Environmental Consultants

Terrestrial Biodiversity Impact Assessment:

Matai Mining (Pty) Ltd Mining Right Application for Vanadium, Titanium and Iron Ore on various Farms within the Magisterial District of Mankwe, North West Province

kimopax

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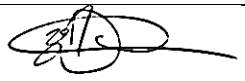
I Ndumiso Ian Dlamini, as duly authorised representative of Niara Environmental Consultants (Pty) Ltd., hereby confirm my independence and declare that I:

- 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.

Signature of the environmental assessment practitioner:	
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Experience (years):	Five (5)
Date:	19 February 2019

Executive Summary

Niara Environmental Consultants (Pty) Ltd was appointed by Kimopax (Pty) Ltd to undertake a Terrestrial Biodiversity Impact Assessment for the proposed Matai Mining Project in the Mankwe Magisterial District of the North West Province. The objectives of this Report are to describe the current state of the flora and fauna within the proposed Project area and assess the impacts of the proposed Project activities on the terrestrial biophysical environment. The Report delivers various flora and fauna findings in compliance with existing provincial and national legislation.

An in-depth desktop study was undertaken as well as two field surveys. The first visit took place in the 14 December 2018 and the second visit took place in 17 January 2019. The flora component included a total of 14 sample plots throughout the project area as well as general species listing. Faunal sampling was concurrently undertaken. Visual sightings were conducted with binoculars and identification enabled with recognised South African literature. The presence of species was evaluated using tracks, dung, ecological indicators and non-fatal traps such as Pit-fall traps and Sherman traps.

The affected environment is typical of the region, which lies within the Savanna Biome (Mucina and Rutherford, 2012) which is located in the northern part of South Africa. The Matai project area is located within the Dwaalboom Thornveld vegetation unit (Mucina and Rutherford, 2006) within the Central Bushveld bioregion. The vegetation unit occurs in the Limpopo and North-West Provinces, stretching from the flats north of the Dwarsberge to the Nietverdiend area and Northam. The vegetation unit is considered to be in a dry climate with a summer rainfall and very dry winters. The Mean Annual Precipitation (MAP) ranges between 500mm to 600mm. The vegetation unit has the highest mean annual potential evaporation of savanna units outside the two Kalahari bioregions. In winter, frost is highly expected throughout the unit.

The vegetation within the project area was largely uniform and represented the Dwaalboom Thornveld vegetation unit. The unit has; however, been altered from the natural state. The tree layer was dominated by *Vechelia totilis* and *Vechelia nilotica*. The grass layer was dominated by *Digitaria eriantha* in some parts and *Cymbopogon pospischilii.* in other parts. Large areas of bare soil were observed within the project area. The overall plant diversity within the project area was considered low with only *Combretum imberbe* being a nationally protected tree species. The land uses within the local area has led to the modification of the natural vegetation and habitat structure. Several land uses were observed in the project area and these include crop cultivation, cattle grazing, roads and homesteads throughout the project.

The potential species that may occur within the project area were determined to be 66 in total. Of the 66 potential species, 11 were determined to be of conservation concern. Only two mammal species were confirmed on the site namely *Aepyceros melampus* (Impala) and *Canis mesomelas* (Black-backed Jackal). There were no mammal species of conservation concern identified within the project area. A total of 340 bird species is

expected to occur within the project area; however, a total of 11 were considered to be of conservation concern. A total of 6 bird species was positively identified within the project area. No birds of conservation concern were identified within the project area. The desktop assessment identified 41 possible herpetofauna species within the project area. No herpetofauna of conservation concern was identified as occurring in the project area. There were no herpetofauna species identified during the field survey; however, there may be present.

The habitat within the project area has been modified by the various land uses within the project area and local surrounds. Fauna species are sensitive to changes to habitat structures and will either migrate or be killed as a result of human-wildlife contact. Furthermore, the lack of water within the area may have caused the faunal species to migrate away in search of water.

The impact assessment identified several impacts to the biodiversity as a result of the proposed project. The impacts during the construction phase will be brought about by the site clearing and establishment activities. The impacts during the construction phase were considered to medium to low pre-mitigation and low after mitigation. The impacts are considered low as the biodiversity of the site is considered low and mitigation measures further reduce the impact rating.

The impacts during the operational phase will be brought about by the operation of the mine, access roads and associated activities and are expected to be long term. The impacts were considered to be medium impacts pre-mitigation and post-mitigation. Although the cleared areas will not be increased, the impacts will be prolonged and as such impact is considered a medium impact.

Impacts during the closure and rehabilitation phase will be brought about by the activities relating to the removal of infrastructure, closing and sealing-off of pits and the final landscape shaping and vegetation. The impacts were considered medium impacts pre-mitigation and medium to low post-mitigation. The rehabilitation will not be able to restore the pre-mining condition; however, the mitigation measures will ensure it is as close as possible. The post-closure phase consists primarily of the monitoring of the final rehabilitation and remedying of any issues identified. The impacts are viewed as positive medium and low impacts with and without mitigation. The post-closure monitoring will aid in the assurance of successful rehabilitation.

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1 Introduction

In recent years, increasing attention has been focused on the role of biodiversity in sustainable development at a global scale:

- Global studies such as the Millennium Ecosystem Assessment (2001-2005) have highlighted the significant role played by our ecosystems in supporting our lives and livelihoods.
- Recognition has been given to the fact that conservation of biodiversity and ecosystem services is fundamental to achieving the Millennium Development Goals, which are respected as a framework for sustainable development.
- Global bodies such as the UNDP are investing resources in developing countries, helping them to integrate biodiversity considerations and commitments in terms of international conventions into national policies and programmes, and into key sectors of their economies.
- International funding bodies and banks have incorporated sustainable development and the associated use of renewable natural resources and protection of biodiversity into their policies, performance standards and principles since 2003 (e.g. International Finance Corporation, World Bank and other Development Finance Institutions that have adopted the Equator Principles).
- The International Council on Mining and Metals has produced “Good practice guidance for mining and biodiversity” (May 2005).
- The International Association for Impact Assessment has produced a Special Publication on “Biodiversity in Impact Assessment” (July 2005).
- The Eighth Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity (Curitiba, Brazil in March 2006) endorsed the voluntary guidelines on biodiversity inclusive impact assessment as being one of the major tools to include biodiversity in holistic decision making.

Niara Environmental Consultants (Pty) Ltd was appointed by Kimopax (Pty) Ltd to undertake Terrestrial Biodiversity Impact Assessment of the mining operations and associated activities of the proposed Matai Mining Project. The proposed project area is situated in the Moses Kotane Local Municipality within the Mankwe Magisterial District of Northwest Province. The mining right is held on the farm Wildebeestkuil 7 JQ, and certain portions of the farms Magazynskraal 3 JQ, Haakdoorn 6 JQ, Syferkuil 9 JQ and Middelkuil 8 JQ. The main objective of the assessment is to evaluate the impact of the mining operations on the ambient air quality of the surrounding areas.

2 Site Location

The Matai Mining Project is located in the Moses Kotane Municipality, Bojanala Platinum District Municipality, North West Province, South Africa. It lies about 13 km south-west of the closest town Northam, approximately, 70 km north of Rustenburg and 150 km north-west of Johannesburg. The Pilanesberg Nature Reserve lies approximately 13 km to the south of the proposed pit area. Other large sources of particulate matter in the area include the Union North and South Mines, the Pilanesberg Platinum mine, and the Dishaba Mine, all of which mine for platinum group minerals, and the Kalaka Mine which mines for limestone (Figure 1).

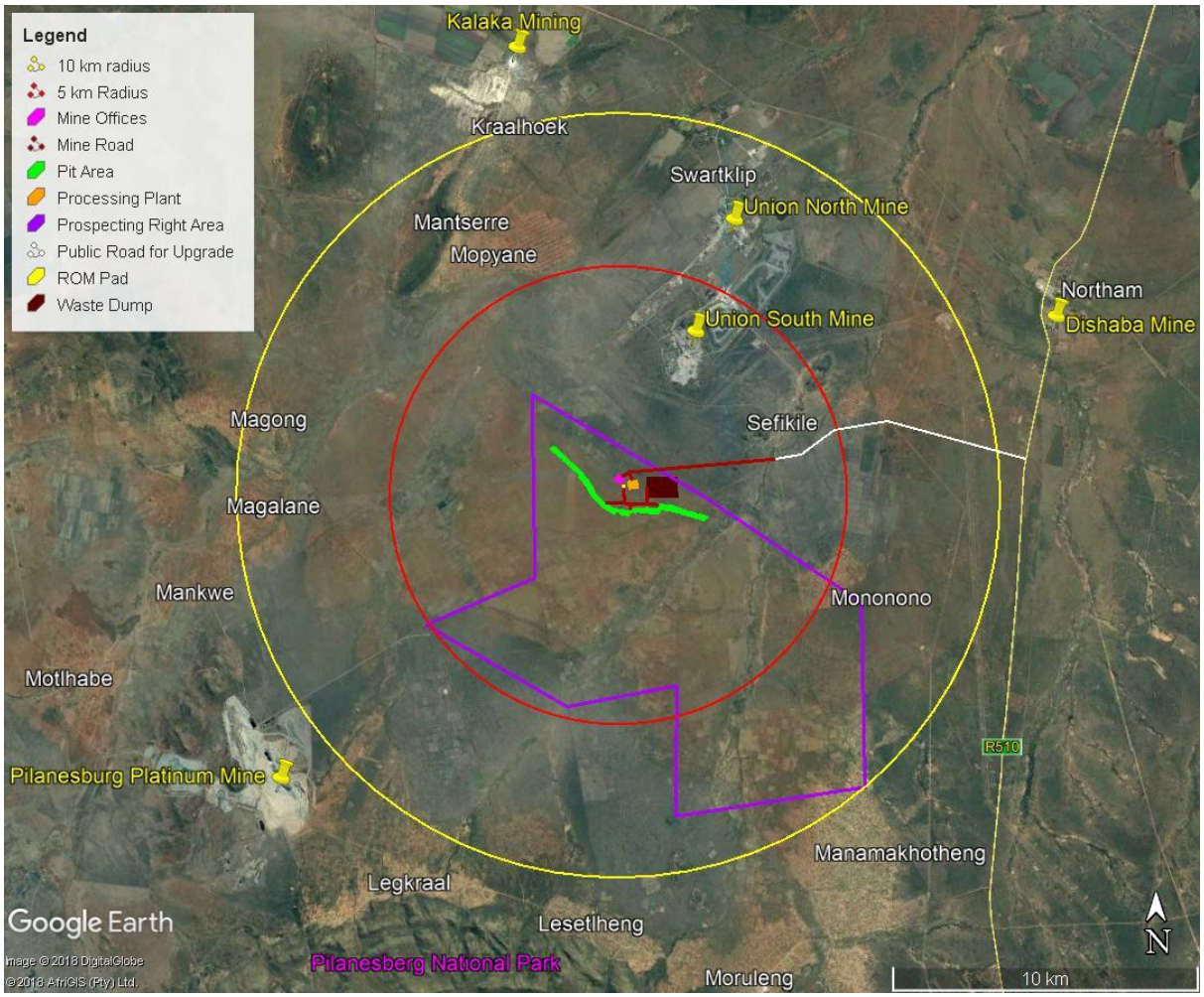

Figure 1: Location of the proposed Matai Mining Project.

The topography immediately surrounding the site is gently undulating with no prominent topographic features in the project area. The Pilanesberg formation to the south, rises from the surrounding plains and consists of the crater of a long extinct volcano fringed by three concentric ridges or rings of hills.

3 Overview of the Matai Project Mining Process

Opencast mining starts with the stripping of usable soil and soft overburden material using a fleet of diesel trucks and shovels. This topsoil and overburden is stockpiled for use in the rehabilitation of the area once the mining is completed. A process of roll-over or strip mining is then followed in which the overburden of each strip is drilled and blasted and then placed in the excavation produced by the previous strip. This backfilling and rehabilitation will be undertaken as the mining progresses. The ore will be mined from the open pit using excavators, bulldozers, trucks, bowl scrapers and shovels.

Crushers will be used to reduce large rocks into smaller rocks, gravel, or rock dust. Three stages of crushing are planned. Trucks will deposit material into a receiving bin at the primary tip. A single jaw crusher will be used as the primary crusher. A static grizzly is placed at the primary tip to remove oversize material, with a vibrating grizzly placed before the crusher to screen off the fines before it enters the crusher. For the purposes of modelling for this report, it was assumed that this primary crushing will take place in the pit (Figure 2. From there, apron feeders will be utilised to extract ore from the bins and feed it to downstream equipment at a predetermined rate. Cone crushers or toothed roll crushers will be used for the secondary and tertiary crushing phases at the processing plant to reduce the size of the material to less than 32mm. Conveyors will also be used to transport the overburden (Kimopax, 2018).

A tripper conveyor will also be used to stack ore onto the stockpile. The ore will be removed from the stockpile by means of bottom extraction. This consists of a tunnel underneath the stockpile with a travelling rotary plough feeder and a conveyor (Kimopax, 2018).

From the crushing plant, ore will be transported in trucks on a gravel road to the R510, and from there by tarred road to its final destination. The final void will be backfilled with the overburden from the initial boxcut.

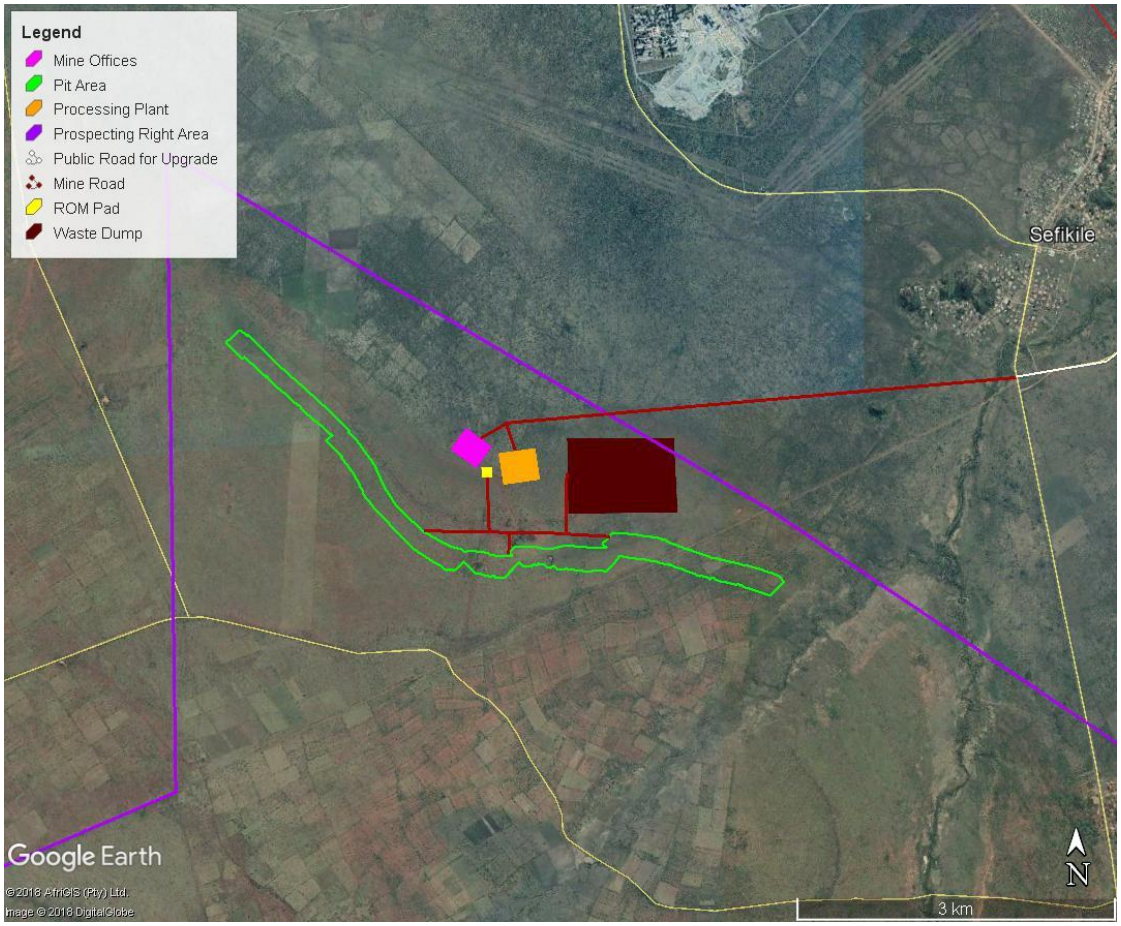

Figure 2: Proposed mine layout

4 Scope of Work

4.1 Aims and Objectives

Information generated from this survey was used to identify the potential impacts that the proposed Matai Mining Project construction activities will have on the environment. To achieve this aim a number of objectives were considered for this specialist study. The specific outcomes in terms of this report are outlined below:

- To define the Present Ecological State (PES) of the terrestrial ecological resources associated with the haul road options and the associated 60m investigation area;
- To conduct a Species of Conservation Concern (SCC) assessment, including potential for such species to occur or to have occurred within the proposed Project area;
- To delineate the various vegetation/habitat types and describe their sensitivity, present within the study area; and
- To determine the environmental impacts that the construction of the development might have on the terrestrial ecology associated with the haul road options and immediate zone of influence (investigation

area), as well as potential impacts on the ecology due to activities related to the proposed development and to develop mitigation and management measures for all phases of the development.

4.2 Terms of Reference

The agreed terms of reference include the following deliverables for this Flora and Fauna Impact Assessment Report:

- Record the plant species that occur within the study area based on the results of the infield vegetation/flora assessment;
- Record the animal species (mammals, reptiles, amphibians, birds and invertebrates (butterflies and spiders) that occur within the study area based on the results of the infield fauna assessments;
- Identify which of the species recorded are Species of Special Concern (SSC) based on the following lists:
    - International Union for the Conservation of Nature (IUCN) Red Data List (2017);
    - The South African National Biodiversity Institute (SANBI) Red Data List (2016);
    - SIBIS: SABIF (South African Biodiversity Information Facility) established by the Department of Science and Technology (DST); and
    - The Threatened Species Programme (TSP) listing in collaboration with the National Botanical Institute (NBI) was consulted to identify any SSC and/ or any Red Data Fauna and Flora Listed Species that may be present within the proposed Matai Project area.
    - The National Environmental Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA): Threatened or Protected Species List (ToPS).
- Determine if any of the recorded species are alien invasive species or problem species in terms of NEMBA alien invasive species;
- Using the results of the vegetation infield assessment and conduct a vegetation classification to identified the different plant communities within the study area;
- Compile a vegetation distribution map of the identified plant communities recorded;
- Map important faunal habitats identified within the study area;
- Determine the biodiversity value of the study area using information gathered on both flora and fauna;
- Compile a Biodiversity sensitivity map based on the identified biodiversity values; and
- Assess the identified impacts of the proposed project and recommend mitigation measures.

3. Legislative Requirements

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

Explanation of certain documents or organisations is provided where these have a high degree of relevance to the project and/or are referred to in this assessment.

3.1. International Legislation and Policy

- Convention on Biological Diversity (Rio de Janeiro, 1992);
- The Ramsar Convention (on wetlands of international importance);
- 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

3.2. National Legislation

- 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 Act (NEMA) No. 107 of 1198): Ecological Assessment Regulations, 2014. Specifically, the requirements of the specialist report as per the requirements of Appendix 6;
- 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 Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations;
- National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003);
- National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
- National Water Act, 1998 (Act 36 of 1998);
- National Veld and Forest Fire Act (101 of 1998);
- Environmental Conservation Act, 1989 (ECA), (Act no. 73 of 1989);
- National Forests Act, 1998 (Act 84 of 1998), specifically with reference to Protected Tree species;
- National Heritage Resources Act, 1999 (Act 25 of 1999);
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983); and
- Sustainable Utilisation of Agricultural Resources (Draft Legislation).

3.3. National Policy and Guidelines

- South Africa's National Biodiversity Strategy and Action Plan (NBSAP);
- National Spatial Ecological Assessment (NSBA); and
- National Freshwater Ecosystem Priority Areas (NFEPA's).

4. Approach

A desktop study was undertaken, aiming to identify:

- Potential species in the site area according to the South African National Biodiversity Institute (SANBI);
- Potential Red Data species and their current status; and
- Expected vegetation type and community structure, (Mucina and Rutherford 2006).

4.1. Flora

Prior to the field visit, a record of floral SCC and their habitat requirements was acquired from SANBI for the Quarter Degree Square in which the investigation area is situated, as well as relevant regional, provincial and national lists. Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

4.1.1 Species List

The species list was compiled from both the description of the vegetation type of the study area supplied by Mucina and Rutherford (2006) as well as the South African National Biodiversity Institute National Herbarium Pretoria Computerised Information System (SANBI PRECIS) list. Lists of expected faunal species were drawn up from several different sources and the IUCN Red Data species likely to be found on site determined. Lists were drawn up for mammals, birds, reptiles, amphibians and invertebrates. The full list of expected species can be found in the appendices.

4.2. Fauna

The following lists and databases were consulted to complete the fauna desktop assessment, prior to the field visit:

- The SIBIS online interactive species distribution map was used to obtain data for the distribution of mammals, reptiles, amphibians and terrestrial invertebrates within the greater study area. Data was acquired for the Quarter Degree Squares (QDS) in which the study is located;
- The potential occurrence of mammals was supplemented by the species distribution maps in Friedman and Daly (2004), and Smithers (2002);
- Lists of birds found in the Quarter Degree Square (QDS) for the study area were determined using online data from the South African Bird Atlas Project (SABAP 2) for 2012;

- The Convention on International Trade of Endangered Species (CITES) species database;
- The IUCN Red-Data List for South African fauna;
- The International IUCN Red-Data List, and;
- National Environmental Management Biodiversity Act (NEMBA 10 of 2004) listed species.

4.3.1 Faunal Assessment Methodology

A reconnaissance 'walk through' on foot was undertaken to determine the general habitat types found throughout the investigation area. Special emphasis was placed on areas that may potentially support faunal SCC. Sites were investigated on foot in order to identify the occurrence of the dominant faunal communities, species and habitat diversities. The presence of any faunal inhabitants of the investigation area was also assessed through direct visual observation or identifying such species through calls, tracks, scats and burrows.

It is important to note that faunal species have varied life cycles, breeding patterns, and are subject to seasonal fluctuations. As such, it is unlikely that all faunal species will have been recorded during the site assessment. However, even though some faunal species may not have been identified during the sight assessment, the habitat units and degree of transformation can be used to establish an accurate understanding of faunal assemblages most likely associated with the investigation area.

4.3. Sensitivity Mapping

All the ecological features associated with the proposed infrastructure areas were considered and sensitive areas were delineated with the use of a Global Positioning System (GPS). In addition, if any SCC and SANBI protected species were observed, their position was also marked by means of GPS. A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps.

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country's variety of ecosystems. These guides are essential to consult for development projects, and will form an important part of the sensitivity analysis. Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed, and have a high sensitivity as they are necessary for overall functioning. In addition, sensitivity analysis in the field based in much finer scale data can be used to ground-truth the larger scale assessments and put it into a more localised context.

The following assessments and assignations were taken into account in determining sensitivity:

- The occurrence of the site within an Internationally recognised Important Bird Area (IBA);
- The National List of Ecosystems that are Threatened and in need of Protection;
- The National Protected Areas Expansion Strategy;

- The National Spatial Biodiversity Assessment and the National Vegetation Map (Mucina and Rutherford, 2006).

The Sensitivity Assessment was conducted based on desktop studies as well as information obtained during the field investigations. Ecological sensitivity was quantified by subjectively assessing two factors, namely ecological function and conservation importance. These were defined as follows:

4.4. Ecological function

Ecological function is rated as described below:

- High ecological function: Sensitive ecosystems with either low inherent resistance or resilience towards disturbance factors or highly dynamic systems considered to be stable and important for the maintenance of ecosystem integrity (e.g. pristine grasslands, pristine wetlands and pristine ridges);
- Medium ecological function: Relatively important ecosystems at gradients of intermediate disturbances. An area may be considered of medium ecological function if it is directly adjacent to sensitive/pristine ecosystem; and
- Low ecological function: Degraded and highly disturbed systems with little or no ecological function.

Functional Status refers to an indication of the services provided by an area and includes both ecological and human related services. Functional Status depends on the degree to which the area or system still provides a noticeable service.

5 Impact Assessment Methodology

The anticipated impacts associated with the proposed project have been assessed according to Niara's standardised impact assessment methodology which is presented below. The following Impact Assessment Methodology has been utilised for the assessment of the environmental impacts.

Generally, the impact assessment is divided into three parts:

- Issue identification - each specialist will be asked to evaluate the 'aspects' arising from the project description and ensure that all issues in their area of expertise have been identified;
- Impact definition - positive and negative impacts associated with these issues (and any others not included) then need to be defined – the definition statement should include the activity (source of impact), aspect and receptor as well as whether the impact is direct, indirect or cumulative. Fatal flaws should also be identified at this stage.
- Impact evaluation – this is not a purely objective and quantitative exercise. It has a subjective element, often using judgement and values as much as science-based criteria and standards. The need therefore

exists to clearly explain how impacts have been interpreted so that others can see the weight attached to different factors and can understand the rationale of the assessment.

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance. The methodology below will be used when determining the significance of impacts associated with the proposed Power Transformer Manufacturing, Repairing and Testing Facility.

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance.

The impact significance rating system is presented in Table 5-1, Table 5-2 and Table 5-3 and involves three parts:

1 **Part A**: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/ population and duration;
2 **Part B**: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
3 **Part C**: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from **Part B**) and the probability of occurrence.

5.1. Part A: Defining Consequence in Terms of Magnitude, Duration and Spatial Scale:

Use these definitions to define the consequence in Part B.

Table 5-1: Consequence Rating Methodology

Impact Characteristics	Definition	Criteria
Magnitude	Major -	Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded
	Moderate -	Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded

Impact Characteristics	Definition	Criteria
	Minor -	Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded
	Minor +	Minor improvement; change not measurable; or threshold never exceeded
	Moderate +	Moderate improvement; within or better than the threshold; or no observed reaction
	Major +	Substantial improvement; within or better than the threshold; or favourable publicity
Spatial scale or population	Site or local	Site specific or confined to the immediate project area
	Regional	May be defined in various ways, e.g. cadastral, catchment, topographic
	National/ International	Nationally or beyond
Duration	Short term	Up to 18 months.
	Medium term	18 months to 5 years
	Long term	Longer than 5 years

5.2. Part B: Determining Consequence Rating:

Rate consequence based on definition of magnitude, spatial extent and duration.

Table 5-2: Consequence Rating Methodology

			Spatial Scale/ Population		
			Site or Local	**Regional**	**National/ International**
MAGNITUDE					
Minor	**DURATION**	**Long term**	Medium	Medium	High
		Medium term	Low	Low	Medium
		Short term	Low	Low	Medium
Moderate	**DURATION**	**Long term**	Medium	High	High
		Medium term	Medium	Medium	High
		Short term	Low	Medium	Medium
Major	**DURATION**	**Long term**	High	High	High
		Medium term	Medium	Medium	High

			Spatial Scale/ Population		
			Site or Local	Regional	National/ International
		Short term	Medium	Medium	High

5.3. Part C: Determining Significance Rating:

Rate significance based on consequence and probability.

Table 5-3: Significance Rating Methodology

		Consequence		
		Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	Medium	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

6 Assumptions and Limitations

The following assumptions and limitations are applicable to this Report:

- The ecological assessment is confined to the proposed Project area, and does not include the neighbouring and adjacent properties; these were however considered as part of the desktop assessment;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral and faunal communities have been accurately assessed and considered;
- Due to the nature and habits of most faunal taxa and the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations were compared with literature studies where necessary; and
- The data presented in this report are based on two site visits, undertaken in December and January by the author and an assistant. Although the season (late summer) was suitable for ecological assessments, more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was significantly augmented with all available desktop data, as well as previous studies conducted in the area, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the proposed Project area.

9 Expertise of the Specialists

Ndumiso Dlamini obtained his BSc Hons degree in Botany in 2011 at the University of Johannesburg and is a registered Pr. Sci. Nat with SACNASP (116579) in Botanical Science and Ecological Science. Ndumiso has been conducting biodiversity, ecological and water resources assessments as an Environmental Consultant for 5 years. He has performed numerous ecological impact assessments for various projects which include mining, housing developments, roads and infrastructure and rehabilitation. A detailed CV is attached in Appendix B.

10 Findings

10.1. Protected Areas

Protected areas refer to areas that have been proclaimed as protected areas in terms of the National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003). The Matai project area does not fall within the boundaries of a protected area and is approximately 5km from the Pilanesburg Provincial Nature Reserve as presented in Figure 3.

Figure 3: Protected Areas in proximity to the Matai Project Area

10.2. Important Bird Areas

Important Bird Areas (IBAs) are areas determined through the National Biodiversity Assessment as areas that are vital for the avifaunal species. These areas present habitat and ecosystems that are favourable for a large number of avifaunal species and contribute to the recreational aspect of birdwatching. The Matai project area does not fall within an IBA (Figure 4).

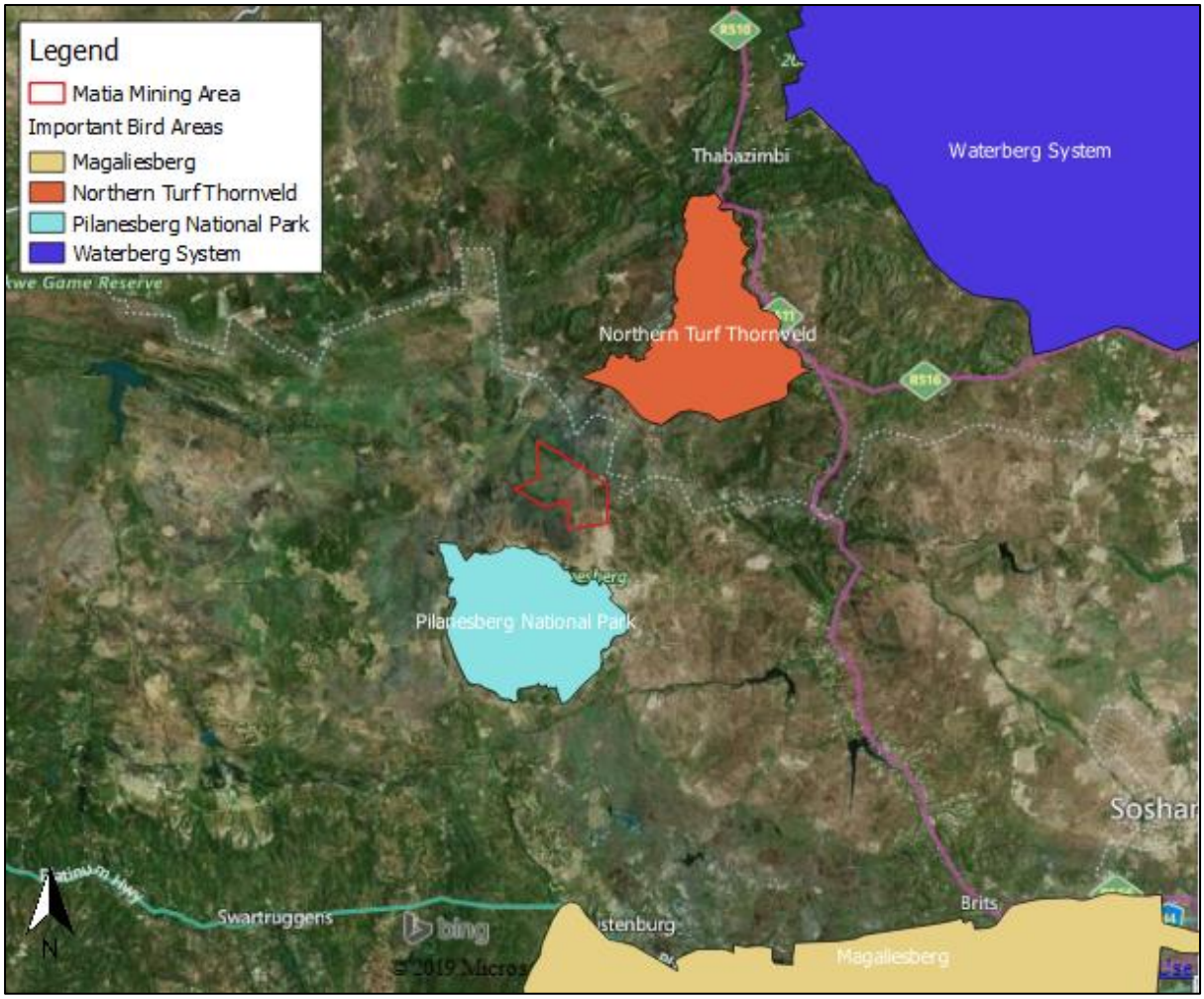

Figure 4: Important Bird Areas in proximity to the Matai Project Area

10.3. Critical Biodiversity Areas

The National Biodiversity Assessment identified and classified ecosystem areas in terms of their level of threat owing to decline and degradation. The Matai project area falls within an ecosystem area that is considered Least Threatened (Figure 5) which indicates that there are no sensitive and unique habitats within the project area.

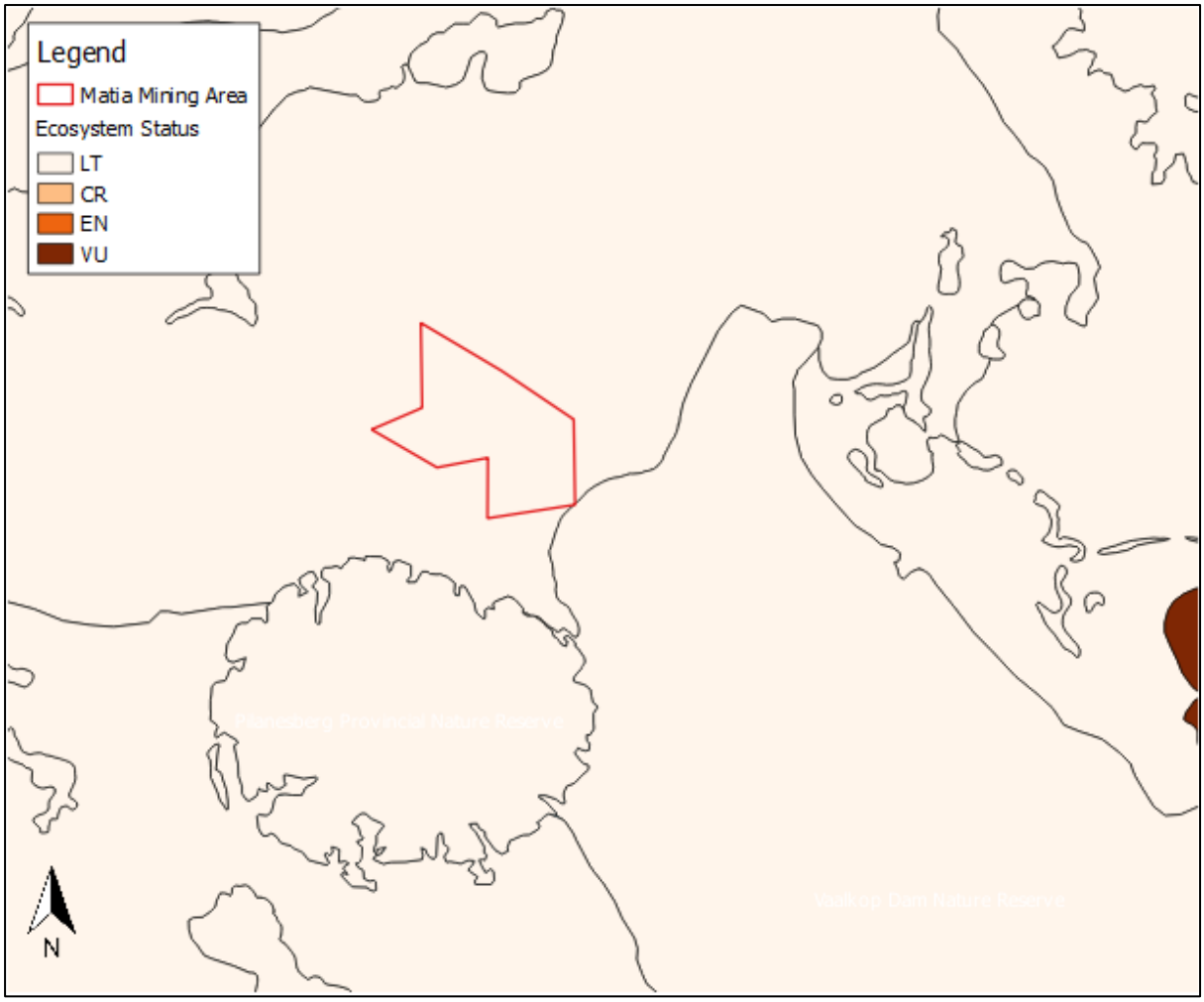

Figure 5: Ecosystem threat status within Matai Project Area

10.4. Flora

10.1.1 Desktop Assessment

The Matai project area is located within the Dwaalboom Thornveld vegetation unit (Mucina and Rutherford, 2006) within the Central Bushveld bioregion. The vegetation unit occurs in the Limpopo and North-West Provinces, stretching from the flats north of the Dwarsberge to the Nietverdiend area and Northam. The vegetation unit occurs in altitudes of 900m – 1200m above sea level.

The vegetation unit is considered to be in a dry climate with a summer rainfall and very dry winters. The Mean Annual Precipitation (MAP) ranges between 500mm to 600mm. The vegetation unit has the highest mean annual potential evaporation of savanna units outside the two Kalahari bioregions. In winter, frost is highly expected throughout the unit.

The unit is characterised by plains with scattered low to medium high trees and shrubs and a grass layer. *Vechelia tortillis* and *Vechelia nilotica* are dominant in the soils with higher clay content through the unit. The dominant soils within the unit are vertic black utramafic clays.

The vegetation unit is considered as Least threatened in terms of the conservation status. Approximately 6% of the vegetation unit is statutorily conserved within the Madikwe Game Reserve with the conservation target set at 19%. An approximate 14% of the vegetation unit has been transformed by cultivation and cattle grazing throughout the unit. Plant species of significance within the vegetation unit are presented in Table 10-1.

Table 10-1: Plants of significance within the Dwaalboom Thornveld vegetation unit

Plant type	Plant species
Trees	*Vachelia erioloba, Vachelia erubescens. Vachelia nilotica, Vechelia tortilis subsp. heteracantha, Vechelia fleckii, Vecehlia mellifera subsp. detinens, Combretum imberbe, Searsia lancea, Ziziphus mucronata*
Shrub	*Vacehlia hebeclada subsp. lycioides, Euclea undulata, Grewia flava, Tarchonanthus camphoratus, Vachelia tenuispina, Abutilon austri-africanum, Aptosimum elongatum, Hirpicium bechuanense, Pavonia burchellii, Solanum delagense, Kalanchoe rotundifolia, Talinum caffrum*
Graminoids	*Aristida bipartite, Bothriochloa insculpta, Digitaria eriantha subsp. eriantha, Ischaemum afrum, Panicum maximum, Cymbopogon posposchilli, Eragrostis curvula, Sehima galpinii, Setaria incrassata*

The expected species within the project area include the species listed in

Table 10-2. There were no plants of conservation concern expected within the Project area.

Table 10-2: The expected plant species within the project area

Family	Species	Conservation status
Acanthaceae	*Crossandra greenstockii*	LC
Aizoaceae	*Zaleya pentandra*	LC
Amaranthaceae	*Hermbstaedtia odorata var. albi-rosea*	LC
Anacardiaceae	*Searsia magalismontana subsp. magalismontana*	LC
Anacardiaceae	*Searsia dentata*	LC
Apocynaceae	*Huernia transvaalensis*	LC
Asteraceae	*Hirpicium bechuanense*	LC
Asteraceae	*Aspilia mossambicensis*	LC
Bryaceae	*Brachymenium acuminatum*	LC
Convolvulaceae	*Merremia palmata*	LC
Cucurbitaceae	*Cucumis hirsutus*	LC
Euphorbiaceae	*Euphorbia schinzii*	LC
Euphorbiaceae	*Jatropha schlechteri subsp. setifera*	LC
Fabaceae	*Sesbania transvaalensis*	LC
Fabaceae	*Rhynchosia holosericea*	LC

Family	Species	Conservation status
Fabaceae	*Indigastrum costatum subsp. macrum*	LC
Fabaceae	*Tephrosia burchellii*	LC
Fabaceae	*Senegalia erubescens*	LC
Fabaceae	*Senegalia mellifera subsp. detinens*	LC
Hyacinthaceae	*Ledebouria atrobrunnea*	LC
Iridaceae	*Gladiolus oatesii*	LC
Malvaceae	*Grewia bicolor var. bicolor*	LC
Malvaceae	*Corchorus asplenifolius*	LC
Malvaceae	*Hermannia umbratica*	LC
Malvaceae	*Malvastrum coromandelianum*	LC
Malvaceae	*Hibiscus micranthus var. micranthus*	LC
Menispermaceae	*Antizoma angustifolia*	LC
Oxalidaceae	*Oxalis smithiana*	LC
Poaceae	*Eriochloa fatmensis*	LC
Poaceae	*Setaria incrassata*	LC
Poaceae	*Echinochloa crus-galli*	LC
Poaceae	*Sporobolus fimbriatus*	LC
Poaceae	*Bothriochloa bladhii*	LC
Poaceae	*Dinebra retroflexa var. condensata*	LC
Poaceae	*Eragrostis curvula*	LC
Poaceae	*Eleusine coracana subsp. africana*	LC
Poaceae	*Brachiaria nigropedata*	LC
Poaceae	*Themeda triandra*	LC
Poaceae	*Eragrostis rigidior*	LC
Poaceae	*Brachiaria brizantha*	LC
Poaceae	*Panicum schinzii*	LC
Poaceae	*Eragrostis cilianensis*	LC
Poaceae	*Digitaria eriantha*	LC
Poaceae	*Eragrostis barbinodis*	LC
Poaceae	*Cymbopogon sp.*	LC
Poaceae	*Panicum maximum*	LC
Poaceae	*Cenchrus ciliaris*	LC
Poaceae	*Brachiaria eruciformis*	LC
Poaceae	*Sorghum versicolor*	LC
Poaceae	*Panicum coloratum*	LC
Poaceae	*Ischaemum fasciculatum*	LC
Poaceae	*Schmidtia pappophoroides*	LC
Poaceae	*Eragrostis biflora*	LC
Pteridaceae	*Cheilanthes nielsii*	LC
Talinaceae	*Talinum arnotii*	LC
Vitaceae	*Cyphostemma sulcatum*	LC

10.1.2 Field Investigation

The field investigation consisted of random sampling throughout the prospecting area with more focused sampling within the opencast pit area and plant area. The vegetation within the project area was largely uniform and represented the Dwaalboom Thornveld vegetation unit as presented in Figure 6. The unit has; however, been altered from the natural state. The tree layer was dominated by *Vechelia totilis* and *Vechelia nilotica*. The grass layer was dominated by *Digitaria eriantha* in some parts and *Cymbopogon pospischilii.* in other parts as can be seen in Figure 7. Large areas of bare soil were observed within the project area (Figure 8). These bare areas seemed to be a natural occurrence as there were no signs of clearing and the bare areas were frequent and widespread. The overall plant diversity within the project area was considered low.

Figure 6: The vegetation within the project area

Figure 7: The different grasslands within the project area a) *Cymbopogon* dominated grassland b) *Digitaria* dominated grassland

Figure 8: Bare areas of soil within project area

The plant species observed within the project area are listed in Table 10-3. There were no alien invasive species identified within the survey transects of the project area.

Table 10-3: Plant species observed in the project area

Species name	Common name	Conservation status	Area observed
Themeda triandra	Red grass		Pit area, Project area
Vacheilia tortilis	Umbrella thorn three		Pit area, Project area
Vachelia nilotica	Gum Arabic tree		Pit area, Project area
Combretum imberbe	Leadwood	Nationally protected	Project area
Cymbopogon pospischilii.	Turpentine grass		Pit area, Project area
Digitaria eriantha	Rhodes grass		Pit area, Project area
Eragrostis curvula	Weeping love grass		Pit area, Project area
Crinum spp.	Crinum		Pit area, Project area
Searsia lancea	Karee tree		Project area
Ziziphus mucronata	Buffalo thorn		Project area
Senegalia erubescens	Blue thorn		Pit area, Project area

10.1.3 Vegetation modification

The land uses within the local area has led to the modification of the natural vegetation and habitat structure. Several land uses were observed in the project area and these include crop cultivation, cattle grazing, roads and homesteads throughout the project. In many instances, human disturbance, including agricultural practices, lead to the degradation of vegetative structures and lowers the plant diversity. This was observed within the project area as a high level of mono-specificity of plant species was determined. The observed impacts are presented in Figure 9.

Figure 9: Impacts to the vegetation a) roads and disturbed areas b) cleared areas for homesteads c) monospecific grazing areas

10.5. Fauna

10.2.1 Mammals

The assessment for mammal species was conducted at desktop level and field investigation to determine the probability of occurrence of faunal species. The potential species that may occur within the project area are listed in Table 10-4. It must be noted that the possible species list is at desktop level and may include species that

were previously recorded in the area and may possibly be no longer occurring within the Project area such as Lions for example.

Table 10-4: The possible mammal species occurring within the project area

Family	Scientific name	Common name	Conservation Status
Bovidae	*Aepyceros melampus*	Impala	LC
Bovidae	*Alcelaphus buselaphus*	Hartebeest	LC
Bovidae	*Alcelaphus buselaphus caama*	Red Hartebeest	LC
Bovidae	*Antidorcas marsupialis*	Springbok	LC
Bovidae	*Connochaetes sp.*	African Antelopes and Gnus	LC
Bovidae	*Connochaetes taurinus*	Blue Wildebeest	LC
Bovidae	*Connochaetes taurinus taurinus*		LC
Bovidae	***Damaliscus lunatus lunatus***	**(Southern African) Tsessebe**	**VU**
Bovidae	***Hippotragus niger niger***		**VU**
Bovidae	*Kobus ellipsiprymnus*	Waterbuck	
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*		LC
Bovidae	*Oreotragus oreotragus*	Klipspringer	LC
Bovidae	*Oryx gazella*	Gemsbok	LC
Bovidae	*Raphicerus campestris*	Steenbok	LC
Bovidae	*Redunca arundinum*	Southern Reedbuck	LC
Bovidae	*Redunca fulvorufula*	Mountain Reedbuck	LC
Bovidae	*Sylvicapra grimmia*	Bush Duiker	LC
Bovidae	*Syncerus caffer*	African Buffalo	LC
Bovidae	*Taurotragus oryx*	Common Eland	LC
Bovidae	*Tragelaphus scriptus*	Bushbuck	LC
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	LC
Canidae	*Canis mesomelas*	Black-backed Jackal	LC
Canidae	***Lycaon pictus***	**African wild dog**	**EN**
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	LC
Cercopithecidae	*Chlorocebus pygerythrus pygerythrus*	Vervet Monkey (subspecies pygerythrus)	LC
Cercopithecidae	*Papio ursinus*	Chacma Baboon	LC
Elephantidae	*Loxodonta africana*	African Bush Elephant	LC
Emballonuridae	*Taphozous (Taphozous) mauritianus*	Mauritian Tomb Bat	LC
Equidae	*Equus quagga*	Plains Zebra	LC
Erinaceidae	***Atelerix frontalis***	**Southern African Hedgehog**	**NT**
Felidae	***Acinonyx jubatus***	**Cheetah**	**VU**
Felidae	*Caracal caracal*	Caracal	LC
Felidae	***Felis nigripes***	**Black-footed Cat**	**VU**
Felidae	*Felis silvestris*	Wildcat	LC
Felidae	***Leptailurus serval***	**Serval**	**NT**
Felidae	*Panthera leo*	Lion	LC
Felidae	***Panthera pardus***	**Leopard**	**VU**
Giraffidae	*Giraffa camelopardalis camelopardalis*	Nubian Giraffe	LC

Family	Scientific name	Common name	Conservation Status
Giraffidae	*Giraffa camelopardalis giraffa*	South African Giraffe	LC
Gliridae	*Graphiurus (Graphiurus) murinus*	Forest African Dormouse	LC
Herpestidae	*Helogale parvula*	Common Dwarf Mongoose	LC
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	LC
Hippopotamidae	*Hippopotamus amphibius*	Common Hippopotamus	LC
Hyaenidae	***Crocuta crocuta***	**Spotted Hyaena**	**NT**
Hyaenidae	***Hyaena brunnea***	**Brown Hyena**	**NT**
Hyaenidae	*Proteles cristata*	Aardwolf	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	LC
Leporidae	*Lepus sp.*	Hares	LC
Leporidae	*Lepus saxatilis*	Scrub Hare	LC
Molossidae	*Sauromys petrophilus*	Roberts's Flat-headed Bat	LC
Muridae	*Aethomys ineptus*	Tete Veld Aethomys	LC
Muridae	*Aethomys namaquensis*	Namaqua Rock Mouse	LC
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	LC
Muridae	*Gerbilliscus leucogaster*	Bushveld Gerbil	LC
Muridae	*Lemniscomys rosalia*	Single-Striped Lemniscomys	LC
Muridae	*Mastomys sp.*	Multimammate Mice	LC
Muridae	***Otomys auratus***	**Southern African Vlei Rat**	**NT**
Muridae	*Thallomys paedulcus*	Acacia Thallomys	LC
Mustelidae	*Mellivora capensis*	Honey Badger	LC
Nesomyidae	*Steatomys pratensis*	Common African Fat Mouse	LC
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	LC
Rhinolophidae	*Rhinolophus simulator*	Bushveld Horseshoe Bat	LC
Sciuridae	*Paraxerus cepapi*	Smith's Bush Squirrel	LC
Suidae	*Phacochoerus africanus*	Common Warthog	LC
Viverridae	*Civettictis civetta*	African Civet	LC
Viverridae	*Genetta tigrina*	Cape Genet (Cape Large-spotted Genet)	LC

The field investigation was conducted by traversing the project area by vehicle and on foot. The faunal activity was determined to be low within the project area and may result from the current lack of water within the area. Only two faunal species were confirmed within the project area as presented in Table 10-5. There were no fauna of conservation concern identified within the project area.

Table 10-5: Identified faunal species within project area

Family	Scientific name	Common name	Conservation Status
Bovidae	*Aepyceros melampus*	Impala	Least Concern
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)

10.2.2 Avifauna

A desktop avifaunal investigation was conducted to determine the bird species that may occur within the project area. A total of 340 bird species is expected to occur within the project area (Appendix A); however, a total of 11 were considered to be of conservation concern as listed in Table 10-6.

Table 10-6: Avifaunal species that may occur within the project area

Common name	Species name	Conservation Status
Bustard, Kori	*Ardeotis kori*	VU
Eagle, Martial	*Polemaetus bellicosus*	VU
Eagle, Tawny	*Aquila rapax*	VU
Falcon, Lanner	*Falco biarmicus*	NT
Marsh-harrier, African	*Circus ranivorus*	VU
Oxpecker, Red-billed	*Buphagus erythrorhynchus*	NT
Secretarybird, Secretarybird	*Sagittarius serpentarius*	NT
Stork, Yellow-billed	*Mycteria ibis*	NT
Vulture, Cape	*Gyps coprotheres*	VU
Vulture, Lappet-faced	*Torgos tracheliotus*	VU
Vulture, White-backed	*Gyps africanus*	VU

The field survey was conducted by traversing the project area by vehicle and on foot. Visual observations and calls are the main identifiers of bird activity, with focus placed on areas around open water and tree canopies. The bird survey determined that avifaunal activity was low within the project as a result of the lack of water. In most instances watercourses such as rivers and streams make for ideal birding locations; in this instance the rivers were dry and did not attract bird species. The bird species that were observed and positively identified within the project area are listed in Table 10-7.

Table 10-7: Identified bird species within the project area

Common name	Species name	Conservation Status
Guineafowl, Helmeted	*Numida meleagris*	LC
Bunting, Cape	*Emberiza capensis*	LC
Pipit, African	*Anthus cinnamomeus*	LC
Olive-pigeon, African	*Columba arquatrix*	LC
Widowbird, Long-tailed	*Euplectes progne*	LC
Plover, Common Ringed	*Charadrius hiaticula*	LC
Robin-chat, Cape	*Cossypha caffra*	LC

10.2.3 Herpetofauna

The herpetofauna survey consisted of a desktop study and the field investigation. The desktop study determined that the species listed in Table 10-8 . There were no herpetofauna of conservation concern expected for the project area.

Table 10-8: The possible herpetofauna within the project area

Family	Scientific name	Common name	Conservation Status
Reptiles			
Agamidae	*Acanthocercus atricollis*	Southern Tree Agama	LC
Agamidae	*Agama aculeata distanti*	Distant's Ground Agama	LC
Agamidae	*Agama atra*	Southern Rock Agama	LC
Chamaeleonidae	*Chamaeleo dilepis*	Common Flap-neck Chameleon	LC
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	LC
Colubridae	*Dispholidus typus viridis*	Northern Boomslang	Not evaluated
Colubridae	*Philothamnus semivariegatus*	Spotted Bush Snake	LC
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	LC
Elapidae	*Dendroaspis polylepis*	Black Mamba	LC
Elapidae	*Naja mossambica*	Mozambique Spitting Cobra	LC
Gekkonidae	*Hemidactylus mabouia*	Common Tropical House Gecko	LC
Gekkonidae	*Lygodactylus capensis capensis*	Common Dwarf Gecko	LC
Gerrhosauridae	*Gerrhosaurus flavigularis*	Yellow-throated Plated Lizard	LC
Lacertidae	*Nucras intertexta*	Spotted Sandveld Lizard	LC
Lamprophiidae	*Limaformosa capensis*	Common File Snake	LC
Lamprophiidae	*Psammophylax tritaeniatus*	Striped Grass Snake	Least Concern (SARCA 2014)
Pelomedusidae	*Pelomedusa galeata*	South African Marsh Terrapin	Not evaluated
Pelomedusidae	*Pelusios sinuatus*	Serrated Hinged Terrapin	LC
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	LC
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	LC
Testudinidae	*Stigmochelys pardalis*	Leopard Tortoise	LC
Varanidae	*Varanus albigularis albigularis*	Rock Monitor	LC
Varanidae	*Varanus niloticus*	Water Monitor	LC
Viperidae	*Bitis arietans arietans*	Puff Adder	LC
Frogs			
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	LC
Bufonidae	*Schismaderma carens*	Red Toad	LC
Bufonidae	*Sclerophrys garmani*	Olive Toad	LC
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	LC
Bufonidae	*Sclerophrys poweri*	Power's Toad	LC
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	LC
Microhylidae	*Phrynomantis bifasciatus*	Banded Rubber Frog	LC

Family	Scientific name	Common name	Conservation Status
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	LC
Pipidae	*Xenopus laevis*	Common Platanna	LC
Ptychadenidae	*Ptychadena anchietae*	Plain Grass Frog	LC
Ptychadenidae	*Ptychadena mossambica*	Broadbanded Grass Frog	LC
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	LC
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	LC
Pyxicephalidae	*Tomopterna sp.*		LC
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	LC
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	LC
Rhacophoridae	*Chiromantis xerampelina*	Southern Foam Nest Frog	LC

There were no herpetofauna species identified during the field investigation. Owing to the brevity of field investigation, the disturbed nature of the project area and the current climate conditions, it is anticipated that these species may have relocated for lack of adequate habitat. It must be noted that occurrence of these species within the project is highly likely.

10.2.4 Invertebrates

The assessment of invertebrates was not conducted as part of this assessment owing the on-site conditions. The site was dry and invertebrate activity was low. Furthermore, it would be advisable that an invertebrate assessment be conducted along with an aquatics survey as the conditions that are conducive for the aquatic assessment would correlate with invertebrate activity within the project area.

10.2.5 Habitat Modification

The habitat within the project area has been modified by the various land uses within the project area and local surrounds. Fauna species are sensitive to changes to habitat structures and will either migrate or be killed as a result of human-wildlife contact. Furthermore, the lack of water within the area may have caused the faunal species to migrate away in search of water. Some of the identified habitat modifiers and impacts to the faunal species within the project area are presented in Figure 10.

Figure 10: Habitat modifications and impacts to faunal species a) Dry streams and rivers b) Degraded vegetation structures c) Homesteads and livestock d) Cattle grazing and management

11 Impact Assessment

The impact assessment considered the impacts that may result in the proposed opencast mining of Vanadium, Titanium and Iron Ore. The following potential activities and potential impacts are expected.

The biodiversity impact assessment includes the following:

- Assess impacts of ongoing and proposed activities on biodiversity within the Project area;
- Assess whether proposed activities are likely to have significant impacts on biodiversity and specifically species of conservation concern (SCC);
- Identify practically implementable mitigation measures to reduce the significance of proposed activities on biodiversity; and
- Assess residual and cumulative impacts after implementation of mitigation measures

11.1. Impacts of the Construction Phase

11.1.1 Impact Description

The impacts during the construction phase will be brought about by the site clearing and establishment activities. The expected impacts during the construction phase are:

- The clearing of vegetation
- Loss of species of conservation concern
- Displacement of faunal species
- Killing of faunal species

11.1.2 Management Objectives

The objective of management measures is to ensure that no plant or animal SSC are harmed or disturbed, furthermore, the impact to habitat is restricted only to the footprint area and that alien plant invasion does not take place as a result of development.

11.1.3 Impact Ratings

The ratings for the impacts during the construction phase are presented in Table 11-1.

Table 11-1: The impact ratings and mitigation measures for impact during the construction phase

Activity	Impact Description	BEFORE MITIGATION SIGNIFICANCE	Mitigation measures / Recommendations	AFTER MITIGATION SIGNIFICANCE
Site clearance for establishment or access roads, infrastructure and pit area	Clearing of vegetation	Medium	Avoid sensitive areas and implement buffer zones	Low

Site clearance for establishment or access roads, infrastructure and pit area	Loss of plant SSC	Low	Limit the footprint area to the pit and infrastructure Avoid areas of remaining indigenous vegetation	Low
Site clearance for establishment or access roads, infrastructure and pit area	Displacement of fauna species	Medium	Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones.	Low
Site clearance for establishment or access roads, infrastructure and pit area	Loss of faunal SSC	Low	Avoid areas in which plant species of conservation concern may occur; If some areas cannot be avoided implement rescue of plant species of conservation concern.	Low

11.2. Impacts of the Operational Phase

11.2.1 Impact Description

The impacts during the operational phase will be brought about by the operation of the mine, access roads and associated activities. The expected impacts during the operational phase are:

- Alien plant establishment
- Disturbance/Displacement of Faunal species
- Disturbance of vegetation communities
- Habitat fragmentation
- Killing of faunal species
- Continuous rehabilitation

11.2.2 Management Objectives

The objective of management measures is to ensure that no plant or animal SSC are harmed or disturbed without authorisation, furthermore, the impact to habitat is restricted only to the footprint area and that alien plant invasion does not take place as a result of development.

11.2.3 Impact Ratings

The ratings for the impacts during the operational phase are presented in Table 11-2.Table 11-1

Table 11-2: Impact ratings and mitigation measures for the operational phase

Activity	Impact Description	BEFORE MITIGATION	Mitigation measures / Recommendations	AFTER MITIGATION
		SIGNIFICANCE		SIGNIFICANCE

Activity	Impact Description	BEFORE MITIGATION SIGNIFICANCE	Mitigation measures / Recommendations	AFTER MITIGATION SIGNIFICANCE
Operation of mine and access roads	Alien plant establishment	Medium	Implementation of alien invasive plant management plan needs to be continued during operation to prevent the growth of invasive on cleared areas.	Medium
Operation of mine and access roads	Disturbance/Displacement of Faunal species	Medium	Minimise footprint area Work only in clearly demarcated areas	Medium
Operation of mine and access roads	Disturbance of vegetation communities	Medium	Minimise footprint area Work only in clearly demarcated areas	Medium
Operation of mine and access roads	Habitat fragmentation	Medium	Minimise footprint area Work only in clearly demarcated areas	Medium
Operation of mine and access roads	Killing of faunal species	Medium	Minimise footprint area Work only in clearly demarcated areas	Medium
Operation of mine and access roads	Continuous rehabilitation	Medium	Implement rehabilitation strategy and rehabilitation interventions	Medium

11.3. Impacts of the Closure and Rehabilitation Phase

11.3.1 Impact Description

Impacts during the closure and rehabilitation phase will be brought about by the activities relating to the removal of infrastructure, closing and sealing-off of pits and the final landscape shaping and revegetation. The expected impacts during the closure and rehabilitation phase are

- Encroachment of alien invasive plant species
- Loss of species of conservation concern
- Impact on the growth and health of both fauna and flora

11.3.2 Management Objectives

The objective of management measures is to ensure that no plant or animal SSC are harmed or disturbed, furthermore, the impact to habitat is restricted only to the footprint area and that alien plant invasion does not take place as a result of development. The final shaping of the landscape must represent the natural topography as far as possible and revegetation must take place immediately.

11.3.3 Impact Ratings

The impact ratings for the closure and rehabilitation phase are presented in Table 11-3

Table 11-3: the impact ratings and mitigation measures for the closure and rehabilitation phase

Activity	Impact Description	BEFORE MITIGATION SIGNIFICANCE	Mitigation measures / Recommendations	AFTER MITIGATION SIGNIFICANCE
Rehabilitation	Encroachment of alien invasive plant species	Medium	Implementation of alien invasive plant management plan needs to be continued during decommissioning to prevent the growth of invasive plants on rehabilitated areas; Rehabilitation of site with indigenous vegetation that occurs in the vicinity of project area.	Low
Shaping of landscape	Loss of species of conservation concern	Medium	All infrastructure that could have a negative impact on faunal species (powerlines etc) needs to be decommissioned and removed.	Low
Revegetation of landscape	Impact on the growth and health of both fauna and flora	Medium	Implement rehabilitation strategy and rehabilitation interventions	Medium

11.4. Impacts of the Post-Closure Phase

11.4.1 Impact Description

The post-closure phase consists primarily of the monitoring of the final rehabilitation and remedying of any issues identified. Furthermore, the response of the vegetation communities and establishment is monitored along with the reconstruction of habitats and reintroduction of faunal species. The impacts identified for the post-closure phase are as follows:

- Habitat reconstruction
- Establishment of vegetation
- Habitat stabilisation

11.4.2 Management Objectives

The objective of management measures is to ensure that the post-mining landscape is as close to the pre-mining landscape as possible. The revegetation of areas with local seed mixes and shaping will create habitat for the pre-mining vegetation and faunal species to re-establish in the project area.

11.4.3 Impact Ratings

The impact ratings for the post-closure phase are presented in Table 11-4.

Table 11-4: Impact ratings and mitigation measures for the post-closure phase

Activity	Impact Description	BEFORE MITIGATION SIGNIFICANCE	Mitigation measures / Recommendations	AFTER MITIGATION SIGNIFICANCE
Monitoring of rehabilitation	Habitat reconstruction	Medium	Implement rehabilitation monitoring plan and remedy actions	Medium
Monitoring of plant species establishment	Establishment of vegetation	Medium	Implement rehabilitation monitoring plan and remedy actions	Medium
Monitoring reintroduction of faunal species	Habitat stabilisation	Low	Implement rehabilitation monitoring plan and remedy actions	Low

11.5. Cumulative Impacts

Cumulative impacts are contextual and encompass a broad spectrum of impacts at different spatial and temporal scales (IFC, 2013) i.e. cumulative impacts can result from individually minor but collectively significant activities taking place over a period of time (Dutta, *et al*., 2012). These are not new types of impacts but recognition that impacts from individual projects and activities can combine together in time and space. In some cases, cumulative impacts occur because a series of projects of the same type are being developed. In other cases, cumulative impacts occur from the combined effects over a given resource of a mix of different types of projects; for example, the development of a manufacturing site, access roads, transmission lines, and other adjacent land uses.

It is necessary to consider the impacts that the development will have from a broad area perspective, by considering land-use and transformation of natural habitat in areas surrounding the site. Cumulative impacts are assessed by considering past, present and anticipated changes to biodiversity.

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

- Destruction of faunal and floral habitat structures;

- Permanent loss of and altered floral and faunal species diversity;
- Alien floral invasion; and
- Disturbed areas are highly unlikely to be rehabilitated to pre-development conditions of ecological functioning and a loss of floral and faunal habitat, species diversity and SCC will most likely be permanent.

11.6. Mitigation

The mitigation hierarchy is international best practice for managing risks and impacts, and is listed by the International Finance Corporation (IFC) as the primary objective of Performance Standard 1 as follows: "To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment." This mitigation hierarchy is represented in Figure 11.

Figure 11: The mitigation hierarchy

The mitigation hierarchy is now widely accepted as an approach for biodiversity conservation for sustainable development. To comply with the International Finance Corporation's (IFC) Performance Standard 6 for Biodiversity Conservation and Sustainable Management of Living Natural Resources, and the performance standards of several other multilateral finance institutions, a project proponent must develop and verify the implementation of a mitigation hierarchy that complies with the Standard.

- Avoidance includes activities that change or stop actions before they take place, in order to prevent their expected negative impacts on biodiversity and decrease the overall potential impact of an operation. For example, adjusting the location, scope or timing of a development could avoid negative impacts to a

vulnerable species or sensitive ecosystem. Avoidance not only makes good business sense, for example by reducing later steps in the mitigation hierarchy, but is imperative for protecting the integrity of valuable and threatened biodiversity and ecosystem services.

- Minimisation measures are taken to reduce the duration, intensity, extent and/or likelihood of impacts that cannot be completely avoided. An example of a minimisation measure would be improvement to the quality treatment of water outflows from mining areas, thereby reducing impacts on aquatic systems.
- Restoration involves altering an area in such a way as to re-establish an ecosystem's composition, structure and function, usually bringing it back to its original (pre-disturbance) state or to a healthy state close to the original.3 This is a holistic process aiming to return an ecosystem to a former natural condition and to restore ecological function. Restoration is preferred to rehabilitation which implies putting the landscape to a new or altered use to preserve a particular human purpose. Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate avoidance, minimisation and restoration measures have been taken.
- Biodiversity offsets are effectively a 'last resort'. A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity; however, a net gain is required in critical habitats – habitats with high biodiversity value, as defined by the IFC.

A graphical representation of the mitigation hierarchy is illustrated in Figure 12.

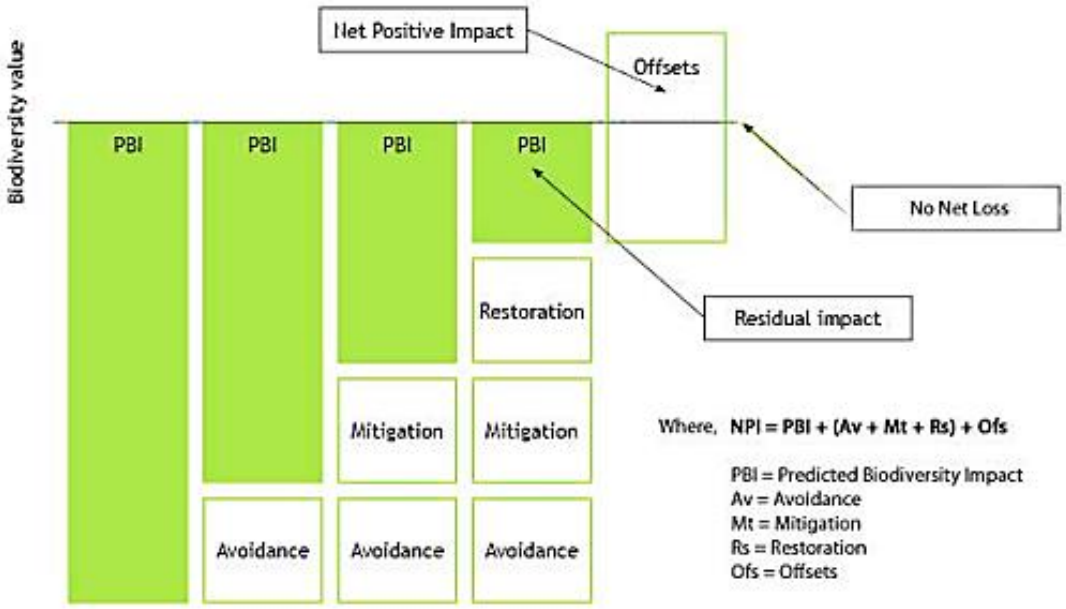

Figure 12: A graphical representation of the mitigation hierarchy

Mitigation measures for the proposed development are thus categorized according to the mitigation hierarchy as follows:

11.6.1 Avoidance

Some of the impacts can be avoided this may be achieved by:

- The placement of the pit area and infrastructure areas beyond sensitive habitats;
- Avoidance of protected plant and animal species
- The relocation of identified faunal species to similar and adequate habitat areas

11.6.2 Minimization

Impacts that cannot be avoided can be minimized; such mitigation measures include the following, for example:

- Control of alien invasive plant species; and
- Maintaining as small a footprint as possible.

11.8.1 Restoration

Areas that are cleared for construction, but not required for operation of the development can be rehabilitated. This should be done using plant SSC rescued and propagated, as well as other species that are propagated for rehabilitation purposes.

11.8.2 Offsets

Considering that areas will be lost as a direct result of the development, as well as the noise impacts of the turbines on fauna, it is recommended that offsets be considered. Offsets will ensure Net Positive Impact on Biodiversity for the project. As discussions are underway for the Matai Mining development of a trust that will ensure conservation of the site, offsets have effectively been taken into consideration. This could potentially result in an overall positive impact on biodiversity as a result of the development. An offset strategy will consider the following:

- An offset strategy is the development of a nursery that will provide plant species for rehabilitation purposes and the restoration of degraded areas.
- The project area is currently dry and most likely is dry throughout the year; provision of “watering holes” for fauna species throughout the area will offset the species displacement.

11.7. Recommendations for Ensuring Application of Mitigation Measures

It is vital that mitigation measures are applied as recommended (based on practicality and cost effectiveness). This can be achieved with a series of plans assuring the process to be followed for monitoring and application of mitigation measures. Plans recommended for the proposed Matai Mining development are as follows:

- An alien invasive management plan;
- A comprehensive assessment of all plant SSC within the footprint of the development and corresponding permit applications for removal of these species (removal includes both transplantation and destruction of these species);
- A search and rescue plan for both plant and animal SSC to be applied before construction (plants) and during construction (animals);
- A rehabilitation plan detailing the methods used for the rehabilitation of areas cleared for construction but not required for operation of the development; and
- An offset plan should be developed should the proponent wish to demonstrate a net gain of biodiversity for the proposed Matai Mining Project.

It is further recommended that all such plans be included in an overall Biodiversity Action Plan or BAP (optional) as is usually required for IFC projects to meet international best practice. Such a plan will allow for centralization of biodiversity-related mitigation actions with associated responsibility assignations and monitoring.

12 Environmental Management Plan

The Environmental Management Plan (EMP) has been described according to the project activities in order to provide an understanding of what objectives and recommended management measures are required to minimise the environmental impacts arising from these activities.

The aims and objectives of the EMP are:

- To provide a detailed action plan for the implementation of the recommendations made in the impact assessment report;
- To provide goals and targets for environmental control that are measurable and auditable;
- To provide a basis on which the prospective contractor can accurately price for environmental management in his tender document;
- To specify particular roles, responsibilities and time scales;
- To provide a basis for monitoring compliance; and
- To provide a site management tool.

12.1. Project Activities with Potentially Significant Impacts

In summary, the impacts of the development on flora and fauna are primarily related to the potential loss of flora and fauna SSC.

12.2. Summary of Mitigation and Management

Table 12-1 provides a description of the mitigation and management options for the environmental impacts anticipated during the construction, operations and closure and rehabilitations phases on the fauna and flora.

Table 12-1: The summary of impacts and mitigation measures for the aspects of the proposed project

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Site clearance for establishment or access roads, infrastructure and pit area	Clearing of vegetation	Flora	C	Avoid sensitive areas and implement buffer zones	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Prior to commencement of activities and throughout
Site clearance for establishment or access roads, infrastructure and pit area	Loss of plant SSC	Flora -	C	Limit the footprint area to the pit and infrastructure Avoid areas of remaining indigenous vegetation	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Prior to commencement of activities and throughout

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Site clearance for establishment or access roads, infrastructure and pit area	Displacement of fauna species	Fauna	C	Avoid high biodiversity sensitivity areas (natural vegetation, watercourses & wetlands) and comply to prescribed buffer zones.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	Planning to End
Site clearance for establishment or access roads, infrastructure and pit area	Loss of faunal SSC	Fauna	C	Avoid areas in which plant species of conservation concern may occur; If some areas cannot be avoided implement rescue of plant species of conservation concern.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	Prior to commencement of activities and throughout
Operation of mine and access roads	Alien plant establishment	Flora	O	Implementation of alien invasive plant management plan needs to be continued during operation to prevent the growth of invasive on cleared areas.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Operation of mine and access roads	Disturbance/Displacement of Faunal species	Fauna	O	Minimise footprint area Work only in clearly demarcated areas	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	
Operation of mine and access roads	Disturbance of vegetation communities	Flora	O	Minimise footprint area Work only in clearly demarcated areas	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Operation of mine and access roads	Habitat fragmentation	Flora	O	Minimise footprint area Work only in clearly demarcated areas	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout
Operation of mine and access roads	Killing of faunal species	Fauna	O	Minimise footprint area Work only in clearly demarcated areas	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Operation of mine and access roads	Continuous rehabilitation	Biodiversity	O	Implement rehabilitation strategy and rehabilitation interventions	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Upon commencement of mining activities
Rehabilitation	Encroachment of alien invasive plant species	Flora	C&R	Implementation of alien invasive plant management plan needs to be continued during decommissioning to prevent the growth of invasive plants on rehabilitated areas; Rehabilitation of site with indigenous vegetation that occurs in the vicinity of project area.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Shaping of landscape	Loss of species of conservation concern	Flora	C&R	All infrastructure that could have a negative impact on faunal species (powerlines etc) needs to be decommissioned and removed.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout
Revegetation of landscape	Impact on the growth and health of both fauna and flora	Biodiversity	C&R	Implement rehabilitation strategy and rehabilitation interventions	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Throughout
Monitoring of rehabilitation	Habitat reconstruction	Biodiversity	P-C	Implement rehabilitation monitoring plan and remedy actions	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	Upon completion of final rehabilitation for 3 years

Activities	Potential Impact	Aspects Affected	Phase	Mitigation Type/Measures	Compliance with standards/Standard to be achieved	Time period for Implementation
Monitoring of plant species establishment	Establishment of vegetation	Flora	P-C	Implement rehabilitation monitoring plan and remedy actions	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act,1983 (Act No. 43 of 1983)	Upon completion of final rehabilitation for 3 years
Monitoring reintroduction of faunal species	Habitat stabilisation	Fauna	P-C	Implement rehabilitation monitoring plan and remedy actions	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	Upon completion of final rehabilitation for 3 years

C: Construction Phase
O: Operational Phase
C&R: Closure and Rehabilitation Phase
P-C: Post-Closure Phase

13 Monitoring Requirements

The main aims of compliance monitoring by the authorities are to:

- Evaluate the adherence by the contractors and developer to the conditions attached to the letter of authorisation;
- To check compliance with the Environmental Management Plan (EMP) and any other legal requirements referred to in the letter of authorisation;
- To assess the contractor's and applicant's effectiveness in implementing the conditions of authorisation and the EMP; and
- To recommend how and where improvements could be made to ensure compliance, enhance environmental performance and promote sustainability of the development.

The fauna and flora monitoring program should be initiated pre-construction and continue through construction thereafter conducted annually during the growing season as close to the same time of year as possible. If the monitoring results indicate the additional presence of red data species, or threatened species, this may require the need to undergo monitoring for that particular species more frequently, especially during the breeding season and birthing season for that species.

Monitoring will include sites in the undisturbed vegetation which will act as control plots, plots within the disturbed infrastructure areas which will have baseline data and then be monitored during the rehabilitation phase. These same plots will be monitored with each survey to ensure collected data is comparable and trends are identified. Where rehabilitation has been conducted, additional plots will be included to monitor the effectiveness of the re-vegetation.

Aspects that will be monitored in the annual surveys will include, species richness, vegetation composition i.e. proportion grasses, forbs and woody species, canopy height, cover percentage, presence of Red Data or protected species, and presence of alien invasive species.

13.1. Monitoring Plan

The fauna and flora monitoring program should be initiated pre-construction and continue through construction thereafter conducted annually during the growing season (December to March) as close to the same time of year as possible. Should the monitoring results indicate the additional presence of red data species, or threatened species, this may necessitate the need to undergo monitoring for that particular species more frequently, especially during the breeding season and birthing season for that species.

Monitoring will include sites in the undisturbed vegetation which will act as control plots, plots within the disturbed infrastructure areas which will have baseline data and then be monitored during the rehabilitation phase. The

same plots will be monitored with each survey so as to ensure collected data is comparable and trends are identified. Where rehabilitation is conducted, additional plots will be included to monitor the efficacy of the re-vegetation.

Aspects that will be monitored in the annual surveys will include, species richness, vegetation composition i.e. proportion grasses, forbs and woody species, canopy height, cover percentage, presence of Red Data or protected species, and presence of alien invasive species.

The only aspect requiring monitoring, based on the flora and fauna assessment, is the floral and alien plant species described below. This should be completed by a qualified botanical specialist in conjunction with a qualified alien invasive plant management officer.

13.1.1 Flora

13.1.1.1 Vegetation Cover Monitoring

The establishment of vegetation on disturbed areas is vital to ensure that the biodiversity value of the area. The monitoring for the vegetation cover will ensure that areas that are not vegetated or recovering are given attention to remedy the lack of cover. Vegetation cover may be used as a measure of the rehabilitation success and requirements.

13.1.1.2 Alien Vegetation Monitoring

Alien invasive plant species thrive on disturbed areas. The project will incorporate a large amount of earth moving and stockpiling which will create the habitat for the establishment of alien invasive plants. The monitoring of the alien invasive plants must be carried out monthly and identified plants must be eradicated as early as possible to minimise the seed bank in the ground.

The mine may make use of local workers for the identification and eradication of alien plant species. These workers will be trained in alien identification and eradication, Furthermore, a qualified botanist must assess the project at least twice a year to identify new alien plants and guide the eradication interventions.

13.1.2 Fauna

13.1.2.1 Birds

Bird species will be monitored for occurrence and volumes. As birds are able to migrate easily, the monitoring will be limited to opportunistic sightings and call identification.

13.1.2.2 Mammals

Mammal species are often sensitive to noise and dust; however, in a disturbed landscape with diminished resources they are likely to occur. Human-wildlife interactions are the most dangerous to the animals and it is advised that fences be put up to minimise the chance of human-wildlife interactions. Monitoring of these faunal

species will be opportunistic sightings, spoor identification and droppings to identify areas of concentrated activities.

A prolonged camera trapping (2 months) period may be used to determine any faunal species that may be in proximity to the project area.

13.1.2.3 *Herpetofauna*

Active searches for both reptiles and amphibians will be used to assess species richness of these groups in the area; due to the difficulty in recording occurrence of these groups data gathering will be limited to species counts.

14 Recommendation/ Opinion of the Specialist

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

The impacts as described, rated and mitigated in this Report does not pose a risk to large natural areas of Very High sensitivity, neither is SSC with restricted ranges being threatened with destruction. All vegetation, habitat and species present on site that could be affected by the activities proposed are of stable populations. The proposed pit area and infrastructure layout will be beyond sensitive areas such as water resources and will endanger protected species in the project area. With firm adherence to the mitigation measures prescribed in this Report, the impacts have been rated as acceptable and it is the opinion of the specialist the proposed Matai Mining Project may proceed.

15 Consultation Undertaken

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that the I&APs are informed of the Project;
- To provide the I&APs with an opportunity to engage and provide comment on the Project;
- To draw on local knowledge by identifying environmental and social concerns associated with the Project;
- To involve the I&APs in identifying methods in which concerns can be addressed;
- To verify stakeholder comments have been recorded accurately; and
- To comply with legal requirements.

No comments relating to fauna and flora were received during the SEP undertaken during the original EIA process.

16 Discussion and Conclusion

The Matai project area is located within the Dwaalboom Thornveld vegetation unit within the Central Bushveld bioregion. The vegetation unit occurs in the Limpopo and North-West Provinces. The vegetation unit is considered to be in a dry climate with a summer rainfall and very dry winters. The Mean Annual Precipitation (MAP) ranges between 500mm to 600mm. The unit is characterised by plains with scattered low to medium high trees and shrubs and a grass layer. *Vechelia tortillis* and *Vechelia nilotica.*

The field investigation consisted of random sampling throughout the prospecting area with more focused sampling within the opencast pit area and plant area. The vegetation within the project area was largely uniform and represented the Dwaalboom Thornveld vegetation. The unit has; however, been altered from the natural state. The tree layer was dominated by *Vechelia totilis* and *Vechelia nilotica*. The grass layer was dominated by *Digitaria eriantha* in some parts and *Cymbopogon pospischilii.* in other parts. Large areas of bare soil were observed within the project area. These bare areas seemed to be a natural occurrence as there were no signs of clearing and the bare areas were frequent and widespread. The overall plant diversity within the project area was considered low with only *Combretum imberbe* being a nationally protected tree species. The land uses within the local area has led to the modification of the natural vegetation and habitat structure. Several land uses were observed in the project area and these include crop cultivation, cattle grazing, roads and homesteads throughout the project.

The assessment for mammal species was conducted at desktop level and field investigation to determine the probability of occurrence of faunal species. The potential species that may occur within the project area were determined to be 66 in total. Of the 66 potential species, 11 were determined to be of conservation concern. The field investigation consisted of random sampling throughout the project area and pit area. Only two mammal species were confirmed on the site namely *Aepyceros melampus* (Impala) and *Canis mesomelas* (Black-backed Jackal). There were no mammal species of conservation concern identified within the project area.

A total of 340 bird species is expected to occur within the project area; however, a total of 11 were considered to be of conservation concern. The field survey was conducted by traversing the project area by vehicle and on foot. Visual observations and calls are the main identifiers of bird activity, with focus placed on areas around open water and tree canopies. A total of 6 bird species was positively identified within the project area. No birds of conservation concern were identified within the project area.

The desktop assessment identified 41 possible herpetofauna species within the project area. No herpetofauna of conservation concern was identified as occurring in the project area. There were no herpetofauna species identified during the field survey; however, there may be present. The habitat within the project area has been modified by the various land uses within the project area and local surrounds. Fauna species are sensitive to changes to habitat structures and will either migrate or be killed as a result of human-wildlife contact.

Furthermore, the lack of water within the area may have caused the faunal species to migrate away in search of water.

The impact assessment identified several impacts to the biodiversity as a result of the proposed project. The impacts during the construction phase will be brought about by the site clearing and establishment activities. The impacts during the construction phase were considered to medium to low pre-mitigation and low after mitigation. The impacts are considered low as the biodiversity of the site is considered low and mitigation measures further reduce the impact rating.

The impacts during the operational phase will be brought about by the operation of the mine, access roads and associated activities and are expected to be long term. The impacts were considered to be medium impacts pre-mitigation and post-mitigation. Although the cleared areas will not be increased, the impacts will be prolonged and as such impact is considered a medium impact.

Impacts during the closure and rehabilitation phase will be brought about by the activities relating to the removal of infrastructure, closing and sealing-off of pits and the final landscape shaping and vegetation. The impacts were considered medium impacts pre-mitigation and medium to low post-mitigation. The rehabilitation will not be able to restore the pre-mining condition; however, the mitigation measures will ensure it is as close as possible. The post-closure phase consists primarily of the monitoring of the final rehabilitation and remedying of any issues identified. The impacts are viewed as positive medium and low impacts with and without mitigation. The post-closure monitoring will aid in the assurance of successful rehabilitation.

17 References

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Appendix A: Possible Avifauna Species

Common Name	Species Name	Conservation Status
Apalis, Bar-throated	Apalis thoracica	
Avocet, Pied	Recurvirostra avosetta	
Babbler, Arrow-marked	Turdoides jardineii	
Babbler, Southern Pied	Turdoides bicolor	
Barbet, Acacia Pied	Tricholaema leucomelas	
Barbet, Black-collared	Lybius torquatus	
Barbet, Crested	Trachyphonus vaillantii	
Batis, Chinspot	Batis molitor	
Bee-eater, European	Merops apiaster	
Bee-eater, Little	Merops pusillus	
Bee-eater, White-fronted	Merops bullockoides	
Bishop, Southern Red	Euplectes orix	
Bishop, Yellow-crowned	Euplectes afer	
Bokmakierie, Bokmakierie	Telophorus zeylonus	
Boubou, Southern	Laniarius ferrugineus	
Brubru, Brubru	Nilaus afer	
Buffalo-weaver, Red-billed	Bubalornis niger	
Bulbul, African Red-eyed	Pycnonotus nigricans	
Bulbul, Dark-capped	Pycnonotus tricolor	
Bunting, Cape	Emberiza capensis	
Bunting, Cinnamon-breasted	Emberiza tahapisi	
Bunting, Golden-breasted	Emberiza flaviventris	
Bunting, Lark-like	Emberiza impetuani	
Bush-shrike, Grey-headed	Malaconotus blanchoti	
Bush-shrike, Orange-breasted	Telophorus sulfureopectus	
Bustard, Kori	Ardeotis kori	VU
Buttonquail, Kurrichane	Turnix sylvaticus	
Buzzard, Jackal	Buteo rufofuscus	
Buzzard, Lizard	Kaupifalco monogrammicus	
Buzzard, Steppe	Buteo vulpinus	
Camaroptera, Grey-backed	Camaroptera brevicaudata	
Canary, Black-throated	Crithagra atrogularis	
Canary, Yellow	Crithagra flaviventris	
Canary, Yellow-fronted	Crithagra mozambicus	
Chat, Familiar	Cercomela familiaris	
Cisticola, Cloud	Cisticola textrix	
Cisticola, Desert	Cisticola aridulus	
Cisticola, Lazy	Cisticola aberrans	
Cisticola, Levaillant's	Cisticola tinniens	
Cisticola, Rattling	Cisticola chiniana	

Cisticola, Wing-snapping	Cisticola ayresii	
Cisticola, Zitting	Cisticola juncidis	
Cliff-chat, Mocking	Thamnolaea cinnamomeiventris	
Coot, Red-knobbed	Fulica cristata	
Cormorant, Reed	Phalacrocorax africanus	
Cormorant, White-breasted	Phalacrocorax carbo	
Coucal, Burchell's	Centropus burchellii	
Courser, Temminck's	Cursorius temminckii	
Crake, Black	Amaurornis flavirostris	
Crombec, Long-billed	Sylvietta rufescens	
Crow, Cape	Corvus capensis	
Crow, Pied	Corvus albus	
Cuckoo, Black	Cuculus clamosus	
Cuckoo, Diderick	Chrysococcyx caprius	
Cuckoo, Great Spotted	Clamator glandarius	
Cuckoo, Jacobin	Clamator jacobinus	
Cuckoo, Klaas's	Chrysococcyx klaas	
Cuckoo, Levaillant's	Clamator levaillantii	
Cuckoo, Red-chested	Cuculus solitarius	
Cuckoo-shrike, Black	Campephaga flava	
Darter, African	Anhinga rufa	
Dove, Laughing	Streptopelia senegalensis	
Dove, Namaqua	Oena capensis	
Dove, Red-eyed	Streptopelia semitorquata	
Dove, Rock	Columba livia	
Drongo, Fork-tailed	Dicrurus adsimilis	
Duck, African Black	Anas sparsa	
Duck, Knob-billed	Sarkidiornis melanotos	
Duck, White-backed	Thalassornis leuconotus	
Duck, White-faced	Dendrocygna viduata	
Duck, Yellow-billed	Anas undulata	
Eagle, Booted	Aquila pennatus	
Eagle, Martial	Polemaetus bellicosus	VU
Eagle, Tawny	Aquila rapax	VU
Eagle, Verreaux's	Aquila verreauxii	
Eagle, Wahlberg's	Aquila wahlbergi	
Eagle-owl, Spotted	Bubo africanus	
Egret, Cattle	Bubulcus ibis	
Egret, Great	Egretta alba	
Egret, Little	Egretta garzetta	
Egret, Yellow-billed	Egretta intermedia	
Eremomela, Burnt-necked	Eremomela usticollis	
Eremomela, Yellow-bellied	Eremomela icteropygialis	

Falcon, Amur	Falco amurensis	
Falcon, Lanner	Falco biarmicus	NT
Falcon, Peregrine	Falco peregrinus	
Finch, Cuckoo	Anomalospiza imberbis	
Finch, Cut-throat	Amadina fasciata	
Finch, Red-headed	Amadina erythrocephala	
Finch, Scaly-feathered	Sporopipes squamifrons	
Firefinch, African	Lagonosticta rubricata	
Firefinch, Jameson's	Lagonosticta rhodopareia	
Firefinch, Red-billed	Lagonosticta senegala	
Fiscal, Common (Southern)	Lanius collaris	
Fish-eagle, African	Haliaeetus vocifer	
Flamingo, Lesser	Phoenicopterus minor	
Flycatcher, Fairy	Stenostira scita	
Flycatcher, Fiscal	Sigelus silens	
Flycatcher, Marico	Bradornis mariquensis	
Flycatcher, Pale	Bradornis pallidus	
Flycatcher, Southern Black	Melaenornis pammelaina	
Flycatcher, Spotted	Muscicapa striata	
Francolin, Coqui	Peliperdix coqui	
Francolin, Crested	Dendroperdix sephaena	
Go-away-bird, Grey	Corythaixoides concolor	
Goose, Egyptian	Alopochen aegyptiacus	
Goose, Spur-winged	Plectropterus gambensis	
Goshawk, Gabar	Melierax gabar	
Goshawk, Southern Pale Chanting	Melierax canorus	
Grebe, Black-necked	Podiceps nigricollis	
Grebe, Little	Tachybaptus ruficollis	
Greenbul, Yellow-bellied	Chlorocichla flaviventris	
Green-pigeon, African	Treron calvus	
Greenshank, Common	Tringa nebularia	
Guineafowl, Helmeted	Numida meleagris	
Hamerkop, Hamerkop	Scopus umbretta	
Harrier-Hawk, African	Polyboroides typus	
Hawk-eagle, African	Aquila spilogaster	
Helmet-shrike, White-crested	Prionops plumatus	
Heron, Black	Egretta ardesiaca	
Heron, Black-headed	Ardea melanocephala	
Heron, Goliath	Ardea goliath	
Heron, Green-backed	Butorides striata	
Heron, Grey	Ardea cinerea	
Heron, Purple	Ardea purpurea	
Heron, Squacco	Ardeola ralloides	

Hobby, Eurasian	Falco subbuteo	
Honeybird, Brown-backed	Prodotiscus regulus	
Honeyguide, Greater	Indicator indicator	
Honeyguide, Lesser	Indicator minor	
Hoopoe, African	Upupa africana	
Hornbill, African Grey	Tockus nasutus	
Hornbill, Red-billed	Tockus erythrorhynchus	
Hornbill, Southern Yellow-billed	Tockus leucomelas	
House-martin, Common	Delichon urbicum	
Ibis, African Sacred	Threskiornis aethiopicus	
Ibis, Glossy	Plegadis falcinellus	
Ibis, Hadeda	Bostrychia hagedash	
Indigobird, Dusky	Vidua funerea	
Indigobird, Purple	Vidua purpurascens	
Indigobird, Village	Vidua chalybeata	
Jacana, African	Actophilornis africanus	
Kestrel, Greater	Falco rupicoloides	
Kestrel, Lesser	Falco naumanni	
Kestrel, Rock	Falco rupicolus	
Kingfisher, Brown-hooded	Halcyon albiventris	
Kingfisher, Giant	Megaceryle maximus	
Kingfisher, Malachite	Alcedo cristata	
Kingfisher, Pied	Ceryle rudis	
Kingfisher, Striped	Halcyon chelicuti	
Kingfisher, Woodland	Halcyon senegalensis	
Kite, Black	Milvus migrans	
Kite, Black-shouldered	Elanus caeruleus	
Kite, Yellow-billed	Milvus aegyptius	
Korhaan, Northern Black	Afrotis afraoides	
Korhaan, Red-crested	Lophotis ruficrista	
Lapwing, African Wattled	Vanellus senegallus	
Lapwing, Blacksmith	Vanellus armatus	
Lapwing, Crowned	Vanellus coronatus	
Lark, Eastern Clapper	Mirafra fasciolata	
Lark, Fawn-coloured	Calendulauda africanoides	
Lark, Flappet	Mirafra rufocinnamomea	
Lark, Melodious	Mirafra cheniana	
Lark, Monotonous	Mirafra passerina	
Lark, Red-capped	Calandrella cinerea	
Lark, Rufous-naped	Mirafra africana	
Lark, Sabota	Calendulauda sabota	
Longclaw, Cape	Macronyx capensis	
Mannikin, Bronze	Spermestes cucullatus	

Marsh-harrier, African	Circus ranivorus	VU
Martin, Banded	Riparia cincta	
Martin, Brown-throated	Riparia paludicola	
Martin, Rock	Hirundo fuligula	
Masked-weaver, Lesser	Ploceus intermedius	
Masked-weaver, Southern	Ploceus velatus	
Moorhen, Common	Gallinula chloropus	
Moorhen, Lesser	Gallinula angulata	
Mousebird, Red-faced	Urocolius indicus	
Mousebird, Speckled	Colius striatus	
Mousebird, White-backed	Colius colius	
Myna, Common	Acridotheres tristis	
Neddicky, Neddicky	Cisticola fulvicapilla	
Night-Heron, Black-crowned	Nycticorax nycticorax	
Nightjar, Fiery-necked	Caprimulgus pectoralis	
Nightjar, Freckled	Caprimulgus tristigma	
Nightjar, Rufous-cheeked	Caprimulgus rufigena	
Olive-pigeon, African	Columba arquatrix	
Oriole, Black-headed	Oriolus larvatus	
Osprey, Osprey	Pandion haliaetus	
Ostrich, Common	Struthio camelus	
Owl, Barn	Tyto alba	
Owl, Marsh	Asio capensis	
Owlet, Pearl-spotted	Glaucidium perlatum	
Oxpecker, Red-billed	Buphagus erythrorhynchus	NT
Painted-snipe, Greater	Rostratula benghalensis	
Palm-swift, African	Cypsiurus parvus	
Paradise-flycatcher, African	Terpsiphone viridis	
Paradise-whydah, Long-tailed	Vidua paradisaea	
Parrot, Meyer's	Poicephalus meyeri	
Penduline-tit, Cape	Anthoscopus minutus	
Penduline-tit, Grey	Anthoscopus caroli	
Petronia, Yellow-throated	Petronia superciliaris	
Pigeon, Speckled	Columba guinea	
Pipit, African	Anthus cinnamomeus	
Pipit, Buffy	Anthus vaalensis	
Pipit, Bushveld	Anthus caffer	
Pipit, Long-billed	Anthus similis	
Pipit, Plain-backed	Anthus leucophrys	
Pipit, Striped	Anthus lineiventris	
Plover, Common Ringed	Charadrius hiaticula	
Plover, Kittlitz's	Charadrius pecuarius	
Plover, Three-banded	Charadrius tricollaris	

Pochard, Southern	Netta erythrophthalma	
Pratincole, Black-winged	Glareola nordmanni	
Prinia, Black-chested	Prinia flavicans	
Prinia, Tawny-flanked	Prinia subflava	
Puffback, Black-backed	Dryoscopus cubla	
Pytilia, Green-winged	Pytilia melba	
Quail, Common	Coturnix coturnix	
Quail, Harlequin	Coturnix delegorguei	
Quailfinch, African	Ortygospiza atricollis	
Quelea, Red-billed	Quelea quelea	
Robin-chat, Cape	Cossypha caffra	
Robin-chat, White-browed	Cossypha heuglini	
Robin-chat, White-throated	Cossypha humeralis	
Rock-thrush, Cape	Monticola rupestris	
Rock-thrush, Short-toed	Monticola brevipes	
Roller, European	Coracias garrulus	
Roller, Lilac-breasted	Coracias caudatus	
Roller, Purple	Coracias naevius	
Rush-warbler, Little	Bradypterus baboecala	
Sandgrouse, Yellow-throated	Pterocles gutturalis	
Sandpiper, Common	Actitis hypoleucos	
Sandpiper, Curlew	Calidris ferruginea	
Sandpiper, Wood	Tringa glareola	
Scimitarbill, Common	Rhinopomastus cyanomelas	
Scops-owl, African	Otus senegalensis	
Scops-owl, Southern White-faced	Ptilopsis granti	
Scrub-robin, Kalahari	Cercotrichas paena	
Scrub-robin, White-browed	Cercotrichas leucophrys	
Secretarybird, Secretarybird	Sagittarius serpentarius	NT
Seedeater, Streaky-headed	Crithagra gularis	
Shelduck, South African	Tadorna cana	
Shikra, Shikra	Accipiter badius	
Shrike, Crimson-breasted	Laniarius atrococcineus	
Shrike, Lesser Grey	Lanius minor	
Shrike, Magpie	Urolestes melanoleucus	
Shrike, Red-backed	Lanius collurio	
Shrike, Southern White-crowned	Eurocephalus anguitimens	
Snake-eagle, Black-chested	Circaetus pectoralis	
Snake-eagle, Brown	Circaetus cinereus	
Snipe, African	Gallinago nigripennis	
Sparrow, Cape	Passer melanurus	
Sparrow, Great	Passer motitensis	
Sparrow, House	Passer domesticus	

Sparrow, Southern Grey-headed	Passer diffusus	
Sparrowhawk, Black	Accipiter melanoleucus	
Sparrowhawk, Little	Accipiter minullus	
Sparrowhawk, Ovambo	Accipiter ovampensis	
Sparrowlark, Chestnut-backed	Eremopterix leucotis	
Sparrow-weaver, White-browed	Plocepasser mahali	
Spoonbill, African	Platalea alba	
Spurfowl, Natal	Pternistis natalensis	
Spurfowl, Swainson's	Pternistis swainsonii	
Starling, Burchell's	Lamprotornis australis	
Starling, Cape Glossy	Lamprotornis nitens	
Starling, Pied	Spreo bicolor	
Starling, Red-winged	Onychognathus morio	
Starling, Violet-backed	Cinnyricinclus leucogaster	
Starling, Wattled	Creatophora cinerea	
Stilt, Black-winged	Himantopus himantopus	
Stint, Little	Calidris minuta	
Stonechat, African	Saxicola torquatus	
Stork, Marabou	Leptoptilos crumeniferus	
Stork, White	Ciconia ciconia	
Stork, Yellow-billed	Mycteria ibis	NT
Sunbird, Amethyst	Chalcomitra amethystina	
Sunbird, Marico	Cinnyris mariquensis	
Sunbird, White-bellied	Cinnyris talatala	
Swallow, Barn	Hirundo rustica	
Swallow, Greater Striped	Hirundo cucullata	
Swallow, Lesser Striped	Hirundo abyssinica	
Swallow, Pearl-breasted	Hirundo dimidiata	
Swallow, Red-breasted	Hirundo semirufa	
Swallow, White-throated	Hirundo albigularis	
Swamphen, African Purple	Porphyrio madagascariensis	
Swamp-warbler, Lesser	Acrocephalus gracilirostris	
Swift, African Black	Apus barbatus	
Swift, Alpine	Tachymarptis melba	
Swift, Common	Apus apus	
Swift, Horus	Apus horus	
Swift, Little	Apus affinis	
Swift, White-rumped	Apus caffer	
Tchagra, Black-crowned	Tchagra senegalus	
Tchagra, Brown-crowned	Tchagra australis	
Teal, Cape	Anas capensis	
Teal, Hottentot	Anas hottentota	
Teal, Red-billed	Anas erythrorhyncha	

Tern, Whiskered	Chlidonias hybrida	
Thick-knee, Spotted	Burhinus capensis	
Thick-knee, Water	Burhinus vermiculatus	
Thrush, Groundscraper	Psophocichla litsipsirupa	
Thrush, Karoo	Turdus smithi	
Thrush, Kurrichane	Turdus libonyanus	
Tinkerbird, Yellow-fronted	Pogoniulus chrysoconus	
Tit, Ashy	Parus cinerascens	
Tit, Southern Black	Parus niger	
Tit-babbler, Chestnut-vented	Parisoma subcaeruleum	
Tit-flycatcher, Grey	Myioparus plumbeus	
Turtle-dove, Cape	Streptopelia capicola	
Vulture, Cape	Gyps coprotheres	VU
Vulture, Lappet-faced	Torgos tracheliotus	VU
Vulture, White-backed	Gyps africanus	VU
Wagtail, African Pied	Motacilla aguimp	
Wagtail, Cape	Motacilla capensis	
Warbler, Icterine	Hippolais icterina	
Warbler, Willow	Phylloscopus trochilus	
Waxbill, Black-faced	Estrilda erythronotos	
Waxbill, Blue	Uraeginthus angolensis	
Waxbill, Common	Estrilda astrild	
Waxbill, Orange-breasted	Amandava subflava	
Waxbill, Violet-eared	Granatina granatina	
Weaver, Cape	Ploceus capensis	
Weaver, Red-headed	Anaplectes rubriceps	
Weaver, Thick-billed	Amblyospiza albifrons	
Weaver, Village	Ploceus cucullatus	
Wheatear, Capped	Oenanthe pileata	
White-eye, Cape	Zosterops virens	
Whitethroat, Common	Sylvia communis	
Whydah, Pin-tailed	Vidua macroura	
Whydah, Shaft-tailed	Vidua regia	
Widowbird, Long-tailed	Euplectes progne	
Widowbird, Red-collared	Euplectes ardens	
Widowbird, White-winged	Euplectes albonotatus	
Wood-dove, Emerald-spotted	Turtur chalcospilos	
Wood-hoopoe, Green	Phoeniculus purpureus	
Woodpecker, Bearded	Dendropicos namaquus	
Woodpecker, Cardinal	Dendropicos fuscescens	
Woodpecker, Golden-tailed	Campethera abingoni	
Wren-warbler, Barred	Calamonastes fasciolatus	

Appendix B: Specialist CV

Ndumiso Dlamini

BSc Hons Botany (Pri. Sci. Nat.)

Cell: +27 71 343 1503

Email: ndumiso@niara.co.za

Profile Summary

Experience with mining projects in South Africa, parts of Africa and providing specialist input into ESHIAs and EMPs.

Specialist guidance, support and facilitation for the compliance with legislative processes, in South Africa as well as with IFC

Provide specialist and technical input for faunal, terrestrial (fauna and flora) ecology and wetland studies.

Areas of Interest

Renewable Energy and Urban & Infrastructure Development Projects, Sustainability and Conservation.

Rehabilitation of Wetlands and Land

Conservation of Water Resources

Publication of scientific journals and articles.

Key Experience

- Familiar with International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland Ecological Assessments
- Fauna and Flora Assessments
- Biodiversity Assessments
- Protected Plant Relocation
- Wetland Rehabilitation
- Mine Rehabilitation
- Monitoring Programmes

Countries worked in

South Africa

Malawi

Mozambique

Zambia

Nationality

South African

Qualifications

- BSc Honours (University of Johannesburg) – Botany
- BSc Life and Environmental Science
- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2015
- Wetland Rehabilitation (Certificate of Competence) – University of Free Sate 2015

RELEVANT PROJECT EXPERIENCE

Project Name: The Baseline Environmental Assessment and Rehabilitation of Anker Coal Mining Operation (Golfview and Elandsfontein Operations)

Client: Anker Coal

Personal position / role on project: Terrestrial Ecology Specialist and Wetland Rehabilitation

Location: Ermelo, South Africa (2015).

Main project features: To identify and map the ecological factors and provide input and guidance for the rehabilitation of wetland areas and to support contractor activities.

Project Name: Environmental Studies for the Liwonde Dry Port

Client: Mota Engil.

Personal position / role on project: Terrestrial Ecology specialist.

Location: Liwonde, Malawi (2015).

Main project features: To determine the current status of the environment and assess potential risks to the environment.

Project Name: The relocation and post-relocation monitoring of *Khadia carolinensis* plants at the Exxaro Eerstelingsfontein Coal Mine.

Client: Exxaro.

Personal position / role on project: Botanist.

Location: Belfast, South Africa (2014 – 2015).

Main project features: Determine suitable relocation habitat for plants and monitor the success of the relocation of the plants.

Project Name: Wetland Impact Assessment for the Northern Coal Jagust Colliery

Client: Northern Coal

Personal position / role on project: Wetland Specialist.

Location: Carolina, South Africa (2015).

Main project features: Delineate and assess the health of wetland areas and provide mitigation measures for potential impacts on wetland areas.

Project Name: Environmental Impact Assessment for the Ixia Imvula Opencast Coal Mine

Client: Ixia Coal.

Personal position / role on project: Wetland Specialist

Location: Secunda, South Africa (2015 – 2016).

Main project features: Conduct a wetland delineation and impact assessment for the proposed opencast mine and river diversion.

Project Name: Water Resource Risk Assessment for several infrastructure development projects (Pipelines, Roads, Residential and Commercial Housing)

Client: Department of Roads and Transport, Various Municipalities

Personal position / role on project: Wetland Specialist.

Location: KwaZulu-Natal, Gauteng, Limpopo, South Africa (2016 – 2018).

Main project features: Delineate and assess the health of wetland areas and provide mitigation measures for potential impacts on wetland areas.

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Conducting onsite investigations of Flora, Fauna and Wetlands;
- Conducting research on ecology and compile technical reports;
- Conduct assessments for rehabilitation of wetlands, compile reports and monitor the progress of rehabilitation of wetlands;
- Conduct and complete Alien Invasive Plant Management Plans;
- Project and budget management;
- Proposal compilation and client liaison;
- Compile integrated biodiversity reports; and
- Complete legislative and regulatory authorisation processes for various projects, which include Environmental Impact Assessments, Basic Assessments and Water Use License Applications, Environmental Management Plans and consult with state departments on legal frameworks.

TRAINING

Some of the more pertinent training undergone include the following:

- Tools for Wetland Delineation Course (Certificate of Competence) – Rhodes University 2015
- Wetland Rehabilitation Methods and Techniques – University of Free State 2015
- Alien Invasive Species Identification and Management – 2016
- Grass Identification – 2017 Land-Use Management Training

EMPLOYMENT EXPERIENCE

EMPLOYMENT: Niara Environmental Consultants (December 2016 – Present)

I was employed as the Ecology Lead Specialist and tasked management of the unit and with providing specialist input into Environmental Impact Assessments and other biodiversity projects. Key focus areas included:

- Wetland Assessments;
- Wetland Rehabilitation;
- Fauna and Flora Assessments;
- Alien Invasive Plant Management; and
- Biodiversity Assessments.

PREVIOUS EMPLOYMENT: The Biodiversity Company (March 2016 – October 2018)

I am currently employed with The Biodiversity Company as an Environmental Consultant. My key responsibilities are to conduct specialist studies of Wetland Assessments, Ecological Assessments and Biodiversity Assessments. Key focus areas include:

- Wetland and Riparian Assessments;
- Wetland Rehabilitation;
- Vegetation Assessments;
- Alien Invasive Plant Management; and
- Biodiversity Assessments.

PREVIOUS EMPLOYMENT: Digby Wells Environmental (May 2014 – February 2016)

I was employed in role of Junior Ecologist and was tasked with providing specialist input into Environmental Impact Assessments and other biodiversity projects. Key focus areas included:

- Wetland Assessments;
- Wetland Rehabilitation;
- Fauna and Flora Assessments;
- Alien Invasive Plant Management; and
- Biodiversity Assessments.

PREVIOUS EMPLOYMENT: University of Pretoria – Genetics Department

- October 2012 – April 2014: Junior Genetic Researcher
  - Researcher
  - Technical assistant for fieldwork
  - Reporting writing
  - Project management

GENERAL SKILLS

Literacy	Read, write and speak English fluently. Read, write and speak Afrikaans. Read, write and speak IsiZulu fluently. Speak and understand other indigenous South African languages.
Generic	Advanced user of Microsoft Office applications.
Mapping	Introductory skill level for ArcGIS and Quantum GIS.

ADDITIONAL EXPERIENCE

Control officer	Acting as an independent Environmental Control Officer (ECO), acting as a quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts
Public consultation	The provision of specialist input in order to communicate project findings as well as assist with providing feedback if and when required.
Water use licenses	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.

ACADEMIC QUALIFICATIONS

University of Johannesburg (UJ), Johannesburg, South Africa (2011): BACCALAUREUS SCIENTIAE HONORIBUS (Hons) – Botany

University of Johannesburg (UJ), Johannesburg, South Africa (2008 - 2010): BACCALAUREUS SCIENTIAE IN LIFE AND ENVIRONMENTAL SCIENCES. Majors: Biochemistry and Botany.