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Report Version:	2020.07.20.01	Email:	riaan@bathusi.org
Report Type:	DRAFT REPORT	Tel:	+27 (0)12 658 5579

BIODIVERSITY SCOPING ASSESSMENT REPORT FOR THE PROPOSED VYGENHOEK MINING PROJECT ON PORTIONS 3 AND 7 OF THE FARM VYGENHOEK 10-JT SITUATED NEAR LYDENBURG IN THE MPUMALANGA PROVINCE

compiled by

BATHUSI ENVIRONMENTAL CONSULTING

Riaan A. J. Robbeson (Pr.Sci.Nat.)

prepared for

ENVIRONMENTAL MANAGEMENT ASSISTANCE

1 PROJECT DETAILS

Client:	Environmental Management Assistance (Pty) Ltd, on behalf of Nomamix (Pty) Ltd
Report name:	Biodiversity Scoping Assessment Report for the proposed mining project on Portions 3 and 7 of the Farm Vygenhoek 10-JT, situated near Lydenburg in the Mpumalanga Province
Report type:	Biodiversity Scoping Assessment Report
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Date of release:	15th July 2020
Report compiled by:	Riaan A. J. Robbeson (Pr.Sci.Nat.) (Bathusi Environmental Consulting)

2 REPORT REFERENCE

When used as a reference, or included as an addendum, this report should be cited as:
Bathusi Environmental Consulting cc. Biodiversity Scoping Assessment Report for the proposed mining project on Portions 3 and 7 of the Farm Vygenhoek 10-JT, situated near Lydenburg in the Mpumalanga Province. Reference Number EMA – VGH – 2020/11, Version 2020.07.20.01.

3 CONTRIBUTING SPECIALISTS

The Natural Scientific Professions Act (South Africa, No. 27 of 2003) aims to 'provide for the establishment of the South African Council of Natural Scientific Professions (SACNASP), and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith'.

Quoting the Natural Scientific Professions Act: '*Only a registered person may practice in a consulting capacity*' (20(1) – pg 14).

Table 1: Contributing biodiversity specialists for this project	
Ecological and Botanical Specialist	*Riaan Robbeson (Pr.Sci.Nat.)*
Qualification:	M.Sc. (Plant Ecology), University of Pretoria
Affiliation:	South African Council for Natural Scientific Professions
Fields of Expertise:	Botanical Scientist & Ecological Scientist
Registration Number:	400005/03
Affiliation:	South African Wildlife Management Association
Affiliation	South African Association of Botanists
Affiliation:	Zoological Society of Southern Africa (ID872)
Faunal and Avifaunal Specialist:	*Lukas Niemand (Pr.Sci.Nat.)*
Qualification:	M.Sc. (Restoration Ecology), University of Pretoria
Affiliation:	South African Council for Natural Scientific Professions
Fields of expertise:	Ecological Scientist & Zoological Scientist
Registration number:	400095/06
Affiliation:	Birdlife South Africa (1039913)
Affiliation:	Hartbeespoort Natural Heritage Society

4 REPORT NAVIGATION

5 LIST OF FIGURES

6 LIST OF TABLES

7 DECLARATION OF INDEPENDENCE

We, the undersigned, acting in a capacity as specialist biodiversity consultants, and the legal representatives of the respective companies (Bathusi Environmental Consulting, Pachnoda Consulting), declare that:

⇒ We acted as independent specialist consultants conducting this biodiversity scoping assessment and preparing this report;

⇒ We performed all activities associated with this project in line with all relevant legislation and complied with ethical requirements related to our profession;

⇒ At the time of completing this report, we did not have any interest, hidden or otherwise, in the proposed development or activity, as outlined in this document, other than fair financial compensation for work performed in a professional capacity, as specified by the National Environmental Management Act (No 107 of 1998) (2014) Regulations GNR 983 and GNR 986, as amended in 2017;

⇒ As affiliated members, we consider ourselves bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);

⇒ Neither BEC, nor Pachnoda Consulting are subsidiaries, legally or financially, of Environmental Management Assistance (Pty) Ltd (EMA) or Nomamix (Pty) Ltd;

⇒ We shall not be affected in any manner by the outcome of the environmental process of which this report and biodiversity assessments form part of, other than being part of the general public;

⇒ We do not necessarily object to or endorse the proposed development, but aim to present facts and recommendations based on scientific data and relevant professional experience;

⇒ We do not have any influence over decisions made by the governing authorities; and

⇒ We undertake to disclose to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2005;

Riaan A. J. Robbeson (Pr.Sci.Nat.)	Lukas J. Niemand (Pr.Sci.Nat.)
on behalf of Bathusi Environmental Consulting cc	*on behalf of Pachnoda Consulting*

20th July 2020

8 LIMITATIONS AND ASSUMPTIONS

- ⇒ It is assumed that third party information (obtained from government, academic/research institution, non-governmental organisations) is accurate and true.
- ⇒ Some of the datasets are out of date and therefore extant distribution ranges may have shifted although these datasets provide insight into historical distribution ranges of relevant species.
- ⇒ The datasets are mainly small-scale and could not always consider azonal habitat types that may be present on the study site (e.g. dams and wetland areas). In addition, datasets often encompass surface areas larger than the study site, which could include habitat types and species that are not present on the study area. Therefore, the potential to overestimate species richness is highly likely while it is also possible that certain cryptic or specialist species could have been overlooked in the past.
- ⇒ Some of the datasets (e.g. SABAP2) managed by the Animal Demography Unit of the University of Cape Town were recently initiated and therefore incomplete, or exhibit a comparative high paucity of accurate information in certain geographical areas.
- ⇒ In order to obtain a comprehensive understanding of the dynamics of terrestrial faunal assemblages and local floristic diversity patterns, with particular reference to endemic, rare, or threatened species in any area, biodiversity assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, such long-term studies are not part of the terms of reference for a scoping assessment.
- ⇒ This report is scaled to present a 'scoping phase' level of information and is by no means considered comprehensive, it is nonetheless regarded sufficient to present a broad-scale overview of the terrestrial biodiversity attributes of the receiving environment, based on a desktop assessment and brief site reconnaissance.
- ⇒ It should be emphasised that information, as presented in this document, only has reference to the study site. The information in this report was sourced from third parties and was not verified in the field - therefore this information cannot be applied to any other area without detailed investigation.
- ⇒ It is not the purpose of this report to provide detail, decisive information, but merely to highlight issues or concerns that should be addressed during the Environmental Impact Assessment (EIA) phase.
- ⇒ Additional information may come to light during a later stage of the process or development and the authors therefore withhold the right to amend this report, results, and recommendations when additional and/ or supporting information becomes available.

10 EXECUTIVE SUMMARIES

(Nomamix (Pty) Ltd) has appointed Environmental Management Assistance (Pty) Ltd as the Environmental Assessment Practitioners (EAP) to compile and submit the Environmental Scoping Report (ESR) as part of the application for mining rights of Portions 3 and 7 of the Farm Vygenhoek 10-JT, which is situated within the Thaba Chweu Municipality of Mpumalanga Province. The site (in totality) comprises approximately 720 ha. Mining of the minerals is planned via an opencast section on the western part of the site, with appurtenant infrastructure, including infrastructure roads, offices and workshops, river crossings to access the pits, temporary waste dumps and stockyard areas.

Bathusi Environmental Consulting, in collaboration with Pachnoda Consulting, has been appointed to appraise the biological environment for this scoping report and identify preliminary sensitivity of the receiving environment. To execute this scoping assessment, a brief site investigation was conducted during the 6th and 7th July 2020.

10.1 BIOPHYSICAL ENVIRONMENT

The proposed site comprises mostly of natural woodland and grassland habitat. Subsistence agricultural activity and settlements characterise the southern part of the site where slopes are gentle, and soils are deeper and less rocky. Land capability is generally low and not economically sustainable.

The study area is situated within the Ib and Ab land types. Topographic placement is defined by the dominant soil forms, with Mispah and overlying Hutton (brown to reddish-brown, structure-less to weakly structured, sandy clay loam topsoil on reddish-brown subsoil on rock) forms predominate the higher lying areas, while low lying areas are dominated by dark brown to black, moderately structured crumbly clay topsoil on strongly structured clay subsoils. The geology of the region is complex, also reflected by the generous topographical variability of the region, ranging from plains to mountainous areas. Elevation ranges from the highest point of 1,490 m on top of the spur, to 1,275 m within the valley located at the north-western edge of the project site. General topographical drainage appears to be in a north north-westerly direction from the project site

Rain is received predominantly in the form of showers and thunderstorms between October and March, ranging from 685 to 710 mm per annum. Summers are generally warm and temperatures rarely exceed 30°C and winters are mild with the lowest average temperatures of approximately 9°C occurring in June and July.

The Dwars River (a tributary of the Steelpoort River which eventually flows into the Olifants River) traverses the project area flowing in a northerly direction and is considered to be a critically endangered biophysical attribute. Considering the planned mining activity, significant impacts on the status of this river is anticipated. A second drainage line and small, non-perennial tributaries traverses the eastern part of the site in a northern direction. The nature of this stream is dimorphic, traversing grasslands and plains systems in the southern part of the site, but changing to a woodland/ savanna nature in the northern part of the site where a significant drop in altitude occurs, forming a considerable waterfall. The location of this small river is such that little effects from the planned mining activity is anticipated.

The Mpumalanga Biodiversity Sector Plan information source categorises the proposed site mostly as 'Other Natural Areas', while deteriorated areas (anthropogenic) are encapsulated in Moderately and Heavily modified areas. The author is in general agreement with this categorisation. However, the local importance of the Vulnerable Sekhukhune Montane Grassland and the critical importance of the Dwars Rivier are not adequately reflected.

A review of available information pertaining to the presence of declared and informal protected areas in the immediate region of the proposed site indicates the general sensitivity and level of conservation efforts, with numerous nature reserves, conservancies and protected areas situated within proximity to the site. The Sekhukhuneland Centre of Plant Endemism (a threatened ecosystem) and De Berg Conservancy (bordering the site to the west) is of particular importance to this site.

10.2 BOTANICAL SCOPING ASSESSMENT

The following key results were obtained from the Botanical Scoping Assessment:

⇒ The study site is spatially situated across the ecotonal interface of the Grassland and Savanna Biomes, specifically comprising of the Sekhukhune Montane Grassland (Vulnerable) in the western part of the study site and Sekhukhune Mountain Bushveld (Least Concern) comprising the eastern part of the study site.

⇒ Information extracted from the NEWPOSA information source (2020) provides for the known high floristic diversity of the general region, with approximately 556 plant species within ¼-degree grid 2530AA, reflecting the ecotonal convergence between the Grassland and Savanna Biomes, as well as manifesting as numerous and complex ecological types and micro-habitat types.

⇒ Results of the brief site investigation confirmed the natural (unperturbed) status of the vegetation and the comparatively high floristic diversity, correlating to the disparity in physiognomic attributes (savanna vs grassland, plains vs ridges and outcrops).

⇒ A review of web-based information and recent surveys conducted in the general surrounds of the study site revealed the known presence of numerous plants species of conservation consideration within the immediate region, reflecting on the local and regional importance of remaining natural habitat. EIA surveys would therefore need to consider various seasonal assessments to accurately evaluate the presence and abundance of these plants within the proposed development footprints.

⇒ The vegetation of the site is highly complex, correlating to a multitude of biophysical attributes, including underlying geology, soils, soil depth, slopes and aspects, and rockiness/ exposed rock and manifesting as mosaical interrelated grassland, savanna and wetland habitat types. An appraisal of physiognomic attributes and results of a brief site investigation revealed the presence of the following preliminary and broad-scale habitat types within the site (to be sampled, delineated, mapped, and described during the EIA phase of the project):
  - *Themeda – Tristachya* rocky grassland plains and crests (medium-high floristic sensitivity);
  - *Eragrostis* grassland plains and deteriorated grassland (high floristic sensitivity);
  - Erosion Gulleys (medium-low floristic sensitivity);
  - Perennial and non-perennial drainage lines and associated hydromorphic vegetation types (high floristic sensitivity);
  - *Lydenburgia - Maytenus* Wooded Rocky Midslopes and Thickets (medium-high floristic sensitivity);
  - *Acacia* thickets (medium floristic sensitivity); and
  - *Maytenus – Cussonia* (medium-high floristic sensitivity);

⇒ The following list of generic impacts on the floristic environment is anticipated.
  1. Impacts on/ losses of taxa of conservation importance and habitat associated with conservation important taxa;
  2. Local depletion of biodiversity, harvesting, etc.;
  3. Loss of natural habitat, including essential habitat refugia, atypical and unique/ restricted habitat types, ecological processes, services, and infrastructure (within the study area).
  4. Deterioration of untransformed habitat in areas surrounding the project area, with specific reference to sensitive habitat types/ species situated in proximity to the activity;
  5. Altered quality and ecological functionality (including fire, erosion) of surrounding areas and natural habitat;
  6. Decreased aesthetic appeal of the landscape;

7. Increased plundering of natural resources due to increased human encroachment, accessibility to the site, etc.;
8. Exacerbation of existing levels of habitat fragmentation and isolation; and
9. Cumulative impacts on local/ regional and national conservation targets and obligations (loss of natural grassland habitat);

⇒ Considering the suggested project layout, impacts on the botanical receiving environment are likely to be significant and high. Aspects that will contribute to the significance include the known presence of protected plant species and habitat that is sensitive and important on a local and regional scale.

⇒ Indirect impacts are generally interpreted with an analysis of nearby and adjacent habitat types in mind. Considering the proximity to sensitive and important riparian habitat, and the dictating topographical nature of the site, anticipated indirect impacts are likely to be severe and significant.

⇒ The comparative small size of the proposed project will result in losses of some natural habitat on a local scale. While these losses are significant on a local scale, the regional significance is anticipated to be comparatively low. However, the increase of mining activities on a local and regional scale will have devastating effects on areas of remaining natural habitat. In particular, conservation efforts within a region where few formalised and legal protective efforts are present, will be affected adversely. Aspects such as habitat fragmentation and isolation, increased pressure from anthropogenic influx to the area and increased activities will undoubtedly result in significant long-term effects.

Despite anticipated significant and high impacts on the botanical receiving environment, no aspects was noted that would require the enforcement of the 'No-Go' Option for this project. Typically, this would constitute the known presence of Critically Endangered habitat or species within the proposed footprint and the undeniably impacts from the proposed development on these habitat or species. The obvious high sensitivity of the floristic receiving environment, as well as the known presence of numerous plant species of (lower) conservation consideration, will inevitably result in impacts of a severe and significant nature, but the development of an extensive and detailed mitigation approach is likely to render most of the potential and likely impacts of an acceptable/ manageable nature and significance. Such a mitigation approach is likely to be costly and extensive, with possible liabilities that might include an extensive monitoring plan and (possibly) Biodiversity Offset Strategy.

10.3 FAUNAL AND AVIFAUNAL SCOPING ASSESSMENT

Pachnoda Consulting cc conducted a terrestrial avifauna and faunal scoping evaluation report for the mining rights application of Portions 3 and 7 of the Farm Vygenhoek 10-JT, which is situated within the Thaba Chweu Municipality of Mpumalanga Province. The main objectives of the scoping exercise were to:

⇒ describe the relevant baseline habitat conditions relating to the avifaunal and faunal community on the study site;

⇒ provide an overview of the expected bird and fauna diversity that could occur on the study site;

⇒ conduct a desktop and literature review of threatened, near threatened and conservation important bird and faunal species (including invertebrate taxa) that could occur on the proposed study site;

⇒ provide an overview of potential impacts on the faunal community related to the anticipated mining operations; and

⇒ provide recommendations and ecological guidelines for a 'Plan of Study' to be used during the EIA process.

The information provided in this report (as part of a scoping phase) was sourced from (1) relevant literature, (2) personal observations from similar habitat types, and (3) an orientation site visit (06-07 July 2020) season.

The following key considerations pertaining to the faunal and avian environment were identified and noted:

⇒ A total of 69 mammal species could potentially occur on the study site, of which 50 species (72 % of expected richness) have a high probability of occurrence.

⇒ Nine threatened and near threatened mammal species could occur on the study site, which included two endangered species, three vulnerable species and four near threatened species. Of these, the vulnerable Leopard (*Panthera pardus*), vulnerable Cohen's Horseshoe Bat (*Rhinolophus cohenae*), near threatened Serval (*Leptailurus serval*), near threatened Brown Hyaena (*Parahyaena brunnea*) and near threatened African Clawless Otter (*Aonyx capensis*) have a high probability to be present.

⇒ Approximately 12 frog species could occur on the study area, of which none are classified as threatened or near threatened species.

⇒ The reptile composition on the study site was poorly known with only 21 species currently known from 2530AA. The various outcrops on the study site provided habitat for two lizard species of conservation concern namely the Sekhukhune Flat Lizard (*Platysaurus orientalis orientalis*) and the FitzSimons' Flat Lizard (*Platysaurus orientalis fitzsimonsi*).

⇒ Approximately 249 bird species were expected to occur on the wider study area (including adjacent habitat), of which 92 species were observed during the orientation site visit of July 2020.

⇒ A total of nine bird species of conservation concern have been recorded in the wider study area which included seven threatened species and two near threatened species.

⇒ The vulnerable Southern Bald Ibis (*Geronticus calvus*) was observed on the study site during the orientation site visits.

⇒ A number of invertebrate species of conservation concern could potentially occur on the study site, of which the restricted range cicada species, namely *Pycna sylvia* is known to be present on the Farm Vygenhoek 10.

⇒ A number of potential impacts were anticipated during the proposed mining operations, especially when corresponding to the various habitat units on the study site. These would include:

Results of this faunal and avian scoping assessment indicates that the proposed mining operations will potentially have the following negative issues (impacts):

⇒ Direct and permanent loss of natural fauna habitat within the development/mining footprints during the construction, operational and also the decommissioning phases. The decommissioning or closure phase will entail rehabilitation of the lost habitat.

⇒ Direct loss of fossorial fauna taxa, taxa of low mobility and/or habitat specialists (e.g. flightless invertebrates, nymphs of *Pycna sylvia*, rupicolous taxa) confined to rocky substrates;

⇒ Indirect loss of threatened and near threatened bird and mammal species due to the displacement from the area during the construction and operational phases;

⇒ Decreased habitat quality of surrounding areas due to peripheral impacts such as spillages, litter, increased erosion, contaminants, etc.

⇒ Indirect ecological impacts at all phases pertaining to the loss of the ecological connectivity across the study site and regional habitat fragmentation associated with negative impacts on population viability;

⇒ Increased plundering of natural resources and poaching of wildlife due to increased human encroachment and accessibility to the site;

⇒ Subsequent habitat change and changes to the local fauna community structure and composition (mainly generalists and secondary species) during decommissioning/rehabilitation; and

⇒ Cumulative impacts on local/regional and national conservation targets and obligations (e.g. loss of natural grassland habitat).

Results of this scoping assessment, based on an appraisal of available information and a brief site reconnaissance survey, indicate the high faunal sensitivity of most of the site.

The nature and significance of anticipated impacts on the faunal and avian receiving environment is likely to be locally significant, but with a diminishing significance on a regional scale. Certain habitat types, notably those that will be directly affected by the mining activities, exhibit attributes of high sensitivity and the effect of habitat destruction and disruptive activities within the mining sites as well as habitat spatially situated within proximity of the activities, will undoubtedly be severe. It should be noted that no Red Flag was identified during this particular assessment, it should be noted that the potential presence of several conservation important species from the site could result in unacceptably high impacts. A comprehensive EIA and compilation of a dedicated EMPr for the proposed development will likely result in lower (but still comparatively high) significance levels of impacts on the faunal and avian environment.

11 ACRONYMS & ABBREVIATIONS

Table 2: Acronyms and abbreviations in the report

ADU	Animal Demography Unit, Department of Biological Sciences, University of the Western Cape
BEC	Bathusi Environmental Consulting cc
CBD	Convention on Biological Diversity
CITES	Convention of International Trade in Endangered Species
CR	Critically Endangered
DD	Data Deficient
EA	Environmental Authorisation
EMP	Environmental Management Plan
EN	Endangered
End	Endemic Species
GPS	Global Positioning System (handheld device)
IBA	Important Bird Area
IR	Infra Red (camera, stationary)
IUCN	International Union for Conservation of Nature
LC	Least Concern
mmasl	Mean Meters Above Sea Level, or m.
NEnd	Near Endemic Species
NT	Near Threatened
Pr.Sci.Nat	Professional Natural Scientist (registered at SACNASP)
RoD	Record of Decision
SABAP	South African Bird Atlas Project
SACNASP	South African Council for Natural Scientific Professions
SCC	Species of Conservation Concern
SSC	Species of Special Concern
VU	Vulnerable+BA2:B42

12 GLOSSARY OF TERMS

Table 3: Glossary of terms for the report	
Abundance	The quantity, number or amount of a species present in a particular area or sample
Ad hoc	Random, non-sequential, opportunistic observations
Altitude	Expressed as mean meters above sea level (mmasl), or meter (m)
Amphibian	a cold-blooded vertebrate animal of a class that comprises the frogs, toads, newts, salamanders, and caecilians
Antelope	Swift running, deer-like ruminant with smooth hair and upward-pointing horns
Anthropogenic	Human induced
Austral	Southern hemisphere
Avifauna	Birds
Biodiversity	Diversity among and within plant and animal species in an environment
Carnivore	Flesh eating animal
Commute	Travel between destinations, normally on a daily basis
Composition	Constituents (animals or plants) of a sample, or area
Conspecific	Animals or plants belonging to the same species
Data Deficient	Species has been categorized (UICN) as offering insufficient information for a proper assessment of conservation status to be made
Density	Number of individuals in a given area
Disjunct	Disjoined or distinct from one another
Diversity	Number of species in a given area
Dominance	The predominance (abundance, numbers) of one or more species in a plant or animal community
Dwarf shrub	A plant that bears hibernating buds on persistent shoots near the ground, usually woody plants with perennating buds borne close to the ground, usually less than 25 centimetres above soil surface
Ecology	The branch of biology that deals with the relations of organisms to one another and to their physical surroundings
Endemic	Restricted to a certain geographic area
Granivore	Animals that eat seeds as the main part of their diet
Herbaceous	Vascular plants that have no persistent woody stems above ground
Herbivorous	Animals that eat plants
Herpetofauna	Amphibians and Reptiles
Hibernate	An animal or plant that spends the winter in a dormant state
Insectivorous	Animals that feed on insects as the main part of their diet
Invertebrate	An animal lacking a backbone, such as an arthropod, mollusc, annelid, coelenterate, etc
Lepidoptera	Butterflies
Mesic	An environment or habitat) containing a moderate amount of moisture
Mammal	A warm-blooded vertebrate animal of a class that is distinguished by the possession of hair or fur, females that secrete milk for the nourishment of the young and (typically) the birth of live young
Nocturnal (animal)	Animals that are active during night periods
Omnivorous	Animals that feed on a variety of foot of both animal and plant origin
Passerine	Relating to or denoting birds of a large order distinguished by having feet that are adapted for perching, including all songbirds
Predator	Animals that naturally preys on other animals, species
Primate	Animals characterized by large brains relative to other mammals, as well as an increased reliance on stereoscopic vision at the expense of smell, the dominant sensory system in most mammals
Putative species	Species that are assumed to exist, or reputed to have existed
Rainfall	Expressed as millimetre (mm)
Red Data	A taxon included in the UICN list of threatened species
Reptile	Tetrapod animals in the class Reptilia, comprising today's turtles, crocodilians, snakes, amphisbaenians, lizards, etc
Rodent	Gnawing mammal of an order that includes rats, mice, squirrels, hamsters, porcupines, and their relatives, distinguished by strong constantly growing incisors and no canine teeth. They constitute the largest order of mammals
Scavenger	An animal that feeds on carrion, dead plant material, or refuse materials
Subterranean	Existing, living under the earth's surface
Territorial	The sociographical area that an animal of a particular species consistently defends against conspecifics (or, occasionally, animals of other species). Animals that defend territories in this way are referred to as territorial. Territoriality is only shown by a minority of species.
Temperature	Expressed as Degrees Celsius (°C)
Threatened	Species (including animals, plants, fungi, etc.) which are vulnerable to endangerment in the near future. Species that are threatened are sometimes characterised by the population dynamics measure of critical dispensation, a mathematical measure of biomass related to population growth rate

13 INTRODUCTION

Most countries are experiencing rapid and extensive rates of biodiversity losses, primarily because of development-related habitat conversion. Concern over the extent of these global declines in biodiversity, and their effects on human wellbeing, have triggered national and international agreements to reduce or halt these trends. The 2002 commitment of the Convention on Biological Diversity (CBD) *'to achieve, by 2010, a significant reduction in the current rate of biodiversity loss at the global, regional and national levels'* is one such example. The Convention on Biological Diversity's '2010 target' has sparked the creation of national and global biodiversity monitoring systems with which to measure progress towards this and other policy targets.

Southern Africa is globally renowned as a megadiverse region that harbours an exceptional number of species in relation to most other countries. On par with its exceptional endowments of biodiversity and ecosystems, is southern Africa's mineral wealth and the mining industry that unlocks this wealth is a long-standing and pivotal driver of the economy, playing a vital role in the growth and development of Africa and its economy. Since the earliest discoveries of minerals in the region, this rich endowment of mineral resources has been a key driver of southern Africa's social and economic development. Mining continues to be one of the most significant sectors of our economy, providing jobs, growing the Gross Domestic Productivity (GDP) and building relations with international trading partners. However, mining and related activities have had significant impacts on biodiversity and ecosystem services (e.g. delivery of high quality water); often causing irreversible and often large-scale habitat loss, at times across large areas or areas that are important to the provision of critical life supporting services, particularly water-related services.

This rich biodiversity and valuable ecological infrastructure of the southern African region underpin and support the social and economic development in numerous direct and indirect ways. Sustaining the goods and services that flow from ecosystems, and the benefits that these provide over the long term, will require limits in mining and other activities in certain areas. The Constitution of Lesotho and the laws stemming from it recognises the vital role of both ecological and mineral resources in a development path built upon the socially just, environmentally sustainable, and economically efficient use of these resources. These are not necessarily opposing objectives, and if pursued carefully, enable people to strive towards the principles and progressively realise the rights outlined in the constitution.

Although the legacy of the mining industry is not always good when it comes to social and environmental impacts, opportunities exist at every stage of the mining life cycle to reduce the impacts of mining on land use, greenhouse gas emissions, water and biodiversity, and increase the benefits to nearby communities. Mitigation of adverse impacts on biodiversity and ecosystem services is a legal requirement and should consider the significance of impacts and the area being affected. Effective mitigation therefore requires proactive planning that is enabled by following a mitigation hierarchy. The application of a mitigation hierarchy is intended to avoid disturbance of ecosystems and loss of biodiversity; where deleterious impacts cannot be avoided, it should be minimised, rehabilitated, or offset significant residual negative impacts on biodiversity. This approach lays the groundwork for integrating relevant biodiversity information into decision making at every stage of the mining life cycle about how best to avoid, minimise or remedy biodiversity impacts to support sustainable development.

Southern Africa's mineral endowment implies that mining and the natural environment will continue to interact, and a co-operative approach is therefore needed to achieve prosperity and sustainability. Without the integrity of natural systems, there will be no sustained long-term economic growth or life. In pursuit of a developmental pathway, a shared vision of sustainability has emerged as a strong driver of industry values and societal behaviour. Conservation of biodiversity is therefore crucial. Noss (1999) outlined four general goals for the conservation of biodiversity, including:

1 Represent all kinds of communities or ecosystems across their natural range of variation in a system of protected areas;
2 Maintain or restore viable populations of all native species in natural patterns of abundance and distribution;
3 Sustain key geomorphological, hydrological, ecological, biological, and evolutionary processes within normal ranges of variation, while being adaptable to a changing environment; and
4 Encourage human uses that are compatible with the maintenance of ecological integrity, and discourage those that are not.

14 PROJECT SYNOPSIS AND SITE LOCATION

The client (Nomamix (Pty) Ltd) has appointed Environmental Management Assistance (Pty) Ltd as the Environmental Assessment Practitioners (EAP) to compile and submit the Environmental Scoping Report (ESR) as part of the application for mining rights of Portions 3 and 7 of the Farm Vygenhoek 10-JT, which is situated within the Thaba Chweu Municipality of Mpumalanga Province (refer **Figure 1**). The site is situated on the provincial border between Mpumalanga and Limpopo Provinces. A general GPS co-ordinate for the site is S25.04296° and E30.16134°, geographically situated approximately 33 km south of Steelpoort, 28 km northeast of Roossenekal and 28 km west of Lydenburg.

The site (in totality) comprises approximately 720 ha and has physical dimensions of approximately 2,940 m (east-west) and 3,320 m (north-south). Aerial imagery of the site boundaries and local surrounds are presented in **Figure 2**.

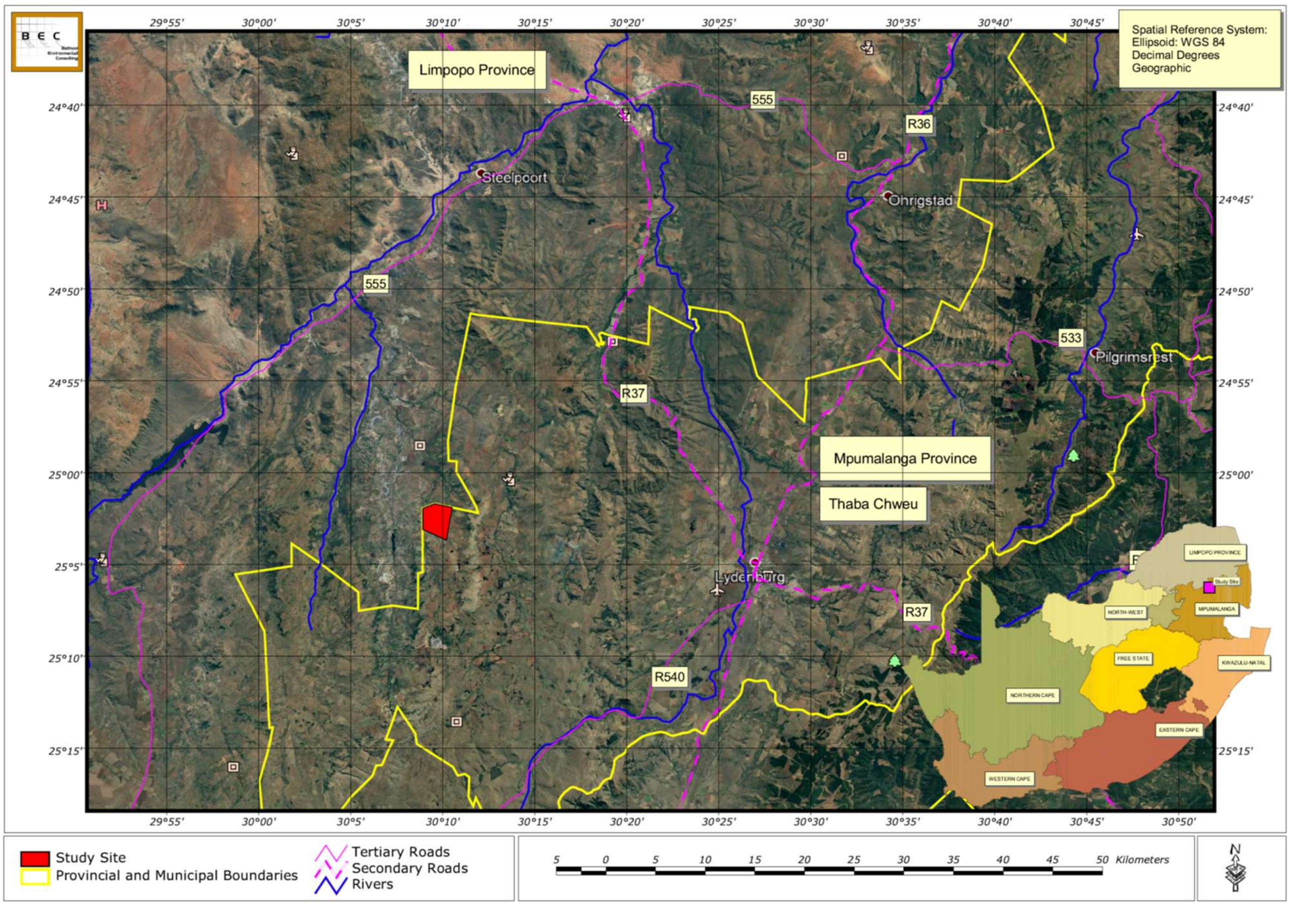

Figure 1: Regional location of the study area
imagery courtesy of Google Earth© (2019)

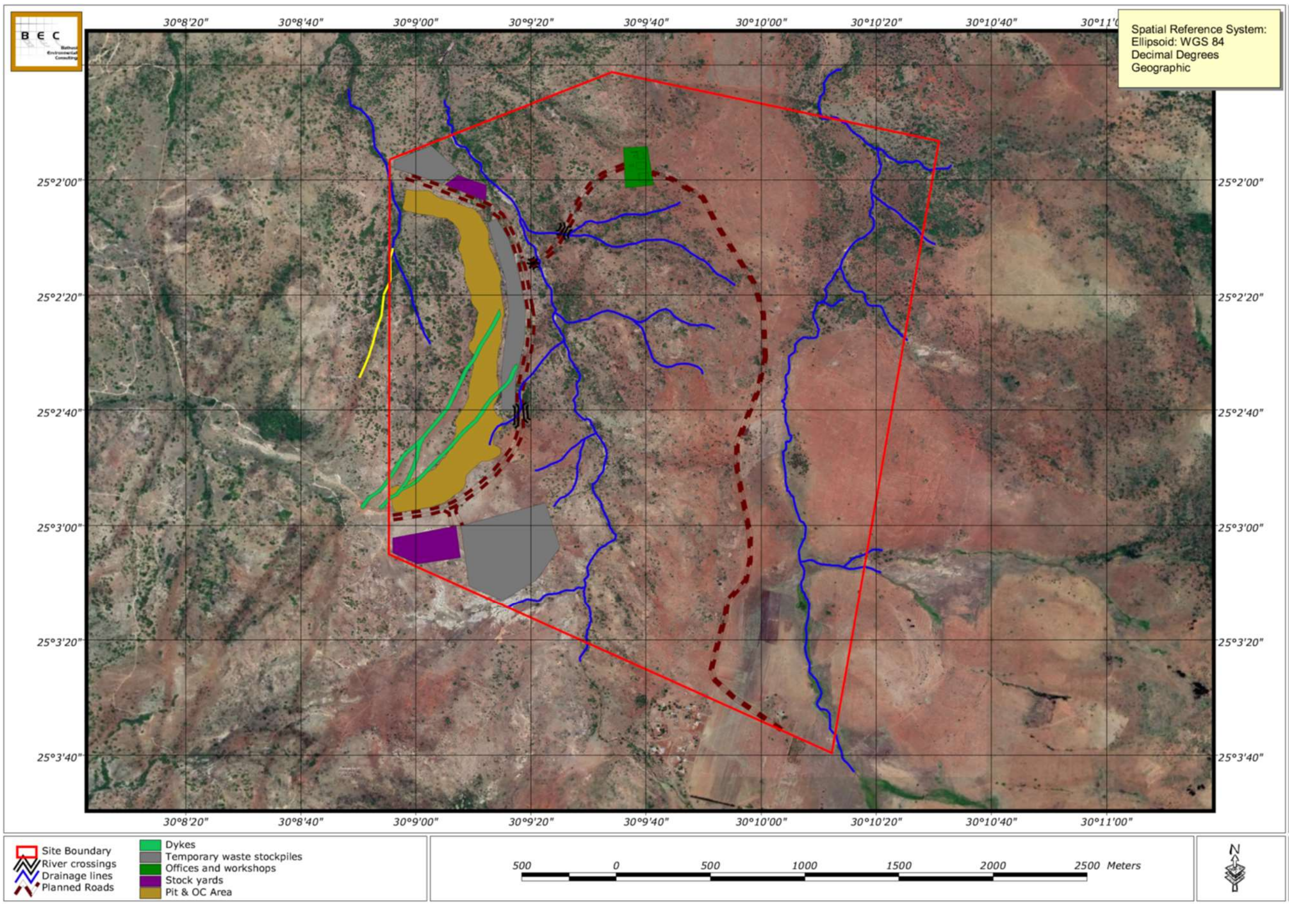

Figure 2: Aerial image of the study area with some project infrastructures
imagery courtesy of Google Earth© (2019)

15 EXISTING INFORMATION AND REPORTS

A number of historic reports and additional project related information is available and relevant information was extracted for the purpose of this scoping report:

⇒ A previous Environmental Impact Assessment Report for the purpose of a Mining Rights Application of this property has been compiled by Digby Wells Environmental in 2012 (*Environmental Impact Assessment Report for the proposed Everest North Platinum Mine*). This application has subsequently lapsed;

⇒ Historic surveys and EIA reports that were compiled in the region and immediate vicinity of the site will provide relevant information that provides further insight into biodiversity richness and patterns of the region, including:
  - Booysendal Expansion Project, Phase 2 (Amec Foster Wheeler, June 2018), situated approximately 11 km south; and
  - Ecological Baseline Assessment of Mareesburg 8-JT (Bathusi Environmental Consulting 2005), situated adjacent (west) to the site;

⇒ Screening Report for an Environmental Authorisation or for a Part Two Amendment of an Environmental Authorisation as required by the 2014 EIA Regulations – Proposed Site Environmental Sensitivity (A. Alers, 2020);

⇒ Species Status Report for Q-grid 2530AA (Mpumalanga Tourism and Parks Agency. M. Lötter, 2020);

⇒ Web-based information sourced and biodiversity related information; and

⇒ *Ad hoc* information, maps, and GIS project related information that has relevance to the assessment of status and importance of ecological attributes of the receiving environment.

16 SECTION A – ANNOTATIONS ON THE BIOPHYSICAL ENVIRONMENT

16.1 LAND COVER & LAND USE OF THE REGION

BGIS information source indicates the extent of the Thaba Chweu Municipality as approximately 571,906 ha, of which 63.9 % is considered untransformed. An approximate 7.81% of this municipality is formally protected in 12 reserves.

Mines and other projects of a disruptive and transformative nature have the ability to influence and change the current land uses both on site (mostly through habitat loss) and in the surrounding areas (through direct, secondary or cumulative impacts) The larger region is decidedly rural. The main anthropogenic disruptive and transformative activities of the larger region include mining and agricultural activities. A number of active mines (mainly platinum) are situated towards the northwest, west and southwest, while agricultural activities are dominated by pastoral/ communal grazing by livestock and wildlife farming activities. Minimal agrestal (cultivation) activities are noted, generally limited by poor soil conditions, high topographic variability, rockiness, and limited access to the area. Agrestal activities are generally restricted to the plains areas in vicinity of drainage lines and rivers where deeper and more productive soils prevail.

Aerial imagery of the site and immediate surrounds (refer Figure 2) reflects the natural status of most of the northern parts of the site, which is generally subjected to communal grazing by cattle, although parts of the site is characterised by low accessibility. Subsistence agricultural activity and settlements characterise the southern part of the site where slopes are gentle, and soils are deeper and less rocky. Land capability is generally low and not economically sustainable.

Isolated stands of exotic trees are noted to the south of the site (notably associated with homesteads and riparian habitats). Only minor and isolated occurrences of invasive and exotic plant species are noted within the site. No major roads are present in the immediate vicinity and the site is accessible through informal roads from the south, notably from the Sekhukhune Road that runs in a north-south direction, situated approximately 5 km east of the site.

16.2 SOILS & GEOLOGY

The study area is situated within the Ib and Ab land types. Map units A refer to yellow and red soils without water tables and belonging in one or more of the Inanda, Kranskop, Magwa, Hutton, Griffin and Clovelly forms. The map units refer to land which does not qualify as a plinthic catena and in which one or more of the above soil forms occupy at least 40 % of the area. Ib indicates land types with exposed rock (exposed country rock, stones, or boulders) covering more than 80 % of the area. These rocky portions may be underlain by soils which would have qualified the unit for inclusion in another broad soil pattern was it not for the surface rockiness (Land Type Survey Staff, 1987).

Topographic placement is defined by the dominant soil forms, with Mispah and overlying Hutton (brown to reddish-brown, structure-less to weakly structured, sandy clay loam topsoil on reddish-brown subsoil on rock) forms predominate the higher lying areas, while low lying areas are dominated by dark brown to black, moderately structured crumbly clay topsoil on strongly structured clay subsoils (mainly Bonheim and Milkwood forms interspersed with Arcadia, Inhoek and Mayo forms). A low agricultural capability (due to dominating shallow and rocky soils) is typical and grazing and conservation has been indicated as the natural capability of the land. Soils are also prone to erosion, as is evident from erosion gulleys on the southeastern perimeter of the site. Results from the Environmental Screening Report indicate the land capability as ranging between Very High and Low, depending on the major soils.

The geology of the region is complex, reflected by the generous topographical variability of the region, ranging from plains to mountainous areas. The regional vegetation types are generally associated with the major geological variability of the region. The region is underlain by Dwars Rivier Norites (Pyroxenite) (west) and the Croydon Clinopyroxenite (east) (Geology of South Africa, 1989) (refer Figure 3).

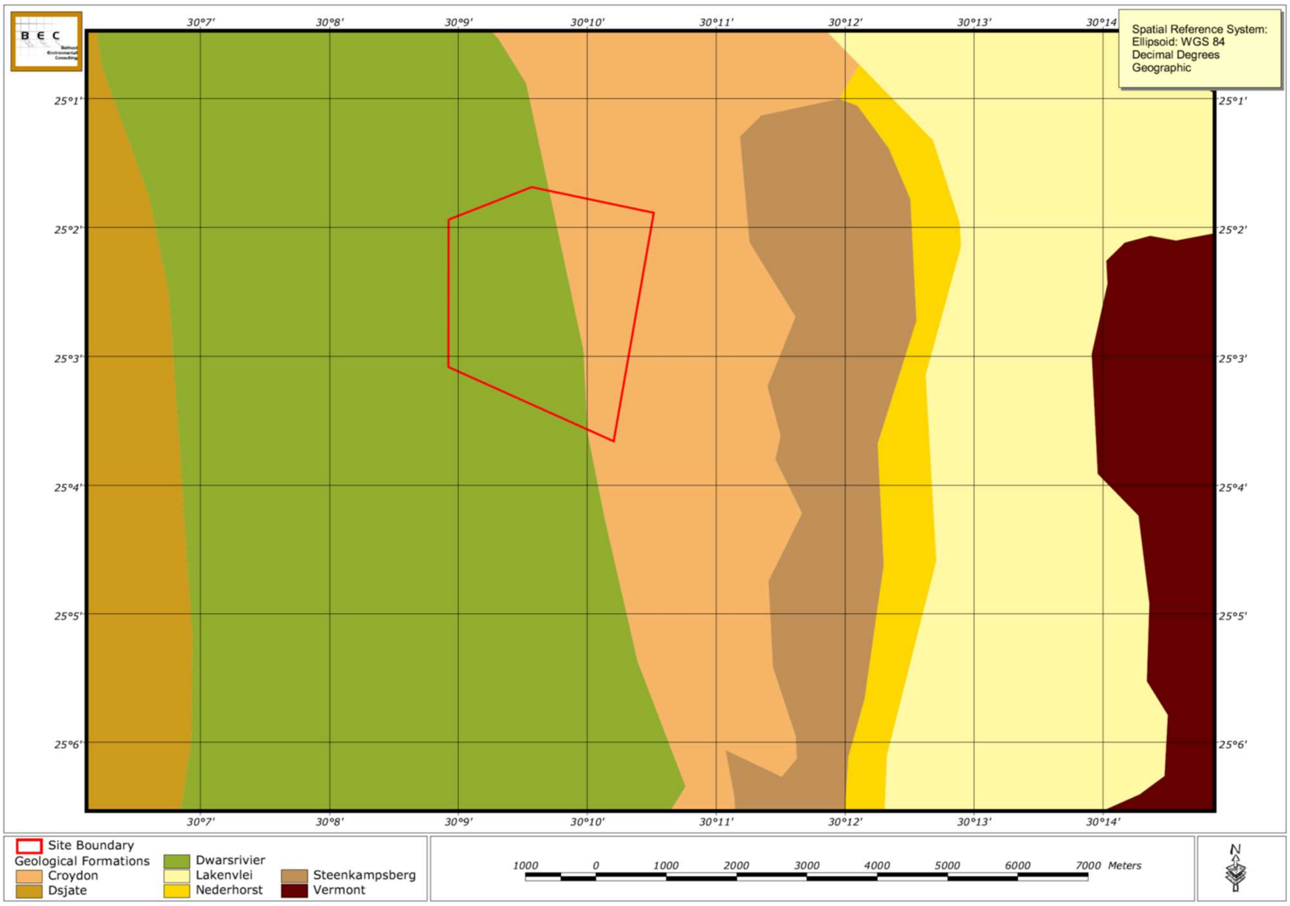

Figure 3: Geological patterns of the site and surrounds

16.3 Climate

Historic climatic information that are relevant to the biodiversity and ecology of the site and immediate surrounds include the spatial location on the eastern escarpment on the border of the Highveld and Northern Transvaal climatic zones (Schulze, 1974). Microclimatic effects are caused by the major topographical variability of the larger region, notably 'shadow' effects during the austral winter period, resulting in lower temperatures and increased moisture holding capacity on southern slopes. Rain is received predominantly in the form of showers and thunderstorms between October and March, ranging from 685 to 710 mm per annum. Summers are generally warm and temperatures rarely exceed 30°C and winters are mild with the lowest average temperatures of approximately 9°C occurring in June and July.

16.4 Topography and Relief

Topographically heterogeneous areas generally exhibit high habitat diversity that features high micro-climatic variability, providing critically important services in the habitat requirements of numerous fauna and flora species. High biodiversity levels are therefore a typical feature of hills, ridges, and mountainous regions, representing important habitat types for sensitive and conservation important species. Effective preservation and management of these landscape features on a local and regional scale will therefore provide impetus for successful conservation of sensitive habitat types and important biological and biodiversity features.

The larger area is mountainous, traversed by incised rivers valleys and associated spurs. Physiographically, the area is described as strongly undulating, consisting of expansive, moderately to strongly undulating plains that are interrupted by koppies and low mountains. The site is situated within the Steelpoort River basin. The topography west of the project site consists of a valley running from the south to the north, drained by a tributary of the Dwars River towards the north.

The eastern section of the project site is dominated by a spur with an elevation of approximately 1,490 m. Elevation ranges from the highest point of 1,490 m on top of the spur, to 1,275 m within the valley located at the north-western edge of the project site. General topographical drainage appears to be in a north north-westerly direction from the project site.

A broad indication of the topography of the site is provided in Figure 4, with contours to indicate topographical variability that ranges from slightly undulating plains to steep and incised valleys.

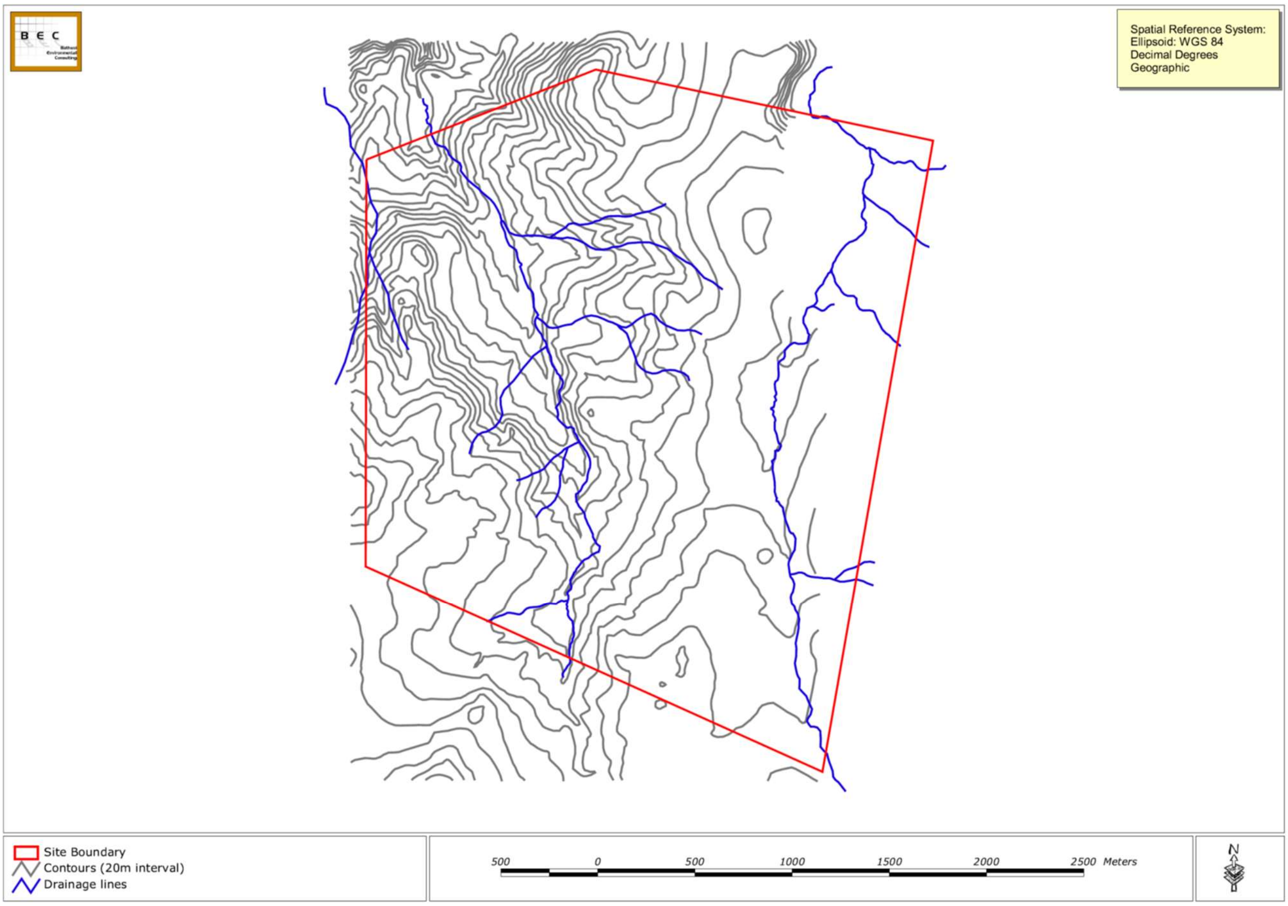

Figure 4: Topography and contours of the site, drainage lines provide indication of slope direction

16.5 WETLANDS AND SURFACE HYDROLOGY

Water, salt, and processes linked to concentration of both are the major controls of the creation, maintenance, and development of peculiar habitats. Habitats formed in and around flowing and stagnant freshwater bodies, experiences waterlogging (seasonal or permanent) and flooding (regular, irregular, or catastrophic), leading to the formation of special soil forms and unique habitat types. Invariably, both waterlogged and salt-laden habitats appear as 'special', deviating strongly from the typical surrounding zonal vegetation. They are considered to be of azonal character (Mucina & Rutherford, 2006). Water, in conjunction with geology, soil, topography and climate, is responsible for the creation of remarkably many types of habitats. Water chemistry, temperature and temporary changes in both, together with the amount of water (depth of water column), timing of occurrence (regular tides or irregular floods) and speed of its movement (discharge, flow and stagnation) are the major factors shaping the ecology of biotic communities occupying such habitats (VEGMAP, 2006).

Ecotones (areas or zones of transition between different habitat types) are occupied by species occurring in both the bordering habitats, and are generally rich in species due to the confluence of habitats. In addition to the daily visitors that utilise the water sources on a frequent basis, some flora and fauna species are specifically adapted to exploit the temporal or seasonal fluctuation in moisture levels in these areas, exhibiting extremely low tolerance levels towards habitat variation. Ecotonal interface areas form narrow bands around areas of surface water and they constitute extremely small portions when calculated on a purely mathematical basis. However, considering this high species richness, these areas are extremely important on a local and regional scale. Rivers also represent important linear migration routes for a number of fauna species as well as an important distribution method for plant seeds.

The project area is situated within quaternary catchment B41G of the Olifants Water Management Area (WMA 4), considered by Kleynhans (2000) to exhibit high ecological importance and sensitive systems. The Dwars River (a tributary of the Steelpoort River which eventually flows into the Olifants River) traverses the project area flowing in a northerly direction. The topography and nature of the area determines that this river is highly erratic in nature and comprises of batholithic channel bottoms, open and large pools and small waterfalls. The steep nature of the adjacent slopes results in a defined streambed with little associated hydromorphic vegetation. This perennial system is considered to be critically endangered, and, considering the planned mining activity, significant impacts on the status of this river is anticipated.

A second drainage line and small, non-perennial tributaries traverses the eastern part of the site in a northern direction. The nature of this stream is dimorphic, traversing grasslands and plains systems in the southern part of the site, but changing to a woodland/ savanna nature in the northern part of the site where a significant drop in altitude occurs, forming a considerable waterfall. The location of this small river is such that little effects from the planned mining activity is anticipated.

A general indication of rivers and their small tributaries is presented in Figure 4.

16.6 ANNOTATIONS ON THE NATIONAL WEB-BASED ENVIRONMENTAL SCREENING TOOL

Regulation 16(1)(v) of the Environmental Impact Assessment Regulations, 20145 (EIA Regulations) provides that an applicant for Environmental Authorisation is required to submit a report generated by the Screening Tool as part of its application. On 5 July 2019, the Minister of Environmental Affairs, Forestry and Fisheries published a notice in the Government Gazette giving notice that the use of the Screening Tool is compulsory for all applicants to submit a report generated by the Screening Tool from 90 days of the date of publication of that notice.

The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The Screening Tool report will indicate the (preliminary) environmental sensitivities that intersect with the proposed development footprint as defined by the applicant as well as the relevant Protocols that the applicant would need to adhere to.

As the Screening Tool contains datasets that are mapped at a national scale, there may be areas where the Screening Tool erroneously assigns, or misses, environmental sensitivities because of mapping resolution and a high paucity of available and accurate data. Broad-scale site investigations will provide for an augmented and site-specific evaluation of the accuracy and 'infilling' of obvious and large-scale inaccuracies. Information extracted from the National Web-based Environmental Screening Tool (Department of Environmental Affairs, 2020), indicated the following aspects (*inter alia*) pertaining to the terrestrial ecological component of the project (report generated 2020/06/18):

Section 5 Terrestrial Biodiversity Impact Assessment;
Section 17 Plant Species Assessment; and
Section 18 Animal Species Assessment.

16.6.1 ANIMAL SPECIES THEME SENSITIVITY

Results of the National Web-based Environmental Screening Tool indicated the following sensitivities associated with animals of conservation importance (inclusive of mammals, birds, amphibians, reptiles, and invertebrates).

The following aspects are provided for consideration:

Sensitivity	Feature (s)
Medium	Insecta – *Lepidochrysops irvingi* (Irving's Blue)
Medium	Mammalia - *Ourebia ourebi ourebi* (Oribi)
Medium	Insecta – *Serradinga clarki amissivallis* (Clark's Lost Widow)
Medium	Insecta – *Orachrysops violescens* (Violescent Blue)

Also please note that the invertebrate component of the Environmental Screening Assessment Tool, is currently under review and will, in all probability, not only be restricted to Lepidoptera, but also contain reference to other invertebrate groups of conservation concern, such as dungbeetles.

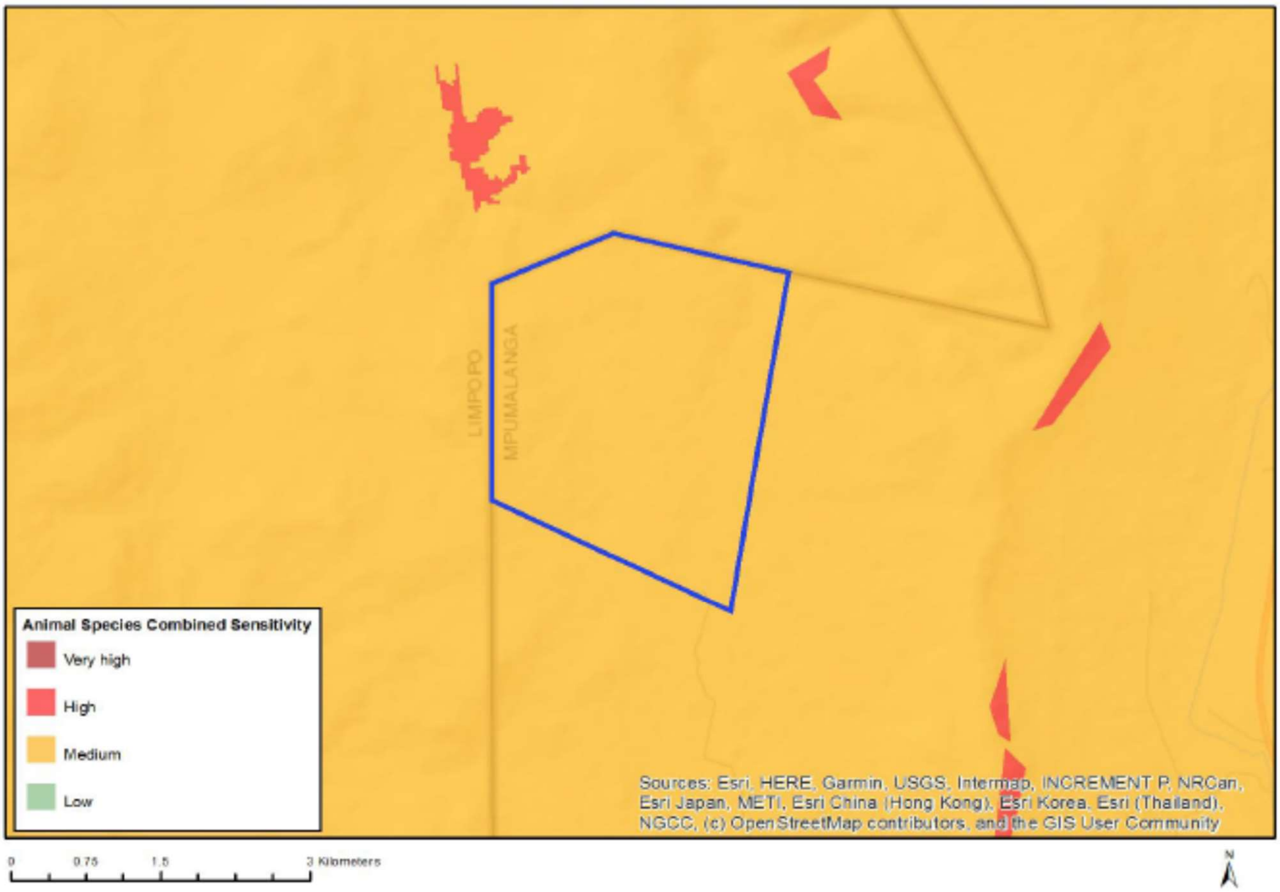

Figure 5: Animal species sensitivity of the site and surrounds

16.6.2 *Plant Species Theme Sensitivity*

Results of the National Web-based Environmental Screening Tool indicated the following sensitivities associated with floristic attributes of the receiving environment.

The following aspects are provided for consideration:

Sensitivity	Features
Medium	Sensitive species 275 (*Dioscorea sylvatica*, VU)
Medium	Sensitive species 14 (*Alepidea cordifolia*, EN)
Medium	Sensitive species 309 (*Aloe kommagensis*, VU)
Medium	Sensitive species 779 (*Zanthedeschia pentlandii, VU*)

16.6.3 *Terrestrial Biodiversity Theme Sensitivity*

Results of the National Web-based Environmental Screening Tool indicated the following sensitivities associated with terrestrial ecology of the receiving environment.

The following aspects are provided for consideration:

Sensitivity	Feature (s)
Very High	Endangered ecosystem
Very High	Critical Biodiversity Area 1
Very High	Ecological Support Area
Very High	Focus Areas for land-based protected areas expansion
Very High	Freshwater ecosystem priority area quinary catchments

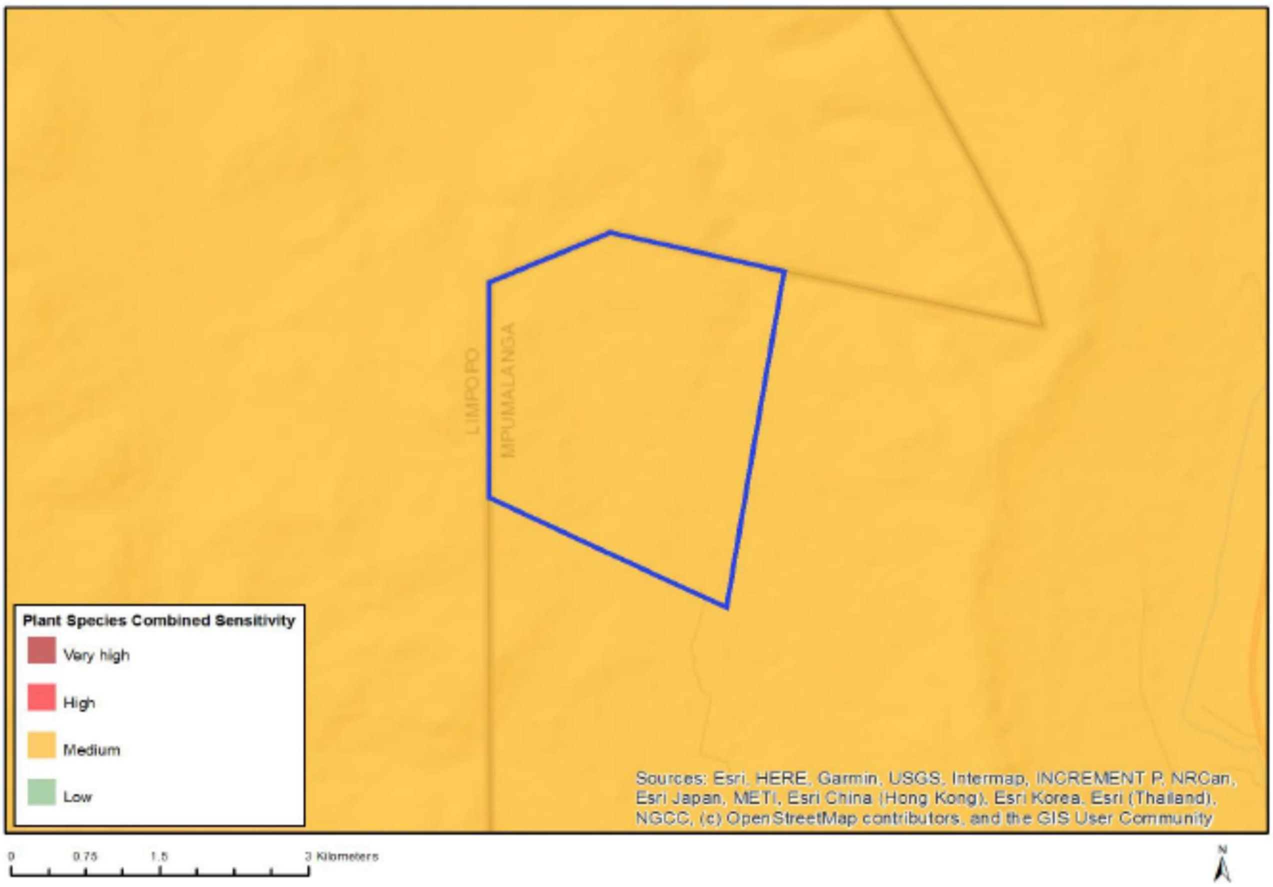

Figure 6: Plant species sensitivity of the site and surrounds

Figure 7: Terrestrial biodiversity sensitivity of the site and surrounds

16.7 MPUMALANGA BIODIVERSITY SECTOR PLAN (2014)

Mpumalanga Biodiversity Sector Plan (MBSP) terrestrial assessment is based on a systematic biodiversity planning approach to identify spatial priority areas that meet both national and provincial targets in the most efficient way possible, while trying to avoid conflict with other land-uses. It actively tries to build in landscape resilience to a changing climate. These spatial priorities are used to inform sustainable development within the Mpumalanga Province

The local and regional designation of Mpumalanga Biodiversity Sector Plans categories (MBSP) (2014) are illustrated in Figure 8. This information source shows the following five broad map categories, some of which are further divided into sub-categories:

⇒ Protected Areas: Areas that are formally protected by law and recognised in terms of the Protected Areas Act (this includes contract protected areas declared through the biodiversity stewardship programme).

⇒ Critical Biodiversity Areas (CBAs): Areas that are required to meet biodiversity targets for species, ecosystems, or ecological processes. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species. These include:
  - All areas required to meet biodiversity pattern targets and to ensure continued existence and functioning of species and ecosystems, special habitats and species of conservation concern;
  - Critically Endangered ecosystems; and
  - Critical linkages (corridor 'pinch-points') to maintain connectivity.

⇒ Ecological Support Areas (ESAs): Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services. In the terrestrial assessment they support landscape connectivity and strengthen resilience to climate change. ESAs need to be maintained in at least a functional and often natural state, supporting the purpose for which they were identified. They include features such as riparian habitat surrounding rivers or wetlands, corridors, over-wintering sites for Blue Cranes, and so on.

⇒ Other Natural Areas (ONAs): Areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions.

⇒ Moderately or Heavily Modified Areas (sometimes called 'transformed'): Areas that have been heavily modified by human activity so that they are by-and-large no longer natural, and do not contribute to biodiversity targets. Some of these areas may still provide limited biodiversity and ecological infrastructural functions but, their biodiversity value has been significantly and, in many cases, irreversibly compromised.

From Figure 8 it is evident that the proposed site comprises mostly of 'Other Natural Areas', while deteriorated areas (anthropogenic) are encapsulated in Moderately and Heavily modified areas. The author is in general agreement with this categorisation, but the local importance of the Vulnerable Sekhukhune Montane Grassland (refer Section 17.1.1) and the critical importance of the Dwars Rivier are not adequately reflected in the database.

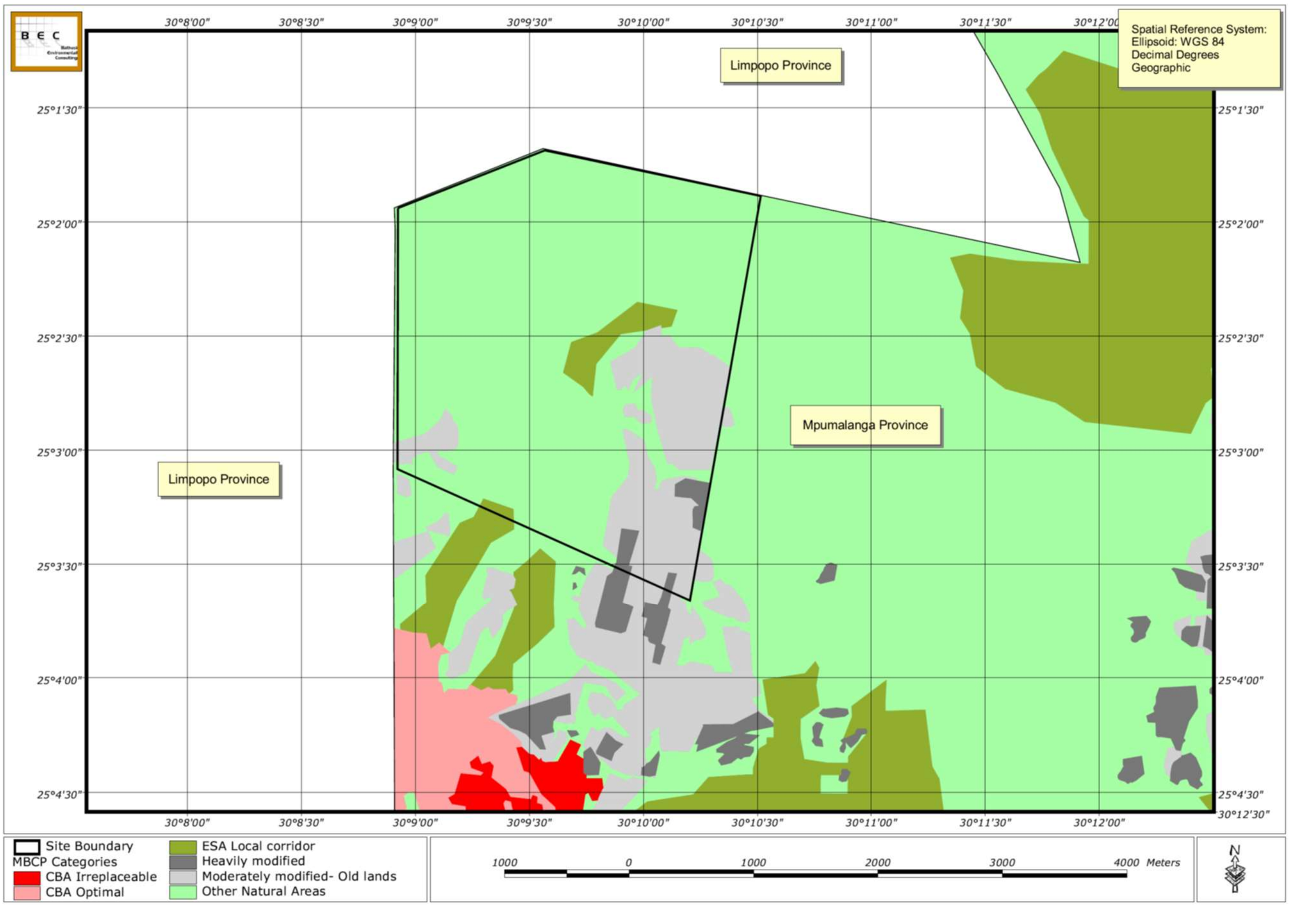

Figure 8: The study site in relation to the Mpumalanga Biodiversity Sector Plan conservation categories

16.8 PROTECTED AND CONSERVATION AREAS

A review of available information pertaining to the presence of declared and informal protected areas in the immediate region of the proposed site indicates the general sensitivity and level of conservation efforts, with numerous nature reserves, conservancies and protected areas situated within proximity to the site. The Sekhukhuneland Centre of Plant Endemism (a threatened ecosystem) and De Berg Conservancy is of particular importance to this site (refer Figure 9).

16.8.1 DE BERG CONSERVANCY

This area comprises approximately 40,778 ha and forms part of the Two Rivers Environmental Management Plan. Animals as well as approximately 6,500 plants have been relocated. The long-term focus is to establish the De Berg Conservancy Programme, which is dedicated to environmental conservation. The programme will establish an area where landowners' rights are guaranteed if sustainable.

16.8.2 SEKHUKHUNELAND CENTRE OF PLANT ENDEMISM

The SCPE comprises a mountainous region with flat to undulating valleys. Sekhukhuneland is known for its parallel belts or rocky ridges and mountains, including the Leolo and Dwars River ranges. The core of the Centre is formed by the surface outcrops of the Rustenburg Layered Suite of the eastern Bushveld Complex. The area is bordered by the Highveld Escarpment to the south, Strydpoort Mountains to the north, the Steenkampsberg and Drakensberg to the east and the Springbok Flats to the west.

Valleys have a sub-tropical climate with little or no frost in the winter, whereas in the mountains, conditions become more temperate with increasing altitude. Fire is an important natural factor in the mountains, affecting both vegetation structure and plant biology. Soils in the SCPE tend to be rich in clay; whereas granite gives rise to 'normal' soils and serpentinite to toxic soils, norite contains slightly higher concentrations of heavy metals than granite, thus giving rise to heavy metal soils. In the SKC the ultramafic substrates, norite, anorthosite and pyroxenite, show a significant positive correlation with percentage endemism (Siebert, 1998).

Little is known of the vegetation of the SCPE, but the bushveld is unique and deserves recognition as a separate type. One of the characteristic trees of this bushveld type is *Kirkia wilmsii*, a species that is relatively rare in other parts of the Mixed Bushveld. Vegetation differences between the north- and south-facing aspects of the mountains are often striking. Intriguing vegetation anomalies associated with heavily eroded soils are present throughout the region. These areas (not serpentinite) are very sparsely vegetated with a distinctive, though highly impoverished flora including, for example *Searsia keetii, Euclea linearis* and *Amphiglossa triflora*. The origin and chemical composition of these eroded areas, which are natural features, are not known.

Many apparent endemic species of the SCPE are awaiting formal description (e.g. in *Acacia, Boscia, Polygala* and *Stylochiton*). The genus *Lydenburgia* (Celastraceae), represented by *Lydenburgia cassinoides* (= *Catha transvaalensis*), is near-endemic to the region, also including in the 'Vulnerable' conservation category (POSA, 2012). Succulents abound in the hot, arid valleys of the SCPE. The genus *Aloe* is particularly prolific, with many of the species being shared with the adjacent Wolkberg Centre. The area around Burgersfort is reputed to have the highest concentration of *Aloe* species in the world.

Despite it scenic landscapes, there is only one official nature reserve in the SCPE, namely Potlake Nature Reserve. Owing to the ruggedness of the terrain, however, the mountainous parts of the SKC are still fairly intact, with many private land owners keen to promote ecotourism in the region. Overgrazing by domestic livestock has seriously degraded the vegetation in the densely populated areas in around the Leolo Mountains. Population pressure is also adversely affecting the flora of the Steelpoort River Valley, particularly in the Steelpoort-Burgersfort-Maandagshoek area. Efforts to conserve high-priority areas in the SCPE must acquire an increased urgency in light of the unusual natural features of these areas, such as the rich phytodiversity of the ultramafic soils. Conservation of this botanically important area should receive the highest priority, not only from a biodiversity point of view, but also because of its importance as a water catchment area.

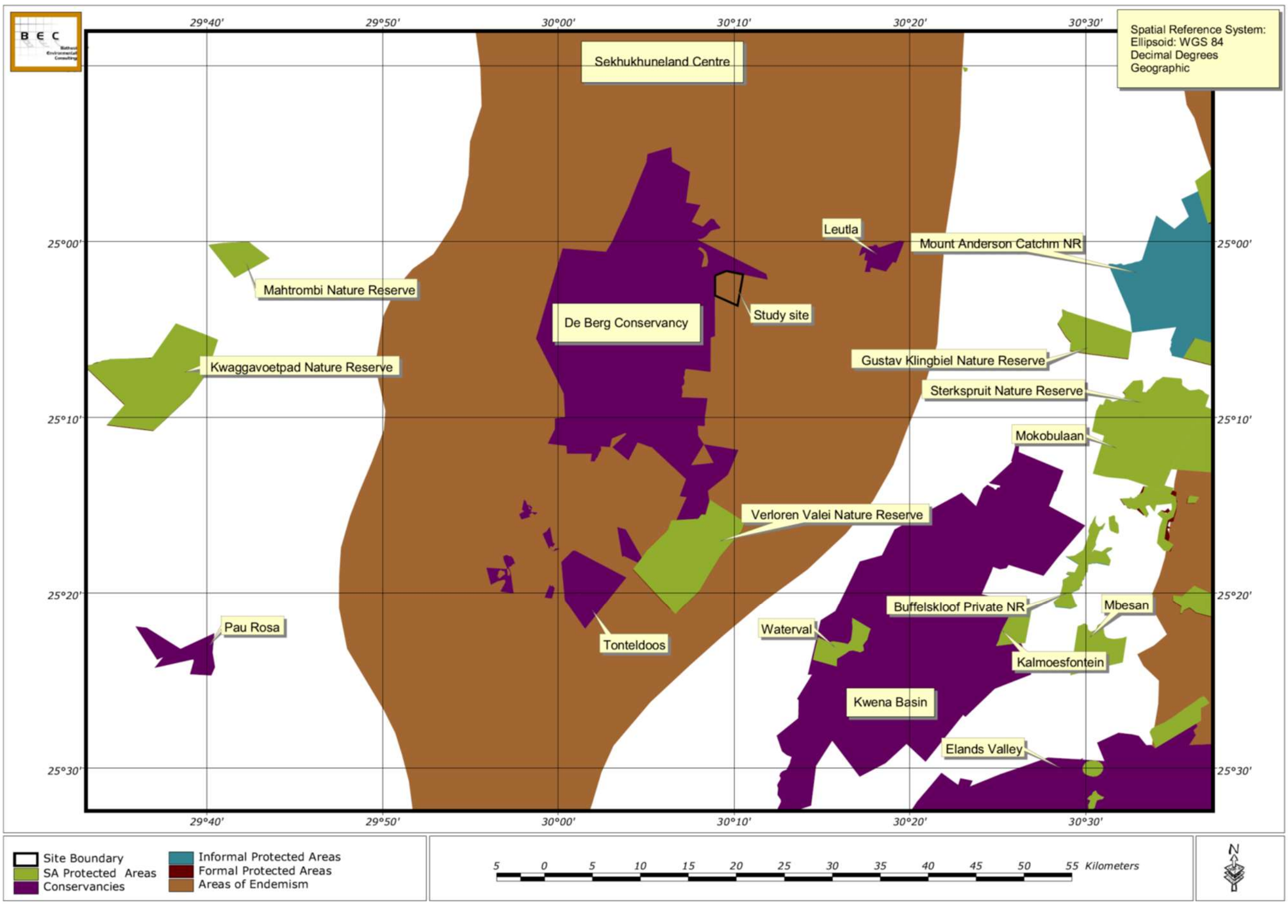

Figure 9: Areas of conservation importance in the region of the site

17 SECTION B – BOTANICAL COMPONENT

17.1 REGIONAL VEGETATION TYPES AND FLORISTIC PATTERNS

The study site is spatially situated across the ecotonal interface of the Grassland and Savanna Biomes, specifically comprising of the Sekhukhune Montane Grassland (Gm19, included in the Mesic Highveld Grassland Bioregion) in the western part of the study site and Sekhukhune Mountain Bushveld (SVcb28, included in the Central Bushveld Bioregion) comprising the eastern part of the study site (refer Figure 10).

17.1.1 SEKHUKHUNE MONTANE GRASSLAND (GM19)

These major chains of hills transect the area in the Roossenekal region and have a north-south orientation, manifesting with moderately steep slopes with predominantly eastern and western aspects. Large norite boulders and stones cover the shallow soils on the hillsides. Mountains and undulating hillside slopes are covered with dense, sour grassland and scattered clumps of trees and shrubs in sheltered habitats. Turf and clay soils characterise the open plains between the chains of hills and culminate in open plains in the Stoffberg area that comprise dense, tall grassland. Encroachment by indigenous or invasion by alien microphyllous tree species is common in places. Dominant soil forms have a high clay content and include Arcadia, Mayo, Milkwood, Mispah, Shortlands and Steendal. Ea land type covers 40 % of the area, with minor occurrences of Ib and Ab.

The conservation status of this unit is currently set at Vulnerable; approximately 30 % of this area is under commercial or subsistence cultivation and vast areas are mined for vanadium using strip mining, and in recent years mining of gabbro has increased substantially (Siebert et al. 2002c). There is no formal conservation in the region, although many farmers have embarked on ecotourism initiatives. Occasional erosion is encountered throughout the unit.

This vegetation type comprises the Roossenekal Subcentre of the Sekhukhuneland CE (Van Wyk & Smith 2001) with numerous endemic plant species, many of which are not yet described. The Roossenekal area comprises heterogeneous rocky habitats (Siebert et al. 2003) and numerous floristic links with other grassland areas have been identified. In terms of floristic diversity, species richness and vegetation structure, this vegetation is related to Rand Highveld Grassland (Gm11), Lydenburg Montane Grassland (Gm18) and Barberton Montane Grassland (Gm17) (Siebert et al. 2002b, Bredenkamp & Brown 2003). A floristic link exists with other mesic mountainous areas in South Africa (Mpumalanga and KwaZulu-Natal) and Swaziland and is supported by the occurrence of *Dyschoriste rogersii*, *Eucomis montana*, *Jamesbrittenia silenoides*, *Pachycarpus transvaalensis*, *Pegolettia lanceolata*, *Seemannaralia gerrardii* and *Thesium multiramulosum*. Floristic links also exist with the Northern Cape, namely *Amphiglossa triflora* and *Nuxia gracilis*, and the Eastern Cape, namely *Brachylaena ilicifolia* and *Maytenus albata*. Species such as *Euclea linearis* and *Melhania randii* are shared with the Great Dyke in Zimbabwe that is located on similar ultramafic rock (Siebert et al. 2001).

Important taxa of this unit include:

Small Trees:	*Protea caffra* subsp. *caffra*, *Acacia caffra*, *Apodytes dimidiata* subsp. *dimidiata*, *Canthium suberosum*, *Cussonia transvaalensis*, *Seemannaralia gerrardii*.
Woody Climbers:	*Rhoicissus tridentata*, *Jasminum quinatum*, *Triaspis glaucophylla*.
Tall Shrubs:	*Euclea crispa* subsp. *crispa*, *Brachylaena ilicifolia*, *Diospyros austro-africana*, *Euclea linearis*, *Pavetta zeyheri*.
Low Shrubs:	*Gnidia caffra*, *Senecio microglossus*, *Dyschoriste rogersii*, *Elephantorrhiza praetermissa*, *Leonotis leonurus, Polygala uncinata*, *Searsia discolor*, *S. tumulicola* var. *meeuseana*, *S. wilmsii*.
Geoxylic Suffrutex:	*Elephantorrhiza elephantina*.

Graminoids:	*Aristida junciformis* subsp. *galpinii*, *Diheteropogon amplectens*, *Elionurus muticus*, *Eragrostis chloromelas*, *E. racemosa*, *Heteropogon contortus*, *Microchloa caffra*, *Monocymbium ceresiiforme*, *Setaria sphacelata*, *Themeda triandra*, *Tristachya leucothrix*, *Andropogon schirensis*, *Aristida aequiglumis*, *Brachiaria serrata*, *Cymbopogon caesius*, *Digitaria diagonalis*, *D. monodactyla*, *Ehrharta capensis*, *Eragrostis capensis*, *E. nindensis*, *E. plana*, *Hyparrhenia hirta*, *Loudetia simplex*, *Panicum natalense*, *Setaria nigrirostris*, *Trachypogon spicatus*, *Triraphis andropogonoides*.
Herbs:	*Acalypha punctata*, *Berkheya setifera*, *Rotheca hirsuta*, *Senecio latifolius*, *Tephrosia purpurea* subsp. *leptostachya*, *Berkheya insignis*, *Gerbera jamesonii*, *Helichrysum nudifolium* var. *nudifolium*, *Ipomoea crassipes*, *Jamesbrittenia silenoides*, *Macledium zeyheri* subsp. *argyrophylum*, *Pegolettia lanceolata*, *Pentanisia prunelloides* subsp. *prunelloides*, *Senecio coronatus*, *Vernonia galpinii*, *V. natalensis*, *V. oligocephala*, *Xerophyta retinervis*.
Geophytic Herbs:	*Hypoxis rigidula* var. *pilosissima*, *Cheilanthes hirta*, *Eucomis montana*, *Hypoxis hemerocallidea*, *Pachycarpus transvaalensis*.
Succulent Herb:	*Kleinia stapeliiformis*.

Biogeographically Important Taxa for this unit include the Northern sourveld endemic and Sekhukhune endemics:

Small Trees:	*Euclea sekhukhuniensis*, *Lydenburgia cassinoides*, *Searsia sekhukhuniensis*.
Woody Climber:	*Rhoicissus sekhukhuniensis*.
Tall Shrub:	*Vitex obovata* subsp. *wilmsii*.
Low Shrubs:	*Dyschoriste perrotteti*, *Grewia vernicosa*, *Helichrysum uninervium*, *Jamesbrittenia macrantha*, *Melhania randii*.
Succulent Shrub:	*Aloe castanea*
Herbs:	*Berkheya densifolia*, *Cyanotis pachyrrhiza*, *Graderia linearifolia*, *Ipomoea bathycolpos* var. *sinuatodentata*, *Rhynchosia rudolfii*, *Tetraselago wilmsii*.
Geophytic Herbs:	*Gladiolus sekukuniensis*, *Zantedeschia pentlandii*.
Succulent Herb:	*Huernia insigniflora*.

Endemic Taxa of this unit include:

Succulent Shrubs:	*Aloe reitzii* var. *reitzii*, *Delosperma deilanthoides*.
Geophytic Herbs:	*Resnova* sp. nov. (‘*megaphylla*’), *Zantedeschia pentlandii*.

17.1.2 SEKHUKHUNE MOUNTAIN BUSHVELD (SVCB28)

This unit is situated in the mountains and undulating hills above the lowlands of the Sekhukhune Plains Bushveld, including parts of the steep slopes of the Leolo Mountains, the Dwars River Mountains and Thaba Sekhukhune, as well as a number of isolated smaller mountains (e.g. Phepane and Morone). It also comprises the undulating small hills in the valley of the Steelpoort River up to and along the Klip River flowing past Roossenekal at altitude ranges between 900 and1 600 m.

The vegetation conforms to dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the northeastern escarpment. The open bushveld is often associated with ultramafic soils on southern aspects, while bushveld on ultramafic soils may contain a high diversity of edaphic specialists. Bushveld of the mountain slopes are generally taller than in the valleys, with a well-developed herb layer and bushveld of valleys and dry northern aspects usually comprise dense vegetation similar to thickets, with a herb layer comprising many short-lived perennials. Dry habitats of this unit contain a number of species with xerophytic adaptations, such as succulence and underground storage organs. Both man-made and natural erosion dongas occur on footslopes of clays rich in heavy metals.

This mountain bushveld is part of the Sekhukhuneland Centre of Plant Endemism (Van Wyk & Smith 2001), more specifically the Steelpoort Subcentre. Because of comparatively low disturbance factors, the vast range of habitat still harbours high plant diversity with many endemics, many of which still await formal description (Siebert et al. 2001). In terms of floristic diversity, species richness and vegetation structure, it is related to Sekhukhune Plains Bushveld, Norite Koppies Bushveld and Ohrigstad Mountain Bushveld (Siebert et al. 2002b, c).

The conservation status of this unit is currently set at Least Threatened and while none is conserved in statutory conservation areas, 0.4 % is conserved in Potlake Nature Reserve. Nearly 15 % has been irreversibly transformed, mainly by cultivation, mining, and urban transformation. Erosion is at moderate to high levels, with donga formation in places. An increasing area along the Dwars River Subsuite is under pressure from mining activities and its associated urbanisation (Siebert et al. 2002d). *Melia azedarach* is currently the most aggressive alien invader.

Important taxa for this unit include:

Tall Tree: *Acacia nigrescens*

Small Trees: *Acacia senegal* var. *leiorhachis*, *Combretum apiculatum*, *Kirkia wilmsii*, *Terminalia prunioides*, *Vitex obovata* subsp. *wilmsii*, *Ziziphus mucronata*, *Bolusanthus speciosus*, *Boscia albitrunca*, *Brachylaena ilicifolia*, *Combretum molle*, *Commiphora mollis*, *Croton gratissimus*, *Cussonia transvaalensis*, *Hippobromus pauciflorus*, *Ozoroa sphaerocarpa*, *Pappea capensis*, *Schotia latifolia*, *Sterculia rogersii*.

Succulent Tree: *Aloe marlothii* subsp. *marlothii*

Tall Shrubs: *Dichrostachys cinerea*, *Euclea crispa* subsp. *crispa*, *Combretum hereroense*, *Euclea linearis*, *Pavetta zeyheri*, *Tinnea rhodesiana*, *Triaspis glaucophylla*.

Low Shrubs: *Elephantorrhiza praetermissa*, *Grewia vernicosa*, *Asparagus intricatus*, *Barleria saxatilis*, *B. senensis*, *Clerodendrum ternatum*, *Commiphora africana*, *Hermannia glanduligera*, *Indigofera lydenburgensis*, *Jatropha latifolia* var. *angustata*, *Melhania prostrata*, *Phyllanthus glaucophyllus*, *Psiadia punctulata*, *Searsia keetii*, *Rhynchosia komatiensis*.

Succulent Shrubs: *Aloe castanea*, *A. cryptopoda*.

Woody Climbers: *Clematis brachiata*, *Rhoicissus tridentata*, *Acacia ataxacantha*.

Woody Succulent Climber: *Sarcostemma viminale*

Graminoids: *Aristida canescens*, *Heteropogon contortus*, *Panicum maximum*, *Setaria lindenbergiana*, *Themeda triandra*, *Aristida transvaalensis*, *Cymbopogon pospischilii*, *Diheteropogon amplectens*, *Enneapogon scoparius*, *Loudetia simplex*, *Panicum deustum*, *Setaria sphacelata*.

Herbs: *Berkheya insignis*, *Commelina africana*, *Cyphostemma woodii*, *Kyphocarpa angustifolia*, *Senecio latifolius*.

Geophytic Herbs: *Hypoxis rigidula*, *Sansevieria hyacinthoides*.

Succulent Herb: *Huernia stapelioides*.

Biogeographically Important Taxa (^{N}Northern Sourveld endemic, ^{CB}Central Bushveld endemic, ^{SK}Sekhukhune endemic, ^{Z}Link to Zimbabwe) include:

Small Tree: *Lydenburgia cassinoides*^{SK}

Tall Shrub: *Rhus sekhukhuniensis*^{SK}

Low Shrubs: *Euclea sekhukhuniensis*^{SK}, *Petalidium oblongifolium*^{CB}, *Plectranthus venteri*^{Z}, Searsia *batophylla*^{SK}.

Woody Climbers: *Asparagus sekukuniensis*^{SK}, *Rhoicissus sekhukhuniensis*^{SK}.

Geophytic Herbs: *Chlorophytum cyperaceum*^{SK}, *Raphionacme chimanimaniana*^{Z}.

Endemic Taxa for this unit include:

Small Tree: *Acacia ormocarpoides*

Succulent Tree: *Euphorbia sekukuniensis*

Soft Shrub: *Plectranthus porcatus.*

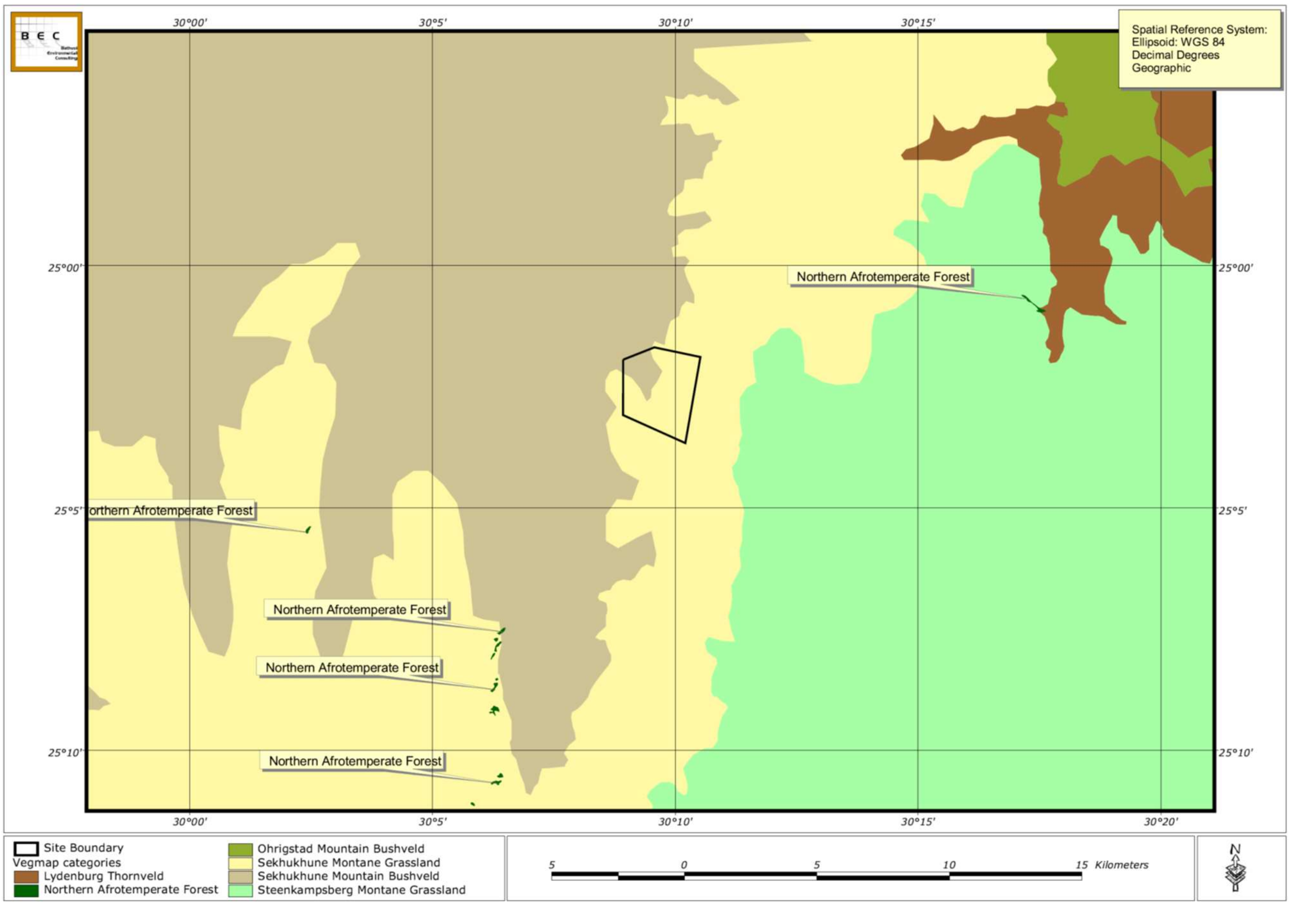

Figure 10: Vegmap (2018) ecological types of the immediate region

17.2 Regional Floristic Diversity

Information extracted from the NEWPOSA information source (2020) provides for the known high floristic diversity of the general region, notably as a result of the spatial inclusion of botanical aspects of both the Grassland and Savanna biomes (refer Section 17.1). The known presence of approximately 556 plant species within ¼-degree grid 2530AA is indicated The floristic diversity not only reflects the ecotonal convergence between the Grassland and Savanna Biomes, but also manifests as numerous and complex ecological types and micro-habitat types, reflecting high geomorphological/ topographic variability (ridges, plains, wetlands, mountains, etc.). Despite this indicated high floristic diversity, the region is generally regarded poorly sampled and the true floristic diversity is estimated to be much higher than indicated by available sampling records. Results of the brief site investigation confirmed the natural (unperturbed) status of the vegetation and the comparatively high floristic diversity, correlating to the disparity in physiognomic attributes (savanna vs grassland, plains vs ridges and outcrops).

A brief appraisal of the growth forms of the region (refer Figure 11) indicates that herbs (34.7 %) provides for the dominant life form, although not necessarily always physiognomically. Geophytes (11.9 %), grasses (11.2 %), succulents (9.9 %), and dwarf shrubs (9.5 %) represent physiognomically, and in terms of diversity, significant life forms, also exhibiting the grassland nature of extensive parts of the region. The presence of a comparatively diverse shrub (6.7 %)

and tree layer (5.0 %) provides evidence of the savanna nature of the region and is similarly represented in parts of the proposed site.

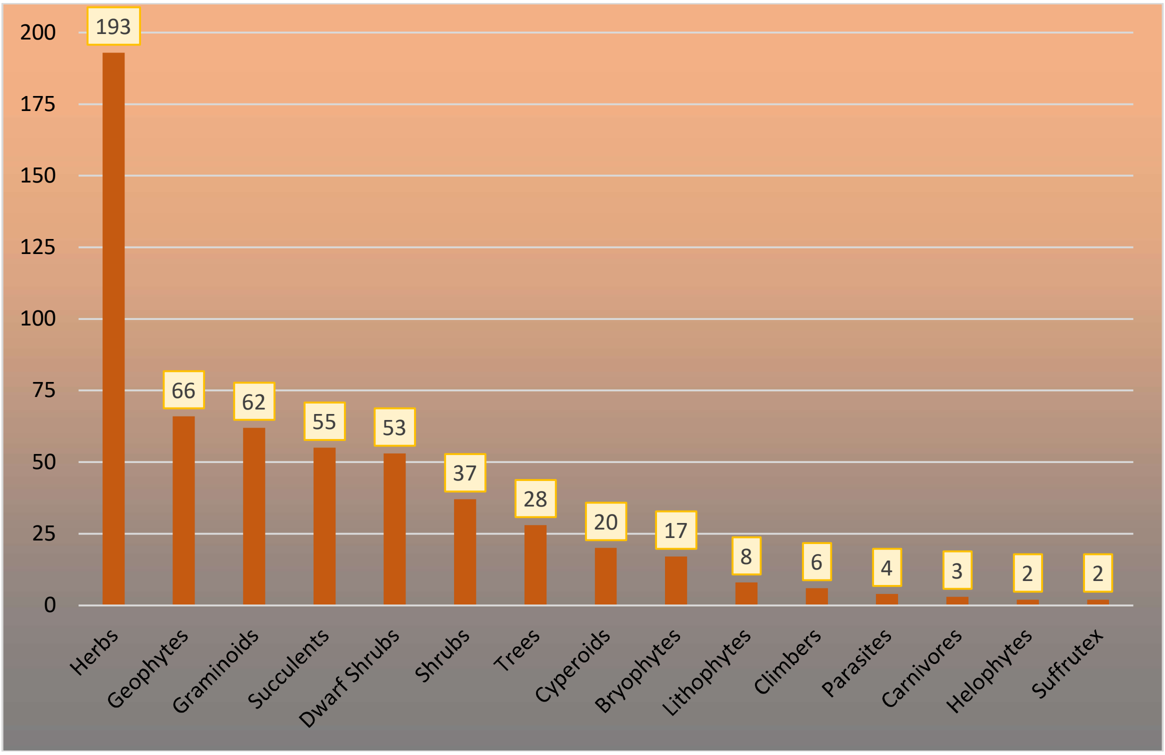

Figure 11: Growth form patterns for the region (2530AA)

A brief appraisal of the prominent plant families that are represented in the region indicated that a total of 101 plant families are represented. Asteraceae (80 species, 14.4 %), Poaceae (62 species, 11.2 %), Fabaceae (42 species, 7.6 %), and Apocynaceae (23 species, 4.1 %) are well prominently represented species in these families. The presence of a diverse cyperoid layer (Cyperaceae, 20 species, 3.6 %) indicates the prominence of wetlands and mesic grassland types. Plant families typically associated with conservation important species that are well represented in the region include Scrophulariaceae, Iridaceae, Apocynaceae, Orchidaceae, Hyacinthaceae, Orobanchaceae, Asphodelaceae, Fabaceae, and Proteaceae.

17.3 Plant Species of Conservation Concern

A review of web-based information and recent surveys conducted in the general surrounds of the study site revealed the following plants species of conservation consideration as being present within the region, with a high probability of occurring within the proposed site.

EIA surveys would need to consider various seasonal assessments to accurately evaluate the presence and abundance of these plants within the proposed development footprints.

Table 4: Plant taxa of conservation consideration recorded in the region

Taxon	*Family*	*Status*
Agapanthus inapertus	Agapanthaceae	Mp MNCA
Alepidea attenuata Weim.	Apiaceae	NT
Aloe arborescens	Asphodelaceae	MNCA
Aloe barbara-jeppeae	Asphodelaceae	NT SCPE (N) MNCA
Aloe cf *parvibracteata* Schonland	Asphodelaceae	MNCA
Aloe cooperi	Asphodelaceae	Declining MNCA

Aloe cryptopoda Baker	Asphodelaceae	SCPE (N)
Aloe greatheadii var. *davyana* ("longibracteata" form)	Asphodelaceae	MNCA
Aloe minima (possibly-unconfirmed)	Asphodelaceae	MNCA
Aloe modesta (possibly-unconfirmed)	Asphodelaceae	VU MNCA
Aloe pretoriensis	Asphodelaceae	SCPE (N) MNCA
Aloe reitzii Reynolds var. *reitzii*	Asphodelaceae	NT
Aloe spp	Asphodelaceae	SCPE (N)
Aloe wickensii Pole-Evans var. *lutea* Reynolds	Asphodelaceae	NT
Asclepias dissona N.E.Br.	Apocynaceae	CR
Asclepias schlechteri (K.Schum.) N.E.Br. (WM754)	Apocynaceae	EN
Berkheya insignis (Sekhukhune form)	Asteraceae	SCPE
Brachycorythis ovata Lindl. subsp. *ovata*	Orchidaceae	MNCA
Brachystelma coddii	Apocynaceae	MNCA
Brachystelma minor E.A.Bruce	Apocynaceae	VU
Brunsvigia radulosa Herb.	Amaranthaceae	MNCA
Callilepis leptophylla	Asteraceae	Declining
Catha edulis	Celastraceae	NFA
Corycium nigrescens	Orchidaceae	MNCA
Curtisia dentata	Cornaceae	NT NFA
Cyphia transvaalensis	Lobeliaceae	SCPE (N)
Cyphostemma sp. nov. aff. *humile*	Vitaceae S	CPE
Delosperma deilanthoides S.A.Hammer	Aizoaceae	VU
Dianthus basuticus Burtt Davy subsp. *fourcadei* S.S.Hooper	Caryophyllaceae	VU
Dioscorea cotinifolia	Dioscoreaceae	MNCA
Disa aconitoides	Orchidaceae	MNCA
Disa alticola H.P.Linder	Orchidaceae	VU
Disa cf. *saxicola*	Orchidaceae	MNCA
Disa patula var. *transvaalensis*	Orchidaceae	MNCA
Disa zuluensis Rolfe	Orchidaceae	EN
Erica drakensbergensis Guthrie & Bolus	Ericaceae	MNCA
Elaeodendron transvaalense (Burtt Davy) R.H.Archer	Sapindaceae	NFA, NT
Euclea crispa (Thunb.) Gurke subsp. *crispa* (Sekhukhune)	Ebenaceae	SCPE
Eucomis autumnalis subsp. *clavata*	Hyacinthaceae	Declining (MP) MNCA
Eucomis montana	Hyacinthaceae	Declining MNCA
Eucomis vandermerwei I.Verd.	Hyacinthaceae	VU LCPE /SCPE (N) MNCA
Eulophia hians var *nutans*	Orchidaceae	MNCA
Eulophia ovalis var *bainesii*	Orchidaceae	MNCA
Eulophia ovalis var *ovalis*	Orchidaceae	MNCA
Eulophia sp.	Orchidaceae	MNCA
Gladiolus cf *ecklonis*	Iridaceae	MNCA
Gladiolus crassifolius	Iridaceae	MNCA
Gladiolus densiflorus	Iridaceae	MNCA
Gladiolus papilio	Iridaceae	MNCA
Gladiolus woodii	Iridaceae	MNCA
Gnidia caffra (Meisn.) Gilg (Form)	Thymelaeaceae	SCPE
Gnidia variabilis (C.H.Wright) Engl.	Thymelaeaceae	VU
Graderia linearifolia Codd	Orobanchaceae	VU
Gymnosporia species A	Celastraceae	SCPE
Habenaria barbertoni Kraenzl. & Schltr.	Orchidaceae	NT MNCA
Habenaria caffra	Orchidaceae	MNCA
Habenaria clavata	Orchidaceae	MNCA
Habenaria pseudociliosa	Orchidaceae	MNCA
Haemanthus humilis	Amaranthaceae	MNCA
Hermannia brachymalla	Malvaceae	LCPE

Huernia zebrina subsp. *insigniflora* (Sekhukhuneland form)	Apocynaceae	SCPE (N) MNCA
Ilex mitis A	quifoliaceae	Declining
Ipomoea bathycolpos subsp. *sinuatodentata*	Convolvulaceae	SCPE
Jamesbrittenia macrantha (Codd) Hilliard	Scrophulariaceae	NT
Khadia beswickii (L.Bolus) N.E.Br.	Aizoaceae	VU
Kleinia longiflora DC. (Form)	Asteraceae	SCPE
Kniphofia fluviatilis	Asphodelaceae	MNCA
Kniphofia linearifolia	Asphodelaceae	MNCA
Ledebouria (*Resnova*) *megaphylla*	Hyacinthaceae	VU (Mp) SCPE
Lydenburgia cassinoides N.Robson	Celastraceae	NT/NFA
Melhania cf *randii* (form)	Malvaceae	SCPE
Merwilla plumbea (Lindl.) Speta	Hyacinthaceae	NT MNCA
Myrothamnus flabellifolius Welw.	Myrothamnaceae	DDT
Neobolusia tysonii	Orchidaceae	MNCA
Olea capensis subsp. *enervis*	Oleaceae	MNCA
Olea europaea subsp. *africana*	Oleaceae	MNCA
Orthochilus foliosa (Lindl.) Bolus	Orchidaceae	MNCA
Pearsonia hirsuta Germish.	Fabaceae	VU
Pittosporum viridiflorum	Pittosporaceae	NFA
Protea caffra Meisn. subsp. *caffra*	Proteaceae	SCPE MNCA
Protea gaguedi	Proteaceae	MNCA
Protea parvula Beard	Proteaceae	NT
Protea roupelliae Meisn. subsp. *roupelliae*	Proteaceae	MNCA
Protea welwitschii	Proteaceae	MNCA
Satyrium cristatum var. *longilabiatum*	Orchidaceae	MNCA
Satyrium ocellatum subsp. *hallackii*	Orchidaceae	MNCA
Satyrium parviflorum	Orchidaceae	MNCA
Scadoxus multiflorus	Amaranthaceae	MNCA
Scadoxus puniceus (L.) Friis & Nordal	Amaranthaceae	MNCA
Schizocarphus nervosus	Hyacinthaceae	MNCA
Searsia batophylla (Codd) Moffett	Anacardiaceae	VU
Searsia tumulicola var. *meeuseana* forma *pumila*	Anacardiaceae	LCPE
Searsia wilmsii (Diels) Moffett	Anacardiaceae	LCPE
Streptocarpus dunnii Hook.f.	Gesneriaceae	Mp
Triaspis glaucophylla Engl.	Malpighiacaeae	SCPE (N)
Vitex obovata E.Mey. subsp. *wilmsii* (Gurke) C.L.Bredenkamp & D.J.Botha	Lamiaceae	SCPE (N)
Watsonia occulta	Iridaceae	Rare LCPE MNCA
Zantedeschia elliottiana (W.Watson) Engl.	Araceae	DD
Zantedeschia pentlandii (R.Whyte ex W.Watson) Wittm.	Araceae	VU SCPE (N) MNCA

IUCN: LC = Least Concern; VU = Vulnerable; NT = Near Threatened; EN = Endangered; DDT: Data Deficient
MNCA: Mpumalanga Nature Conservation Act (No.10 of 1998)
NFA: National Forest Act
SCPE: Sekhukhuneland Centre of Plant Endemism
LCPE: Mashishing (Lydenburg) Centre of Plant Endemism

17.4 PRELIMINARY HABITAT TYPES AND ESTIMATED BOTANICAL SENSITIVITY

Development of the regional (natural) vegetation is generally the result of complex interacting driving forces that include climatic-, geological (soil), topographical- and moisture gradients typical of the savanna and grassland regions of southern Africa. The ecotonal interference of the grassland and savanna biomes is characterised by a highly complex and transitional vegetation types, on a local and regional scale. Changes to the vegetation caused by disruptive (but generally localised) subsistence agriculture is often reflected through significant and obvious species changes of the grass sward and structural changes in the woody layers, reflecting severe divergence from the 'normal' composition of the primary habitats (Sekhukhune Mountain Bushveld and Sekhukune Montane Grassland types). Natural woodland and grasslands of the study area is therefore highly representative of the regional types, representing a primary climax status. Locally, the development of vegetation patterns are likely to be driven by topographical placement, slopes, local soil characteristics and moisture content and inundation of the soils, resulting in a continuum of gradients between woodland and grassland variations.

As dictated by the regional types, the vegetation of the site is highly complex, correlating to a multitude of biophysical attributes, including underlying geology, soils, soildepth, slopes and aspects, and rockiness/ exposed rock (refer Figure 12). These manifest as mosaical interrelated grassland, savanna, and wetland habitat types. Abrupt changes from outcrops that are predominantly wooded, to areas with deeper soils and a prominent graminoid and herbaceous layer is noted in some areas, but gradual transitions from grassland (Sekhukhune Montane Grassland) to savanna (Sekhukhune Mountain Woodland) is noted in other areas, complicating the accurate delineation and description of plant communities and finer variatioins. These transitional forms are dominated by a variety of savanna and highveld grass and forbaceous elements. Broadly speaking, grassland types are largely contained to areas with gentle slopes and flatter terrain, while dense thickets and woodlands are associated with steeper slopes and areas where surface rocks predominate. These rocks generally vary in size from 50 cm to batholitic forms that may exceed 15 m and heights in excess of 10 m.

The complex nature of the vegetation therefore necessitates a comprehensive assessment and classification during the EIA phase of the project, as it is generally believed that the floristic variations and communities of the site is characterised by unique and atypical compositions that would also reflect the structural disparity between these units. Furthermore, existing records from available information sources and previous surveys in the immediate region indicate a high floristic diversity that should be documented.
An appraisal of physiognomic attributes and results of a brief site investigation revealed the presence of the following preliminary and broad-scale habitat types within the site:

⇒ *Themeda – Tristachya* rocky grassland plains and crests – these areas indicate a high affinity to the regional Sekhukhune Montane Grassland type and is characterised by a well-developed and diverse herbaceous layer and the presence of occasional and isolated woody species. It is generally situated on midslopes and crests and the rock cover may be high, conforming to small and medium-sized rocks (<50 cm). Soils in these areas are generally loamy to sandy and red, apedal. Depending on the level of deterioration and historic utilisation, several smaller variations can be noted. This unit is also strongly associated with the transitional types towards the savanna units. Typical species noted in this unit include the grasses *Themeda triandra, Tristachya biseriata, Heteropogon contortus, Brachiaria serrata, Monocymbium cerisiiforme, Aristida* species, *Eragrostis* species and *Diheteropogon amplectens*, while other common species are *Heteropogon contortus, Cymbopogon pospischilii.* Shrubs and forb species that are characteristic of this unit include *Lopholoaena coriifolia, Tetraselago nelsonii, Rhoicissus tridentata, Aloe* cf. *burgersfortensis, Vangueria infausta,*and *Triumfetta sonderii.* Trees that occur in this unit generally reflect a strong affinity to the highveld grasslands, including *Protea caffra, Acacia caffra, Acacia karoo, Vitex obovatum, Ozoroa paniculosa* and *Cussonia* spp. This unit corresponds to the regional Sekhukhune Montane

Grassland vegetation type and, as such, is afforded a Vulnerable conservation status. As a result of the high diversity, pristine status, and likely presence of conservation important species within this unit, a Medium-High sensitivity is ascribed.

⇒ *Eragrostis* grassland plains and deteriorated grassland – the near-complete absence and a poorly developed graminoid layer that exhibit a poor diversity is characteristic of these units. Historic and recent subsistence agriculture and persistently high grazing pressure determines the generally poor status of these parts. As a result of the moderate to severe level of deterioration, altered vegetatal substrate, composition and structure, a Medium-low floristic sensitivity is ascribed.

⇒ *Myrothamnus – Xerophyta* Shrubland on sheetrock – this unit is present as embedded units throughout the study area and generally also reflect a measure of the surrounding vegetation along the edges. The distinguishing features include dominating rock sheets that are (often) densely populated by *Myrothamnus falbellifolius, Aloe castanea, Selaginella dregei, Xerophyta viscosa, X. retinervis* and *Cotyledon thrysiifolia.* The moderate to high floristic diversity, spatial and geographic restrictive presence within the larger environment and atypical features, and contribution to ecological habitat diversity ultimately render this unit highly sensitive.

⇒ Erosion Gulleys – occur in the southern part of the site and is generally devoid of an established vegetation layer. Severely eroded areas are strongly associated with the riparian habitat type, but constitute a separate habitat type because of a unique species composition and atypical physical habitat attributes. Siebert (2002) described this particular habitat as a natural occurrence in the region as "Intriguing vegetation anomalies" that are associated with heavily eroded soils. These areas, although not serpentinite, are very sparsely vegetated with a distinctive, though highly impoverished flora including, for example *Searsia keetii, Euclea linearis* and *Amphiglossa triflora*. The origin and chemical composition of these eroded areas, which are often considered as natural features, are not known. Habitat conditions in this unit are typical of severely eroded habitat, soil conditions vary between open soils, which could frequently be eroded to bedrock, or soils with a high percentage of rocks and boulders. Deep banks with steep sides border this unit and sometimes forms isolated 'islands' of remaining (original) vegetation within this unit. Changes to the substrate are frequent and recurring with severe raining events, available soils and seeds are frequently removed from the top layer, explaining the absence of even most opportunistic species. Deeply rooted vegetation, such as shrubs and trees therefore represents the highest incidences of vegetation in these parts. The deteriorated nature of these features render the floristic importance on a local and regional scale Medium-low

⇒ Perennial and non-perennial drainage lines and associated hydromorphic vegetation types – include all perennial and non-perennial drainage lines across the site. The spatial inclusion of the drainage lines within grassland and woodland habitat types dictate significant structural and compositional variability, ranging from deeply channelled valley bottoms to seeps and meadows, sheetrock wetlands, deep ponds, waterfalls with densely wooded streambanks. Furthermore, the geographic placement within a basin dictates the presence of ephemeral wetlands and drainage lines, unchallenged valley bottoms, and seepages that collects and drain towards channelled valley bottoms and established, perennial drainage lines and rivers that are characterised by obligate wetland taxa, such as sedges and hydrophylic species. The species composition of this type is, similarly, highly erratic and variable according to the surrounding habitat types, ranging between grassland and densely wooded and thickets. For the purpose of this assessment all wetland types are collectively included in a single unit; EIA studies will elaborate on the variability and compositional aspects of the specific communities. The typical ecological importance, contribution to ecological infrastructure and services, the known presence of conservation important plant species, high diversity values, high conservation value and pristine status of these habitat types ultimately render it highly sensitive in terms of floristic attributes.

⇒ *Lydenburgia - Maytenus* Wooded Rocky Midslopes and Thickets - This community represent areas where the vegetation physiognomy is dominated by trees (characteristically with a crown cover exceeding 30%), with a subdominant, but nonetheless diverse, herbaceous layer. Slopes are generally high (>10% - 100%) and the rockiness is high (>20 – 70%). Woody species that are frequently encountered include *Lydenburgia cassinoides, Combretum hereroense, C. zeyheri, Cussonia spicata, C. transvaalensis, Dombeya rotundifolia, Euclea crispa, Faurea saligna, Hippobromus pauciflorus, Mundulea sericea, Ozoroa paniculosa, Searsia* spp., *Vitex obovata* ssp *obovate, Aloe arborescens, Olea capensis* ssp. *enervis, Sclerocarya birrea* ssp. *africana,* and *Ziziphus mucronata.* The species composition of the forb layer and grass sward a high diversity of species, but is extremely variable across the site. Numerous smaller variations are noted within this unit. The floristic structure and composition of these rocky outcrops is extremely variable. The high floristic diversity, multitudes of micro-habitat that contribute to ecological infrastructure and services, the known presence of plant taxa of conservation importance, the ecotonal placement inbetween the Grassland and Savanna Biomes ultimately renders the floristic importance of this unit Medium-high.

⇒ *Acacia* thickets – occur as isolated stands within the grassland and savanna transitional sones and is dominated by *Acacia karoo.* A high utilisation factor and devastating effects of wood harvesting affect these areas adversely. The (apparent) deteriorated status and high utilisation factor, poor floristic diversity ultimately render the floristic importance of this unit Medium, mainly as a result to the contribution to ecological infrastructure and services.

⇒ *Maytenus – Cussonia* transitional woodland between grassland and savanna - this community is characterised by a dominant herbaceous layer generally occurring on dark soils with prominent trees that are often grouped in stands associated with embedded rocky outcrops. It is characteristically present in areas where the slopes are not particularly high and the available topsoil is relative deep. Embedded areas of high rockiness occur in the form of boulders, sheets, and rocks, populated by wooded stands where the boulder clusters provide protection against devastating effects of fire. The herbaceous layer is dominated by grasses, in terms of physiognomy, but a diverse layer of forbs are present. Prominent grass species may include *Andropogon schirensis, Brachiaria serrata, Diheteropogon filifolius, Elionurus muticus, Trachypogon spicatus* and *Themeda triandra*. Forb species frequently encountered include *Acalypha indica, Anomatheca grandiflora, Barleria prionitis, Berkheya insignis, Commelina africana, Clerodendrum triphyllum, Cyanotis speciosa, Aloe castanea, Cyphostemma woodii, Dicoma montana, Hibiscus trionum, Hypoxis rigidula, Indigofera* species, *Pearsonia sessilifolia, Sphedamnocarpus pruriens, Sphenostylis angustifolia, Triaspis glaucophylla, Turbina oblongata* and *Xerophyta retinervis.* Typical trees occurring in this unit include *Maytenus undata, Cussonia spicata, Lydenburgia cassinoides, Olea capensis* ssp. *enervis, Ziziphus mucronata.* The floristic structure and composition of these rocky outcrops is extremely variable. The high floristic diversity, multitudes of micro-habitat that contribute to ecological infrastructure and services, the known presence of plant taxa of conservation importance, the ecotonal placement inbetween the Grassland and Savanna Biomes ultimately renders the floristic importance of this unit Medium-high.

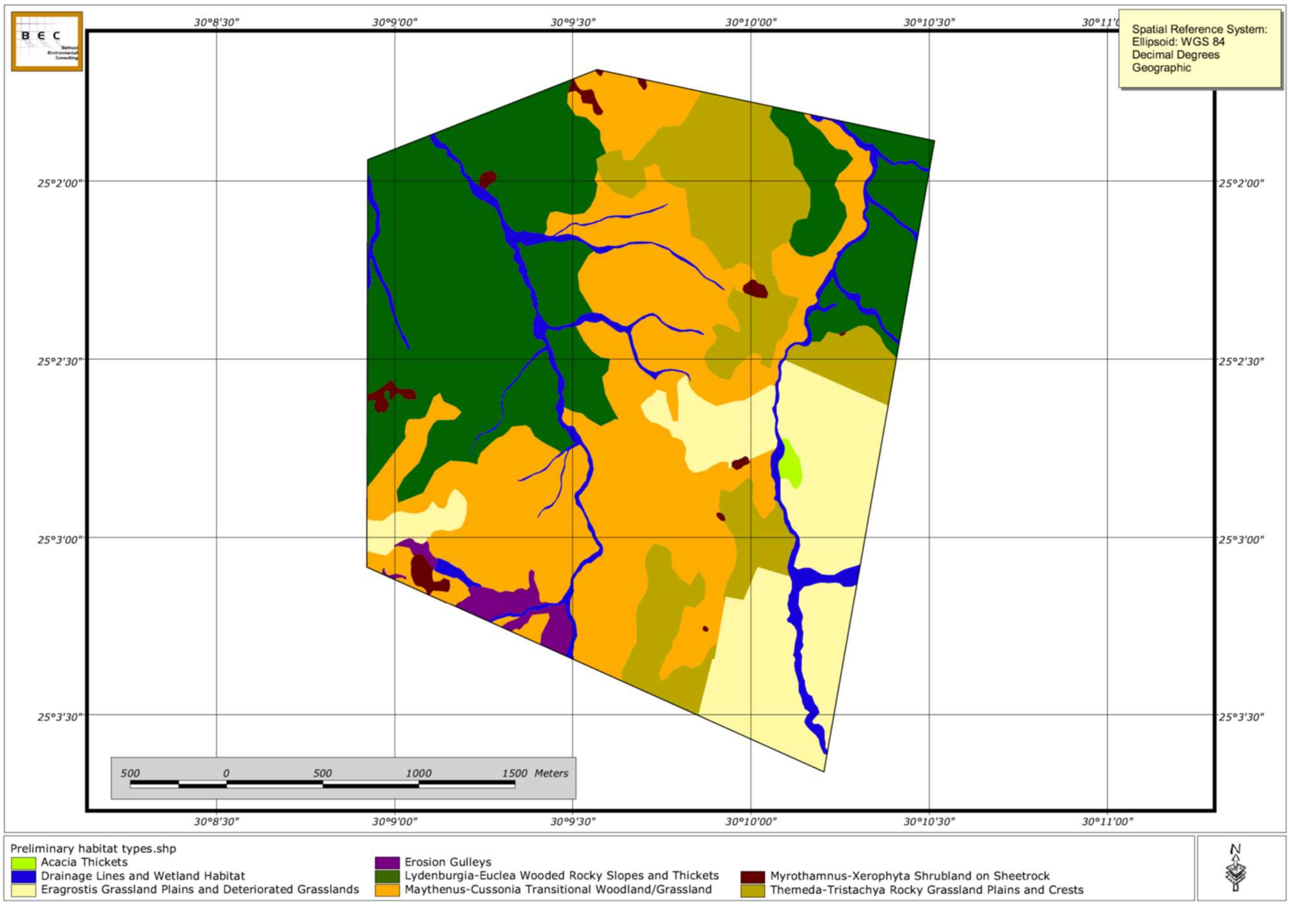

Figure 12: Preliminary indication of broad-scale habitat types within the study area

17.5 Estimated Floristic Sensitivity for the study site, based on broad-scale habitat types

The estimated floristic sensitivity of the receiving environment is based on a subjective evaluation of the following aspects:

⇒ Apparent floristic diversity;

⇒ Inherent contribution to local and regional ecological infrastructure and services (biotic and abiotic);

⇒ Local and regional conservation status;

⇒ Local and regional representation;

⇒ Disturbance level/ representation of regional ecological types/ Ecological functional state; and

⇒ Presence and/ or suitability for plant taxa of conservation importance.

An illustration of the estimated floristic sensitivities of the receiving environment is presented in Figure 13.

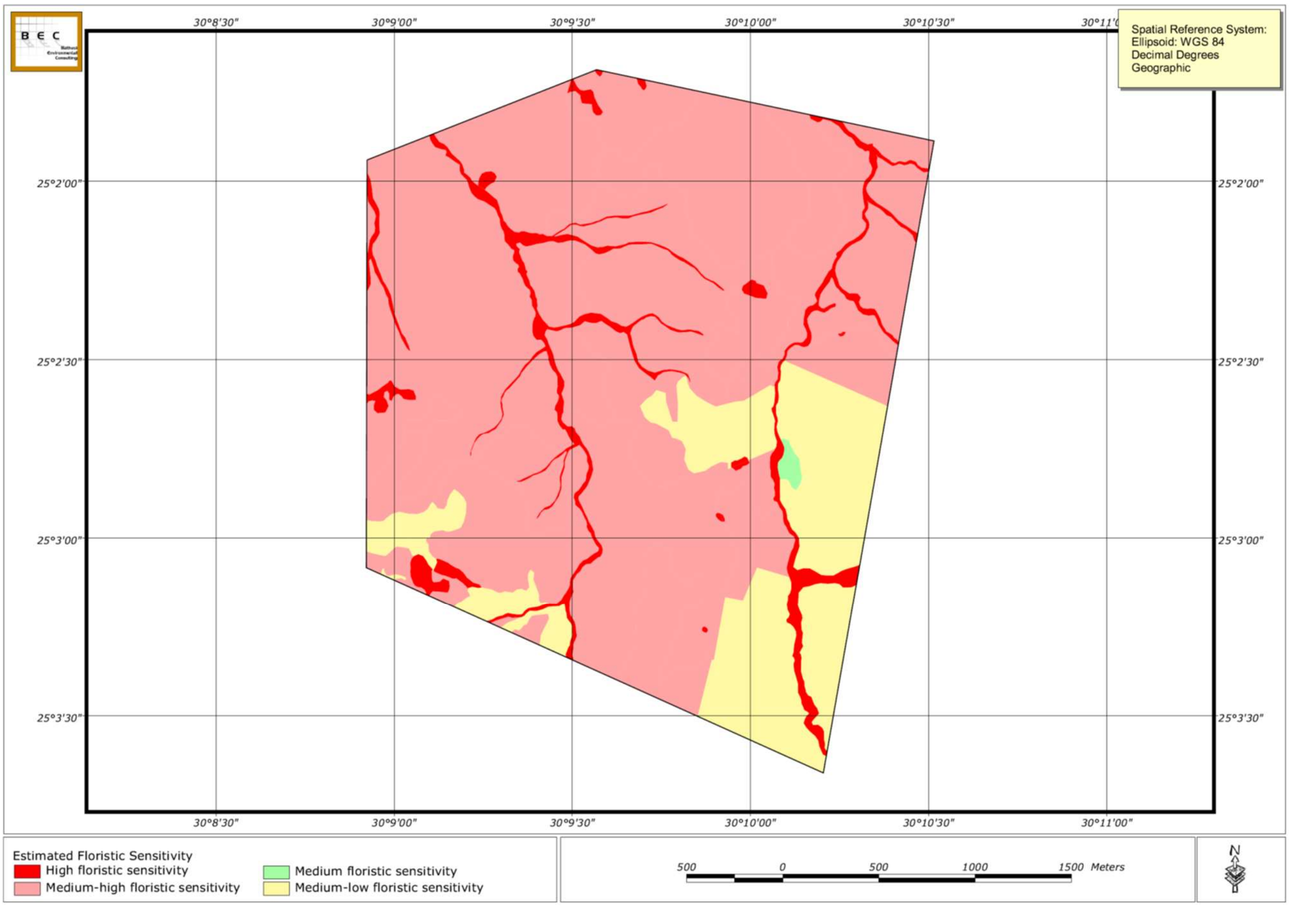

Figure 13: Estimated floristic sensitivity of the study site

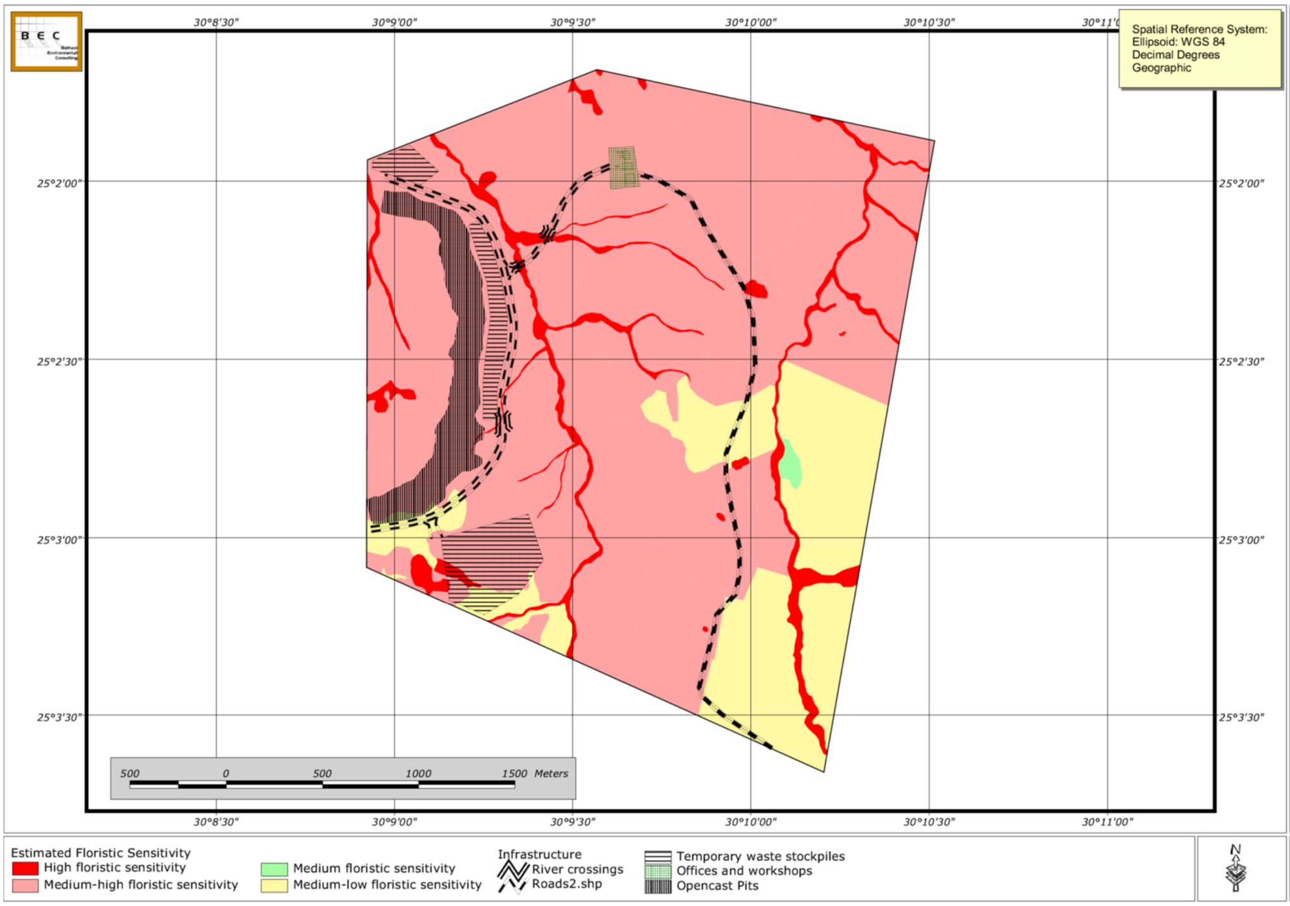

Figure 14: Spatial location of project infrastructure in relation to floristic sensitivity

17.6 ANTICIPATED IMPACTS ON THE FLORISTIC RECEIVING ENVIRONMENT

From Figure 14 it is evident that habitat of medium-high floristic sensitivity will be affected by the proposed project. It is important to note that the proximity to high sensitivity areas, notably the wetland and riparian habitat, also driven by the topographical characteristics of the site, will ultimately render potential and likely impacts particularly high.

The following list of generic impacts on the floristic environment is anticipated.

17.6.1 DIRECT IMPACTS

The largest extent of impacts within the botanical environment is likely to result due to direct (physical) effects of land clearing activities and habitat loss. Typically with opencast mining operations, these impacts are often locally devastative. Direct impacts include any effect on the various habitat types, including locally endemic species, populations, or individual species of conservation importance, as well as on overall species richness, diversity and abundance. These impacts include effects on genetic variability, population dynamics, overall species existence or health and on habitats important for species of conservation consideration. Loss of sensitive, restricted, or protected habitat types are included in this category, but only on a local scale. These impacts are mostly measurable and easy to assess, as the effects thereof are immediately visible and can be determined to an acceptable level of certainty. Impacts of a direct nature include the following:

1. Impacts on/ losses of taxa of conservation importance and habitat associated with conservation important taxa;
2. Local depletion of biodiversity, harvesting, etc.; and
3. Loss of natural habitat, including essential habitat refugia, atypical and unique/ restricted habitat types, ecological processes, services, and infrastructure (within the study area).

17.6.2 INDIRECT IMPACTS

In contrast, indirect impacts are not always immediately evident and can consequently not be measured at a specific moment in time; 'spill-over effects' are spatially and temporally removed from the actual activity and manifestations are typically more subtle compared to direct impacts. The extent is frequently at a scale that is larger than the actual site of impact, but usually restricted to a local scale (and not regional). A measure of estimation, extrapolation, or interpretation is therefore required to evaluate the significance of these impacts and it is usually a factor of the sensitivity of the receiving surrounding environment. Indirect impacts typically result in adverse effects or deterioration of the surrounding areas. In addition, the ecological functionality of the surrounding area could be adversely affected by the activity, with reference to the ecological interaction between plants and animals. The aesthetic appeal of the region, although a personal and highly debatable attribute, is regarded a potential receiver of landscape changes resulting from land transformation. Lastly, one of the most important effects of indirect impacts is the alteration of biophysical characteristics of the surrounding areas through the introduction and proliferation of species with an exotic nature or encroachment characteristics, changes in topographical features, etc.

Impacts of an indirect nature generally include the following:

4. Deterioration of untransformed habitat in areas surrounding the project area, with specific reference to sensitive habitat types/ species situated in proximity to the activity;
5. Altered quality and ecological functionality (including fire, erosion) of surrounding areas and natural habitat;
6. Decreased aesthetic appeal of the landscape; and

17.6.3 CUMULATIVE IMPACTS

Cumulative impacts represent the totality of impacts in a given area resulting from this activity and related (similar projects or activities that could conceivably be regarded as 'spin-offs' from this project), and how these activities impact upon the ecology of a region. The exact nature, duration, significance, and scale of cumulative impacts are difficult to quantify and also extremely problematic to mitigate against. However, cumulative impacts are significant and require consideration during this process of mitigating impacts and managing the natural ecological environment of the region. Anticipated cumulative impacts of the proposed project on the ecology of the region include:

7. Increased plundering of natural resources due to increased human encroachment, accessibility to the site, etc.;
8. Exacerbation of existing levels of habitat fragmentation and isolation; and
9. Cumulative impacts on local/ regional and national conservation targets and obligations (loss of natural grassland habitat).

17.7 COMMENTS

Key results from the scoping assessment include the following:

⇒ Considering the suggested project layout (refer Figure 14), impacts on the botanical receiving environment are likely to be significant and high. Aspects that will contribute to the significance include the known presence of protected plant species and habitat that is sensitive and important on a local and regional scale.

⇒ Indirect impacts are generally interpreted with an analysis of nearby and adjacent habitat types in mind. Considering the proximity to sensitive and important riparian habitat, and the dictating topographical nature of the site, anticipated indirect impacts are likely to be severe and significant.

⇒ The comparative small size of the proposed project will result in losses of some natural habitat on a local scale. While these losses are significant on a local scale, the regional significance is anticipated to be comparatively low. However, the increase of mining activities on a local and regional scale will have devastating effects on areas of remaining natural habitat. In particular, conservation efforts within a region where few formalised and legal protective efforts are present, will be affected adversely. Aspects such as habitat fragmentation and isolation, increased pressure from anthropogenic influx to the area and increased activities will undoubtedly result in significant long-term effects.

Despite anticipated significant and high impacts on the botanical receiving environment, no aspects was noted that would require the enforcement of the 'No-Go' Option for this project. Typically, this would constitute the known presence of Critically Endangered habitat or species within the proposed footprint and the undeniably impacts from the proposed development on these habitat or species. The obvious high sensitivity of the floristic receiving environment, as well as the known presence of numerous plant species of (lower) conservation consideration, will inevitably result in impacts of a severe and significant nature, but the development of an extensive and detailed mitigation approach is likely to render most of the potential and likely impacts of an acceptable/ manageable nature and significance. Such a mitigation approach is likely to be costly and extensive, with possible liabilities that might include an extensive monitoring plan and (possibly) Biodiversity Offset Strategy.

17.8 TERMS OF REFERENCE FOR THE BOTANICAL EIA

Vegetation is often described at various hierarchical levels from biome, to broad-scale vegetation types, and down to plant community level with associated local habitat conditions. To accurately evaluate the level and significance of impacts associated with the planned mining activity on the botanical receiving environment, the following plan of study for the EIA phase of the project is recommended.

The assessment of impacts, and development of a suitable mitigation approach with relevant monitoring requirements should be based on the following project deliverables:

1. Brief review and description of relevant biophysical habitat attributes pertaining to floristic developmental drivers;
2. A review of the local and regional importance of the site in terms of threatened ecosystems, biodiversity conservation planning, etc.;
3. Collation and brief review of available historic reports relevant to the project and site;
4. Comprehensive surveys of representative broad-scale habitat types to determine floristic diversity and compositional patterns, also with particular reference to plant taxa of conservation consideration, which might require seasonal consideration for some plant species (i.e. austral summer and winter surveys);
5. Suitable surveys to determine the abundance, distribution and location of plant species of conservation importance/ concern (typically conducted as a separate, stand-alone phase);
6. Determining the presence and abundance of exotic and invasive plant species, providing relevant management measures;
7. Suitable analysis and appraisal of diversity patterns from collected data;
8. Structural and compositional descriptions and analysis of floristic communities and fine-scale variations with associated biophysical attributes, including rockiness, main soil characteristics, slopes, aspects, topography, moisture, etc.
9. Mapping and delineation procedures;
10. Appraisal of the floristic sensitivity that is based on popular and suitable vegetatal attributes;
11. A site- and project-specific Impact Assessment on the floristic receiving environment, with the objective of demonstrating the anticipated effect of the proposed project;
12. Provision of recommendations, based on results from the botanical assessment; and
13. Development of a suitable mitigation approach, a botanical monitoring plant, contributions to the EMPr, and (if necessary) recommendations pertaining to a Biodiversity Offset Programme.

17.8.1 FIELD METHODOLOGY AND DATA COLLATION

For proper and efficient surveying of an area, the ecological stratification of the study area on the basis of terrain morphology and vegetation cover is made in advance (such as the preliminary habitat types presented in Figure 12), which would represent a physiognomic assessment of the vegetation. Contributing data, such as landforms, geology, soil types, hydrology and topographical variability are also interpreted to establish the habitat variability of the site. These features are subsequently surveyed and ground-truthed during a site visit and the stratification is used to determine the position and number of sample plots (stratified-random approach), forming the basis for data assimilation, ultimately used to identify habitat types and to produce a vegetation map. For the particular area, and considering the level of required interpretation of data, a total of at least 50 sample plots is recommended, to be subjected to analysis software and interpretation to determine the major communities and smaller variations.

Vegetation surveys will be conducted following the Zurich-Montpellier (Braun-Blanquet) School of total floristic composition (Werger 1974). In the Braun-Blanquet approach, vegetation types are perceived as units that can be recognised and identified by their total floristic composition. Instead of definitive sample plots, an approach of stratified meander surveys (SMS) will be employed within each of the stratified/ homogenous units, taking care not to exceed the apparent boundaries of physiognomic units, to assimilate relevant floristic data. A comprehensive list of species and associated data will be compiled for each SMS to determine the Alpha diversity of the site. Data collected will entail the recording of all the identifiable trees, shrubs, grasses, sedges, ferns, forbs, geophytes, succulents, and alien (exotic) plant species during each SMS and within identifiable units.

Each species is allocated a percentage canopy cover value, which is required for the classification and description of the plant associations (Werger 1974). Canopy cover estimates will be according to the Braun-Blanquet approach:

+ a canopy cover/abundance estimate of less than 1 %;
1 a canopy cover of 1 – 5 %;
2a a canopy cover value of >5 to 15 %;
2b a canopy cover value of >15 – 25 %;
3 a canopy cover value of >25 – 50 %;
4 a canopy cover value of >50 – 75 %; and
5 a canopy cover value of >75 %.

Additionally, an estimate of the total vegetation cover (%) will be made for different strata: trees (>3 m), shrubs (≤3 m), dwarf shrubs (≤1 m), grasses and forbs (non-grassy herbaceous plants), geophytes, succulents, etc. Additionally, biophysical habitat attributes will be recorded at each sampling point (releveè), e.g. topography, slope, aspect, geology, rock cover, rock size, gravel cover, soil texture, soil depth and soil colour. Data obtained from other specialist surveys, e.g. soils, geology, wetland delineations, etc., might be included as more accurate estimations.

17.8.2 DATA ANALYSIS AND PRESENTATION

Species accumulation curves (SAC) for the botanical sampling points (releveès) will be generated using the software program Estimates S (version 9) with 100 randomizations (as recommended in Colwell, 2013). Sampling sufficiency will be determined by establishing whether a point had been reached where a line representing one new sample adding one new species was tangent to the curve .

All data collected will be presented in a matrix, with rows representing the relative abundances of each species/taxon, and columns representing the respective species; this matrix will form the basis for the data analyses The mean number of species (S) and the Shannon-Wiener diversity index (H') will also be calculated for each taxon group representing each habitat type.

Floristic data will be captured and analysed with the TURBOVEG and JUICE computer programs (Hennekens & Schaminee 2001, Tichy 2002). The table of sample plots against species will be further refined using Braun- Blanquet tabulation procedures (Werger 1974) to produce a hierarchical classification. A categorised species list will be generated indicating the conservation status of the plant species (IUCN category); NEM:BA ToPS classification; CITES status and Protected Tree status for each plant species. List of plant species for the grid around the mine will be obtained from the NewPosa plant species databank (SANBI) and compared to survey results as an indication of the status of the vegetation within the site. An analysis of species richness and various diversity parameters (e.g. Shannon-Wiener index (H'), Evenness (E); complement of Simpson's index (1-D); and exponent H' will be presented per plant community identified.

Results from the Braun-Blanquet table will be used to present the range of floristic communities and variations, the Alpha diversity, characteristic species, and general floristic attributes of each community. These communities and variations will be mapped and subjected to a sensitivity analysis and recommendations will flow from the interpretation.

17.8.3 *COLLECTION OF DATA RELEVANT TO PLANT TAXA OF CONSERVATION CONSIDERATION*

Separate surveys will be scheduled to determine the abundance and geo-location of plant taxa of conservation consideration, refer Section 17.3) to assist the client with the compilation and submission of relevant permit applications to attain legal compliance. It should be noted that, considering the range of conservation important plant species that could potentially occur on the site, it is likely that surveys should be conducted across seasonal spans, i.e. austral winter and summer surveys. The purpose and objectives of the winter survey would be to record and identify plant species of conservation concern that typically flower during the winter period and which is non-descript and problematical to identify during the typical summer surveys, and are often not included or identified correctly.

17.8.4 *TIMELINES AND PROJECT CONSIDERATIONS*

The following schedule and time allowance is suggested:

⇒ EIA Winter Surveys – a single survey to establish the presence, abundance, and identification of winter flowering plant species, with specific reference to plant species of conservation consideration. Winter surveys are typically conducted during the middle and latter part of the austral winter period, typically between June and August. To allow for project schedules and timeframes, it is strongly suggested that this winter survey be conducted during this current winter period, preferably during August. Target species would typically include *Aloe* species and *Protea* species and would specifically target areas where impacts are anticipated.

⇒ EIA Summer Surveys - during the height of the growing season, which is typically between November and March. Consideration for multiple surveys is recommended to allow for the flowering patterns of different plant species of conservation consideration, although this would be subject to project considerations and budgetary constraints.

⇒ Red Data abundance and geo-location survey – a single survey to determine the abundance and geo-location of specific plant/ tree species for permitting requirements, specifically within the affected areas. This survey should ideally be conducted prior to the submission of the EIA application to inform decision making and to highlight project liabilities.

The appointment of a suitable specialist/ company to conduct the surveys should consider the execution of these surveys and the implication on the timelines pertaining to the submission of applications.

18 SECTION C – FAUNAL AND AVIFAUNAL COMPONENT

18.1 OBJECTIVE OF THE FAUNAL AND AVIAN SCOPING ASSESSMENT

The main objectives of the scoping exercise are to:

⇒ describe the relevant baseline habitat conditions relating to the avifaunal and faunal community on the study site;
⇒ provide an overview of the expected bird and fauna diversity that could occur on the study site;
⇒ conduct a desktop and literature review of threatened, near threatened and conservation important bird and faunal species (including invertebrate taxa) that could occur on the proposed study site;
⇒ provide an overview of potential impacts on the faunal community related to the anticipated mining operations; and
⇒ provide recommendations and ecological guidelines for a 'Plan of Study' to be used during the EIA process.

Specific tasks to be undertaken during the EIA assessment will include (during the austral summer):
⇒ Identify bird and terrestrial faunal compositions on the study site and their association with particular broad-scale habitats and/or plant communities;
⇒ Provide an evaluation of their importance in a local, regional or national context, especially "rare" and/or threatened species;
⇒ Identify habitat unit or discrete habitat area for bird and faunal species on the study site that are threatened or near-threatened (Red Data);
⇒ Evaluate the importance of the site as foraging/roosting/breeding habitat for charismatic (iconic) bird species and large mammalian carnivores (such as Leopard Panthera pardus and large birds of prey);
⇒ Examine the ecological relationships/associations between recorded species and taxa, and the different habitat types in which they are found; and
⇒ Identify any specific areas in the study site that may require special protective measures to avoid future degradation or environmental damage.

18.2 METHODS AND APPROACH

The avifaunal and faunal assessment for this project will be completed in two phases of which the first part, the scoping phase, will entail a literature review accompanied by an orientation site visit, which was conducted during 6th and 7th July 2020. Phase 1 will then set a benchmark for further detailed surveys that will form part of the second phase (the EIA phase).

The information provided in this report (as part of the scoping phase) was sourced from:
1 relevant literature;
2 personal observations from similar habitat types; and
3 an orientation site visit (06-07 July 2020).

18.2.1 *LITERATURE SURVEY AND INFORMATION BASE*

Mammals

⇒ The potential (expected) occurrence and conservation status of mammal taxa were based on the IUCN Red List (2020) and the national Red Data Book by Child et al. (2016), while mammalian nomenclature was informed by Stuart and Stuart (2015) and Child et al. (2016), unless otherwise indicated.

⇒ The historical and extant (contemporary) distribution ranges of mammal taxa sympatric to the study site were sourced from MammalMap (c. 2530AA and bordering grids (refer **Figure 16**)) along with applicable field guides, in particular Stuart & Stuart (2015), Skinner & Chimimba (2005), Child et al. (2016) and Friedmann & Daly (2004).

⇒ Additional information was also provided by the Mpumalanga Parks and Tourism Agency (MPTA) for QDS 2530AA.

Avifauna

⇒ Hockey et al. (2005), Harrison et al. (1997) and Del Hoyo et al. (1992-2011) were consulted for general information on the life history attributes of the relevant bird species. They also provide basic distributional information at small geographic scales.

⇒ Marnewick et al. (2015) was consulted for information regarding the biogeographic affinities (sensu Important Bird and Biodiversity Areas) of selected bird species that could be present on the study site.

⇒ The conservation status of bird species was categorised according to the global IUCN Red List of threatened species (IUCN, 2020) and the regional conservation assessment of Taylor et al. (2015).

⇒ Distributional data was sourced from the South African Bird Atlas Project (SABAP1) and verified against Harrison et al. (1997) for species corresponding to the quarter-degree grid cell (QDGC) 2530AA (although all eight bordering grids were also investigated; see **Figure 15**). The information was then modified according to the prevalent habitat types present on the study area. The SABAP1 data provides a "snapshot" of the abundance and composition of species recorded within a quarter degree grid cell (QDGC) which was the sampling unit chosen (corresponding to an area of approximately 15 min lat and 15 min long). It should be noted that the atlas data makes use of reporting rates that were calculated from observer cards submitted by the public as well as citizen scientists. It therefore provides an indication of the thoroughness of which the QDGCs were surveyed between 1987 and 1991.

⇒ Additional distributional data was also sourced from the SABAP2 database (http://www.sabap2.adu.org.za). The information was then modified according to the prevalent habitat types present on the study area. Since bird distributions are dynamic (based on landscape changes such as fragmentation and climate change), SABAP2 was launched in 2007 from SABAP1 with the main difference being that all sampling is done at a finer scale known as pentad grids (5 min lat x 5 min long, equating to 9 pentads within a QDGC). Therefore, the data is more site-specific, recent, and more comparable with observations made during the site survey (due to increased standardisation of data collection). The pentad grids that are relevant to the current project include 2500_3005 and 2500_3010. In addition, the pentad grids adjacent the study site were also inspected during the assessment (c. 2455_3000, 2455_3005, 2455_3010, 2505_3010, 2505_3005, 2505_3000 and 2500_3000; refer **Figure 16**).

⇒ The choice of scientific nomenclature, taxonomy and common names were recommended by the International Ornithological Committee (the IOC World Bird Names, version 10.1), unless otherwise specified (see www.worldbirdnames.org; Gill & Donsker, 2020).

⇒ Additional information was also provided by the Mpumalanga Parks and Tourism Agency (MPTA) for QDS 2530AA.

⇒ All observations obtained during the screening/orientation site visit of 06 - 07 July 2020 was submitted to the South African Bird Atlas Project (SABAP2).

Herpetofauna (reptiles and amphibians)

⇒ Red List categories for reptile species were chosen according to the conservation assessment conducted by Bates et al. (2014).

⇒ Red List categories and listings of amphibian taxa follow Minter et al. (2004) and Measey (2010).

⇒ The distribution of reptile and amphibian species was verified against the ADU's database consisting of ReptileMap and FrogMap (c. 2530AA and the eight bordering grids; refer **Figure 15**).

⇒ Additional information was also provided by the Mpumalanga Parks and Tourism Agency (MPTA) for QDS 2530AA.

Invertebrate taxa of conservation concern

⇒ The occurrence of threatened butterfly taxa was based on Woodhall (2005), while Mecenero et al. (2013) was consulted regarding their conservation status.

⇒ The SABCA database (c. LepiMap) provided a preliminary list of butterflies for the study area (2530AA, including all eight bordering grids; refer **Figure 15**);

⇒ The Dung BeetleMap database was consulted for species observed in the study area (c. 2530AA, including all eight bordering grids; refer **Figure 15**).

⇒ The Odonata (dragonflies and damselflies) database was consulted for species observed in the study area (c. 2530AA, including all eight bordering grids; refer **Figure 15**).

⇒ The ScorpionMap and SpiderMap databases were consulted for scorpion and spider species observed in the study area (c. 2530AA, including all eight bordering grids; refer **Figure 15**).

18.2.2 FIELD SURVEYS

Detailed field surveys were not part of the scope of work for this report, although a two day orientation site visit was undertaken.

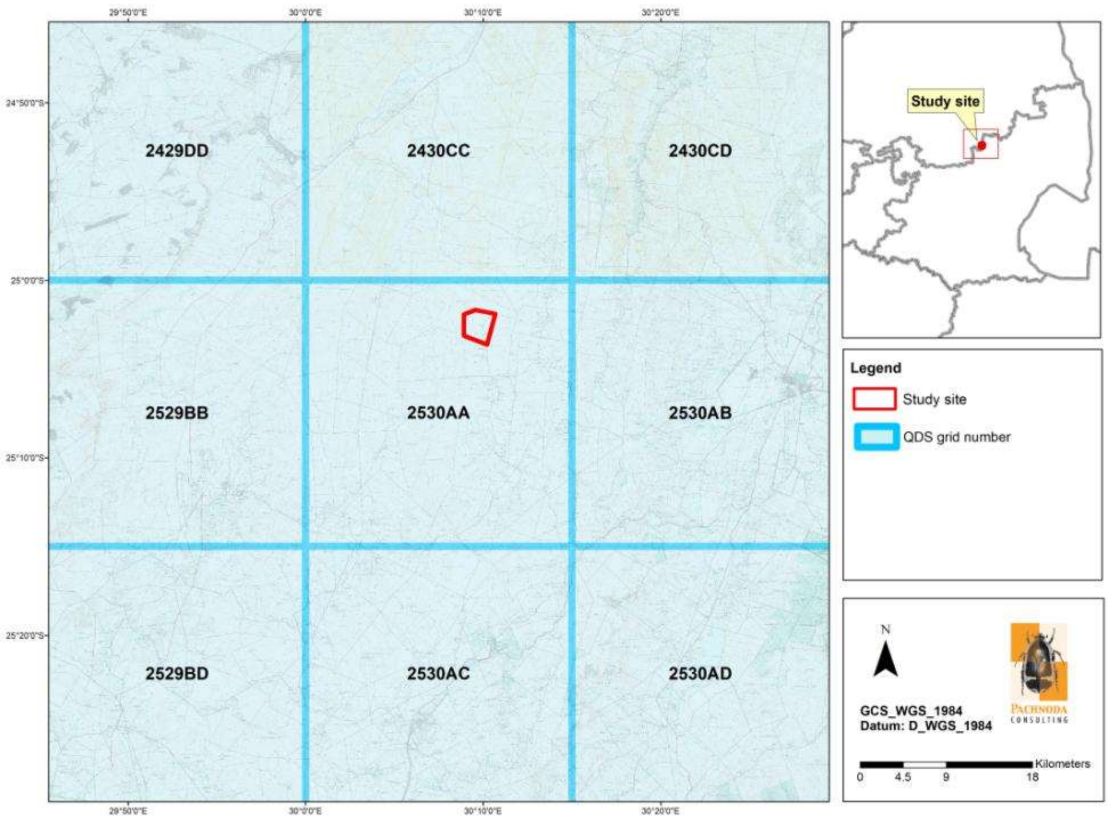

Figure 15: The quarter-degree grid squares (sensu ADU and SABAP1) relevant to the study area.

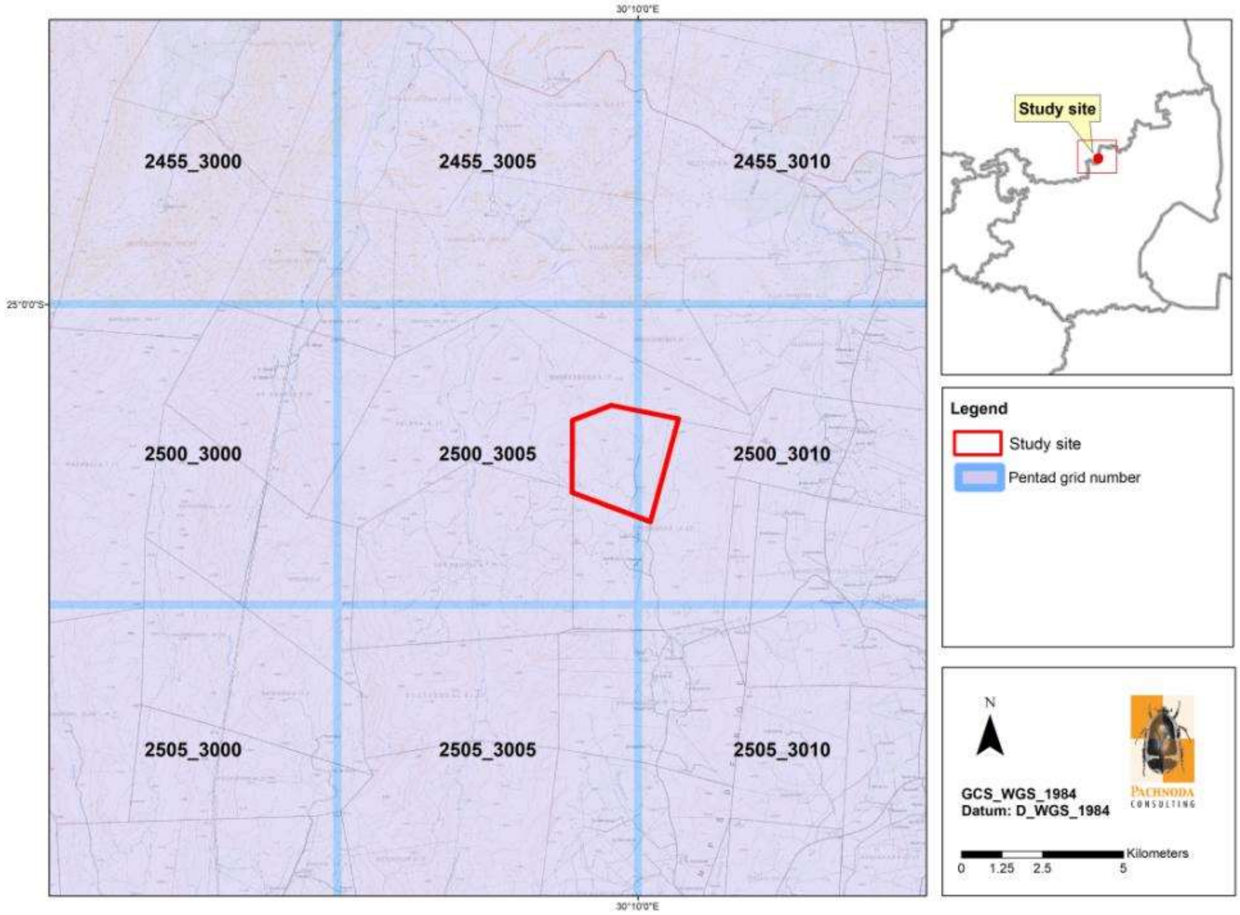

Figure 16: The pentad grids (sensu SABAP2) relevant to the study area.

18.3 PRELIMINARY RESULTS

18.3.1 MAMMALS

Expected species Richness and Composition

According to the habitat types available, as well as the historical and extant distribution ranges (*sensu* MammalMap), the study site and immediate surrounding habitat could sustain 69 mammal species (refer Table 5). Approximately 50 of these species (72 % of the total expected richness) have a high probability of occurrence on the study site, another nine with a moderate probability of occurrence, while 10 species have a low probability of occurrence and is regarded to be peripheral to the study site.

Those taxa with the highest number of records for the area (dominant taxa - sensu MammalMap) within the study area include large-bodied carnivores and scavengers such as Leopard (*Panthera pardus* - 77 records), Brown Hyaena (*Parahyaena brunnea* - 63 records) and other taxa such as Aardvark (*Orycteropus afer* - 54 records), Cape Serotine Bat (*Neoromicia capensis* - 48 records), Black-backed Jackal (*Canis mesomelas* - 42 records), Common Large-spotted Genet (*Genetta maculosa* - 40 records), Bushbuck (*Tragelaphus strepsiceros* - 40 records) and Natal Multimammate Mouse (*Mastomys natalensis* - 35 records).

During the orientation site visit it was evident that the observed mammal richness was much lower when compared to the expected richness with 13 species observed. These include mainly widespread species such as Cape Porcupine (*Hystrix africaeaustralis*), African Savanna Hare (*Lepus victoriae*), Highveld Mole-rat (*Cryptomys cf. pretoriae*), Common Duiker (*Sylvicapra grimmia*), Vervet Monkey (*Chlorocebus pygerythrus*), Chacma Baboon (*Papio ursinus*), Plains Zebra (*Equus quagga*) and the Highveld Gerbil (*Gerbilliscus brantsii*). Other confirmed species include rupicolous taxa confined to the many outcrops, rocky slopes, and sheetrock habitat such as the Namaqua Rock Mouse (*Micaelamys namaquensis*), Eastern Rock Sengi (*Elephantulus myurus*) and Smith's Red Rock Hare (*Pronolagus cf. rupestris*[1]). The near threatened Cape Clawless Otter (*Aonyx capensis*) and Marsh Mongoose (*Atilax paludinosus*) was confirmed from the perennial streams that occur on the western section of the study site. The low observed richness is probably attributed to recent human activities and settlements and the presence of livestock (resulting in grazing pressure and disturbances caused by trampling).

Table 5: Inventory of mammalian taxa predicted to occur on the study site (and immediate surroundings)
based on the presence of suitable habitat and with known distribution ranges sympatric to the site (sensu MammalMap and professional judgement).

Family	*Scientific name*	*Common name*	*Conservation Status*	*Probability of Occurrence*
Bovidae	*Ourebia ourebi*	Oribi	Endangered	Low
Bovidae	*Tragelaphus scriptus*	Bushbuck	Least Concern	High
Emballonuridae	*Taphozous (Taphozous) mauritianus*	Mauritian Tomb Bat	Least Concern	High
Muridae	*Acomys spinosissimus*	Spiny Mouse	Least Concern	High
Muridae	*Mus (Nannomys) minutoides*	Pygmy Mouse	Least Concern	High
Viveridae	*Genetta genetta*	Small-spotted Genet	Least Concern	High
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	Least Concern	High (confirmed)
Leporidae	*Lepus victoriae (=saxatilis)*	African Savanna Hare	Least Concern	High (confirmed)
Muridae	*Micaelamys namaquensis*	Namaqua Rock Mouse	Least Concern	High (confirmed)
Bovidae	*Aepyceros melampus*	Impala	Least Concern	Low
Bovidae	*Redunca fulvorufula*	Mountain Reedbuck	Endangered	Low
Leporidae	*Lepus capensis*	Cape Hare	Least Concern	Low
Vespertilionidae	*Pipistrellus (Pipistrellus) hesperidus*	Dusky Pipistrelle	Least Concern	Low
Bovidae	*Raphicerus campestris*	Steenbok	Least Concern	High

[1] This species is herewith treated as Smith's Red Rock Hare (Pronolagus cf. rupestris) although the study site is located on a contact zone between *P. rupestris* and *P. randensis*. Additional surveys will be required to determine the status of these two species on the study site.

Table 5: Inventory of mammalian taxa predicted to occur on the study site (and immediate surroundings) *based on the presence of suitable habitat and with known distribution ranges sympatric to the site (sensu MammalMap and professional judgement).*

Family	*Scientific name*	*Common name*	*Conservation Status*	*Probability of Occurrence*
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern	High
Felidae	*Caracal caracal*	Caracal	Least Concern	High
Felidae	*Felis silvestris*	African Wild Cat	Least Concern	High
Galagidae	*Galago moholi*	Southern Lesser Galago	Least Concern	High
Gliridae	*Graphiurus (Graphiurus) platyops*	Rock Dormouse	Least Concern	High
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Least Concern	High
Herpestidae	*Helogale parvula*	Dwarf Mongoose	Least Concern	High
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	Least Concern	High
Herpestidae	*Ichneumia albicauda*	White-tailed Mongoose	Least Concern	High
Molossidae	*Tadarida aegyptiaca*	Egyptian Free-tailed Bat	Least Concern	High
Muridae	*Aethomys ineptus*	Tete Veld Mouse	Least Concern	High
Muridae	*Mastomys natalensis*	Natal Multimammate Mouse	Least Concern	High
Muridae	*Rhabdomys pumilio*	Four-striped Grass Mouse	Least Concern	High
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern	High
Mustelidae	*Mellivora capensis*	Honey Badger	Least Concern	High
Nesomyidae	*Saccostomus campestris*	Pouched Mouse	Least Concern	High
Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	Least Concern	High
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern	High
Pteropodidae	*Epomophorus wahlbergi*	Wahlberg's Epauletted Fruit Bat	Least Concern	High
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	Least Concern	High
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern	High
Suidae	*Phacochoerus africanus*	Common Warthog	Least Concern	High
Suidae	*Potamochoerus larvatus koiropotamus*	Bush-pig	Least Concern	High
Vespertilionidae	*Miniopterus natalensis*	Natal Long-fingered Bat	Least Concern	High
Vespertilionidae	*Neoromicia capensis*	Cape Serotine Bat	Least Concern	High
Viverridae	*Civettictis civetta*	African Civet	Least Concern	High
Viverridae	*Genetta maculata*	Common Large-spotted Genet	Least Concern	High
Bathyergidae	*Cryptomys pretoriae (=hottentotus)*	Highveld Mole-rat	Least Concern	High (confirmed)
Bovidae	*Sylvicapra grimmia*	Common Duiker	Least Concern	High (confirmed)
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern	High (confirmed)
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern	High (confirmed)
Equidae	*Equus quagga*	Plains Zebra	Least Concern	High (confirmed)
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern	High (confirmed)
Leporidae	*Pronolagus rupestris*	Smith's Red Rock Hare	Least Concern	High (confirmed)
Macroscelididae	*Elephantulus myurus*	Eastern Rock Sengi	Least Concern	High (confirmed)
Muridae	*Gerbilliscus brantsii*	Highveld Gerbil	Least Concern	High (confirmed)
Canidae	*Vulpes chama*	Cape Fox	Least Concern	Low
Hipposideridae	*Hipposideros caffer*	Sundevall's Leaf-nosed Bat	Least Concern	Low
Muridae	*Mastomys coucha*	Multimammate Mouse	Least Concern	Low
Nesomyidae	*Dendromus melanotis*	Grey Climbing Mouse	Least Concern	Low
Bovidae	*Oreotragus oreotragus*	Klipspringer	Least Concern	Moderate
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	Least Concern	Moderate
Hyaenidae	*Proteles cristata*	Aardwolf	Least Concern	Moderate
Muridae	*Lemniscomys rosalia*	Single-Striped Grass Mouse	Least Concern	Moderate
Muridae	*Otomys angoniensis*	Angoni Vlei Rat	Least Concern	Moderate
Soricidae	*Crocidura cyanea*	Reddish-gray Musk Shrew	Least Concern	Moderate
Soricidae	*Crocidura flavescens*	Greater Red Musk Shrew	Least Concern	Moderate
Vespertilionidae	*Myotis welwitschii*	Welwitsch's Hairy Bat	Least Concern	Moderate
Hyaenidae	*Parahyaena brunnea*	Brown Hyena	Near Threatened	High
Mustelidae	*Aonyx capensis*	African Clawless Otter	Near Threatened	High (confirmed)
Erinaceidae	*Atelerix frontalis*	Southern African Hedgehog	Near Threatened	Low
Felidae	*Leptailurus serval*	Serval	Near Threatened	High
Felidae	*Panthera pardus*	Leopard	Vulnerable	High
Rhinolophidae	*Rhinolophus cohenae*	Cohen's Horseshoe Bat	Vulnerable	High
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Vulnerable	Moderate

Threatened and near threatened species

Nine threatened and near threatened mammal species could occur on the study site, which include two endangered species, three vulnerable species and four near threatened species:

⇒ Oribi (*Ourebia ourebi*) - Endangered: This small ungulate species is fairly abundant on the nearby "Bergkant" escarpment mountain that is located to the east of the study site. However, it may occur (low to moderate probability of occurrence) on the *Themeda-Tristachya* rocky grassland plains.

⇒ Mountain Reedbuck (*Redunca fulvorufula*) - Endangered: This ungulate is confined to mountain ridges and escarpments. It is probably uncommon on the study site and probably fairly abundant on the nearby "Bergkant" escarpment mountain that is located to the east of the study site.

⇒ Spotted-necked Otter (*Hydrictis maculicollis*) - Vulnerable: This mustelid is often prominent on clear high-altitude waterways where it is often regarded as a "problem" species on trout farms in the Lydenburg area. It may utilise the numerous perennial streams during foraging bouts since it prefers to hunt by sight in clear-running rivers and streams (systems with low silt loads).

⇒ Leopard (*Panthera pardus*) - Vulnerable: This large carnivore has a high probability of occurrence and given the rural nature of the study site and topographic complicity thereof it is predicted that the study site overlaps with the home range of at least one to two individuals.

⇒ Cohen's Horseshoe Bat (*Rhinolophus cohenae*) - Vulnerable: This bat species was recently described (c. 2012) as a formal species where it was initially part of the *R. hildebrandtii* complex. It is known to occur along the Mpumalanga escarpment from Mariepskop to Barberton but was also known to be present within QDS 2530AA where it was recorded at a locality approximately 7 km south of the study site and at Farm Sterkfontein 53 (approx. 13 km south of the study site). This species have a high probability to be present on the study site based on the numerous outcrops and sheetrock habitat on the site.

⇒ Southern African Hedgehog (*Atelerix frontalis*) - Near Threatened: an overlooked and skulking species that may be present on the dry habitat nits on the study site.

⇒ Serval (*Leptailurus serval*) - Near Threatened: This feline species have a high probability of occurrence and may associate with the moist grassland along the many streams and river on the study site.

⇒ Brown Hyaena (*Parahyaena brunnea*) - Near threatened: A widespread scavenger species with a varied habitat tolerance. It is predicted that the study site overlaps with the home range of at least one to two individuals.

⇒ African Clawless Otter (*Aonyx capensis*) - Near Threatened: A widespread mustelid that was confirmed from the study site where it occurs along the perennial streams on the study site.

18.3.2 AMPHIBIANS

Expected species Richness and Composition

The amphibian richness on the study site is low to moderate with 20 frog species expected to occur. However, only 12 of these are regarded to be resident (high probability of occurrence) on the study site (refer Table 6). The study site provides breeding habitat for obligate or "true" aquatic frog species such as Delalande's River Frog (*Amietia delalandii*) and provides ephemeral foraging and breeding habitat for many widespread species such as Guttural Toad (*Sclerophrys gutturalis*), Common Caco (*Cacosternum boettgeri*) and Bubbling Kassina (*Kassina senegalensis*). Some sections of the perennial stream consists of small cascades and waterfalls located in dense woodland which may provide habitat for the Natal Cascade Frog (*Hadromophryne natalensis*) - a species that is confirmed from QDS 2530AA. However, the status of *Hadromophryne natalensis* on the study site requires verification during the EIA phase.

Table 6: Inventory of frog taxa predicted to occur on the study area (and immediate surroundings) *based on the presence of suitable habitat and with known distribution ranges sympatric to the site (sensu FrogMap and professional judgement*

Family	*Scientific name*	*Common name*	*Conservation Status*	*Probability of Occurrence*
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	Least Concern	High
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern	High
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern	High
Pipidae	*Xenopus laevis*	Common Platanna	Least Concern	High
Ptychadenidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern	High
Pyxicephalidae	*Cacosternum boettgeri*	Common Caco	Least Concern	High
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern	High
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern	High
Pyxicephalidae	*Tomopterna natalensis*	Natal Sand Frog	Least Concern	High
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	High
Pyxicephalidae	*Tomopterna cryptotis*	Tremelo Sand Frog	Least Concern	High
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern	High (confirmed)
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern	Low (peripheral to study site)
Pyxicephalidae	*Cacosternum nanum*	Bronze Caco	Least Concern	Low (peripheral to study site)
Bufonidae	*Schismaderma carens*	Red Toad	Least Concern	Low (peripheral to study site)
Brevicepitidae	*Breviceps mossambicus*	Mozambique Rain Frog	Least Concern	Low-Moderate
Bufonidae	*Sclerophrys garmani*	Olive Toad	Least Concern	Low-Moderate
Hyperoliidae	*Hyperolius marmoratus*	Painted Reed Frog	Least Concern	Moderate
Pyxicephalidae	*Amietia cf. poyntoni*	Poynton's River Frog	Least Concern	Moderate
Heleophrynidae	*Hadromophryne natalensis*	Natal Cascade Frog	Least Concern	Status uncertain (requires verification)

Threatened and near threatened species

No frog species of conservation concern is expected to be present on the study site.

18.3.3 Reptiles

Expected species Richness and Composition

The reptile composition on the study site is poorly known with only 21 species currently known from 2530AA, of which 16 species have a high probability of occurrence (refer Table 7). However, the expected richness is grossly underestimated for the study site and it is predicted that the richness may well be double the known richness given the high topographic complexity of the site, high spatial heterogeneity, and rural nature of the area. *Trachylepis* cf. *varia* was a dominant species on the study site during the orientation site visits (pers. obs.).

Table 7: Inventory of reptile taxa that are sympatric to the study area and occur within QGS 2530AA (sensu ReptileMap)

Family	*Scientific name*	*Common name*	*Conservation Status*	*Probability of Occurrence*
Agamidae	*Agama atra*	Southern Rock Agama	Least Concern	High
Chamaeleonidae	*Bradypodion transvaalense*	Wolkberg Dwarf Chameleon	Least Concern	Low (probably absent)
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern	High
Colubridae	*Philothamnus hoplogaster*	South Eastern Green Snake	Least Concern	High
Cordylidae	*Cordylus vittifer*	Common Girdled Lizard	Least Concern	High
Cordylidae	*Platysaurus orientalis orientalis*	Sekhukhune Flat Lizard	Near threatened (in Mpumalanga)	High (confirmed)
Cordylidae	*Pseudocordylus melanotus melanotus*	Common Crag Lizard	Least Concern	High
Gekkonidae	*Homopholis wahlbergii*	Wahlberg's Velvet Gecko	Least Concern	Moderate
Gekkonidae	*Lygodactylus ocellatus*	Spotted Dwarf Gecko	Least Concern	Moderate-High
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern	High
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	Least Concern	High
Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern	High
Lamprophiidae	*Psammophis crucifer*	Cross-marked Grass Snake	Least Concern	Low
Lamprophiidae	*Psammophylax rhombeatus*	Spotted Grass Snake	Least Concern	High
Leptotyphlopidae	*Leptotyphlops scutifrons conjunctus*	Eastern Thread Snake	Least Concern	High
Scincidae	*Acontias cf. albigularis*	White-throated Legless Skink	Least Concern	Low
Scincidae	*Trachylepis capensis*	Cape Skink	Least Concern	High
Scincidae	*Trachylepis punctatissima*	Speckled Rock Skink	Least Concern	High
Scincidae	*Trachylepis varia sensu lato*	Common Variable Skink Complex	Least Concern	High
Typhlopidae	*Afrotyphlops bibronii*	Bibron's Blind Snake	Least Concern	High

Threatened and near threatened species

The Sekhukhune Flat Lizard (*Platysaurus orientalis orientalis*) was confirmed from the study site where it is confined to large boulders and outcrops of the *Lydenburgia-Euclea* Wooded Rocky Slopes and Thickets. This species is regarded as a near threatened species in Mpumalanga where it is restricted to the Sekhukuneland region although its conservation status on national level is regarded as least concern (*sensu* Bates et al., 2014).

Another lizard species which may occur a required confirmation is the regionally near threatened FitzSimons' Flat Lizard (*Platysaurus orientalis fitzsimonsi*). This species is morphologically similar to the sympatric *P. o. orientalis* which will require careful examination of the populations on the study site to differentiate between *P. o. fitzsimonsi* and *P. o. orientalis*. *P. o. fitzsimonsi* has been recorded from two QDS grids which border the study site and since it occurs in similar habitat to *P. o. orientalis,* it could be present on the study site.

18.3.4 BIRDS

Expected species Richness and Composition

Approximately 249 bird species are expected to occur on the wider study area (including adjacent habitat), of which 92 species were observed during the orientation site visit of July 2020 (refer Appendix 1 & Table 9). The orientation site visit took place during the austral dry season when many of the migratory species (intra-African and Palearctic species) were absent and many of the residing species are not ubiquitous since they are less vocal and less easily detected, thereby suggesting that the observed richness should be much higher during the austral wet season.

The expected richness was inferred from the South African Bird Atlas Project[2] (SABAP2; www.sabap2.birdmap.africa), professional judgement and the presence of suitable habitat in the study site. This equates to 25 % of the approximate 979[3] species listed for the southern African subregion[4] (and approximately 29 % of the 855 species recorded within South Africa[5]). Although 92 species were recorded in the study site during the brief (winter) site reconnaissance, the average richness per pentad grid is lower than the expected richness at 135 species. The statistics obtained for the pentad grids described approximately 54 % of the expected richness. The low observed richness value at the pentad grid scale is attributed to poor atlas coverage in the area. However, the 92 species observed is higher than the mean number of 45.1 species observed for each full protocol card submitted (e.g. when observations took two hours and longer), meaning that the observed number is a true reflection of the bird diversity present on the study site.

According to Table 8, the study site is poorly represented by biome-restricted[6], regional endemic and local near-endemic bird species. It supports ca. 16 % of the near-endemic species confined to South Africa, and only five Biome restricted species confined to the Zambezian Woodlands and Afrotropical Highlands. These include Southern Bald Ibis (*Geronticus calvus*) and Swee Waxbill (*Coccopygia melanotis*) with strong affinities to the Afrotropical Highlands Biome and the Kurrichane Thrush (*Turdus libonyanus*), White-bellied Sunbird (*Cynnyris talatala*) and the White-throated Robin-chat (*Cossypha humeralis*) confined to the Zambezian Woodlands. Of the 249 expected bird species, nine are threatened and/or near threatened species of which the vulnerable Southern Bald Ibis (*Geronticus calvus*) was confirmed during the orientation site visit.

Table 8: Summary table of the total number of bird species, Red listed species (according to Taylor et al., 2015 and the IUCN, 2020), endemics and biome-restricted species (Marnewick et al., 2015) expected (sensu SABAP2) to occur in the study site (and immediate surroundings)

Description	*Expected Richness Value (study site and surroundings)****
Total number of species*	249 (29 %)
Number of Red Listed species*	9 (6.4 %)
Number of biome-restricted species – Zambezian and Afrotropical Highlands Biome*	5 (15.6 %)
Number of local endemics (BirdLife SA, 2018)*	4 (10.3 %)
Number of local near-endemics (BirdLife SA, 2018)*	5 (16.6 %)
Number of regional endemics (Hockey *et al.,* 2005)**	15 (14.3 %)
Number of regional near-endemics (Hockey *et al.,* 2005)**	8 (13 %)

* only species in the geographic boundaries of South Africa (including Lesotho and eSwatini) were considered.
** only species in the geographic boundaries of southern Africa (including Namibia, Botswana, Zimbabwe and Mozambique south of the Zambezi River) were considered
*** Percentage values in brackets refer to totals compared against the South African avifauna (*sensu* BirdLife SA, 2018).

[2] The expected richness statistic was derived (and adjusted) from pentad grid 2500_3005 including the eight adjacent grids totalling a mean of 298 bird species (based on 44 full protocol cards and 15 ad hoc cards.
[3] *sensu* www.zestforbirds.co.za (Hardaker, 2019).
[4] A geographical area south of the Cunene and Zambezi Rivers (includes Namibia, Botswana, Zimbabwe, southern Mozambique, South Africa, Swaziland and Lesotho).
[5] With reference to South Africa (including Lesotho and Swaziland (BirdLife South Africa, 2018).
[6] A species with a breeding distribution confined to one biome. Many biome-restricted species are also endemic to southern Africa.

Threatened and near threatened species

Table 9 provides an overview of bird species of conservation concern that could occur on the study area based on their distribution ranges and the presence of suitable habitat. According to **Table 9**, a total of nine (9) species have been recorded in the wider study area (sensu SABAP2 and personal observations) which include seven threatened species and two near threatened species.

Only the vulnerable Southern Bald Ibis (*Geronticus calvus*) was observed on the study site during the orientation site visit. This species is regarded as a fairly regular foraging visitor (mainly in winter) to the *Eragrostis* and deteriorated grasslands on the study site. The only other three species that are regarded as fairly common are the vulnerable Lanner Falcon (*Falco biarmicus*), near threatened Half-collared Kingfisher (*Alcedo semitorquata*) and the endangered Cape Vulture (*Gyps coprotheres*), although the latter is more often observed soaring overhead. The perennial streams on the study site also provide optimal foraging and breeding habitat for the near threatened Half-collared Kingfisher (*Alcedo semitorquata*). This species is probably overlooked and may occur on the study site even though it was not recorded from the overlapping pentad grids. The status of this species on the study site requires confirmation during the EIA phase since a disused kingfisher nest was observed along the study site which may belong to this species.

The remaining species as listed in **Table 9** are regarded as irregular visitors, although the Secretarybird (*Sagittarius serpentarius*) may occur more regularly on the grassland seres and may have been overlooked in the past.

Table 9: Threatened and near-threatened bird species that could utilise the proposed study area based on their known distribution range and the presence of suitable habitat
Conservation categories were used according to the IUCN (2020) and Taylor et al. (2015)***

Species	*Global Conservation Status**	*Regional Conservation Status***	*SABAP2 mean reporting rate*	*Preferred Habitat*	*Occurrence Status*
Alcedo semitorquata (Half-collared Kingfisher)	–	Near threatened	4.26	Clear, fast running stream and rivers with overhanging vegetation. Steep embankments in close proximity of the streams/rivers required for this species to nest.	Could be resident along the perennial rivers/streams on the study site. Status requires confirmation.
Aquila rapax (Tawny Eagle)	-	Endangered	2.13	Lowveld and Kalahari savannas, especially game farming areas and reserves.	A highly irregular foraging visitor or vagrant to study site. Its occurrence depends on the presence of carcasses. It was last observed in the area during 2017 from a pentad grid adjacent to the study site/
Aquila verreauxii # (Verreaux's' eagle)	-	Vulnerable	25.00	Mountainous areas or areas with prominent outcrops with a high prey base (e.g. hyrax)	Regarded as an irregular foraging visitor. It was last recorded during 2014 from grid 2500_3010 where it probably occurs along the "Bergkant" escarpment to the east of the study site.
Ciconia abdimii (Abdim's Stork)	-	Near-threatened	7.69 (ad hoc observation)	Open stunted grassland, fallow land and agricultural fields	An uncommon summer foraging visitor to areas consisting of secondary grassland or *Eragrostis* plains and deteriorated grassland near the south-eastern section of the study site. It was last recorded during 2015 in the study area.
Falco biarmicus (Lanner Falcon)	-	Vulnerable	6.38	Varied, but prefers to breed in mountainous areas.	An occasional foraging visitor on the study area. Partial to pan depressions in open woodland (utilised as hunting habitat).

Table 9: Threatened and near-threatened bird species that could utilise the proposed study area based on their known distribution range and the presence of suitable habitat
Conservation categories were used according to the IUCN (2020) and Taylor et al. (2015)***

Species	*Global Conservation Status**	*Regional Conservation Status***	*SABAP2 mean reporting rate*	*Preferred Habitat*	*Occurrence Status*
Geronticus calvus (Southern Bald Ibis)	Vulnerable	Vulnerable	8.51	A species restricted to montane grassland (especially when burned) and breed/nest on steep cliffs.	A regular foraging visitor to the manicured *Eragrostis* and deteriorated grasslands on the study site. It was confirmed during the July 2020 orientation site visits.
Gyps coprotheres (Cape Vulture)	Vulnerable	Endangered	23.40	Mainly confined to mountain ranges, especially near breeding site. Ventures far afield in search of food.	A fairly regular foraging visitor (mainly individuals) - often recorded overhead. Unlikely to breed on the study site.
Polemaetus bellicosus (Martial Eagle)	Vulnerable	Endangered	4.26	Varied, from open karroid shrub to lowland savanna.	An irregular foraging visitor. Most probably seen overhead when hunting. It was last seen during 2014 from pentad grid 2500_3010.
Sagittarius serpentarius (Secretarybird)	Vulnerable	Vulnerable	2.13	Prefers open grassland or lightly wooded habitat.	Regarded as an irregular foraging visitor the plains grasslands on the study site. Probably overlooked although only last recorded in the region during 2013.

<u>Important bird and Biodiversity Areas</u>

The study site does not overlap with any Important Bird and Biodiversity Area (IBA), with the nearest IBA (c. Steenkampsberg; SA016) being 15 km south of the study site (sensu Marnewick et al., 2015).

18.3.5 INVERTEBRATES OF CONSERVATION CONCERN

The results of a screening report as per the outcome of the Environmental Screening Tool (based on the 2014 EIA regulations) produced a medium sensitivity for the animal theme on the study site (refer **Section 16.6**). The potential occurrence of three diurnal butterfly species is relevant to the study area: Irving's Blue (*Lepidochrysops irvingi*), Clark's Widow (*Serradinga clarki amissivallis*) and Violescent Blue (*Orachrysops violescens*).

L. irvingi is an Endangered species occurring in montane grassland along the Mpumalanga escarpment from Malolotja in eSwatini to Graskop in the north (sensu Mecenero et al., 2013). *S. clarki amissivallis* is a habitat specialist with a very restricted range near Dullstroom (at Verloren Vallei), while the Vulnerable *O. violescens* is endemic to the Mpumalanga escarpment between Hendriksdal in the south and Mariepskop in the north. The latter was also recorded on Khandiswe Mountain near Berg-en-Dal in the Kruger National Park (Mecenero et al., 2013). However, none of these species have been recorded in QDS 2530AA, and it is highly doubtful that these species will be present on the study site. In addition, the current ecological condition and altitude of the grassland seres on the study site are probably not optimal for these species which show a high preference for high altitude or montane grassland. Therefore, based on the extant distribution range of these species, it is of the opinion that the probability for them to occur on the study site is low. However, it is still recommended that searches be conducted during the appropriate time of the year to confirm the presence/absence of these three species (c. September - November for *L. irvingi,* December to January for *S. clarki amissivallis* and September to December for *O. Violescens).*

Apart from the butterfly species, the study site also sustain a sub-population of the range-restricted and localised cicada *Pycna* (=*Platypleura*) *sylvia* which is believed to be widespread within the *Lydenburgia-Euclea* Wooded Rocky Slopes and Thickets (pers. comm; Mr P. Hawkes). The distribution range of this species appears to be restricted to the Dwars River valley and associated catchment. Apart from *P. sylvia*, an undescribed ant, *Anoplolepis* sp. which were recorded from the Farm Vygenhoek 10 JT, may be endemic to the Sekhukuneland region (pers. comm.; Mr P. Hawkes).

Two dragonflies and one damselfly of conservation concern could be present along the various drainage lines on the study site, and their occurrence on the site requires verification during the EIA process:

⇒ *Diplacodes pumila* - regarded as Endangered;
⇒ *Phyllomacromia monoceros* - regarded as Near Threatened; and
⇒ *Proischnura rotundipennis* - regarded as Vulnerable in Mpumalanga.

18.4 PRELIMINARY FAUNAL IMPORTANCE

The drainage lines, wetlands, *Lydenburgia-Euclea* Wooded Rocky Slopes, *Myrothamnus – Xerophyta* Shrubland on sheetrock, and Thickets and *Maytenus-Cussonia* Transitional Woodland/Grassland are regarded as habitat with high faunal importance due to the following attributes (refer Figure 17):

⇒ These habitat types are fairly intact and of high spatial heterogeneity, thereby implying that they will hold the highest faunal diversities on the study site.
⇒ These habitat types provide potential foraging habitat for two large carnivore species, namely the Vulnerable Leopard (*Panthera pardus*) and the near threatened Brown Hyaena (*Parahyaena brunnea*).
⇒ The outcrops associated with the *Lydenburgia-Euclea* Wooded Rocky Slopes and *Myrothamnus-Xerophyta* Shrubland on Sheetrock provide suitable habitat for two near threatened lizard species (c. *Platysaurus orientalis orientalis* and *P. o. fitzsimonsi)* and one threatened bat species (c. *Rhinolophus cohenae*).
⇒ The perennial streams and drainage lines provide suitable foraging habitat for the near threatened Cape Clawless Otter (Aonyx capensis) and potentially also the vulnerable Spotted-necked Otter (*Hydrictis maculicollis*) and near threatened Half-collared Kingfisher (*Alcedo semitorquata*).
⇒ These habitat types show a high ecological connectivity with similar habitat types occurring adjacent to the study site and thereby facilitate animal dispersal.
⇒ The Lydenburgia woodland provide optimal habitat for the localised invertebrate species *Pycna sylvia*.

The *Themeda-Tristachya* Rocky Grassland Plains and Crests have a medium - high faunal importance since it provides ephemeral habitat for upland grassland species (e.g. Oribi) which are considered to be absent from the other habitat types. The remaining habitat types are either medium to low or of medium importance since they appear to be degraded due to anthropogenic activities and grazing. The faunal diversity on these units are perceived to be lower when compared to the other units and the composition are predicted to consist mainly of widespread and/or generalist species.

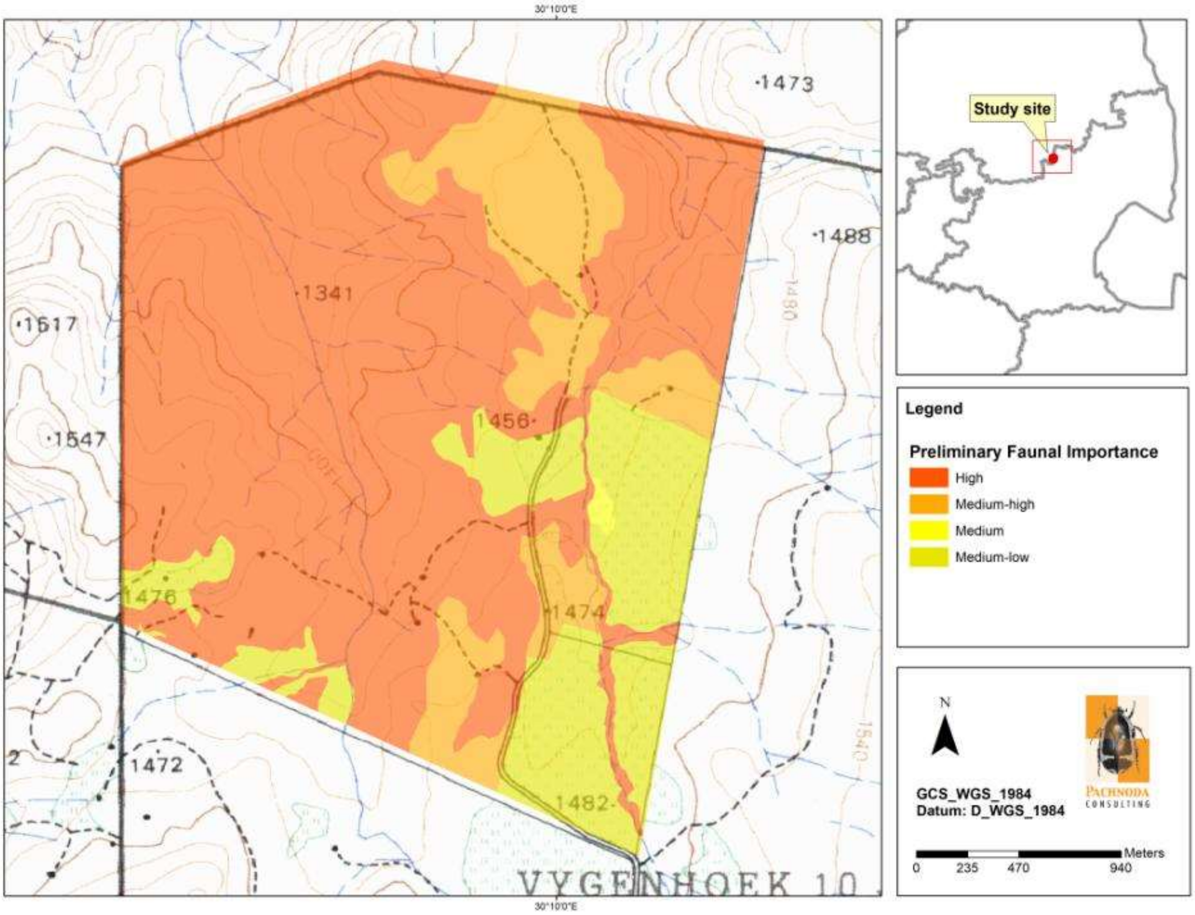

Figure 17: The preliminary faunal importance (sensitivity) of the broad-scale habitat units on the study site

18.5 ANTICIPATED IMPACTS ON FAUNAL ASSEMBLAGES, RICHNESS AND COMPOSITION

Results of this faunal and avian scoping assessment indicates that the proposed mining operations will potentially have the following negative issues:

⇒ Direct and permanent loss of natural fauna habitat within the development/mining footprints during the construction, operational and also the decommissioning phases. The decommissioning or closure phase will entail rehabilitation of the lost habitat.

⇒ Direct loss of fossorial fauna taxa, taxa of low mobility and/or habitat specialists (e.g. flightless invertebrates, nymphs of *Pycna sylvia*, rupicolous taxa) confined to rocky substrates;

⇒ Indirect loss of threatened and near threatened bird and mammal species due to the displacement from the area during the construction and operational phases;

⇒ Decreased habitat quality of surrounding areas due to peripheral impacts such as spillages, litter, increased erosion, contaminants, etc.

⇒ Indirect ecological impacts at all phases pertaining to the loss of the ecological connectivity across the study site and regional habitat fragmentation associated with negative impacts on population viability;

⇒ Increased plundering of natural resources and poaching of wildlife due to increased human encroachment and accessibility to the site;

⇒ Subsequent habitat change and changes to the local fauna community structure and composition (mainly generalists and secondary species) during decommissioning/rehabilitation; and

⇒ Cumulative impacts on local/regional and national conservation targets and obligations (e.g. loss of natural grassland habitat).

18.6 COMMENTS

Results of this scoping assessment, based on an appraisal of available information and a brief site reconnaissance survey, indicate the high faunal sensitivity of most of the site.

The nature and significance of anticipated impacts on the faunal and avian receiving environment is likely to be locally significant, but with a diminishing significance on a regional scale. Certain habitat types, notably those that will be directly affected by the mining activities, exhibit attributes of high sensitivity and the effect of habitat destruction and disruptive activities within the mining sites as well as habitat spatially situated within proximity of the activities, will undoubtedly be severe. It should be noted that no Red Flag was identified during this particular assessment, it should be noted that the potential presence of several conservation important species from the site could result in unacceptably high impacts. A comprehensive EIA and compilation of a dedicated EMPr for the proposed development will likely result in lower (but still comparatively high) significance levels of impacts on the faunal and avian environment.

18.7 EIA Plan of Study

To accurately evaluate the level and significance of impacts associated with the planned mining activity on the fauna and avifauna assemblages, the following plan of study for the EIA phase of the project is recommended:

The main objectives of the EIA will consist of the following (inter alia):

⇒ a review of the local and regional importance of the site in terms of threatened ecosystems, biodiversity conservation planning, etc;

⇒ to provide a description of the faunal assemblages on the proposed study area by means of accepted and scientific survey methods;

⇒ conduct a survey of threatened, near threatened, protected, endemic and conservation important fauna species on the study site;

⇒ provide a general overview of the mammal assemblage and richness on the study site through an inventory of observed and expected species;

⇒ provide a detailed overview of the avifaunal assemblage and richness on the study site through an inventory of observed and expected species by means of qualitative and semi-quantitative methods (e.g. point counts);

⇒ provide a general overview of the herpetofauna on the study site through an inventory of observed and expected species;

⇒ provide an indication (opinion) on the occurrence of threatened, near threatened, endemic and protected invertebrate taxa on the study site;

⇒ provide a habitat description of the study site and an indication of the occurrence of suitable habitat (e.g. foraging, breeding or roosting habitat) for animal taxa of conservation concern;

⇒ provide an indication on the relative conservation importance and ecological function of the study site (to be incorporated into a sensitivity map); and

⇒ provide recommendations regarding the proposed mining activities, where ecologically viable.

18.7.1 Field Methodology and Data Collation

The following methods will be considered during the field surveys:

<u>Mammals</u>

⇒ *Likelihood of Occurrence*: There is a high likelihood that not all mammal species known to occur on the study site will be recorded during the baseline survey. Therefore, a 'Likelihood of Occurrence' review will be applied. A summary of expected and observed mammals, as well as those species of conservation concern will be provided, with a simple probability of occurrence attached.

⇒ *Live small mammal trapping/Sherman trapping*: Small mammal (Sherman) traps will be used to sample small mammal populations. Trapping stations will be identified and deployed in representative and homogenous habitat units. Each trapping station will consists of at least 25 traps placed along a single trap line spaced 20 m apart. Traps will be baited and checked daily in the morning in order to prevent trap mortalities. Bait used will consist of a combination of peanut-butter, raisins, rolled oats and pilchards. Traps will be deployed for a minimum period of five nights per trapping station for the purpose to determine richness. The data based on species richness and trap effort will provide insight into the successional stadia and ecological condition of the area.

⇒ *Camera trapping*: Camera traps will be deployed based on available cover and habitat diversity along with the potential of detecting mammal taxa. The bait will consists of fish remains (mainly sardines) and chicken livers.

⇒ *Scats and pellets*: Mammal scats and owl pellets will be analysed to identify the presence of mammal taxa and to identify rodent taxa present on a study site. Scats and droppings will be randomly acquired and identified during ad hoc fieldwork.

⇒ *Ad hoc observations*: All mammals observed during the survey will be noted along with their geographic coordinates and habitat preference. Observations will be obtained by means of driving, walking and active searching.

⇒ *Additional observations*: Particular notice will be given to important dispersal or migratory routes and spoor within the study site or within the immediate region. These will invariably be relative to larger herbivores and carnivores.

⇒ *Bats* (in particular *Rhinolophus cohenae*): Bat echolocation calls (or more precisely the calls of bat "passes") will be recorded using an EchoMeter Touch 2 Pro detector of Wildlife Acoustics Inc. It represents a professional-level ultrasonic module making use of a semi-directional highly sensitive microphone capable of recording at a maximum frequency of 192kHz with a sample rate of 256k or 384 k samples per seconds at 16 bits. Recordings will be made at potential roosting sites representing night sessions from dusk until bats are no longer active. The recordings will be converted to spectrograms whereby echolocation parameters (e.g. Fc, the characteristic frequency of the call at the end or flattest portion of the call, Kk, the frequency at the knee or the point at which the slope of the call abruptly changes from a downward slope to a more level slope) will be calculated to enable nearest "identification" using the software program Kaleidoscope Version 4.5.4 (Copyright Wildlife Acoustics Inc).

Birds

⇒ *Point Counts*: Bird data will be collected by means of point counts (Buckland et al. 1993), where all birds seen and heard from a specific point over a set period of time are recorded. Data from the point counts will be analysed to determine dominant and indicator bird species (so-called discriminant or typical species) and to delineate the different associations present. The use of point counts is advantageous since it is the preferred method to use for skulking or elusive species. In addition, it is the preferred method to line transect counts where access is problematic, or when the terrain appears to be complex (e.g. mountainous). It is considered to be a good method to use, and very efficient for gathering a large amount of data in a short period of time (Sutherland, 2006). The spatial placement of the point counts will be determined through a stratified random design, which ensures coverage of each habitat type and/or macro-habitat (Sutherland et al., 2004). At each point, all the bird species seen within approximately 50 m from the centre of the point will be recorded along with their respective abundance values. Each point count lasted approximately 10-20 minutes, while the area within the immediate vicinity is slowly traversed to ensure that all bird species were detected (according to Watson, 2003). To ensure the independence of observations, points will be positioned at least 200 m apart.

⇒ *Random (ad hoc) surveys*: To obtain an inventory of bird species present (apart from those observed during the point counts), all bird species observed/detected while moving between point counts will be identified and noted. Particular attention will be devoted to suitable roosting, foraging and nesting habitat for species of conservation concern (e.g. threatened or near threatened species).

⇒ *Playback/broadcasting and recording of bird vocalisations*: The probability of detecting skulking/ elusive species or species for which the distribution ranges are insufficiently known in the area will be verified by playback of bird calls/songs wherever suitable habitat will be detected. Special care will be taken to keep disturbance to a minimum and not to affect the bird's natural behaviour (e.g. to prevent unnecessary habituation).

Herpetofauna

⇒ Possible burrows, or likely reptile habitat (termitaria, stumps or rocks) will be inspected - focus will be placed on the presence/absence of *Platysaurus orientalis orientalis* and *P. o. fitzsimonsi*.

⇒ Amphibians will be identified by their vocalisations (if any) and through likely habitat types (e.g. water features, drainage lines, etc.). A passive recorded (song meter) will also be deployed to record the calls of frogs.

Invertebrates of Conservation Concern

⇒ The occurrence of threatened butterfly taxa will be verified on habitat comprising of suitable habitat by means of a standard handnet along timed transect walks;

⇒ The occurrence of threatened or near threatened Odonata will be verified by means of hand collecting and active searching at suitable habitat by means of a standard handnet along timed transect walks; and

⇒ The presence/absence of *Pycna sylvia* will be determined through sound recording of calling adults by using either passive and handheld recorders. The recordings will be converted to spectrograms which will be compared to "control" calls of this species.

18.7.2 DATA ANALYSIS AND PRESENTATION

Species accumulation curves (SAC) for the bird point count data will be generated using the software program Estimates S (version 9) with 100 randomizations (as recommended in Colwell, 2013). Sampling sufficiency will be determined by establishing whether a point had been reached where a line representing one new sample adding one new species was tangent to the curve .

All data collected will be presented in a matrix, with rows representing the relative abundances of each species/taxon, and columns representing the respective point counts/samples within each of the sampled habitat types. This matrix will form the basis for the data analyses. Comparison of the different faunal associations relative to each habitat type will be performed using multivariate community analyses of Bray-Curtis similarity coefficients. Non-metric multidimensional scaling (NMDS) will be used to map the inter-relationships between the samples in an ordination with a specified number of dimensions (Kruskal & Wish, 1978). The mean number of species (S) and the Shannon-Wiener diversity index (H') will also be calculated for each taxon group representing each habitat type.

18.7.3 TIMELINES AND PROJECT CONSIDERATIONS

The following schedule and time allowance is suggested:

⇒ EIA Austral Summer/Wet Season Surveys - preferably 2 surveys during the height of the growing season, which is typically between November and March (preferably November and December. Consideration for multiple surveys is suggested to allow for univoltine[7] butterfly activity.

⇒ Red Data distribution and geo-location survey – a single survey to determine the relative abundance and geo-location of specific animal species for permitting requirements and/or determining the extent of occurrence of sub-populations of confirmed species. This survey should ideally be conducted prior to the submission of the EIA application to inform decision making and to highlight project liabilities.

[7] Producing a single generation per year, and especially a single brood of eggs capable of hibernating

19 REFERENCES

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20 APPENDIX 1

A shortlist of bird species expected and observed (during July 2020) on the study site and immediate surrounding area. Scientific and common names were used according to Gill & Donsker (2020).

Ref. number	*Common Name*		*Genus*	*Species*	*Observed (July 2020)*	*SABAP2 Full Protocol*		*SABAP2 Ad hoc Protocol*	
						Reporting Rate (%)	*Number of cards*	*Reporting Rate (%)*	*Number of cards*
622	Apalis	Bar-throated	*Apalis*	*thoracica*	X	27.66	13	7.69	1
625	Apalis	Yellow-breasted	*Apalis*	*flavida*	X	29.79	14	0.00	0
533	Babbler	Arrow-marked	*Turdoides*	*jardineii*	X	42.55	20	0.00	0
432	Barbet	Acacia Pied	*Tricholaema*	*leucomelas*	X	10.64	5	7.69	1
431	Barbet	Black-collared	*Lybius*	*torquatus*	X	70.21	33	7.69	1
439	Barbet	Crested	*Trachyphonus*	*vaillantii*	X	25.53	12	0.00	0
672	Batis	Cape	*Batis*	*capensis*		6.38	3	0.00	0
673	Batis	Chinspot	*Batis*	*molitor*	X	48.94	23	0.00	0
404	Bee-eater	European	*Merops*	*apiaster*		48.94	23	0.00	0
410	Bee-eater	Little	*Merops*	*pusillus*		23.40	11	0.00	0
409	Bee-eater	White-fronted	*Merops*	*bullockoides*		14.89	7	0.00	0
808	Bishop	Southern Red	*Euplectes*	*orix*		38.30	18	7.69	1
810	Bishop	Yellow	*Euplectes*	*capensis*		4.26	2	7.69	1
722	Bokmakierie	Bokmakierie	*Telophorus*	*zeylonus*	X	25.53	12	15.38	2
709	Boubou	Southern	*Laniarius*	*ferrugineus*	X	61.70	29	0.00	0
731	Brubru	Brubru	*Nilaus*	*afer*	X	27.66	13	0.00	0
545	Bulbul	Dark-capped	*Pycnonotus*	*tricolor*	X	95.74	45	7.69	1
872	Bunting	Cinnamon-breasted	*Emberiza*	*tahapisi*		48.94	23	0.00	0
874	Bunting	Golden-breasted	*Emberiza*	*flaviventris*	X	38.30	18	0.00	0
723	Bush-shrike	Grey-headed	*Malaconotus*	*blanchoti*	X	12.77	6	0.00	0
719	Bush-shrike	Orange-breasted	*Chlorophoneus*	*sulfureopectus*		23.40	11	0.00	0
196	Buttonquail	Kurrichane	*Turnix*	*sylvaticus*		8.51	4	0.00	0
152	Buzzard	Jackal	*Buteo*	*rufofuscus*		12.77	6	0.00	0
144	Buzzard	Lizard	*Kaupifalco*	*monogrammicus*		12.77	6	0.00	0
154	Buzzard	Steppe (Common)	*Buteo*	*buteo vulpinus*		25.53	12	0.00	0
628	Camaroptera	Grey-backed	*Camaroptera*	*brevicaudata*		4.26	2	0.00	0
860	Canary	Black-throated	*Crithagra*	*atrogularis*		2.13	1	0.00	0
857	Canary	Cape	*Serinus*	*canicollis*	X	27.66	13	0.00	0
859	Canary	Yellow-fronted	*Crithagra*	*mozambicus*	X	59.57	28	0.00	0
570	Chat	Familiar	*Oenanthe*	*familiaris*	X	38.30	18	0.00	0
648	Cisticola	Lazy	*Cisticola*	*aberrans*	X	40.43	19	0.00	0
646	Cisticola	Levaillant's	*Cisticola*	*tinniens*		29.79	14	0.00	0
642	Cisticola	Rattling	*Cisticola*	*chiniana*		14.89	7	0.00	0
644	Cisticola	Red-faced	*Cisticola*	*erythrops*		6.38	3	0.00	0
629	Cisticola	Zitting	*Cisticola*	*juncidis*	X	40.43	19	0.00	0
573	Cliff-chat	Mocking	*Thamnolaea*	*cinnamomeiventris*		19.15	9	0.00	0
50	Cormorant	Reed	*Microcarbo*	*africanus*	X	46.81	22	0.00	0
4131	Coucal	Burchell's	*Centropus*	*burchellii*		10.64	5	0.00	0
277	Courser	Temminck's	*Cursorius*	*temminckii*		2.13	1	0.00	0
621	Crombec	Long-billed	*Sylvietta*	*rufescens*	X	31.91	15	0.00	0
523	Crow	Cape	*Corvus*	*capensis*		2.13	1	0.00	0
522	Crow	Pied	*Corvus*	*albus*		44.68	21	0.00	0
341	Cuckoo	African	*Cuculus*	*gularis*		2.13	1	0.00	0
344	Cuckoo	Black	*Cuculus*	*clamosus*		21.28	10	0.00	0
352	Cuckoo	Diderick	*Chrysococcyx*	*caprius*		34.04	16	7.69	1
348	Cuckoo	Jacobin	*Clamator*	*jacobinus*		8.51	4	0.00	0
351	Cuckoo	Klaas's	*Chrysococcyx*	*klaas*		19.15	9	0.00	0
347	Cuckoo	Levaillant's	*Clamator*	*levaillantii*		2.13	1	0.00	0
343	Cuckoo	Red-chested	*Cuculus*	*solitarius*		29.79	14	0.00	0
513	Cuckoo-shrike	Black	*Campephaga*	*flava*	X	19.15	9	0.00	0
52	Darter	African	*Anhinga*	*rufa*	X	10.64	5	0.00	0

Ref. number	Common Name		Genus	Species	Observed (July 2020)	SABAP2 Full Protocol		SABAP2 Ad hoc Protocol	
						Reporting Rate (%)	Number of cards	Reporting Rate (%)	Number of cards
317	Dove	Laughing	*Spilopelia*	*senegalensis*	X	68.09	32	0.00	0
318	Dove	Namaqua	*Oena*	*capensis*		6.38	3	7.69	1
314	Dove	Red-eyed	*Streptopelia*	*semitorquata*	X	53.19	25	0.00	0
319	Dove	Tambourine	*Turtur*	*tympanistria*		2.13	1	0.00	0
517	Drongo	Fork-tailed	*Dicrurus*	*adsimilis*	X	82.98	39	7.69	1
95	Duck	African Black	*Anas*	*sparsa*		6.38	3	0.00	0
100	Duck	White-faced	*Dendrocygna*	*viduata*		6.38	3	0.00	0
96	Duck	Yellow-billed	*Anas*	*undulata*	X	14.89	7	7.69	1
139	Eagle	Booted	*Aquila*	*pennatus*		2.13	1	0.00	0
138	Eagle	Long-crested	*Lophaetus*	*occipitalis*		6.38	3	0.00	0
142	Eagle	Martial	*Polemaetus*	*bellicosus*		4.26	2	0.00	0
134	Eagle	Tawny	*Aquila*	*rapax*		2.13	1	0.00	0
133	Eagle	Verreaux's	*Aquila*	*verreauxii*		4.26	2	0.00	0
137	Eagle	Wahlberg's	*Aquila*	*wahlbergi*		12.77	6	0.00	0
368	Eagle-owl	Spotted	*Bubo*	*africanus*		2.13	1	0.00	0
61	Egret	Western Cattle	*Bubulcus*	*ibis*		40.43	19	15.38	2
601	Eremomela	Burnt-necked	*Eremomela*	*usticollis*		8.51	4	0.00	0
602	Eremomela	Gree-capped	*Eremomela*	*scotops*	X				
119	Falcon	Amur	*Falco*	*amurensis*		4.26	2	7.69	1
114	Falcon	Lanner	*Falco*	*biarmicus*		6.38	3	0.00	0
821	Finch	Cut-throat	*Amadina*	*fasciata*		4.26	2	0.00	0
789	Finch	Scaly-feathered	*Sporopipes*	*squamifrons*		2.13	1	0.00	0
833	Firefinch	African	*Lagonosticta*	*rubricata*	X	17.02	8	0.00	0
835	Firefinch	Jameson's	*Lagonosticta*	*rhodopareia*	X	21.28	10	0.00	0
837	Firefinch	Red-billed	*Lagonosticta*	*senegala*		4.26	2	0.00	0
707	Fiscal	Southern	*Lanius*	*collaris*	X	87.23	41	7.69	1
149	Fish-eagle	African	*Haliaeetus*	*vocifer*		14.89	7	0.00	0
656	Flycatcher	Ashy	*Muscicapa*	*caerulescens*		8.51	4	0.00	0
665	Flycatcher	Fiscal	*Melaenornis*	*silens*	X	10.64	5	0.00	0
661	Flycatcher	Marico	*Melaenornis*	*mariquensis*		4.26	2	0.00	0
662	Flycatcher	Pale	*Melaenornis*	*pallidus*		2.13	1	0.00	0
664	Flycatcher	Southern Black	*Melaenornis*	*pammelaina*	X	25.53	12	0.00	0
654	Flycatcher	Spotted	*Muscicapa*	*striata*		12.77	6	0.00	0
174	Francolin	Crested	*Dendroperdix*	*sephaena*		8.51	4	0.00	0
178	Francolin	Red-winged	*Scleroptila*	*levaillantii*		8.51	4	0.00	0
177	Francolin	Shelley's	*Scleroptila*	*shelleyi*		2.13	1	0.00	0
339	Go-away-bird	Grey	*Corythaixoides*	*concolor*		19.15	9	7.69	1
89	Goose	Egyptian	*Alopochen*	*aegyptiacus*	X	40.43	19	0.00	0
160	Goshawk	African	*Accipiter*	*tachiro*		4.26	2	0.00	0
162	Goshawk	Gabar	*Melierax*	*gabar*		4.26	2	0.00	0
323	Green-pigeon	African	*Treron*	*calvus*	X	6.38	3	0.00	0
551	Greenbul	Sombre	*Andropadus*	*importunus*		6.38	3	0.00	0
192	Guineafowl	Helmeted	*Numida*	*meleagris*	X	48.94	23	0.00	0
72	Hamerkop	Hamerkop	*Scopus*	*umbretta*		23.40	11	0.00	0
171	Harrier-Hawk	African	*Polyboroides*	*typus*		2.13	1	0.00	0
728	Helmet-shrike	Retz's	*Prionops*	*retzii*		2.13	1	0.00	0
727	Helmet-shrike	White-crested	*Prionops*	*plumatus*		8.51	4	0.00	0
55	Heron	Black-headed	*Ardea*	*melanocephala*		6.38	3	0.00	0
443	Honeybird	Brown-backed	*Prodotiscus*	*regulus*		4.26	2	0.00	0
440	Honeyguide	Greater	*Indicator*	*indicator*		8.51	4	0.00	0
442	Honeyguide	Lesser	*Indicator*	*minor*	X	10.64	5	0.00	0
418	Hoopoe	African	*Upupa*	*africana*	X	12.77	6	0.00	0
424	Hornbill	African Grey	*Tockus*	*nasutus*	X	10.64	5	7.69	1
426	Hornbill	Southern Yellow-billed	*Tockus*	*leucomelas*		8.51	4	0.00	0
507	House-martin	Common	*Delichon*	*urbicum*		6.38	3	0.00	0
81	Ibis	African Sacred	*Threskiornis*	*aethiopicus*		2.13	1	0.00	0
83	Ibis	Glossy	*Plegadis*	*falcinellus*		4.26	2	0.00	0
84	Ibis	Hadeda	*Bostrychia*	*hagedash*	X	61.70	29	7.69	1

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82	Ibis	Southern Bald	*Geronticus*	*calvus*	X	8.51	4	0.00	0
849	Indigobird	Dusky	*Vidua*	*funerea*		4.26	2	7.69	1
851	Indigobird	Village	*Vidua*	*chalybeata*		2.13	1	0.00	0
125	Kestrel	Lesser	*Falco*	*naumanni*		2.13	1	0.00	0
123	Kestrel	Rock	*Falco*	*rupicolus*	X	14.89	7	0.00	0
402	Kingfisher	Brown-hooded	*Halcyon*	*albiventris*	X	46.81	22	7.69	1
395	Kingfisher	Giant	*Megaceryle*	*maximus*		14.89	7	0.00	0
396	Kingfisher	Half-collared	*Alcedo*	*semitorquata*		4.26	2	0.00	0
397	Kingfisher	Malachite	*Alcedo*	*cristata*		2.13	1	0.00	0
394	Kingfisher	Pied	*Ceryle*	*rudis*		12.77	6	0.00	0
403	Kingfisher	Striped	*Halcyon*	*chelicuti*		8.51	4	0.00	0
399	Kingfisher	Woodland	*Halcyon*	*senegalensis*		2.13	1	0.00	0
130	Kite	Black-winged	*Elanus*	*caeruleus*	X	27.66	13	0.00	0
129	Kite	Yellow-billed	*Milvus*	*aegyptius*		19.15	9	0.00	0
247	Lapwing	African Wattled	*Vanellus*	*senegallus*		14.89	7	0.00	0
245	Lapwing	Blacksmith	*Vanellus*	*armatus*	X	29.79	14	0.00	0
242	Lapwing	Crowned	*Vanellus*	*coronatus*	X	2.13	1	0.00	0
468	Lark	Flappet	*Mirafra*	*rufocinnamomea*	X	10.64	5	0.00	0
458	Lark	Rufous-naped	*Mirafra*	*africana*	X	48.94	23	0.00	0
460	Lark	Sabota	*Calendulauda*	*sabota*		2.13	1	0.00	0
703	Longclaw	Cape	*Macronyx*	*capensis*		17.02	8	0.00	0
823	Mannikin	Bronze	*Spermestes*	*cucullatus*	X	8.51	4	0.00	0
510	Martin	Banded	*Riparia*	*cincta*		6.38	3	0.00	0
509	Martin	Brown-throated	*Riparia*	*paludicola*		12.77	6	0.00	0
506	Martin	Rock	*Hirundo*	*fuligula*	X	23.40	11	0.00	0
792	Masked-weaver	Lesser	*Ploceus*	*intermedius*		6.38	3	0.00	0
803	Masked-weaver	Southern	*Ploceus*	*velatus*		53.19	25	0.00	0
392	Mousebird	Red-faced	*Urocolius*	*indicus*		34.04	16	0.00	0
390	Mousebird	Speckled	*Colius*	*striatus*		59.57	28	7.69	1
734	Myna	Common	*Acridotheres*	*tristis*		23.40	11	0.00	0
637	Neddicky	Neddicky	*Cisticola*	*fulvicapilla*	X	68.09	32	0.00	0
373	Nightjar	Fiery-necked	*Caprimulgus*	*pectoralis*		8.51	4	0.00	0
372	Nightjar	Rufous-cheeked	*Caprimulgus*	*rufigena*		4.26	2	0.00	0
521	Oriole	Black-headed	*Oriolus*	*larvatus*	X	48.94	23	7.69	1
359	Owl	Western Barn	*Tyto*	*alba*		10.64	5	0.00	0
365	Owlet	Pearl-spotted	*Glaucidium*	*perlatum*		2.13	1	0.00	0
748	Oxpecker	Red-billed	*Buphagus*	*erythrorhynchus*	X	21.28	10	0.00	0
387	Palm-swift	African	*Cypsiurus*	*parvus*		23.40	11	0.00	0
682	Paradise-flycatcher	African	*Terpsiphone*	*viridis*		42.55	20	0.00	0
852	Paradise-whydah	Long-tailed	*Vidua*	*paradisaea*		2.13	1	0.00	0
530	Penduline-tit	Grey	*Anthoscopus*	*caroli*		4.26	2	0.00	0
788	Petronia	Yellow-throated	*Petronia*	*superciliaris*		10.64	5	0.00	0
311	Pigeon	Speckled	*Columba*	*guinea*	X	34.04	16	0.00	0
692	Pipit	African	*Anthus*	*cinnamomeus*	X	21.28	10	0.00	0
695	Pipit	Buffy	*Anthus*	*vaalensis*	X	2.13	1	0.00	0
699	Pipit	Bushveld	*Anthus*	*caffer*	X	10.64	5	0.00	0
10877	Pipit	Nicholson's	*Anthus*	*nicholsoni*		17.02	8	0.00	0
696	Pipit	Striped	*Anthus*	*lineiventris*		19.15	9	0.00	0
238	Plover	Three-banded	*Charadrius*	*tricollaris*		12.77	6	0.00	0
650	Prinia	Black-chested	*Prinia*	*flavicans*		4.26	2	0.00	0
649	Prinia	Tawny-flanked	*Prinia*	*subflava*	X	70.21	33	0.00	0
712	Puffback	Black-backed	*Dryoscopus*	*cubla*	X	59.57	28	7.69	1
830	Pytilia	Green-winged	*Pytilia*	*melba*		2.13	1	0.00	0
189	Quail	Common	*Coturnix*	*coturnix*		2.13	1	0.00	0
844	Quailfinch	African	*Ortygospiza*	*atricollis*		17.02	8	0.00	0
805	Quelea	Red-billed	*Quelea*	*quelea*		14.89	7	0.00	0
524	Raven	White-necked	*Corvus*	*albicollis*	X	12.77	6	0.00	0

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581	Robin-chat	Cape	*Cossypha*	*caffra*	X	38.30	18	0.00	0
582	Robin-chat	White-throated	*Cossypha*	*humeralis*	X	17.02	8	0.00	0
559	Rock-thrush	Cape	*Monticola*	*rupestris*		4.26	2	0.00	0
412	Roller	European	*Coracias*	*garrulus*		2.13	1	0.00	0
511	Saw-wing	Black (Southern race)	*Psalidoprocne*	*holomelaena*		12.77	6	0.00	0
588	Scrub-robin	White-browed	*Cercotrichas*	*leucophrys*	X	36.17	17	0.00	0
105	Secretarybird	Secretarybird	*Sagittarius*	*serpentarius*		2.13	1	7.69	1
867	Seedeater	Streaky-headed	*Crithagra*	*gularis*	X	57.45	27	15.38	2
711	Shrike	Crimson-breasted	*Laniarius*	*atrococcineus*		10.64	5	0.00	0
708	Shrike	Red-backed	*Lanius*	*collurio*		4.26	2	0.00	0
146	Snake-eagle	Black-chested	*Circaetus*	*pectoralis*	X	12.77	6	0.00	0
145	Snake-eagle	Brown	*Circaetus*	*cinereus*		12.77	6	7.69	1
786	Sparrow	Cape	*Passer*	*melanurus*		6.38	3	0.00	0
784	Sparrow	House	*Passer*	*domesticus*		21.28	10	0.00	0
4142	Sparrow	Southern Grey-headed	*Passer*	*diffusus*	X	51.06	24	0.00	0
780	Sparrow-weaver	White-browed	*Plocepasser*	*mahali*		21.28	10	0.00	0
158	Sparrowhawk	Little	*Accipiter*	*minullus*		2.13	1	0.00	0
484	Sparrowlark	Chestnut-backed	*Eremopterix*	*leucotis*		2.13	1	0.00	0
183	Spurfowl	Natal	*Pternistis*	*natalensis*	X	36.17	17	0.00	0
185	Spurfowl	Swainson's	*Pternistis*	*swainsonii*	X	17.02	8	0.00	0
737	Starling	Cape Glossy	*Lamprotornis*	*nitens*	X	44.68	21	7.69	1
746	Starling	Pied	*Lamprotornis*	*bicolor*	X	10.64	5	0.00	0
745	Starling	Red-winged	*Onychognathus*	*morio*	X	65.96	31	7.69	1
736	Starling	Violet-backed	*Cinnyricinclus*	*leucogaster*		21.28	10	7.69	1
576	Stonechat	African	*Saxicola*	*torquatus*	X	36.17	17	0.00	0
78	Stork	Abdim's	*Ciconia*	*abdimii*		0.00	0	7.69	1
80	Stork	White	*Ciconia*	*ciconia*		2.13	1	0.00	0
772	Sunbird	Amethyst	*Chalcomitra*	*amethystina*		65.96	31	0.00	0
758	Sunbird	Greater Double-collared	*Cinnyris*	*afer*	X	42.55	20	7.69	1
751	Sunbird	Malachite	*Nectarinia*	*famosa*		6.38	3	0.00	0
763	Sunbird	White-bellied	*Cinnyris*	*talatala*		48.94	23	7.69	1
493	Swallow	Barn	*Hirundo*	*rustica*		59.57	28	7.69	1
502	Swallow	Greater Striped	*Hirundo*	*cucullata*	X	63.83	30	0.00	0
503	Swallow	Lesser Striped	*Hirundo*	*abyssinica*		38.30	18	0.00	0
498	Swallow	Pearl-breasted	*Hirundo*	*dimidiata*	X	14.89	7	0.00	0
501	Swallow	Red-breasted	*Hirundo*	*semirufa*		2.13	1	0.00	0
495	Swallow	White-throated	*Hirundo*	*albigularis*		19.15	9	0.00	0
380	Swift	African Black	*Apus*	*barbatus*		8.51	4	0.00	0
386	Swift	Alpine	*Tachymarptis*	*melba*		12.77	6	0.00	0
378	Swift	Common	*Apus*	*apus*		6.38	3	0.00	0
384	Swift	Horus	*Apus*	*horus*		6.38	3	0.00	0
385	Swift	Little	*Apus*	*affinis*		31.91	15	0.00	0
383	Swift	White-rumped	*Apus*	*caffer*		42.55	20	0.00	0
715	Tchagra	Black-crowned	*Tchagra*	*senegalus*	X	59.57	28	0.00	0
714	Tchagra	Brown-crowned	*Tchagra*	*australis*		14.89	7	0.00	0
275	Thick-knee	Spotted	*Burhinus*	*capensis*		4.26	2	0.00	0
557	Thrush	Groundscraper	*Psophocichla*	*litsipsirupa*	X	34.04	16	15.38	2
552	Thrush	Kurrichane	*Turdus*	*libonyanus*	X	36.17	17	0.00	0
437	Tinkerbird	Yellow-fronted	*Pogoniulus*	*chrysoconus*	X	46.81	22	0.00	0
527	Tit	Southern Black	*Parus*	*niger*	X	27.66	13	0.00	0
658	Warbler	Chestnut-vented	*Sylvia*	*subcaerulea*		6.38	3	0.00	0
657	Tit-flycatcher	Grey	*Myioparus*	*plumbeus*	X	6.38	3	0.00	0
337	Turaco	Purple-crested	*Gallirex*	*porphyreolophus*		23.40	11	0.00	0
316	Dove	Ring-necked	*Streptopelia*	*capicola*	X	87.23	41	7.69	1
106	Vulture	Cape	*Gyps*	*coprotheres*		23.40	11	0.00	0
685	Wagtail	African Pied	*Motacilla*	*aguimp*		4.26	2	0.00	0

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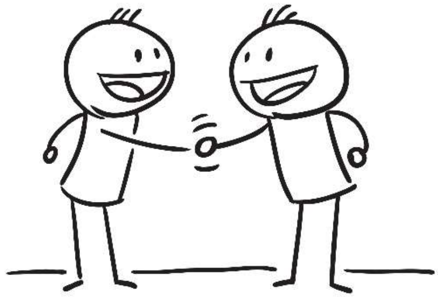
686	Wagtail	Cape	*Motacilla*	*capensis*		42.55	20	0.00	0
688	Wagtail	Mountain	*Motacilla*	*clara*	X	8.51	4	0.00	0
607	Warbler	Marsh	*Acrocephalus*	*palustris*		6.38	3	0.00	0
599	Warbler	Willow	*Phylloscopus*	*trochilus*		14.89	7	0.00	0
841	Waxbill	Black-faced	*Estrilda*	*erythronotos*		2.13	1	0.00	0
839	Waxbill	Blue	*Uraeginthus*	*angolensis*	X	31.91	15	15.38	2
843	Waxbill	Common	*Estrilda*	*astrild*		42.55	20	0.00	0
838	Waxbill	Orange-breasted	*Amandava*	*subflava*		6.38	3	0.00	0
825	Waxbill	Swee	*Coccopygia*	*melanotis*	X	8.51	4	0.00	0
840	Waxbill	Violet-eared	*Granatina*	*granatina*		6.38	3	0.00	0
799	Weaver	Cape	*Ploceus*	*capensis*	X	36.17	17	0.00	0
791	Weaver	Spectacled	*Ploceus*	*ocularis*		10.64	5	0.00	0
804	Weaver	Thick-billed	*Amblyospiza*	*albifrons*		19.15	9	0.00	0
797	Weaver	Village	*Ploceus*	*cucullatus*	X	25.53	12	7.69	1
1172	White-eye	Cape	*Zosterops*	*virens*	X	59.57	28	0.00	0
846	Whydah	Pin-tailed	*Vidua*	*macroura*		29.79	14	7.69	1
847	Whydah	Shaft-tailed	*Vidua*	*regia*		2.13	1	0.00	0
816	Widowbird	Fan-tailed	*Euplectes*	*axillaris*		10.64	5	0.00	0
818	Widowbird	Long-tailed	*Euplectes*	*progne*		14.89	7	0.00	0
813	Widowbird	Red-collared	*Euplectes*	*ardens*	X	34.04	16	0.00	0
814	Widowbird	White-winged	*Euplectes*	*albonotatus*		21.28	10	0.00	0
321	Wood-dove	Emerald-spotted	*Turtur*	*chalcospilos*		23.40	11	0.00	0
419	Wood-hoopoe	Green	*Phoeniculus*	*purpureus*		14.89	7	0.00	0
451	Woodpecker	Bearded	*Dendropicos*	*namaquus*	X	14.89	7	0.00	0
450	Woodpecker	Cardinal	*Dendropicos*	*fuscescens*	X	29.79	14	0.00	0
447	Woodpecker	Golden-tailed	*Campethera*	*abingoni*	X	12.77	6	0.00	0
453	Wryneck	Red-throated	*Jynx*	*ruficollis*	X	17.02	8	0.00	0



Contact us, let us help you!

082 3765 933

riaan@bathusi.org

012 658 5579