



BIODIVERSITY BASELINE ASSESSMENT FOR THE NORTHAM PLATINUM ZONDEREINDE MINE 3 SHAFT.

Limpopo, South Africa

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CLIENT



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Submitted to	PRISM
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Declaration	<p>The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2014 (as amended). We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principles of science.</p>



DECLARATION

I, Martinus Erasmus, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



Martinus Erasmus

Terrestrial Ecologist

The Biodiversity Company

10th October 2019

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1 Introduction

The Biodiversity Company (TBC) was appointed to conduct a baseline biodiversity assessment for the proposed the Northam Platinum Zondereinde 3 Shaft project.

A wet season terrestrial biodiversity survey was conducted on the 12th of December 2018, and a follow up survey was conducted in the 4th of September 2019 by two terrestrial ecologists. The survey primarily focussed on the development footprint area, referred to as the project area herein.

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed development.

1.1 Project Description

The proposed activity to commence on site entails the drilling and sinking of two shafts for underground mining activities.

The shafts will be positioned on two constructed terraces one for the up-cast ventilation shafts (Terrace 2) and one for the two access shafts and downcast ventilation shaft (Terrace 1). The purpose of Terrace 1 is to house a full shaft infrastructure that supports the downcast and access shafts. The purpose of Terrace 2 is to house the two up-cast ventilation shafts (3b and 3b shafts) each equipped with two ventilation fans.

The aim of the study will be to undertake and compile a biodiversity baseline and impact (risk) assessment for the proposed project. This biodiversity assessment will be informed by the National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004.

1.2 Fieldwork

A wet season terrestrial biodiversity survey was conducted on the 12th of December 2018 and a follow up survey was conducted in the 4th of September 2019. The surveys primarily focussed on the development footprint area. Furthermore, the identification and description of any sensitive receptors were recorded across the project area, and the manner in which these sensitive receptors may be affected by the proposed activity was also investigated.

2 Project Area

The project area is located South of the town Thabazimbi just off the R510 in the Limpopo Province. The proposed project area is outlined in Figure 1.

The land uses surrounding the project area consist mainly of mining and existing game farms. Infrastructure such as tar roads and gravel roads occur within the proximity of the project area (Figure 1).

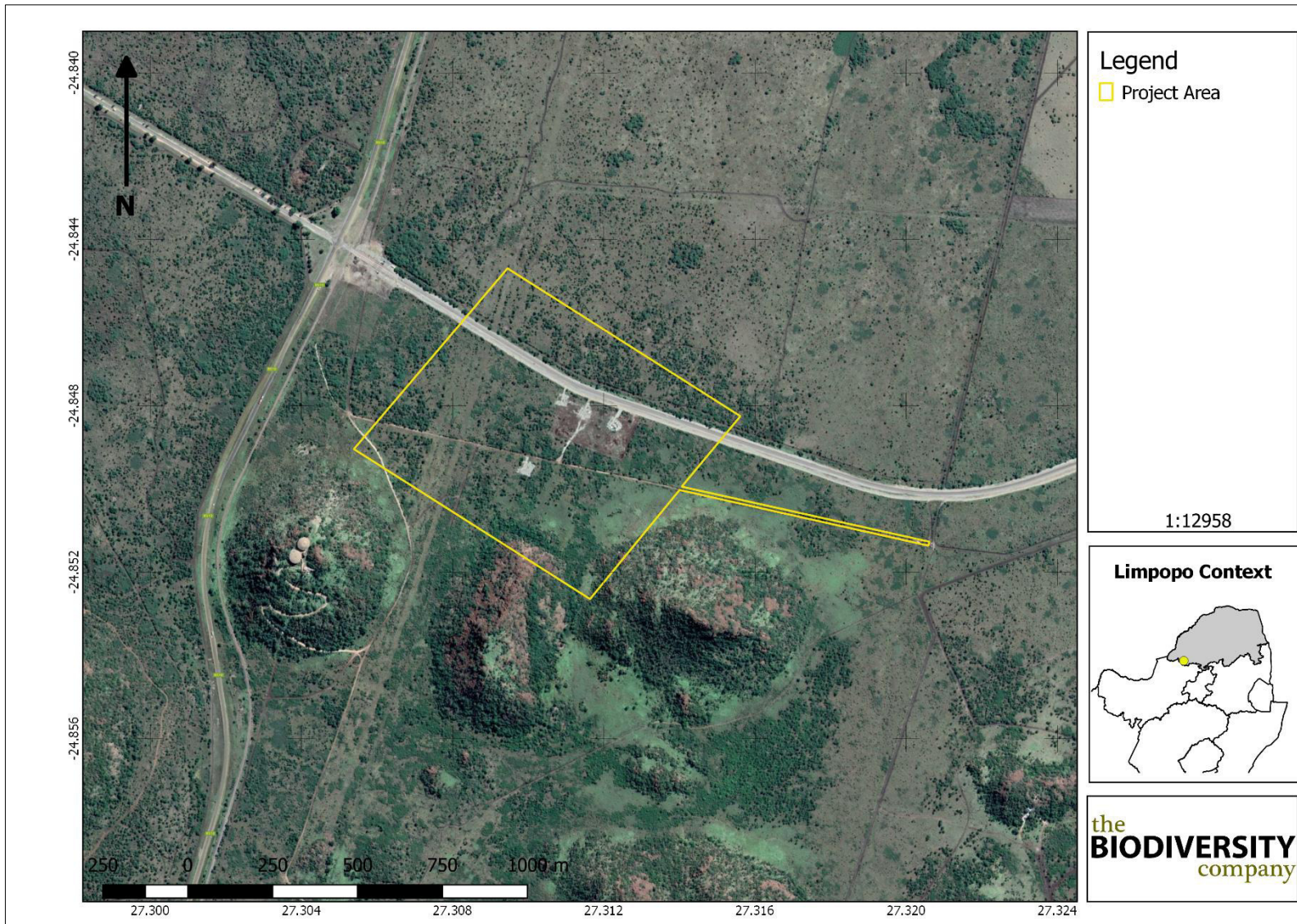


Figure 1: The general location of the proposed project area.

3 Scope of Work

The Terms of Reference (ToR) included the following:

- Desktop description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity) that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed development areas;
- Identification of conservation significant habitats around the project area which might be impacted by the proposed development;
- Site visit to verify desktop information; and
- Provide a map to identifying sensitive receptors in the project area, based on available maps, database information & site visit verification.

4 Limitations

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised of one assessment only, which was conducted during the wet season.
- This study has not assessed any temporal trends for the respective seasons; and
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided.

5 Methodologies

5.1 Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into GIS software to establish how the proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (Mucina et al., 2006);
- Important Bird Areas 2015 – BirdLife South Africa (vector geospatial dataset); and
- Department of Environmental Affairs (DEA) National Landcover 2015.

Field surveys were conducted to confirm (or refute) the presence of species identified in the desktop assessment. The specialist disciplines completed for this study included:

- Botanical;

- Fauna (mammals and avifauna); and
- Herpetology (reptiles and amphibians).

Brief descriptions of the standardised methodologies applied in each of the specialist disciplines are provided below. More detailed descriptions of survey methodologies are available upon request.

5.2 Botanical Assessment

The botanical study encompassed an assessment of all the vegetation units and habitat types within the project area. The focus was on an ecological assessment of habitat types as well as identification of any Red Data species within the known distribution of the project area. Due to the survey being conducted in the dry season this represented a severe limitation to the number of species identified. Furthermore, much of the project area had been recently burnt which further limited the identification of floral species. The methodology included the following survey techniques:

- Sensitivity analysis based on available remaining natural structural habitat; and
- Identification of expected floral red-data species (desktop analysis).

5.3 Literature Study

A literature review was conducted as part of the desktop study to identify the potential habitats present within the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa (BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution.

The Red List of South African Plants website (SANBI, 2017) was utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- Field Guide to the Wild Flowers of the Highveld (Van Wyk & Malan, 1997);
- A Field Guide to Wild Flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk et al., 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification Guide to Southern African Grasses. An identification manual with keys, descriptions and distributions. (Fish et al., 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012);
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo et al., 2009; SANBI, 2016).

5.4 Faunal Assessment (Mammals & Avifauna)

The faunal desktop assessment included the following:

- Compilation of expected species lists;
- Compilation of identified species lists;
- Identification of any Red Data or species of conservation concern (SCC) present or potentially occurring in the area; and
- Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.

The field survey component of the study utilised a variety of sampling techniques including, but not limited to, the following:

- Visual observations;
- Identification of tracks and signs; and
- Utilization of local knowledge.

Habitat types sampled included pristine, disturbed and semi-disturbed zones, drainage lines and wetlands.

Mammal distribution data were obtained from the following information sources:

- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem et al., 2010);
- The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (EWT, 2016);
- Animal Demography Unit (ADU) - MammalMap Category (MammalMap, 2017) (mammalmap.adu.org.za);
- A Field Guide to the Tracks and Signs of Southern, Central and East African Wildlife (Stuart & Stuart, 2013); and
- The Smaller Mammals of KwaZulu-Natal (Taylor, 1998).

5.5 Herpetology (Reptiles & Amphibians)

A herpetofauna assessment of the project area was also conducted. The herpetological field survey comprised the following techniques:

- Diurnal hand searches - are used for reptile species that shelter in or under particular microhabitats (typically rocks, exfoliating rock outcrops, fallen timber, leaf litter, bark etc.);
- Visual searches - typically undertaken for species whose behaviour involves surface activity or for species that are difficult to detect by hand-searches or pitfall trapping. May include walking transects or using binoculars to view the species from a distance without the animal being disturbed;
- Amphibians – many of the survey techniques listed above will be able to detect species of amphibians. Over and above these techniques, vocalisation sampling techniques are often the best to detect the presence of amphibians as each species has a distinct call;
- Opportunistic sampling - reptiles, especially snakes, are incredibly elusive and difficult to observe. Consequently, all possible opportunities to observe reptiles are taken in order to augment the standard sampling procedures described above. This will include talking to local people and staff at the site and reviewing photographs of reptiles and amphibians that the other biodiversity specialists may come across while on site.

Herpetofauna distributional data was obtained from the following information sources:

- South African Reptile Conservation Assessment (SARCA) (sarca.adu.org);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007);
- Field guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Atlas and Red list of Reptiles of South Africa, Lesotho and Swaziland (Bates et al., 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009);
- Animal Demography Unit (ADU) - FrogMAP (frogmap.adu.org.za);
- Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Mintner et al., 2004); and
- Ensuring a future for South Africa's frogs (Measey, 2011).

5.6 Wet Season Fieldwork

The wet season fieldwork and sample sites were placed within specific areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork.

The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological habitat assessment at

each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with proposed development areas.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area. Effort was made to cover all the different habitat types within the limits of time and access. The geographic location of sample sites and site coverage are shown under the Results section.

5.7 Key Legislative Requirements

The legislation, policies and guidelines listed below are applicable to the current project in terms of biodiversity and ecological support systems (Table 1). The list below, although extensive, may not be exhaustive and other legislation, policies and guidelines may apply in addition to those listed below.

Explanation of certain documents, organisations or legislation is provided (below Table 1) where these have a high degree of relevance to the project and/or are referred to in this assessment.

Table 1: A list of key legislative requirements relevant to biodiversity and conservation

INTERNATIONAL	<p>Convention on Biological Diversity (CBD, 1993)</p> <p>The United Nations Framework Convention on Climate Change (UNFCCC, 1994)</p> <p>The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)</p> <p>The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)</p>
NATIONAL	<p>Constitution of the Republic of South Africa (Act No. 108 of 2006)</p> <p>The National Environmental Management Act (NEMA) (Act No. 107 of 1998)</p> <p>The National Environmental Management Protected Areas Act (Act No. 57 of 2003)</p> <p>The National Environmental Management Biodiversity Act (Act No. 10 of 2004)</p> <p>The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);</p> <p>The Environment Conservation Act (Act No. 73 of 1989)</p> <p>National Environmental Management Air Quality Act (No. 39 of 2004)</p> <p>National Protected Areas Expansion Strategy (NPAES)</p> <p>Natural Scientific Professions Act (Act No. 27 of 2003)</p> <p>National Biodiversity Framework (NBF, 2009)</p> <p>National Forest Act (Act No. 84 of 1998)</p> <p>National Veld and Forest Fire Act (101 of 1998)</p> <p>National Water Act, 1998 (Act 36 of 1998)</p> <p>National Freshwater Ecosystem Priority Areas (NFEPA's)</p> <p>National Spatial Biodiversity Assessment (NSBA)</p> <p>World Heritage Convention Act (Act No. 49 of 1999)</p> <p>National Heritage Resources Act, 1999 (Act 25 of 1999)</p> <p>Municipal Systems Act (Act No. 32 of 2000)</p> <p>Alien and Invasive Species Regulations, 2014</p> <p>South Africa's National Biodiversity Strategy and Action Plan (NBSAP)</p> <p>Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)</p> <p>Sustainable Utilisation of Agricultural Resources (Draft Legislation).</p> <p>White Paper on Biodiversity</p>
PROVINCIAL	<p>The Limpopo Conservation Plan, Version 2</p>

International Legislation and Policy

- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival; and
- The IUCN (World Conservation Union). The IUCN's mission is to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

National Level

- Constitution of the Republic of South Africa (Act 108 of 1996). The Bill of Rights, in the Constitution of South Africa states that everyone has a right to a nonthreatening environment and requires that reasonable measures be applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development;
- The National Environmental Management: Biodiversity Act (NEM:BA) No. 10 of 2004: specifically, the management and conservation of biological diversity within the RSA and of the components of such biological diversity;
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species;
- National Biodiversity Assessment (NBA): The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver et al., 2011). The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver et al., 2011).

Provincial and Municipal Level

In addition to national legislation, South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996).

The Limpopo Conservation Plan, Version 2 (Desmet et al., 2013) is the main provincial legislation for the province.

6 Project Area

6.1 General Land Use and Cover

The land uses surrounding the project area consist mainly of mining and game farms. Infrastructure such as secondary tar roads and gravel roads, occur within the proximity of the project area. The following infrastructure exists within the project area and surroundings:

- Various secondary tar and gravel access roads; and
- Electrical infrastructure.

6.2 Project Area in Relation to the Limpopo Conservation Plan, Version 2 (LCPv2)

The Limpopo Conservation Plan, Version 2 (LCPv2), was completed in 2013 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet et al., 2013). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan

(i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet et al., 2013). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1 (CBA1);
- Critical Biodiversity Area 2 (CBA2);
- Ecological Support Area 1 (ESA1);
- Ecological Support Area 2 (ESA2);
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet et al., 2013).

ESA's are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

ONAs consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Driver et al., 2017).

NNR are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Driver et al., 2017).

The proposed shaft area is situated entirely across, and will impact upon, an ONA (Figure 2). The majority of the project area is classified as an ONA which is not considered as sensitive as a CBA 1 and CBA 2 categories. A CBA area 2 does however occur in close proximity to the project area.

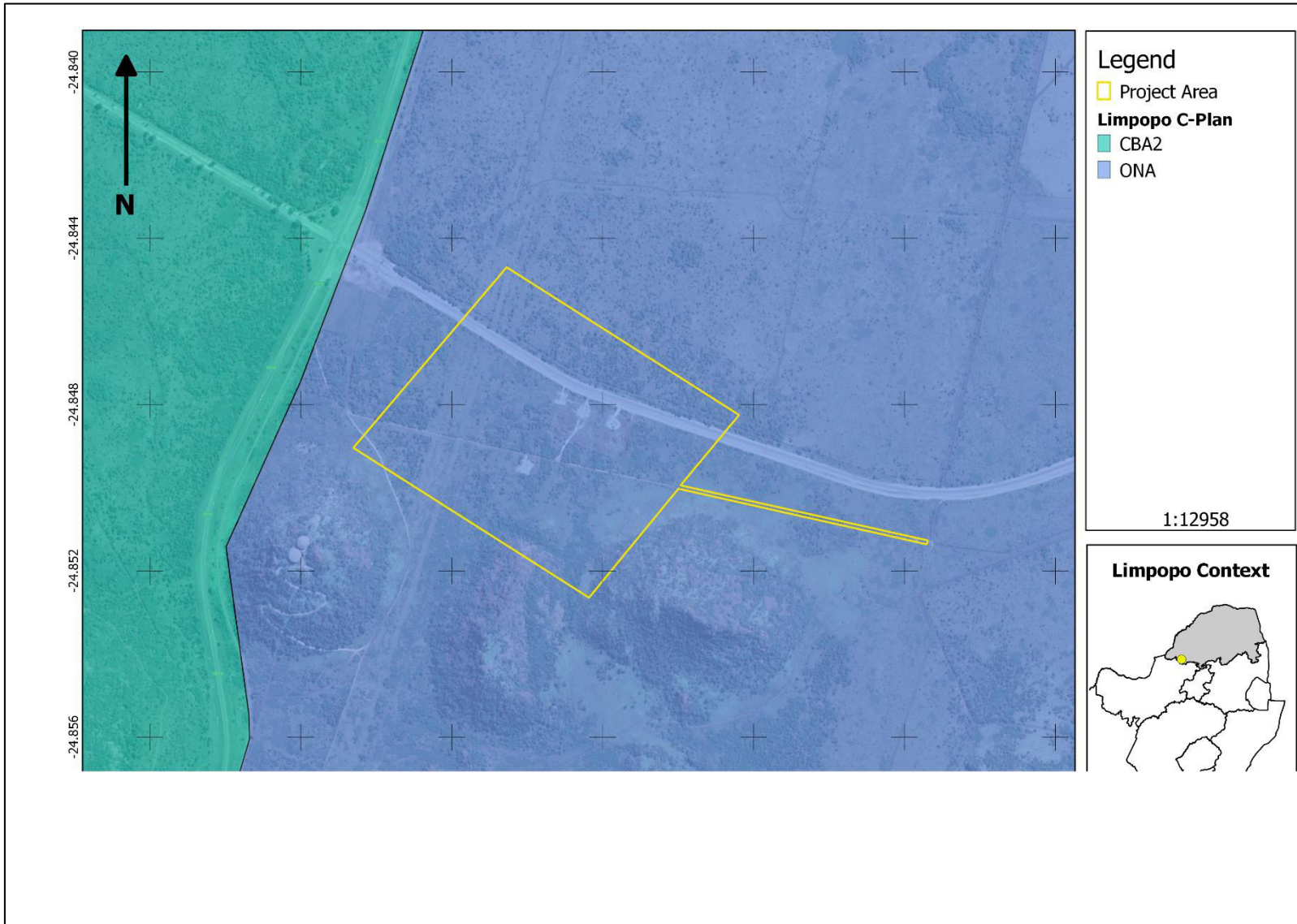


Figure 2: Project area in relation to the Limpopo Conservation Plan, Version 2 (LCPv2)



6.3 National Biodiversity Assessment

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level (Driver et al., 2011).

6.3.1 Ecosystem Threat Status

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver et al., 2011).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver et al., 2011).

The proposed project was superimposed on the terrestrial ecosystem threat status (Figure 3). As seen in this figure the project area falls across one ecosystem, which is listed as Least Threatened (LT).

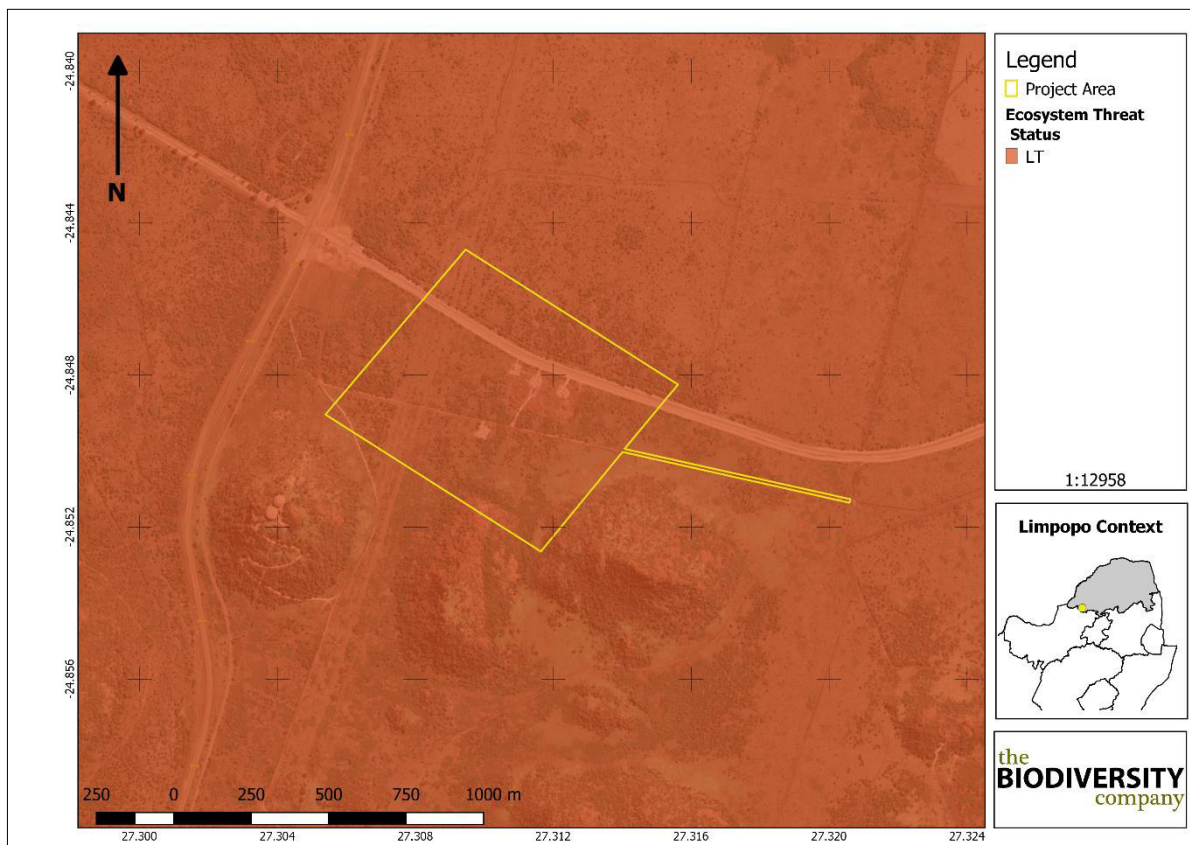


Figure 3: The project area showing the ecosystem threat status of the associated terrestrial ecosystems (NBA, 2012)

6.3.2 Ecosystem Protection Level

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Driver et al., 2011).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development (Figure 4). Based on this the terrestrial ecosystems associated with the proposed project area are rated as *poorly protected*. This means that these ecosystem types (and associated habitats) are not well protected anywhere in the country (such as in nationally protected areas).

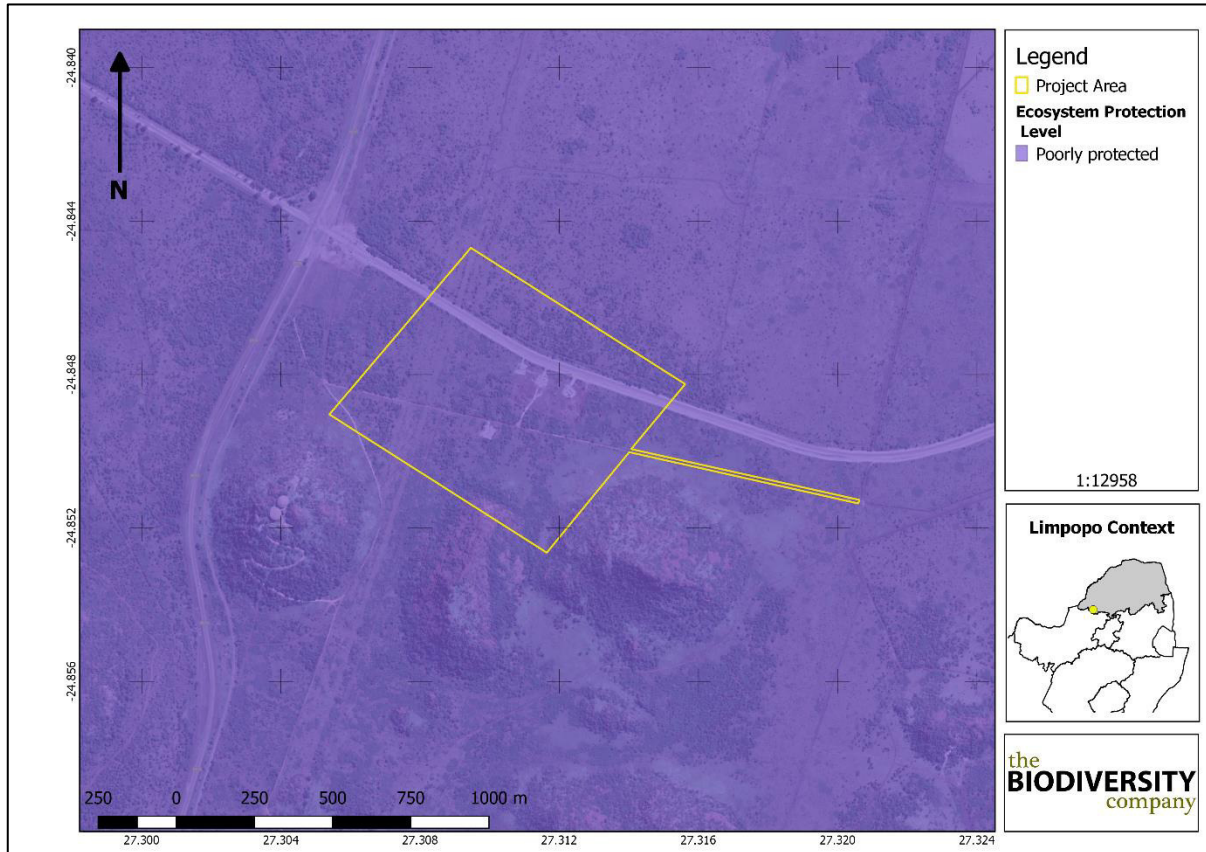


Figure 4: The project area showing the level of protection of terrestrial ecosystems (NBA, 2012)

6.4 Project Area in Relation to Protected Areas

Figure 5 shows the location of formally protected areas in relation to the project area. Formally protected areas refer to areas protected either by national or provincial legislation. Based on the SANBI (2010) Protected Areas Map and the National Protected Areas Expansion Strategy (NPAES) the project area does not overlap with, any formally protected areas (Figure 5). However, Madelein Robinson Nature Reserve is in situated the 1 km protected areas buffer.

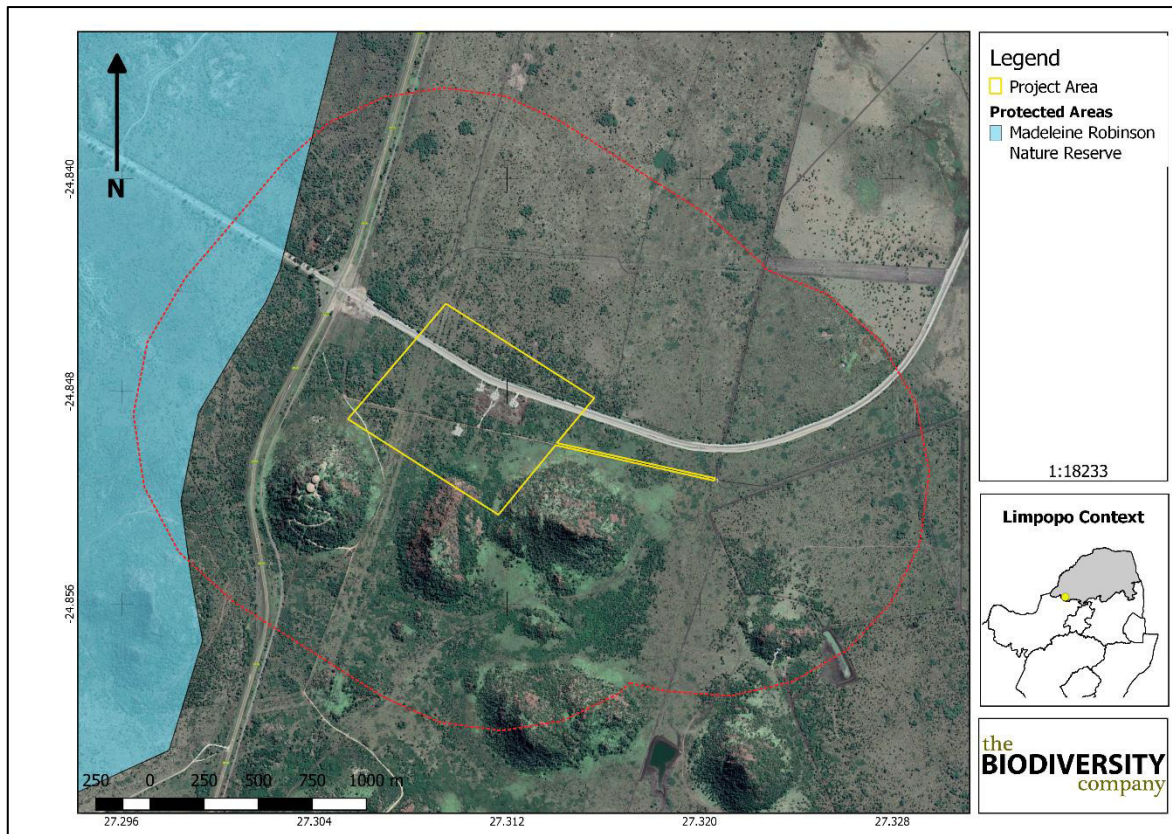


Figure 5: The project area in relation to the formally protected areas (NPAES, 2011)

6.5 Mining and Biodiversity Guidelines

The Mining and Biodiversity Guidelines (2013) was developed by the Department of Mineral Resources, the Chamber of Mines, the South African National Biodiversity Institute and the South African Mining and Biodiversity Forum, with the intention to find a balance between economic growth and environmental sustainability. The Guideline is envisioned as a tool to “foster a strong relationship between biodiversity and mining which will eventually translate into best practice within the mining sector. In identifying biodiversity priority areas which have different levels of risk against mining, the Guideline categorises biodiversity priority areas into four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas:

- A) Legally protected areas, where mining is prohibited;
- B) Areas of highest biodiversity importance, which are at the highest risk for mining;
- C) Areas of high biodiversity importance, which are at a high risk for mining; and
- D) Areas of moderate biodiversity importance, which are at a moderate risk for mining.

Table 2 shows the four different categories and the implications for mining within each of these categories.

The Guideline provides a tool to facilitate the sustainable development of South Africa’s mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country’s biodiversity and ecosystem services. It provides the mining sector with a practical, user- friendly manual for integrating biodiversity considerations into the planning

processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. The Guideline provides explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining.

Overall, proponents of a mining activity in biodiversity priority areas should demonstrate that:

- There is significant cause to undertake mining by commenting on whether the biodiversity priority area coincides with mineral or petroleum reserves that are strategically in the national interest to exploit. Reference should also be made to whether alternative deposits or reserves exist that could be exploited in areas that are not biodiversity priority areas or are less environmentally sensitive areas.
- Through the process of a rigorous EIA and associated specialist biodiversity studies the impacts of the proposed mining are properly assessed following good practice. It is critical that sufficient time and resources are budgeted to do so early in the planning and impact assessment process, including appointing appropriate team of people with the relevant skills and knowledge as required by legislation.
- Cumulative impacts have been taken into account.
- The mitigation hierarchy has been systematically applied and alternatives have been rigorously considered.
- The issues related to biodiversity priority areas have been incorporated into a robust EMP as the main tool for describing how the mining or prospecting operation's environmental impacts are to be mitigated and managed.
- Good practice environmental management is followed, and monitoring and compliance enforcement is ensured.

Table 2: The mining and biodiversity guidelines categories

Category	Biodiversity priority areas	Risk for mining	Implications for mining
A. Legally protected	<ul style="list-style-type: none"> Protected areas (including National Parks, Nature Reserves, World Heritage Sites, Protected Environments, Nature Reserves) Areas declared under Section 49 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) 	Mining prohibited	<p>Mining projects cannot commence as mining is legally prohibited. Although mining is prohibited in Protected Areas, it may be allowed in Protected Environments if both the Minister of Mineral Resources and Minister of Environmental Affairs approve it.</p> <p>In cases where mining activities were conducted lawfully in protected areas before Section 48 of the Protected Areas Act (No. 57 of 2003) came into effect, the Minister of Environmental Affairs may, after consulting with the Minister of Mineral Resources, allow such mining activities to continue, subject to prescribed conditions that reduce environmental impacts.</p>
B. Highest biodiversity importance	<ul style="list-style-type: none"> Critically endangered and endangered ecosystems Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans River and wetland Freshwater Ecosystem Priority Areas (FEPAs) and a 1km buffer around these FEPAs Ramsar Sites 	Highest risk for mining	<p>Environmental screening, environmental impact assessment (EIA) and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licenses, and environmental authorisations.</p> <p>If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being.</p> <p>An EIA should include the strategic assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. This assessment should fully take into account the environmental sensitivity of the area, the overall environmental and socio-economic costs and benefits of mining, as well as the potential strategic importance of the minerals to the country. Authorisations may well not be granted. If granted, the authorisation may set limits on allowed activities and impacts and may specify biodiversity offsets that would be written into license agreements and/or authorisations.</p>
C. High biodiversity importance	<ul style="list-style-type: none"> Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves) Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas) Other identified priorities from provincial spatial biodiversity plans High water yield areas Coastal Protection Zone Estuarine functional zone 	High risk for mining	<p>These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, and for maintaining important ecosystem services for particular communities or the country as a whole.</p> <p>An EIA should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity.</p> <p>Mining options may be limited in these areas, and limitations for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.</p>
D. Moderate biodiversity importance	<ul style="list-style-type: none"> Ecological support areas Vulnerable ecosystems Focus areas for protected area expansion (land-based and offshore protection) 	Moderate risk for mining	<p>These areas are of moderate biodiversity value.</p> <p>EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy.</p> <p>Authorisations may set limits and specify biodiversity offsets that would be written into license agreements and/or authorisations.</p>

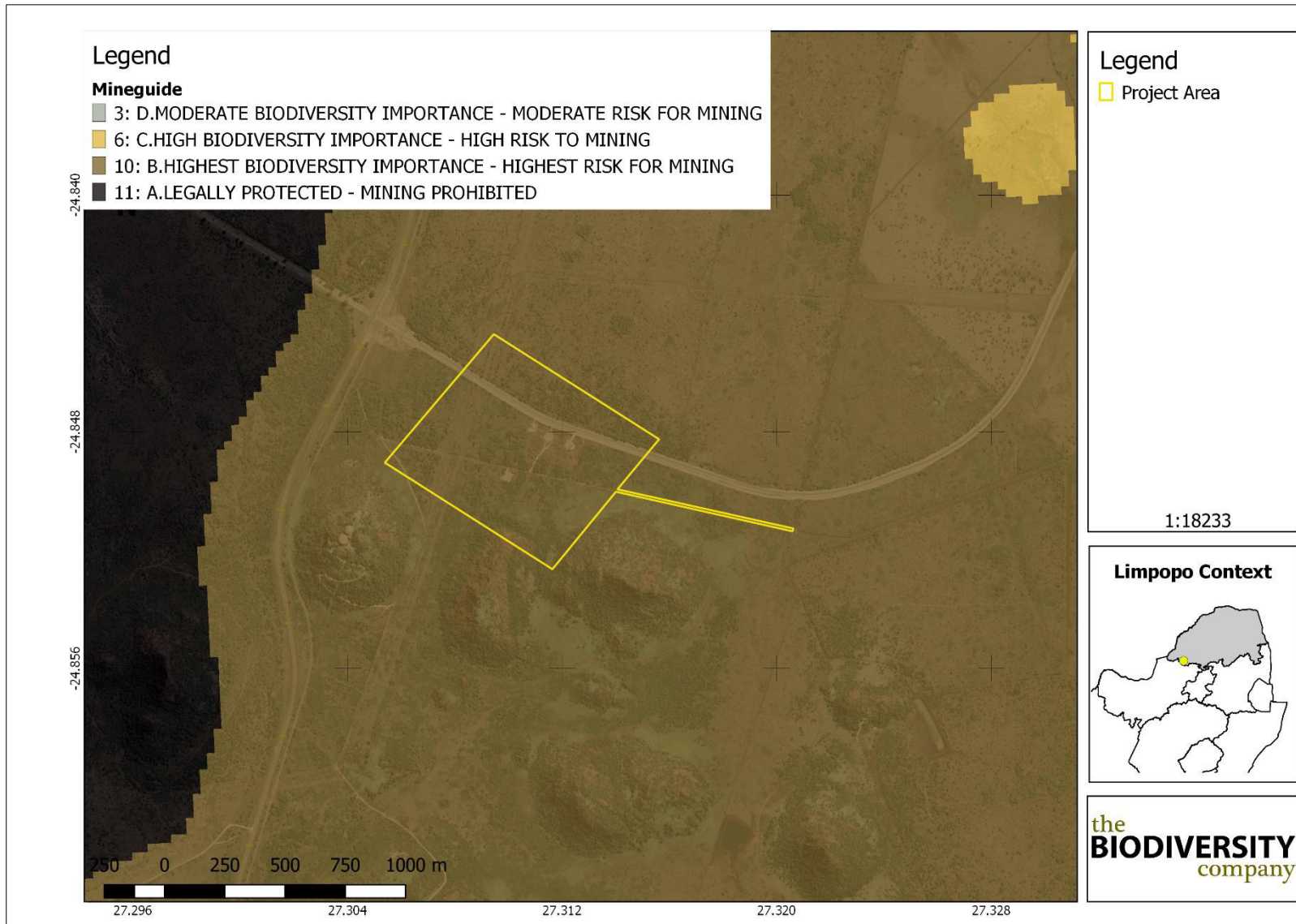


Figure 6: The project area superimposed on the Mining and Biodiversity Guidelines spatial dataset (2013)

According to these guidelines, the proposed project area falls within an area which is considered the 'highest risk for mining' and of 'high biodiversity importance' (Figure 6). Based on this information, the project area will most likely have an impact on this area and its associated activity and thus the specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision-making for mining, water use licenses, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being

7 Results & Discussion

7.1 Desktop Assessment

7.1.1 Vegetation Assessment

The site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

- a) Seasonal precipitation; and
- b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include Acacia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

7.1.1.1 Vegetation Types

The Savanna biome comprises many different vegetation types. The project area falls within Mucina & Rutherford's (2006) Dwaalboom thornveld (SVcb1) (Figure 7) vegetation type.



Figure 7: The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS,2017)

7.1.1.2 Dwaalboom Thornveld

The Savanna biome comprises many different vegetation types. The project area falls within Mucina & Rutherford's (2006) Dwaalboom thornveld (SVcb1) vegetation type of the savanna biome (Figure 7).

Dwaalboom Thornveld is restricted to and is distributed in Limpopo and North-West Provinces within flats north of the Dwarsberge and associated ridges mainly west of the Crocodile River in the Dwaalboom area but including a patch around Sentrum. South of the ridges it extends eastwards from the Nietverdiend area, north of the Pilanesberg to the Northam area at an altitude range of between 900 and 1,200m AMSL. Its main vegetation and landscape features include plains with a layer of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species. There is almost a continuous herbaceous layer dominated by grass species.

7.1.1.3 Important Plant Taxa

Based on Mucina & Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly

abundant) or are prominent in the landscape within a particular vegetation type. They note the following species are important taxa in the Dwaalboom Thornveld vegetation type:

Trees: *Vachellia erioloba*, *Vachellia erubescens*, *Vachellia nilotica*, *Vachellia tortilis* subsp. *heteracantha*, *Senegalia fleckii*, *Senegalia burkei*, *Searsia lancea* (Mucina & Rutherford, 2006).

Shrubs: *Diospyros lycioides* subsp. *lycioides*, *Grewia flava*, *Mystroxydon aethiopicum* subsp. *burkeanum*, *Agathisanthemum bojeri* (Mucina & Rutherford, 2006).

Graminoids: *Aristida bipartite*, *Bothriochloa insculpta*, *Digitaria eriantha* subsp. *eriantha*, *Ischaemum afrum*, *Panicum maximum* and *Cymbopogon pospischilii* (Mucina & Rutherford, 2006).

7.1.1.4 Conservation Status of the Vegetation Type

According to Mucina & Rutherford (2006) Dwaalboom Thornveld is classified as Least Threatened. Although the target for conservation is 19%, only 6% of this vegetation type is currently under statutory conservation in reserves such as the Madikwe Game Reserve (approximately 150km west of the project area). Cultivation and to a lesser extent urbanisation have resulted in the transformation of approximately 14% of Dwaalboom Thornveld and exotic invasive plants are present. Incidences of erosion are low to very low (Mucina & Rutherford, 2006).

Based on the Plants of Southern Africa (POSA, 2017) database, 200 plant species are expected to occur in topographical grid square 2527CB. The list of expected plant species is provided in Appendix A.

7.1.1.5 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 192 plant species are expected to occur in the project area. Figure 8 shows the extent of the grid that was used to compile the expected species list based on the Plants of Southern Africa (BODATSA-POSA, 2016) database. The list of expected plant species is provided in Appendix A.

Of the 192-plant species, two (2) species are listed as being Species of Conservation Concern (SCC) (Table 3).

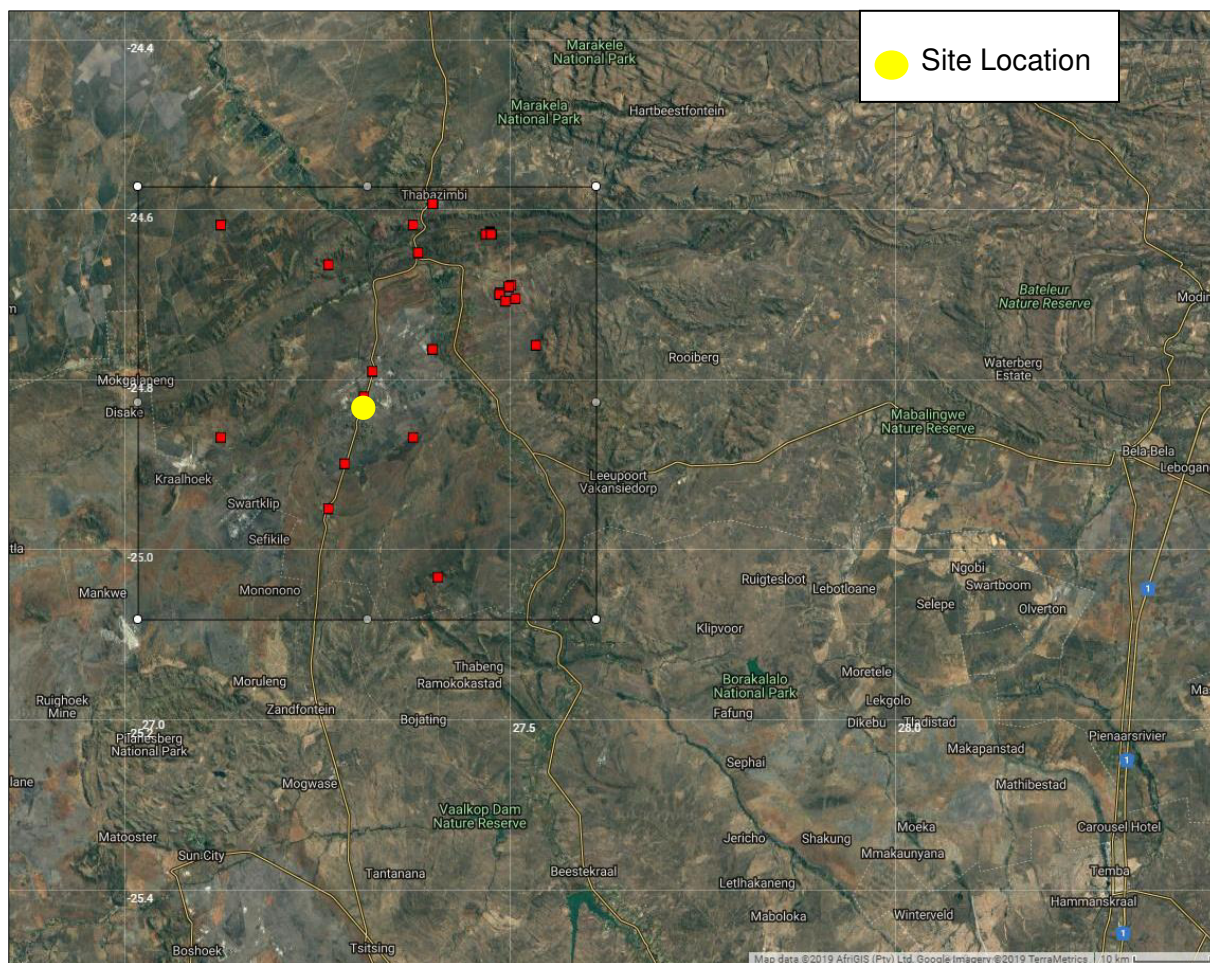


Figure 8: Map showing the grid drawn to compile an expected species list (BODATSA-POSA, 2016)

Table 3: Plant Species of Conservation Concern (SCC) expected to occur in the project area (BODATSA-POSA, 2016)

Family	Taxon	Author1	IUCN	Habitat Preference	Likelihood of occurrence
Scrophulariaceae	<i>Jamesbrittenia bergae</i>	Lemmer	VU	Mixed bushveld, in crevices on ferricrete outcrops with a southern aspect, 1056-1106m	Moderate
Apocynaceae	<i>Stenostelma umbelluliferum</i>	(Schltr.) Bester & Nicholas	NT	Deep black turf in open woodland mainly in the vicinity of drainage lines.	Moderate

7.1.2 Faunal Assessment

7.1.2.1 Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 356 bird species are expected to occur in the vicinity of the project area (pentads 2440_2715; 2440_2720; 2440_2725; 2445_2715; 2445_2720; 2445_2720; 2450_2715; 2450_2720; 2450_2725). The full list of potential bird species is provided in Appendix B.

Of the expected bird species, twenty-three (23) species are listed as SCC either on a regional scale or international scale (Table 4). The SCC include the following:

- One species which is listed as Critically Endangered (CR) on a regional basis;
- Five (5) species that are listed as Endangered (EN) on a regional basis;
- Six (6) species that are listed as Vulnerable (VU) on a regional basis; and
- Nine (9) species that are listed as Near Threatened (NT) on a regional basis.

Table 4: List of bird species of regional or global conservation importance that are expected to occur in pentads 2440_2715; 2440_2720; 2440_2725; 2445_2715; 2445_2720; 2445_2720; 2450_2715; 2450_2720; 2450_2725 (SABAP2, 2018, ESKOM, 2015; IUCN, 2017)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Aquila nipalensis</i>	Eagle, Steppe	LC	EN	Low
<i>Aquila verreauxii</i>	Eagle, Verreaux's	VU	LC	Moderate
<i>Ardeotis kori</i>	Bustard, Kori	NT	NT	Moderate
<i>Calidris ferruginea</i>	Sandpiper, Curlew	LC	NT	Low
<i>Ciconia abdimii</i>	Stork, Abdim's	NT	LC	Moderate
<i>Ciconia nigra</i>	Stork, Black	VU	LC	Low
<i>Circus ranivorus</i>	Marsh-harrier, African	EN	LC	Low
<i>Coracias garrulus</i>	Roller, European	NT	LC	High
<i>Falco biarmicus</i>	Falcon, Lanner	VU	LC	High
<i>Falco vespertinus</i>	Falcon, Red-footed	NT	NT	Moderate
<i>Glareola nordmanni</i>	Pratincole, Black-winged	NT	NT	Low
<i>Gyps africanus</i>	Vulture, White-backed	CR	CR	Moderate
<i>Gyps coprotheres</i>	Vulture, Cape	EN	EN	High
<i>Mycteria ibis</i>	Stork, Yellow-billed	EN	LC	Low
<i>Pelecanus rufescens</i>	Pelican, Pink-backed	VU	LC	Low
<i>Phoeniconaias minor</i>	Flamingo, Lesser	NT	NT	Low
<i>Phoenicopterus ruber</i>	Flamingo, Greater	NT	LC	Low
<i>Podica senegalensis</i>	Finfoot, African	VU	LC	Low
<i>Polemaetus bellicosus</i>	Eagle, Martial	EN	VU	High
<i>Pterocles gutturalis</i>	Sandgrouse, Yellow-throated	NT	LC	High
<i>Rostratula benghalensis</i>	Painted-snipe, Greater	NT	LC	Low
<i>Sagittarius serpentarius</i>	Secretarybird	VU	VU	High
<i>Torgos tracheliotus</i>	Vulture, Lappet-faced	EN	EN	Moderate

Aquila nipalensis (Steppe Eagle) is listed as LT regionally but as EN on a global scale. It is a migrant bird species that over-winters in South Africa and has undergone extremely rapid population declines within its range. This species does not breed in South Africa and would only use the project area as a temporary foraging site, thus the likelihood of occurrence is rated as low.

Aquila verreauxii (Verreaux's Eagle) is listed as VU on a regional scale and LC on a global scale. This species is locally persecuted in southern Africa where it coincides with livestock farms, but because the species does not take carrion, is little threatened by poisoned carcasses. Where hyraxes are hunted for food and skins, eagle populations have declined (IUCN, 2017). Based on the expected habitat, the close proximity of the mountains and ridges as well as the availability of prey items, the likelihood of occurrence of this species at the project site is rated as moderate.

Ardeotis kori (Kori Bustard) is listed as NT both on a regional and global scale. It occurs in flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks. Collisions with high voltage power lines are a major threat to this species in the Karoo of South Africa (IUCN, 2007). The habitat at the project site, being typical habitat of this species and therefore it's likelihood of occurrence is rated moderate.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). Due to the lack of these habitat types within the project area the likelihood of occurrence of this species was rated as low.

Ciconia abdimii (Abdim's Stork) is listed as NT on a local scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes. They tend to roost in trees or cliffs (IUCN, 2017). The existence of roosting areas creates the potential for this species to occur in the proximity of the area and thus the likelihood of occurrence was rated as moderate.

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). Due to the lack of these habitat types within the project area the likelihood of occurrence of this species was rated as low.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. Due to the lack of these habitat types within the project area the likelihood of occurrence of this species was rated as low.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a high chance of this species occurring in the project area.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals but have also been observed solitary. Their diet is mainly composed of

small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Falco vespertinus (Red-footed Falcon) is known to breed from eastern Europe and northern Asia to north-western China, heading south in the non-breeding season to southern Angola and southern Africa. Within southern Africa it is locally uncommon to common in Botswana, northern Namibia, central Zimbabwe and the area in and around Gauteng, South Africa (Hockey et al, 2005). The habitat it generally prefers is open habitats with scattered trees, such as open grassy woodland, wetlands, forest fringes and croplands. Many of these habitats are present in the project area and thus the likelihood of occurrence is rated as moderate.

Glareola nordmanni (Black-winged Pratincole) is a migratory species which is listed as NT both globally and regionally. This species has a very large range, breeding mostly in Europe and Russia, before migrating to southern Africa. Overall population declines of approximately 20% for this species are suspected (IUCN, 2017). This species generally occurs near water and damp meadows, or marshes overgrown with dense grass. Due to its migratory nature, this species will only be present in South Africa for a few months during the year and will not breed locally. There is no suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as low.

Gyps africanus (White-backed Vulture) has a large range and only occurs throughout sub-Saharan Africa. Primarily a lowland species of open wooded savanna, particularly areas of Acacia (*Vachellia*). It requires tall trees for nesting. According to the IUCN (2017) this species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning. The likelihood of suitably large trees for nesting for this species is low at the project site, but due to the relatively pristine nature of the project area and the abundance of game on the property and surrounding properties, the likelihood of occurrence for the species is moderate.

Gyps coprotheres (Cape Vulture) is listed as Endangered (EN) on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). Individuals may be seen foraging within the area but are unlikely to be resident. Likelihood of occurrence is rated as high.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and Least Concern (LC) on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The lack of extensive water bodies within the project area creates a low possibility that this species may occur there.

Pelecanus rufescens (Pink-backed Pelican) is listed as Vulnerable on a regional scale. This species is threatened by habitat loss in KwaZulu-Natal, as many suitable pans and flood-plains are being altered through drainage and cultivation, and the natural flooding regime of pans in the Pongolo system has been altered by the Jozini Dam (Barnes 2000). There is no suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as low.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). Due to the absence of its preferred habitat within the project area the likelihood of occurrence is low.

Podica senegalensis (African Finfoot) occurs in forest and wooded savanna along permanent streams with thick growths of *Syzygium guineense*, along secluded reaches of thickly wooded rivers and on the edges of pools, lakes and dams with well-vegetated banks on the edges of dense papyrus beds far from the shore. It is rarely found away from shoreline vegetation and generally avoids stagnant or fast-flowing water (IUCN, 2017). There is no suitable habitat within the project area and adjacent to it and as such the likelihood of occurrence is rated as low.

Polemaetus bellicosus (Martial eagle) is listed as EN on a regional scale and VU on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). With the presence of good savanna habitat in the project there is a high chance of this species occurring.

Pterocles gutturalis (Yellow Throated Sandgrouse) is categorised as Near Threatened on a regional scale. The species inhabits short open grassland and recently burnt veld, especially on black clay soils near water. The chance of occurrence is high due to the IBA the project area occurs within.

Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, in this case, sewage pools, reservoirs, mudflats overgrown with marsh grass which may possibly exist within the project area, thus the likelihood of occurrence is low.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the extensive savanna present in the project area.

Torgos tracheliotus (Lappet-faced Vulture) is listed as EN, both on a regional and global level. Only a small, very rapidly declining population remains, owing primarily to poisoning and persecution, as well as ecosystem alterations (IUCN, 2017). The species inhabits dry savanna, arid plains, deserts and open mountain. It ranges widely when foraging and is mainly a scavenger, feeding predominantly on any large carcasses or their remains. This rare species is unlikely to be resident within the project area due to unsuitable nesting sites but may scavenge on any dead carcasses in the area, and therefore the likelihood of occurrence is rated as moderate.

7.1.2.1.1 Important Bird and Biodiversity Areas

Important Bird and Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

One significant IBAs occurs within the proposed project area, namely the Northern Turf Thornveld IBA and the project area falls entirely within this IBA (Figure 9). This IBA consists of a group of privately-owned farms. Characterised by flat plains on black vertic clays derived from basalt, the area is widely used for wheat, maize, sunflower and livestock farming. Temperatures vary between extremes of -6 °C and 40 °C, with an average of 19 °C. The summer rainfall is erratic and variable, ranging from 450 to 750 mm per year. Some natural patches of clay thorn bushveld remain and are scattered throughout the farmland.

The area is well known for holding the core of the remaining resident South African population of Yellow-throated Sandgrouse (*Pterocles gutturalis*). The sandgrouse inhabit short, open grasslands, fallow fields and recently burnt veld, especially on black clay soils near water. Other important birds in the IBA include Secretarybird, Kori Bustard, Lanner Falcon and Black-winged Pratincole (Birdlife, 2017).

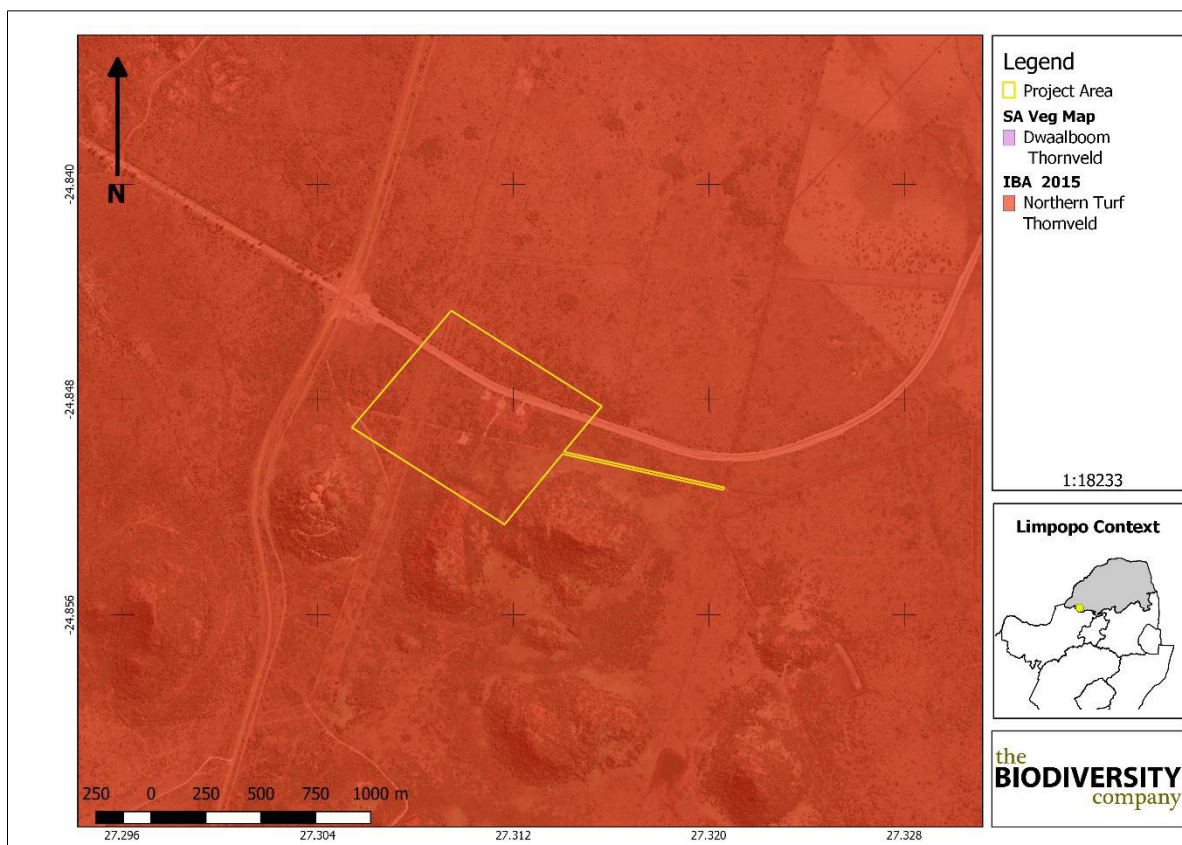


Figure 9: The project area in relation to defined IBAs (Birdlife, 2017)

7.1.2.2 Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 99 mammal species that could be expected to occur within the vicinity of the project area (Appendix C). Of these species, 7 are medium to large conservation dependant species, such as *Ceratotherium simum* (Southern White Rhinoceros) and *Equus quagga* (Plains Zebra) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in Appendix C.

Of the remaining 92 small to medium sized mammal species, thirteen (13) are listed as being of conservation concern on a regional or global basis) Table 5.

The list of potential species includes:

- Two (2) that is listed as Endangered (EN) on a regional basis;
- Three (3) that are listed as Vulnerable (VU) on a regional basis; and
- Eight (8) that are listed as Near Threatened (NT) on a regional scale (Table 5).

Table 5: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016)

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	

<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT	Low
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC	High
<i>Cloeotis percivali</i>	Short-eared Trident Bat	EN	LC	Moderate
<i>Crocidura mariquensis</i>	Swamp Musk Shrew	NT	LC	Low
<i>Crocuta crocuta</i>	Spotted Hyaena	NT	LC	Low
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	Moderate
<i>Leptailurus serval</i>	Serval	NT	LC	Moderate
<i>Panthera pardus</i>	Leopard	VU	VU	Moderate
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT	Moderate
<i>Pelea capreolus</i>	Grey Rhebok	NT	LC	Low
<i>Poecilogale albinucha</i>	African Striped Weasel	NT	LC	High
<i>Redunca fulvorufula</i>	Mountain Reedbuck	EN	LC	Moderate
<i>Smutsia temminckii</i>	Temminck's Ground Pangolin	VU	VU	Moderate

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water. Based on the absence of any water systems within the project vicinity the likelihood of occurrence of this species occurring in the project area is considered to be low.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area and therefore the likelihood of occurrence is rated as high.

Cloeotis percivali (Short-eared Trident Bat) occurs in savanna areas where there is sufficient cover in the form of caves and mine tunnels for day roosting (IUCN, 2017). It feeds exclusively on moths and appears to be very sensitive to disturbance. Suitable habitat can be found around the project area and therefore the likelihood of finding this species is rated as moderate.

Crocidura mariquensis (Swamp Musk Shrew) has very specific habitat requirements. It occurs in close proximity to open water with a distinct preference for marshy ponds, and riverine and semi-aquatic vegetation such as reed beds (IUCN, 2017). It is considered to be common in suitable habitats. Due to the absence of preferred habitat, the likelihood of occurrence of this species was rated as low.

Crocuta Crocuta (Spotted Hyaena) is classified as Near-Threatened on a national scale. This species mainly occurs in protected areas but in Limpopo and the North-west Provinces they can still be found outside of protected areas. This species is predominantly found in savanna habitats, where they can occur in close association with humans. The likelihood of occurrence in this project area is low due to the lack of suitable prey species.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the more arid Karoo region of South Africa, the habitat in the

project area can be considered to be sub-optimal for the species and the likelihood of occurrence is rated as moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Due to the absence of natural grassland areas in the Project area and human disturbance, the likelihood of occurrence for this species is rated as low.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low. The likelihood of occurrence in the project area which is in such close proximity protected area is regarded as moderate.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate.

Pelea capreolus (Grey Rhebok) is endemic to a small region in southern Africa, inhabiting montane and plateau grasslands of South Africa, Swaziland, and Lesotho. In South Africa, their distribution is irregular and patchy, and they no longer occur north of the Orange River in the Northern Cape, or in parts of the North-West Province (IUCN, 2017). Grey Rhebok can be found in suitable habitat which has rocky hills, grassy mountain slopes, and montane and plateau grasslands in southern Africa. They are predominantly browsers, and largely water independent, obtaining most of their water requirements from their food. Based on the lack of their favoured habitat within the project area, the likelihood of occurrence of this species is rated as low.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wider habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas where it does occur. There is sufficient habitat for this species in the project area and the likelihood of occurrence of this species is therefore considered to be high.

Redunca fulvorufula (Mountain Reedbuck) is listed as EN both regionally and globally. The South African population has undergone a decline of 61-73% in the last three generations (15 years) (IUCN, 2017). Mountain Reedbuck live on ridges and hillsides in broken rocky country and high-altitude grasslands (often with some tree or bush cover). Although there is not extensive mountainous regions in the project area, there are a number rocky ridges that this

species may utilise and as such, the likelihood of occurrence for this species is rated as moderate.

Smutsia temminckii (Temminck's Ground Pangolin) is a predominantly solitary, terrestrial species that inhabits mainly savanna woodland in low-lying regions with moderate to dense scrub where average annual rainfall is between 250 mm and 1,400 mm (IUCN, 2017). The species is eaten as bushmeat to various extents across its range (e.g. South Africa, Zimbabwe, Namibia, Mozambique, Tanzania). Of greater threat is overexploitation for body parts and scales which have superstitious value and are used for medicinal purposes (IUCN, 2017). The likelihood of occurrence of this species in the project area is moderate.

7.1.2.3 Herpetofauna (Reptiles & Amphibians)

7.1.2.3.1 Reptiles

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 81 reptile species are expected to occur in the project area (Appendix D). One (1) reptile species of conservation concern is expected to be present in the project area (Table 6).

Table 6: Expected reptile species of conservation concern that may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Crocodylus niloticus</i>	Nile Crocodile	VU	LC	Low
<i>Lygodactylus waterbergensis</i>	Waterberg Dwarf Gecko	NT	NT	High
<i>Pseudocordylus transvaalensis</i>	Northern Crag Lizard	NT	NT	High

Crocodylus niloticus (Nile Crocodile) prefers permanent water bodies with suitable sandy banks for basking and egg-laying. This species is often persecuted by people. The likelihood of occurrence for this species within the overall project area is rated as low.

Lygodactylus waterbergensis (Waterberg Dwarf Gecko) is classified as Near-Threatened both regionally and internationally. This species is endemic to Limpopo Province, where it is found in rocky areas of the grassland and savannas. The likelihood of occurrence is high as rocky habitat is present in the proximity project area.

Pseudocordylus transvaalensis (Northern Crag Lizard) is categorised as Near-Threatened on both a regional and a global scale. This species is threatened by the pet trade and is listed on CITES. The likelihood of occurrence in the project area is high because of the rocky habitat present nearby which appears to be suitable habitat for this species.

7.1.2.3.2 Amphibians

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2017) thirty-one (31) amphibian species are expected to occur in the project area (Appendix E).

One (1) amphibian species of conservation concern could be present in the project area according to the above-mentioned sources (Table 7).

Table 7: Amphibian species of conservation concern which may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC	Low



The Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that will possibly occur in the project area. The Giant Bull Frog is listed as Near-Threatened on a regional scale. It is a species of drier savannahs. It is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). There appears to be minimal

suitable habitat for this species in the project area and therefore the likelihood of occurrence is regarded as low.

7.2 Field Survey

The field survey for the project area was conducted on the 12th of December 2018 by two terrestrial ecologists. During the surveys the floral and faunal communities within the project development footprint were assessed. The project area was ground-truthed on foot, which included spot checks in pre-selected areas to validate desktop data. Photographs were recorded during the site visits and some are provided in this section of the report. All site photographs are available on request.

7.2.1 Habitat Assessment

Habitats identified during the field visit can be seen in Figure 11. Three primary habitats were delineated for this assessment, namely: Koppie, Degraded and secondary Savanna (Figure 11).

Disturbed habitats are those which were considered to have been extensively altered from their natural state and no longer provide ecosystem services or suitable habitat for indigenous species. This area had been cleared of trees and vegetation and was covered by an introduced layer of soil (Figure 10).

Secondary savanna occurred was identified within the project area. These areas are considered to have been altered in the recent past and are still recovering from the disturbance. The primary disturbance is most likely overgrazing due to the presence of cattle as well as encroachment by *Dichrostachys cinerea*. This habitat functions as a refuge area as well as an ecological support area for the surrounding habitat, especially supporting the rocky ridges to the south of the project area.

The “koppie” habitat refer to the rocky hill habitats that exist in close proximity to the south of the project area. The koppies have an inherent high sensitivity due to the uniqueness of the habitat within the landscape and the role as habitat for various species of fauna and flora

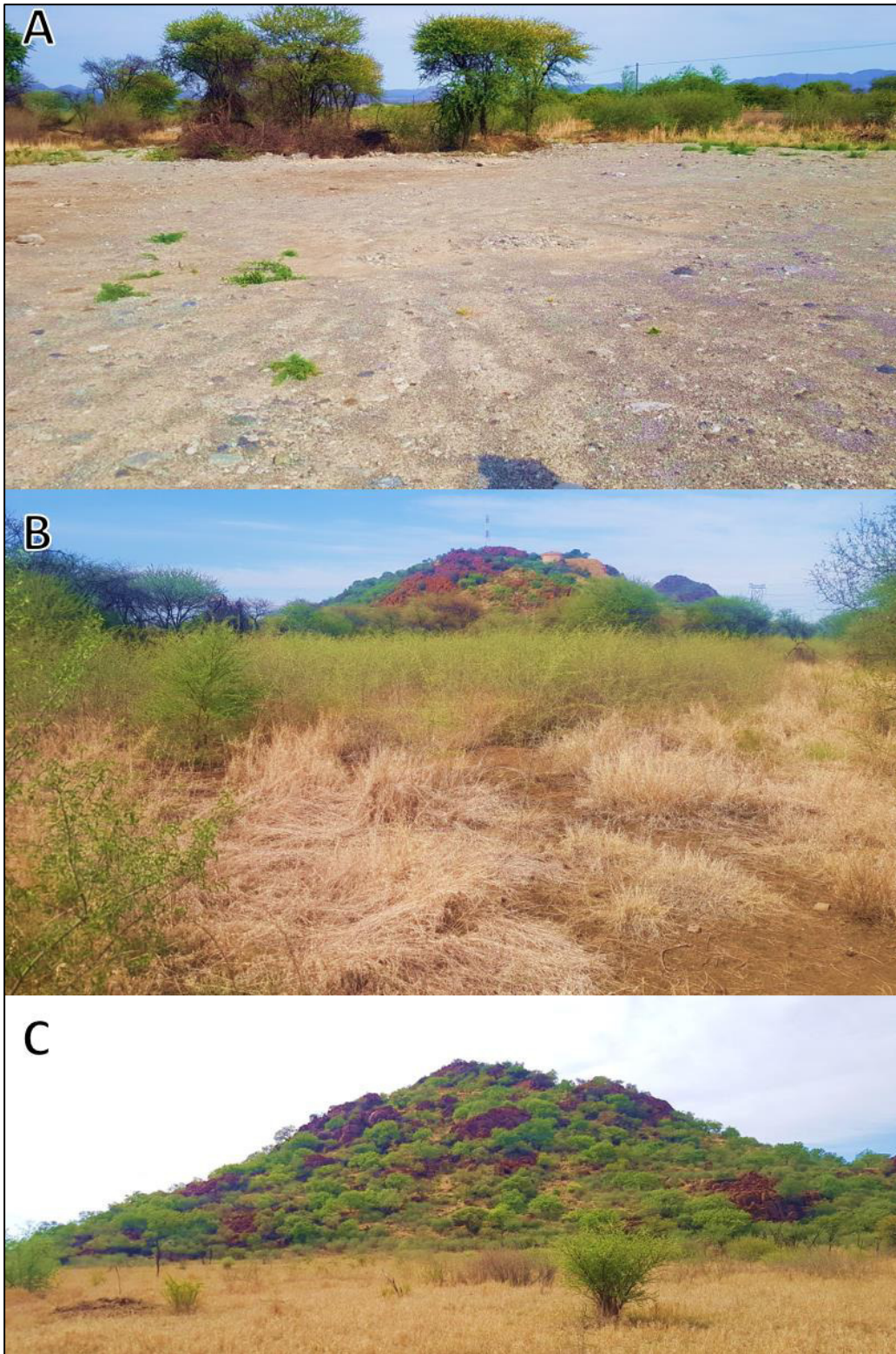


Figure 10: Habitats within the project area; A) Cleared and introduced soil area, B) Semi-natural habitat, C) Koppie habitat

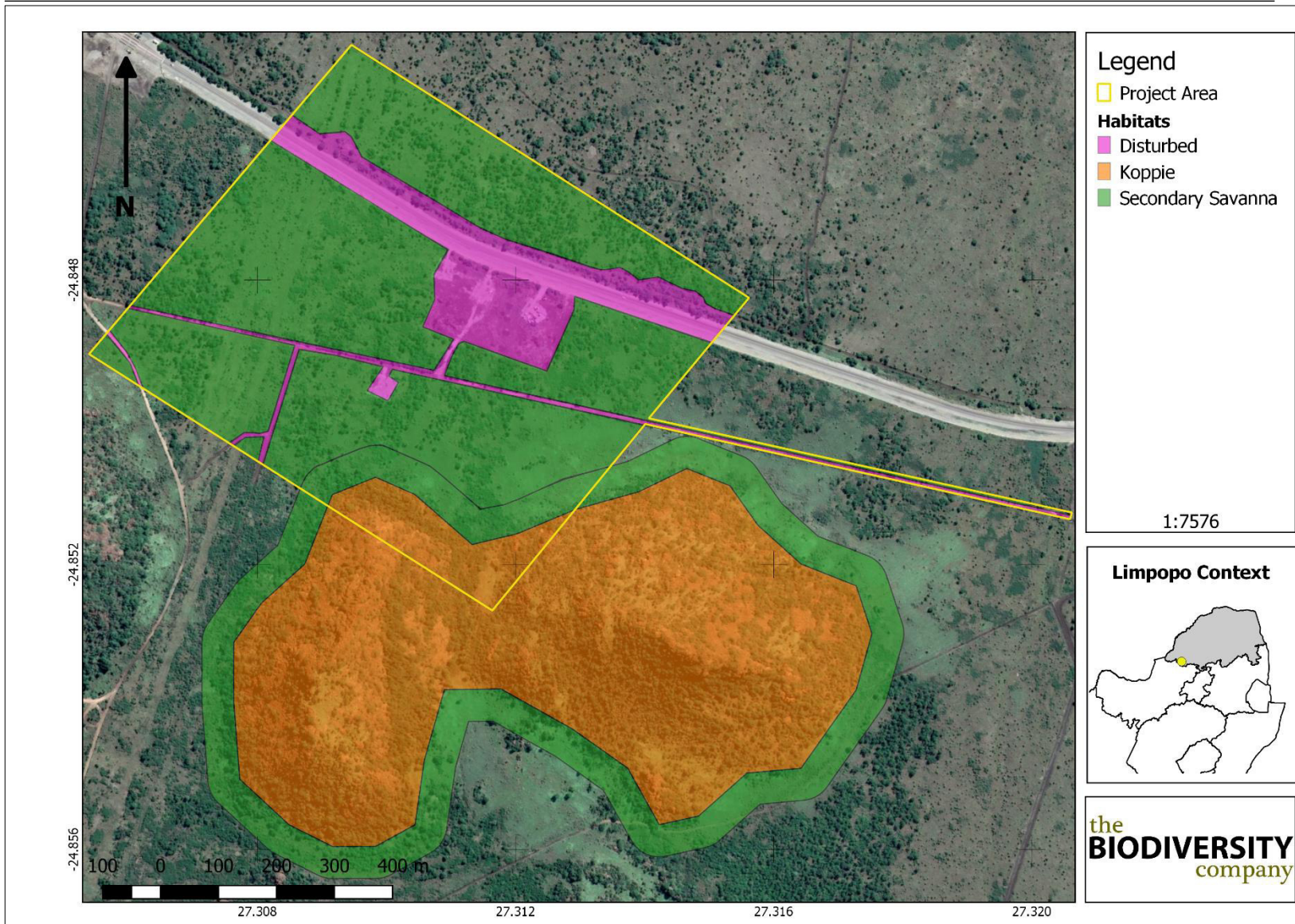


Figure 11: Habitats identified in the general project area

7.2.2 Vegetation Assessment

The vegetation assessment was conducted throughout the extent of the project area.

A total of 34 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 8) (Figure 12). Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in green text. Plants listed in Category 2 or as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text.



Figure 12: Some plants species recorded during fieldwork. A) *Pappea capensis*, B) *Dichrostachys cinerea*, C) *Vachellia karroo*, D) *Grewia flava*, E) *Seddera capensis*, F) *Nidorella resedifolia*

Table 8: Trees, shrubs and weeds recorded at the proposed project area

Species	Threat status (SANBI, 2017)	SA Endemic	Alien Category
<i>Asparagus cooperi</i>	LC	No	
<i>Berchemia zeyheri</i>	LC	No	
<i>Boscia albitrunca</i> *	LC (Protected)	No	
<i>Bothriochloa insculpta</i>	LC	No	



<i>Conyza bonariensis</i>			Naturalized exotic weed
<i>Dichrostachys cinerea</i>	LC	No	
<i>Digitaria eriantha</i>	LC	No	
<i>Diheteropogon amplexans</i>	LC	No	
<i>Ehretia rigida</i>	LC	No	
<i>Enneapogon cenchroides</i>	LC	No	
<i>Eragrostis rigidior</i>	LC	No	
<i>Flaveria bidentis</i>			NEMBA Category 1B
<i>Grewia flava</i>	LC	No	
<i>Grewia flavescens</i>	LC	No	
<i>Gymnosporia buxifolia</i>	LC	No	
<i>Imperata cylindrica</i>	LC	No	
<i>Loudetia flavida</i>	LC	No	
<i>Nidorella resedifolia</i>	LC	No	
<i>Pappea capensis</i>	LC	No	
<i>Pennisetum setaceum</i>			Naturalized exotic
<i>Schkuhria pinnata</i>			Naturalized exotic weed
<i>Searsia lancea</i>	LC	No	
<i>Seddera capensis</i>	LC	No	
<i>Senegalia erubescens</i>	LC	No	
<i>Senegalia mellifera</i>	LC	No	
<i>Setaria sphacelata var sphacelata</i>	LC	No	
<i>Solanum campylacanthum</i>	LC	No	
<i>Tagetes minuta</i>			Naturalized exotic weed
<i>Tribulus terrestris</i>	LC	No	
<i>Vachellia karoo</i>	LC	No	
<i>Vachellia nilotica</i>	LC	No	
<i>Vachellia tortilis</i>	LC	No	
<i>Ximenia americana</i>	LC	No	
<i>Ziziphus mucronata</i>	LC	No	

*Nationally Protected tree in SA.

7.2.2.1 Protected Tree Species

According to the list of protected tree species under the National Forests Act, 1998 (Act NO.84 of 2014) in terms of section 15 (1) of the Forests Act, 1998 (DAFF, 2014), no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence.

One individual *Boscia albitrunca* (Shepard's Tree) was observed within the property (Figure 16). Should the proposed development impact on these areas, then application for a relocation or destruction permit needs to be made OR to move the proposed development footprint in order to avoid the trees currently present.

7.2.2.2 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of these systems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014, and was amended in February 2018 in the Government Gazette No. 41445. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
 - Section 75 of the Act;
 - The relevant invasive species management programme developed in terms of regulation 4; and
 - Any directive issued in terms of section 73(3) of the Act.

One (1) Category 1b invasive plant species were recorded within the project area and it is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the Act as stated above. The NEMBA listed species identified within the project area are marked in green (Table 8).

7.2.3 Fauna

7.2.3.1 Avifauna

Twenty-five (25) bird species were recorded in the project area during the December 2018 survey based on either direct observations, vocalisations, or the presence of visual tracks & signs (Table 9) (Figure 13). One avifaunal SCC were recorded during the survey, namely, Cape Vulture (*Gyps coprotheres*). The species is unlikely to be a resident and was most likely foraging.

Table 9: A list of avifaunal species recorded for the project area (species highlighted in red are SCC)

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Chrysococcyx caprius</i>	Cuckoo, Diderick	Unlisted	LC
<i>Cinnyris talatala</i>	Sunbird, White-bellied	Unlisted	LC
<i>Cisticola aberrans</i>	Cisticola, Lazy	Unlisted	LC
<i>Coracias caudatus</i>	Roller, Lilac-breasted	Unlisted	LC
<i>Corythaixoides concolor</i>	Go-away-bird, Grey	Unlisted	LC
<i>Delichon urbicum</i>	House-martin, Common	Unlisted	LC
<i>Dicrurus adsimilis</i>	Drongo, Fork-tailed	Unlisted	LC
<i>Elanus caeruleus</i>	Kite, Black-shouldered	Unlisted	LC
<i>Gyps coprotheres</i>	Vulture, Cape	EN	EN
<i>Indicator minor</i>	Honeyguide, Lesser	Unlisted	LC
<i>Lamprotornis nitens</i>	Starling, Cape Glossy	Unlisted	LC
<i>Lanius collaris</i>	Fiscal, Common (Southern)	Unlisted	LC
<i>Lanius collurio</i>	Shrike, Red-backed	Unlisted	LC
<i>Milvus aegyptius</i>	Kite, Yellow-billed	Unlisted	Unlisted
<i>Muscicapa striata</i>	Flycatcher, Spotted	Unlisted	LC
<i>Numida meleagris</i>	Guineafowl, Helmeted	Unlisted	LC
<i>Parisoma subcaeruleum</i>	Tit-babbler, Chestnut-vented	Unlisted	Unlisted

<i>Ploceus velatus</i>	Southern Masked-weaver, Southern	Unlisted	LC
<i>Pternistis swainsonii</i>	Spurfowl, Swainson's	Unlisted	LC
<i>Pycnonotus tricolor</i>	Bulbul, Dark-capped	Unlisted	Unlisted
<i>Streptopelia capicola</i>	Turtle-dove, Cape	Unlisted	LC
<i>Streptopelia semitorquata</i>	Dove, Red-eyed	Unlisted	LC
<i>Streptopelia senegalensis</i>	Dove, Laughing	Unlisted	LC
<i>Sylvietta rufescens</i>	Crombec, Long-billed	Unlisted	LC
<i>Urocolius indicus</i>	Mousebird, Red-faced	Unlisted	LC



Figure 13: Some of the avifauna recorded within the project area: A) Dark-Capped Bulbul (*Pycnonotus tricolor*), B) Chestnut-vented Tit-babbler (*Parisoma subcaeruleum*), C) Black Shouldered Kite (*Elanus caeruleus*), D) Cape Vulture (*Gyps coprotheres*), E) Spotted flycatcher (*Muscicapa striata*), F) Red-faced Mousebird (*Urocolius indicus*) and G) Red-backed Shrike (*Lanius collaris*)

7.2.3.2 Mammals

Overall, mammal diversity in the project area was moderate to low, with three mammal species being recorded during the December 2018 survey based on direct observations and/or the presence of visual tracks & signs (Table 10).

Table 10: Mammal species recorded in the project area during the December 2018 survey (species highlighted in red are listed species)

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC
<i>Lepus sp.</i>		LC	LC
<i>Papio ursinus</i>	Chacma Baboon	LC	LC



Figure 14: Some of the mammals recorded within the project area: A) *Lepus* sp droppings, B) Mongoose droppings, likely Yellow Mongoose as they were observed in the project area, C and D) Baboon droppings

7.2.3.3 Herpetofauna (Reptiles & Amphibians)

Herpetofauna diversity was considered to be low with one reptile (Table 11) and no amphibian species observed or recorded in the project area during the December 2018 survey.

Table 11: Reptile species recorded in the project area during the December 2018 survey.

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Trachylepis varia</i>	Variable Skink	LC	LC

7.2.3.4 Invertebrates

Invertebrates are animals that neither possess nor develop a vertebral column (commonly known as a backbone or spine), derived from the notochord. Invertebrates play an important role in the ecosystem, they function as:

- Pollinators;
- Food for other species;
- Pest control;
- Decomposers; and

- Aerators of soil.

Some of the invertebrates noticed in the project area are shown in Figure 15.



Figure 15: Some of the invertebrates recorded within the project area A) *Colotis* sp. and B) Green Milkweed Locust (*Phymateus viridipes*)

8 Habitat Sensitivity Mapping

8.1 Development Area

As per the terms of reference for the project, a GIS sensitivity map is required in order to identify sensitive features in terms of the relevant specialist discipline/s within the project area, especially in reference to the development, and in this case the project area created which surrounds the proposed activity. The sensitivity scores identified during the field survey for each habitat were then visually mapped (Figure 16).

Areas that were classified as having low or moderate sensitivities are those areas which were deemed by the specialists to have been most impacted upon and/or were modified from their original condition due to factors such as over-grazing, human activity and/or presence of alien invasive species.

A portion (green) of the of the project area (shaft platform) is highly disturbed and encroached due to clearing of vegetation, and associated activities of human activity such as litter and roads and therefore these areas are given a low sensitivity rating. The remaining portion (orange) of the project area are less disturbed and more natural, however this portion has also been previously disturbed and also doesn't have a 'sensitivity' allocated by the NBA or LCPv2, thus a low-moderate sensitivity was allocated.

The moderate and high sensitivity areas are the koppie (high) and the 50 meter buffer around the koppie (moderate). It is important to note that this map does not replace any local, provincial or government legislation relating to these areas or the land use capabilities or sensitivities of these environments.



Figure 16: Habitat sensitivity map of the project area

9 Impact Assessment

Development-related activities can have significant impacts on biodiversity and ecosystem services, often causing irreversible and large-scale habitat loss across large areas or areas important for the provision of important ecosystem services.

Key impacts commonly associated with development activities are discussed below. The listed activities are merely indicative, and the proposed developments may either have additional or fewer activities depending on the circumstances. It should be noted that these categories, with associated impact descriptions is not exhaustive, and more impacts may be identified at a later stage as more information becomes available. The significance (quantification) of potential environmental impacts has been assessed in terms of the Guideline Documentation on EIA Regulation; Department of Environmental Affairs and Tourism, 2014 (Impact Assessment Methodology, Appendix 6).

9.1 Impact Assessment Methodology

Potential impacts were evaluated against the data captured during the desktop-and field assessment to identify relevance to the project area. The relevant impacts associated with the proposed project were then subjected to a prescribed impact assessment methodology which is available on request.

9.2 Current Impacts

During the field survey, the current impacts that are having a negative impact on the area were identified, and are listed below and some are shown in Figure 17;

- Dumping of rubble and litter in the project area;
- Overgrazing by livestock such as cattle;
- Adjacent secondary roads; and
- Powerlines within the vicinity of the project area.



Figure 17: Impacts observed during the fieldwork A) Gravel roads with bush encroachment visible on the sides of the road, B) Powerlines, C) Boreholes, D) Cleared areas, E) Sewerage network and F) Cows manure showing the presence of cattle.

9.3 Terrestrial Impact Assessment

The proposed activity may lead to the loss and destruction of habitats, direct mortalities and displacement of fauna and flora. The removal of natural vegetation to accommodate infrastructure may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area, at least temporarily.

Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors.

9.3.1 Anticipated Impact Framework

Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the study area. The following list provides a framework for the anticipated impacts associated with the project (Table 12).

Table 12: Anticipated Impact Framework for the project

Main Impact	Project activities that can cause loss of habitat (especially with regard to the proposed infrastructure areas):	Secondary impacts anticipated
1. Loss / degradation of ecosystems	<ul style="list-style-type: none"> Physical removal of vegetation Access roads and servitudes Pipelines Soil dust precipitation Leakages (waste, oil etc.) Dumping of waste products Random events such as fire (cooking fires or cigarettes) 	<ul style="list-style-type: none"> Displacement/loss of flora & fauna (including possible SCC) Increased potential for soil erosion Habitat fragmentation Increased potential for establishment of alien & invasive vegetation
2. Spread and/or establishment of alien and/or invasive species	<ul style="list-style-type: none"> Vegetation removal Vehicles potentially spreading seed Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents Creation of infrastructure suitable for breeding activities of alien and/or invasive birds Vehicles potentially spreading seed Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents 	<ul style="list-style-type: none"> Habitat loss for native flora & fauna (including SCC) Spreading of potentially dangerous diseases due to invasive and pest species Alteration of fauna assemblages due to habitat modification
3. Direct mortality of fauna	<ul style="list-style-type: none"> Clearing of vegetation Roadkill due to vehicle collision Pollution of water resources due to dust effects, chemical spills, acid mine drainage etc. Intentional killing of fauna for food (hunting) or otherwise (killing of snakes) Bird collisions with electrical lines 	<ul style="list-style-type: none"> Displacement/loss of fauna (including possible SCC) Loss of ecosystem services Increase in rodent populations and associated disease risk
4. Reduced dispersal/migration of fauna	<ul style="list-style-type: none"> Loss of landscape used as corridor Compacted roads Removal of vegetation 	<ul style="list-style-type: none"> Loss of ecosystem services Reduced plant seed dispersal
5. Environmental pollution due to water/ mine drainage runoff	<ul style="list-style-type: none"> Chemical (organic/inorganic) spills Erosion Acid mine drainage 	<ul style="list-style-type: none"> Secondary impacts associated with pollution in water courses and the surrounding environment Faunal mortality (direct and indirectly) Groundwater pollution Loss of ecosystem services
6. Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise	<ul style="list-style-type: none"> Operation of machinery (Large earth moving machinery, generators, water cannons, slurry pumps, vehicles) 	<ul style="list-style-type: none"> Loss of ecosystem services
7. Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to dust	<ul style="list-style-type: none"> Vehicles Exposed mine dumps 	<ul style="list-style-type: none"> Loss of ecosystem services
8. Staff and others interacting directly with potentially dangerous fauna or poaching of animals	<ul style="list-style-type: none"> All unregulated/supervised activities outdoors 	<ul style="list-style-type: none"> Loss of ecosystem services Introduction of diseases and feral species such as cats.

The potential impacts associated with the various project stages are discussed below.

9.3.2 Construction Phase

The following potential impacts were considered on terrestrial biodiversity communities:

- Destruction of, and fragmentation of, portions of the vegetation community;
- Destruction of protected tree species; and
- Displacement of faunal community (including possible threatened or protected species) due to habitat loss, disturbance (noise, dust and vibration) and/or direct mortalities.

9.3.3 Operational Phase

The following potential impacts were considered on terrestrial biodiversity:

- Continued disturbance and degradation of the vegetation community and encroachment by alien invasive plant species; and
- Potential leaks, discharges and/or pollutant from the shaft area and associated activities into the surrounding environment.
- Continued displacement and fragmentation of the faunal community (including threatened or protected species) due to ongoing anthropogenic disturbances and habitat degradation (litter, road mortalities and/or poaching); and
- Infringement by humans into the few remaining natural, koppie and wetlands areas, with associated impacts such as poaching, litter as well as introduction of pests, diseases and feral species such as cats.

10 Assessment of Significance

10.1 Construction Phase

Table 13 shows the significance of potential impacts associated with the development on biodiversity before and after implementation of mitigation measures. Prior to implementation of mitigation measures the significance of impacts were rated as *Moderate- High* (Table 13). Implementation of avoidance measures as mitigation reduced the significance of potential impact on the vegetation community to a *Low* level (Table 13).

10.2 Operational Phase

Table 14 shows the significance of potential operational phase impacts on biodiversity before and after implementation of mitigation measures. The significance of the continued removal and fragmentation a vegetation community was rated as *Moderate-High* prior to mitigation. Implementation of mitigation measures in the form an alien invasive plant management plan and rehabilitation of project footprint, reduced the significance of the impact to reduced levels (Table 14).

Table 14 the significance of potential operational phase impacts of potential leaks, discharges and/or pollutants into the surrounding environment. The significance of was rated as *Moderate-High* pre-mitigation and *Low-Absent*, post-mitigation (Table 14).

The significance of operational phase impacts on terrestrial fauna communities was rated as *Moderate-High* prior to mitigation and *Low* post mitigation (Table 14). This impact was attributed to the expected continued loss and fragmentation of the vegetation community in

the project area and the associated loss of the faunal community which it supports unless definitive measures are taken. These measures include:

1. Awareness of the sensitivity of this community (in particular a threatened vegetation type, rocky ridge habitats, CBA areas, IBAs and possibility of occurrence of certain threatened species);
2. A commitment to safely and properly relocate all fauna encountered during the operational phase, including invertebrate species such as scorpions, all reptiles, amphibian, bird and/or mammal species;
3. All access roads should make use of existing access roads where possible. Signs should also be erected that warn motorists of wildlife which may stray onto access roads and all relevant speed limits should be put in place to prevent road-mortalities;
4. Where possible, new infrastructure must be placed in areas that area already disturbed and should not cross CBAs, wetland areas, rivers or rocky ridge zones;
5. Strict measures must be put in place to prevent the presence of any feral cats, dogs or livestock on site; and
6. Limiting the construction area to the current/final project layout and only impacting those areas.

Table 13: Assessment of significance of potential **construction impacts** on terrestrial biodiversity associated with the proposed development pre- and post- mitigation:

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, further loss and fragmentation of the vegetation community	4	3	4	4	5		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	Moderately High	One year to five years: Medium Term	Development specific/ within the site boundary	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	Low
Destruction of protected tree species.	5	3	4	3	3		2	2	2	2	2	
	Permanent	Local area/ within 1 km of the site boundary	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	Moderate	One month to one year: Short Term	Development specific/ within the site boundary	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	Absent
Displacement of faunal community (including threatened and protected species) due to habitat loss, direct mortalities and disturbance (noise, dust and vibration).	4	4	4	4	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	Moderately High	One month to one year: Short Term	Development specific/ within the site boundary	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	Low

Table 14: Assessment of significance of potential operational impacts on terrestrial biodiversity associated with the proposed development and pre- and post- mitigation:

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued disturbance and degradation of the vegetation community and encroachment by alien invasive plant species	5	3	4	3	4		2	2	3	2	3	
	Permanent	Local area/ within 1 km of the site boundary	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	Moderately High	One month to one year: Short Term	Development specific/ within the site boundary	Significant / ecosystem structure and function moderately altered	Ecology with limited sensitivity/importance	Likely	Low
Continued displacement and fragmentation of the faunal community due to ongoing anthropogenic disturbances (noise, traffic and dust)	5	3	3	4	3		2	2	2	2	2	
	Permanent	Local area/ within 1 km of the site boundary	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	Moderately High	One month to one year: Short Term	Development specific/ within the site boundary	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	Absent
Loss of faunal species (road mortalities and/or poaching)	5	3	3	4	3		2	2	2	2	3	
	Permanent	Local area/ within 1 km of the site boundary	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	Moderately High	One month to one year: Short Term	Development specific/ within the site boundary	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	Low
	5	3	4	4	3		2	2	2	2	2	

Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching, litter as well as introduction of pests, diseases and feral species such as cats	Permanent	Local area/ within 1 km of the site boundary	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Likely	Moderately High	One month to one year: Short Term	Development specific/ within the site boundary	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	Absent
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10.3 Mitigation Measure Objectives

The focus of mitigation measures should be to reduce the significance of potential impacts associated with the development thereby to:

- Prevent the unnecessary destruction of, and fragmentation of, the vegetation community as well as the surrounding environment;
- Prevent the loss of the faunal community (including occurring species of conservation concern) associated with these vegetation communities.

10.3.1 Mitigation Measures for Impacts

The mitigation actions provided below are important to consider with other specialist assessments. These mitigation measures should be implemented in the Environmental Management Plan (EMP) should the project go-ahead.

The focus of mitigation measures is to reduce the significance of potential impacts associated with the development:

- As far as possible, the proposed developments should be placed in areas that have already been disturbed (low-moderate sensitivity areas). No further loss of the koppie areas or the buffer should be permitted as construction of the infrastructure and roads should only take place in the transformed areas. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon (including fencing off the defined project area);
 - The primary mitigation measure recommended for the project area is for there to be no new development in remaining koppie areas including the buffer;
- All dumping and storage during the construction phase must be within the existing infrastructure footprint and the low sensitivity areas;
- Construction activities should be limited during summer when the risk of disturbing sensitive life history stages (e.g. nesting) is lowest;
- Where possible, work should be restricted to one area at a time. This will give the smaller birds, mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.
- All laydown, storage areas etc should be restricted to transformed areas during construction, close to the preferred option and existing roads should be used as far as possible;
- The number (and size) of laydown, storage and staff facilities must be kept to a minimum for the duration of the project. These areas must be designated in already disturbed areas, adhering to the avoidance of moderately and highly sensitive areas;
- Building material must be stored in areas that has previously been disturbed and is classified as a low risk according to the sensitivity map in this report;
- Building materials may not be stored for extended periods of time and must be removed from the site once the project has been concluded;

- Dumping in moderate and highly sensitive areas must be prevented;
- Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces;
- A spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas and particularly the savanna and koppie;
- During construction activities, all rubble generated must be removed from the site;
- No vehicles or activities, dumping or clearing is permitted within the moderate to high sensitive areas as defined in this report;
- The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly;
- Environmental protection activities during the reclamation process are;
 - Keep storm water away from the working/mining areas;
 - Prevent rainwater and the process water that has fallen on site from leaving the site in an uncontrolled and unregulated fashion; and
 - Prevent dust pollution during dry, windy conditions.
- If any faunal are recorded during construction, activities should temporarily cease, and time permitted for the species to move away. In the event the species does not move away (voluntarily), the species must be removed safely from the area and relocated to a suitable area that will not be directly disturbed by the project;
- Fauna species that have not moved away should be carefully and safely removed to a suitable location beyond the extent of the development footprint by a suitably qualified ECO trained in the handling and relocation of animals;
- Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site;
- The intentional killing of any animals including snakes, insects, lizards, birds or other animals should be strictly prohibited;
- Inspections and monitoring of the pipelines for leaks must be done on a regular basis for the life of the project;
- Speedbumps as well as regulated slow speeds need to be enforced on all the roads especially the servitude that will be close to the koppie habitat;
- The transmission lines should be fitted with bird diverters. These relatively inexpensive flappers will drastically reduce the potential for collision by avifauna, including the recorded CR Cape Vulture;

- Lighting should be kept to a minimum to avoid disturbing crepuscular and nocturnal species. Lighting fixtures should be fitted with hoods and directed downward, to minimize light pollution;
- A site plan of the area must be made available onsite for all contractors and personnel indicating parking & storage areas, site offices and placement of ablution facilities. If a sewerage network is available, preference is that this be tied into for this project;
- The Operator should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. A minimum of one toilet must be provided per 10 persons;
- Where a registered disposal facility is not available close to the site, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site. Temporary storage of domestic waste shall be in covered waste skips;
- Fire management plan must be in place for the areas surrounding the project area and the road to restrict the impact from fire on the natural flora and fauna communities;
- Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use;
- Dust monitoring must be done on a continued basis for the life of the project;
- Monitoring of Alien Invasive Plant species and their presence, in conjunction with the alien invasive plant management plan for the life of the project;
- The collecting and/or destruction of plants in the surrounding area by unauthorized persons must be prevented;
- Leaking equipment must be repaired immediately or be removed from site to facilitate repair; and
- All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area;
 - The avoidance and protection of the sensitive CBA areas and ridges must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the sensitive areas to be avoided.
- If possible, access to the surrounding areas should be prevented. Human encroachment into this area will most likely severely alter the state of this important area. The feasibility of fencing this area off to prevent access is strongly encouraged and should be investigated;
- The surrounding areas should be declared a 'no-go' area during the construction and operational phases and all efforts must be made to prevent access to this area from construction workers, machinery, domestic animals and the general public. This should be implemented with the exception of those areas in which authorisation for development has been granted;

- Rehabilitation of the disturbed areas existing in the project area must be made a priority. Top soils must also be utilised as soon as possible, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type;
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.

11 Recommendations

It is recommended that a comprehensive baseline study is conducted of the koppie habitat in order to be able to create an ecological baseline for this habitat. This will assist in future monitoring the koppie throughout the life of the project.

12 Conclusion

The completion of a study, in conjunction with the detailed results from the survey means that there is a high confidence in the information provided. The survey, which was completed, and the corresponding studies resulted in good site coverage, within the proposed footprint area, assessing the major habitats and ecosystems, obtaining a general species (fauna and flora) overview and observing the major current impacts.

It is clear from the regional ecological overview, as well as the baseline data collected to date that the project area is an assembly of different habitats that have been altered both historically and presently. Current impacts include secondary roads and associated human activity, including dumping of rubble, livestock, litter and infringement by people and livestock into natural areas.

The proposed project area is disturbed primarily due to clearing of vegetation, and associated activities of human activity such as litter and roads and was given a lower sensitivity rating. The project area surrounding the shaft area is in a semi-natural state and was giving a low-moderate sensitivity due the area not being threatened either according to the NBA and/or LCPv2. According to the Mining and Biodiversity Guidelines, the project area is situated within an area that is considered to be 'highest risk for mining' and of 'highest biodiversity importance'. Mining is often considered incompatible with these areas and this may represent a fatal flaw for the project if any of the remaining natural habitat is disturbed or impacted on.

The koppie habitat exhibits a healthy ecological functionality, integrity and may provide habitat for some threatened species. This diversity is indicative of the importance of these systems to collectively provide refugia, food and corridors for dispersal in and through the surrounding area. No development of construction may be allowed within the 50-meter buffer or the koppie habitat. Access to these surrounding areas should be prevented. Human encroachment into this area is severely altering the state of this important area. The feasibility of fencing this area off, around the 50 m buffer to prevent access should be highly considered.

13 Impact Statement

An impact statement is required as per the NEMA EIA regulations (as amended) with regards to the proposed development.

Based on the findings of this report, and the outcomes of the field surveys, it is the opinion of the specialists that the proposed development can be considered for authorisation. Field surveys confirmed the ecological integrity of this some areas present, as well as the presence and likelihood of some threatened species in the area. Therefore, it is imperative that the recommendations and mitigations in this report be strictly adhered to.

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APPENDIX A: *Floral species expected to occur in the project area*

Family	Scientific name	Author1	IUCN	Ecology
Malvaceae	<i>Abutilon angulatum</i> var. <i>angulatum</i>	(Guill. & Perr.) Mast.	NE	Indigenous
Loranthaceae	<i>Agelanthus natalitius</i> subsp. <i>zeyheri</i>	(Meisn.) Polhill & Wiens		Indigenous
Orobanchaceae	<i>Alectra orobanchoides</i>	Benth.	LC	Indigenous
Poaceae	<i>Anthephora pubescens</i>	Nees	LC	Indigenous
Menispermaceae	<i>Antizoma angustifolia</i>	(Burch.) Miers ex Harv.	LC	Indigenous
Poaceae	<i>Aristida adscensionis</i>	L.	LC	Indigenous
Poaceae	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	Roem. & Schult.	LC	Indigenous
Poaceae	<i>Aristida scabrivalvis</i> subsp. <i>scabrivalvis</i>	Hack.	LC	Indigenous
Poaceae	<i>Aristida stipitata</i> subsp. <i>graciliflora</i>	Hack.	LC	Indigenous
Asparagaceae	<i>Asparagus cooperi</i>	Baker	LC	Indigenous
Asteraceae	<i>Aspilia mossambicensis</i>	(Oliv.) Wild	LC	Indigenous
Acanthaceae	<i>Barleria bremekampii</i>	Oberm.	LC	Indigenous
Acanthaceae	<i>Barleria crossandriiformis</i>	C.B.Clarke		Indigenous
Acanthaceae	<i>Barleria macrostegia</i>	Nees		Indigenous
Capparaceae	<i>Boscia albitrunca</i>	(Burch.) Gilg & Gilg-Ben.	LC	Indigenous
Poaceae	<i>Bothriochloa bladhii</i>	(Retz.) S.T.Blake	LC	Indigenous
Poaceae	<i>Brachiaria brizantha</i>	(A.Rich.) Stapf	LC	Indigenous
Poaceae	<i>Brachiaria deflexa</i>	(Schumach.) C.E.Hubb. ex Robyns	LC	Indigenous
Poaceae	<i>Brachiaria eruciformis</i>	(Sm.) Griseb.	LC	Indigenous
Poaceae	<i>Brachiaria nigropedata</i>	(Ficalho & Hiern) Stapf	LC	Indigenous
Bryaceae	<i>Brachymerium acuminatum</i>	Harv.		Indigenous
Scrophulariaceae	<i>Buddleja salviifolia</i>	(L.) Lam.	LC	Indigenous
Cyperaceae	<i>Bulbostylis burchellii</i>	(Ficalho & Hiern) C.B.Clarke	LC	Indigenous
Fabaceae	<i>Calpurnia aurea</i> subsp. <i>aurea</i>	(Aiton) Benth.	LC	Indigenous
Apocynaceae	<i>Carissa bispinosa</i>	(L.) Desf. ex Brenan	LC	Indigenous
Poaceae	<i>Cenchrus ciliaris</i>	L.	LC	Indigenous
Ditrichaceae	<i>Ceratodon purpureus</i> subsp. <i>stenocarpus</i>	(Hedw.) Brid.		Indigenous
Pteridaceae	<i>Cheilanthes nielsii</i>	W.Jacobsen	LC	Indigenous; Endemic
Poaceae	<i>Chloris virgata</i>	Sw.	LC	Indigenous
Lamiaceae	<i>Clerodendrum ternatum</i>	Schinz		Indigenous
Euphorbiaceae	<i>Clutia natalensis</i>	Bernh.	LC	Indigenous
Combretaceae	<i>Combretum hereroense</i>	Schinz		Indigenous
Burseraceae	<i>Commiphora mollis</i>	(Oliv.) Engl.	LC	Indigenous
Malvaceae	<i>Corchorus asplenifolius</i>	Burch.	LC	Indigenous
Acanthaceae	<i>Crabbea angustifolia</i>	Nees		Indigenous; Endemic
Acanthaceae	<i>Crabbea hirsuta</i>	Harv.		Indigenous

Amaryllidaceae	<i>Crinum crassicaule</i>	Baker	LC	Indigenous
Acanthaceae	<i>Crossandra greenstockii</i>	S.Moore	LC	Indigenous
Acanthaceae	<i>Crossandra zuluensis</i>	W.T.Vos & T.J.Edwards	LC	Indigenous
Fabaceae	<i>Crotalaria laburnifolia subsp. australis</i>	L.	LC	Indigenous
Euphorbiaceae	<i>Croton megalobotrys</i>	Mull.Arg.	LC	Indigenous
Cucurbitaceae	<i>Cucumis hirsutus</i>	Sond.	LC	Indigenous
Poaceae	<i>Cymbopogon pospischilii</i>	(K.Schum.) C.E.Hubb.	NE	Indigenous
Poaceae	<i>Cymbopogon sp.</i>			
Cyperaceae	<i>Cyperus austro-africanus</i>	C.Archer & Goetgh.	LC	Indigenous
Cyperaceae	<i>Cyperus decurvatus</i>	(C.B.Clarke) C.Archer & Goetgh.	LC	Indigenous
Cyperaceae	<i>Cyperus digitatus subsp. auricomus</i>	Roxb.	LC	Indigenous
Cyperaceae	<i>Cyperus fulgens</i>	C.B.Clarke	LC	Indigenous
Cyperaceae	<i>Cyperus margaritaceus var. margaritaceus</i>	Vahl	LC	Indigenous
Cyperaceae	<i>Cyperus sexangularis</i>	Nees	LC	Indigenous
Vitaceae	<i>Cyphostemma sulcatum</i>	(C.A.Sm.) J.J.M.van der Merwe		Indigenous; Endemic
Poaceae	<i>Dactyloctenium aegyptium</i>	(L.) Willd.	LC	Indigenous
Poaceae	<i>Dichanthium annulatum var. papillosum</i>	(Forssk.) Stapf	LC	Indigenous
Acanthaceae	<i>Dicliptera minor subsp. minor</i>	C.B.Clarke		Indigenous
Asteraceae	<i>Dicoma anomala subsp. gerrardii</i>	Sond.	LC	Indigenous
Poaceae	<i>Digitaria eriantha</i>	Steud.	LC	Indigenous
Poaceae	<i>Diheteropogon amplexens var. amplexens</i>	(Nees) Clayton	LC	Indigenous
Poaceae	<i>Dinebra retroflexa var. condensata</i>	(Vahl) Panz.	LC	Indigenous
Poaceae	<i>Echinochloa crus-galli</i>	(L.) P.Beauv.	LC	Indigenous
Poaceae	<i>Eleusine coracana subsp. africana</i>	(L.) Gaertn.	LC	Indigenous
Poaceae	<i>Elionurus muticus</i>	(Spreng.) Kunth	LC	Indigenous
Poaceae	<i>Enneapogon cenchroides</i>	(Licht. ex Roem. & Schult.) C.E.Hubb.	LC	Indigenous
Poaceae	<i>Eragrostis barbinodis</i>	Hack.	LC	Indigenous
Poaceae	<i>Eragrostis biflora</i>	Hack. ex Schinz	LC	Indigenous
Poaceae	<i>Eragrostis cilianensis</i>	(All.) Vignolo ex Janch.	LC	Indigenous
Poaceae	<i>Eragrostis curvula</i>	(Schrad.) Nees	LC	Indigenous
Poaceae	<i>Eragrostis gummiflua</i>	Nees	LC	Indigenous
Poaceae	<i>Eragrostis nindensis</i>	Ficalho & Hiern	LC	Indigenous
Poaceae	<i>Eragrostis rigidior</i>	Pilg.	LC	Indigenous
Poaceae	<i>Eragrostis superba</i>	Peyr.	LC	Indigenous
Poaceae	<i>Eragrostis trichophora</i>	Coss. & Durieu	LC	Indigenous
Poaceae	<i>Eriochloa fatmensis</i>	(Hochst. & Steud.) Clayton	LC	Indigenous
Sapindaceae	<i>Erythrophysa transvaalensis</i>	I.Verd.		Indigenous
Ebenaceae	<i>Euclea linearis</i>	Zeyh. ex Hiern		Indigenous
Ebenaceae	<i>Euclea undulata</i>	Thunb.		Indigenous
Euphorbiaceae	<i>Euphorbia duseimata</i>	R.A.Dyer	LC	Indigenous; Endemic

Euphorbiaceae	<i>Euphorbia schinzii</i>	Pax	LC	Indigenous
Poaceae	<i>Eustachys paspaloides</i>	(Vahl) Lanza & Mattei	LC	Indigenous
Convolvulaceae	<i>Evolvulus alsinoides</i>	(L.) L.	LC	Indigenous
Moraceae	<i>Ficus salicifolia</i>	Vahl	LC	Indigenous
Scrophulariaceae	<i>Freylinia tropica</i>	S.Moore	LC	Indigenous
Iridaceae	<i>Gladiolus elliotii</i>	Baker	LC	Indigenous
Iridaceae	<i>Gladiolus oatesii</i>	Rolfe	LC	Indigenous
Iridaceae	<i>Gladiolus sericeovillosus</i> <i>subsp. calvatus</i>	Hook.f.	LC	Indigenous
Apocynaceae	<i>Gomphocarpus tomentosus</i> <i>subsp. tomentosus</i>	Burch.	LC	Indigenous
Malvaceae	<i>Grewia bicolor</i> var. <i>bicolor</i>	Juss.	LC	Indigenous
Malvaceae	<i>Grewia subspathulata</i>	N.E.Br.	LC	Indigenous
Orchidaceae	<i>Habenaria filicornis</i>	Lindl.	LC	Indigenous
Pedaliaceae	<i>Harpagophytum zeyheri</i> <i>subsp. zeyheri</i>	Decne.	LC	Indigenous
Asteraceae	<i>Helichrysum</i> <i>chionosphaerum</i>	DC.	LC	Indigenous
Malvaceae	<i>Hermannia holosericea</i>	Jacq.	LC	Indigenous; Endemic
Malvaceae	<i>Hermannia umbratica</i>	I.Verd.	LC	Indigenous; Endemic
Amaranthaceae	<i>Hermestaedia odorata</i> var. <i>albi-rosea</i>	(Burch.) T.Cooke	NE	Indigenous
Poaceae	<i>Heteropogon contortus</i>	(L.) Roem. & Schult.	LC	Indigenous
Malvaceae	<i>Hibiscus marlothianus</i>	K.Schum.	LC	Indigenous; Endemic
Malvaceae	<i>Hibiscus micranthus</i> var. <i>micranthus</i>	L.f.	LC	Indigenous
Malvaceae	<i>Hibiscus sidiformis</i>	Baill.	LC	Indigenous
Asteraceae	<i>Hirpicium bechuanense</i>	(S.Moore) Roessler	LC	Indigenous
Apocynaceae	<i>Huernia transvaalensis</i>	Stent	LC	Indigenous; Endemic
Poaceae	<i>Hyperthelia dissoluta</i>	(Nees ex Steud.) Clayton	LC	Indigenous
Fabaceae	<i>Indigastrum costatum</i> subsp. <i>macrum</i>	(Guill. & Perr.) Schrire	LC	Indigenous
Fabaceae	<i>Indigofera circinnata</i>	Benth. ex Harv.	LC	Indigenous
Fabaceae	<i>Indigofera pongolana</i>	N.E.Br.	LC	Indigenous; Endemic
Convolvulaceae	<i>Ipomoea magnusiana</i>	Schinz	LC	Indigenous
Convolvulaceae	<i>Ipomoea sinensis</i> subsp. <i>blepharosepala</i>	(Desr.) Choisy	LC	Indigenous
Poaceae	<i>Ischaemum fasciculatum</i>	Brongn.	LC	Indigenous
Scrophulariaceae	<i>Jamesbrittenia bergae</i>	Lemmer	VU	Indigenous; Endemic
Euphorbiaceae	<i>Jatropha schlechteri</i>	Pax		Indigenous
Euphorbiaceae	<i>Jatropha schlechteri</i> subsp. <i>setifera</i>	Pax	LC	Indigenous
Euphorbiaceae	<i>Jatropha zeyheri</i>	Sond.	LC	Indigenous
Verbenaceae	<i>Lantana rugosa</i>	Thunb.		Indigenous
Hyacinthaceae	<i>Ledebouria atrobrunnea</i>	S.Venter		Indigenous; Endemic
Lamiaceae	<i>Leonotis pentadentata</i>	J.C.Manning & Goldblatt	LC	Indigenous
Polypodiaceae	<i>Lepisorus excavatus</i>	(Bory ex Willd.) Ching	LC	Indigenous

Poaceae	<i>Loudetia flavida</i>	(Stapf) C.E.Hubb.	LC	Indigenous
Capparaceae	<i>Maerua angolensis subsp. angolensis</i>	DC.	LC	Indigenous
Malvaceae	<i>Malvastrum coromandelianum</i>	(L.) Garcke		Not Indigenous; Naturalised; Invasive
Convolvulaceae	<i>Merremia palmata</i>	Hallier f.	LC	Indigenous
Amaryllidaceae	<i>Nerine laticoma</i>	(Ker Gawl.) T.Durand & Schinz	LC	Indigenous
Asteraceae	<i>Nidorella resedifolia subsp. resedifolia</i>	DC.	LC	Indigenous
Oxalidaceae	<i>Oxalis smithiana</i>	Eckl. & Zeyh.	LC	Indigenous
Anacardiaceae	<i>Ozoroa paniculosa var. paniculosa</i>	(Sond.) R.Fern. & A.Fern.	LC	Indigenous
Poaceae	<i>Panicum coloratum</i>	L.	LC	Indigenous
Poaceae	<i>Panicum maximum</i>	Jacq.	LC	Indigenous
Poaceae	<i>Panicum schinzii</i>	Hack.	LC	Indigenous
Molluginaceae	<i>Paramollugo nudicaulis</i>	(Lam.) Thulin		Indigenous
Malvaceae	<i>Pavonia transvaalensis</i>	(Ulbr.) A.Meeuse	LC	Indigenous; Endemic
Poaceae	<i>Pennisetum setaceum</i>	(Forssk.) Chiov.	NE	Not Indigenous; Naturalised; Invasive
Poaceae	<i>Perotis patens</i>	Gand.	LC	Indigenous
Poaceae	<i>Pogonarthria squarrosa</i>	(Roem. & Schult.) Pilg.	LC	Indigenous
Polytrichaceae	<i>Pogonatum capense</i>	(Hampe) A.Jaeger		Indigenous
Polygalaceae	<i>Polygala albida subsp. albida</i>	Schinz	LC	Indigenous
Polytrichaceae	<i>Polytrichum commune</i>	Hedw.		Indigenous
Proteaceae	<i>Protea roupelliae</i>	Meisn.		Indigenous
Proteaceae	<i>Protea welwitschii</i>	Engl.	LC	Indigenous
Fabaceae	<i>Pterocarpus rotundifolius subsp. rotundifolius</i>	(Sond.) Druce	LC	Indigenous
Apocynaceae	<i>Raphionacme dyeri</i>	Retief & Venter	LC	Indigenous
Rhamnaceae	<i>Rhamnus prinoides</i>	L'Her.		Indigenous
Fabaceae	<i>Rhynchosia densiflora subsp. chrysadenia</i>	(Roth) DC.	LC	Indigenous
Fabaceae	<i>Rhynchosia holosericea</i>	Schinz	LC	Indigenous
Fabaceae	<i>Rhynchosia monophylla</i>	Schltr.	LC	Indigenous
Ricciaceae	<i>Riccia atropurpurea</i>	Sim		Indigenous
Acanthaceae	<i>Ruellia patula</i>	Jacq.		Indigenous
Lamiaceae	<i>Salvia reflexa</i>	Hornem.		Not Indigenous; Naturalised; Invasive
Poaceae	<i>Schizachyrium jeffreysii</i>	(Hack.) Stapf	LC	Indigenous
Poaceae	<i>Schizachyrium sanguineum</i>	(Retz.) Alston	LC	Indigenous
Poaceae	<i>Schmidia pappophoroides</i>	Steud.	LC	Indigenous
Salicaceae	<i>Scolopia zeyheri</i>	(Nees) Harv.	LC	Indigenous
Anacardiaceae	<i>Searsia dentata</i>	(Thunb.) F.A.Barkley		Indigenous
Anacardiaceae	<i>Searsia magalismontana subsp. magalismontana</i>	(Sond.) Moffett		Indigenous
Anacardiaceae	<i>Searsia tenuinervis</i>	(Engl.) Moffett		Indigenous
Selaginellaceae	<i>Selaginella dregei</i>	(C.Presl) Hieron.		Indigenous

Fabaceae	<i>Senegalia caffra</i>	(Thunb.) P.J.H.Hurter & Mabb.	LC	Indigenous
Fabaceae	<i>Senegalia erubescens</i>	(Welw. ex Oliv.) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	<i>Senegalia galpinii</i>	(Burt Davy) Seigler & Ebinger	LC	Indigenous
Fabaceae	<i>Senegalia mellifera subsp. detinens</i>	(Vahl) Seigler & Ebinger	LC	Indigenous
Fabaceae	<i>Sesbania transvaalensis</i>	J.B.Gillett	LC	Indigenous
Poaceae	<i>Setaria incrassata</i>	(Hochst.) Hack.	LC	Indigenous
Poaceae	<i>Setaria verticillata</i>	(L.) P.Beauv.	LC	Indigenous
Malvaceae	<i>Sida sp.</i>			
Poaceae	<i>Sorghum versicolor</i>	Andersson	LC	Indigenous
Sphagnaceae	<i>Sphagnum capense</i>	Hornsch.		Indigenous
Sphagnaceae	<i>Sphagnum violascens</i>	Mull.Hal.		Indigenous
Poaceae	<i>Sporobolus fimbriatus</i>	(Trin.) Nees	LC	Indigenous
Poaceae	<i>Sporobolus ioclados</i>	(Trin.) Nees	LC	Indigenous
Poaceae	<i>Sporobolus nitens</i>	Stent	LC	Indigenous
Apocynaceae	<i>Stenostelma umbelluliferum</i>	(Schltr.) Bester & Nicholas	NT	Indigenous; Endemic
Poaceae	<i>Stipagrostis uniplumis var. uniplumis</i>	(Licht.) De Winter	LC	Indigenous
Orobanchaceae	<i>Striga asiatica</i>	(L.) Kuntze	LC	Indigenous
Orobanchaceae	<i>Striga gesnerioides</i>	(Willd.) Vatke	LC	Indigenous
Lamiaceae	<i>Syncolostemon elliottii</i>	(Baker) D.F.Otieno	LC	Indigenous
Anacampserotaceae	<i>Talinum arnotii</i>	Hook.f.		Indigenous
Asteraceae	<i>Tarchonanthus trilobus var. galpinii</i>	DC.	LC	Indigenous
Scrophulariaceae	<i>Teedia lucida</i>	(Sol.) Rudolphi	LC	Indigenous
Fabaceae	<i>Tephrosia burchellii</i>	Burt Davy	LC	Indigenous
Fabaceae	<i>Tephrosia purpurea subsp. leptostachya</i>	(L.) Pers.	NE	Indigenous
Combretaceae	<i>Terminalia sericea</i>	Burch. ex DC.	LC	Indigenous
Lamiaceae	<i>Tetradenia brevispicata</i>	(N.E.Br.) Codd	LC	Indigenous
Poaceae	<i>Themeda triandra</i>	Forssk.	LC	Indigenous
Euphorbiaceae	<i>Tragia dioica</i>	Sond.	LC	Indigenous
Poaceae	<i>Tricholaena monachne</i>	(Trin.) Stapf & C.E.Hubb.	LC	Indigenous
Poaceae	<i>Trichoneura grandiglumis</i>	(Nees) Ekman	LC	Indigenous
Pottiaceae	<i>Trichostomum brachydontium</i>	Bruch		Indigenous
Malvaceae	<i>Triumfetta sonderi</i>	Ficalho & Hiern	LC	Indigenous; Endemic
Poaceae	<i>Urochloa mosambicensis</i>	(Hack.) Dandy	LC	Indigenous
Fabaceae	<i>Vachellia gerrardii subsp. gerrardii</i>	(Benth.) P.J.H.Hurter		Indigenous
Fabaceae	<i>Vachellia karroo</i>	(Hayne) Banfi & Gallaso	LC	Indigenous
Santalaceae	<i>Viscum combreticola</i>	Engl.		Indigenous
Lamiaceae	<i>Vitex pooara</i>	Corbishley		Indigenous; Endemic
Poaceae	<i>Vulpia myuros</i>	(L.) C.C.Gmel.	NE	Not Indigenous; Naturalised
Aizoaceae	<i>Zaleya pentandra</i>	(L.) C.Jeffrey	LC	Indigenous

Rhamnaceae	<i>Ziziphus zeyheriana</i>	Sond.		Indigenous
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APPENDIX B: Avifaunal species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Accipiter badius</i>	Shikra	Unlisted	LC
<i>Accipiter minullus</i>	Sparrowhawk, Little	Unlisted	LC
<i>Accipiter ovampensis</i>	Sparrowhawk, Ovambo	Unlisted	LC
<i>Acridotheres tristis</i>	Myna, Common	Unlisted	LC
<i>Acrocephalus arundinaceus</i>	Reed-warbler, Great	Unlisted	LC
<i>Acrocephalus gracilirostris</i>	Swamp-warbler, Lesser	Unlisted	LC
<i>Acrocephalus schoenobaenus</i>	Warbler, Sedge	Unlisted	LC
<i>Actitis hypoleucos</i>	Sandpiper, Common	Unlisted	LC
<i>Actophilornis africanus</i>	Jacana, African	Unlisted	LC
<i>Afrotis afraoides</i>	Korhaan, Northern Black	Unlisted	LC
<i>Alcedo cristata</i>	Kingfisher, Malachite	Unlisted	Unlisted
<i>Alopochen aegyptiacus</i>	Goose, Egyptian	Unlisted	LC
<i>Amadina erythrocephala</i>	Finch, Red-headed	Unlisted	LC
<i>Amadina fasciata</i>	Finch, Cut-throat	Unlisted	Unlisted
<i>Amandava subflava</i>	Waxbill, Orange-breasted	Unlisted	Unlisted
<i>Amaurornis flavirostris</i>	Crake, Black	Unlisted	LC
<i>Amblyospiza albifrons</i>	Weaver, Thick-billed	Unlisted	LC
<i>Anaplectes rubriceps</i>	Weaver, Red-headed	Unlisted	LC
<i>Anas capensis</i>	Teal, Cape	Unlisted	LC
<i>Anas erythrorhyncha</i>	Teal, Red-billed	Unlisted	LC
<i>Anas hottentota</i>	Teal, Hottentot	Unlisted	LC
<i>Anas smithii</i>	Shoveler, Cape	Unlisted	LC
<i>Anas sparsa</i>	Duck, African Black	Unlisted	LC
<i>Anas undulata</i>	Duck, Yellow-billed	Unlisted	LC
<i>Anhinga rufa</i>	Darter, African	Unlisted	LC
<i>Anomalospiza imberbis</i>	Finch, Cuckoo	Unlisted	LC
<i>Anthoscopus caroli</i>	Penduline-tit, Grey	Unlisted	LC
<i>Anthoscopus minutus</i>	Penduline-tit, Cape	Unlisted	LC
<i>Anthus caffer</i>	Pipit, Bushveld	Unlisted	LC
<i>Anthus cinnamomeus</i>	Pipit, African	Unlisted	LC
<i>Anthus leucophrys</i>	Pipit, Plain-backed	Unlisted	LC
<i>Anthus lineiventris</i>	Pipit, Striped	Unlisted	LC
<i>Anthus similis</i>	Pipit, Long-billed	Unlisted	LC
<i>Apalis thoracica</i>	Apalis, Bar-throated	Unlisted	LC
<i>Apus affinis</i>	Swift, Little	Unlisted	LC
<i>Apus apus</i>	Swift, Common	Unlisted	LC
<i>Apus barbatus</i>	Swift, African Black	Unlisted	LC
<i>Apus caffer</i>	Swift, White-rumped	Unlisted	LC
<i>Apus horus</i>	Swift, Horus	Unlisted	LC
<i>Aquila nipalensis</i>	Eagle, Steppe	LC	EN
<i>Aquila rapax</i>	Eagle, Tawny	EN	LC

<i>Aquila spilogaster</i>	Hawk-eagle, African	Unlisted	LC
<i>Aquila verreauxii</i>	Eagle, Verreaux's	VU	LC
<i>Aquila wahlbergi</i>	Eagle, Wahlberg's	Unlisted	LC
<i>Ardea cinerea</i>	Heron, Grey	Unlisted	LC
<i>Ardea goliath</i>	Heron, Goliath	Unlisted	LC
<i>Ardea melanocephala</i>	Heron, Black-headed	Unlisted	LC
<i>Ardea purpurea</i>	Heron, Purple	Unlisted	LC
<i>Ardeola ralloides</i>	Heron, Squacco	Unlisted	LC
<i>Ardeotis kori</i>	Bustard, Kori	NT	NT
<i>Asio capensis</i>	Owl, Marsh	Unlisted	LC
<i>Batis molitor</i>	Batis, Chinspot	Unlisted	LC
<i>Bostrychia hagedash</i>	Ibis, Hadedda	Unlisted	LC
<i>Bradornis mariquensis</i>	Flycatcher, Marico	Unlisted	LC
<i>Bradornis pallidus</i>	Flycatcher, Pale	Unlisted	LC
<i>Bradypterus baboecala</i>	Rush-warbler, Little	Unlisted	LC
<i>Bubalornis niger</i>	Buffalo-weaver, Red-billed	Unlisted	LC
<i>Bubo africanus</i>	Eagle-owl, Spotted	Unlisted	LC
<i>Bubo lacteus</i>	Eagle-owl, Verreaux's	Unlisted	LC
<i>Bubulcus ibis</i>	Egret, Cattle	Unlisted	LC
<i>Buphagus erythrorhynchus</i>	Oxpecker, Red-billed	Unlisted	Unlisted
<i>Burhinus capensis</i>	Thick-knee, Spotted	Unlisted	LC
<i>Buteo rufufuscus</i>	Buzzard, Jackal	Unlisted	LC
<i>Buteo vulpinus</i>	Buzzard, Common	Unlisted	Unlisted
<i>Butorides striata</i>	Heron, Green-backed	Unlisted	LC
<i>Calamonastes fasciolatus</i>	Wren-warbler, Barred	Unlisted	LC
<i>Calandrella cinerea</i>	Lark, Red-capped	Unlisted	LC
<i>Calendulauda sabota</i>	Lark, Sabota	Unlisted	LC
<i>Calidris ferruginea</i>	Sandpiper, Curlew	LC	NT
<i>Calidris minuta</i>	Stint, Little	LC	LC
<i>Camaropectera brachyura</i>	Camaropectera, Green-backed	Unlisted	LC
<i>Camaropectera brevicaudata</i>	Camaropectera, Grey-backed	Unlisted	Unlisted
<i>Campephaga flava</i>	Cuckoo-shrike, Black	Unlisted	LC
<i>Campethera abingoni</i>	Woodpecker, Golden-tailed	Unlisted	LC
<i>Campethera bennettii</i>	Woodpecker, Bennett's	Unlisted	LC
<i>Caprimulgus pectoralis</i>	Nightjar, Fiery-necked	Unlisted	LC
<i>Caprimulgus rufigena</i>	Nightjar, Rufous-cheeked	Unlisted	LC
<i>Caprimulgus tristigma</i>	Nightjar, Freckled	Unlisted	LC
<i>Centropus burchellii</i>	Coucal, Burchell's	Unlisted	Unlisted
<i>Centropus superciliosus</i>	Coucal, White-browed	Unlisted	LC
<i>Cercomela familiaris</i>	Chat, Familiar	Unlisted	LC
<i>Cercotrichas leucophrys</i>	Scrub-robin, White-browed	Unlisted	LC
<i>Cercotrichas paena</i>	Scrub-robin, Kalahari	Unlisted	LC
<i>Ceryle rudis</i>	Kingfisher, Pied	Unlisted	LC
<i>Chalcomitra amethystina</i>	Sunbird, Amethyst	Unlisted	LC
<i>Charadrius pecuarius</i>	Plover, Kittlitz's	Unlisted	LC

<i>Charadrius tricollaris</i>	Plover, Three-banded	Unlisted	LC
<i>Chlidonias hybrida</i>	Tern, Whiskered	Unlisted	LC
<i>Chlidonias leucopterus</i>	Tern, White-winged	Unlisted	LC
<i>Chlorocichla flaviventris</i>	Greenbul, Yellow-bellied	Unlisted	LC
<i>Chrysococcyx caprius</i>	Cuckoo, Diderick	Unlisted	LC
<i>Chrysococcyx klaas</i>	Cuckoo, Klaas's	Unlisted	LC
<i>Ciconia abdimii</i>	Stork, Abdim's	NT	LC
<i>Ciconia ciconia</i>	Stork, White	Unlisted	LC
<i>Ciconia nigra</i>	Stork, Black	VU	LC
<i>Cinnyricinclus leucogaster</i>	Starling, Violet-backed	Unlisted	LC
<i>Cinnyris mariquensis</i>	Sunbird, Marico	Unlisted	LC
<i>Cinnyris talatala</i>	Sunbird, White-bellied	Unlisted	LC
<i>Circaetus cinereus</i>	Snake-eagle, Brown	Unlisted	LC
<i>Circaetus pectoralis</i>	Snake-eagle, Black-chested	Unlisted	LC
<i>Circus pygargus</i>	Montagu's Harrier	Unlisted	LC
<i>Circus ranivorus</i>	Marsh-harrier, African	EN	LC
<i>Cisticola aberrans</i>	Cisticola, Lazy	Unlisted	LC
<i>Cisticola aridulus</i>	Cisticola, Desert	Unlisted	LC
<i>Cisticola ayresii</i>	Cisticola, Wing-snapping	Unlisted	LC
<i>Cisticola chiniana</i>	Cisticola, Rattling	Unlisted	LC
<i>Cisticola fulvicapilla</i>	Neddicky, Neddicky	Unlisted	LC
<i>Cisticola juncidis</i>	Cisticola, Zitting	Unlisted	LC
<i>Cisticola tinniens</i>	Cisticola, Levallant's	Unlisted	LC
<i>Clamator glandarius</i>	Cuckoo, Great Spotted	Unlisted	LC
<i>Clamator jacobinus</i>	Cuckoo, Jacobin	Unlisted	LC
<i>Clamator levallantii</i>	Cuckoo, Levallant's	Unlisted	LC
<i>Clanga pomarina</i>	Eagle, Lesser Spotted	Unlisted	LC
<i>Colius colius</i>	Mousebird, White-backed	Unlisted	LC
<i>Colius striatus</i>	Mousebird, Speckled	Unlisted	LC
<i>Columba arquatrix</i>	Olive-pigeon, African	Unlisted	LC
<i>Columba guinea</i>	Pigeon, Speckled	Unlisted	LC
<i>Columba livia</i>	Dove, Rock	Unlisted	LC
<i>Coracias caudatus</i>	Roller, Lilac-breasted	Unlisted	LC
<i>Coracias garrulus</i>	Roller, European	NT	LC
<i>Coracias naevius</i>	Roller, Purple	Unlisted	LC
<i>Corvus albus</i>	Crow, Pied	Unlisted	LC
<i>Corythaixoides concolor</i>	Go-away-bird, Grey	Unlisted	LC
<i>Cossypha caffra</i>	Robin-chat, Cape	Unlisted	LC
<i>Cossypha humeralis</i>	Robin-chat, White-throated	Unlisted	LC
<i>Coturnix coturnix</i>	Quail, Common	Unlisted	LC
<i>Coturnix delegorguei</i>	Quail, Harlequin	Unlisted	LC
<i>Creatophora cinerea</i>	Starling, Wattled	Unlisted	LC
<i>Crithagra atrogularis</i>	Canary, Black-throated	Unlisted	LC
<i>Crithagra gularis</i>	Seedeater, Streaky-headed	Unlisted	LC
<i>Crithagra mozambica</i>	Canary, Yellow-fronted	Unlisted	LC

<i>Cuculus clamosus</i>	Cuckoo, Black	Unlisted	LC
<i>Cuculus gularis</i>	Cuckoo, African	Unlisted	LC
<i>Cuculus solitarius</i>	Cuckoo, Red-chested	Unlisted	LC
<i>Cursorius temminckii</i>	Cursor, Temminck's	Unlisted	LC
<i>Cypsiurus parvus</i>	Palm-swift, African	Unlisted	LC
<i>Delichon urbicum</i>	House-martin, Common	Unlisted	LC
<i>Dendrocygna viduata</i>	Duck, White-faced Whistling	Unlisted	LC
<i>Dendroperdix sephaena</i>	Francolin, Crested	Unlisted	LC
<i>Dendropicos fuscescens</i>	Woodpecker, Cardinal	Unlisted	LC
<i>Dendropicos namaquus</i>	Woodpecker, Bearded	Unlisted	LC
<i>Dicrurus adsimilis</i>	Drongo, Fork-tailed	Unlisted	LC
<i>Dryoscopus cubla</i>	Puffback, Black-backed	Unlisted	LC
<i>Egretta alba</i>	Egret, Great	Unlisted	LC
<i>Egretta ardesiaca</i>	Heron, Black	Unlisted	LC
<i>Egretta garzetta</i>	Egret, Little	Unlisted	LC
<i>Egretta intermedia</i>	Egret, Yellow-billed	Unlisted	LC
<i>Elanus caeruleus</i>	Kite, Black-shouldered	Unlisted	LC
<i>Emberiza capensis</i>	Bunting, Cape	Unlisted	LC
<i>Emberiza flaviventris</i>	Bunting, Golden-breasted	Unlisted	LC
<i>Emberiza tahapisi</i>	Bunting, Cinnamon-breasted	Unlisted	LC
<i>Eremomela icteropygialis</i>	Eremomela, Yellow-bellied	Unlisted	LC
<i>Eremomela usticollis</i>	Eremomela, Burnt-necked	Unlisted	LC
<i>Eremopterix leucotis</i>	Sparrowlark, Chestnut-backed	Unlisted	LC
<i>Eremopterix verticalis</i>	Sparrowlark, Grey-backed	Unlisted	LC
<i>Estrilda astrild</i>	Waxbill, Common	Unlisted	LC
<i>Estrilda erythronotos</i>	Waxbill, Black-faced	Unlisted	LC
<i>Euplectes afer</i>	Bishop, Yellow-crowned	Unlisted	LC
<i>Euplectes albonotatus</i>	Widowbird, White-winged	Unlisted	LC
<i>Euplectes orix</i>	Bishop, Southern Red	Unlisted	LC
<i>Euplectes progne</i>	Widowbird, Long-tailed	Unlisted	LC
<i>Eurocephalus anguitimens</i>	Shrike, Southern White-crowned	Unlisted	LC
<i>Falco amurensis</i>	Falcon, Amur	Unlisted	LC
<i>Falco biarmicus</i>	Falcon, Lanner	VU	LC
<i>Falco naumanni</i>	Kestrel, Lesser	Unlisted	LC
<i>Falco rupicoloides</i>	Kestrel, Greater	Unlisted	LC
<i>Falco rupicolus</i>	Kestrel, Rock	Unlisted	LC
<i>Falco vespertinus</i>	Falcon, Red-footed	NT	NT
<i>Fulica cristata</i>	Coot, Red-knobbed	Unlisted	LC
<i>Gallinula chloropus</i>	Moorhen, Common	Unlisted	LC
<i>Glareola nordmanni</i>	Pratincole, Black-winged	NT	NT
<i>Glaucidium perlatum</i>	Owlet, Pearl-spotted	Unlisted	LC
<i>Granatina granatina</i>	Waxbill, Violet-eared	Unlisted	LC
<i>Gyps africanus</i>	Vulture, White-backed	CR	CR
<i>Gyps coprotheres</i>	Vulture, Cape	EN	EN

<i>Halcyon albiventris</i>	Kingfisher, Brown-hooded	Unlisted	LC
<i>Halcyon chelicuti</i>	Kingfisher, Striped	Unlisted	LC
<i>Halcyon leucocephala</i>	Kingfisher, Grey-headed	Unlisted	LC
<i>Halcyon senegalensis</i>	Kingfisher, Woodland	Unlisted	LC
<i>Haliaeetus vocifer</i>	Fish-eagle, African	Unlisted	LC
<i>Himantopus himantopus</i>	Stilt, Black-winged	Unlisted	LC
<i>Hippolais icterina</i>	Warbler, Icterine	Unlisted	LC
<i>Hippolais olivetorum</i>	Warbler, Olive-tree	Unlisted	LC
<i>Hirundo abyssinica</i>	Swallow, Lesser Striped	Unlisted	LC
<i>Hirundo albigularis</i>	Swallow, White-throated	Unlisted	LC
<i>Hirundo cucullata</i>	Swallow, Greater Striped	Unlisted	LC
<i>Hirundo dimidiata</i>	Swallow, Pearl-breasted	Unlisted	LC
<i>Hirundo fuligula</i>	Martin, Rock	Unlisted	Unlisted
<i>Hirundo rustica</i>	Swallow, Barn	Unlisted	LC
<i>Hirundo semirufa</i>	Swallow, Red-breasted	Unlisted	LC
<i>Indicator indicator</i>	Honeyguide, Greater	Unlisted	LC
<i>Indicator minor</i>	Honeyguide, Lesser	Unlisted	LC
<i>Ixobrychus minutus</i>	Bittern, Little	Unlisted	LC
<i>Ixobrychus sturmii</i>	Bittern, Dwarf	Unlisted	LC
<i>Kaupifalco monogrammicus</i>	Buzzard, Lizard	Unlisted	LC
<i>Lagonosticta rhodopareia</i>	Firefinch, Jameson's	Unlisted	LC
<i>Lagonosticta rubricata</i>	Firefinch, African	Unlisted	LC
<i>Lagonosticta senegala</i>	Firefinch, Red-billed	Unlisted	LC
<i>Lamprotonis australis</i>	Starling, Burchell's	Unlisted	LC
<i>Lamprotonis nitens</i>	Starling, Cape Glossy	Unlisted	LC
<i>Laniarius atrococcineus</i>	Shrike, Crimson-breasted	Unlisted	LC
<i>Laniarius ferrugineus</i>	Boubou, Southern	Unlisted	LC
<i>Lanius collaris</i>	Fiscal, Common (Southern)	Unlisted	LC
<i>Lanius collurio</i>	Shrike, Red-backed	Unlisted	LC
<i>Lanius minor</i>	Shrike, Lesser Grey	Unlisted	LC
<i>Larus cirrocephalus</i>	Gull, Grey-headed	Unlisted	LC
<i>Leptoptilos crumeniferus</i>	Stork, Marabou	Unlisted	LC
<i>Lophaelus occipitalis</i>	Eagle, Long-crested	Unlisted	LC
<i>Lophotis ruficrista</i>	Korhaan, Red-crested	Unlisted	LC
<i>Lybius torquatus</i>	Barbet, Black-collared	Unlisted	LC
<i>Malaconotus blanchoti</i>	Bush-shrike, Grey-headed	Unlisted	LC
<i>Megaceryle maximus</i>	Kingfisher, Giant	Unlisted	Unlisted
<i>Melaenornis pammelaina</i>	Flycatcher, Southern Black	Unlisted	LC
<i>Melierax canorus</i>	Goshawk, Southern Pale Chanting	Unlisted	LC
<i>Melierax gabar</i>	Goshawk, Gabar	Unlisted	LC
<i>Merops apiaster</i>	Bee-eater, European	Unlisted	LC
<i>Merops bullockoides</i>	Bee-eater, White-fronted	Unlisted	LC
<i>Merops hirundineus</i>	Bee-eater, Swallow-tailed	Unlisted	LC
<i>Merops nubicoides</i>	Bee-eater, Southern Carmine	Unlisted	LC

<i>Merops persicus</i>	Bee-eater, Blue-cheeked	Unlisted	LC
<i>Merops pusillus</i>	Bee-eater, Little	Unlisted	LC
<i>Milvus aegyptius</i>	Kite, Yellow-billed	Unlisted	Unlisted
<i>Milvus migrans</i>	Kite, Black	Unlisted	LC
<i>Mirafra africana</i>	Lark, Rufous-naped	Unlisted	LC
<i>Monticola brevipes</i>	Rock-thrush, Short-toed	Unlisted	LC
<i>Motacilla aguimp</i>	Wagtail, African Pied	Unlisted	LC
<i>Motacilla capensis</i>	Wagtail, Cape	Unlisted	LC
<i>Muscicapa striata</i>	Flycatcher, Spotted	Unlisted	LC
<i>Mycteria ibis</i>	Stork, Yellow-billed	EN	LC
<i>Myioparus plumbeus</i>	Tit-flycatcher, Grey	Unlisted	LC
<i>Myrmecocichla formicivora</i>	Chat, Anteating	Unlisted	LC
<i>Nectarinia famosa</i>	Sunbird, Malachite	Unlisted	LC
<i>Netta erythrophthalma</i>	Pochard, Southern	Unlisted	LC
<i>Nilaus afer</i>	Brubru	Unlisted	LC
<i>Numida meleagris</i>	Guinea fowl, Helmeted	Unlisted	LC
<i>Nycticorax nycticorax</i>	Night-Heron, Black-crowned	Unlisted	LC
<i>Oena capensis</i>	Dove, Namaqua	Unlisted	LC
<i>Oenanthe pileata</i>	Wheatear, Capped	Unlisted	LC
<i>Onychognathus morio</i>	Starling, Red-winged	Unlisted	LC
<i>Oriolus larvatus</i>	Oriole, Black-headed	Unlisted	LC
<i>Oriolus oriolus</i>	Oriole, Eurasian Golden	Unlisted	LC
<i>Ortygospiza atricollis</i>	Quailfinch, African	Unlisted	LC
<i>Otus senegalensis</i>	Scops-owl, African	Unlisted	LC
<i>Parisoma subcaeruleum</i>	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
<i>Parus cinerascens</i>	Tit, Ashy	Unlisted	LC
<i>Parus niger</i>	Tit, Southern Black	Unlisted	Unlisted
<i>Passer diffusus</i>	Sparrow, Southern Grey-headed	Unlisted	LC
<i>Passer domesticus</i>	Sparrow, House	Unlisted	LC
<i>Passer griseus</i>	Sparrow, Northern Grey-headed	Unlisted	LC
<i>Passer melanurus</i>	Sparrow, Cape	Unlisted	LC
<i>Passer motitensis</i>	Sparrow, Great	Unlisted	LC
<i>Pavo cristatus</i>	Peacock, Common	Unlisted	LC
<i>Pelecanus rufescens</i>	Pelican, Pink-backed	VU	LC
<i>Peliperdix coqui</i>	Francolin, Coqui	Unlisted	LC
<i>Petronia supercilialis</i>	Petronia, Yellow-throated	Unlisted	LC
<i>Phalacrocorax africanus</i>	Cormorant, Reed	Unlisted	LC
<i>Phalacrocorax carbo</i>	Cormorant, White-breasted	LC	LC
<i>Philomachus pugnax</i>	Ruff	Unlisted	LC
<i>Phoeniconaias minor</i>	Flamingo, Lesser	NT	NT
<i>Phoenicopterus ruber</i>	Flamingo, Greater	NT	LC
<i>Phoeniculus purpureus</i>	Wood-hoopoe, Green	Unlisted	LC
<i>Phylloscopus trochilus</i>	Warbler, Willow	Unlisted	LC
<i>Platalea alba</i>	Spoonbill, African	Unlisted	LC

<i>Plectropterus gambensis</i>	Goose, Spur-winged	Unlisted	LC
<i>Plegadis falcinellus</i>	Ibis, Glossy	Unlisted	LC
<i>Plocepasser mahali</i>	Sparrow-weaver, White-browed	Unlisted	LC
<i>Ploceus capensis</i>	Weaver, Cape	Unlisted	LC
<i>Ploceus cucullatus</i>	Weaver, Village	Unlisted	LC
<i>Ploceus intermedius</i>	Masked-weaver, Lesser	Unlisted	LC
<i>Ploceus velatus</i>	Southern Masked-weaver, Southern	Unlisted	LC
<i>Podica senegalensis</i>	Finfoot, African	VU	LC
<i>Podiceps cristatus</i>	Grebe, Great Crested	Unlisted	LC
<i>Pogoniulus chrysoconus</i>	Tinkerbird, Yellow-fronted	Unlisted	LC
<i>Poicephalus meyeri</i>	Parrot, Meyer's	Unlisted	LC
<i>Polemaetus bellicosus</i>	Eagle, Martial	EN	VU
<i>Polyboroides typus</i>	Harrier-Hawk, African	Unlisted	LC
<i>Porphyrio madagascariensis</i>	Swamphen, African Purple	Unlisted	Unlisted
<i>Prinia flavicans</i>	Prinia, Black-chested	Unlisted	LC
<i>Prinia subflava</i>	Prinia, Tawny-flanked	Unlisted	LC
<i>Prionops plumatus</i>	Helmet-shrike, White-crested	Unlisted	LC
<i>Psophocichla litsipsirupa</i>	Thrush, Groundscraper	Unlisted	Unlisted
<i>Pternistis natalensis</i>	Spurfowl, Natal	Unlisted	LC
<i>Pternistis swainsonii</i>	Spurfowl, Swainson's	Unlisted	LC
<i>Pterocles bicinctus</i>	Sandgrouse, Double-banded	Unlisted	LC
<i>Pterocles gutturalis</i>	Sandgrouse, Yellow-throated	NT	LC
<i>Ptilopsis granti</i>	Scops-owl, Southern White-faced	Unlisted	Unlisted
<i>Pycnonotus nigricans</i>	Bulbul, African Red-eyed	Unlisted	LC
<i>Pycnonotus tricolor</i>	Bulbul, Dark-capped	Unlisted	Unlisted
<i>Pytilia melba</i>	Pytilia, Green-winged	Unlisted	LC
<i>Quelea quelea</i>	Quelea, Red-billed	Unlisted	LC
<i>Recurvirostra avosetta</i>	Avocet, Pied	Unlisted	LC
<i>Rhinopomastus cyanomelas</i>	Scimitarbill, Common	Unlisted	LC
<i>Rhinoptilus chalcopterus</i>	Courser, Bronze-winged	Unlisted	LC
<i>Riparia cincta</i>	Martin, Banded	Unlisted	LC
<i>Riparia paludicola</i>	Martin, Brown-throated	Unlisted	LC
<i>Riparia riparia</i>	Martin, Sand	Unlisted	LC
<i>Rostratula benghalensis</i>	Painted-snipe, Greater	NT	LC
<i>Sagittarius serpentarius</i>	Secretarybird	VU	VU
<i>Sarkidiornis melanotos</i>	Duck, Comb	Unlisted	LC
<i>Sarothrura rufa</i>	Flufftail, Red-chested	Unlisted	LC
<i>Saxicola torquatus</i>	Stonechat, African	Unlisted	LC
<i>Scopus umbretta</i>	Hamerkop, Hamerkop	Unlisted	LC
<i>Sigelus silens</i>	Flycatcher, Fiscal	Unlisted	LC
<i>Spermestes cucullatus</i>	Mannikin, Bronze	Unlisted	Unlisted
<i>Spizocorys conirostris</i>	Lark, Pink-billed	Unlisted	LC
<i>Sporopipes squamifrons</i>	Finch, Scaly-feathered	Unlisted	LC
<i>Stenostira scita</i>	Flycatcher, Fairy	Unlisted	LC

<i>Streptopelia capicola</i>	Turtle-dove, Cape	Unlisted	LC
<i>Streptopelia semitorquata</i>	Dove, Red-eyed	Unlisted	LC
<i>Streptopelia senegalensis</i>	Dove, Laughing	Unlisted	LC
<i>Struthio camelus</i>	Ostrich, Common	Unlisted	LC
<i>Sylvia communis</i>	Whitethroat, Common	Unlisted	LC
<i>Sylvietta rufescens</i>	Crombec, Long-billed	Unlisted	LC
<i>Tachybaptus ruficollis</i>	Grebe, Little	Unlisted	LC
<i>Tachymarptis melba</i>	Swift, Alpine	Unlisted	LC
<i>Tadorna cana</i>	Shelduck, South African	Unlisted	LC
<i>Tchagra australis</i>	Tchagra, Brown-crowned	Unlisted	LC
<i>Tchagra senegalus</i>	Tchagra, Black-crowned	Unlisted	LC
<i>Telophorus sulfureopectus</i>	Bush-shrike, Orange-breasted	Unlisted	LC
<i>Terpsiphone viridis</i>	Paradise-flycatcher, African	Unlisted	LC
<i>Thalassornis leuconotus</i>	Duck, White-backed	Unlisted	LC
<i>Thamnolaea cinnamomeiventris</i>	Cliff-chat, Mocking	Unlisted	LC
<i>Threskiornis aethiopicus</i>	Ibis, African Sacred	Unlisted	LC
<i>Tockus erythrorhynchus</i>	Hornbill, Red-billed	Unlisted	LC
<i>Tockus leucomelas</i>	Hornbill, Southern Yellow-billed	Unlisted	LC
<i>Tockus nasutus</i>	Hornbill, African Grey	Unlisted	LC
<i>Torgos tracheliotus</i>	Vulture, Lappet-faced	EN	EN
<i>Trachyphonus vaillantii</i>	Barbet, Crested	Unlisted	LC
<i>Treron calvus</i>	Green-pigeon, African	Unlisted	LC
<i>Tricholaema leucomelas</i>	Barbet, Acacia Pied	Unlisted	LC
<i>Tringa glareola</i>	Sandpiper, Wood	Unlisted	LC
<i>Tringa nebularia</i>	Greenshank, Common	Unlisted	LC
<i>Tringa stagnatilis</i>	Sandpiper, Marsh	Unlisted	LC
<i>Turdoides bicolor</i>	Babbler, Southern Pied	Unlisted	LC
<i>Turdoides jardineii</i>	Babbler, Arrow-marked	Unlisted	LC
<i>Turdus libonyanus</i>	Thrush, Kurrichane	Unlisted	Unlisted
<i>Turdus olivaceus</i>	Thrush, Olive	Unlisted	LC
<i>Turdus smithi</i>	Thrush, Karoo	Unlisted	LC
<i>Turnix sylvaticus</i>	Buttonquail, Kurrichane	Unlisted	LC
<i>Turtur chalcospilos</i>	Wood-dove, Emerald-spotted	Unlisted	LC
<i>Tyto alba</i>	Owl, Barn	Unlisted	LC
<i>Upupa africana</i>	Hoopoe, African	Unlisted	LC
<i>Uraeginthus angolensis</i>	Waxbill, Blue	Unlisted	LC
<i>Urocolius indicus</i>	Mousebird, Red-faced	Unlisted	LC
<i>Urolestes melanoleucus</i>	Shrike, Magpie	Unlisted	LC
<i>Vanellus armatus</i>	Lapwing, Blacksmith	Unlisted	LC
<i>Vanellus coronatus</i>	Lapwing, Crowned	Unlisted	LC
<i>Vanellus senegallus</i>	Lapwing, African Wattled	Unlisted	LC
<i>Vidua chalybeata</i>	Indigobird, Village	Unlisted	LC
<i>Vidua funerea</i>	Indigobird, Dusky	Unlisted	LC
<i>Vidua macroura</i>	Whydah, Pin-tailed	Unlisted	LC

<i>Vidua paradisaea</i>	Paradise-whydah, Long-tailed	Unlisted	LC
<i>Vidua purpurascens</i>	Indigobird, Purple	Unlisted	LC
<i>Vidua regia</i>	Whydah, Shaft-tailed	Unlisted	LC
<i>Zosterops pallidus</i>	White-eye, Orange River	Unlisted	LC
<i>Zosterops virens</i>	White-eye, Cape	Unlisted	LC

APPENDIX C: Mammals species expected to occur in the project area

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Acinonyx jubatus</i>	Cheetah	VU	VU
<i>Acomys spinosissimus</i>	Spiny Mouse	LC	LC
<i>Aepyceros melampus</i>	Impala	LC	LC
<i>Aethomys chrysophilus</i>	Red Veld Rat	LC	LC
<i>Aethomys ineptus</i>	Tete Veld Rat	LC	LC
<i>Aethomys namaquensis</i>	Namaqua rock rat	LC	LC
<i>Alcelaphus buselaphus</i>	Hartebeest	LC	LC
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC
<i>Atilax paludinosus</i>	Water Mongoose	LC	LC
<i>Canis mesomelas</i>	Black-backed Jackal	LC	LC
<i>Caracal caracal</i>	Caracal	LC	LC
<i>Ceratotherium simum</i>	White Rhinoceros	NT	NT
<i>Chlorocebus pygerythrus</i>	Vervet Monkey	LC	LC
<i>Civettictis civetta</i>	African Civet	LC	LC
<i>Cloeotis percivali</i>	Short-eared Trident Bat	EN	LC
<i>Connochaetes taurinus</i>	Blue Wildebeest	LC	LC
<i>Crocidura cyanea</i>	Reddish-grey Musk Shrew	LC	LC
<i>Crocidura fuscomurina</i>	Tiny Musk Shrew	LC	LC
<i>Crocidura hirta</i>	Lesser Red Musk Shrew	LC	LC
<i>Crocidura mariquensis</i>	Swamp Musk Shrew	NT	LC
<i>Crocidura silacea</i>	Lesser Grey-brown Musk Shrew	LC	LC
<i>Crocuta crocuta</i>	Spotted Hyaena	NT	LC
<i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC
<i>Damaliscus lunatus</i>	Tsessebe	VU	LC
<i>Dendromus melanotis</i>	Grey Climbing Mouse	LC	LC
<i>Diceros bicornis</i>	Black Rhinoceros	EN	CR
<i>Elephantulus brachyrhynchus</i>	Short-snouted Sengi	LC	LC
<i>Elephantulus myurus</i>	Eastern Rock Sengi	LC	LC
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	LC	LC
<i>Equus quagga</i>	Plains Zebra	LC	NT
<i>Felis nigripes</i>	Black-footed Cat	VU	VU
<i>Felis silvestris</i>	African Wildcat	LC	LC
<i>Galago moholi</i>	Southern Lesser Galago	LC	LC
<i>Genetta genetta</i>	Small-spotted Genet	LC	LC
<i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC
<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC
<i>Giraffa camelopardalis</i>	Giraffe	LC	VU
<i>Graphiurus microtis</i>	Large Savanna African Dormouse	LC	LC
<i>Graphiurus platyops</i>	Rock Dormouse	LC	LC

<i>Helogale parvula</i>	Dwarf Mongoose	LC	LC
<i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC
<i>Hipposideros caffer</i>	Sundevall's Leaf-nosed Bat	LC	LC
<i>Hippotragus equinus</i>	Roan Antelope	EN	LC
<i>Hippotragus niger</i>	Sable Antelope	VU	LC
<i>Hystrix africae australis</i>	Cape Porcupine	LC	LC
<i>Ictonyx striatus</i>	Striped Polecat	LC	LC
<i>Kerivoula lanosa</i>	Lesser Woolly Bat	LC	LC
<i>Kobus ellipsiprymnus</i>	Common Waterbuck	LC	LC
<i>Lemniscomys rosalia</i>	Single-striped Mouse	LC	LC
<i>Leptailurus serval</i>	Serval	NT	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC	LC
<i>Lepus victoriae</i>	African Savanna Hare	LC	LC
<i>Mastomys coucha</i>	Multimammate Mouse	LC	LC
<i>Mellivora capensis</i>	Honey Badger	LC	LC
<i>Mungos mungo</i>	Banded Mongoose	LC	LC
<i>Mus indutus</i>	Desert Pygmy Mouse	LC	LC
<i>Myotis tricolor</i>	Temminck's Hairy Bat	LC	LC
<i>Neoromicia capensis</i>	Cape Serotine Bat	LC	LC
<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat	LC	LC
<i>Oreotragus oreotragus</i>	Klipspringer	LC	LC
<i>Orycteropus afer</i>	Aardvark	LC	LC
<i>Oryx gazella</i>	Gemsbok	LC	LC
<i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC
<i>Otomys angoniensis</i>	Angoni Vlei Rat	LC	LC
<i>Panthera pardus</i>	Leopard	VU	VU
<i>Papio ursinus</i>	Chacma Baboon	LC	LC
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT
<i>Paraxerus cepapi</i>	Tree Squirrel	LC	LC
<i>Pedetes capensis</i>	Springhare	LC	LC
<i>Pelea capreolus</i>	Grey Rhebok	NT	LC
<i>Phacochoerus africanus</i>	Common Warthog	LC	LC
<i>Poecilogle albinucha</i>	African Striped Weasel	NT	LC
<i>Procavia capensis</i>	Rock Hyrax	LC	LC
<i>Pronolagus randensis</i>	Jameson's Red Rock Rabbit	LC	LC
<i>Proteles cristata</i>	Aardwolf	LC	LC
<i>Raphicerus campestris</i>	Steenbok	LC	LC
<i>Rattus rattus</i>	House Rat	Exotic (Not listed)	LC
<i>Redunca arundinum</i>	Southern Reedbuck	LC	LC
<i>Redunca fulvorufula</i>	Mountain Reedbuck	EN	LC
<i>Rhabdomys pumilio</i>	Xeric Four-striped Mouse	LC	LC
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	LC
<i>Rhinolophus simulator</i>	Bushveld Horseshoe Bat	LC	LC
<i>Saccostomus campestris</i>	Pouched Mouse	LC	LC

<i>Sauromys petrophilus</i>	Flat-headed Free-tail Bat	LC	LC
<i>Scotophilus dinganii</i>	Yellow House Bat	LC	LC
<i>Smutsia temminckii</i>	Temminck's Ground Pangolin	VU	VU
<i>Steatomys pratensis</i>	Fat Mouse	LC	LC
<i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	LC
<i>Sylvicapra grimmia</i>	Common Duiker	LC	LC
<i>Syncerus caffer</i>	African Buffalo	LC	LC
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC
<i>Taphozous mauritianus</i>	Mauritian Tomb Bat	LC	LC
<i>Thallomys paedulus</i>	Tree Rat	LC	LC
<i>Thryonomys swinderianus</i>	Greater Cane Rat	LC	LC
<i>Tragelaphus oryx</i>	Common Eland	LC	LC
<i>Tragelaphus scriptus</i>	Cape Bushbuck	LC	LC
<i>Tragelaphus strepsiceros</i>	Greater Kudu	LC	LC
<i>Vulpes chama</i>	Cape Fox	LC	LC

APPENDIX D: *Reptile species expected to occur within the project area*

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Acanthocercus atricollis</i>	Southern Tree Agama	LC	LC
<i>Acontias occidentalis</i>	Savanna Legless Skink	LC	Unlisted
<i>Acontias percivali</i>	Percival's legless lizard	Unlisted	LC
<i>Afrotyphlops bibronii</i>	Bibron's Blind Snake	LC	LC
<i>Agama aculeata distanti</i>	Eastern Ground Agama	LC	LC
<i>Agama atra</i>	Southern Rock Agama	LC	LC
<i>Amblyodipsas polylepsis polylepsis</i>	Common Purple-Glossed Snake	LC	LC
<i>Amblyodipsas ventrimaculata</i>	Kalahari purple-glossed snake	Unlisted	LC
<i>Aparallactus capensis</i>	Black-headed Centipede-eater	LC	LC
<i>Aspidelaps scutatus scutatus</i>	Common Shield Snake	LC	Unlisted
<i>Atractaspis bibronii</i>	Bibron's Stiletto Snake	LC	Unlisted
<i>Bitis arietans arietans</i>	Puff Adder	LC	Unlisted
<i>Boaedon capensis</i>	Brown House Snake	LC	LC
<i>Causus defilippii</i>	Snouted Night Adder	LC	Unlisted
<i>Chamaeleo dilepis</i>	Common Flap-neck Chameleon	LC	LC
<i>Chondrodactylus turneri</i>	Turner's Gecko	LC	Unlisted
<i>Cordylus jonesii</i>	Jones' Girdled Lizard	LC	Unlisted
<i>Cordylus vittifer</i>	Common Girdled Lizard	LC	LC
<i>Crocodylus niloticus</i>	Nile Crocodile	VU	LC
<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	LC	Unlisted
<i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC	LC
<i>Dendroaspis polylepis</i>	Black Mamba	LC	LC
<i>Dispholidus typus</i>	Boomslang	LC	Unlisted
<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	LC	Unlisted
<i>Gonionotophis capensis</i>	Common File Snake	LC	LC
<i>Gracililima nyassae</i>	Black File Snake	LC	LC
<i>Heliobolus lugubris</i>	Bushveld Lizard	LC	Unlisted
<i>Hemidactylus mabouia</i>	Common Tropical House Gecko	LC	Unlisted
<i>Hemirhagerrhis nototaenia</i>	Eastern Bark Snake	LC	Unlisted
<i>Homopholis wahlbergii</i>	Wahlberg's Velvet Gecko	LC	LC
<i>Ichnotropis capensis</i>	Ornate Rough-scaled Lizard	LC	Unlisted
<i>Kinixys lobatsiana</i>	Lobatse hinged-back Tortoise	LC	LC
<i>Kinixys spekii</i>	Speke's Hinged-Back Tortoise	LC	Unlisted
<i>Leptotyphlops scutifrons scutifrons</i>	Peters' Thread Snake	LC	Unlisted
<i>Limaformosa capensis</i>	Common File Snake	LC	Unlisted
<i>Lycodonomorphus rufulus</i>	Brown Water Snake	LC	Unlisted
<i>Lycophidion capense capense</i>	Cape Wolf Snake	LC	Unlisted
<i>Lygodactylus capensis capensis</i>	Common Dwarf Gecko	LC	Unlisted
<i>Lygodactylus waterbergensis</i>	Waterberg Dwarf Gecko	NT	NT

<i>Matobosaurus validus</i>	Common Giant Plated Lizard	LC	Unlisted
<i>Meroles squamulosus</i>	Common Rough-scaled Lizard	LC	Unlisted
<i>Mochlus sundevallii</i>	Sundevall's Writhing Skink	LC	LC
<i>Monopeltis capensis</i>	Cape Worm Lizard	LC	LC
<i>Naja annulifera</i>	Snouted Cobra	LC	Unlisted
<i>Naja mossambica</i>	Mozambique Spitting Cobra	LC	Unlisted
<i>Nucras holubi</i>	Holub's Sandveld Lizard	LC	Unlisted
<i>Nucras intertexta</i>	Spotted Sandveld Lizard	LC	Unlisted
<i>Pachydactylus affinis</i>	Transvaal Gecko	LC	LC
<i>Panaspis wahlbergi</i>	Wahlberg's Snake-eyed Skink	LC	Unlisted
<i>Pedioplanis lineocellata lineocellata</i>	Spotted Sand Lizard	LC	Unlisted
<i>Pelomedusa galeata</i>	South African Marsh Terrapin	NE	Unlisted
<i>Pelusios sinuatus</i>	Serrated Hinged Terrapin	LC	Unlisted
<i>Philothamnus semivariegatus</i>	Spotted Bush Snake	LC	Unlisted
<i>Platysaurus guttatus</i>	Dwarf Flat Lizard	LC	LC
<i>Platysaurus minor</i>	Waterberg Flat Lizard	LC	LC
<i>Prosymna ambigua</i>	Angolan Shovel-snout	Unlisted	LC
<i>Prosymna bivittata</i>	Two-Striped Shovel-Snout	LC	Unlisted
<i>Psammobates oculifer</i>	Serrated Tent Tortoise	LC	Unlisted
<i>Psammophis angolensis</i>	Dwarf Sand Snake	LC	Unlisted
<i>Psammophis brevirostris</i>	Short-snouted Grass Snake	LC	Unlisted
<i>Psammophis jallae</i>	Jalla's Sand Snake	LC	Unlisted
<i>Psammophis subtaeniatus</i>	Stripe-bellied Sand Snake	LC	LC
<i>Psammophylax tritaeniatus</i>	Striped Grass Snake	LC	LC
<i>Pseudaspis cana</i>	Mole Snake	LC	Unlisted
<i>Pseudocordylus transvaalensis</i>	Nothern Crag Lizard	NT	NT
<i>Python natalensis</i>	Southern African Python	LC	Unlisted
<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	LC	Unlisted
<i>Scelotes limpopoensis limpopoensis</i>	Limpopo Dwarf Burrowing Skink	LC	Unlisted
<i>Smaug breyeri</i>	Waterberg Dragon Lizard	LC	LC
<i>Stigmochelys pardalis</i>	Leopard Tortoise	LC	LC
<i>Telescopus semiannulatus semiannulatus</i>	Eastern Tiger Snake	LC	Unlisted
<i>Thelotornis capensis</i>	Southern Twig Snake	LC	LC
<i>Trachylepis capensis</i>	Cape Skink	LC	Unlisted
<i>Trachylepis damarana</i>	Damara skink	Unlisted	LC
<i>Trachylepis margaritifera</i>	Rainbow Skink	LC	LC
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC	LC
<i>Trachylepis striata</i>	Striped Skink	LC	Unlisted
<i>Trachylepis varia</i>	Variable Skink	LC	LC
<i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC	Unlisted
<i>Varanus niloticus</i>	Water Monitor	LC	Unlisted
<i>Xenocalamus bicolor australis</i>	Waterberg Quill-snouted Snake	LC	Unlisted

APPENDIX E: Amphibian species expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Amietia angolensis</i>	Angola River Frog	LC	LC
<i>Amietia delalandii</i>	Delalande's River Frog	LC	Unlisted
<i>Breviceps adspersus</i>	Bushveld Rain Frog	LC	LC
<i>Breviceps mossambicus</i>	Mozambique Rain Frog	LC	LC
<i>Cacosternum boettgeri</i>	Common Caco	LC	LC
<i>Chiromantis xerampelina</i>	Southern Foam Nest Frog	LC	LC
<i>Hildebrandtia ornata</i>	Southern Ornate Frog	LC	LC
<i>Hyperolius marmoratus</i>	Painted Reed Frog	LC	LC
<i>Kassina senegalensis</i>	Bubbling Kassina	LC	LC
<i>Phrynobatrachus mababiensis</i>	Dwarf Puddle Frog	LC	LC
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	LC	LC
<i>Phrynomantis bifasciatus</i>	Banded Rubber Frog	LC	LC
<i>Poyntonophrynus fenoulheti</i>	Northern Pygmy Toad	LC	LC
<i>Ptychadena anchietae</i>	Plain Grass Frog	LC	LC
<i>Ptychadena mossambica</i>	Mozambique Ridged Frog	LC	LC
<i>Ptychadena porosissima</i>	Striped Grass Frog	LC	LC
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC
<i>Pyxicephalus edulis</i>	African Bullfrog	LC	LC
<i>Schismaderma carens</i>	African Red Toad	LC	LC
<i>Sclerophrys capensis</i>	Raucous Toad	LC	LC
<i>Sclerophrys garmani</i>	Olive Toad	LC	LC
<i>Sclerophrys gutturalis</i>	Guttural Toad	LC	LC
<i>Sclerophrys poweri</i>	Power's Toad	LC	LC
<i>Sclerophrys pusilla</i>	Flatbacked Toad	LC	LC
<i>Strongylopus fasciatus</i>	Striped Stream Frog	LC	LC
<i>Strongylopus grayii</i>	Clicking Stream Frog	LC	LC
<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	LC	LC
<i>Tomopterna krugerensis</i>	Knocking Sand Frog	LC	LC
<i>Tomopterna natalensis</i>	Natal Sand Frog	LC	LC
<i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC	LC
<i>Xenopus laevis</i>	Common Platanna	LC	LC

Martinus Erasmus

B-Tech Nature Conservation (*Cand Sci Nat*)

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Date of birth: 03 September 1992



Profile Summary

Working experience throughout South Africa and Africa.

Specialist experience with mining, hydropower, renewable energy, development and veld management.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements.

Specialist expertise includes Botany and Terrestrial Ecology.

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services
Infrastructure Development, Sustainability and Conservation.

Key Experience

- Environmental, Social and Health Impact Assessments (ESHIA)
- Terrestrial Ecological Assessments
- Rehabilitation Plans and Monitoring
- Botany, especially in the Limpopo, Mpumalanga, Gauteng and North-West provinces in South-Africa.
- Veld management

Countries worked in

Liberia
Mozambique
South Africa
Guinea
Lesotho
Swaziland

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- B-Tech in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa.
- National Diploma in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa.
- Cand Sci Nat (118630)
- SASS Accredited

SELECTED PROJECT EXPERIENCE

Project Name: A biodiversity baseline and impact assessment for the proposed Umsimbithi Emakhazeni Coal Mining Project, in Mpumalanga Province, South Africa.

Client: Kongiwe

Personal position / role on project: Terrestrial Ecologist.

Location: Mpumalanga Province, South Africa (2017).

Main project features: To conduct a dual season terrestrial ecology baseline and impact assessment for the expected impact footprint area.

Project Name: Biodiversity Assessment associated with eThembeni Integrated Mixed use housing development, Kwazulu-Natal province.

Client: K2M Environmental (Pty) Ltd.

Personal position / role on project: Terrestrial Ecologist

Location: South Africa (2017).

Main project features: Conduct a detailed terrestrial ecology basic assessment for the expected impact footprint area.

Project Name: A biodiversity baseline and impact assessment for the proposed Pavua Hydropower Project, in Sofala Province, Central Mozambique.

Client: Mott MacDonald.

Personal position / role on project: Assistant Botanist

Location: Sofala Province, Mozambique (2017).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the expected impact footprint area, including Gorongosa National. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline and impact assessment for the proposed Gold Mine Project, in Grand Cape Mt Province, Liberia.

Client: Aureus

Personal position / role on project: Assistant to specialist/ field technician

Location: Grand Cape Mt Province, Liberia (2015).

Main project features: To conduct a dual season ecological baseline assessment for the expected impact footprint area. The study was required to meet national and IFC (International Finance Corporation) requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline and impact assessment for the proposed Siguiri Gold Mine Project, in Kankan Province, Guinea.

Client: SRK Consulting

Personal position / role on project: Terrestrial Ecologist

Location: Siguiri, Guinea, West-Africa (2018)

Main project features: To conduct a dual season terrestrial ecological baseline and impact assessment for the expected impact footprint area. The study was required to meet national and IFC (International Finance Corporation) requirements, including a Critical Habitat assessment.

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Terrestrial Ecological Assessments.
- Faunal surveys which includes mammals, birds, amphibians and reptiles.
- Floral surveys
- Rehabilitation Plans and Monitoring for the terrestrial component.
- Botany, especially in the Limpopo, Mpumalanga, Gauteng and North-West provinces in South-Africa.
- Veld management
- Environmental Control Officer (ECO) experience

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (August 2017 – Present)

I started working at The Biodiversity Company in mid-2017.

The team at The Biodiversity Company have conducted stand-alone specialist studies and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

My roles include:

- Faunal and Floral surveys for baseline, basic or impact assessments;
- Floral surveys for vegetation verifications, management plans and alien invasive species control;
- Report writing;
- Equipment management;
- Technical assistant for fieldwork for the aquatics and wetland departments; and
- Specialist inputs to the above mention services.

EMPLOYMENT: Enviro-Insight (January 2015 – July 2017)

Enviro-Insight assigned me to the role of general and field assistant. I assisted most specialists in field but also had administrative duties:

- The processing and uploading of several organisms to the ADU (Animal Demography Unit) virtual museum, which assists in obtaining spatial data concerning those species.
- Assisted with the generation of the companies' DNA database which distributes the DNA samples to the South African National Biodiversity Institute (SANBI).
- Assisted with field work involving all the different specialist work which includes mammalogy, herpetology and botany.

ADDITIONAL EXPERIENCE

<i>Compliance audits</i>	Conducting site investigations in order to determine the level of compliance attained, ensuring that the client maintains an appropriate measure of compliance with environmental regulations by means of a legislative approach
<i>Control officer</i>	Acting as an independent Environmental Control Officer (ECO), acting as a quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts
<i>Public consultation</i>	The provision of specialist input in order to communicate project findings as well as assist with providing feedback if and when required.
<i>Closure</i>	Primarily the review of closure projects, with emphasis on the closure cost calculations. Support was also provided by assisting with the measurements of structures during fieldwork.

ACADEMIC QUALIFICATIONS

B-Tech in Nature Conservation, Tshwane University of Technology, Pretoria, South Africa:

Title: The expansion of the distribution of *Xenopus muelleri*.

National Diploma in Nature Conservation , Tshwane University of Technology, Pretoria, South Africa

Lindi Steyn

PhD Biodiversity and Conservation
(*Cand Sci Nat*)



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Identity Number: 8805250059080

Date of birth: 25 May 1988

Profile Summary

Working experience throughout South Africa.

Specialist experience with mining, road development and engineering.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements.

Specialist expertise include Avifauna and Terrestrial Ecology.

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Sustainability and Conservation.

Research publication with a conservation influence.

Birding

Key Experience

- Environmental Impact Assessment
- Terrestrial Ecological Assessments
- Rehabilitation Plans and Monitoring
- Avifaunal Conservation Surveys
- Conservation Management Plans
- Laboratory analysis
- The use of avifaunal species as indicators of pollution.

Countries worked in

South Africa
Swaziland

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- PhD Biodiversity and Conservation, University of Johannesburg, South Africa.
- MSc Biodiversity and Conservation, University of Johannesburg, South Africa.
- BSc Hons Biodiversity and Conservation.
- BSc Botany and Zoology.
- Certificate in Field Guiding, Damelin.
- Certificate in Ecotraining.
- Field Guiding FGASA level 1 certificate (2007).

SELECTED PROJECT EXPERIENCE

Project Name: An environmental and impact assessment for the proposed Jozini (N2) road expansion for SANRAL, KwaZulu Natal, South Africa.

Client: EnviroPro

Personal position / role on project: Terrestrial Ecologist.

Location: KwaZulu Natal, South Africa (2018).

Main project features: To conduct a terrestrial environmental and impact assessment for the expected impact footprint area.

Project Name: Biodiversity Assessment associated with Greylingstad Waste Water Treatment work and reticulation network, Mpumalanga, South Africa.

Client: EcoSphere

Personal position / role on project: Terrestrial Ecologist

Location: South Africa (2018).

Main project features: Conduct a detailed terrestrial ecology basic assessment for the expected impact footprint area.

Project Name: An Environmental and impact assessment for the proposed Kalabasfontein Coal Mining Expansion Project, Mpumalanga, South Africa.

Client: EIMS

Personal position / role on project: Terrestrial Ecologist/ Avifaunal specialist

Location: Mpumalanga, South Africa

Main project features: To conduct a terrestrial environmental and impact assessment for the expected impact footprint area.

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Terrestrial Ecological Assessments.
- Faunal surveys which includes mammals, birds, amphibians and reptiles.
- Conservation Plans and Monitoring for the terrestrial component.
- Avifaunal surveys
- Bioaccumulation assessments for birds
- Toxicity analysis of air dust samples, sediment, water and biota.

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (May 2018 – Present)

I started working at The Biodiversity Company in mid-2018.

The team at The Biodiversity Company have conducted stand-alone specialist studies and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

My roles include:

- Faunal and Floral surveys for baseline, basic or impact assessments
- Report writing
- GIS map work
- Equipment management
- Technical assistant for fieldwork for the aquatics and wetland departments
- Specialist inputs to the above mention services.

EMPLOYMENT: University of Johannesburg (January 2012 – July 2018)

UJ assigned me to the role of laboratory assistant and assistant lecture.

- Research
 - Report writing
 - Performed toxicity testing on biota, sediment, water and air dust samples.
 - Completed day to day administration of the laboratory.
 - Assisted with field work involving all the different specialist work which includes mammalogy, aquatics and botany.
 - Lectured courses, including parasitology and Biology for teachers
-

ACADEMIC QUALIFICATIONS

University of Johannesburg, Johannesburg, South Africa (2018): PHILOSOPHIAE DOCTOR (PhD) – Biodiversity and Conservation

Title: *The effect of DDT on the histology, reproductive success and overall health of the House Sparrow in designated areas.*

University of Johannesburg, Johannesburg, South Africa (2013): MAGISTER SCIENTIAE (MSc)- Biodiversity and Conservation

Title: Comparative determination of the numbers of four garden bird species, the House Sparrow, *Passer domesticus*, the Cape Glossy Starling, *Lamprotornis nitens*, the Cape Turtle Dove, *Streptopelia capicola* and the Laughing Dove, *Streptopelia senegalensis* in the Johannesburg and Vaalwater areas with study into possible causes of expected declines.

University of Johannesburg, Johannesburg, South Africa (2011): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

Title: The influence of agriculture on selected Mpumalanga Pans.

University of Johannesburg, Johannesburg, South Africa (2010): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

Damelin, Bramley, Johannesburg: National Certificate in Field Guiding (Lodge Management) (2007)

Damelin, Bramley, Johannesburg: Field guiding FGASA level 1 certificate (2007)

Damelin, Bramley, Johannesburg: Ecotraining- Karongwe & Selati (2007)

PUBLICATIONS

Steyn, L., Bouwman, H., Maina, J.N. (2018). Associations between DDT and egg parameters of the House Sparrow *Passer domesticus* from the Thohoyandou area of South Africa, Chemosphere.

Steyn, L., Bouwman, H., Maina, J.N. (2018). The effect of DDT and its metabolites on the structure of the shells of the eggs of the House Sparrow, *Passer domesticus*: A morphometric study. 7th International Toxicology Symposium in Africa.

Steyn, L., Bouwman, H., Maina, A.W, Hoffman, J., Maina, J.N. (2018). Bone density and asymmetry are not related to DDT in House Sparrows: insights from micro-focus X-ray computed tomography. Chemosphere.

Steyn, L., Maina, J.N. (2016). Comparison of the numbers of three species of birds in an urban- and a rural area of South Africa and possible relationship to the numbers of free (surface) macrophages in the respiratory systems. Journal of Ornithology

Willoughby, B., Steyn, L., Maina, J.N. (2015). X-ray microcomputed tomography study of the microstructure and the morphometry of the shell of the ostrich, *Struthio camerus*, egg. Anatomical record

Steyn, L., Maina, J.N. (2013). Die verwagte afname van die getalle van vier voël spesie, die Huisvossie, Kleinglansspreeu, Gewone Tortelduif en die Rooiborsduifie in Gauteng en Limpopo provinsies en moontelike oorsake van die dalings. Die Suid-Afrikaanse akademie vir wetenskap en kuns afdeling biologiese wetenskappe, Pretoria.

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

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Identity Number: 7904195054081

Date of birth: 19 April 1979



Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia.

Specialist experience with on-shore drilling, mining, engineering, hydropower and renewable energy.

Considerable experience with project management of national and international multi-disciplinary projects. Including managing and compiling ESHIAs and EMPs

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, aquatic ecology and wetlands resources.

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Sustainability and Conservation.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture

Country Experience

Botswana, Cameroon
Democratic Republic of Congo
Ghana, Ivory Coast, Lesotho
Liberia, Mali, Mozambique
Republic of Armenia, Senegal
Sierra Leone, South Africa
Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondli Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

SELECTED PROJECT EXPERIENCE

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed Nondvo Dam

Client: WSP

Personal position / role on project: Project Manager.

Location: Swaziland

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the proposed dam. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed solar photovoltaic facility and transmission in Cuamba

Client: WSP

Personal position / role on project: Project Manager.

Location: Mozambique

Main project features: To conduct a single season terrestrial and aquatic ecological baseline and impact assessment for the proposed dam. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline assessment for the proposed Siguiri Gold Mine Project, in Kankan Province, Guinea.

Client: SRK Consulting.

Personal position / role on project: Project Manager.

Location: Siguiri, Guinea, West-Africa (2018).

Main project features: To conduct a dual season ecological baseline assessment for the expected impact footprint area. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline and impact assessment for the proposed Lesotho Bulk Water Supply Scheme, Lesotho.

Client: WSP.

Personal position / role on project: Wetland & Aquatic Ecologist, PROBFLO and Project Manager.

Location: Mohale's Hoek, Lesotho (2018).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the pipeline route and proposed weir. The study was required to meet national and IFC requirements, including a Critical Habitat assessment. The study also contributed to prescribing Instream Flow Requirements using PROBFLO for the system.

Project Name: A biodiversity baseline and impact assessment for the proposed Pavua Hydropower Project, in Sofala Province, Central Mozambique.

Client: Mott MacDonald.

Personal position / role on project: Project Manager.

Location: Sofala Province, Mozambique (2017).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the expected impact footprint area, including Gorongosa National. The study was required to meet national and IFC requirements, including a Critical Habitat assessment. The study also contributed to prescribing Instream Flow Requirements for the system.

Project Name: An aquatic and wetland specialist baseline and impact assessment for the proposed Onshore 2D seismic Survey in Block P5-A, in Maputo and Gaza Provinces.

Client: Impacto.

Personal position / role on project: Wetland / Aquatic Specialist.

Location: Maputo & Gaza Provinces, Mozambique (2016).

Main project features: To conduct a dry season (Winter) ecological baseline and impact assessment of the watercourses for the proposed Delonex Energy project.

Project Name: The ecological constraints mapping and Critical Habitat re-evaluation for the Anadarko LNG project: Specialist Consultant to conduct Ecological Studies (Fauna and Habitat) and the delineation of wetland systems.

Client: Anadarko.

Personal position / role on project: Wetland Specialist.

Location: Afungi, Mozambique (2015).

Main project features: To identify and map the ecological constraints is to support contractor activities. To redefine the critical habitats within the project area

Project Name: A Joint Basin Survey of the Upper Orange, Lower Orange and Vaal catchments to determine the current status of the systems: Specialist Consultants to conduct Ecological Studies (Fish, Macroinvertebrate, Diatoms, Water Quality and Habitat) and report on the current status (defining system trends).

Client: ORASECOM.

Personal position / role on project: Specialist Ichthyologist.

Location: South Africa (including Namibia, Botswana & Lesotho) (2015).

Main project features: To determine the current status of the catchments and to discuss the temporal and spatial trends of the monitoring reaches.

Project Name: Ecological baseline assessment of local river systems for the Ntem Iron Ore Mine: Specialist Consultants to Undertake Baseline Studies (Fish, Macroinvertebrate, Water Quality and Habitat).

Client: IMIC.

Personal position / role on project: Senior Ichthyologist.

Location: Cameroon (2013).

Main project features: Establishment of the ecological baseline status and functioning assessment of the local river systems.

Project Name: Instream Flow Requirement determination study for the Kibali River hydropower project: Specialist Consultants to Undertake Baseline Studies (Flow, Water Quality and Geomorphology) and Instream Flow Requirement (IFR) Assessment.

Client: Randgold Resources.

Personal position / role on project: Ichthyologist and IFR.

Location: DRC (2012).

Main project features: Establishment of the ecological flow requirements of fishes within the Kibali River.

Project Name: Cost analysis, including the current and potential earing potential of an aquaculture facility: Specialist Consultants to determine the Cost (Current & Potential Earnings) and the Construction of an identical facility (Physical Costs).

Client: Goldtstone Resources.

Personal position / role on project: Ichthyologist.

Location: Ghana (2012).

Main project features: Conduct a detailed costs analysis of an aquaculture facility for the compensation for the removal of the operation.

Project Name: Instream Flow Requirement determination study for the Nzoro River hydropower project: Specialist Consultants to Undertake Baseline Studies (Flow, Water Quality and Geomorphology) and Instream Flow Requirement (IFR) Assessment.

Client: Randgold Resources.

Personal position / role on project: Ichthyologist and IFR.

Location: DRC (2011).

Main project features: Establishment of the ecological flow requirements of fishes within the Nzoro River.

Project Name: Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam.

Client: European Union

Personal position / role on project: Ichthyologist.

Location: Selebi-Phikwe, Botswana (2007 - 2009).

Main project features: Evaluation of the existing fish communities within the Letsibogo Man-made lake with specific consideration of the threats of alien invasive fishes in the lake. The study resulted in the publication of two peer-reviewed papers titled: Comparative behavioural assessment of an established and a new Tigerfish *Hydrocynus vittatus* population in two man-made lakes in the Limpopo (O'Brien et al., 2013) and First observation of Africa Tigerfish (*Hydrocynus vittatus*) predated on Barn Swallows (*Hirundo rustica*) in flight (O'Brien et al., in press).

Project Name: Environmental and Social Impact Assessment of the Kazungula Bridge, Zambezi River.

Client: Loci on behalf of the Government of Botswana.

Personal position / role on project: Ichthyologist.

Location: Botswana, Zambia, Namibia and Zimbabwe (2009-2010).

Main project features: Evaluation of the current ecological integrity status of various living and non-living components of the Zambezi River ecosystem and the potential ecological and social consequences of the construction and use of the Kazungula Bridge. The study showed that although water quality and habitat modification impacts will occur as a result of the construction and use of the bridge the long term impacts associated with the operation of the bridge should not result in any major impacts to the local aquatic ecosystem.

OVERVIEW

An overview of the specialist technical expertise include the following:

- Aquatic ecological state and functional assessments of rivers and dams.
- Instream Flow Requirement or Ecological Water Requirement using PROBFLO studies for river systems.
- Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
- Wetland offset strategy designs.
- Wetland rehabilitation plans.
- Monitoring plans for rivers and other wetland systems.
- Toxicity and metal analysis of water, sediment and biota.
- Bioaccumulation assessment of fish communities.
- Fish telemetry assessment that included the translocation of fish as well as the monitoring of fish in order to determine the suitability of the hosting system.
- Faunal surveys which includes mammals, birds, amphibians and reptiles.
- The design, compilation and implementation of Biodiversity and Land Management Plans and strategies.

TRAINING

Some of the more pertinent training undergone includes the following:

- Wetland and Riparian Delineation Course for Consultants (Certificate of Competence) – DWAF 2008
 - The threats and impacts posed on wetlands by infrastructure and development: Mitigation and rehabilitation thereof – Gauteng Wetland Forum 2010
 - Ecological State Assessment of Lentic Systems using Fish Population Dynamics – University of Johannesburg/Rivers of Life 2010
 - Soil Classification and Wetland Delineation – Terra Soil Science 2010
 - Wetland Rehabilitation Methods and Techniques - Gauteng Wetland Forum 2011
 - Application of the Fish Response Assessment Index (FRAI) and Macroinvertebrate Response Assessment Index (MIRAI) for the River Health Programme 2011
 - Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2011
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- PROBFLO for conducting Ecological Flow Assessments – 2018/19

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (January 2015 – Present)

I founded The Biodiversity Company in 2015, now consisting of experienced ecologists who provide technical expertise and policy advice to numerous sectors, such as mining, agriculture, construction and natural resources. The team at The Biodiversity Company have conducted stand-alone specialist studies, and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

EMPLOYMENT: Digby Wells Environmental (October 2013 – December 2014)

Digby Wells assigned me to the role of Country Manager for the United Kingdom. This was a new endeavour for the company as the company's global footprint continues to increase. The primary responsibilities for the role included the following:

- **Client liaison** to be able to interact more efficiently and personally with current mining clients, mining industry service providers, legal firms and banking institutions in order to introduce Digby Wells as a services provider with the aim of securing work.
- **Project management** for international projects which may require a presence in the United Kingdom, this was dependent on the location and needs of the client. These projects would mostly be based on the Equator Principles (EP) and International Finance Corporation (IFC) Performance Standards.
- **Technical input** to provide specialist technical expertise for projects, this included fauna, aquatic ecology, wetlands and rehabilitation. Continued with the design and implementation of Biodiversity and Land Management Plans to assist clients with managing the natural resources. Responsibilities also included the mentorship and management (including reviewing and guiding) other expertise such as flora, fauna and pedology.

EMPLOYMENT: Digby Wells Environmental (March 2012 – September 2013)

Manager of a multi-disciplinary department of scientists providing specialist services in support of national and international requirements as well as best practice guidelines, primarily focussing on the mining sector. In addition to managing the department, I was also expected to contribute specialist services, most notably focusing on water resources. Further responsibilities also included the management of numerous projects on a national or international scale. A general overview of the required responsibilities are as follows:

- **Project management** for single as well as multi-disciplinary studies on a national and international scale. This included legislation and commitments for the respective country being operated in, as well as included the World Bank (WB), EP and IFC requirements.
- **Individual and/or team management** in order to provide mentoring and supportive structures for development and growth in support of the company's strategic objectives.
- **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.
- **Report reviewing** in order to ensure compliance and consideration of relevant legislation and guidelines and also quality control.
- **Specialist management** to facilitate the collaboration and integration of specialist skills for the respective projects. This also included the development of Biodiversity and Land Management Plan for clients.
- **Client Resource Manager** for numerous clients in order to establish as well as maintain working relationships.

An overview of the tenure working with the company is provided below:

- **October 2013 – December 2014: London Operations Manager** – Deployed to establish a presence for the company (remote office) in the United Kingdom by means of generating project work to support the employment of staff and operation of a business structure.
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- **March 2012 – September 2013: Biophysical Department Manager** – Responsible for the development and growth of the department to consist of four specialist units. This included the development of a new specialist unit, namely Rehabilitation.
- **January 2011 - February 2012: Ecological Unit Manager** – In addition to implementing aquatic and wetland specialist services, the role required the overall management of additional specialist services which included fauna & flora.
- **June 2010 - December 2010: Aquatic Services Manager** – This required the marketing and implementation of specialist programmes for the client base such as biomonitoring and wetland off-set strategies. In addition to this, this also included expanding on the existing skill set to include services such as toxicity, bioaccumulation and ecological flow assessments.
- **August 2008: Aquatic ecologist** – Employed as a specialist to establish the aquatic services within the company. In addition to this, wetland specialist services were added to the existing portfolio.

PREVIOUS EMPLOYMENT: Econ@UJ (University of Johannesburg)

- June 2007 – July 2008: Junior aquatic ecologist
 - Researcher
 - Technical assistant for fieldwork
 - Reporting writing
 - Project management

ADDITIONAL EXPERIENCE

<i>Compliance audits</i>	Conducting site investigations in order to determine the level of compliance attained, ensuring that the client maintains an appropriate measure of compliance with environmental regulations by means of a legislative approach
<i>Control officer</i>	Acting as an independent Environmental Control Officer (ECO), acting as a quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts
<i>Screening studies</i>	Project investigations in order to determine the level of complexity for the environmental and social studies required for a project. This is a form of risk assessment to guide the advancement of the project.
<i>Public consultation</i>	The provision of specialist input in order to communicate project findings as well as assist with providing feedback if and when required.
<i>Water use licenses</i>	Consultation with the relevant authorities in order to establish the project requirements, as well as provide specialist (aquatics/wetland) input for the application in order to achieve authorisation.
<i>Closure</i>	Primarily the review of closure projects, with emphasis on the closure cost calculations. Support was also provided by assisting with the measurements of structures during fieldwork.
<i>Visual</i>	The review of visual studies as well as the collation of field data to be considered for the visual interpretation for the project.

ACADEMIC QUALIFICATIONS

University of Johannesburg, Johannesburg, South Africa (2009): MAGISTER SCIENTIAE (MSc) - Aquatic Health:

Title: *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE

CUM HONORIBUS (Hons) – Zoology

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

PUBLICATIONS

Tate RB and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate RB and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Ivoire. African Journal of Aquatic Science.

O'Brien GC, Bulfin JB, Husted A. and Smit NJ. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi, H, Husted, A, O'Brien, GC, Cloete, Y, Van Dyk C, Pieterse GM, Wepener V, Nel A and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).
