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**BIODIVERSITY ASSESSMENT AS PART OF THE
ENVIRONMENTAL AUTHORISATION PROCESS FOR THE
PROPOSED DEVELOPMENT OF A NEW TAILINGS
STORAGE FACILITY AND FUEL STORAGE AREAS AT THE
DWARSRIVIER CHROME MINE, LIMPOPO PROVINCE**

Prepared for

Envirologistics (Pty) Ltd

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SAS Environmental Group of Companies

EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct a terrestrial ecological assessment as part of the Environmental Authorisation (EA) process for five proposed projects for the Dwarsrivier Chrome Mine (DCM), near Steelpoort, Limpopo Province, within the mine's existing Mining Rights Area (MRA), specifically:

- Project 1: the proposed development of a new Tailings Storage Facility (TSF);
- Project 2: diesel and emulsion batching;
- Project 3: main parking extension;
- Project 4: widening of access road between South Shaft / Main Offices and Plant; and
- Project 5: access crossing between Plant and North Mine.

Desktop research

The proposed five projects are situated within the Savanna Biome and the Central Bushveld Bioregion. The project areas are further associated with the Sekhukhune Mountain Bushveld which is listed as least concern (Mucina & Rutherford, 2006), whilst the National Threatened Ecosystems database (2011) indicated that the project areas are located in the Sekhukhune Mountainlands which is listed as endangered.

Floral and Faunal Ecology

Based on the results of the field investigation on the 4th and 5th of December 2018 and the 20th May 2021, three broad habitat units were distinguished for the proposed five project areas:

- **Sekhukhune Mountain Bushveld habitat:** The majority of Project 2 is located within the habitat unit, with smaller portions of the other project footprint areas being located in this habitat unit. The vegetation structure and floral species composition is representative of the vegetation type as described by Mucina & Rutherford (2006), and as such, is generally considered to be intact and of increased sensitivity. During the assessment, the National Forestry Act (1998) (NFA) listed tree species *Sclerocarya birrea* subsp. *caffra* was observed in the footprint area of Project 2. The intact vegetation structure supports an increased diversity of faunal species, with the endemic insect species *Pycna sylvia* (Cicada) also being observed.
- **Secondary Bushveld habitat:** This habitat unit is associated with areas of historical agriculture as well as areas where vegetation clearance associated with mining took place. Vegetation has been allowed to naturally recovery, however these areas are largely dominated by pioneer and subclimax plant species and of a decreased species diversity. This habitat unit is not considered representative of the reference vegetation type. Faunal species diversity was notably lower in this habitat unit, attributable to the decreased habitat and food resource availability herein. No faunal or floral SCC are expected to occur within this habitat unit.
- **Transformed areas:** Associated with existing gravel roads and the active mining area, comprising of little to no remaining vegetation.

Impact Summary

The proposed five projects are associated with floral SCC within the footprint areas and as such, these species will be directly impacted upon by the proposed activities – although with mitigation measures implemented, and due to the small extent of the footprints, the impacts can remain localised in extent and are unlikely to impact significantly on SCC population dynamics in the region. The SCC recorded on site include species protected under the NFA, which are species not threatened in terms of the National Environmental Management: Biodiversity Act (NEMBA) Section 56.

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **Medium-Low** and **Very Low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to **Low** and **Very low** significances.

From a fauna perspective, construction activities will result in the clearance of vegetation from areas of **intermediate** and **moderately high** sensitivity which will impact on faunal species habitat and diversity, whilst clearance of vegetation in the areas of **low** sensitivity will have minimal impacts on faunal species.



A single endemic insect species, *Pycna sylvia* (Cicada) was observed on site. This species is generally associated with the tree species *Vitex obovate* subsp. *wilmsii*, which was recorded in the footprint of Project 2. Other SCC may occur temporarily within the footprint areas, predominantly that of Project 2, however, due to the small extent of the footprints these SCC are unlikely to be wholly reliant on these footprint areas, notably since the construction of the TRP TSF pipeline commenced.

The most significant impacts that will impact the floral and faunal habitat integrity and species diversity include, but are not limited to, the following:

- Clearance of vegetation within the footprint areas;
- Habitat fragmented and resulting in reduced movement of species and reduced dispersal opportunities for plant species;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprints; and
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species.

It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the proposed five project areas will be made in support of the principle of sustainable development.



DOCUMENT GUIDE

The table below provides a guide to the reporting of biodiversity impacts as they relate to 1) Government Notice No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Biodiversity** as published in Government Gazette 43110 dated 20 March 2020, and 2) Government Notice No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on **Terrestrial Plant and Animal Species** as published in Government Gazette 43855 dated 30 October 2020.

Theme-Specific Requirements as per Government Notice No. 320 Terrestrial Biodiversity Theme – Very High Sensitivity Rating as per Screening Tool Output		
No.	SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS	Section in report/Notes
2	Terrestrial Biodiversity Specialist Assessment	
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Appendix I
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 1
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these;	Section 4
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site;	Section 4
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna;	Section 4
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of Strategic Water Source Areas (SWSAs) or Freshwater Ecosystem Priority Area (FEPA) sub catchments;	Section 4
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: <ul style="list-style-type: none"> a) main vegetation types; b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified; c) ecological connectivity, habitat fragmentation, ecological processes and fine scale habitats; and d) species, distribution, important habitats (e.g. feeding grounds, nesting sites, etc.) and movement patterns identified; 	Section 3 (desktop analysis)
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification; and	Not Applicable.
2.3.7	The assessment must be based on the results of a site inspection undertaken on the preferred site and must identify:	
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: <ul style="list-style-type: none"> a) <i>the reasons why an area has been identified as a CBA;</i> b) <i>an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation;</i> c) <i>the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s);</i> d) <i>the impact on ecosystem threat status;</i> e) <i>the impact on explicit subtypes in the vegetation;</i> f) <i>the impact on overall species and ecosystem diversity of the site; and</i> g) <i>the impact on any changes to threat status of populations of species of conservation concern in the CBA;</i> 	Section 3 (desktop analysis) and 4
2.3.7.2	Terrestrial Ecological Support Areas (ESAs), including: <ul style="list-style-type: none"> a) <i>the impact on the ecological processes that operate within or across the site;</i> 	



	<ul style="list-style-type: none"> b) <i>the extent the proposed development will impact on the functionality of the ESA; and</i> c) <i>loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna;</i> 	
2.3.7.3	<p>Protected areas as defined by the National Environmental Management Protected Areas Act, 2003 including-</p> <ul style="list-style-type: none"> a) <i>an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan;</i> 	Section 3 (desktop analysis)
2.3.7.4	<p>Priority areas for protected area expansion, including-</p> <ul style="list-style-type: none"> a) <i>the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network;</i> 	Section 3 (desktop analysis)
2.3.7.5	<p>SWSAs including:</p> <ul style="list-style-type: none"> a) <i>the impact(s) on the terrestrial habitat of a SWSA; and</i> b) <i>the impacts of the proposed development on the SWSA water quality and quantity (e.g., describing potential increased runoff leading to increased sediment load in water courses);</i> 	Section 3 (desktop analysis)
2.3.7.6	<p>FEPA sub catchments, including-</p> <ul style="list-style-type: none"> a) <i>the impacts of the proposed development on habitat condition and species in the FEPA sub catchment;</i> 	Not Applicable
2.3.7.7	<p>Indigenous forests, including:</p> <ul style="list-style-type: none"> a) <i>impact on the ecological integrity of the forest; and</i> b) <i>percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.</i> 	Not Applicable
2.4	The findings of the assessment must be written up in a Terrestrial Biodiversity Specialist Assessment Report.	
	Results of the Floral Assessment as well as conclusions on Terrestrial Biodiversity as it relates to vegetation communities and the results of the Faunal Assessment as well as conclusions on Terrestrial Biodiversity as it relates to faunal communities are in Sections 4 – 6 .	
3	Terrestrial Biodiversity Specialist Assessment Report	
3.1	The Terrestrial Biodiversity Specialist Assessment Report must contain, as a minimum, the following information:	
3.1.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Appendix I
3.1.2	A signed statement of independence by the specialist;	Appendix I
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 1.3
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Section 2 Appendices B, C & D
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Section 1.3
3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Section 5 & 6
	<p>Impact Assessment Requirements</p> <ul style="list-style-type: none"> 3.1.7 Additional environmental impacts expected from the proposed development; 3.1.8 Any direct, indirect and cumulative impacts of the proposed development; 3.1.9 The degree to which impacts and risks can be mitigated; 3.1.10 The degree to which the impacts and risks can be reversed; 3.1.11 The degree to which the impacts and risks can cause loss of irreplaceable resources; 3.1.12 Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr); 	Section 6



3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a “low” terrestrial biodiversity sensitivity and that were not considered appropriate;	Not Applicable to this report
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Executive summary & Section 7
3.1.15	Any conditions to which this statement is subjected.	Section 5 & 6
3.2	The findings of the Terrestrial Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr where relevant.	Not Applicable to this report
3.3	A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	Not Applicable to this report



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GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson *et al.* (2011), Hui and Richardson (2017) and Wilson *et al.* (2017), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), and the associated Alien and Invasive Species Regulations, 2020].

Alien species (syn. exotic species; non-native species)	A species that is present in a region outside its natural range due to human actions (intentional or accidental) that have enabled it to overcome biogeographic barriers.
Biological diversity or Biodiversity (as per the definition in NEM:BA)	The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).	A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires).
Bioregion (as per the definition in NEM:BA)	A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act;
Critical Biodiversity Area (CBA)	A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges.
Corridor	A dispersal route or a physical connection of suitable habitats linking previously unconnected regions.
Disturbance	A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions.
Ecoregion	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g., southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range.
Ecological Support Area (ESA)	An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation.
Ground-truth	Ground truth is a term used in various fields to refer to information provided by direct observation (i.e., empirical evidence) as opposed to information provided by inference.
Habitat (as per the definition in NEM:BA)	A place where a species or ecological community naturally occurs.
Important Bird and Biodiversity Area (IBA)	The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations.
Indigenous vegetation (as per the definition in NEMA)	Vegetation occurring naturally within a defined area, regardless of the level of alien infestation and where the topsoil has not been lawfully disturbed during the preceding ten years.
Integrity (ecological)	The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes.
Invasive species	Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances.
Listed alien species	All alien species that are regulated in South Africa under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004), Alien and Invasive Species Regulations, 2020.
Least Threatened	Least threatened ecosystems are still largely intact.
Native species (syn. indigenous species)	Species that are found within their natural range where they have evolved without human intervention (intentional or accidental). Also includes species that have



	expanded their range as a result of human modification of the environment that does not directly impact dispersal (e.g., species are still native if they increase their range as a result of watered gardens but are alien if they increase their range as a result of spread along human-created corridors linking previously separate biogeographic regions).
Red Data listed (RDL) species	According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), Critically Endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern (SCC)	The term SCC in the context of this report refers to all RDL and IUCN listed threatened species as well as protected species of relevance to the project.



ACRONYMS

AIP	Alien Invasive Plant
BA	Basic Assessment
BGIS	Biodiversity Geographic Information Systems
CARA	Conservation of Agricultural Resource Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
DCM	Dwarsrivier Chrome Mine
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
E-GIS	Environmental Geographical Information Systems
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EN	Endangered
ESA	Ecological Support Area
EW	Extinct in the Wild
FEPA	Freshwater Ecosystem Priority Areas
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
GWC	Griqualand West Centre
Ha	Hectares
IBA	Important Bird Area
IEM	Integrated Environmental Management
IUCN	International Union for the Conservation of Nature
MAMSL	Meter Above Mean Sea Level
MAP	Mean Annual Precipitation
MAPE	Mean Annual Potential for Evaporation
MASMS	Mean Annual Soil Moisture Stress
MAT	Mean Annual Temperature
MFD	Mean Frost Days
MRA	Mining Right Area
NBA	National Biodiversity Assessment
NEMA	National Environmental Management, 1998 Act (Act No. 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act, 1998 (Act No. 10 of 2004)
NFA	National Forest Act, 1998 [Act No. 84 of 1998]
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
NTBA	Not Yet Been Assessed
ONA	Other Natural Areas
PES	Present Ecological State
POC	Probability of Occurrence
PRECIS	Pretoria Computer Information System
QDS	Quarter Degree Square (1:50,000 topographical mapping references)
RDL	Red Data List
SABAP 2	Southern African Bird Atlas 2
SACAD	South Africa Conservation Areas Database



SACNASP	Professional member of the South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SanParks	South African National Parks
SAPAD	South Africa Protected Area Database
SCC	Species of Conservation Concern
SAS	Scientific Aquatic Services CC
SWSA	Strategic Water Source Area
TOPS	Threatened or Protected Species
TSP	Threatened Species Programme
TSF	Tailings Storage Facility
VEGMAP	National Vegetation Map Project
VU	Vulnerable
WAS	Water Source Area



INTRODUCTION

Scientific Aquatic Services (SAS) was appointed to conduct a terrestrial ecological assessment as part of the Environmental Authorisation (EA) process for five proposed projects for the Dwarsrivier Chrome Mine (DCM), near Steelpoort, Limpopo Province, within the mine's existing Mining Rights Area (MRA), specifically:

- Project 1: the proposed development of a new Tailings Storage Facility (TSF);
- Project 2: diesel and emulsion batching;
- Project 3: main parking extension;
- Project 4: widening of an access road between South Shaft / Main Offices and Plant; and
- Project 5: access Crossing between Plant and North Mine.

Further detail regarding the above projects is provided in Section 1.1 of this report.

The DCM MRA is located in the Dwars River Valley, approximately 13 km south of the town of Steelpoort and approximately 5.5 km west of the Mpumalanga/Limpopo Province border within the Greater Tubatse Local Municipality and the Greater Sekhukhune District Municipality, Limpopo Province. The R555 is situated approximately 10 km northwest of the MRA, with the R37 situated approximately 19 km east of the MRA.

The purpose of this report is to define each of the proposed projects in terms of faunal and floral ecology at a high level, by means of analysis of relevant datasets, prior studies conducted by SAS for DCM, and a brief site assessment of each the proposed projects. It is a further aim of this study to provide adequate relevant information to the EAP, the proponent and the relevant authorities to allow for informed decision-making in consideration of the principles of Integrated Environmental Management (IEM) and sustainable development as enshrined in Section 24 of the Constitution of South Africa.

1.1 Project description

A brief description of each of the five proposed projects is provided below. It must be noted that the project description was obtained from the report "Dwarsrivier Chrome Mine (Pty) Ltd Environmental Authorisation Application form for new Capital Projects and the proposed new Khulu Tailings Storage Facility and associated infrastructure (4th Draft) prepared by Envirogistics (Pty) Ltd, as received by the specialist on 2nd June 2021. SAS, therefore, takes no responsibility for the accuracy of the information presented in this section. The localities of the five proposed projects are presented in Figures 1 and 2, following the project descriptions.



Project 1: Tailings Storage Facility

Dwarsrivier is currently depositing at the existing North Tailings Storage Facility (NTSF) at the eastern side of their process plant on the remaining portion of the Farm Dwarsrivier 372. It is anticipated that the existing active NTSF will reach its full capacity sooner than anticipated due to tonnage ramp ups and additional tonnages from other sites.

The mine identified seven (7) potential TSF options initially, which was subsequently reduced to four (4) site options during the initial scoping phases (Option B, C, D and F). During the pre-feasibility studies, SAS undertook an alternative analysis of the four proposed options (SAS, 2021). This analysis concluded that Option B was deemed to be the preferred option from a terrestrial ecological perspective, as the majority of this site has already been disturbed and will not lead to the loss of habitat connectivity (refer to the summary below, taken from SAS, 2021 scoping document):

Table 1: Partial summary of the results of the investigation and comparison of TSF option B (SAS, 2021).

	Ecological Results	Business Case
Option B	Option B is located in an area which was historically cleared and used for agricultural purposes. The footprint area at present is dominated by pioneer and sub-climax plant species indicative of disturbed areas. Option B is located in the western corner of the mine property and surrounded by high electrified fences, limiting faunal, notably mammal, species movement. The proposed footprint will not result in a loss of habitat connectivity or species movement. Further, no loss of important intact habitat or faunal / floral SCC will occur should this footprint be utilised for the proposed TSF.	The construction of this TSF Option will result in the loss of approximately 24ha of vegetation. Option B is located nearby (approx. 360m) from the Groot Dwars River. Should the TSF fail, or any spills/leaching occur, it will have a significant impact on the freshwater system not just at the point of contact but also further downstream. The footprint area is not considered to be ecologically intact and as such, from an ecological integrity point of view, is considered the favourable option, provided risks to the freshwater system can be mitigated.

Project 2: Diesel and Emulsion Batching

The mine plans to erect two (2) respective diesel and emulsion batching areas, to supply diesel and emulsion to the underground mining operations. The location of this area is to the north-east of the old Two Rivers Platinum Mine (TRP) and on opposite sides of the new TRP Mine TSF Pipeline.

The project will include:

- Construction of an approximate 80 m access road to the diesel batching area;
- Parking Area, with security offices at both areas (no dangerous good storage planned at any time);
- At the Diesel Batching area, the following tanks will be present: 23 m³ Diesel + 23 m³ Engine Oil + 23 m³ Hydraulic Oil;
- At the Emulsion Batching area, a 60 m³ emulsion tank will be placed; and
- Feed into pipeline for underground used at both areas.



Project 3: Main Parking Extension

The Mine requires the expansion of the existing parking area at the Main Offices. The current parking area is about 0.8 ha with the parking bays not sufficient to cater for the number of vehicles. The current parking bay comprises a tarred surface area and steel roof parking bays. The same principle will be applied at the expanded area. No new entrances will be required.

Project 4: Widening of Access Road between South Shaft/Main Offices and Plant

An existing road provides access between the Main Office Buildings and the Plant. The current width of the road ranges between 5 - 6 m. To accommodate for larger vehicles such as trucks, the mine is planning on increasing a section of 700 m of this road to a width of 16 m (to accommodate two way traffic).

Project 5: Access Crossing between Plant and North Mine

To ensure more optimal logistical management of traffic between the South Mine and the North Mine, and to reduce the number of vehicles on the regional road, the mine is planning on constructing a road under the regional road bridge to allow for access between the two areas.



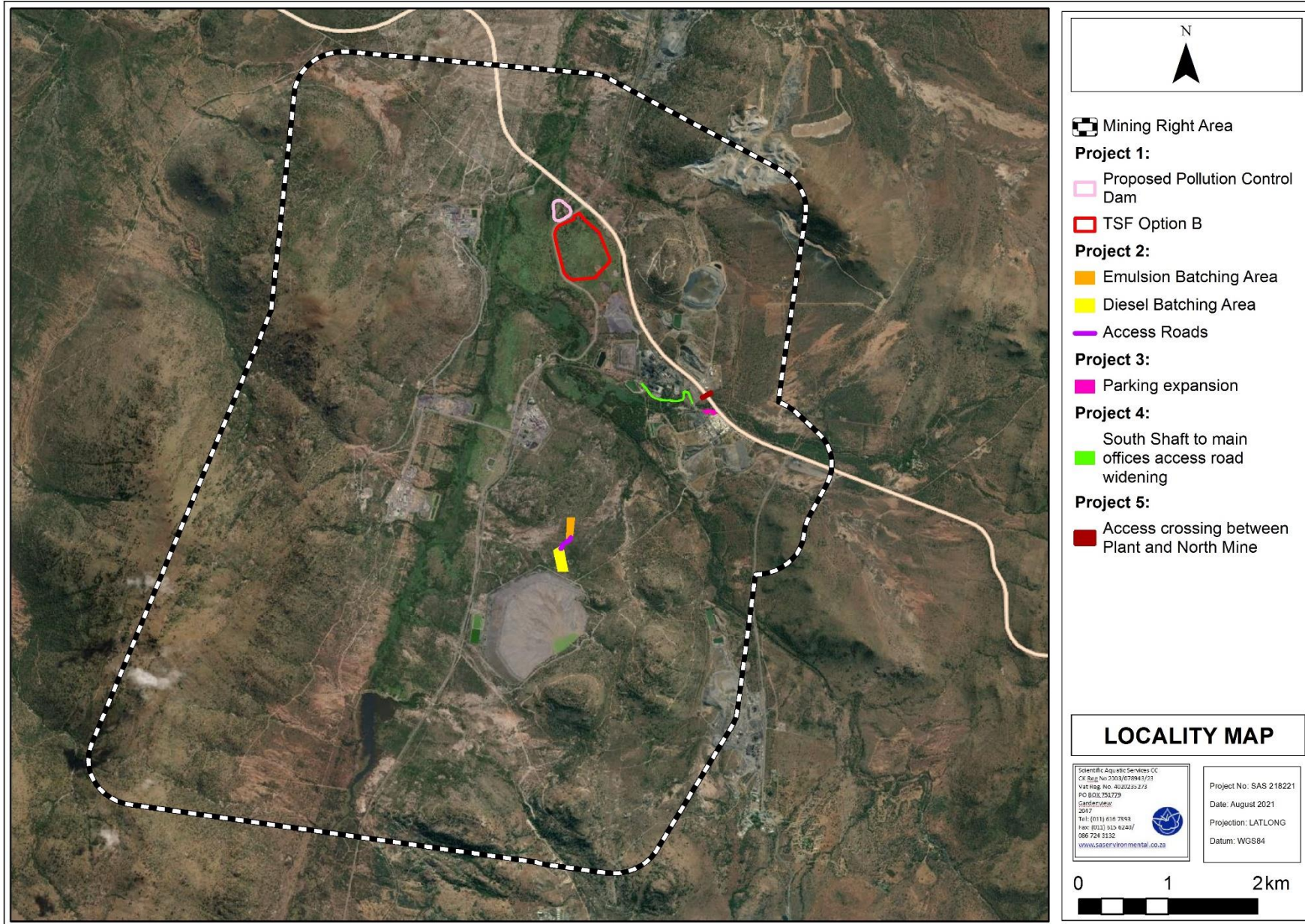


Figure 1: Digital satellite image depicting the five proposed projects in relation to the MRA.



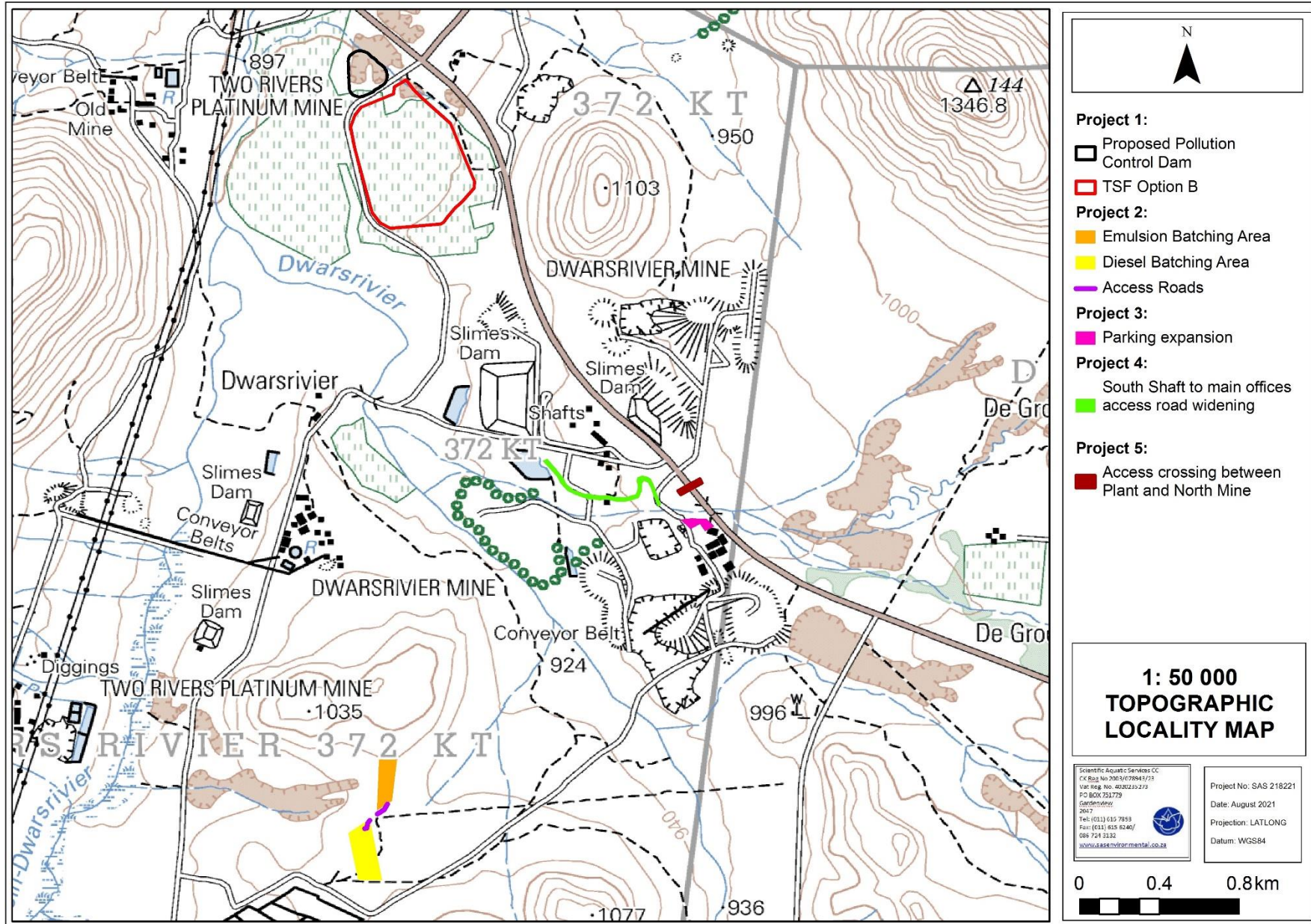


Figure 2: The location of the five proposed projects depicted on a 1:50 000 topographical map in relation to the surrounding area.



1.2 Project Scope

Specific outcomes in terms of the report are as follows:

- To outline the legislative requirements that were considered for the assessment (Appendix A of this report);
- Compile a desktop study with all relevant information as presented by SANBI's Biodiversity Geographic Information Systems (BGIS) website (<http://bgis.sanbi.org>), including the Limpopo Conservation Plan Version 2 (2013), to gain background information on the physical habitat and potential floral and faunal biodiversity associated with the five proposed projects;
- To define the Present Ecological State (PES) of the biodiversity of the five proposed projects;
- To determine and describe habitats, communities and the ecological state of the five proposed projects;
- To conduct a faunal and floral Species of Conservation Concern (SCC) assessment, including the potential of suitable habitat to occur within the five proposed projects for SCC;
- To identify and consider all sensitive landscapes, including rocky ridges, wetlands and any other ecologically important features, if present;
- To verify the outcomes of the screening tool for the five proposed projects;
- To determine the environmental impacts that the construction of the proposed development might have on the biodiversity of the surrounding area; and
- To develop mitigation and management measures for all phases of the five proposed projects.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- The biodiversity assessment was confined to the footprint of the five proposed projects and did not include the neighbouring and adjacent properties. These were considered as part of the desktop assessment (Section 3);
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most floral and faunal communities have been accurately assessed and considered. Relevant online sources and background information were further accessed to improve on the overall understanding of the five proposed projects' ecology;



- Due to most faunal taxa's nature and habits, it is unlikely that all species would have been observed during a field assessment of limited duration. As such, background data (desktop) and literature studies (previous studies undertaken in the immediate area) were used to further infer faunal species composition and sensitivities in relation to the available habitat;
- Sampling, by its nature, means that not all individuals are assessed and identified. Some species and taxa associated with the assessment zone may therefore have been missed during the assessment;
- The data presented in this report are based on the site visit, undertaken on the 4th and 5th of December 2018 and the 20th May 2021. On-site data was further augmented with all available desktop data, historical studies and specialist experience in the area, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the areas assessed. The assessment and information was deemed sufficient based on the scope of work;
- The footprint areas of the proposed emulsion batching area (Project 2), main parking extension (Project 3), widening of access road (Project 4) and access crossing between the Plant and North Mine (Project 5) were not ground-truthed specifically as part of this investigation. However, ground-truthing data obtained in these areas by SAS between March 2017 and March 2020 (based on other work experience in the area) was utilised to inform the terrestrial ecology of those areas where required;
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics at a fine scale. However, this information is considered to be useful as background information to the study, and sufficient decision making can take place with regards to the development activities based on the desktop results; and
- Assessments were carried out using a habitat focused approach to assess the habitat sensitivity associated with the five proposed projects.

1.4 Legislative Requirements

The following legislative requirements were considered during the assessment:

- The Constitution of the Republic of South Africa, 1996;
- The Conservation of Agricultural Resource Act, 1983 (Act No. 43 of 1983) (CARA);
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA);



- Government Notice (GN) number R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25 September 2020 as it relates to the NEM:BA;
- The National Forest Act, 1998 (Act No. 84 of 1998, amended 2001) (NFA);
- GN 536 List of Protected Tree Species as published in the Government Gazette 41887 dated 7 September 2018 as it relates to the NFA;
- GN No. 320 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity as published in Government Gazette 43110 dated 20 March 2020;
- GN No. 1150 Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Plant and Terrestrial Animal Species as published in Government Gazette 43855 dated 30 October 2020;
- Minerals and Petroleum Resource Development Act, 2002 (Act No. 28 of 2002) (MPRDA); and
- Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA);

The details of each of the above, as they pertain to this study, are provided in Appendix B of this report.

2 ASSESSMENT APPROACH

2.1 General Approach

Maps and digital satellite images were generated prior to the field assessment to determine broad habitats, vegetation types and potentially sensitive sites. The biodiversity desktop assessment is confined to the five proposed projects and does not include the neighbouring and adjacent properties, although the sensitivity of surrounding areas is included on the respective maps. Relevant databases and documentation that were considered during the assessment of the project areas include¹:

- 2010 National Protected Area Expansion Strategy (NPAES) (Government of South Africa, 2010; DEA & SANBI, 2009), including the below-listed vector datasets:

¹ Datasets obtained from:

- SANBI BGIS (2020). The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: <http://bgis.sanbi.org>; and
- Environmental Geographical Information Systems (E-GIS) website. URL: <https://egis.environment.gov.za/>



- NPAES Focus Areas 2010: National Protected Areas Expansion Strategy: Focus areas for protected area expansion (South African National Parks (SanParks), 2010);
- NPAES Formal: Polygons of formal protected national parks areas in South Africa (SANParks/SANBI, 2013); and
- NPAES Protected Areas – Informal: Informal conservation areas in South Africa (SANParks/SANBI, 2012).
- The South African Conservation Areas Database, Quarter 1 (SACAD, 2021);
- The South African Protected Areas Database, Quarter 1 (SAPAD, 2021);
- The National Vegetation Map Project (VEGMAP), with the below vector dataset used for information on Biomes, Bioregions and Vegetation Type(s):
 - 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018a)
- The National List of Threatened Ecosystems 2011 (SANBI 2011; South Africa, 2011);
- From the National Biodiversity Assessment (NBA, 2018) Terrestrial Assessment project (Skowno et al., 2019):
 - 2018 Terrestrial ecosystem threat status and protection level - remaining extent (SANBI, 2018b); and
 - 2018 Terrestrial ecosystem threat status and protection level layer (SANBI, 2018c).
- The Important Bird and Biodiversity Areas (IBA) Programme and vector dataset (BirdLife South Africa, 2015; Marnewick *et al.*, 2015a and 2015b), in conjunction with the South African Bird Atlas Project 2 (SABAP 2);
- The Limpopo Conservation Plan Version 2 (2013);
- The International Union for Conservation of Nature (IUCN);
- The National Web-Based Environmental Screening Tool (accessed 2021) – hereafter referred to as the “screening tool”; and
- From the 2017 Strategic Water Source Areas (SWSA) project:
 - 2017 SWSA Surface water (Water Research Commission, 2017).

The field assessment took place during on the 4th and 5th of December 2018 and again on the 20th May 2021 to determine the ecological status of the five proposed projects and to “ground-truth” the results of the desktop assessment. Results of the field assessment are presented in Section 4.



2.2 Sensitivity Mapping

All the ecological features associated with the five proposed projects were considered, and sensitive areas were delineated using a Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto satellite imagery.

3 RESULTS OF THE DESKTOP ANALYSIS

3.1 Conservation Characteristics of the five proposed projects based on National and Provincial Datasets

The following section contains data accessed as part of the desktop assessment and are presented as a “dashboard” report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for improved assimilation of results by the reader to take place. Where required, further discussion and interpretation is provided.



Table 2: Summary of the conservation characteristics for the five proposed projects.

Details of the five proposed projects in terms of Mucina & Rutherford (2018c)		Description of the vegetation type(s) relevant to the five proposed projects (Mucina & Rutherford 2006)	
Biome	The five proposed projects are situated within the Savanna Biome .	Vegetation Type	Sekhukhune Mountain Bushveld
Bioregion	The five proposed projects is located within the Central Bushveld Bioregion	Climate	Summer rainfall with very dry winters
Vegetation Type	The five proposed projects is situated within the Sekhukhune Mountain Bushveld (SVcb28) .	Altitude (m)	900–1 600 m
		MAP* (mm)	609 mm
Conservation details pertaining to the five proposed projects (Various databases)		MAT* (°C)	17.5 °C
NBA (2018) (Figure 3)	The majority of the of the portions of the five proposed projects currently fall within the remaining extent of the least concerned Sekhukhune Mountain Bushveld , that is currently poorly protected . Ecosystem types are categorised ² as “not protected”, “poorly protected”, “moderately protected” and “well protected” based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type.	MFD* (Days)	5
		MAPE* (mm)	2043 mm
		MASMS* (%)	77 %
		Distribution	Limpopo and Mpumalanga Provinces
National Threatened Ecosystems (2011)	Portions of Project 1 and Projects 2 to 5 fall within an area considered to form part of the remaining extent of the Endangered Sekhukhune Mountainlands (Figure 4). According to the description in GN 1002, the Sekhukhune Mountainlands falls under Criterion F , which are priority areas for meeting explicit biodiversity targets as defined in a systemic biodiversity plan. These areas have a very high irreplaceability and are of medium threat. Endangered ecosystems have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems. For this purpose, habitat is considered severely degraded if it would be unable to recover to a natural or near-natural state following the removal of the cause of the degradation (e.g., invasive aliens, over-grazing), even after very long time periods. Note: For Environmental Impact Assessments (EIAs), the 2011 National list of Threatened Ecosystems remains the trigger for a Basic Assessment in terms of Listing Notice 3 of the EIA Regulations published under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).	Geology & Soils	Rocks mainly ultramafic intrusives of the lower, critical and main zones of the eastern Rustenburg Layered Suite of the Bushveld Igneous Complex (Vaalian). Three subsuites (zones), namely Croydon, Dwars River and Dsjate consist mainly of norite, pyroxenite, anorthosite and gabbro, and are characterised by localised intrusions of magnetite, diorite, dunite, bronzitite and harzburgite. Soils are predominantly shallow, rocky and clayey. Glenrosa and Mispah soil forms are common, with lime present in low-lying areas. Rocky areas without soil are common on steep slopes. The Dwars River Valley is characterised by prisma-cutanic horizons with melanic structured diagnostic horizons. Around Steelpoort red apedal, freely drained soils occur, and these deeper soils include Hutton, Bonheim and Steendal soil forms
		Conservation	Least threatened. Target 24%. None conserved in statutory conservation areas
		Vegetation & landscape features (Dominant Floral Taxa in Appendix C)	Dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes that form concentric belts parallel to the north-eastern escarpment. Open bushveld often associated with ultramafic soils on southern aspects. Bushveld on ultramafic soils contain a high diversity of edaphic specialists. Bushveld of mountain slopes generally taller than in the valleys, with a well-developed herb layer. Bushveld of valleys and dry northern aspects usually dense, like thicket, with a herb layer comprising many short-lived perennials. Dry habitats contain a number of species with xerophytic adaptations, such as succulence and underground storage organs. Both man-made and natural erosion dongas occur on foot slopes of clays rich in heavy metals.
		National Web-based Screening Tool (2020)	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 different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below:

² The ecosystem protection level status is assigned using the following criteria:

- i. If an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either A or B, it is classified as Well Protected;
- ii. When less than 100% of the biodiversity target is met in formal A or B protected areas it is classified as Moderately Protected;
- iii. If less than 50% of the biodiversity target is met, it is classified as Poorly Protected; and
- iv. If less than 5% it is Hardly Protected.



<p>SAPAD (2020)³; SACAD (2020)⁴; & NPAES (2009)</p>	<p>According to the SAPAD (2018), the various projects are located approximately 6 km east of the De Hoop Dam Protected Environment. The NPAES (2009) and SACAD (2020) databases does not indicate any formally or informally protected areas or conservation areas to be situated within 10 km of the five proposed project. The NPAES database does indicate that Project 2 is situated within 2 km of the Mpumalanga Mesic Grasslands (Figure 5), whilst the remaining projects are located within 3 km and 5 km. The Mpumalanga Mesic Grasslands focus area represents opportunities to conserve poorly protected grassland and bushveld vegetation types as well as whole river reaches and threatened river types. It was also identified as a national priority in the Grasslands systematic biodiversity plan.</p>	<ul style="list-style-type: none"> ➤ Very High: Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km² are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa’s National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale. ➤ High: Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. ➤ Medium: Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. ➤ Low: Areas where no SCC are known or expected to occur. 	
<p>IBA (2015)</p>	<p>The five proposed projects are not situated within 10 km of an Important Bird and Biodiversity Area (IBA).</p>	<p>Terrestrial Biodiversity Theme</p>	<p>For the terrestrial biodiversity theme, the five proposed projects are considered to have an overall sensitivity of very high. The triggered sensitivity features include CBA Category 1 and ESA Category 2, FEPA catchment, an endangered ecosystem and focus areas for land based protected area environment. These correspond with the various databases as presented in this dashboard.</p>
<p>Mining and Biodiversity Guidelines (2013)</p>		<p>Animal Species Theme</p>	<p>For the animal species theme, the five proposed projects are considered to have an overall sensitivity of medium. Species identified by the EIA Screening tool include: <i>Chrysospalax villosus</i> (Rough-haired golden mole, VU), <i>Crocidura maquassiensis</i> (Makwassie Musk Shrew, LC), <i>Dasymys robertsii</i> (Robert’s shaggy rat, DD) and <i>Sagittarius serpentarius</i> (Secretary bird, EN). Figure 8.</p>
<p>Highest Biodiversity Importance</p>	<p>The five proposed projects fall within an area considered to be of Highest Biodiversity Importance. Highest Biodiversity Importance areas include areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive the necessary authorisations.</p>	<p>Plant Species Theme</p>	<p>For the plant species theme, the five proposed projects are considered to have a medium sensitivity. Species identified by the EIA Screening tool include: <i>Asparagus furei</i> (VU), <i>Polygala sekhukhuniensis</i> (VU), <i>Searsia batophylla</i> (VU), <i>S. sekhukhuniensis</i> (Rare) and <i>Combretum petrophilum</i> (Rare).</p>
<p>Limpopo Conservation Plan Version 2 (2013) (Figure 6)</p>			
<p>Critical Biodiversity Area (CBA) 1</p>	<p>The Project 5 falls within an area defined as a Category 1 CBA. These are “Irreplaceable” areas, which are required to meet biodiversity pattern and/or ecological processes targets; and with no alternative sites available to meet targets.</p>	<p>Ecological Support Area (ESA) 2</p>	<p>Project 1, 2 and portions of Projects 3 and 4 falls within areas defined as a Category 2 ESA. These are areas where no natural habitat remains, but that are still important for meeting ecological processes.</p>
<p>Strategic Water Source Areas (SWSA)</p>			
<p>Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage.</p>			
<p>Name and Criteria</p>	<p>The five proposed projects area are not within 10 km of a Strategic Water Source Area.</p>		

NBA = National Biodiversity Assessment; SAPAD = South African Protected Areas Database; NPAES = National Protected Areas Expansion Strategy; IBA = Important Bird Area; MAP = Mean annual precipitation; MAT = Mean annual temperature; MAPE = Mean annual potential evaporation; MFD = Mean Frost Days; MASMS = Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).

³ **SACAD (2020):** The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

⁴ **SAPAD (2020):** The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).



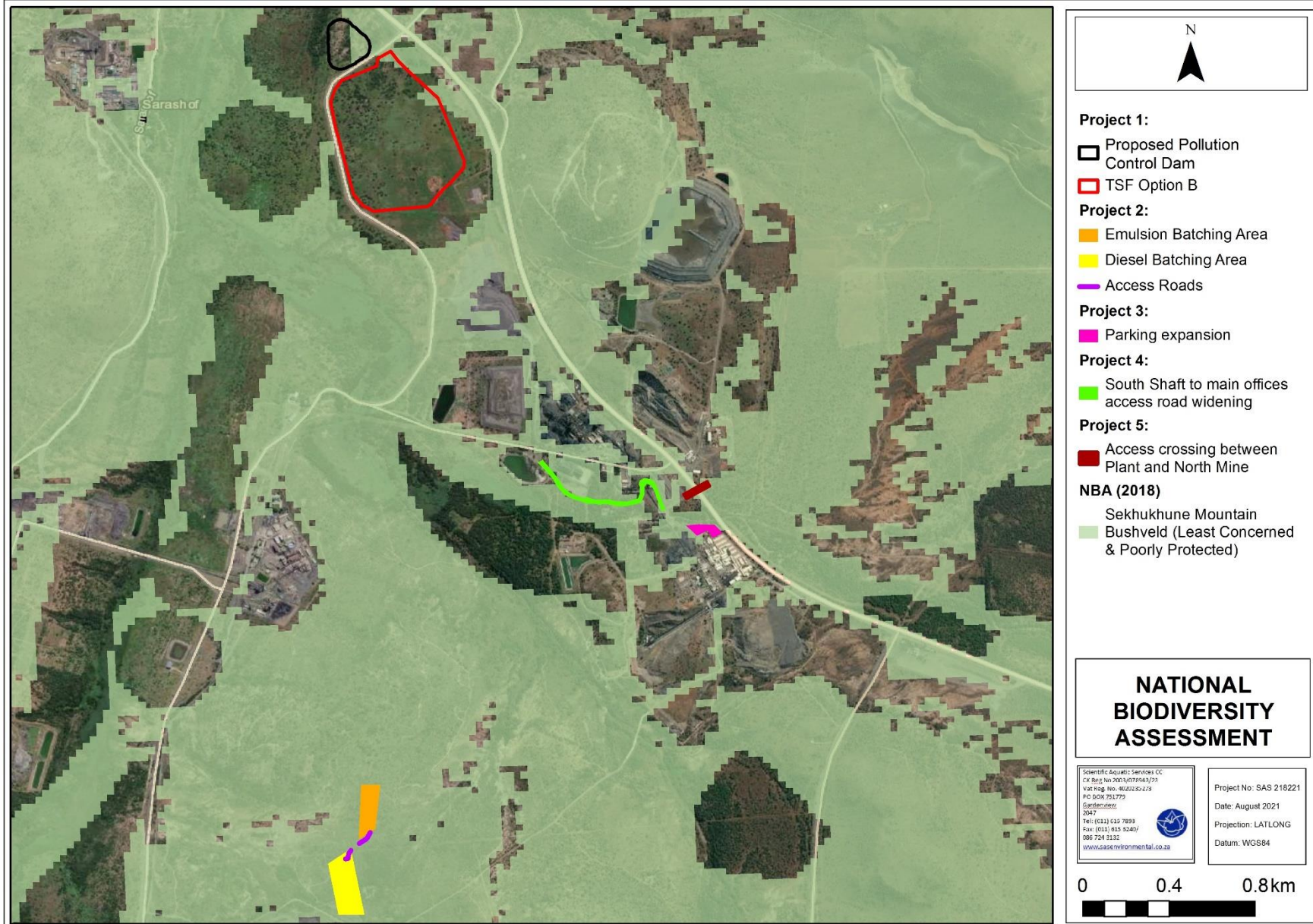


Figure 3: The remaining extent of the Sekhukhune Mountain Bushveld associated with the five proposed projects according to the National Biodiversity Assessment (NBA, 2018).



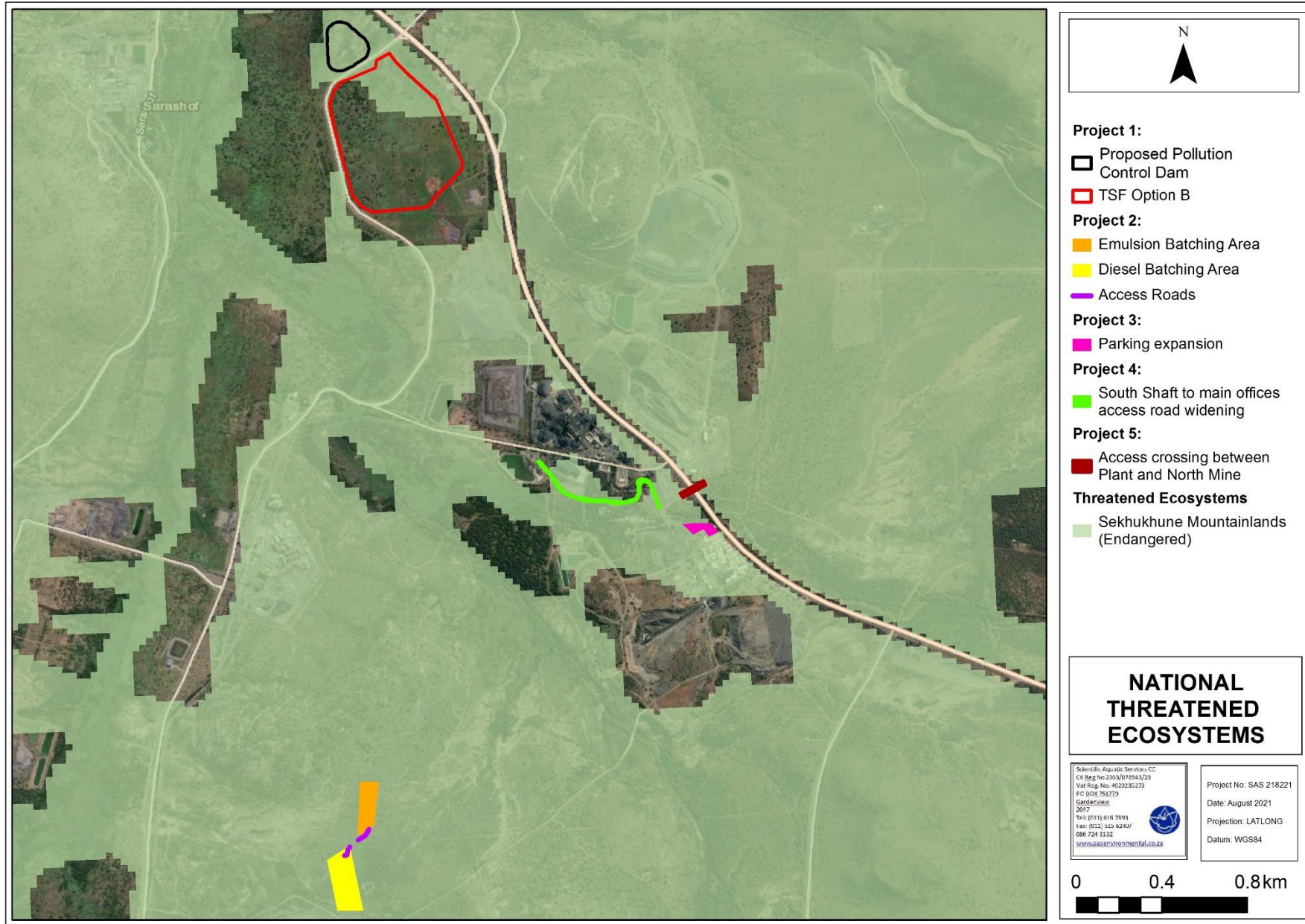


Figure 4: Endangered Sekhukhune Mountainlands associated with the five proposed projects (National Threatened Ecosystems, 2011).



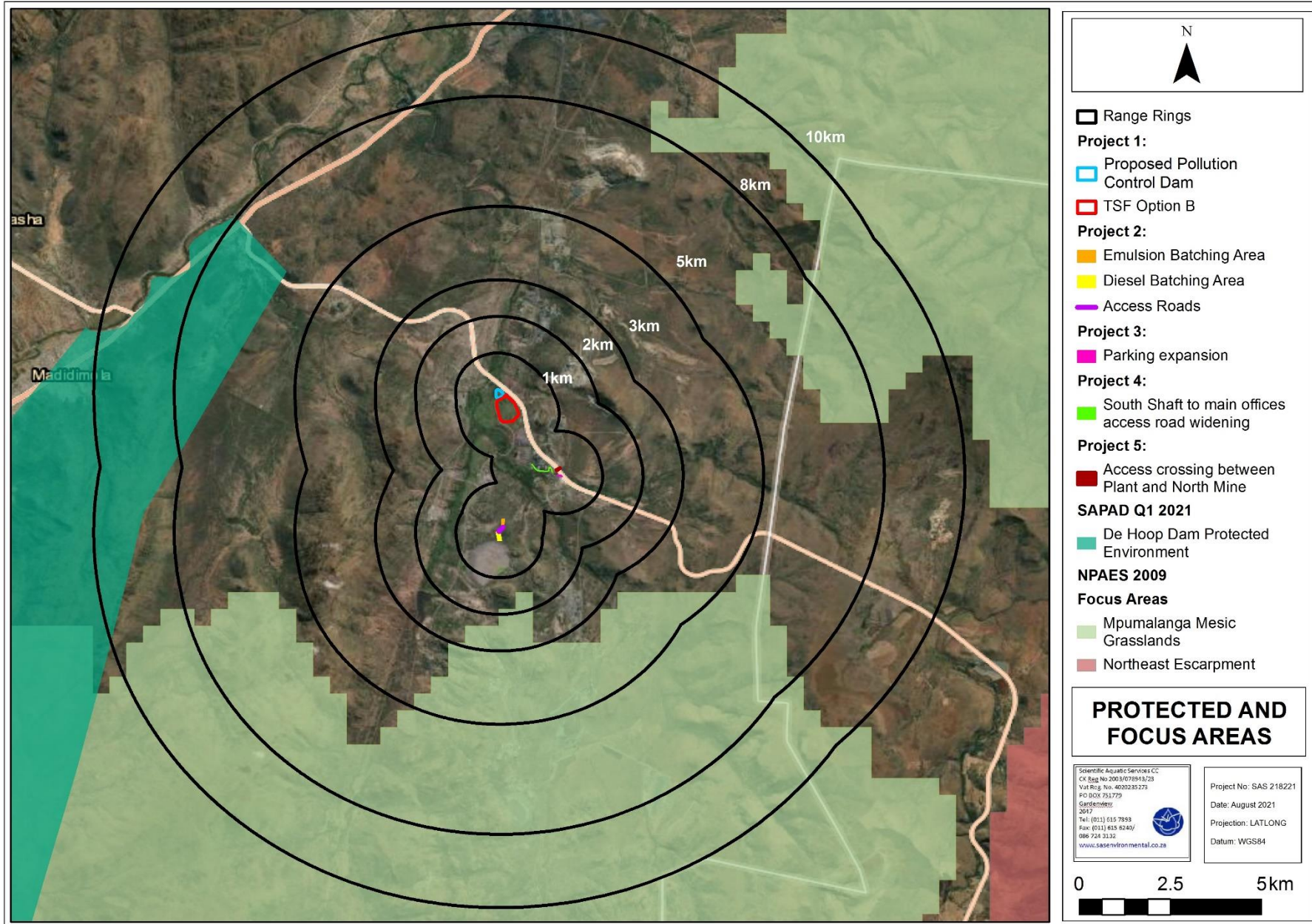


Figure 5: The protected areas and focus areas in relation to the five proposed projects (SAPAD, 2020 and NPAES, 2009).



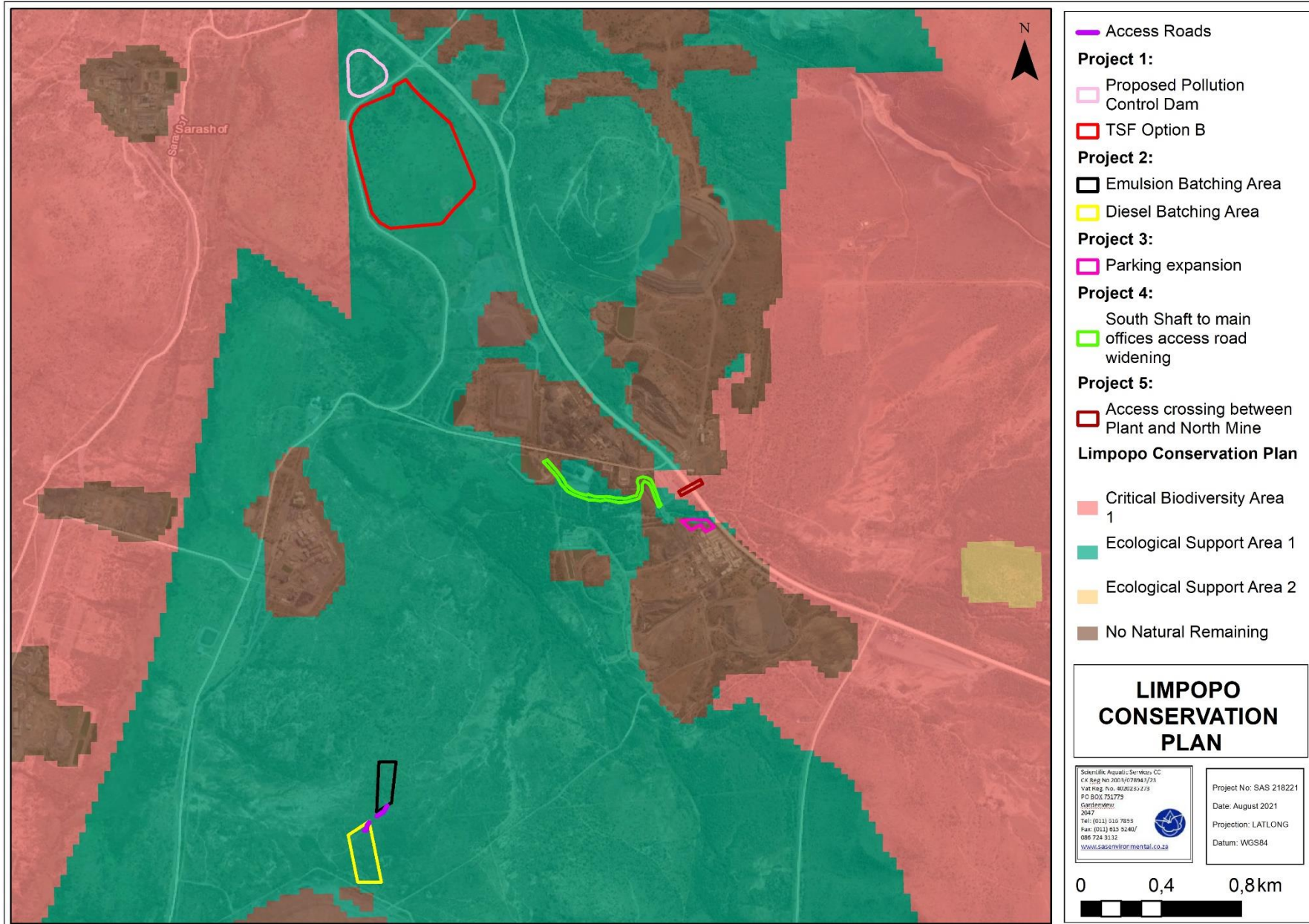


Figure 6: CBA 1 and ESA 1 associated with the five proposed projects according to the Limpopo Conservation Plan V2 (2013).



4 ASSESSMENT RESULTS

The various proposed projects are all located within the existing and approved MRA. The various projects are located within areas ranging from total transformation with no natural habitat remaining to areas which are still considered natural, comprising of indigenous vegetation. The assessment zone is located within the Sekhukhune Mountain Bushveld vegetation type, according to Mucina & Rutherford (2006).

During the field assessment three broad habitat units were identified namely:

1. The Sekhukhune Mountain Bushveld,
2. The Secondary Bushveld; and
3. The Transformed areas.

The Transformed habitat is briefly described below only and will not be further discussed in detail as it does not provide suitable floral or faunal habitat. The Sekhukhune Mountain Bushveld and the Secondary Bushveld are mapped in Figures 7 – 9 in relation to the project areas and discussed and expanded upon in the dashboard in Section 4.1 and 4.2 below.

Transformed Areas

The Transformed areas include existing gravel roads and the active mining area and comprise of little to no remaining vegetation. This habitat unit is no longer representative of the associated vegetation type nor is there sufficient vegetation to provide habitat for faunal species.

The existing impacts on the biodiversity associated with the various project areas include the below:

- Historic transformation of mining areas, including the road network;
- Edge effects from the mining activities including trimming of vegetation along the road networks;
- Growth of alien plant species in the disturbed areas, notably in the transformed areas; and
- Active mining leading to dust and noise pollution, impacting on the biodiversity in the adjacent areas.





Figure 7: Habitat units associated with Project 1.



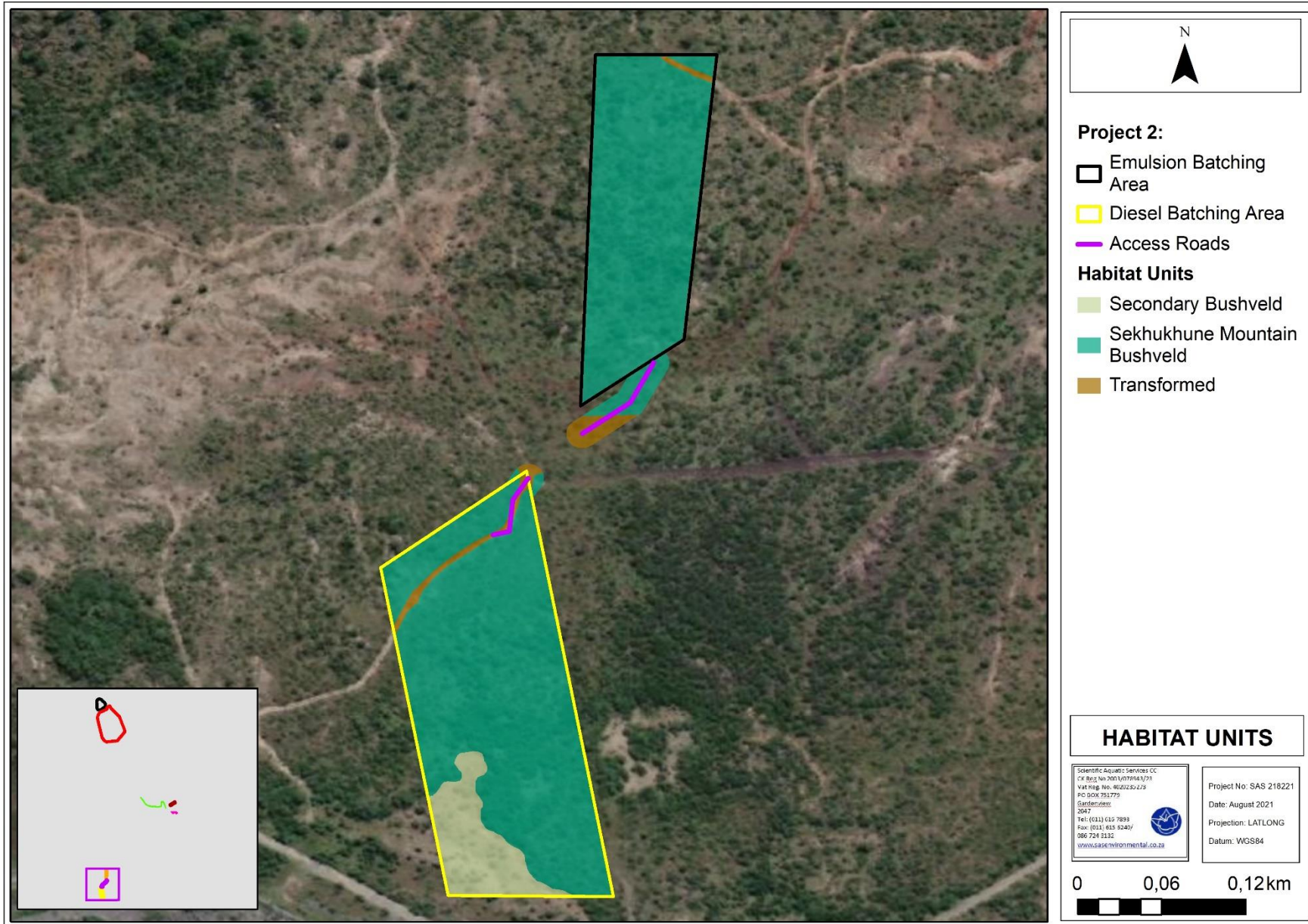


Figure 8: Habitat units associated with Project 2.



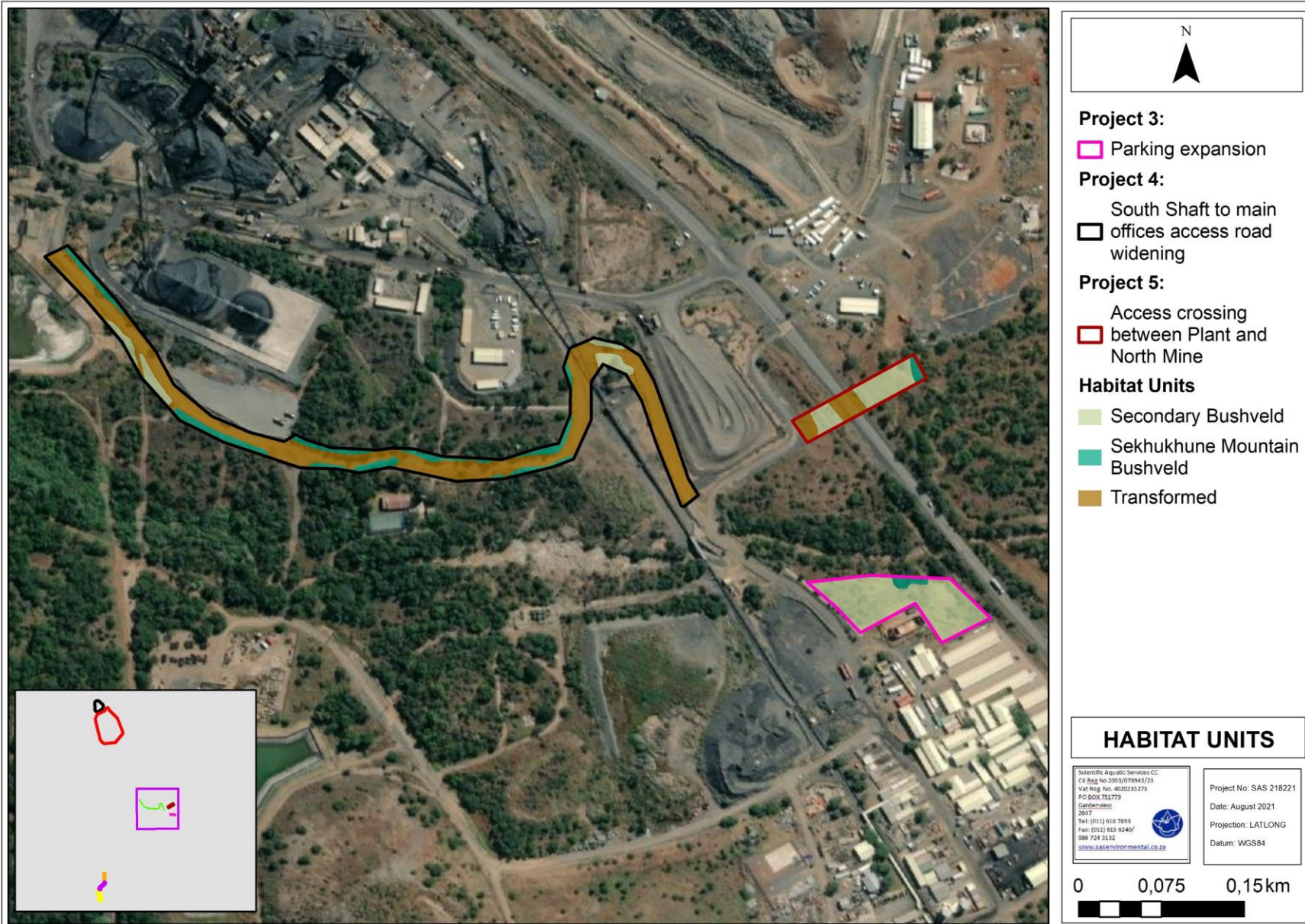




Figure 9: Habitat units associated with Projects 3-5.



4.1 Floral Assessment

	Sekhukhune Mountain Bushveld	Secondary Bushveld
Reference photos		
Habitat Overview	<p>This habitat unit has been exposed to some degree of impact stemming from mining related edge effects but more notably from historic farming (cattle grazing) activities, and the alteration / exclusion of ecological functions such as fire and heavy large grazers / browsers. This habitat unit, although potentially more encroached than what it would have been historically, is still considered representative of the reference vegetation type as described by Mucina and Rutherford (2006).</p> <p><u>Vegetation structure</u> Medium to tall woody species interspersed with grasses and forbs indicative of the Sekhukhune Mountain Bushveld habitat</p>	<p>This habitat unit varies with areas where the graminoid layer is limited with bare patches of soil evident to areas of dense grass species with limited herbaceous species evident. The woody component is more open with woody density notably lower than that of the Sekhukhune Mountain Bushveld. This habitat unit is not considered representative of the reference vegetation type as described by Mucina and Rutherford (2006).</p> <p><u>Vegetation structure</u> Open bushveld with scattered woody species, dominated by herbaceous species indicative vegetation that is in the primary and secondary phases of succession.</p>
Species Overview	<p>Dominant Indigenous Vegetation:</p> <ul style="list-style-type: none"> - <u>Trees and Shrubs:</u> <i>Vitex obovata</i> subsp. <i>wilmsii</i>, <i>Combretum</i> spp, <i>Pappea capensis</i>, <i>Euclea crispa</i> subsp. <i>crispa</i> and <i>Dichrostachys cinerea</i>; - <u>Herbs and Forbs:</u> <i>Rhoicissus sekhukhuniensis</i>, <i>Ledebouria marginata</i>, <i>sansevieria hyacinthoides</i> and <i>Blepharis subvulbilis</i>; and - <u>Graminoids:</u> <i>Heteropogon contortus</i>, <i>Panicum maximum</i>, <i>Cymbopogon pospischillii</i>, <i>Themeda triandra</i> and <i>Aristida</i> spp. <p>Refer to Appendix F for a complete list of species recorded on site.</p> <p>Dominant Alien Vegetation: <i>Solanum lichtensteinii</i> and <i>Bidens pilosa</i>.</p> <p>Refer to Section 4.3 for further information pertaining to Alien Invasive Plant (AIP) species.</p>	<p>Dominant Indigenous Vegetation:</p> <ul style="list-style-type: none"> - <u>Trees and Shrubs:</u> <i>Vachellia karoo</i>, <i>Vachellia tortilis</i>, <i>Dichrostachys cinerea</i>, <i>Sersia pyroides</i>, <i>Peltophorum africanum</i> and <i>Euclea crispa</i> subsp. <i>crispa</i>; - <u>Herbs and Forbs:</u> <i>Pterodiscus ngamicus</i>; - <u>Graminoids:</u> <i>Heteropogon contortus</i>, <i>Eragrostis</i> spp, <i>Aristida</i> spp. <p>Refer to Appendix F for a complete list of species recorded on site.</p> <p>Dominant Alien Vegetation: <i>Tagetes minuta</i>, <i>Datura ferox</i>, <i>Solanum</i> sp and <i>Bidens Pilosa</i>,</p> <p>Refer to Section 4.3 for further information pertaining to AIPs.</p>



Species of Conservation Concern and Presence of Unique Landscapes (CBAs, ESAs, Protected Areas, Indigenous Forest, etc)	
Presence of Unique Landscapes	The habitat units are both located within the Sekhukhune Centre of Endemism, with the Sekhukhune Mountain Bushveld habitat being representative of the vegetation type. This vegetation type is diminishing in the region due to development and exploitation for wood and material resources, as such, the intact nature of the habitat observed is considered to be unique, even if it is still widespread in the MRA currently. The Secondary Bushveld and Transformed areas are not considered unique.
Species of Conservation Concern	<p>The following floral SCC as per the national and provincial protected species regulations were observed within the assessment zone:</p> <ul style="list-style-type: none"> ➤ The NFA: <ul style="list-style-type: none"> • <i>Sclerocarya birrea</i> subsp. <i>caffra</i>. <p>None of the protected species as per the above lists are considered threatened according to the Red List of South African Plants. Additionally, the following floral SCC are considered to have an increased probability of occurring within the assessment zone:</p> <ul style="list-style-type: none"> ➤ <i>Boscia foetida</i> (NFA, LEMA); ➤ <i>Lydenburgia cassinoides</i> (NFA); ➤ <i>Aloe castanea</i> (LEMA); ➤ <i>Chlorophytum cf. cyperaceum</i> (<i>Anthericum cyperaceum</i>) (LEMA); and ➤ <i>Euphorbia</i> spp (LEMA). <p>Prior to any ground clearing activities, permits must be obtained from the Department of Forestry, Fisheries and the Environment (DFFE) and the Limpopo Department of Economic Development, Environment and Tourism (LEDET) for the removal or destruction of any protected / listed species.</p> <p>Refer to Appendix G for the list of SCC considered as part of this assessment.</p>
Concluding Remarks	
<p>The Sekhukhune Mountain Bushveld habitat unit is considered important from an ecological perspective, is of increased species diversity whilst there is the potential that several floral SCC may occur in this habitat. The Secondary Bushveld habitat is considered less important as this habitat is currently in a state of ecological succession and has limited species diversity and no recorded floral SCC.</p> <p>Important considerations:</p> <ul style="list-style-type: none"> - The Sekhukhune Mountain Bushveld habitat units is considered to be representative of the reference vegetation type, i.e., the Sekhukhune Mountain Bushveld; - Whilst only a single floral SCC was observed on site, it is likely that several more may occur, notably in the Sekhukhune Mountain Bushveld habitat; - No AIP's were observed in the Sekhukhune Mountain Bushveld habitat, however several species were observed in the Secondary Bushveld habitat. As such, the areas must be monitored for AIPs and when such are found, they are to be removed / controlled as per an AIP control plan; - According to the Limpopo C-Plan (V2, 2013) database, Projects 1, 2, 3 and 5 and the majority of Project 4 falls within areas is defined as a Category 1 CBA whilst a small portion of Project 4 falls within an area classified as a Category 2 ESA; - The majority of the proposed TSF (Project 1) is located in the Secondary Bushveld which does not align with that of the CBA 1 classification. Similarly, Projects 3, 4 and 5 are also predominantly located in the Secondary Bushveld and Transformed areas and are not representative of the CBA 1 listing as per the background data; and - The Screening Tool output for the area indicated a medium sensitivity for the project areas. Following the field verification, it can be concluded that the Secondary Bushveld may, to a degree, align with the screening tool output, however, the Sekhukhune Mountain Bushveld should be considered of higher sensitivity, whilst the Transformed areas can be considered to be of lower sensitivity. 	



4.2 Faunal Assessment

Selected examples of fauna species recorded within the various project areas					
					
<p>Left to right: <i>Argiope lobata</i> (Black-lobed garden orb-web), <i>Idolomorpha dentifrons</i> (Cone-headed Mantid), <i>Hystrix africaeausalis</i> (Porcupine) spoor, <i>Plocepasser mahali</i> (White-browed sparrow-weaver) nests, <i>Platysaurus orientalis</i> (Sekhukhune Flat Lizard) and <i>Harpactirella overdijki</i> (Lesser baboon spider).</p>					
Species of Conservation Concern	<p>One endemic insect was observed in the vicinity of Project 2, namely <i>Pycna sylvia</i> (Cicada) whilst <i>Python natalensis</i> (African Python, VU) has also been recorded in the adjacent habitat. Of importance is that <i>Pycna sylvia</i> (cicada) appears to be largely endemic to the Dwars River Valley and is most commonly associated with the tree species <i>Vitex obovata</i> subsp. <i>wilmsii</i> and as such habitat loss and consequently the loss of individuals in the area may have a significant knock-on impact to the overall population of this species in the valley. Additionally, there is the increased probability that species such as <i>Panthera pardus</i> (Leopard, Vulnerable, TOPS Listed), <i>Parahyaena brunnea</i> (Brown hyaena, NT, TOPS Listed), <i>Sagittarius serpentarius</i> (Secretary bird, VU), <i>Polemaetus bellicosus</i> (Martial Eagle, VU) and <i>Neotis denhami</i> (Denham's Bustard, NT) are likely to utilise the Sekhukhune Mountain Bushveld habitat unit. Although Project 2 which occurs in this habitat is small in extent, the development of such will still lead to a decrease in habitat, foraging grounds and may hinder SCC movement for terrestrial species.</p>				
Faunal Habitat Overview	<p>The Sekhukhune Mountain Bushveld habitat with its well-developed woody and herbaceous layer provides habitat to a diversity of generalist and specialist species, as well as endemics (generalist and specialist species, as well as endemics such as <i>Pycna sylvia</i> (cicada)). The varying vegetation and abiotic structures within the habitat further adds to habitat complexity and the habitats' ability to support a diversity of species. Habitat structure is known to be an important driver for avifaunal diversity, whilst insect species also benefit from such. The rocky patches provide suitable areas of refuge for small mammals, reptiles and invertebrates, whilst the avifaunal species were observed throughout the habitat. The Sekhukhune Mountain Bushveld habitat will likely support a healthy insect population, considered of increased importance as insects serve an important ecological role in the environment. Insects not only help cycle nutrients and detrital material but also serve as important food resource for many species on higher trophic levels. Additionally, herbivorous insects are often able to feed upon plant material that is high in lignin and otherwise unpalatable to other herbivores, whilst also transporting dead plant material sub-surface (termites), helping to maintain the nutrient cycle. Although a high diversity of species is likely to occur, abundance levels therein are expected to be limited due to several factors. The relatively nutrient poor sand soil substrate result in the vegetation growth being that of plant species of decreased palatability, meaning species less tolerant to low plant palatability will need to forage over greater distances to obtain the required nutrition intake. Additionally, the current land use activities adjacent to the remaining Sekhukhune Mountain Bushveld habitat (mining and small-scale cattle farming) as well as fencing off of areas, has resulted in a loss of large mammals in the area. The loss of large herbivores (with the exception of a small number of Kudus which roam through the whole valley) and an altered fire regime has led to a change in ecological processes, impacting vegetation structure and influencing faunal species presence, overall diversity and abundances.</p> <p>The Secondary Bushveld habitat comprises areas that were disturbed as a result of farming (crops) and/or construction activities and that resulted in the clearance of the indigenous vegetation. These areas have subsequently been left to revegetate over time, however, with the exclusion / limited input of key ecological processes, the overall vegetation composition and structure does not resemble that of the Sekhukhune Mountain Bushveld reference state. As such, faunal species diversity is not as rich in this habitat unit, food resources are notably lower and AIP proliferation higher. The Secondary Bushveld habitat supports predominantly common faunal species, notably common insects and avifaunal species, which show greater tolerance to disturbed areas and those which select for more open grassland areas, notably ground foraging avifauna such</p>				



as Francolins and Guineafowls. The open grassland structure may favour predatory snakes, however, limited signs of small mammal activity was observed and such, food resources for these snakes is likely a limiting factor herein. The large homogenous stands of low palatability grasses in this habitat unit limit habitat structure and as such, species diversity. Additionally, areas of refuge for small mammals, invertebrates and reptiles are limited, increasing the risk of predation and as such, it is likely these species will select for areas of more suitable habitat. The Secondary Bushveld provides no unique or important niche habitat for faunal species in the region, with species abundances notably lower and species observations more infrequent, indicating that the majority of fauna are seemingly avoiding this habitat and, understandably, showing preference for the intact Sekhukhune Mountain Bushveld habitat in the adjacent areas.

The Transformed areas are largely devoid of vegetation and therefore food resources and shelter. Some hardier species such as small skinks, common avifauna and individuals of the Order Orthoptera (Grasshoppers and crickets) were observed. Skinks and smaller avifauna are often found in developed areas, as they are able to adapt to such areas more readily, utilise buildings for shelter and obtain food resources from insects attracted to the night lights and scraps of food left by people. Overall, the transformed areas are not considered important for faunal species nor do the transformed areas provide important ecological services or functions for fauna.

During the site assessment the majority of faunal species were observed within the Sekhukhune Mountain Bushveld (associated with Project 2). Species observed include *Raphicerus campestris* (Steenbok), *Tragelaphus strepsiceros* (Kudu), *Lepus capensis* (Cape Hare), *Hystrix africaeaustralis* (Porcupine), *Idolomorphia dentifrons* (Cone-headed Mantis), *Dicrurus adsimilis* (Fork-tailed Drongo), *Agama aculeata distanti* (Distant's Ground Agama), *Trachylepis margaritifer* (Rainbow Skink) and *Prinia subflava* (Tawny-flanked Prinia) amongst others. Within the Secondary Bushveld species or signs thereof observed include *Lepus capensis* (Cape Hare), *Plocepasser mahali* (White-browed Sparrow-weaver), *Streptopelia capicola* (Cape Turtle Dove), *Numida meleagris* (Helmeted Guineafowl) and *Pternistis swainsonii* (Swainson's Spurrow) amongst others.

For a full list of observed species please refer to **Appendix I**.

Concluding Remarks

The Sekhukhune Mountain Bushveld is considered of greater importance for faunal species in terms of habitat provision, breeding opportunities and food resources when compared to the Secondary Bushveld habitat, however, the small footprint area of Project 2 is unlikely to have a significant impact on the overall faunal species diversity and abundance levels in the region. Due to the small footprints of the projects affecting the Sekhukhune Mountain Bushveld, impacts on faunal species herein are not expected to be high. Additionally, TRP mine has recently constructed a new TSF pipeline which intersects the 2 footprint areas of Project 2. This pipeline will likely be more of an impact to habitat connectivity than that of Project 2 itself. Projects 3 – 5 are located inside the active mining area, which is surrounded by fences and as such, these projects are unlikely to impact species movement patterns or habitat connectivity. The PCD and the TSF associated with Project 1 are located in the far corners of fenced off areas and currently are not considered vital or important for faunal movement, nor do they serve important habitat connection functions. As such, although habitat loss will occur, there is likely to be limited impact on species movement, habitat availability and habitat utilisation in these areas as well as the adjacent areas.

Important considerations:

- Habitat loss is inevitable as ground clearing and vegetation removal is unavoidable within the footprint areas. This will lead to habitat loss and species displacement herein;
- It is important that disturbed areas are rehabilitated and natural vegetation reinstated where possible to limit additional habitat loss through erosive actions and AIP proliferation;
- The Screening Tool indicated the site sensitivity as medium for animals. Following the site assessment, the Sekhukhune Mountain bushveld is considered to be of higher sensitivity than the screening tool listed (refer to Section 5), whilst the Secondary Bushveld is considered to be similar in terms of the screening tool (refer to Section 5). The Transformed areas however do not coincide with the sensitivity as presented by the screening tool;
- The Screening Tool indicated the following species as potentially occurring in the assessment areas: *Chrysospalax villous* (Rough-haired golden mole, VU), *Crocidura maquassiensis* (Makwassie Musk Shrew, LC) and *Dasymys robertsii* (Robert's shaggy rat, DD). Following the site assessment, it is considered unlikely that these species will utilise the various project sites and as such, the proposed activities pose no threat to the ongoing conservation of these species; and
- From a faunal ecological perspective, although the proposed activities will lead to habitat loss, this loss is not expected to have a significant impact on the current faunal populations in the region, provided strict site management is undertaken and all mitigation measures implemented.



4.3 Alien and Invasive Plant (AIP) Species

South Africa is home to an estimated 759 naturalised or invasive terrestrial plant species (Richardson *et al.*, 2020), with 327 plant species, most of which are invasive, listed in national legislation⁵. Many introduced species are beneficial, e.g., almost all agriculture and forestry production are based on alien species, with alien species also widely used in industries such as horticulture. However, some of these species manage to “escape” from their original locations, spread and become invasive. Although only a small proportion of introduced species become invasive (~0.1–10%), those that do proceed to impact negatively on biodiversity and the services that South Africa’s diverse natural ecosystems provide (from ecotourism to harvesting food, cut flowers, and medicinal products) (van Wilgen and Wilson, 2018).

4.3.1 Legal Context

South Africa has released several Acts legislating the control of alien species. Currently, invasive species are controlled by the NEM:BA – Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated 25th of September 2020. AIPs defined in terms of NEM:BA are assigned a category and listed within the NEM:BA List of Alien and Invasive Species (2020) in accordance with Section 70(1)(a) of the NEM:BA:

- **Category 1a** species are those targeted for urgent national eradication;
- **Category 1b** species must be controlled as part of a national management programme, and cannot be traded or otherwise allowed to spread;
- **Category 2** species are the same as category 1b species, except that permits can be issued for their usage (e.g., invasive tree species can still be used in commercial forestry, providing a permit is issued that specifies where they may be grown and that permit holders “*Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3*”); and
- **Category 3** are listed invasive species that can be kept without permits, although they may not be traded or further propagated, and must be considered a Category 1b species if they occur in riparian zones.

Duty of care related to listed invasive species are referred to in NEM:BA Section 73⁶. The motivation for this duty of care is both environmentally and economically driven. Management

⁵ GN number 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the National Environmental Management Biodiversity Act, 2004 (Act No 10 of 2004).

⁶ Section 73(2): A person who is the owner of land on which a listed invasive species occurs must-

a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;



of alien species in South Africa is estimated to cost at least ZAR 2 billion (US\$142 million) each year - this being the amount currently spent by the national government's DFFE - i.e. the Working for Water programme (van Wilgen, 2020). Managing AIPs early on will reduce clearing costs in the long run.

4.3.2 Site Results

During the site assessment, a number of AIPs were observed, predominantly in the Secondary Bushveld and the Transformed Areas, but also in the small pockets of Sekhukhune Mountain Bushveld habitat associated with Project 1 and Projects 3-5. The Sekhukhune Mountain Bushveld habitat associated with Project 2 did not appear, at the time of assessment, to be associated with AIP growth, however, if left uncontrolled this may change with time.

Table 3: Dominant alien vegetation species identified during the field assessment.

Species	English name	NEMBA Category
Succulents		
<i>Agave sisalana</i>	Sisal	2
<i>Cereus jamacara</i>	Queen of The Night	1b
<i>Opuntia ficus-indica</i>	Prickly Pear	1b
Trees/ shrubs		
<i>Melia azedarach</i>	Syringa	1b
Grasses		
<i>Arundo donax</i>	Spanish Reed	1b
<i>Pennisetum setaceum</i>	Fountain Grass	1b
Forbs		
<i>Argemone ochroleuca</i>	White-flowered Mexican Poppy	1b
<i>Datura ferox</i>	Large Thorn Apple	1b
<i>Datura stramonium</i>	Common Thorn Apple	1b
<i>Solanum elaeagnifolium</i>	Silverleaf bitter apple	1b
<i>Solanum sisymbriifolium</i>	Dense-thorned Bitter Apple	1b
<i>Verbena bonariensis</i>	Wild Verbena	1b
Plant species not listed in NEMBA		
<i>Alternanthera pungens</i>	Khakiweed	-
<i>Amaranthus hybridus</i>	Pigweed	-
<i>Bidens pilosa</i>	Common Black Jack	-
<i>Tagetes minuta</i>	Tall Khaki Weed	-
<i>Zinnia peruviana</i>	Redstar Zinnia	-

- b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
 c) take all the required steps to prevent or minimise harm to biodiversity.

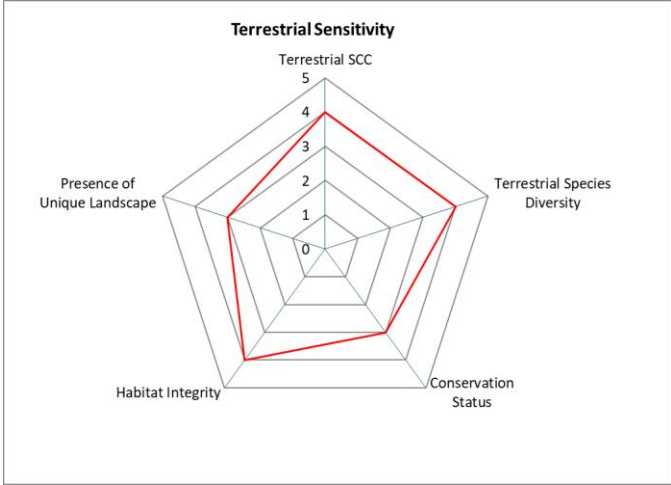
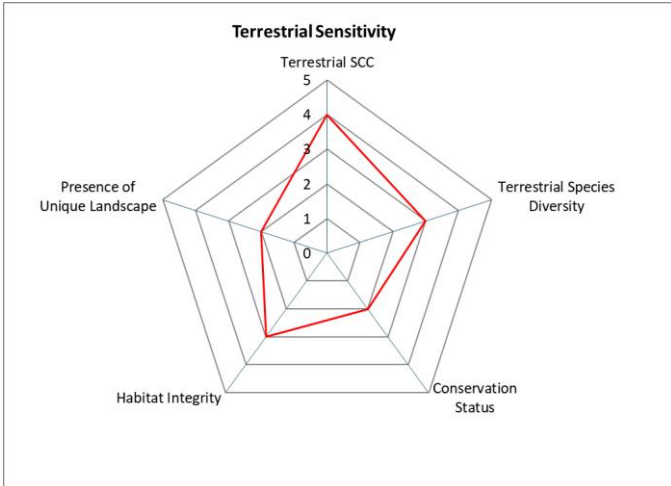


5 SENSITIVITY MAPPING

Figures 10 - 12 conceptually illustrate the areas of ecological sensitivity – depicting the sensitivity for flora and fauna, respectively. The proposed projects are depicted according to their sensitivity in terms of the presence or potential for SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity. Table 4 (below) presents the sensitivity of each identified habitat unit for i) flora and ii) fauna, along with an associated conservation objective and implications for development.



Table 4: A summary of the floral and faunal sensitivity of each habitat unit and implications for development.

Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
<p style="text-align: center; background-color: #f4a460; padding: 5px;">Moderately High</p>  <p>Terrestrial Sensitivity</p> <p>Terrestrial SCC</p> <p>5 4 3 2 1 0</p> <p>Presence of Unique Landscape</p> <p>Terrestrial Species Diversity</p> <p>Habitat Integrity</p> <p>Conservation Status</p>	<p>Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.</p>	<p>Sekhukhune Mountain Bushveld – Project 1 and 2</p>	<ul style="list-style-type: none"> - Intact habitat and vegetation structure representative of the reference vegetation type; - High diversity of faunal and floral species of which some are endemic to the region; - Floral and faunal SCC observed in the habitat whilst increased probability that several more may occur in the habitat unit; and - Vegetation representative of the CBA 1 listing.
<p style="text-align: center; background-color: #fff9c4; padding: 5px;">Intermediate</p>  <p>Terrestrial Sensitivity</p> <p>Terrestrial SCC</p> <p>5 4 3 2 1 0</p> <p>Presence of Unique Landscape</p> <p>Terrestrial Species Diversity</p> <p>Habitat Integrity</p> <p>Conservation Status</p>	<p>Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.</p>	<p>Sekhukhune Mountain Bushveld – Project 3-5</p> <p>Secondary Bushveld</p>	<ul style="list-style-type: none"> - Representative of vegetation currently in a secondary state of succession resulting from habitat clearance / disturbance from past agriculture and mining activities; - Not representative of the vegetation type; - Dominated by common floral and faunal species, however lacks species that are unique / dominant to the Sekhukhune Centre of Endemism; and - No floral or faunal SCC observed with a decreased probability for of their occurrence herein.



Habitat Sensitivity	Conservation objective	Habitat Unit	Key habitat characteristics
<p style="text-align: center; background-color: #4CAF50; color: white; padding: 5px;">Low</p> <div style="border: 1px solid black; padding: 10px; text-align: center;"> <p>Terrestrial Sensitivity</p> </div>	<p>Optimise development potential.</p>	<p>Transformed Areas</p>	<ul style="list-style-type: none"> - This habitat has been largely transformed from the reference vegetation type due to the development of the mine and roads; - Little to no native vegetation remains; and - No floral or faunal SCC were observed or expected to occur.



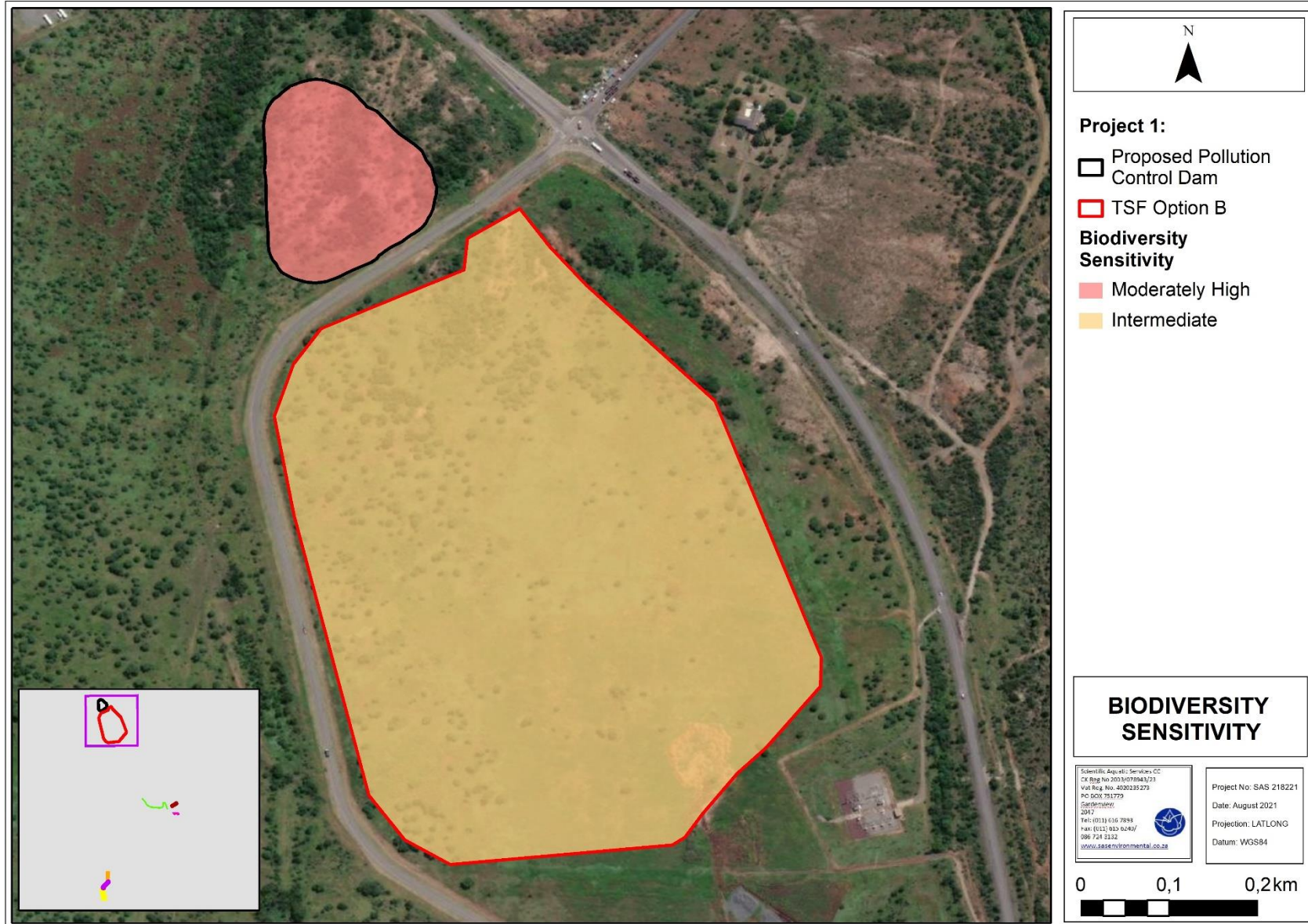


Figure 10: Habitat sensitivity associated with Project 1.



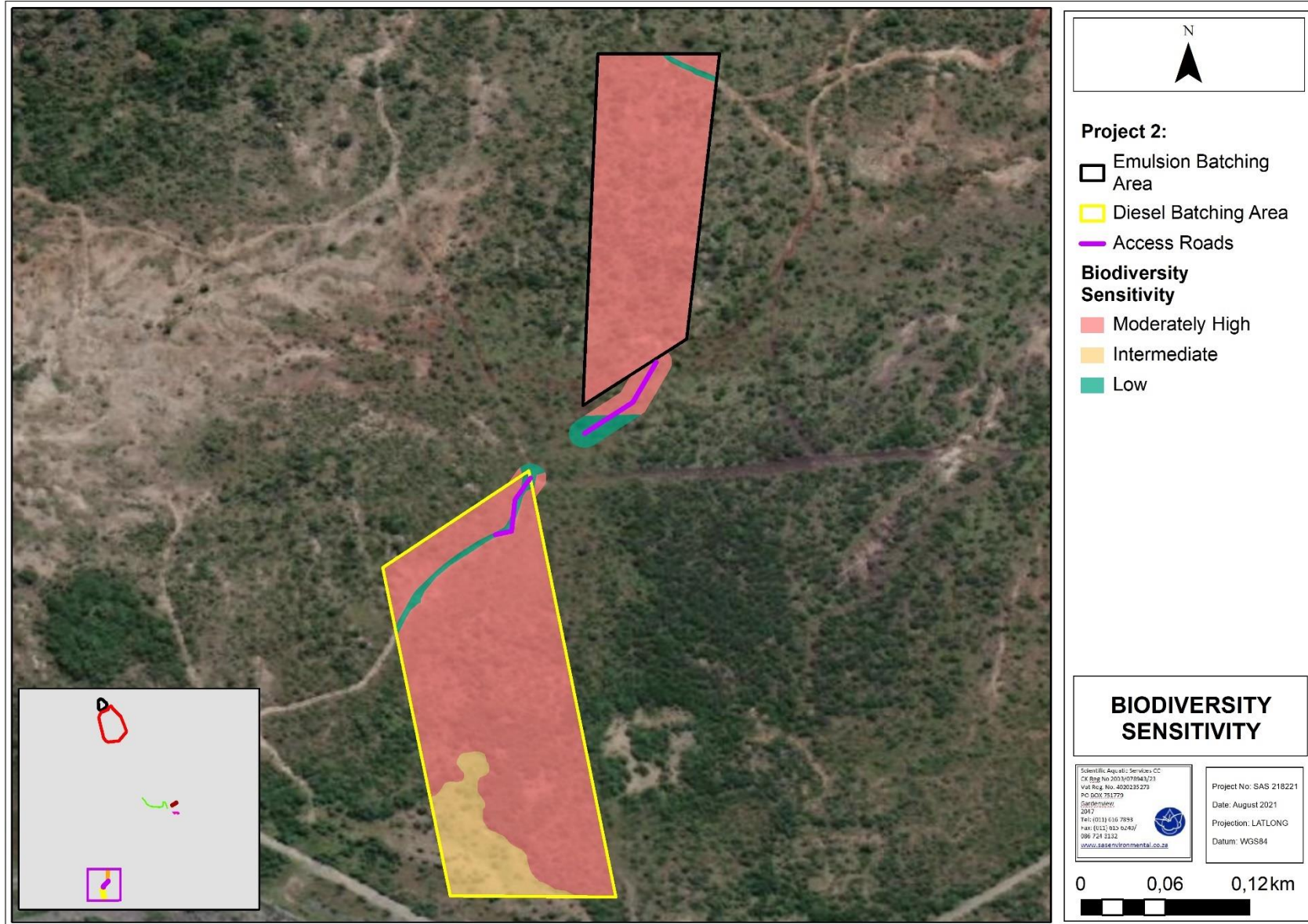


Figure 11: Habitat sensitivity associated with Project 2.





Figure 12: Habitat sensitivity associated with Projects 3-5.



6 IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts on the floral and faunal ecology of Projects 1 – 5 (Full project description in Section 1.1). An impact discussion and assessment of all potential pre-construction, construction, operational and maintenance phase impacts are provided in Section 6.1. All mitigatory measures required to minimise the perceived impacts are presented in Section 6.2.

Table 5: Activities and Aspects likely to impact on the faunal and floral resources associated with the Projects.

ACTIVITIES AND ASPECTS REGISTER	
Pre-Construction Phase	
-	Potential failure to conduct a walkdown of the sites prior to construction activities to identify SCC locations.
-	Potential failure to obtain permits and to relocate floral or faunal SCC to suitable habitat outside the five proposed projects footprint.
-	Impact: Loss of faunal or floral SCC within the five proposed projects.
-	Inconsiderate planning, infrastructure placement and design, leading to the loss of potential sensitive floral and faunal species and/or habitat for such species, as well as unnecessary edge effect impacts on areas outside of the five proposed projects footprint.
-	Impact: Degradation and modification of the receiving environment, loss of faunal and floral habitat.
-	Potential failure implement an Alien and Invasive Plant (AIP) Management/Control plan before the commencement of construction activities, resulting in the further proliferation of AIPs.
-	Impact: Spreads of AIPs, leading to potential loss of floral species diversity from surrounding natural habitat.
Construction Phase	
-	Site clearing and the removal of vegetation.
-	Impact: Loss of faunal and floral habitat, diversity, and the possible loss of floral SCC.
-	Potential failure to monitor the success of relocated floral SCC.
-	Impact: Loss of SCC individuals.
-	Proliferation of AIP species that colonise in areas of increased disturbances and that outcompete native species, including the further transformation of adjacent natural habitat.
-	Impact: Loss of favourable faunal and floral habitat outside of the five proposed projects footprint, including a decrease in species diversity and a potential loss of faunal and floral SCC.
-	Dumping and laydown of construction material within areas where no construction is planned thereby leading to habitat disturbance - allowing the establishment and spread of AIPs and further alteration of faunal habitat.
-	Impact: Loss of preferred faunal and floral habitat, diversity and SCC as AIPs outcompete the indigenous plant species in these disturbed areas.
-	Potential overexploitation through the trapping and/or hunting of faunal species, including faunal SCC, beyond the direct footprint area.
-	Impact: Local loss of faunal abundance and diversity.
-	Potentially poorly managed edge effects: <ul style="list-style-type: none"> • Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the floral habitat; and • Compaction of soils outside of the focus area due to indiscriminate driving of construction vehicles through natural vegetation.
-	Impact: Loss of floral and faunal habitat, diversity, and SCC within the direct footprint of the proposed development. Loss of surrounding floral and faunal diversity and floral SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas.
-	Possible increased fire frequency during construction.
-	Impact: Loss or alteration of floral and faunal habitat and species diversity.



ACTIVITIES AND ASPECTS REGISTER	
<ul style="list-style-type: none"> - Dust generated during construction and operational activities accumulates on the surrounding floral individuals, altering the photosynthetic ability of plants⁷ and potentially further decreasing optimal growing/re-establishing conditions. - Impact: Declines in plant functioning leading to loss of floral species and habitat for optimal growth. 	
Operational and Maintenance Phases	
<ul style="list-style-type: none"> - Potential failure to monitor the success of relocated floral SCC. - Impact: Loss of SCC individuals. 	
<ul style="list-style-type: none"> - Increased introduction and proliferation of alien plant species due to a lack of maintenance activities, or poorly implemented and monitored AIP Management programme, leading to ongoing displacement of natural vegetation outside of the footprint area. - Impact: Ongoing or permanent loss of faunal and floral habitat, diversity, and potential SCC. 	
<ul style="list-style-type: none"> - Increased human presence in the area as part of maintenance activities, potentially leading to illegal harvesting/ collection of SCC plants, the persecution of fauna, or an increased risk of fire frequency impacting on floral and faunal communities in the surrounding natural habitat. - Impact: Loss of faunal and floral habitat, medicinal flora, and SCC, as well as overall species diversity within the local area. 	
Decommissioning & Closure Phase	
<ul style="list-style-type: none"> - Ineffective rehabilitation of exposed and impacted areas potentially leading to a shift in vegetation type; - Impact: Permanent loss of floral and faunal habitat, diversity and SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural vegetation of increased sensitivity. 	
<ul style="list-style-type: none"> - Potential poor management and failure to monitor rehabilitation efforts, leading to: <ul style="list-style-type: none"> • Landscapes left fragmented, resulting in reduced dispersal capabilities of floral species, reduced habitation and dispersal capabilities of faunal species, and an overall decrease in floral and faunal diversity; • Compacted soils limiting the re-establishment of natural vegetation; • Increased risk of erosion in areas left disturbed. - Impact: Long-term (or permanent) loss of floral and faunal habitat, diversity and SCC. 	
<ul style="list-style-type: none"> - Disturbance of soils as part of demolition activities. - Impact: Loss of favourable growing conditions for floral communities and the subsequent loss of faunal habitat. 	
<ul style="list-style-type: none"> - Insufficient aftercare and maintenance leading to erosion and sedimentation. - Impact: Loss of floral and faunal habitat and overall species diversity within the area. 	

6.1 Floral Impact Assessment

6.1.1 Floral Impact Assessment Results

Table 6 below indicates the perceived risks to the floral ecology associated with all phases of the proposed five projects. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

⁷ Sett, R. (2017). Responses in plants exposed to dust pollution. *Horticulture International Journal*, 1(2), 00010.).



Table 6: Impact on the floral ecology the proposed Projects (1-5).

Impacting activities and associated habitat unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PLANNING PHASE																
Floral Habitat and Diversity Project 1																
Sekhukhune Mountain Bushveld: Project 1	5	4	3	2	2	9	7	63 Medium low	5	4	3	1	1	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 2	5	4	4	2	2	9	8	72 Medium low	5	4	3	1	1	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 3-5	5	3	3	2	2	8	7	56 Medium low	5	3	2	1	1	8	4	32 Low
Secondary Bushveld: Project 1	5	3	3	2	2	8	7	56 Medium low	5	3	2	1	1	8	4	32 Low
Secondary Bushveld: Project 2	5	3	3	2	2	8	7	56 Medium low	5	3	2	1	1	8	4	32 Low
Secondary Bushveld: Project 3-5	5	3	2	1	2	8	5	40 Low	5	3	2	1	1	8	5	40 Low
Transformed Areas	5	1	1	1	2	6	3	18 Very low	5	1	1	1	1	6	2	12 Very low
Floral Species of Conservation Concern																
Project 1	4	3	3	2	2	7	7	49 Low	3	3	2	1	1	6	4	20 Very low
Project 2	4	4	3	2	2	8	7	56 Medium Low	3	4	2	1	1	7	4	28 Low
Project 3-5	2	2	1	1	2	4	4	16 Very low	1	1	1	1	1	2	3	6 Very low
CONSTRUCTION PHASE																
Floral Habitat and Diversity																
Sekhukhune Mountain Bushveld: Project 1	5	4	3	2	3	9	8	72 Medium low	5	4	3	1	2	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 2	5	4	4	2	3	9	9	81 Medium high	5	4	3	1	2	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 3-5	5	3	3	2	3	8	8	64 Medium low	5	3	2	1	2	8	5	40 Low
Secondary Bushveld: Project 1	5	3	3	2	3	8	8	64 Medium low	5	3	2	1	2	8	5	40 Low
Secondary Bushveld: Project 2	5	3	3	2	3	8	8	64 Medium low	5	3	2	1	2	8	5	40 Low
Secondary Bushveld: Project 3-5	5	3	2	1	3	8	6	48 Low	5	3	2	1	2	8	5	40 Low
Transformed Areas	5	1	1	1	3	6	4	24 Very low	5	1	1	1	1	6	3	18 Very low
Floral Species of Conservation Concern																
Project 1	4	3	3	2	3	7	7	49 Low	3	3	2	1	2	6	4	20 Very low
Project 2	4	4	4	2	3	8	9	72 Medium Low	3	4	3	1	2	7	6	42 Low
Project 3-5	2	2	1	1	2	4	4	16	1	1	1	1	1	2	3	6



Impacting activities and associated habitat unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
								Very low								Very low
OPERATIONAL AND MAINTENANCE PHASES																
Floral Habitat and Diversity																
Sekhukhune Mountain Bushveld: Project 1	3	4	3	1	4	7	8	56 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 2	3	4	4	1	4	7	9	63 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 3-5	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 1	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 2	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 3-5	2	3	2	1	4	5	7	35 Low	2	3	2	1	4	5	7	35 Low
Transformed Areas	1	1	1	1	4	2	6	12 Very low	1	1	1	1	4	2	6	12 Very low
Floral Species of Conservation Concern																
Project 1	4	3	3	1	3	7	7	49 Low	1	3	2	1	4	4	7	28 Low
Project 2	4	4	3	1	4	8	8	56 Medium Low	1	4	2	1	4	5	7	35 Low
Project 3-5	2	2	1	1	4	4	6	24 Very low	1	1	1	1	4	2	6	12 Very low
DECOMMISSIONING AND CLOSURE PHASE																
Floral Habitat and Diversity																
Sekhukhune Mountain Bushveld: Project 1	3	4	3	1	4	7	8	56 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 2	3	4	4	1	4	7	9	63 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 3-5	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 1	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 2	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 3-5	2	3	2	1	4	5	7	35 Low	2	3	2	1	4	5	7	35 Low
Transformed Areas	1	1	1	1	4	2	6	12 Very low	1	1	1	1	4	2	6	12 Very low
Floral Species of Conservation Concern																
Project 1	4	3	3	1	3	7	7	49 Low	1	3	2	1	4	4	7	28 Low
Project 2	4	4	3	1	4	8	8	56 Medium Low	1	4	2	1	4	5	7	35 Low
Project 3-5	2	2	1	1	4	4	6	24 Very low	1	1	1	1	4	2	6	12 Very low



6.1.2 Impact Discussion

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed five projects.

Direct impacts on floral habitat and species diversity will be greatest during the construction phase, with secondary impacts from poorly managed edge effects (e.g., AIP proliferation, disturbed areas left unrehabilitated and erosion) to be most significant during the operational and maintenance phases. The impacts will be limited in their extent and the perceived effects on floral ecology can be kept to a local scale with sufficiently implemented mitigation measures. The decommissioning and closure phase pose the opportunity for positive impacts if vegetation is adequately reinstated in these areas.

Impacts on protected floral species will be higher during the construction phase when vegetation clearance activities take place. Prior to clearance activities, permits for the relocation / destruction of any floral SCC must be obtained from the relevant authorities. Relocation of geophytes and succulent SCC on site will likely be successful, with woody species more likely requiring destruction, unless individuals are small and can be relocated. It is important that if a species is destroyed, the same species is currently being grown in the Dwarsrivier nursery and that these species are reinstated as part of rehabilitation activities. Impacts during the operational phase can be reduced to lower impact significance provided edge effects are managed and that all mitigation measures are implemented.

6.1.2.1 Impact on Floral Habitat and Diversity

The impact assessment was undertaken on all aspects of floral ecology deemed likely to be affected by the proposed five projects. The proposed five projects will result in the clearance of vegetation that is of **intermediate to moderately high** sensitivity.

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **Medium-Low** and **Very Low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to **Low** and **Very low** significances.

The most significant impacts to the floral habitat integrity and species diversity resulting from the proposed five projects during the construction phase include, but are not limited to, the following:

- Clearance of floral species within the proposed footprint areas as well as nationally and provincially protected floral species;



- Habitat fragmented and reduced dispersal opportunities for plant species as the disturbed / impacted areas will be less attractive to faunal species who are important mechanisms for seed dispersal;
- Increase risk of erosion and poor stormwater management - resulting in loss of soils, the down-slope sedimentation of habitat and the consequent loss of habitat beyond the planned footprint; and
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous flora and altering favourable habitat conditions for the establishment of indigenous species.

6.1.2.2 Impacts on Floral SCC

The proposed five projects are associated with floral SCC, which will likely be directly impacted by the proposed activities. The SCC recorded on site (*Sclerocarya birrea* subsp. *caffra*) is protected under the NFA. Additionally, there is an increased chance that several other NFA and LEMA listed floral SCC may occur within the footprint areas.

Without mitigation implemented, the anticipated impact significance on floral SCC communities varies between **Medium Low** and **Very Low**. The impacts on SCC are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced to **Low and Very low** significance levels.

The proposed 5 projects are not anticipated to have a high impact on floral SCC and with mitigation measures implemented the impacts can remain localised in extent. Succulents and geophytes are good candidates for rescue and relocation to suitable sites outside of the proposed footprints, either to surrounding natural habitat or to the Dwarsrivier nursery. Woody species are less likely to be successfully relocated, especially larger individuals. Where woody SCC species are to be cleared and not relocated, it must be ensured that the same species are currently being propagated in the nursery. If this is not the case, seeds can be harvested from the surrounding areas and / or from the individuals that will be cleared as part of vegetation clearing activities to be propagated off-site and reinstated as part of rehabilitation activities.

Activities which are likely to negatively affect the flora of conservation concern within and around the proposed five projects include, but are not limited to, the following:

- Disturbance, fragmentation and alteration of floral SCC habitat;
- Destruction, removal or harvesting of floral SCC during construction and operational activities; and



- Potentially poorly implemented and monitored rescue and relocation of SCC or not ensuring that the same species are being propagated in the Dwarsrivier nursery.

6.1.2.3 Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

According to the desktop database, the proposed five projects will impact on a CBA 1 and the Sekhukhune Mountainlands threatened ecosystem, however, following the site assessment this is more accurately only applicable to the RWD of Project 1 and the footprint areas of Project 2. The remaining areas associated with the TSF (Project 1) and Projects 3-5 have all been impacted on and are associated with the active mining footprint. According to the desktop database, a small portion of Project 4 will impact on an ESA however, this section of the ESA has been degraded in terms of habitat integrity and is located within the active mining area.

6.1.3 Probable Residual Impacts

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

- Fragmentation of ecologically intact habitat resulting in altered ecological functioning of habitat beyond the authorised projects, notably Project 2;
- Potential further loss of and altered floral species diversity outside of the footprint areas, including loss of favourable habitat for SCC if effects from AIP proliferation and the intensification of woody encroachment are not managed; and
- Loss of NFA protected tree species as a result of vegetation clearing and/or potential harvesting in the region.

6.1.4 Cumulative Impacts

A significant threat for the floral ecology associated with the five projects is the potential proliferation of AIP species and particularly a potential for indigenous bush encroachment, resulting in the overall loss of native floral communities within the local area.

6.2 Faunal Impact Assessment

6.2.1 Faunal Impact Assessment Results

Table 7 below indicates the perceived risks to the faunal ecology associated with all phases of the proposed five projects. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as



stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

Table 7: Impact on the faunal ecology the proposed Projects (1-5).

Impacting activities and associated habitat unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
PLANNING PHASE																
Faunal Habitat and Diversity Project 1																
Sekhukhune Mountain Bushveld: Project 1	5	4	3	2	2	9	7	63 Medium low	5	4	3	1	1	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 2	5	4	4	2	2	9	8	72 Medium low	5	4	3	1	1	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 3-5	5	3	3	2	2	8	7	56 Medium low	5	3	2	1	1	8	4	32 Low
Secondary Bushveld: Project 1	5	3	3	2	2	8	7	56 Medium low	5	3	2	1	1	8	4	32 Low
Secondary Bushveld: Project 2	5	3	3	2	2	8	7	56 Medium low	5	3	2	1	1	8	4	32 Low
Secondary Bushveld: Project 3-5	5	3	2	1	2	8	5	40 Low	5	3	2	1	1	8	5	40 Low
Transformed Areas	5	1	1	1	2	6	3	18 Very low	5	1	1	1	1	6	2	12 Very low
Faunal Species of Conservation Concern																
Project 1	4	3	3	2	2	7	7	49 Low	3	3	2	1	1	6	4	20 Very low
Project 2	4	4	3	2	2	8	7	56 Medium Low	3	4	2	1	1	7	4	28 Low
Project 3-5	2	2	1	1	2	4	4	16 Very low	1	1	1	1	1	2	3	6 Very low
CONSTRUCTION PHASE																
Faunal Habitat and Diversity																
Sekhukhune Mountain Bushveld: Project 1	5	4	3	2	3	9	8	72 Medium low	5	4	3	1	2	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 2	5	4	4	2	3	9	9	81 Medium high	5	4	3	1	2	9	5	45 Low
Sekhukhune Mountain Bushveld: Project 3-5	5	3	3	2	3	8	8	64 Medium low	5	3	2	1	2	8	5	40 Low
Secondary Bushveld: Project 1	5	3	3	2	3	8	8	64 Medium low	5	3	2	1	2	8	5	40 Low
Secondary Bushveld: Project 2	5	3	3	2	3	8	8	64 Medium low	5	3	2	1	2	8	5	40 Low
Secondary Bushveld: Project 3-5	5	3	2	1	3	8	6	48 Low	5	3	2	1	2	8	5	40 Low
Transformed Areas	5	1	1	1	3	6	4	24 Very low	5	1	1	1	1	6	3	18 Very low
Faunal Species of Conservation Concern																
Project 1	4	3	3	2	3	7	7	49 Low	3	3	2	1	2	6	4	20 Very low
Project 2	4	4	4	2	3	8	9	72 Medium Low	3	4	3	1	2	7	6	42 Low
Project 3-5	2	2	1	1	2	4	4	16	1	1	1	1	1	2	3	6



Impacting activities and associated habitat unit	UNMANAGED								MANAGED							
	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance	Probability of Impact	Sensitivity	Severity	Spatial Scale	Duration of Impact	Likelihood	Consequence	Significance
								Very low								Very low
OPERATIONAL AND MAINTENANCE PHASES																
Faunal Habitat and Diversity																
Sekhukhune Mountain Bushveld: Project 1	3	4	3	1	4	7	8	56 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 2	3	4	4	1	4	7	9	63 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 3-5	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 1	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 2	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 3-5	2	3	2	1	4	5	7	35 Low	2	3	2	1	4	5	7	35 Low
Transformed Areas	1	1	1	1	4	2	6	12 Very low	1	1	1	1	4	2	6	12 Very low
Faunal Species of Conservation Concern																
Project 1	4	3	3	1	3	7	7	49 Low	1	3	2	1	4	4	7	28 Low
Project 2	4	4	3	1	4	8	8	56 Medium Low	1	4	2	1	4	5	7	35 Low
Project 3-5	2	2	1	1	4	4	6	24 Very low	1	1	1	1	4	2	6	12 Very low
DECOMMISSIONING AND CLOSURE PHASE																
Faunal Habitat and Diversity																
Sekhukhune Mountain Bushveld: Project 1	3	4	3	1	4	7	8	56 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 2	3	4	4	1	4	7	9	63 Medium low	3	4	2	1	4	7	7	49 Low
Sekhukhune Mountain Bushveld: Project 3-5	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 1	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 2	2	3	3	1	4	5	8	40 Low	2	3	2	1	4	5	7	35 Low
Secondary Bushveld: Project 3-5	2	3	2	1	4	5	7	35 Low	2	3	2	1	4	5	7	35 Low
Transformed Areas	1	1	1	1	4	2	6	12 Very low	1	1	1	1	4	2	6	12 Very low
Faunal Species of Conservation Concern																
Project 1	4	3	3	1	3	7	7	49 Low	1	3	2	1	4	4	7	28 Low
Project 2	4	4	3	1	4	8	8	56 Medium Low	1	4	2	1	4	5	7	35 Low
Project 3-5	2	2	1	1	4	4	6	24 Very low	1	1	1	1	4	2	6	12 Very low



6.2.2 Impact Discussion

Direct impacts on faunal habitat and species diversity will be greatest during the construction phase with secondary impacts stemming from poorly managed edge effects and potential hunting/snaring of species during this phase. During the operational phase, these impacts will decrease as there will be less people on site and less vehicles movement, however habitat fragmentation, noise and dust pollution leading to reduced faunal movement and habitat availability/utilisation is considered the greatest impact. The impacts will be limited in their extent and the perceived effects on faunal ecology can be kept to a local scale with sufficiently implemented mitigation measures.

Potential impacts on protected faunal species are expected to be higher during the construction phase during which vegetation is being cleared and earth moving activities are being undertaken. Impacts during the construction phase can be reduced to lower impact significance on faunal SCC provided a walk down is undertaken and all construction teams are monitored to ensure no snare or traps are set and that no species are collected for the pet / traditional medicine trade either. Due to the limited extent of the various proposed projects impacts to faunal SCC are not anticipated to be high, provided mitigation measures are adequately implemented.

6.2.2.1 Impact on Faunal Habitat and Diversity

The impact assessment was undertaken on all aspects of faunal ecology deemed likely to be affected by the five proposed projects. The five proposed projects will result in the clearance of vegetation that varies from **low to moderately high sensitivity**. The loss of habitat will have a negative impact of faunal species diversity within the five footprint areas, however it is unlikely that such habitat loss will impact upon the overall species diversity and abundance levels of the region, due to the small extents of the footprints. Impacts to the low and intermediate sensitivity habitats are considered to be **Very low to Low** in significance. Impacts to areas of increased sensitivity can also be maintained at low impact significances, provided all mitigation measures are implemented and the overall extent of the five proposed projects remains within, or smaller than, the proposed footprint areas.

Most significant impacts that will affect faunal habitat and species diversity as a result of the five proposed projects during the construction phase include, but are not limited to, the following:

- Clearance of habitat leading to the displacement of faunal species;
- Habitat fragmented and resulting in reduced movement of species and potentially reduced dispersal opportunities;



- Increased risk of trapping / snaring and the potential collection for the pet / traditional medicine trade; and
- AIP proliferation and woody encroachment into natural vegetation, displacing indigenous vegetation and altering favourable habitat conditions for faunal species.

6.2.2.2 Impacts on Faunal SCC

The five proposed projects are associated with habitats that are known to host faunal SCC, notably the Sekhukhune Mountain Bushveld habitat. The remaining habitats may serve as intermediary or transitional habitats for such species, but not permanent habitat. One SCC was recorded on site, namely *Pycna sylvia* (Cicada) whilst *Python natalensis* (African Python, VU) has also been recorded in the adjacent areas. *Panthera pardus* (Leopard, Vulnerable, TOPS Listed), *Parahyaena brunnea* (Brown hyaena, NT, TOPS Listed), *Sagittarius serpentarius* (Secretary bird, VU), *Polemaetus bellicosus* (Martial Eagle, VU) and *Neotis denhami* (Denham's Bustard, NT) are also considered to have a medium probability of occurring, however such occurrences are likely to be transitional and not permanent, as the footprint areas are not sufficient in extent to permanently host these species nor are there sufficient food resources within the five proposed project footprint areas alone to support these species. Mammalian, avifaunal and some reptilian SCC are likely to maintain large home ranges that will far exceed the extent of the five proposed project footprint areas. Due to the small project footprint extents and ability of many of the SCC to relocate ahead of construction activities, impacts stemming from the proposed projects are not expected to pose a significant risk to these species.

Without mitigation implemented, the anticipated impact significance on faunal SCC varies between **Very-Low to Medium Low**. The impacts on SCC are deemed to be mitigatable and thus with mitigation measures implemented, the impact significance can be reduced to **Low to Very low** levels.

6.2.3 Probable Residual Impacts

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

- Loss of / altered faunal species diversity in the footprint areas and the areas adjacent to the proposed projects;
- Edge effects such as habitat fragmentation, AIP proliferation and bush encroachment limiting faunal species habitat utilisation;



- Potential further loss of SCC/protected faunal species and suitable habitat for such species; and
- It is unlikely that disturbed areas will be rehabilitated to an ecologically functioning state resulting in significant loss of habitat and species diversity, with reinstatement to pre-mining levels being unlikely.

6.2.4 Cumulative Impacts

The Dwars Valley and notably the Sekhukhune Mountain Bushveld vegetation habitat has, over the years, been exposed to significant impacts in terms of vegetation clearance for mining development. This has led to a notable decrease in species diversity and abundance levels in the region. The remaining intact areas are as such becoming of increased importance for the remaining species. The five proposed projects will result in the loss of habitat, pushing species within those areas into the adjacent remaining habitats. This may result in increased competition for space and food resources, potentially leading to further loss of species. It is important to note that the TRP mine has recently constructed a new TSF pipeline between the two proposed footprints of Project 2, further adding to the cumulative loss of habitat and species displacement in that area. Projects 1 and 3 - 5 are all located adjacent to the current Dwarsrivier active mining footprint and as such, these projects will further add to the cumulative loss of habitat in this area, although much of this habitat has already been somewhat disturbed. Such additional impacts will, however add to potential long term impacts and rehabilitation efforts during mine closure.

6.3 Integrated Impact Mitigation

The table below highlights the key, general integrated mitigation measures that are applicable to the proposed railway loop in order to suitably manage and mitigate the ecological impacts that are associated with all phases of the five proposed projects.

Provided that all management and mitigation measures are implemented, as stipulated in this report, the overall risk to floral and faunal diversity, habitat and SCC can be mitigated and minimised.



Table 8: A summary of the mitigatory requirements for the biodiversity associated with Projects 1 - 5.

Project phase	Construction Phase
Impact Summary	Loss of floral and faunal habitat, species, and SCC
Proposed mitigation and management measures:	
Development footprint	
<ul style="list-style-type: none"> • Prior to any vegetation clearance activities taking place a walkdown of the footprint must be undertaken and all floral and faunal SCC encountered must be GPS marked and the necessary permits applied for with the relevant national and provincial departments. The site walk down is to be conducted prior to clearance activities and ideally post good rains between November and February when the smaller bulbous plants are growing and visible; • The construction footprint must be kept as small as possible to minimise impact on the surrounding environment (edge effect management); • Removal of vegetation must be restricted to what is absolutely necessary and should remain within the approved footprint; • As far as possible clearing of vegetation should take place in a phased manner moving away from fences and/or barriers. This will allow for any faunal species within the proposed footprints to flee and avoid harm; • Smaller species such as scorpions and reptiles will not as readily be able to move out of an area ahead of ground clearing. As such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint. Construction personnel are to be educated about these species and instructed not to kill them. Smaller scorpion species and harmless reptiles (that are likely present within the footprint areas) should be carefully relocated by a suitably nominated construction person. For larger venomous snakes, a suitably trained specialist, or on-site personnel, should be contacted to carry out the relocation of the species, should it not move off on its own; • Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimal; • No hunting or trapping of faunal species is to be allowed by construction personnel; • Informal fires by construction personnel should be prohibited, and no uncontrolled fires whatsoever should be allowed; • Care should be taken during the construction of the five proposed projects to limit edge effects to surrounding natural habitat. This can be achieved by: <ul style="list-style-type: none"> • Demarcating all footprint areas during construction activities; • No dumping of litter, rubble or cleared vegetation on site should be allowed. Rubble / waste should be disposed of at an appropriate registered dump site away from the development footprint. No temporary dump sites should be allowed in areas with natural vegetation. It is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste; and • Manage the spread of AIP species as per the mines mine's AIP control plan. • Appropriate sanitary facilities must be provided during the construction of the development and must be removed to an appropriate waste disposal site; • If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on-site at all times. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised, preventing the ingress of hydrocarbons into the topsoil; and • Upon completion of construction activities, it must be ensured that no bare areas remain, and that indigenous species be used to revegetate the disturbed area. 	
Alien Vegetation	
<ul style="list-style-type: none"> • Edge effects arising from the proposed development, such as erosion and alien plant species proliferation, which may affect adjacent natural areas, need to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020); • AIP monitoring and clearing/control should take place throughout the construction phase of the development, and a 30 m buffer surrounding the proposed railway loop should be regularly checked for AIP proliferation and to prevent inward and or/outward spread of AIPs, notably into non infested areas outside of the proposed railway loop or into newly rehabilitated areas; and • Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards. 	



Floral and Faunal SCC	
<ul style="list-style-type: none"> • Should any floral SCC be relocated, the relocation success of such species should be monitored during the construction phase to ensure immediate actions can be taken if it becomes evident that relocation is not successful; • No collection of floral SCC must be allowed by construction personnel without the relevant permits; • Edge effect control needs to be implemented to prevent further degradation and potential loss of floral and faunal SCC outside of the five proposed project footprint areas; and • Should the presence of any faunal or floral SCC be noted within the development footprint post walkdown and during vegetation clearance / construction activities, a suitably qualified specialist should be consulted on the best way to proceed. 	
Project phase	Operational and Maintenance Phase
Impact Summary	Loss of floral and faunal habitat, species, and SCC
Proposed mitigation and management measures:	
Development footprint	
<ul style="list-style-type: none"> • The footprint area must be regularly inspected for sign of erosion, edge effects and any new areas of disturbance which will lead to further habitat loss and/or the proliferation of AIPs; and • No dumping of litter or waste must be allowed on-site. 	
Alien Vegetation	
<ul style="list-style-type: none"> • AIP proliferation which may affect adjacent natural areas needs to be strictly managed. Specific mention in this regard is made of Category 1b AIP species (as listed in the NEM:BA Alien species lists, 2020), in line with the NEM:BA Alien and Invasive Species Regulations (2020); • Ongoing AIP monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas; and • Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which complies with legal standards. 	
Floral and Faunal SCC	
<ul style="list-style-type: none"> • If any relocation of SCC took place, monitoring of relocation success should continue for at least three years after the completion of the construction phase, or until it is evident that the species have established self-sustaining populations. 	

7 CONCLUSION

SAS was appointed to conduct a terrestrial ecological assessment as part of the EIA process for five proposed projects for the Dwarsrivier Chrome Mine (DCM), specifically:

- Project 1: the proposed development of a new Tailings Storage Facility (TSF);
- Project 2: diesel and emulsion batching;
- Project 3: main parking extension;
- Project 4: widening of an access road between South Shaft / Main Offices and Plant; and
- Project 5: access crossing between Plant and North Mine.

Based on the results of the field investigation of three broad habitat units were distinguished for the proposed 5 projects:

1. The **Sekhukhune Mountain Bushveld**, which is considered to be representative of the reference vegetation type (Mucin & Rutherford, 2006);



2. The **Secondary Bushveld**, which comprises of old agricultural lands and areas which have historically been cleared during construction and mining activities, which are in a state of secondary succession. This habitat unit is not considered representative of the reference vegetation type; and
3. The **Transformed areas**, associated with existing gravel roads and the active mining area, comprising of little to no remaining vegetation.

Floral assessment

The proposed five projects will result in the clearance of vegetation that is of **intermediate** sensitivity to **moderately high** sensitivity, with some sections of **low** sensitivity also requiring clearance.

The proposed five projects are associated with floral SCC within the footprint areas and as such, these species will be directly impacted upon by the proposed activities – although with mitigation measures implemented, and due to the small extent of the footprints, the impacts can remain localised in extent and are unlikely to impact significantly on SCC population dynamics in the region. The SCC recorded on site include species protected under the NFA, which are species not threatened in terms of NEMBA Section 56.

Prior to mitigation measures implemented, impact significance on floral habitat and diversity varies between **Medium-Low** and **Very Low**. With mitigation measures implemented, the direct and indirect impacts on the floral habitat and diversity can mostly be reduced to **Low** and **Very low** significances.

Faunal assessment

Construction activities will result in the clearance of vegetation from areas of **intermediate** and **moderately high** sensitivity which will impact on faunal species habitat and diversity, whilst clearance of vegetation in the areas of **low** sensitivity will have minimal impacts on faunal species.

A single endemic insect species, *Pycna sylvia* (Cicada) was observed on site. This species is generally associated with the tree species *Vitex obovate* subsp. *wilmsii*, which was recorded in the footprint of Project 2. Other SCC may occur temporarily within the footprint areas, predominantly that of Project 2, however due to the small extent of the footprints these SCC are unlikely to be wholly reliant on these footprint areas, notably since the construction of the TRP TSF pipeline commenced.



Prior to mitigation measures implemented, impact significance on faunal habitat and diversity varies between **Medium high** and **Very Low**. With mitigation measures implemented, the impacts on the faunal habitat, diversity and SCC can mostly be reduced to **Low** and **Very low**.

It is the opinion of the ecologists that this study provides the relevant information required in order to implement Integrated Environmental Management (IEM) and to ensure that the best long-term use of the ecological resources in the proposed five project areas will be made in support of the principle of sustainable development.

8 REFERENCES

- BirdLife South Africa. Important Bird Areas 2015 [vector geospatial dataset] 2015. Available from the Biodiversity GIS website. Mucina, L. and Rutherford, M.C. (2006).
- Bromilow, C. (2010). Revised Edition, First Impression. Problem Plants of South Africa. Briza Publications, Pretoria, RSA.
- Chittendan, H. (2007). Roberts Bird Guide. A comprehensive field guide to over 950 bird species in southern Africa. John Voekler Bird Book Fund. Cape Town.
- DEA & SANBI. 2009. National Protected Area Expansion Strategy Resource Document.
- Hui C, Richardson DM (2017) Invasion dynamics. Oxford University Press, Oxford.
<https://doi.org/10.1093/acprof:oso/9780198745334.001.0001>
- IUCN (2019-2). <http://www.iucnredlist.org/>.
- Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.
- Limpopo C Plan V2. Technical Report. 2013. Desmet, P. G., Holness, S., Skowno, A. & Egan, V.T. Contract Number EDET/2216/2012. Report for Limpopo Department of Economic Development, Environment & Tourism (LEDET) by ECOSOL GIS.
- Limpopo Environmental Management Act (LEMA) 7 of 2003
- Minerals and Petroleum Resource Development Act (MPRDA) 28 of 2002
- Mining Guidelines: Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute. 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector. Pretoria. 100 pages. Online available: <http://bgis.sanbi.org/Mining/project.asp>
- Marnewick MD, Retief EF, Theron NT, Wright DR, Anderson TA. 2015a. Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa.
- Marnewick MD, Retief EF, Wright DR, Theron NT. 2015b. South Africa's Important Bird and Biodiversity Areas Status Report 2015. Johannesburg: BirdLife South Africa.
- Mucina, L. & Rutherford, M.C. (Eds). (2012). The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria, RSA.
- NPAES: DEA and SANBI. 2009. National Protected Areas Expansion Strategy Resource Document. Online available: <http://bgis.sanbi.org/protectedareas/NPAESinfo.asp>
- Picker. M., Griffiths. C. & Weaving. A. (2004). New Edition. Field Guide to Insects of South Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA.
- Pyšek, P., Richardson, D.M., Rejmánek, M., Webster, G.L., Williamson, M. and Kirschner, J., 2004. Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. *Taxon*, 53(1), pp.131-143.
- Raimondo, D., von Staden, L., Foden., W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A., Manyama, P.A. (eds) (2009). Red List of South African Plants Strelitzia 25. South African National Biodiversity Institute, Pretoria.
- Richardson, D.M., Pyšek, P., Rejmánek, M., Barbour, M.G., Panetta, F.D. and West, C.J., 2000. Naturalization and invasion of alien plants: concepts and definitions. *Diversity and distributions*, 6(2), pp.93-107.
- Richardson DM, Pyšek P, Carlton JT (2011) A compendium of essential concepts and terminology in invasion ecology. In: Richardson DM (ed) Fifty years of invasion ecology. The legacy of Charles Elton. Wiley-Blackwell, Oxford, pp 409–420. <https://doi.org/10.1002/9781444329988.ch30>
- Richardson, D.M., Foxcroft, L.C., Latombe, G., Le Maitre, D.C., Rouget, M. and Wilson, J.R., 2020. The biogeography of South African terrestrial plant invasions. *Biological invasions in South Africa*, pp.67-96.
- SACAD: Department of Environmental Affairs. 2018. South Africa Protected Areas Database (SACAD_OR_2021_Q1). Online available: [<http://egis.environment.gov.za>]



- SANBI. 2011. National List of Threatened Ecosystems 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website.
- SANBI. 2018a. 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland [Vector] 2018. Available from the Biodiversity GIS website.
- SANBI. 2018b. Terrestrial ecosystem threat status and protection level - remaining extent [Vector] 2018. URL: <http://bgis.sanbi.org>
- SANBI. 2018c. Terrestrial ecosystem threat status and protection level layer [Vector] 2018. URL: <http://bgis.sanbi.org>
- SANParks/SANBI. 2013. NPAES Formal [vector geospatial dataset] 2013. Available from the Biodiversity GIS website
- SANParks/SANBI. 2012. NPAES Protected Areas - Informal 2010 [vector geospatial dataset] 2012. Available from the Biodiversity GIS website.
- South Africa. 2011. National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection. Government Gazette, 558(34809): 1 – 544, December 9.
- South African National Parks (SANParks). 2010. NPAES Focus Areas 2010 [vector geospatial dataset] 2010. Available from the Biodiversity GIS website.
- SAPAD: Department of Environmental Affairs. 2018. South Africa Protected Areas Database (SAPAD_OR_2021_Q1). Online available: [<http://egis.environment.gov.za>]
- Skinner JD, Chimimba CT. 2005. The Mammals of the Southern African Subregion. Third edition. Cambridge University Press, Cambridge, UK.
- Skowno, Andrew & C.J., Poole, & Raimondo, Domitilla & K.J., Sink, & Van Deventer, Heidi & Van Niekerk, Lara & Harris, Linda & Smith-Adao, Lindie & Tolley, Krystal & Zengeya, Tsungai & W.B., Foden, & G.F., Midgley, & Driver, Amanda. 2019. National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries, Pretoria. South Africa. 2011. National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection. Government Gazette, 558(34809): 1 – 544, December 9.
- Smithers, R. H. N. 2000. Third Edition. Edited by Peter Apps. The Mammals of the Southern African. A Field Guide. Struik Publishers, Cape Town, RSA.
- Southern African Bird Atlas Project (SABAP) 2. 2007 -2019. Online available: <http://sabap2.adu.org.za/>.
- The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: <http://bgis.sanbi.org> as retrieved in 2019
- Threatened Species Programme (2017). Red Data List of South African Plant Species. Available online: <http://www.redlist.org>.
- Van Oudtshoorn, F. (2004). Second Edition, Third Print. Guide to Grasses of South Africa. Briza Publications, Pretoria, RSA.
- van Wilgen BW, Wilson JR (eds) (2018) The status of biological invasions and their management in South Africa in 2017. S Afr Nat Biodiv Inst, Cape Town and DST-NRF Cent Excel Invas Biol, Stellenbosch.
- van Wilgen, B.W., 2020. A brief, selective history of researchers and research initiatives related to biological invasions in South Africa. In Biological Invasions in South Africa (pp. 33-64). Springer, Cham.
- Van Wyk, B. and van Wyk, P. 1997. Field guide to Trees of Southern Africa. Struik Nature. Cape Town, RSA
- Water Research Commission. 2017. SWSA Surface water [Vector] 2017. Available from the Biodiversity GIS website.
- Wilson JRU, Gaertner M, Richardson DM et al (2017) Contributions to the national status report on biological invasions in South Africa. Bothalia 47: a2207. <https://doi.org/10.4102/abc.v47i2.2207>
- Woodhall, S. (2005). Field Guide to Butterflies of South Africa. Struik Publishers (Pty) Ltd, Cape Town, RSA



APPENDIX A: LEGISLATIVE REQUIREMENTS AND INDEMNITY

THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996

The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive realisation of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.

THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) (NEMA)

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations (GN R326 as amended in 2017 and well as listing notices 1, 2 and 3 (GN R327, R325 and R324 of 2017), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the Environmental Impact Assessment process depending on the nature of the activity and scale of the impact.

THE NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT, 2004 (ACT NO. 10 OF 2004) (NEM:BA)

The objectives of this act are (within the framework of NEMA) to provide for:

- The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- The use of indigenous biological resources in a sustainable manner;
- The fair and equitable sharing among stakeholders of the benefits arising from bio prospecting involving indigenous biological resources;
- To give effect to ratify international agreements relating to biodiversity which are binding to the Republic;
- To provide for cooperative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.

Furthermore, a person may not carry out a restricted activity involving either:

- a) A specimen of a listed threatened or protected species;
- b) Specimens of an alien species; or
- c) A specimen of a listed invasive species without a permit.



MINERALS AND PETROLEUM RESOURCE DEVELOPMENT ACT, 2002 (ACT 28 OF 2002) (MPRDA)

The obtaining of a New Order Mining Right (NOMR) is governed by the MPRDA. The MPRDA requires the applicant to apply to the Department of Mineral Resources (DMR) for a NOMR which triggers a process of compliance with the various applicable sections of the MPRDA. The NOMR process requires environmental authorisation in terms of the MPRDA Regulations and specifically requires the preparation of a Scoping Report, an Environmental Impact Assessment (EIA) and Environmental Management Programme (EMP), and a Public Participation Process (PPP).

THE NATIONAL FOREST ACT, 1998 (ACT NO. 84 OF 1998), AS AMENDED IN SEPTEMBER 2011 (NFA)

According to the department of Department of Forestry, Fisheries and the Environment (DFFE) (previously the Department of Agriculture, Forestry and Fisheries (DAFF)) ©2019 website (<https://www.daff.gov.za/daffweb3/>):

“In terms of the National Forests Act of 1998 certain tree species (types of trees) can be identified and declared as protected. The Department of Water Affairs and Forestry followed an objective, scientific and participative process to arrive at the new list of protected tree species, enacted in 2004. All trees occurring in natural forests are also protected in terms of the Act. Protective actions take place within the framework of the Act as well as national policy and guidelines. Trees are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization.”

Applicable sections of the NFA pertaining to the proposed project include the below:

Section 12:

Declaration of trees as protected

- 1) The Minister may declare-
 - a. particular tree,
 - b. a particular group of trees,
 - c. a particular woodland; or
 - d. trees belonging to a particular species,
 to be a protected tree, group of trees, woodland or species.
- 2) The Minister may make such a declaration only if he or she is of the opinion that the tree, group of trees, woodland or species is not already adequately protected in terms of other legislation.
- 3) In exercising a discretion in terms of this section, the Minister must consider the principles set out in section 3(3) of the NFA.

Section 15(1):

No person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence granted by the Minister or in terms of an exemption from the provisions of this subsection published by the Minister in the Gazette.

Contravention of this declaration is regarded as a first category offence that may result in a person who is found guilty of being sentenced to a fine or imprisonment for a period up to three years, or both a fine and imprisonment.



GOVERNMENT NOTICE NUMBER R.1020: ALIEN AND INVASIVE SPECIES REGULATIONS, 2020 (IN GOVERNMENT GAZETTE 43735), INCLUDING GOVERNMENT NOTICE NUMBER 1003: ALIEN AND INVASIVE SPECIES LISTS, 2020 (IN GOVERNMENT GAZETTE 43726) AS IT RELATES TO THE NEM:BA

NEM:BA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aims to:

- Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur,
- Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and
- Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004) as:

- (a) A species that is not an indigenous species; or
- (b) An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.

Categories according to NEM:BA (Alien and Invasive Species Regulations, 2020):

- **Category 1a:** Invasive species that require compulsory control;
- **Category 1b:** Invasive species that require control by means of an invasive species management programme;
- **Category 2:** Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread; and
- **Category 3:** Ornamentally used plants that may no longer be planted.

THE CONSERVATION OF AGRICULTURAL RESOURCES ACT, 1983 (ACT NO. 43 OF 1983) (CARA)

Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of species should take place throughout the construction and operation, phases.

LIMPOPO ENVIRONMENTAL MANAGEMENT ACT, 2003 (ACT 7 OF 2003) (LEMA)

The objectives of this Act are:

- to manage and protect the environment in the Province;
- to secure ecologically sustainable development and responsible use of natural resources in the Province;
- generally, to contribute to the progressive realisation of the fundamental rights contained in section 24 of the Constitution of the Republic of South Africa Act, 1996 (Act No. 108 of 1996), and
- to give effect to international agreements affecting environmental management which are binding on the Province.

This Act must be interpreted and applied in accordance with the national environmental management principles set out in Section 2 of the National Environmental Management Act, 1998 (Act 107 of 1998).



Indemnity and Terms of use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

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APPENDIX B: FLORAL METHOD OF ASSESSMENT

Floral Species of Conservational Concern Assessment

Prior to the site visit, a record of floral SCC and their habitat requirements was developed for the focus area, which includes consulting the National Web-based Environmental Screening Tool. Because not all SCC have been included in the Screening Tool layers (e.g. NT and DD taxa), it remains important for the specialist to be on the lookout for additional SCC. For this study, two primary sources were consulted and are described below.

The National Web-Based Environmental Screening Tool

The Screening Tool was accessed to obtain a list of potentially occurring species of conservation concern for the focus area. Each of the themes in the Screening Tool consists of theme-specific spatial datasets which have been assigned a sensitivity level namely, “*low*”, “*medium*”, “*high*” and “*very high*” sensitivity. The four levels of sensitivity are derived and identified in different ways, e.g. for **confirmed** areas of occupied habitat for SCC a Very High and High Sensitivity is assigned and for areas of suitable habitat where SCC may occur based on spatial models only, a Medium Sensitivity is assigned. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below⁸:

- **Very High:** Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km² are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa’s National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale.
- **High:** Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2000) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat.
- **Medium:** Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.
- **Low:** Areas where no SCC are known or expected to occur.

BRAHMS Online Website

The Botanical Database of Southern Africa (BODATSA) is accessed to obtain plant names and floristic details (<http://posa.sanbi.org/>) for species of conservation concern within a selected boundary;

- This website provides access to South African plant names (taxa), specimens (herbarium sheets) and observations of plants made in the field (botanical records). Data is obtained from the Botanical Database of Southern Africa (BODATSA), which contains records from the National Herbarium in Pretoria (PRE), the Compton Herbarium in Cape Town (NBG & SAM) and the KwaZulu-Natal Herbarium in Durban (NH).

⁸ More details on the use of the Screening Tool for Species of Conservation Concern can be found in the below resources:

- South African National Biodiversity Institute (SANBI). 2020. Draft Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.0.
- The National Web based Environmental Screening Tool website:
<https://screening.environment.gov.za/screeningtool/#/pages/welcome>



- Information on habitat requirements etc. is obtained from the SANBI Red List of South African Plants website (<http://redlist.sanbi.org/>).
- Typically, data is extracted for the Quarter Degree Square (QDS) in which the focus area is situated but where it is deemed appropriate, a larger area can be included.

NEM:BA TOPS Species

The National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004) (NEM:BA) Threatened or Protected Species (TOPS) list (Government Gazette [GN] 29657, as amended in GN R1187 in Government Gazette 30568 of 2007 and again in GN 627 in Government Gazette 43386 of 2020) were taken into consideration.

Nationally Protected Trees

The National Forest Act, 1998 (act 10 of 1998), as amended in September 2011 (NFA), affords protection to a list of tree species. All nationally protected trees were included as SCC in this report.

Throughout the floral assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species.

The Probability of Occurrence (POC) for each floral SCC is described:

- **“Confirmed”**: if observed during the survey;
- **“High”**: if within the species’ known distribution range and suitable habitat is available;
- **“Medium”**: if either within the known distribution range of the species or if suitable habitat is present; or
- **“Low”**: if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Vegetation Surveys

When planning the timing of a floristic survey, it is important to remember that the primary objective is not an exhaustive species list but rather to ensure that sufficient data are collected to describe all the vegetation communities present in the area of interest, to optimise the detection of SCC and to assess habitat suitability for other potentially occurring SCC (SANBI, 2020).

The vegetation survey incorporates the subjective (or stratified) sampling method. Subjective sampling is a sampling technique in which the specialist relies on his or her own professional experience when choosing sample sites within the focus area. This allows representative recordings of floral communities and optimal detection of SCC. Subjective sampling is used to consider different areas (or habitat units) which are identified within the main body of a habitat/focus area.

One of the problems with random sampling, another popular sampling method, is that random samples may not cover all areas of a focus area equally and thus increase the potential to miss floral SCC. Random sampling methods also tend to require more time in the field to locate the amount of SCC that can be detected using subjective sampling methods - In the context of an EIA where time constraints are often restrictive, priority needs to be given to collecting data in the shortest time possible without compromising the efficiency of locating SCC (SANBI, 2020).

Floral Habitat Sensitivity

The floral habitat sensitivity of each habitat unit was determined by calculating the mean of five different parameters which influence floral communities and provide an indication of the overall floristic ecological integrity, importance, and sensitivity of the habitat unit. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Floral SCC**: The confirmed presence or potential for floral SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Unique Landscapes**: The presence of unique landscapes or the presence of an ecologically intact habitat unit in a transformed region;



- **Conservation Status:** The conservation status of the ecosystem or vegetation type in which the habitat unit is situated based on local, regional, and national databases. Whether the habitat is representative of a Critical Biodiversity Area or forms part of an Ecological Support Area is also taken into consideration;
- **Floral Diversity:** The recorded floral diversity compared to a suitable reference condition such as surrounding natural areas or available floristic databases; and
- **Habitat Integrity:** The degree to which the habitat unit is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the floral habitat sensitivity class in which each habitat unit falls. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the habitat unit in question. To present the results use is made of spider diagrams to depict the significance of each aspect of floral ecology for each vegetation type. The different classes and land-use objectives are presented in the table below:

Table B1: Floral habitat sensitivity rankings and associated land-use objectives.

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



APPENDIX C: FAUNAL METHOD OF ASSESSMENT

It is important to note that due to the nature and habits of fauna, varied stages of life cycles, seasonal and temporal fluctuations along with other external factors, it is unlikely that all faunal species will have been recorded during the site assessment. The presence of human habitation nearby the focus area and the associated anthropogenic activities may have an impact on faunal behaviour and in turn the rate of observations.

Mammals

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

Avifauna

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

Reptiles

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

Amphibians

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

Invertebrates

Whilst conducting transects through the focus area, all insect species visually observed were identified, and where possible photographs taken.

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



Arachnids

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

Faunal Species of Conservational Concern Assessment

The Probability of Occurrence (POC) for each faunal SCC is described:

- **“Confirmed”**: if observed during the survey;
- **“High”**: if within the species’ known distribution range and suitable habitat is available;
- **“Medium”**: if either within the known distribution range of the species or if suitable habitat is present; or
- **“Low”**: if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

Faunal Habitat Sensitivity

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

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

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

Table C1: Faunal habitat sensitivity rankings and associated land-use objectives.

Score	Rating significance	Conservation objective
1.0 < 1.5	Low	Optimise development potential.
≥1.5 <2.5	Moderately low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.
≥2.5 <3.5	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.
≥3.5 <4.5	Moderately high	Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance.
≥4.5 ≤ 5.0	High	Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered.



APPENDIX D: IMPACT ASSESSMENT METHODOLOGY

Ecological Impact Assessment Method

In order for the Environmental Assessment Practitioner (EAP) to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the applicant to understand the process and rationale upon which risks/impacts have been assessed. The method used for assessing risks/impacts is outlined in the sections below.

The first stage of risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation.
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'⁹. The interaction of an aspect with the environment June result in an impact.
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should be stipulated what the receptor is.
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems.
- **Resources** include components of the biophysical environment.
- **Frequency of activity** refers to how often the proposed activity will take place.
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor.
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- **Spatial extent** refers to the geographical scale of the impact.
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria. Refer to the Table B1. The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity and the frequency of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 10. The values for likelihood and consequence of the impact are then read off a significance-rating matrix and are used to determine the level of mitigation that June be necessary¹⁰.

The assessment of significance is undertaken twice. Initial significance is based on only natural and existing mitigation measures (including built-in engineering designs). The subsequent assessment takes into account the recommended management measures required to mitigate the impacts.

⁹ The definition has been aligned with that used in the ISO 14001 Standard.

¹⁰ Some risks/impacts that have low significance will however still require mitigation.



Measures such as demolishing infrastructure, and reinstatement and rehabilitation of land, are considered post-mitigation.

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

Table D1: Criteria for assessing significance of impacts
LIKELIHOOD DESCRIPTORS

Probability of impact	RATING
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	RATING
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

CONSEQUENCE DESCRIPTORS

Severity of impact	RATING
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	RATING
Activity specific/ < 5 ha impacted / Linear developments affected < 100m	1
Development specific/ within the site boundary / < 100ha impacted / Linear developments affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear developments affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear developments affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear developments affected > 3000m	5
Duration of impact	RATING
One day to one month	1
One month to one year	2
One year to five years	3
Life of operation or less than 20 years	4
Permanent	5



Table D2: Significance Rating Matrix.

		CONSEQUENCE (Severity + Spatial Scope + Duration)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LIKELIHOOD (Frequency of activity + Frequency of impact)	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	2	4	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	3	6	9	12	16	20	24	28	32	36	40	44	48	52	56	60
	4	8	12	16	20	25	30	35	40	45	50	55	60	65	70	75
	5	10	15	20	24	30	36	42	48	54	60	66	72	78	84	90
	6	12	18	24	30	36	42	49	56	63	70	77	84	91	98	105
	7	14	21	28	35	42	48	56	64	72	80	88	96	104	112	120
	8	16	24	32	40	48	54	63	72	81	90	99	108	117	126	135
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160

Table D3: Positive/Negative Mitigation Ratings.

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very high	126-150	Critically consider the viability of proposed projects Improve current management of existing projects significantly and immediately	Maintain current management
High	101-125	Comprehensively consider the viability of proposed projects Improve current management of existing projects significantly	Maintain current management
Medium-high	76-100	Consider the viability of proposed projects Improve current management of existing projects	Maintain current management
Medium-low	51-75	Actively seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Low	26-50	Where deemed necessary seek mechanisms to minimise impacts in line with the mitigation hierarchy	Maintain current management and/or proposed project criteria and strive for continuous improvement
Very low	1-25	Maintain current management and/or proposed project criteria and strive for continuous improvement	Maintain current management and/or proposed project criteria and strive for continuous improvement

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
 - Primary project site and related facilities that the proponent and their contractors develops or controls;
 - Areas potentially impacted by cumulative impacts for any existing project or condition and other project-related developments; and
 - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that June occur later or at a different location.
 - Risks/Impacts were assessed for all stages of the project cycle including:
 - Pre-construction;
 - Construction;
 - Operation;
 - Closure and decommissioning.
- If applicable, transboundary or global effects were assessed.
- Individuals or groups who June be differentially or disproportionately affected by the project because of their *disadvantaged* or *vulnerable* status were assessed.



- Particular attention was paid to describing any residual impacts that will occur after rehabilitation.

Mitigation measure development

According to the DEA *et al.*, (2013) “Rich biodiversity underpins the diverse ecosystems that deliver ecosystem services that are of benefit to people, including the provision of basic services and goods such as clean air, water, food, medicine and fibre; as well as more complex services that regulate and mitigate our climate, protect people and other life forms from natural disaster and provide people with a rich heritage of nature-based cultural traditions. Intact ecological infrastructure contributes significant savings through, for example, the regulation of natural hazards such as storm surges and flooding which is attenuated by wetlands”.

According to the DEA *et al.*, (2013) Ecosystem services can be divided into 4 main categories:

- Provisioning services are the harvestable goods or products obtained from ecosystems such as food, timber, fibre, medicine, and fresh water;
- Cultural services are the non-material benefits such as heritage landscapes and seascapes, recreation, ecotourism, spiritual values and aesthetic enjoyment;
- Regulating services are the benefits obtained from an ecosystem’s control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards; and
- Supporting services are the natural processes such as nutrient cycling, soil formation and primary production that maintain the other services.

Loss of biodiversity puts aspects of the economy, wellbeing and quality of life at risk, and reduces socio-economic options for future generations. This is of particular concern for the poor in rural areas who have limited assets and are more dependent on common property resources for their livelihoods. The importance of maintaining biodiversity and intact ecosystems for ensuring on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa’s Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) (hereafter referred to as the Biodiversity Act) and is fundamental to the notion of sustainable development. In addition, International guidelines and commitments as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa (DEA *et al.*, 2013).

The primary environmental objective of the Minerals and Petroleum Resources Development Act, 2002 (Act No 28 of 2002) (MPRDA) is to give effect to the environmental right contained in the South African Constitution. Furthermore, Section 37(2) of the MPRDA states that “any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that exploitation of mineral resources serves present and future generations”.

Pressures on biodiversity are numerous and increasing. According to the DEA *et al.*, (2013) Loss of natural habitat is the single biggest cause of biodiversity loss in South Africa and much of the world. The most severe transformation of habitat arises from the direct conversion of natural habitat for human requirements, including¹¹:

- Cultivation and grazing activities;
- Rural and urban development;
- Industrial and mining activities, and
- Infrastructure development.

Impacts on biodiversity can largely take place in four ways (DEA *et al.*, 2013):

¹¹ Limpopo Province Environment Outlook. A Report on the State of the Environment, 2002. Chapter 4.



- **Direct impacts:** are impacts directly related to the project including project aspects such as site clearing, water abstraction and discharge of water from riverine resources;
- **Indirect impacts:** are impacts associated with a project that June occur within the zone of influence in a project such as surrounding terrestrial areas and downstream areas on water courses;
- **Induced impacts:** are impacts directly attributable to the project but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries; and
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous mining operations within the same drainage catchment or numerous residential developments within the same habitat for faunal or floral species.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted the definition of a clear mitigation strategy for biodiversity impacts.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of mining or any other land use. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level. Offsetting of impacts is considered to be the last option in the mitigation hierarchy for any project.

The mitigation hierarchy in general consists of the following in order of which impacts should be mitigated (DEA *et al.*, 2013):

- **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high the "no project" option should also be considered, especially where it is expected that the lower levels of mitigation will not be adequate to limit environmental damage and eco-service provision to suitable levels;
- **Minimise impact:** can be done through utilisation of alternatives that will ensure that impacts on biodiversity and ecoservices provision are reduced. Impact minimisation is considered an essential part of any development project;
- **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable where an attempt to re-instate impacted areas and return them to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation can however not be considered as the primary mitigation tool as even with significant resources and effort rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
 - **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long terms sustainable ecological structure;
 - **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources on the focus area supports the intended post closure land use. In this regard special mention is made of the need to ensure the continued functioning and integrity of wetland and riverine areas throughout and after the rehabilitation phase;
 - **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local post closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community or community suitable for supporting the intended post closure land use; and



- **Species reinstatement** which focuses on the re-introduction of any ecologically important species which June be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species re-instatement need only occur if deemed necessary.
- **Offset impact:** refers to compensating for latent or unavoidable negative impacts on biodiversity. Offsetting should take place to address any impacts deemed to be unacceptable which cannot be mitigated through the other mechanisms in the mitigation hierarchy. The objective of biodiversity offsets should be to ensure no net loss of biodiversity. Biodiversity offsets can be considered to be a last resort to compensate for residual negative impacts on biodiversity.

The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss or irreplaceable biodiversity the residual impacts should be considered to be of *very high significance* and when residual impacts are considered to be of *very high significance*, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative June be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.¹²

In light of the above discussion the following points present the key concepts considered in the development of mitigation measures for the proposed project.

- Mitigation and performance improvement measures and actions that address the risks and impacts¹³ are identified and described in as much detail as possible.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation where possible.
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, with estimates of the resources (including human resource and training requirements) and responsibilities for implementation wherever possible.

Recommendations

Recommendations were developed to address and mitigate impacts associated with the proposed projects. These recommendations also include general management measures which apply to the proposed projects as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the projects from planning, through to construction and operation.

¹² Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

¹³ Mitigation measures should address both positive and negative impacts



APPENDIX E: VEGETATION TYPE

Sekhukhune Mountain Bushveld

Table E1: Dominant & typical floristic species of Sekhukhune Mountain Bushveld (Mucina & Rutherford, 2012).

Floral Community	Species
Tall Tree	<i>Senegalia nigrescens</i>
Small Trees	<i>Senegalia senegal</i> var. <i>leiorhachis</i> (d), <i>Combretum apiculatum</i> (d), <i>Kirkia wilmsii</i> (d), <i>Terminalia prunioides</i> (d), <i>Vitex obovata</i> subsp. <i>wilmsii</i> (d), <i>Ziziphus mucronata</i> (d), <i>Bolusanthus speciosus</i> , <i>Boscia albitrunca</i> , <i>Brachylaena ilicifolia</i> , <i>Combretum molle</i> , <i>Commiphora mollis</i> , <i>Croton gratissimus</i> , <i>Cussonia transvaalensis</i> , <i>Hippobromus pauciflorus</i> , <i>Ozoroa sphaerocarpa</i> , <i>Pappea capensis</i> , <i>Schotia latifolia</i> , <i>Sterculia rogersii</i> . Succulent Tree: <i>Aloe marlothii</i> subsp. <i>marlothii</i> .
Tall Shrubs	<i>Dichrostachys cinerea</i> (d), <i>Euclea crispa</i> subsp. <i>crispa</i> (d), <i>Combretum hereroense</i> , <i>Euclea linearis</i> , <i>Pavetta zeyheri</i> , <i>Tinnea rhodesiana</i> , <i>Triaspis glaucophylla</i>
Low Shrubs	<i>Elephantorrhiza praetermissa</i> (d), <i>Grewia vernicosa</i> (d), <i>Asparagus intricatus</i> , <i>Barleria saxatilis</i> , <i>B. senensis</i> , <i>Clerodendrum ternatum</i> , <i>Commiphora africana</i> , <i>Hermannia glanduligera</i> , <i>Indigofera lydenburgensis</i> , <i>Jatropha latifolia</i> var. <i>angustata</i> , <i>Melhania prostrata</i> , <i>Phyllanthus glaucophyllus</i> , <i>Psiadia punctulata</i> , <i>Rhus keetii</i> , <i>Rhynchosia komatiensis</i> . Succulent Shrubs: <i>Aloe castanea</i> (d), <i>A. cryptopoda</i> (d).
Woody Climbers	<i>Clematis brachiata</i> (d), <i>Rhoicissus tridentata</i> (d), <i>Acacia ataxacantha</i>
Woody Succulent Climber	<i>Sarcostemma viminale</i>
Graminoids	<i>Aristida canescens</i> (d), <i>Heteropogon contortus</i> (d), <i>Panicum maximum</i> (d), <i>Setaria lindenbergiana</i> (d), <i>Themeda triandra</i> (d), <i>Aristida transvaalensis</i> , <i>Cymbopogon pospischilii</i> , <i>Diheteropogon amplexans</i> , <i>Enneapogon scoparius</i> , <i>Loudetia simplex</i> , <i>Panicum deustum</i> , <i>Setaria sphacelata</i> .
Herbs	<i>Berkheya insignis</i> (d), <i>Commelina africana</i> (d), <i>Cyphostemma woodii</i> , <i>Kyphocarpa angustifolia</i> , <i>Senecio latifolius</i> . Geophytic Herbs: <i>Hypoxis rigidula</i> , <i>Sansevieria hyacinthoides</i>
Succulent Herb	<i>Huernia stapelioides</i>

*(d) – Dominant species for the vegetation type
(The genus for all *Senegalia* spp. were formerly *Acacia*)



APPENDIX F: FLORAL SCC

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action. For the POC assessment, a list of Red Data Listed (RDL) species previously recorded within the 10 km of the study area was pulled from the Botanical Database of Southern Africa (BODATSA) (<http://posa.sanbi.org/>). This list was further cross-checked with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) TOPS flora) to identify provincially protected species previously recorded for the area.

Definitions of the national Red List categories

Categories marked with ^N are non-IUCN, national Red List categories for species not in danger of extinction but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

- **Extinct (EX)** A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
- **Extinct in the Wild (EW)** A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
- **Regionally Extinct (RE)** A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
- **Critically Endangered, Possibly Extinct (CR PE)** Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
- **Critically Endangered (CR)** A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
- **Endangered (EN)** A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
- **Vulnerable (VU)** A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
- **Near Threatened (NT)** A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable and is therefore likely to become at risk of extinction in the near future.
- ^N**Critically Rare** A species is Critically Rare when it is known to occur at a single site but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
- ^N**Rare** A species is Rare when it meets at least one of four South African criteria for rarity but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:
 - Restricted range: Extent of Occurrence (EOO) <500 km², OR
 - Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km², OR
 - Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
 - Small global population: Less than 10 000 mature individuals.
- **Least Concern** A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least



Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

- **Data Deficient - Insufficient Information (DDD)** A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required, and that future research could show that a threatened classification is appropriate.
- **Data Deficient - Taxonomically Problematic (DDT)** A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
- **Not Evaluated (NE)** A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in [Plants of southern Africa: an online checklist](#) are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

The below tables present the results of the POC assessment.

NEMBA TOPS List for South Africa¹⁴

Table F1: TOPS list for South Africa – plant species.

NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Adenia wilmsii</i>	No common name	Low	Provincial distribution: Mpumalanga Range: Lydenburg to Waterval Boven Description: Dolerite outcrops or red loam soil, in open woodland, 1300-1500 m.	EN; P
<i>Adenium swazicum</i>	Swaziland Impala Lily	Low	Range: Kruger National Park to Swaziland along the Lebombo Mountains and adjacent areas in south-western Mozambique.	VU
<i>Adenium swazicum</i>	Swaziland Impala Lily	Low	Provincial distribution: Mpumalanga	VU
<i>Aloe albida</i>	Grass Aloe	Low	Provincial distribution: Mpumalanga Range: Aloe albida has a restricted range in the mountains south of Barberton, Mpumalanga, extending to Malolotja in north-western Swaziland.	NT
<i>Aloe pillansii</i> (now <i>Aloidendron pillansii</i>)	False Quiver Tree	Low	Provincial distribution: Northern Cape Range: Richtersveld and southern Namibia.	EN
<i>Aloe simii</i>	No common name	Low	Provincial distribution: Mpumalanga Range: This species is endemic to a small area in the transition area between the Mpumalanga Lowveld and Escarpment, where it occurs from Sabie southwards to White River and around Nelspruit. Description: It occurs along drainage lines and in wetlands in open woodland and grassland, 600-1100 m.	EN; P
<i>Clivia mirabilis</i>	"Oorlogskloof" Bush Lily	Low	Provincial distribution: Northern Cape, Western Cape	VU; P
<i>Diaphananche millarii</i>	Tree Orchid	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal Range: East London and Durban.	VU

¹⁴ National Environmental Management: Biodiversity Act 10 of 2004 - Threatened or Protected Species Regulations, 2007. Government Notice R152 in Government Gazette 29657 dated 23 February 2007. Commencement date: 1 June 2007 [GN R150, Gazette no. 29657], as amended.



NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Disa macrostachya</i>	No common name	Low	Provincial distribution: Northern Cape	EN; P
<i>Disa nubigena</i>	No common name	Low	Provincial distribution: Western Cape	Rare; P
<i>Disa physodes</i>	No common name	Low	Provincial distribution: Western Cape	CR; P
<i>Disa procera</i>	No common name	Low	Provincial distribution: Western Cape	EN; P
<i>Disa sabulosa</i>	No common name	Low	Provincial distribution: Western Cape	EN; P
<i>Encephalartos aemulans</i>	Ngotshe Cycad	Low	Provincial distribution: KwaZulu-Natal	CR
<i>Encephalartos altensteinii</i>	Bread Palm	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	VU; P
<i>Encephalartos arenarius</i>	Dune Cycad	Low	Provincial distribution: Eastern Cape	EN
<i>Encephalartos brevifoliolatus</i>	Escarpment Cycad	Low	Provincial distribution: Limpopo	EW
<i>Encephalartos caffer</i>	Breadfruit Tree	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	NT; P
<i>Encephalartos cerinus</i>	Waxen Cycad	Low	Provincial distribution: KwaZulu-Natal	CR
<i>Encephalartos cupidus</i>	Blyde River Cycad	Low	Provincial distribution: Limpopo, Mpumalanga Description: Grassland, on steep, rocky slopes or cliffs and sometimes near seepage areas bordering gallery forests.	CR
<i>Encephalartos dolomiticus</i>	Wolkberg Cycad	Low	Provincial distribution: Limpopo	CR
<i>Encephalartos dyerianus</i>	Lowveld Cycad	Low	Provincial distribution: Limpopo	CR; P
<i>Encephalartos eugene-maraisii</i>	Waterberg Cycad	Low	Provincial distribution: Limpopo	EN
<i>Encephalartos friderici-guilielmi</i>	No common name	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	NT; P
<i>Encephalartos ghellinckii</i>	No common name	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	VU; P
<i>Encephalartos heenanii</i>	Woolly Cycad	Low	Provincial distribution: Mpumalanga Description: Open areas of montane grasslands amidst scarp forest in deep valleys and ravines.	CR
<i>Encephalartos hirsutus</i>	Venda Cycad	Low	Provincial distribution: Limpopo	CR
<i>Encephalartos horridus</i>	Eastern Cape Blue Cycad	Low	Provincial distribution: Eastern Cape	EN
<i>Encephalartos humilis</i>	No common name	Low	Provincial distribution: Mpumalanga Description: Montane and mistbelt grassland, rocky sandstone slopes.	VU; P
<i>Encephalartos inopinus</i>	Lydenburg Cycad	Low	Provincial distribution: Limpopo	CR
<i>Encephalartos laevifolius</i>	Kaapsehoop Cycad	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal, Limpopo, Mpumalanga Description: Steep, rocky slopes in mistbelt grassland, 1300-1500 m.	CR
<i>Encephalartos lanatus</i>	No common name	Low	Provincial distribution: Gauteng and western Mpumalanga Description: Sheltered, wooded ravines in sandstone ridges, 1200-1500 m.	NT; P
<i>Encephalartos latifrons</i>	Albany Cycad	Low	Provincial distribution: Eastern Cape	CR
<i>Encephalartos lebomboensis</i>	Lebombo Cycad	Low	Provincial distribution: KwaZulu-Natal, Mpumalanga Description: Cliffs and rocky ravines in savanna and grassland.	EN
<i>Encephalartos lehmannii</i>	No common name	Low	Provincial distribution: Eastern Cape	NT; P



NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Encephalartos longifolius</i>	No common name	Low	Provincial distribution: Eastern Cape	NT; P
<i>Encephalartos middelburgensis</i>	Middelburg Cycad	Low	Provincial distribution: Gauteng, Mpumalanga Description: Open grasslands and in sheltered valleys.	CR
<i>Encephalartos msinganus</i>	Msinga, Cycad	Low	Provincial distribution: KwaZulu-Natal	CR
<i>Encephalartos natalensis</i>	Natal Giant Cycad	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	NT; P
<i>Encephalartos ngoyanus</i>	Ngoye Dwarf Cycad	Low	Provincial distribution: KwaZulu-Natal	VU
<i>Encephalartos nubimontanus</i>	Blue Cycad	Low	Provincial distribution: Limpopo	EW
<i>Encephalartos paucidentatus</i>	No common name	Low	Provincial distribution: Mpumalanga Description: Forest, occurs on steep rocky slopes and alongside streams in deep gorges.	VU; P
<i>Encephalartos princeps</i>	No common name	Low	Provincial distribution: Eastern Cape	VU; P
<i>Encephalartos senticosus</i>	No common name	Low	Provincial distribution: KwaZulu-Natal	VU; P
<i>Encephalartos transvenosus</i>	Modjadje Cycad	Low	Provincial distribution: Limpopo	LC; P
<i>Encephalartos trispinosus</i>	No common name	Low	Provincial distribution: Eastern Cape	VU; P
<i>Encephalartos woodii</i>	Wood's Cycad	Low	Provincial distribution: KwaZulu-Natal	EW
<i>Euphorbia clivicola</i>	No common name	Low	Provincial distribution: Limpopo	CR; P
<i>Euphorbia meloformis</i>	No common name	Low	Provincial distribution: Eastern Cape	NT; P
<i>Euphorbia obesa</i>	No common name	Low	Provincial distribution: Eastern Cape	EN; P
<i>Harpagophytum procumbens</i>	Devil's Claw	Low	Provincial distribution: Free State, Limpopo, Northern Cape, North West	LC; P
<i>Harpagophytum zeyherii</i>	Devil's Claw	Low	Provincial distribution: Gauteng, Limpopo, Mpumalanga, North West	LC; P
<i>Hoodia currorii</i>	Ghaap	Low	Provincial distribution: Limpopo	P
<i>Hoodia gordonii</i>	Ghaap	Low	Provincial distribution: Free State, Northern Cape, Western Cape	DDD; P
<i>Jubaeopsis caffra</i>	Pondoland Coconut	Low	Provincial distribution: Eastern Cape	EN
<i>Merwillia plumbea</i>	Blue Squill	Low	Provincial distribution: KwaZulu-Natal, Mpumalanga Major habitats: Grassland Description: Montane mistbelt and Ngongoni grassland, rocky areas on steep, well drained slopes. 300-2500 m.	NT
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	Lebombo Wattle	Low	Provincial distribution: KwaZulu-Natal	Now LC
<i>Protea odorata</i>	Swartland Sugarbush	Low	Provincial distribution: Western Cape	CR; P
<i>Siphonochilus aethiopicus</i>	Wild Ginger	Low	Provincial distribution: KwaZulu-Natal, Limpopo, Mpumalanga Range: Sporadically from the Letaba catchment in the Limpopo Lowveld to Swaziland. Extinct in KwaZulu-Natal. Widespread elsewhere in Africa. Description: Tall open or closed woodland, wooded grassland or bushveld.	CR
<i>Stangeria eriopus</i>	No common name	Low	Provincial distribution: Eastern Cape, KwaZulu-Natal	VU; P



NEMBA TOPS LIST (PLANT SPECIES)				
Scientific Name	Common Name	POC	Provincial Distribution	Conservation Status
<i>Warburgia salutaris</i>	Pepper-bark Tree	Low	Provincial distribution: KwaZulu-Natal, Limpopo, Mpumalanga Range: North-eastern KwaZulu-Natal, Mpumalanga and Limpopo Province. Also occurs in Swaziland, Mozambique and Zimbabwe and Malawi. Description: Variable, including coastal, riverine, dune and montane forest as well as open woodland and thickets.	EN
<i>Zantedeschia jucunda</i>	Yellow Arum Lilly	Low	Provincial distribution: Limpopo	VU

CR = Critically Endangered, EN = Endangered, EW = Extinct in the Wild, NT = Near Threatened, VU = Vulnerable, P = Protected, POC = Probability of Occurrence.

Provincially Protected Flora

Table F2: Protected Plants (Schedule 12) for the Limpopo Province.

Common name	Scientific name	POC
Trees and Shrubs		
The following <i>Adenia</i> species	<i>Adenia fruticosa simpliciflora</i>	Low
Baobab	<i>Adansonia digitata</i>	Low
Beech	<i>Faurea macnaughtonii</i>	Low
Bitter False Thorn	<i>Albizia amara sericocephala</i>	Low
The following <i>Boscia</i> species	<i>Boscia angustifolia</i> var. <i>corymbosa</i>	Low
	<i>Boscia foetida minima</i>	Medium
Borassus Palm	<i>Borassus aethiopicum</i>	Low
Brackenridgea	<i>Brackenridgea zanguebarica</i>	Low
Capper Bush	<i>Capparis sepiaria</i> var. <i>subglabra</i>	Low
	<i>Combretum collinum taborense</i>	Low
	<i>Combretum padoides</i>	Low
The following <i>Combretum</i> species	<i>Combretum petrophilum</i>	Low
	<i>Combretum vendae</i>	Low
	The following <i>Commiphora</i> species	<i>Commiphora zanzibarica</i>
Currant	<i>Allophylus ainifolius</i>	Low
The following elephantorrhiza species	<i>Elephantorrhiza praetermissa</i>	Low
The following <i>Grewia</i> species	<i>Grewia rogersii</i>	Low
	<i>Hibiscus articulatus</i>	Low
The following <i>Hibiscus</i> species	<i>Hibiscus barnardii</i>	Low
	<i>Hibiscus sabiensis</i>	Low
Large Cape Myrtle	<i>Myrsine pillansii</i>	Low
Largeleaved Dragon Tree	<i>Dracaena hookerana</i>	Low
Largeleaved Saucerberry	<i>Cordia africana</i>	Low
The following <i>Maytenus</i> species	<i>Maytenus oxycarpa</i>	Low
	<i>Maytenus pubescens</i>	Low
The following <i>Ochna</i> species	<i>Ochna glauca</i>	Low
Pepperbark Tree	<i>Warburgia salutaris</i>	Low
Pincushion	<i>Leucospermum saxosum</i>	Low
The following <i>Rhus</i> species	<i>Searsia batophylla</i>	Low
Sand ironplum	<i>Drypetes mossambicensis</i>	Low
Salati Palm	<i>Borassus aethiopicum</i>	Low



Common name	Scientific name	POC
Stinkwood, Black	<i>Ocotea bullata</i>	Low
Stinkwood, Transvaal	<i>Ocotea kenyensis</i>	Low
Tamboti	<i>Spirostachys africana</i>	Low
The following Tarenna species	<i>Tarenna zygoon</i>	Low
Transvaal Red Balloon	<i>Erythrophysa transvaalensis</i>	Low
Venda Beadstring	<i>Alchornea laxiflora</i>	Low
Wild Banana	<i>Ensete ventricosum</i>	Low
Wild Teak	<i>Pterocarpus angolensis</i>	Low
Yellowwood, Outeniqua	<i>Podocarpus latifolius</i>	Low
Yellowwood, Real	<i>Podocarpus falcatus</i>	Low
Succulents		
All species of aloes indigenous to the Province excluding the following species:		
Aculeata	<i>Aloe aculeata</i>	Low
Aloe Catstail	<i>Aloe castanea</i>	Medium
Aloe Krans	<i>Aloe arborescens</i>	Low
Ammophilla	<i>Aloe ammophilla</i>	Low
Davyana	<i>Aloe davyana</i>	Low
Fosteri	<i>Aloe fosteri</i>	Low
Globuligemma	<i>Aloe globuligemma</i>	Low
Grandidentata	<i>Aloe grandidentata</i>	Low
Greatheadii	<i>Aloe greatheadii</i>	Low
Lutescens	<i>Aloe lutescens</i>	Low
Mutans	<i>Aloe mutans</i>	Low
Parvibracteata	<i>Aloe parvibracteata</i>	Low
Transvaalensis	<i>Aloe transvaalensis</i>	Low
Wickensii	<i>Aloe wickensii</i>	Low
All species of Brachystelma	<i>Brachystelma spp</i>	Low
All species of Ceropogia	<i>Ceropogia spp</i>	Low
All species of Duvalia	<i>Duvalia spp</i>	Low
	<i>Euphorbia barnardii</i>	Low
	<i>Euphorbia divicola</i>	Low
	<i>Euphorbia grandialata</i>	Low
	<i>Euphorbia groenewaldii</i>	Low
The following species Euphorbias:	<i>Euphorbia louwii</i>	Low
	<i>Euphorbia restricta</i>	Low
	<i>Euphorbia rowlandii</i>	Low
	<i>Euphorbia tortirama</i>	Low
	<i>Euphorbia waterbergensis</i>	Low
Ghaap	<i>Hoodia lugardii</i>	Low
All species of Ghaap	<i>Tavaresia spp</i>	Low
All species of Huernia	<i>Huernia spp</i> (i.e., <i>Huernia zebrina</i> subsp. <i>magniflora</i>)	Low
All species of Huerniopsis	<i>Huerniopsis spp</i>	Low
The following Impala Lilies	<i>Adenium multiflorum</i>	Low
Multiflorum en Oleifolium	<i>Adenium oleifolium</i>	Low
Kudu Lily	<i>Pachypodium saundersii</i>	Low
All species of Orbeanthus	<i>Orbeanthus spp</i>	Low
All species of Orbeas	<i>Orbea spp</i>	Low
All species of Orbeopsis	<i>Orbeopsis spp</i>	Low
All species of Pachycymbiums	<i>Pachycymbium spp</i>	Low
All species of Riocreuxias	<i>Riocreuxia spp</i>	Low



Common name	Scientific name	POC
All species of Stapeliads	<i>Stapelia</i> spp (i.e., <i>Stapelia gigantea</i>)	Low
Stone Plant	<i>Lithops lesliei</i>	Low
Other Plants		
The following Agapanthus species	<i>Agapanthus coddii</i> , <i>A. dyeri</i>	Low
The following Anacampseros species	<i>Anacampseros bemenkampii</i> (now <i>A. rhodesica</i>)	Low
All species of Anomatheca	<i>Anomatheca</i> spp	Low
The following Anthericum species	<i>Anthericum cyperaceum</i>	Medium
The following Arum Lilies:		Low
Jucunda, Pentlandii and Rehmännii	<i>Zantedeschia jucunda</i> , <i>Z. pentlandii</i> , <i>Z. rehmannii</i>	Low
The following Babiana Species	<i>Babiana hypogea</i> var. <i>longituba</i>	Low
Batesiana Gasteria	<i>Gasteria batesiana</i>	Low
Blue Squill	<i>Scilla natalensis</i>	Low
Clivia	<i>Clivia caulescens</i>	Low
The following Cyathula species	<i>Cyathula natalensis</i>	Low
The following Eragrostis species	<i>Eragrostis arenicola</i>	Low
The following Eriosema species	<i>Eriosema transvaalense</i>	Low
The following Eulophia species	<i>Eulophia coddii</i>	Low
	<i>Eulophia leachii</i>	Low
The following Felicia species	<i>Felicia fruticosa brevipendunculata</i>	Low
The following Festuca species	<i>Festuca dracomontana</i>	Low
All species of Fire Lily	<i>Cyrtanthus</i> spp	Low
The following Freylinia species	<i>Freylinia tropica</i>	Low
The following Gladiolus species	<i>Gladiolus macneilii</i>	Low
The following Habernaria species	<i>Habernaria kraenzliniana</i>	Low
The following Heinsia species	<i>Heinsia crinita</i>	Low
The following Hermstaedtia species	<i>Hermstaedtia capitata</i>	Low
The following Hippocratea species	<i>Hippocratea parvifolia</i>	Low
The following Hymenodictyon species	<i>Hymenodictyon parvifolium parvifolium</i>	Low
The following Hyptis species	<i>Hyptis spicigera</i>	Low
The following Inula species	<i>Inula paniculata</i>	Low
The following Jasminum species	<i>Jasminum abyssinbicum</i>	Low
The following Kalanchoe species	<i>Kalanchoe crundallii</i>	Low
	<i>Kalanchoe rogersii</i>	Low
	<i>Kniphofia coralligemma</i>	Low
The following Kniphofia species	<i>Kniphofia crassifolia</i>	Low
	<i>Kniphofia rigidifolia</i>	Low
The following Kotschya species	<i>Kotschya thymodora</i>	Low
The following Melinus species	<i>Melinus tenuissima</i>	Low
The following Mondia species	<i>Mondia whitei</i>	Low
The following Monsonia species	<i>Monsonia lanuginosa</i>	Low
The following Neobulosia species	<i>Neobulosia tysonii</i>	Low
The following Nervillia species	<i>Nervillia umbroza</i>	Low
The following Nymphaea species	<i>Nymphaea lotus</i>	Low
The following Oberonia species	<i>Oberonia distichia</i>	Low
The following Oreosyce species	<i>Oreosyce africana</i>	Low
Paint Brush	<i>Haemanthus montanus</i>	Low
	<i>Peristrophe cliffordii</i>	Low
The following Peristrophe species	<i>Peristrophe gililandorum</i>	Low
	<i>Peristrophe transvaalensis</i>	Low
The following Phyllanthus species	<i>Phyllanthus pinnatus</i>	Low



Common name	Scientific name	POC
The following Pilea species	<i>Pilea rivularis</i>	Low
The following Plinthus species	<i>Plinthus rehmannii</i>	Low
The following Polycarpea species	<i>Polycarpea eriantha</i> var. <i>effusa</i>	Low
The following Polystachya species	<i>Polystachya albescens imbricata</i>	Low
The following Portulaca species	<i>Portulaca foliosa</i>	Low
	<i>Portulaca trianthemoides</i>	Low
The following Rhyncosia species	<i>Rhyncosia vendae</i>	Low
Royal Paint Brush (Blood lily)	<i>Scadoxys puniceus</i>	Low
The following Sartidia species	<i>Sartidia jucunda</i>	Low
The following Schizagyrium species	<i>Schizagyrium brevifolium</i>	Low
All species of South African Orchid	Family <i>Orchidaceae</i>	Low
The following Stadmania species	<i>Stadmania oppositifolia</i>	Low
The following Streptocarpus species	<i>Streptocarpus decipiens</i>	Low
The following Strophanthus species	<i>Strophanthus luteolus</i>	Low
The following Sutera species	<i>Sutera maerantha</i>	Low
The following Thorncroftia species	<i>Thorncroftia media</i>	Low
All species of Tree Ferns	<i>Cyathea</i> spp	Low
All species of Tree Moss	<i>Poroathamnum</i> , <i>Pilotrichella</i> and <i>Papillaria</i> spp	Low
The following Trilepisium species	<i>Trilepisium madagascariensis</i>	Low
The following Tristachya species	<i>Tristachya trifaria</i>	Low
The following Turbina species	<i>Turbina shirensis</i>	Low
	<i>Watsonia densiflora</i>	Low
The following Watsonia species	<i>Watsonia transvaalensis</i>	Low
	<i>Watsonia wilmsii</i>	Low
Wild Ginger	<i>Burmanna madagascariensis</i>	Low
Wild Ginger	<i>Siphonochilus aethiopicus</i>	Low
The following Xylopia species	<i>Xylopia parviflora</i>	Low

Table F3: NFA plant list for species with a known distribution range falling within the study area¹⁵.

SCIENTIFIC NAME	HABITAT & DISTRIBUTION ¹⁶ & ¹⁷	NATIONAL RED LIST STATUS	POC
<i>Boscia albitrunca</i>	Habitat mainly includes dry, open woodland and bushveld, mostly in hot, arid, semi-desert areas, often on termitaria. The vast distribution range covers Botswana, Limpopo, Gauteng, North-West, Swaziland, the Free State, Northern Cape and KwaZulu-Natal. It also extends into Zambia, Zimbabwe, and Mozambique.	LC P	Medium
<i>Combretum imberbe</i>	The leadwood can be found in all the bushveld regions and in mixed forest in southern Africa. Preferred habitat includes open bushveld, mixed woodland, rivers or dry watercourses and often on alluvial soils. It is widespread in Lowveld areas and grows along streams and rivers. <i>Combretum imberbe</i> is widespread in northern Namibia. It is also found in Mpumalanga, Limpopo, North-West Province, Mozambique, and into tropical Africa.	LC P	Low
<i>Catha edulis</i>	Khat is found in woodlands and on rocky outcrops. It is scattered in KwaZulu-Natal and Eastern Cape, mostly from the mistbelt, moving inland. It is also found in the Western Cape, Mpumalanga, Swaziland, Mozambique and through to tropical Africa and the Arab countries.	LC P	Low

¹⁵ <https://www.thetreeapp.co.za/team/>

¹⁶ <http://pza.sanbi.org/>

¹⁷ <http://redlist.sanbi.org/index.php>



SCIENTIFIC NAME	HABITAT & DISTRIBUTION ¹⁶ & ¹⁷	NATIONAL RED LIST STATUS	POC
<i>Elaeodendron transvaalense</i>	Savanna or bushveld, from open woodland to thickets, often on termite mounds.	NT P	Low
<i>Sclerocarya birrea</i> subsp. <i>Caffra</i>	The Marula is widespread in Africa from Ethiopia in the north to KwaZulu-Natal in the south. In South Africa it is more dominant in the Baphalaborwa area in Limpopo. It occurs naturally in various types of woodland, on sandy soil or occasionally sandy loam.	LC P	Confirmed
<i>Philenoptera violacea</i>	Alluvial flats in bushveld	LC P	Low
<i>Pittosporum viridiflorum</i>	<i>Pittosporum viridiflorum</i> is widely distributed in the eastern half of South Africa, occurring from the Western Cape up into tropical Africa and beyond to Arabia and India. It grows over a wide range of altitudes and varies in form from one location to another. <i>Pittosporum viridiflorum</i> grows in tall forest and in scrub on the forest margin, kloofs and on stream banks.	LC P	Low
<i>Prunus africana</i>	<i>Prunus africana</i> is confined to evergreen forests from near the coast to the mist belt and montane forests in KwaZulu-Natal, Eastern Cape, Swaziland, Mpumalanga, Zimbabwe, and tropical Africa. This It is a moderately fast-growing tree which is sensitive to heavy frost, preferring areas where there is regular rain; it will tolerate moderate frosts.	VU P	Low
<i>Vachellia erioloba</i>	Found in dry woodland, bushveld, grassland, and watercourses in arid areas usually on stony or sandy soil. Widespread in the arid northern provinces of South Africa, also Namibia, Botswana, Zimbabwe, southern Angola, and south-western Zambia.	LC P	Low
<i>Erythrophysa transvaalensis</i>	This species has a limited distribution in South Africa occurring in Gauteng, Limpopo, and the North West Province. It grows in a few places in western Gauteng, on the slope of a hill near the Bospoort Dam in the Rustenburg District, near Thabazimbi, and in the western Waterberg. It was first thought to be endemic to syenite hills (koppies) in the Pilanesberg Nature Reserve, but it has been found since in a wider area (Balkwill 1994). I.C. Verdoorn (1942) described one of the original collections as coming from a norite koppie (near Bospoort Dam). It also occurs in Limpopo in a few areas including near the Strydom tunnel on dolomite (Pieter Winter pers. comm.). It has also been collected in Zimbabwe.	LC P	Low
<i>Securidaca longepedunculata</i>	It occurs in the North-West and Limpopo provinces of South Africa, in Mozambique and is widely distributed in tropical Africa. The violet tree is found in woodland and arid savanna soils.	LC P	Low
<i>Lydenburgia cassinoides</i>	Occurs in Limpopo and Mpumalanga from Roossenekal to Strydpoort Mountains.	NT	Medium
<i>Podocarpus latifolius</i>	The real yellowwood grows naturally in mountainous areas and forests in the southern, eastern and northern parts of South Africa, extending into Zimbabwe and further north. It is also found on rocky hillsides and mountain slopes but does not get as tall where it is exposed as it does in the forest.	LC P	Low

CR= Critically Endangered, EN = Endangered, LC = Least Concern; NT = Near Threatened, P= Protected, POC = Probability of Occurrence;

R = Rare



APPENDIX G: FLORAL SPECIES LIST

Table G1: Dominant floral species encountered during the field assessment. Alien species identified during the field assessment are indicated with an asterisk (*).

Species	Sekhukhune Mountain Bushveld	Secondary Bushveld	Transformed Areas
Grasses			
<i>Aristida congesta</i> subsp <i>congesta</i>	X	X	X
<i>Cymbopogon excavatus</i>	X	X	X
<i>Cynodon dactylon</i>	X	X	X
<i>Digitaria eriantha</i>	X	X	X
<i>Eragrostis gummiflua</i>			
<i>Eragrostis rigidior</i>	X		
<i>Eragrostis capensis</i>	X	X	X
<i>Elionurus muticus</i>	X		
<i>Heteropogon contortus</i>	X	X	X
<i>Arundo donax</i>			X
<i>Hyparrhenia hirta</i>	X	X	X
<i>Loudetia simplex</i>	X		
<i>Melinis repens</i>	X	X	X
<i>Panicum maximum</i>	X		
<i>Phragmites australis</i>			X
<i>Setaria sphacelata</i>	X		
<i>Themeda triandra</i>	X	X	X
<i>Urochloa panicoides</i>	X		
Forbs and groundcovers			
* <i>Bidens pilosa</i>	X	X	X
<i>Argemone ochroleuca</i> (1b)		X	X
<i>Ledebouria inquinata</i>	X		
<i>Blepharis subvolubilis</i>	X		
<i>Ledebouria marginata</i>	X		
<i>Crotalaria monteiroi</i> var. <i>galpinii</i>			
* <i>Datura ferox</i> (1b)	X	X	X
* <i>Flaveria bidentis</i> (1b)	X	X	X
<i>Stylochaeton natalensis</i>	X		
* <i>Alternanthera pungens</i>		X	X
* <i>Amaranthus hybridus</i>			X
* <i>Zinnia peruviana</i>		X	X
* <i>Verbena bonariensis</i> (1bb)		X	X
<i>Datura stramonium</i> (1b)			X
<i>Hippobromus pauciflorus</i>	X		
<i>Hypoxis rigidula</i>			
<i>Pellaea calomelanos</i>	X		
<i>Plectranthus hadiensis</i>	X		
<i>Rhoicissus sekhukhuniensis</i>	X		
<i>Rhynchosia minima</i>	X		
<i>Sansevieria hyacinthoides</i>	X		
* <i>Solanum elaeagnifolium</i> (1b)		X	X
* <i>Solanum sisymbriifolium</i> (1b)		X	X
* <i>Tagetes minuta</i>	X	X	X
<i>Xerophyta retinervis</i>	X		
Succulents			
<i>Aloe greatheadii</i> var <i>davyana</i>	X	X	X
<i>Kleinia stapeliiformis</i>	X		
<i>Aloe marlothii</i>	X		
* <i>Agave sisalana</i> (2)			X
* <i>Cereus jamacara</i> (1b)			X
* <i>Opuntia ficus-indica</i> (1b)			X



Species	Sekhukhune Mountain Bushveld	Secondary Bushveld	Transformed Areas
Trees and Shrubs			
<i>Bolusanthus speciosus</i>	X		
<i>Berchemia zeyheri</i>		X	X
<i>Carissa bispinosa</i>	X	X	X
<i>Combretum apiculatum</i>	X	X	X
<i>Combretum hereroense</i>	X	X	X
<i>Combretum molle</i>	X		
<i>Combretum zeyheri</i>	X		
<i>Cussonia transvaalensis</i>	X		
<i>Dichrostachys cinerea</i>	X	X	X
<i>Dombeya rotundifolia</i>	X		
<i>Euclea sekhukhuniensis</i>	X	X	
<i>Grewia flava</i>	X	X	X
<i>Gymnosporia senegalensis</i>	X		
<i>Leucaena leucocephala</i>			X
* <i>Melia azedarach</i> (1b)		X	X
<i>Mundulea sericea</i>	X		
<i>Peltophorum africanum</i>	X	X	
<i>Schotia brachypetala</i>	X		
<i>Sclerocarya birrea</i> subsp. <i>caffra</i>	X		
<i>Searsia lancea</i>	X	X	X
<i>Searsia keetii</i>	X		
<i>Searsia leptodictya</i>	X		
<i>Searsia pyroides</i>	X		
<i>Vachellia karroo</i>		X	X
<i>Vachellia nilotica</i>	X	X	
<i>Vachellia tortilis</i>		X	X
<i>Vitex obovata</i> subsp. <i>wilmsii</i>	X		
<i>Ziziphus mucronata</i>	X	X	



APPENDIX H: FAUNAL SCC

Table H1: Red Data Mammal species listed in the Limpopo SoER 2004 report including IUCN status.

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

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

Table H2: Red Data Bird species listed in the Limpopo SoER 2004 report including IUCN status.

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

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

Table H3: Red Data Amphibian species listed in the Limpopo SoER 2004 report including IUCN status.

Scientific name	Common Name	Limpopo SoER 2004 Status	IUCN Red List Status
<i>Breviceps sylvestrus</i>	Transvaal forest rain frog	VU	EN
<i>Ptychadena uzungwensis</i>		P	LC
<i>Leptopelis bocagii</i>		P	LC



<i>Hemismus guineensis</i>	Guinea Snout-burrower	P	LC
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LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, P = Peripheral. NYBA = Not yet been assessed by the IUCN.

Table H4: Red Data Reptile species listed in the Limpopo SoER 2004 report including IUCN status.

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

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

Table H5: Red Data Invertebrates species mentioned in the Limpopo SoER 2004 report including IUCN status.

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

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

South African Bird Atlas Project 2 list

Table H6: Avifaunal Species for the pentads 2355_2850 within the QDS 2328DD.

PENTADS	LINK TO PENTAD SUMMARY ON THE SOUTH AFRICAN BIRD ATLAS PROJECT 2 WEB PAGE
2355_2850	http://sabap2.adu.org.za/coverage/pentad/2355_2850



APPENDIX I: FAUNAL SPECIES LIST

Table I1: Mammal species recorded during the field assessment.

Scientific Name	Common Name	IUCN Status
<i>Tragelaphus strepsiceros</i>	Kudu	LC
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC
<i>Herpestes sanguinea</i>	Slender Mongoose	NYBA
<i>Sylvicapra grimmia</i>	Grey Duiker	LC
<i>Raphicerus campestris</i>	Steenbok	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC

LC – Least Concern, NYBA – Not yet Been Assessed

Table I2: Avifaunal species recorded during the survey.

Scientific name	English name	IUCN Status
<i>Apalis thoracica</i>	Bar-throated Apalis	LC
<i>Upupa africana</i>	African Hoopoe	LC
<i>Motacilla aguimp</i>	African Pied Wagtail	LC
<i>Ortygospiza fuscocrissa</i>	African Quail-finch	LC
<i>Pycnonotus nigricans</i>	African Red-eyed Bulbul	LC
<i>Threskiornis aethiopicus</i>	African Sacred Ibis	LC
<i>Saxicola torquatus</i>	African Stonechat	LC
<i>Myrmecocichla formicivora</i>	Ant-eating Chat	LC
<i>Ardea melanocephala</i>	Black-headed Heron	LC
<i>Elanus caeruleus</i>	Black-shouldered Kite	LC
<i>Vanellus armatus</i>	Blacksmith Lapwing	LC
<i>Batis molitor</i>	Chin-spot Batis	LC
<i>Passer melanurus</i>	Cape Sparrow	LC
<i>Merops pusillus</i>	Little Bee-eater	LC
<i>Streptopelia capicola</i>	Cape Turtle Dove	LC
<i>Motacilla capensis</i>	Cape Wagtail	LC
<i>Pycnonotus tricolor</i>	Dark-capped Bulbul	LC
<i>Lanius collaris</i>	Common Fiscal	LC
<i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting	LC
<i>Estrilda astrild</i>	Common Waxbill	LC
<i>Emberiza flaviventris</i>	Golden-breasted Bunting	LC
<i>Malaconotus blanchoti</i>	Grey-headed Bush-shrike	LC
<i>Crithagra mozambicus</i>	Yellow-fronted Canary	LC
<i>Scopus umbretta</i>	Hamerkop	LC
<i>Numida meleagris</i>	Helmeted Guinea fowl	LC
<i>Cercomela familiaris</i>	Familiar Chat	LC
<i>Passer domesticus</i>	House Sparrow	LC
<i>Streptopelia senegalensis</i>	Laughing Dove	LC
<i>Cisticola tinniens</i>	Levaillant's Cisticola	LC
<i>Apus affinis</i>	Little Swift	LC
<i>Corvus albus</i>	Pied Crow	LC



Scientific name	English name	IUCN Status
<i>Dicrurus adsimilis</i>	Fork-tailed Drongo	LC
<i>Cisticola fulvicapilla</i>	Neddicky	LC
<i>Corvus albus</i>	Pied Crow	LC
<i>Streptopelia semitorquata</i>	Red-eyed Dove	LC
<i>Lanius collaris</i>	Common Fiscal	LC
<i>Corythaixoides concolor</i>	Grey Go-away Bird	LC
<i>Phalacrocorax africanus</i>	Reed Cormorant	LC
<i>Oriolus larvatus</i>	Black-headed Oriole	LC
<i>Ploceus velatus</i>	Southern Masked Weaver	LC
<i>Euplectes orix</i>	Southern Red Bishop	LC
<i>Colius striatus</i>	Speckled Mousebird	LC
<i>Burhinus capensis</i>	Spotted Thick-knee	LC
<i>Prinia subflava</i>	Tawny-flanked Prinia,	LC
<i>Pternistis swainsonii</i>	Swainson's Spurfowl	LC
<i>Prinia subflava</i>	Tawny-flanked Prinia	LC
<i>Bubulcus ibis</i>	Western Cattle Egret	LC
<i>Lamprotornis nitens</i>	Cape Glossy Starling	LC
<i>Cinnyris talatala</i>	White-bellied Sunbird	LC
<i>Crithagra gularis</i>	Streaky-headed Seedeater	LC
<i>Psophocichla litsipsirupa</i>	Groundscraper Thrush	LC
<i>Buteo vulpinus</i>	Steppe Buzzard	LC
<i>Cossypha humeralis</i>	White-throated Robin-chat	LC
<i>Lanius collurio</i>	Red-backed Shrike	LC
<i>Gallirex porphyreolophus</i>	Purple-crested Turaco	LC
<i>Anas undulata</i>	Yellow-billed Duck	LC

LC = Least Concern

Table I3: Reptile species recorded during the field assessment.

Scientific name	Common Name	IUCN Status
<i>Trachylepis margaritifer</i>	Rainbow Skink	LC
<i>Platysaurus orientalis</i>	Sekukhune Flat Lizard	LC
<i>Agama aculeata distanti</i>	Distant's Ground Agama	LC

LC = Least Concern, NYBA = Not yet Been Assessed

Table I4: Invertebrate species recorded during the field assessment.

Scientific Name	Common Name	IUCN Status
<i>Eurema brigitta</i>	Broad-bordered Grass Yellow	NYBA
<i>Belenois aurota</i>	Brown-veined White	NYBA
<i>Junonia oenone</i>	Blue Pansy	LC
<i>Junonia hierta</i>	Yellow Pansy	LC
<i>Cyilgramma latona</i>	Cream-striped Owl	LC
<i>Crocothemis sanguinolenta</i>	Small Scarlet	LC
<i>Musca domestica</i>	House Fly	NYBA
<i>Catantops humeralis</i>	N/A	NYBA
<i>Odaleus sp.</i>	N/A	NYBA
<i>Rhachitopis sp.</i>	N/A	NYBA
<i>Anoplolepis custodiens</i>	Pugnacious Ant	NYBA



Scientific Name	Common Name	IUCN Status
<i>Gryllus bimaculatus</i>	Common Garden Cricket	NYBA
<i>Lampetis amaurotica</i>	Eyed Jewel Beetle	NYBA
<i>Anomalipus elephas</i>	Large Armoured Darkling Beetle	NYBA
<i>Junonia hierta</i>	Yellow Pansy	LC
<i>Heteracris</i> sp	N/A	NYBA
<i>Gegenes pumilio gambica</i>	Dark Hottentot Skipper	NYBA
<i>Trithemis stictica</i>	Jaunting Dropwing	LC
<i>Cynthia cardui</i>	Painted Lady	NYBA
<i>Lepidochrysops plebeia plebeia</i>	Twin-spot Blue	LC
<i>Acrida acuminata</i>	Common Stick Grasshopper	NYBA
<i>Trithemis annulata</i>	Violet Dropwing	LC
<i>Garreta</i> sp	Dung Beetle	NYBA
<i>Linepithema humile</i>	Argentine Ant	NYBA
<i>Danaus chrysippus</i>	African Monarch	LC
<i>Pselaphelia flavivitta</i>	Leaf Emperor	LC
<i>Phalanta phalantha</i>	Common Leopard	LC
Asopinae (Subfamily)	Predatory Stink Bugs	NYBA
<i>Papilio nireus</i>	Green-banded Swallowtail	LC
<i>Colotis euipe</i>	Smokey Orange Tip	LC
<i>Junonia Octavia</i>	Gaudy Commodore	LC
<i>Byblia ilythia</i>	Spotted Joker	LC
<i>Papilio demodocus</i>	Citrus Swallowtail	LC
<i>Hamanumida Daedalus</i>	Guinea Fowl	LC
<i>Gastrimargus</i> sp	N/A	NYBA
<i>Lycus trabeatus</i>	Tailed Net-winged Beetle	NYBA
<i>Catopsilia florella</i>	African Migrant	LC
<i>Idolomorpha dentifrons</i>	Cone-headed Mantid	NYBA
<i>Rachitopsis</i> sp	N/A	NYBA
<i>Chlorocala</i> sp	Fruit Chafer	NYBA
<i>Pontia helice</i>	Meadow White	LC
<i>Paternympha loxophthalma</i>	Big-eye Brown	LC

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

Table D5: Arachnid species recorded during the site assessment

Common Name	Scientific Name	IUCN Status
<i>Nephila fenestrata</i>	Black-legged Nephila	NYBA
<i>Olurunia ocellata</i>	Grass Funnel-web Spider	NYBA
<i>Harpactirella overdijki</i>	Lesser baboon spider	NYBA
<i>Argiope lobata</i>	Black-lobed garden orb-web	NYBA
<i>Nephila senegalensis</i>	Banded-legged Nephila	NYBA

LC = Least Concern, NYBA = Not yet Been Assessed



APPENDIX J: DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

11. (a) (i) Details of the specialist who prepared the report

Nelanie Cloete	MSc Botany and Environmental Management (University of Johannesburg)
Christopher Hooton	BTech Nature Conservation (Tshwane University of Technology)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Christien Steyn	MSc. Plant Science (University of Pretoria)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Terrestrial Services		
Name / Contact person:	Nelanie Cloete		
Postal address:	PO. Box 751779, Gardenview		
Postal code:	2047	Cell:	084 311 4878
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	Nelanie@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg) MSc Botany (University of Johannesburg) BSc (Hons) Botany (University of Johannesburg) BSc (Botany and Zoology) (Rand Afrikaans University)		
Registration / Associations	Professional member of the South African Council for Natural Scientific Professions (SACNASP) Member of the South African Association of Botanists (SAAB) Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group Member of the Grassland Society of South Africa (GSSA)		

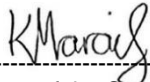
Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Kim Marais		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville		
Postal code:	7539	Cell:	071 413 2245
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	kim@sasenvgroup.co.za		
Qualifications	BSc (Hons) Zoology (University of the Witwatersrand) BSc (Zoology and Conservation) (University of the Witwatersrand)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Member of South African Wetland Forum		



1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Kim Marais, declare that -

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



Signature of the Specialist

I, Christopher Hooton, declare that -

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



Specialist Signature

I, Nelanie Cloete, declare that -

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



Signature of the Specialist



SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF NELANIE CLOETE

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Water Resource and Botanical Discipline Lead
Joined SAS Environmental Group of Companies	2011

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 400503/14)
 Member of the South African Association of Botanists (SAAB)
 Member of the International Affiliation for Impact Assessments (IAIAsa) South Africa group
 Member of the Grassland Society of South Africa (GSSA)
 Member of the Botanical Society of South Africa (BotSoc)
 Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2013
MSc Botany (University of Johannesburg)	2007
BSc (Hons) Botany (University of Johannesburg)	2005
BSc (Botany and Zoology) (Rand Afrikaans University)	2004

Short Courses

Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)	2009
Introduction to Project Management - Online course by the University of Adelaide	2016
Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Northern Cape, Eastern Cape, Free State

Africa - Democratic Republic of the Congo (DRC)



KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Plant species and Landscape Plan

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Environmental Control Officer monitoring





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Senior Scientist Water Resource Manager
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal, Northern Cape, Eastern Cape,
Africa - Uganda

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning



- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes





SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTOPHER HOOTON

PERSONAL DETAILS

Position in Company	Senior Scientist, Member Biodiversity Specialist
Joined SAS Environmental Group of Companies	2013

EDUCATION

Qualifications

BTech Nature Conservation (Tshwane University of Technology)	2013
National Diploma Nature Conservation (Tshwane University of Technology)	2008

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Free State
Zimbabwe, Sierra Leone, Zambia

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Floral Assessments
- Faunal Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

Freshwater Assessments

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

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