessments were combined in this report to give a more accurate representation of the biodiversity associated with the study area. During the field assessment three habitat units were identified, i.e. Soutpansberg Mountain Bushveld, Mopane Bushveld and the Freshwtare Resources habitat units. The Freshwater habitat is considered to be of high faunal ecological importance, Soutpansberg Mountain Bushveld habitat unit is considered to be of moderately high faunal ecological importance and the Mopane Bushveld unit is considered to be of Moderately-low faunal ecological importance.

Due to the sensitivity of the study area impacts to faunal habitat and communities ranged from Medium-High to Very High unmitigated. If effective mitigation takes place as listed in Section 7, some of the impacts may be reduced to a medium – high, medium – low ratings in the construction and operational phases. Impacts in the decommissioning and closure phase with mitigation measures adhered to can be reduced to a medium-low rating, largely since severe impacts would have already taken place, although residual impacts such as groundwater seepage may have a negative impact on amphibian and mammalian life if it enters the Mutamba River. It is thus deemed essential that a cogently developed, documented and managed biodiversity management plan be implemented and maintained throughout the life of the proposed mine. Moreover, the study area falls within the Vhembe Biosphere Reserve and, albeit within the transitional zone thereof, the area should aim to both conserve the uniquely biodiverse environment, while simultaneously supporting and promoting sustainable development – of which mining is not deemed a compatible land use (Limpopo C-Plan).

The objective of this study was to provide sufficient information on the floral ecology of the area, together with other studies on the physical and socio-cultural environment, in order for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) and the concept of sustainable development. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure economic development of the country. It is the opinion of the ecologists that this study provides the relevant information required in order to implement IEM and to ensure that the

best long-term use of the ecological resources in the study area will be made in support of the principle of sustainable development.

8 REFERENCES

Alexander, G and Marais, J 2008 Second Edition. A guide to the reptiles of Southern Africa. Struik Publishers, Cape Town.

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

Branch, B. 1998. Third Edition. Field Guide to Snakes and other Reptiles in Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

Branch, W.R. (Ed). 1988. South African Red Data Book of Reptiles and Amphibians. South African National Scientific Programmes Report No. 151

Carruthers, V. 2001. Frogs and frogging in Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

Endangered Wildlife Trust (Conservation Breeding Specialist Group). 2004. Red Data Book of the Mammals of South Africa: A conservation Assessment.

Henning, G.A & Henning, S.F. 1989*. South African Red Data Book of Butterflies. South African National Scientific Programmes Report No. 158

IUCN Red Data Book Third edition, part 1. Cambridge, U.K.: International Council for Bird Preservation, and International Union for Conservation of Nature and Natural Resource. Online available: http://www.iucnredlist.org/about/red-list-overview

Leeming, J. 2003. Scorpions of Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

Leroy, A. & Leroy, J. Second Edition. 2003. Spiders of Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

Marais, J. 2004. A complete guide to the Snakes of Southern Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

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

Picker. M., Griffiths. C. & Weaving. A. 2004. New Edition. Field Guide to Insects of South Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

Sinclair, I., Hockey, P. & Tarboton, W. 2002. Third Edition. Sasol Birds of Southern Africa. Struik Publishers, Cape Town, RSA

Smithers, R. H. N. 2000. Third Edition. Edited by Peter Apps. The Mammals of the Southern African. A Field Guide. Struik Publishers, Cape Town, RSA.

Southern African Bird Atlas Project (SABAP) 2. 2015. Online available: http://sabap2.adu.org.za/.

Walker, C. 1988. Fourth Edition. Signs of the Wild. Struik Publishers (Pty) Ltd, Cape Town, RSA

Woodhall, S. 2005. Field Guide to Butterflies of South Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA

APPENDIX A: Faunal Method of Assessment

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of human habitation nearby the study area and the associated anthropogenic activities may have an impact on faunal behaviour and in turn the rate of observations. In order to increase overall observation time within the study area, as well as increasing the likelihood of observing shy and hesitant species, camera traps were strategically placed within the MRA. Sherman traps were also used to increase the likelihood of capturing and observing small mammal species, notably small nocturnal mammals.

Mammals

Mammal species were recorded during the field assessment with the use of camera traps, Sherman traps and visual identification of spoor, call and dung. Specific attention was paid to mammal SCC as listed by the IUCN, 2015.

Figure A1: Field methods used during the assessments left: camera trap, right : Sherman trap

Avifauna

The Southern African Bird Atlas Project 2 database (http://sabap2.adu.org.za/) was compared with the recent field survey of avifaunal species identified on the MRA. Field surveys were undertaken utilising a pair of Bushnell 10x50 binoculars and bird call identification techniques were utilised during the assessment in order to accurately identify avifaunal species. Specific attention was given to avifaunal SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Reptiles

Reptiles were identified during the field survey. Suitable applicable habitat areas (rocky outcrops and fallen dead trees) were inspected and all reptiles encountered were identified. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which reptile species are likely to occur on the MRA. Specific attention was given to reptile SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Amphibians

Identifying amphibian species is done by the use of direct visual identification along with call identification technique. Amphibian species flourish in and around wetland, riparian and moist grassland areas. It is unlikely that all amphibian species will have been recorded during the site assessment, due to their cryptic nature and habits, varied stages of life cycles and seasonal and temporal fluctuations within the environment. The data gathered during the assessment along with the habitat analysis provided an accurate indication of which amphibian species are likely to occur within the study area as well as the surrounding area. Specific attention was given to amphibian SCC listed on a regional and

national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Invertebrates

Whilst conducting transects through the MRA, all insect species visually observed were identified, and where possible photographs taken. Furthermore, at suitable and open sites within the MRA sweep netting was conducted, and all the insects captured identified. Due to the terrain, and shallow/ rocky soil structure pitfall traps were not utilised during the site assessment.

It must be noted however that due to the cryptic nature and habits of insects, varied stages of life cycles and seasonal and temporal fluctuations within the environment, it is unlikely that all insect species will have been recorded during the site assessment period. Nevertheless, the data gathered during the assessment along with the habitat analysis provided an accurate indication of which species are likely to occur in the MRA at the time of survey. Specific attention was given to insect SCC listed on a regional and national level, as well as those identified by the International Union for the Conservation of Nature (IUCN).

Arachnids

Suitable applicable habitat areas (rocky outcrops, sandy areas and fallen dead trees) where spiders and scorpions are likely to reside were searched. Rocks were overturned and inspected for signs of these species. Specific attention was paid to searching for Mygalomorphae arachnids (Trapdoor and Baboon spiders) as well as potential SCC scorpions within the MRA.

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC was determined using the following four parameters:

- Species distribution;
- Habitat availability;
- Food availability; and
- Habitat disturbance.

The accuracy of the calculation is based on the available knowledge about the species in question. Therefore, it is important that the literature available is also considered during the calculation.
Each factor contributes an equal value to the calculation.

Scoring Guideline				
Habitat availability				
No Habitat	**Very low**	**Low**	**Moderate**	**High**
1	2	3	4	5
Food availability				
No food available	**Very low**	**Low**	**Moderate**	**High**
1	2	3	4	5
Habitat disturbance				
Very High	**High**	**Moderate**	**Low**	**Very Low**
1	2	3	4	5
Distribution/Range				
Not Recorded		**Historically Recorded**		**Recently Recorded**
1		3		5

[Habitat availability + Food availability + Habitat disturbance + Distribution/Range] / 20 x 100 = POC%

Faunal Habitat Sensitivity

The sensitivity of the MRA for each faunal class (i.e. mammals, birds, reptiles, amphibians and invertebrates) was determined by calculating the mean of five different parameters which influence each faunal class and provide an indication of the overall faunal ecological integrity, importance and sensitivity of the MRA for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Faunal SCC:** The confirmed presence or potential for faunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for each class;
- **Food Availability:** The availability of food within the MRA for each faunal class;
- **Faunal Diversity:** The recorded faunal diversity compared to a suitable reference condition such as surrounding natural areas or available faunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the MRA for each faunal class. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the MRA in relation to each faunal class. The different classes and land-use objectives are presented in the table below:

Table A1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit ar surrounds while optimising development potential.
≥3.5<4.5	Moderately high	Preserve and enhance the biodiversity of the habitat un limit development and disturbance.
≥4.5 ≤5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.

APPENDIX B: FAUNAL SCC

Faunal Species of Conservation Concern

Table C1: Red Data Mammal species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status
Diceros bicornis	Black Rhinoceros	CR	CR
Neamblysomus julianae	Juliana's golden mole	CR	VU
Loxodonta africana	African elephant	VU	VU
Lycaon pictus	African wild dog	EN	EN
Amblysomus gunningi	Gunning's golden mole	VU	EN
Lutra maculicollis	Spotted-necked otter	VU	LC
Acinonyx jubatus	Cheetah	VU	VU
Felis lybica	African Wild Cat	VU	NYBA
Panthera leo	Lion	VU	VU
Ceratotherium simum	White rhinoceros	NT	NT

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened. NYBA = Not yet been assessed by the IUCN.

Table C2: Red Data Bird species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status
Gyps coprotheres	Cape Vulture	T	VU
Ciconia nigra	Black Stork	T	LC
Falco naumanni	Lesser Kestrel	T	LC
Certhilauda chuana	Short-clawed Lark	T	LC
Pterocles gutturalis	Yellow throated Sandgrouse	T	LC
Anthropoides paradiseus	Blue Crane	T	VU
Gyps africanus	White backed Vultures	T	EN
Ardeotis kori	Kori Bustard	T	LC
Scotopelia peli	Pel's Fishing Owl	T	LC
Bucorvus leadbeateri	Southern Ground Hornbill	T	VU
Buphagus erythrorhynchus	Red-billed Oxpecker	T	LC
Terathopius ecaudatus	Bateleur	T	NT
Polemaetus bellicosus	Martial Eagle	T	NT
Aquila rapax	Tawny Eagle	T	LC
Torgos tracheliotos	Lappet faced Vulture	T	VU
Trigonoceps occipitalis	White headed Vulture	T	VU
Buphagus africanus	Yellow billed Oxpecker	T	LC
Stephanoaetus coronatus	Crowned hawk Eagle	T	NT

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened. NYBA = Not yet been assessed by the IUCN. T = listed as threatened but with no specific status for the Limpopo Province

Table C3: Red Data Amphibian species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status
Breviceps sylvestris	Transvaal forest rain frog	VU	EN
Ptychadena uzungwensis	Udzungwa ridged frog	P	LC
Leptopelis bocagii	*Bocage's tree frog*	P	LC
Hemisus guineensis	Guinea Snout-burrower	P	LC

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table C4: Red Data Reptile species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status
Homoroselaps dorsalis	Striped Harlequin snake	R	NT
Xenocalamus transvaalensis	Transvaal Quill-snout snake	R	DD
Lamprophis swazicus	Swazi Rock Snake	R	NT
Python natalensis	African Rock Python	VU	NYBA
Lygodactylus methueni	Methuen's Dwarf Gecko	VU	VU
Crocodylus niloticus	Nile Crocodile	VU	LC
Lycophidion variegatum	Variegated Wolf snake	P	NYBA
Psammophis jallae	Jalla's Sand snake	P	NYBA

R = Rare, DD = Data Deficient, LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table C5: Red Data Invertebrates species mentioned in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status
Taurhina splendens	Splendid fruit chafer *	T	NYBA
Charaxes marieps	Marieps Charaxes butterfly *	T	NYBA
Trichostetha fasicularis	Protea beetle *	T	NYBA
Ischnestoma ficqui	Fruit eating beetles *	T	NYBA

R = Rare, DD = Data Deficient, LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened. NYBA = Not yet been assessed by the IUCN. T = listed as threatened but with no specific status for the Limpopo Province. * Very little detailed or general information exists on terrestrial invertebrates in the Limpopo Province, thus in general there is very little consolidated information regarding invertebrates (Limpopo SOER, 2004).

South African Bird Atlas Project 2 list for quadrant 2230CA and 2230CC

Table C6: Avifaunal Species for the pentads 2240_3000 and **2245_3000 within the QDS 2327CB.**

Pentads	Link to pentad summary on the South African Bird Atlas Project 2 web page
2240_3000	http://sabap2.adu.org.za/coverage/pentad/2240_3000
2245_3000	http://sabap2.adu.org.za/coverage/pentad/2245_3000

APPENDIX D: Faunal Species List

Table D1: Mammal species recorded during the field assessment.

Scientific name	Common Name	IUCN Red List Status
Sylvicapra grimmia	Common Duiker	LC
Aepyceros melampus	Impala	LC
Kobus ellipsiprymnus	Waterbuck	LC
Hyaena brunnea	Brown Hyaena	**NT**
Phacochoerus africanus	Warthog	LC
Civettictis civetta	African Civet	LC
Panthera pardus	Leopard	**NT**
Canis mesomelas	Black-backed Jackal	LC
Otocyon megalotis	Bat-eared Fox	LC
Tragelaphus strepsiceros	Kudu	LC
Hystrix africaeaustralis	Cape Porcupine	LC
Chlorocebus aithiops	Vervet Monkey	LC
Papio ursinus	Chacma Baboon	LC
Lepus saxatilis	Scrub Hare	LC
Procavia capensis	Rock Dassie	LC
Galerella sanguinea	Slender Mongoose	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC
Paraxerus cepapi	Tree Squirrel	LC
Tragelaphus angasii	Nyala	LC
Taphozous mauritianus	Mauritian tomb bat	LC

Highlighted species are protected species NT: Near Threatened

Table D2: Avifaunal species recorded during the field assessment.

Scientific name	Common Name	IUCN Red List Status
Streptopelia capicola	Cape turtle-dove	LC
Eremomela usticollis	Burnt-necked Eremomela	LC
Cossypha humeralis	White-throated Robin-chat	LC
Petronia superciliaris	Yellow-throated Sparrow	LC
Cuculus solitarius	Red-chested Cuckoo	LC
Vidua regia	Shaft tailed whydah	LC
Centropus superciliosus	Burchell's Coucal	LC
Vidua paradisaea	Paradise-whydah	LC
Melierax gabar	Gabar Goshawk	LC
Vidua macroura	Pin-tailed Whydah	LC
Bubalornis niger	Red-billed Buffalo-weaver	LC
Lanius collaris	Fiscal Shrike	LC
Hieraaetus spilogaster	African Hawk Eagle	LC
Merops pusillus	Little Bee-eater	LC
Prinia subflava	Tawny flanked Prinia	LC
Turtur chalcospilos	Emerald-spotted Wood-dove	LC
Amadina fasciata	Cut-throat Finch	LC
Lagonosticta rubricata	African Firefinch	LC
Streptopelia senegalensis	Laughing dove	LC

Tockus leucomelas	Southern Yellow-billed Hornbill	LC
Tockus nasutus	African Grey Hornbill	LC
Estrilda astrild	Common Waxbill	LC
Uraeginthus angolensis	Blue Waxbill	LC
Coturnix coturnix	Common Quail	LC
Streptopelia senegalensis	Laughing Dove	LC
Oena capensis	Namaqua Dove	LC
Cinnyricinclus leucogaster	Plum-coloured Starling	LC
Laniarius atrococcineus	Crimson-breasted Shrike	LC
Thamnolaea cinnamomeiventris	Mocking Chat	LC
Phoeniculus purpureus	Green Woodhoopoe	LC
Delichon urbica	House Martin	LC
Riparia paludicola	Brown-throated Martin	LC
Hirundo dimidiata	Pearl-breasted Swallow	LC
Ardea melanocephala	Black-headed Heron	LC
Scopus umbretta	Hammerkop	LC
Halcyon senegalensis	Woodland Kingfisher	LC
Coracias caudatus	Lilac-breasted Roller	LC
Corythaixoides concolor	Grey Go-away Bird	LC
Oenanthe monticola	Mountain Wheatear	LC
Clamator levaillantii	Striped Cuckoo	LC
Dicrurus adsimilis	Fork-tailed Drongo	LC
Buteo vulpinus (B.buteo)	Steppe buzzard	LC
Anthus cinnamomeus	African Pipit	LC
Urocolius indicus	Red-faced Mousebird	LC
Passer domesticus	House sparrow	LC
Lagonosticta rhodopareia	Jameson's Firefinch	LC
Tchagra senegalus	Black-crowned Tchagra	LC
Tchagra australis	Three-streaked Tchagra	LC
Lanius collurio	Red-backed Shrike	LC
Numida meleagris	Helmeted Guineafowl	LC
Anthus leucophrys	Plain Backed Pipit	LC
Prinia flavicans	Black-chested Prinia	LC
Mirafra sabota	Sabota Lark	LC
Lanius minor	Lesser Grey Shrike	LC
Lamprotornis chalybaeus	Greater Blue-eared Glossy Starling	LC

LC = Least Concern, N-End Near-endemic

Table D3: Reptile species recorded during the field assessment.

Scientific name	Common Name	IUCN Red List Status
Bitis caudalis	Horned Adder	NYBA
Naja mossambica	Mozambique Spitting Cobra	NYBA
Trachylepis varia	Variable Skink	NYBA
Heliobolus lugubris	Bushveld Lizard	NYBA
Pachydactylus vansoni	Van Son's Gecko	LC
Chondrodactylus turneri	Turner's Tubercled Gecko	NYBA
Trachylepis punctatissima	Montane Speckled Skink	LC
Stigmochelys pardalis	Leopard tortoise	NYBA

LC = Least Concern, NYBA = Not Yet Been Assessed

Table D4: General invertebrate recorded during the field assessment.

Order	Family	Scientific Name	Common Name	IUCN 2015 Status
Lepidoptera	Pieridae	*Belenois aurota*	Brown-veined White	NYBA
		Eurema brigitta brigitta	Broad-bordered Grass Yellow	NYBA
		Pontia helice helice	Meadow White	NYBA
		Phalanta phalanta	Common Leopard	NYBA
		Byblia ilythia	Spotted Joker	NYBA
		Colotis auxo	Sulphur Orange Tip	NYBA
		Colotis pallene	Bushveld Orange Tip	NYBA
		Colotis danae	Scarlet Tip	NYBA
		Hamanumida daedalus	Guinea Fowl	NYBA
	Nymphalidae	*Ypthima asterope*	African Ringlet	NYBA
		Junonia octavia	Gaudy Commodore	NYBA
		Junonia hierta	Yellow Pansy	LC
		Danaus chrysippus	African Monarch	NYBA
	Lycaenidae	*Chilades trochylus*	Grass Jewel Blue	NYBA
		Euchrysops Osiris	Osiris Smoky Blue	NYBA
		Cacyreus marshalli	Common Geranium Bronze	NYBA
	Papilionidae	*Papilio demodocus*	Citrus Swallowtail	NYBA
		Papilio constantinus constantinus	Constantine's Swallowtail	NYBA
	Hesperiidae	*Leucochitonea levubu*	White-cloaked Skipper	NYBA
Orthoptera	Acrididae	*Cannula gracilis*	Grass mimicking Grasshopper	NYBA
		Orthoctha dasycnemis	N/A	NYBA
		Eyprepocnemis plorans		NYBA
		Rhachitopis sp.	N/A	NYBA
		Orthoctha dasycnemis	N/A	NYBA
		Conistica saucia	Rock Grasshopper	NYBA
	Bradyporidae	*Acanthoplus armiventris*	Corn Cricket	NYBA
	Thericleidae	*Thericles sp*	N/A	NYBA
Odonata	Libellulidae	*Pantala flavescens*	Wandering Glider	LC
		Hemistigma albipuncta	Piedspot	LC
		Orthetrum julia	Julia Skimmer	LC
		Urothemis assignata	Red Basker	LC
Hemitera	Cicadidae	*Platypleura haglundi*	Orange-wing	NYBA
		Stagira sp	Green-wings	NYBA
		Colotis euippe	Smoky Orange Tip	NYBA
		Pynca semiclara	Giant Forest Cicada	NYBA
	Scutelleridae	*Solenostethium liligerum*	N/A	NYBA
	Alydidae	*Hypselopus gigas*	Giant Broad-headed Bug	NYBA
Coleoptera	Meloidae	*Decapotoma lunata*	Lunate Blister Beetle	NYBA
	Scarabaeidae	*Anachalcos convexus*	Plum Dung Beetle	NYBA
		Pachylomerus femoralis	Flattened Giant Dung Beetle	NYBA
	Tenebrionidae	*Psammodes virago*	Giant Toktokkie	NYBA
Phasmatodea	Heteronemiidae	*Bactrododema tiaratum*	Giant Stick Insect	NYBA
Diptera	Asilidae	*Pegesimallus pulchriventris*	N/A	NYBA

Mantodea	Sibyllidae	*Idolomorpha dentifrons*	Cone-headed Mantid	NYBA
		Miomantis Sp		NYBA
Hymenoptera	Formicidae	*Anoplolepis custodiens*	Pugnacious Ant	NYBA
		Plectroctena mandibularis	N/A	NYBA
	Sphecidae	*Ammophila ferrugineipes*	Thread-waisted Wasp	NYBA
	Apidae	*Apis mellifera*	Honey Bee	NYBA
		Meliponula sp	Mopane Bees	NYBA

LC = Least Concern, NYBA = Not yet been assessed by the IUCN

Table D5: Arachnid species recorded during the site assessment.

Scientific name	Common Name	IUCN Red List Status
Hottentotta trilineatus	N/A	NYBA
Parabuthus transvaalicus	Transvaal Thick-tailed Scorpion	NYBA
Cheloctonus jonesii	Burrowing Scorpion	NYBA
Hadogenes troglodytes	Black Rock Scorpion	NYBA
Damon variegatus	Whip Scorpion	NYBA

Table D6: Arachnid species recorded during the site assessment.

Scientific name	Common Name	IUCN Red List Status
Ceratogyrus darlingi	Horned Baboon Spider	NYBA
Selenopidae sp	Wall Crab Spider	NYBA
Nephila senegalensis	Banded-legged Orb Spider	NYBA
Nephila inaurata	Red-legged Orb Spider	NYBA
Soligfuge sp	Red Roman Spider	NYBA

LC = Least Concern, NYBA = Not Yet Been Assessed