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TERRESTRIAL BIODIVERSITY  
ASSESSMENT AND PLANT SPECIES  
IMPACT ASSESSMENT


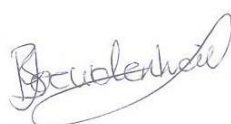
PROPOSED ROAD UPGRADE OF THE  
NATIONAL ROAD R33, SECTION 13,  
FROM MODIMOLLE (KM 0.6) TO WITKLIP  
(KM 13.6), LIMPOPO PROVINCE

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## DECLARATION OF INDEPENDENCE

I, **Arno van den Berg**, in my capacity as a specialist consultant, hereby declare that I -  
Act as an independent consultant.

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998).
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998).
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.

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## EXECUTIVE SUMMARY

The project area lies within the Savanna Biome. Two vegetation types, according to the National Vegetation Map (SANBI, 2006 – 2018), occur in the project area, namely Waterberg Mountain Bushveld and the Central Sandy Bushveld.

Site Ecological characteristics:

- The Waterberg Mountain Bushveld and Central Sandy Bushveld are both not listed in the “National List of Ecosystems that are Threatened and in need of protection” and are classified as Least Concern by the 2018 National Biodiversity Assessment.
- The study area is situated in an area categorized as a Critical Biodiversity Area (CBA1 and CBA2), Ecological Support Area (ESA 1 and ESA 2) in terms of the Limpopo bio-sector plan.
  - CBA 1 areas are deemed irreplaceable and are required to meet biodiversity patterns and ecological processes targets.
  - CBA2 areas selected to meet biodiversity targets.
  - ESA 1 areas - Natural, near natural and degraded areas supporting CBAs by maintaining Ecological processes.
  - ESA 2 areas - Areas with no natural habitat that is important for supporting ecological processes.

Two broad vegetation units were identified to occur mostly outside of the proposed project footprint, i.e., Waterberg Mountain Bushveld and Central Sandy Bushveld. The planned upgrades are largely focused on the existing road reserve where the two vegetation units have already been impacted and mostly transformed.

Areas associated with the mountain pass (as illustrated in the habitat map in Figure 12 in pink) has more concentrated indigenous vegetation closer to the road reserve due to historical road cuts into the mountain sides, which will probably be impacted on most.

Although the site is located within designated CBA areas in accordance with bioregional information of Limpopo (LCPv2), the existing R33 road impact was not considered in these maps which would have resulted in a lower conservation status. The road reserve did contribute to an edge effect on adjacent vegetation compositions historically and the existing road reserve is mostly transformed.

Summary of Floral species findings:

- A total of 58 plant species were recorded in the study area during the time of the study and indicates moderate species diversity. The purpose of the species assessment was to identify any SCC plants and to determine vegetation unit association.
- 12 specimens of the protected tree species *Sclerocarya birrea* (Marula) was found to occur on the project footprint where the road upgrade will most likely have an impact. These tree species are protected in terms of the National Forest Act 84 of 1998. These trees are of Least Concern but protected. The coordinates of these trees are provided below:

Protected tree	Coordinates
1. <i>Sclerocarya birrea</i>	-24.682049° 28.388703°
2. <i>Sclerocarya birrea</i>	-24.678651° 28.384578°
3. <i>Sclerocarya birrea</i>	-24.658541° 28.362859°
4. <i>Sclerocarya birrea</i>	-24.654509° 28.355758°
5. <i>Sclerocarya birrea</i>	-24.653715° 28.354447°
6. <i>Sclerocarya birrea</i>	-24.642886° 28.333329°
7. <i>Sclerocarya birrea</i>	-24.642675° 28.332906°
8. <i>Sclerocarya birrea</i>	-24.642576° 28.332732°
9. <i>Sclerocarya birrea</i>	-24.642552° 28.332609°
10. <i>Sclerocarya birrea</i>	-24.644116° 28.335772°
11. <i>Sclerocarya birrea</i>	-24.643926° 28.335428°
12. <i>Sclerocarya birrea</i>	-24.643616° 28.334831°

- No SCC was identified to occur on the project footprint during the site survey.
- 16 NEMBA listed Alien Invasive plants were listed that need to be controlled.

The impact assessment indicated that all impacts in terms of terrestrial biodiversity and plant species is of medium to low significance after mitigation.

The impact on threatened plants is deemed to be low as most of the site has been disturbed historically and no SCC plants were found.

All areas identified as part of the development is suitable for development. Areas within the mountain pass section as illustrated in pink in Figure 12, contains concentrated bushveld vegetation as the road reserve is narrow due to cutting of the road into the mountain sides.

It is the opinion of the specialist that the proposed upgrade of the R33 could be approved by the competent authority. The findings of the specialist study, for impacts on terrestrial biodiversity and plants, would be within acceptable limits if all mitigation measures are implemented. Conditions of this statement would require permit applications for all protected trees that would be affected by the proposed R33 upgrade.

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## 1 INTRODUCTION

This report contains the data gathered and interpreted, specifically taking vegetation and flora on site into account. A discussion on sensitive areas and species have also been included in the report together with mitigation measures proposed to limit the extent of the impact (if any).

Literature and Quarter Degree Grid Square readings were undertaken, which was then followed by comparative field surveys to allow for physical scanning of the proposed construction/operational areas (hereafter also referred to as the study area).

This Specialist Study forms part of the Basic Assessment (BA) process currently underway for the proposed project. For the Basic Assessment process, it is necessary to assess the flora potential of the study area to determine the possible impact of the proposed development activity on the relevant environment.

### 1.1 LOCALITY AND BACKGROUND

The project is located on National Road R33 Section 13, just outside the town of Modimolle in Limpopo Province in the Waterberg District Municipality. The total length of the proposed road upgrade is approximately 13.0 km.

The road is a single carriageway road with 3,7m lanes and 0.3m to 0.5m surfaced shoulders. There is an existing climbing lane on the West bound (LHS) of the road from km 5.6 to km 6.2. From km 4.6 to km 6.2 the posted speed is reduced due to the very sharp horizontal curves (Figure 1).

The road traverses an easy rolling to flat terrain. From km 4.6 to km 6.2 the speed is reduced due to the very sharp horizontal curves. The total length of the project is approximately 13.0 km.

The design is dependent on various aspects of which the following are deemed as the most significant:

- 4-lane configuration versus single carriageway with 3m surfaced shoulders versus climbing/passing lanes.
- Adherence of the road R33 design standards (horizontal and vertical).

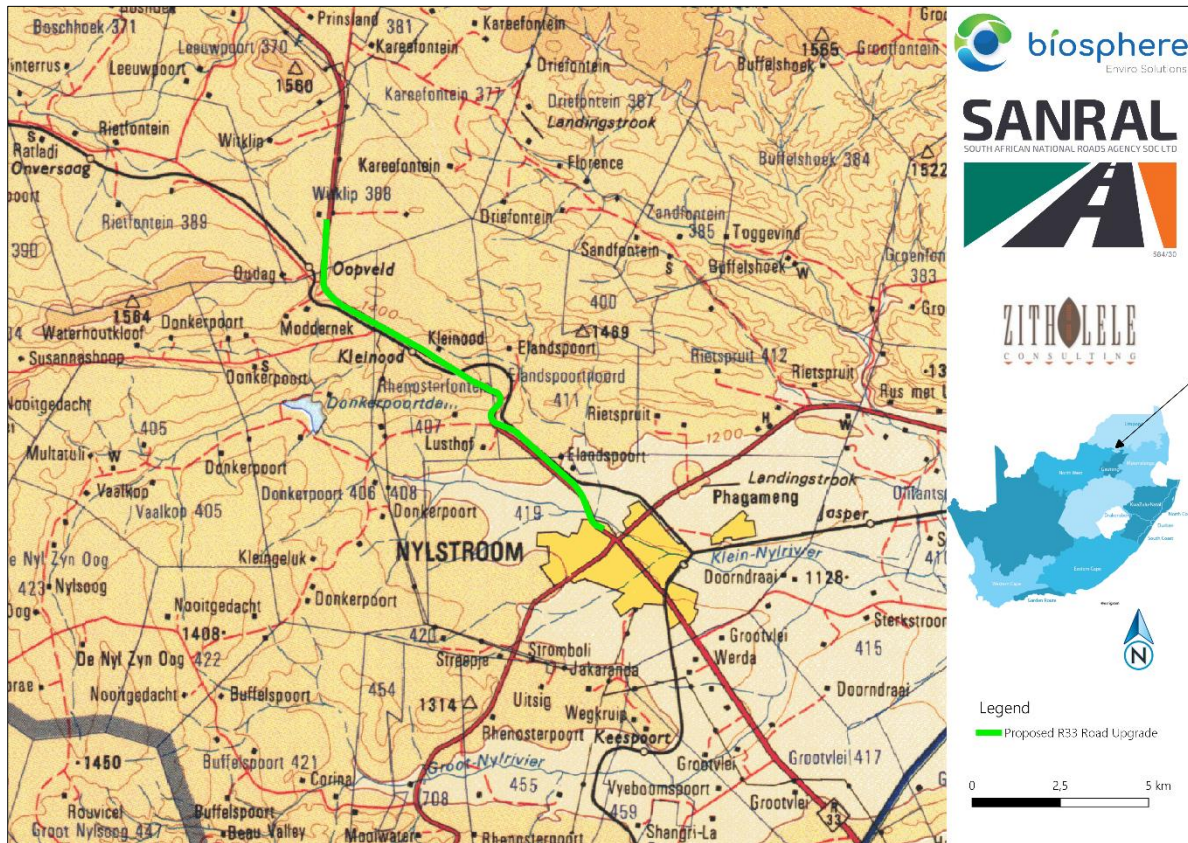


Figure 1: Locality Map

## 1.2 TERMS OF REFERENCE

The terms of reference for the Vegetation Assessment are as follows:

- Describe the affected floristic environment from available literature and by means of a desktop study to identify a list of possible floral species that are likely to occur on site.
- List and record endangered, red data and protected plant species found on site.
- List exotic and invasive plant species found on site.
- List plants found on site with medicinal properties.
- List species endemic to the study area found on site.
- Identification of anticipated impact, as well as cumulative impacts of the proposed project on the vegetation and ecosystem services
- Provide proposals for mitigation of identified impacts.
- Development of a strategy to relocate Red Data/endangered or protected species.
- Draw up a sensitivity map indicating all sensitive areas, transformed areas and buffers of 200 m around sensitive features.

### 1.3 ASSUMPTIONS AND LIMITATIONS

The field assessment was carried out in March 2023. To target flowering seasons of plant species of interest that may occur onsite, the study should include a site visit with seasonal variances. The study was conducted in summer and evidence suggest that rain has fallen. It should therefore be noted that historical transformation can be plotted using historical arial images combined with physical site characteristics.

Red and orange list species are, by their nature, very rare and difficult to locate. It is important to note that, although the predicted impacts are mostly concerned with Red Data species, any sensitive non-Red Data species will also benefit from the proposed mitigation measures as they share the same habitat and face the same potential impacts as the Red Data species.

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time, and budget. Discussions and proposed mitigations are to some extent made on reasonable and informed assumptions built on *bone fide* information sources, as well as deductive reasoning. Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may become known at a later stage. Biosphere can thus not accept responsibility for conclusions and mitigation measures made in good faith based on our own databases or on the information provided at the time of the directive. This report should therefore be viewed and acted upon with these limitations in mind.

### 1.4 STUDY APPROACH

The study approach for the study site was to identify potential sensitive areas via a desktop study and to concentrate on these areas for evaluation in the field. A comprehensive plant list was compiled, as well as plants listed as Alien and invasive species.

### 1.5 LEGISLATION

Table 1: Relevant Legislation/Agreements pertaining to Terrestrial Ecosystems and Biodiversity in SA and Limpopo

LEGISLATION	DESCRIPTION
<p>South African Constitution 108 of 1996</p>	<p>The Constitution is the supreme law of the land and includes the Bill of rights which is the cornerstone of democracy in South Africa and enshrines the rights of people in the country. It includes the right to an environment which is not harmful to human health or well-being and to have the environment protected for the benefit of present and future generations through reasonable legislative and other measures.</p>
<p>National Environmental Management Act (NEMA), 107 of 1998</p>	<p>NEMA requires that:</p> <ul style="list-style-type: none"> <li>• “development must be socially, environmentally, and economically sustainable”,</li> <li>• “disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied”, and</li> <li>• “a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions”.</li> </ul> <p>NEMA states that “the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people’s common heritage”.</p>
<p>National Environmental Management: Biodiversity Act (NEMBA), 10 of 2004</p>	<p>In terms of NEMBA, the developer has a responsibility for:</p> <ul style="list-style-type: none"> <li>• The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations),</li> <li>• Promotion of the application of appropriate environmental management tools to ensure integrated environmental management of activities thereby ensuring that all development within the area is in line with ecological sustainable development and protection of biodiversity, and</li> <li>• Limiting further loss of biodiversity and conserving endangered ecosystems.</li> <li>• Adhering to all regulations and legislation promulgated because of the National Environmental Management: Biodiversity Act (NEMBA), 10 of 2004.</li> </ul>

LEGISLATION	DESCRIPTION
	Furthermore, a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued as per Chapter 7 of NEMBA.
Alien and Invasive Species Regulations, 2014 (NEMBA)	<p>Alien and Invader plant species in South Africa are categorised according to one of the following categories:</p> <ul style="list-style-type: none"> <li>• Prohibited Species: May not be introduced into the country.</li> <li>• Category 1a Listed Invasive Species: those species that must be combatted or eradicated.</li> <li>• Category 1b Listed Invasive Species: those species that must be controlled.</li> <li>• Category 2 Listed Invasive Species: those species that require a permit to carry out a restricted activity within an area, as specified in the act / regulations.</li> <li>• Category 3 Listed Invasive Species: those species that are subject to certain exemptions and prohibitions, as specified in the act / regulations.</li> </ul>
National Water Act, 36 of 1998	The National Water Act provides for the protection of water resources, including protecting aquatic and associated ecosystems and their biodiversity and reducing and preventing pollution and degradation of water resources.
National Forests, 1998 (Act No. 84 of 1998)	The protection, sustainable management and use of forests and trees within South Africa are provided for under the National Forests Act, 1998 (Act No. 84 of 1998). Government Gazette No 26731 of August 2004, and any later revisions as released, provides a list of tree species protected under the National Forests Act.
National List of Ecosystems that are threatened and in need of Protection, No 1002 of 2011.	A national list of threatened terrestrial ecosystems and provides supporting information to accompany the list, including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed terrestrial ecosystems. It also includes individual maps and detailed information for each listed ecosystem.
Species Environmental Assessment Guidelines V2.1 (2021)	The methods used in the Species Assessment Guidelines were used to evaluate and determine sensitivities of species on and around the site. The Sensitivity was determined by using the Species Environmental Assessment Guidelines through the Site Ecological Importance.

## 2 BACKGROUND TO THE STUDY AREA

### 2.1 REGIONAL VEGETATION

#### 2.1.1 Waterberg Mountain Bushveld

Waterberg Mountains, including the foothills, escarpment, and tablelands south of the line between Lephalale and Marken and north of Bela-Bela and west of Mokopane and with outliers in the southwest such as the Boshofsberge and Vlieëpoortberge near Thabazimbi. Altitude about 1 000–1 600 m and generally at a lower altitude than the Gm 29 Waterberg-Magaliesberg Summit Sourveld.

Rugged mountains with vegetation grading from *Faurea saligna*–*Protea caffra* bushveld on higher slopes (in turn grading into the Gm 29 Waterberg-Magaliesberg Summit Sourveld) through broad-leaved deciduous bushveld (dominated by *Diplorhynchus condylocarpon*) on rocky mid- and footslopes to *Burkea africana*–*Terminalia sericea* savanna in the lower-lying valleys as well as on deeper sands of the plateaus. The grass layer is moderately developed or well developed.

#### 2.1.2 Central Sandy Bushveld

Undulating terrain occurs mainly in a broad arc south of the Springbokvlakte from the Pilanesberg in the west through Hammanskraal and Groblersdal to GaMasemola in the east. A generally narrow irregular band along the northwestern edge of the Springbokvlakte (including Modimolle) extending into a series of valleys and lower-altitude areas within the Waterberg including the upper Mokolo River Valley near Vaalwater, the corridor between Rankins Pass and the Doorndraai Dam, and the lowlands from the Mabula area to south of the Hoekberge. Some isolated sandy rises are found on the Springbokvlakte. Altitude about 850–1 450m.

Low undulating areas, sometimes between mountains, and sandy plains and catenas supporting tall, deciduous *Terminalia sericea* and *Burkea africana* woodland on deep sandy soils (with the former often dominant on the lower slopes of sandy catenas) and low, broad-leaved Combretum woodland on shallow rocky or gravelly soils. Species of *Acacia*, *Ziziphus* and *Euclea* are found on flats and lower slopes on eutrophic sands and some less sandy soils. A.

tortilis may dominate some areas along valleys. Grass-dominated herbaceous layer with relatively low basal cover on dystrophic sands.

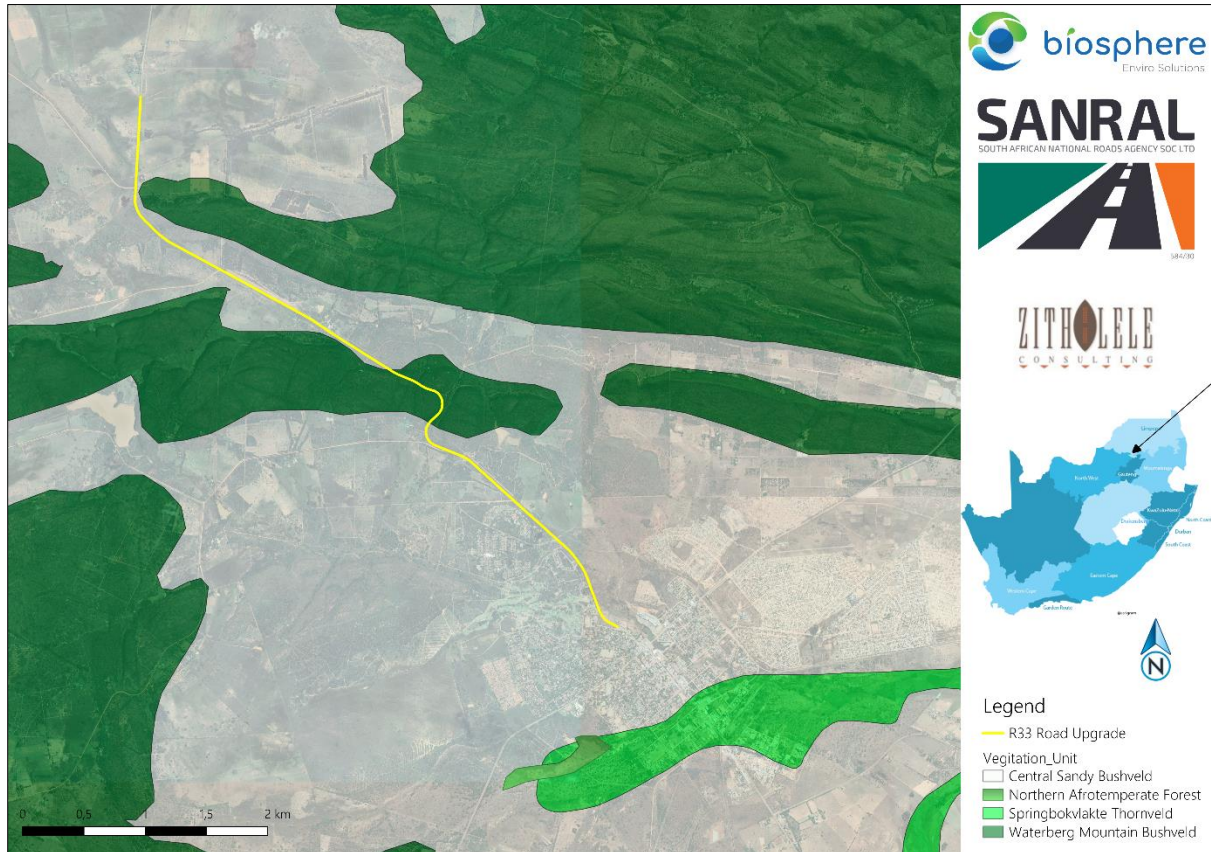


Figure 2: Vegetation Units relevant to the Study Area

## 2.2 CONSERVATION STATUS IN TERMS OF MUCINA AND RUTHERFORD (2006)

This Central Sandy Bushveld vegetation type is classified as vulnerable according to Mucina and Rutherford (2006), and less than 3% is statutorily conserved. Some 24% has been transformed for cultivation and urban sprawl. This

The Waterberg Mountain Bushveld vegetation type is classified as Least Concerned according to Mucina and Rutherford (2006), and around 9% is statutorily conserved. Some 9% has been transformed for cultivation.



### 2.3 THREATENED ECOSYSTEM STATUS

Both the Central Sandy Bushveld vegetation and Waterberg Mountain Bushveld vegetation are listed as Least Concerned in the List of Threatened Ecosystems published in 2011. This classification replaced the classification listed in Mucina and Rutherford (2006).

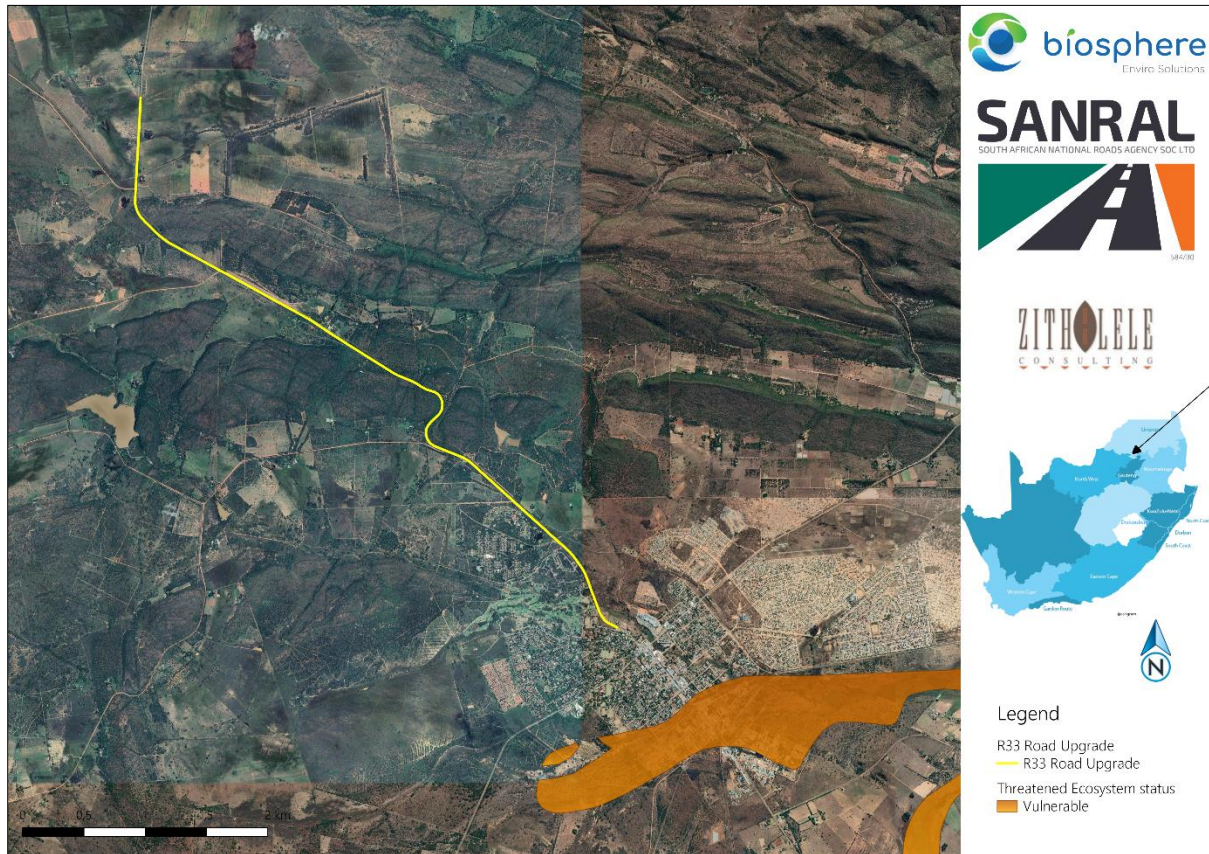


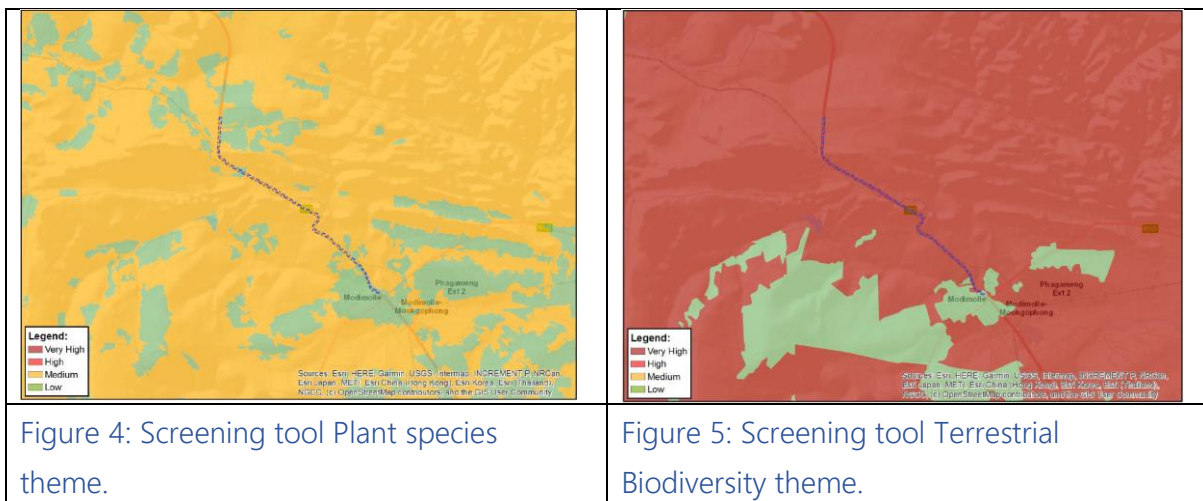
Figure 3: Threatened Ecosystem status.

### 2.4 LIMPOPO BIOREGIONAL PLAN

The Limpopo Critical Biodiversity Areas database indicates the study area as running through CBA 1, CBA2 and ESA 2 areas. It will be important to take into consideration that the Limpopo CBA map does not account for the existing R33 road that transverse through these CBA and ESA areas and therefore also through the terrestrial biodiversity of the area. The impacts on biodiversity of the current R33 will be included in the results for this study as a baseline for the proposed upgrade.

## 2.5 EIA SCREENING TOOL

The EIA screening tool awarded the entire site as a high sensitivity area and indicated the entire site as being located within CBA and ESA areas. The plant species sensitivity theme indicated the site as being of medium sensitivity and listed six potential SCC plants of medium sensitivity. As per the best practice guideline that accompanies the protocol and screening tool, the name of the sensitive species may not appear in the final BAR report nor any of the specialist reports released into the public domain.



## 2.6 GENERAL CLIMATE

Summer rainfall with very dry winters. Effectively three seasons, namely a cool dry season from May to mid-August, a hot dry season from mid-August to about October and a hot wet season from about November to April. MAP from about 500–700 mm. Frost infrequent.

## 2.7 GEOLOGY

The soil in the area mostly consists of freely drained soils, with high erodibility. This type of conditions is associated with soil with a very low Plasticity Index soil. The soil is most probably a sandy/gravel type of soil with a relatively moderate to low bearing capacity and poor grading (low Grading Modulus).

It is possible that most of the soil is weathered granite and sandstone, which will explain the low PI in the soil. It is also indicated that the soils have restricted depth, which was witnessed on the site visit. Old borrow pits are all very shallow.

It is possible that obtaining gravel for this project might be problematic.

## 2.8 CRITICAL BIODIVERSITY AREAS AND ECOLOGICAL SUPPORT AREAS

Critical Biodiversity areas and Ecological Supported areas are contained in a map produced by the Limpopo Conservation Plan V2 (LCPv2, 2013), and updated consecutively and individually for the Waterberg (2015), Mopani (2016), Vhembe (2017), Sekhukhune (2018) and Capricorn (2018) district municipalities as part the compilation of bioregional plans for these municipalities. Each bioregional plan produced an updated CBA map for the district.

Critical Biodiversity Areas within the bioregion are the portfolio of sites that are required to meet the region's biodiversity targets and need to be maintained in the appropriate condition for their category. A map of CBAs for Limpopo was produced as part of this plan and sites were assigned to CBA categories based on their biodiversity characteristics, spatial configuration, and requirement for meeting targets for both biodiversity pattern and ecological processes.

Based on the Limpopo Conservation Plan V2, 40% of the province is designated as a Critical Biodiversity Area. These CBAs have been split into CBA 1 and CBA 2 based on selection frequency and the underlying characteristics of the biodiversity features which are being protected (i.e., location fixed features such as sites for CR species and flexible ones such as Least Cost Corridors). Most of the CBAs in the province are CBA 1 (22 %), which can be considered "irreplaceable" in that there is little choice in terms of areas available to meet targets. If CBA 1 areas are not maintained in a natural state, then targets cannot be achieved. CBA 2's is considered "optimal" as there is significant design involved in their identification, make up 18 % of the province. CBA 2's represents areas where there are spatial options for achieving targets and the selected sites are the ones that best achieve targets within the landscape design objectives of the plan.

An additional 23% of the province is designated as Ecological Support Area. This category has also been split based on land-cover into ESA 1 (16%) and ESA 2 (7%), with ESA 1 being in a largely natural state while ESA 2 areas are no longer intact but potentially retain significant

importance from a process perspective (e.g., maintaining landscape connectivity). Other Natural Areas make up 20% of the province and just over 11% is designated as formal Protected Area

An objective of the CBA map is to identify a network of areas, which if managed according to the land use guidelines would meet the pattern targets for all important biodiversity features, while at the same time ensuring the areas necessary for supporting necessary ecological processes remain functional. Hence, the key measure of whether a network of Critical Biodiversity Areas is sufficient, is the extent to which targets for biodiversity features are met. Details of the extent of each biodiversity feature in protected areas and each of the categories on the Critical Biodiversity Area map.

For ease of evaluation, the categories used were aligned with those used for evaluating habitats in the National Biodiversity Assessment (Driver et al 2012). When the current Protected Area network is examined in terms of the representation of features, although the Protected Area network is extensive, it is neither efficient nor fully representative (Figure 6).

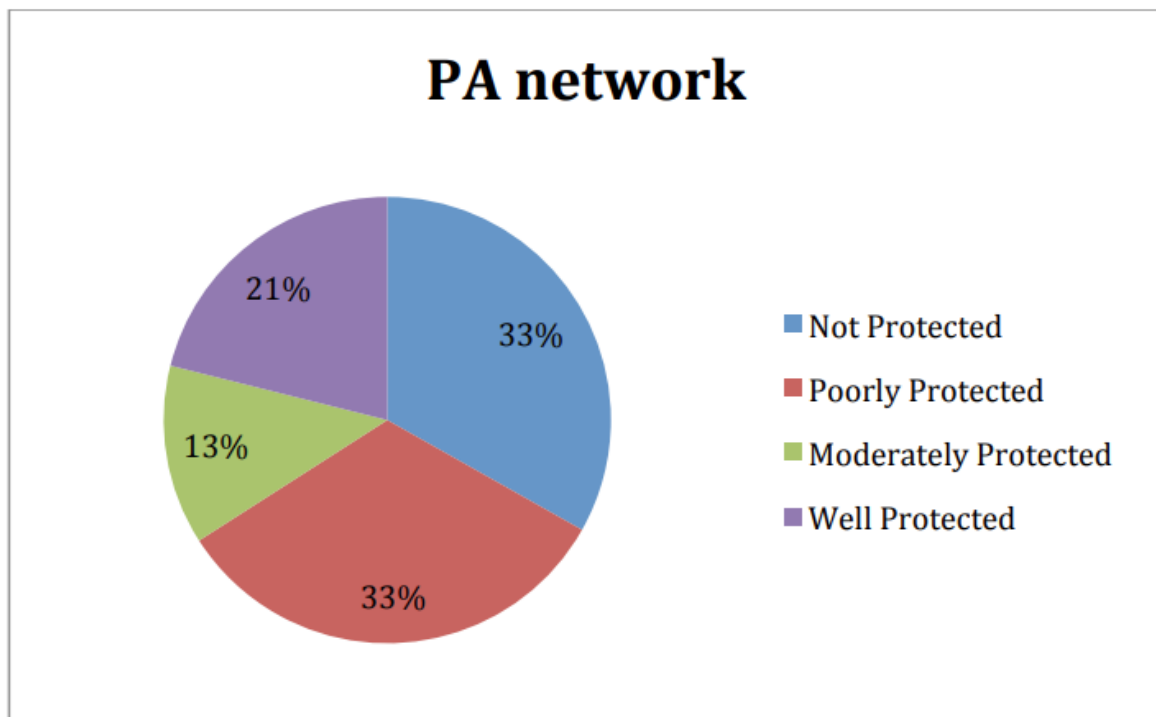


Figure 6: Targets for biodiversity features achieved by the current Protected Area network.

While 21% of the features have their targets met and are Well Protected, a third of the features (74 of the 223 types) are Not Protected while another third (73 types) are Poorly Protected. Securing the Critical Biodiversity Area network, however, in addition to the current Protected Areas, would protect a far more representative set of biodiversity features (Figure 8). 89% of features (199 out of 223 types) would be Well Protected, with the remaining 24 types being Moderately Protected.

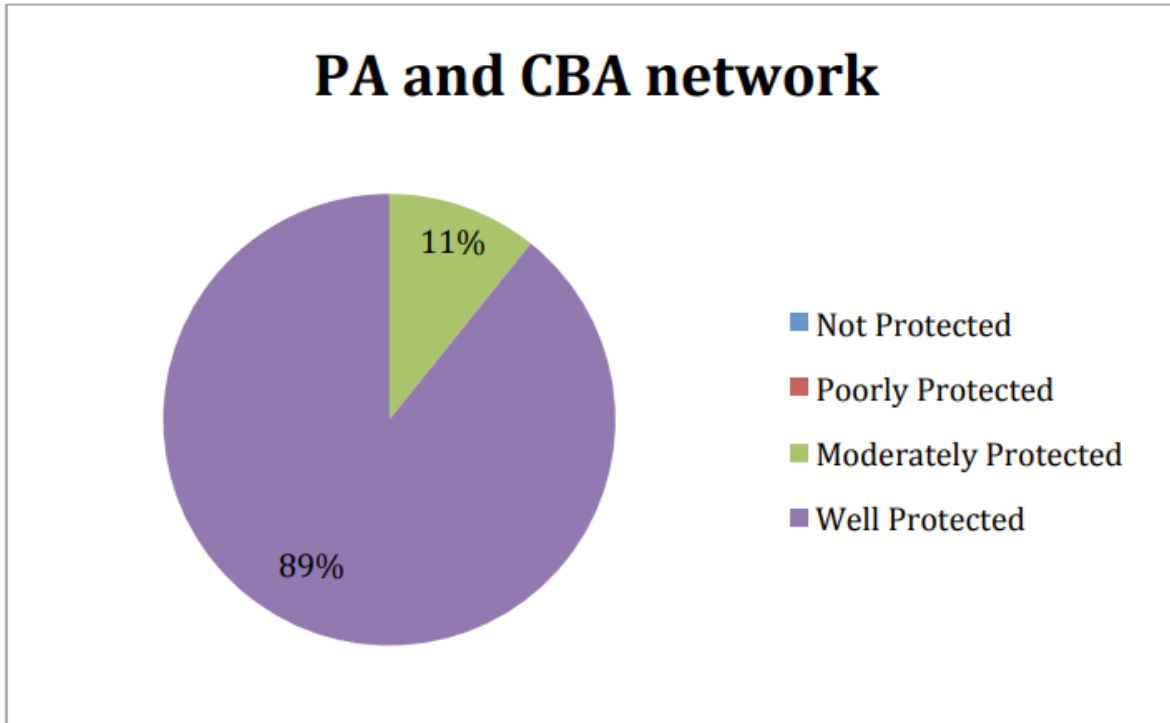


Figure 7: Targets for biodiversity features achieved by the current Protected Area network plus the identified network of Critical Biodiversity Areas

Protection of the priority areas identified in the LCPv2, and bioregional plans would contribute to meeting national biodiversity targets for the South African vegetation types.

2.8.1 Classification of CBA and ESA areas:

CBA and ESA classifications from the LCPv2 is explained below. The explanation indicates the basis on which the LCPv2 was drawn up. Each classification is listed with justification in terms of targets and proposed mitigations.

- Critical Biodiversity Areas (1) (CBA1):
  - Irreplaceable Sites.
  - Areas required to meet biodiversity pattern and/or ecological processes targets. No alternative Sites are Available to Meet targets.
  - Maintain In a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near natural state and manage for no further degradation.
- Critical Biodiversity Area (2) (CBA2):
  - Best Design Selected Sites.
  - Areas selected to meet biodiversity pattern and/or ecological process targets. Alternative sites may be available to meet targets.
  - Maintain in a natural state with limited or no biodiversity loss.
  - Maintain current agricultural activities. Ensure that land use is not intensified and that activities are managed to minimize impact on threatened species.
- Ecological Support Areas (1) (ESA1):
  - Natural, near natural and degraded areas supporting CBAs by maintaining Ecological processes.
  - Maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern.
- Ecological Support Areas (2) (ESA2):
  - Areas with no natural habitat that is important for supporting ecological processes.
  - Avoid additional / new impacts on ecological processes.
- Other Natural Areas (ONA):
  - Natural and intact but not required to meet targets or identified as CBA or ESA.
  - No management objectives, land management recommendations or land-use guidelines are prescribed.
- No natural habitat remaining:
  - Areas with no significant direct biodiversity value.
  - Not Natural or degraded natural areas that are not required as ESA, including intensive agriculture, urban, industry, and human infrastructure.
  - No management objectives, land management recommendations or land-use guidelines are prescribed.

The LCPv2 data retrieved for the study area is represented in Figure 8 . The data is based on the classification of CBA and ESA areas as described above.

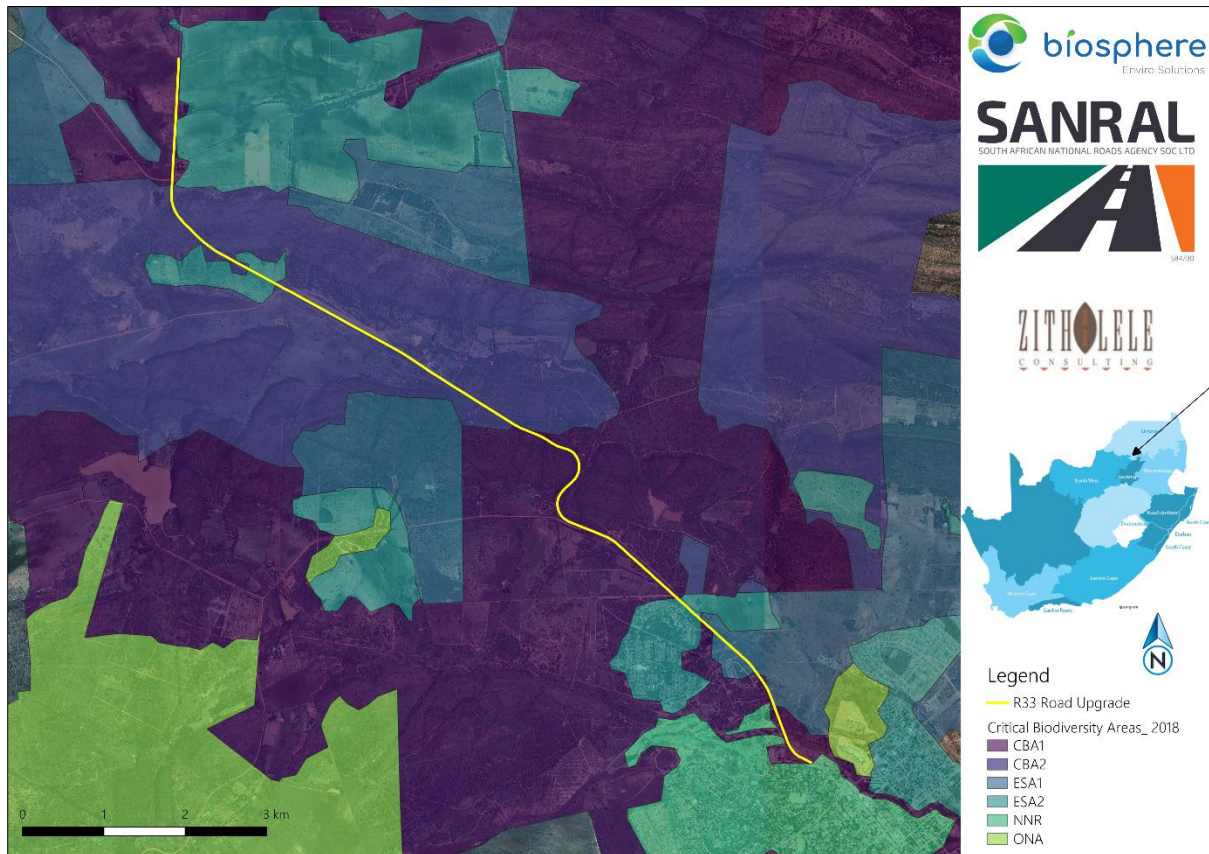


Figure 8: CBA Map in terms of the LCPv2.

### 3 METHODOLOGY

A site visit was undertaken on 22 March 2023. To describe the overall site characteristics, Google earth imagery and 1:50 000 topographical maps were used and examined. Many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have been previously disturbed. Assessing the impacts of a proposed project often requires evaluating the conservation value of the site relative to other natural areas of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site and the species found within it includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on site of national/provincial importance?

- Would development of the site lead to contravention of any international, national, or provincial legislation, policy, convention, or regulation?
- Is the site modified/disturbed in any way?

Thus, the general approach and angle adopted for this type of study is to identify any potential flora species that may be affected by the proposed development. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species. Thus, the general approach adopted for this type of study is to **identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place**, i.e., to specifically **focus on red flags and/or potential fatal flaws**. Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species.

Rare, threatened, protected and conservation-worthy species and habitats are the highest priority, the presence of which is most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources.

### 3.1 RED DATA PLANTS

South Africa has adopted the IUCN Red List Categories and Criteria to provide an objective, rigorous, scientifically founded system to identify Red List species. A published list of the Red List species of South African plants (Raimondo et al. 2009) contains a list of all species that are at risk of extinction. This list is updated regularly to take new information into account, but these are not published in book/paper format. Updated assessments are provided on the SANBI website (<http://redlist.sanbi.org/>). According to the website of the Red List of Southern African Plants (<http://redlist.sanbi.org/>), the conservation status of plants indicated on the Red List of South African Plants Online represents the status of the species within South Africa's borders. This means that when a species is not endemic to South Africa, only the portion of the species population occurring within South Africa has been assessed. The global conservation status, which is a result of the assessment of the entire global range of a species, can be found on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species: <http://www.iucnredlist.org.za>. The South African assessment is used in this study. An explanation of the conservation categories is provided in Table 2. The purpose of listing Red List plant species is to provide information on the potential occurrence of species at risk of



extinction in the study area that may be affected by the proposed infrastructure. Species appearing on these lists can then be assessed in terms of their habitat requirements to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (<http://.sanbi.org>) for the quarter degree square/s (2428CB) within which the study area is situated). Habitat information for each species was obtained from various published sources. The probability of finding any of these species will then be assessed by comparing the habitat requirements with those habitats that occur on site.

Table 2: Explanation of IUCN Ver. 3.1 categories (IUCN, 2001), and Orange List categories (Victor & Keith, 2004).

IUCN / ORANGE LIST CATEGORY	DEFINITION	CLASS
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well-known, not enough information for assessment	Data Deficient
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient
LC	Least Concern	Least Concern

For all listed plant species that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given in Table 3 below:

Table 3: Rating of likelihood of occurrence

RATING OF LIKELIHOOD	DEFINITION
LOW	No suitable habitats occur on site / habitats on site do not match habitat description for species;
MEDIUM	Habitats on site match general habitat description for species (e.g., grassland), but detailed microhabitat requirements (e.g., rocky grassland on shallow soils overlying dolomite) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;
HIGH	Habitats found on site match very strongly the general and microhabitat description for the species (e.g., rocky grassland on shallow soils overlying dolomite);
DEFINITE	Species found on site.

### 3.2 PROTECTED TREES.

Regulations published for the National Forests Act (Act 84 of 1998) as amended, provide a list of protected tree species for South Africa. The species on site and surrounding the site was checked against the list provided. The protected species list was also referenced against historical recorded data for the quarter degree grid cell to see if any of the species have been recorded historically. One protected tree species namely *Sclerocarya birrea* was found to occur within the study area.

### 3.3 PROTECTED ECOSYSTEMS

A literature review was conducted to investigate previous vegetation classification studies carried out on / near the study site. These studies were investigated before the field visit. To describe broad vegetation patterns within the study area, Mucina and Rutherford (2006) were used.



Figure 10: Classifications of vegetation types in accordance with their ecological status (Driver et al., 2005).

To describe the conservation status of the vegetation units occurring within the study area, Mucina and Rutherford (2006), The National List of Ecosystems that need Protection (NEMBA, 2004) and the method described in Strelitzia 17 (Driver et al., 2005) is used. This method classifies vegetation types into four categories, according to the percentage of untransformed natural habitat remaining (Figure 10).

A survey was conducted on rare and protected plants that might possibly occur in the study area. For this investigation, the South African National Biodiversity Institute (SANBI), PRECIS and SIBIS websites and databases were consulted. The possible and actual presence of rare and protected species were recorded during the field visit. A field assessment was conducted to classify vegetation zones, identify rare and protected species, and identify sensitive habitats. This was done by doing a survey of the site.

Vegetation communities were identified during the survey and a vegetation assessment was carried out at sites within each vegetation zone.

### 3.4 SENSITIVITY ANALYSIS

The location of potentially sensitive features in the study area was determined by taking the following into consideration:

- A field survey was conducted on 22 March 2023.
- Satellite imagery/Google Earth imagery was used to determine natural state of land cover against areas already transformed.
- The National Spatial Biodiversity Assessment (NSBA) is a conservation planning tools from the Mpumalanga province that was used in the sensitivity mapping.
- Habitat in which sensitive plants occur was deemed as sensitive.

Sensitivity rating intensities are given in Table 4 below. Areas containing untransformed natural vegetation of conservation concern, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 4: Explanation of sensitivity ratings.

RATING	FACTORS CONTRIBUTING TO SENSITIVITY	EXAMPLES OF QUALIFYING FEATURES
VERY HIGH	<p>Indigenous natural areas that are highly positive for any of the following:</p> <ul style="list-style-type: none"> <li>• <u>Presence of threatened species</u> (Critically Endangered, Endangered, Vulnerable) and/or habitat critical for the survival of populations of threatened species.</li> <li>• <u>High conservation status</u> (low proportion remaining intact, highly fragmented, habitat for species that are at risk).</li> <li>• <u>Protected habitats</u> (areas protected according to national / provincial legislation, e.g., National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act).</li> </ul>	<ul style="list-style-type: none"> <li>• CBA 1 areas.</li> <li>• Remaining areas of vegetation type listed in Ecosystem List of NEM: BA as Critically Endangered, Endangered or Vulnerable.</li> <li>• Protected forest patches.</li> <li>• Confirmed presence of populations of threatened species.</li> </ul>
HIGH	<p>Indigenous natural areas that are positive for any of the following:</p> <ul style="list-style-type: none"> <li>• High <u>intrinsic biodiversity value</u> (moderate/high species richness and/or turnover).</li> <li>• Presence of <u>habitat highly suitable</u> for threatened species (Critically Endangered, Endangered, Vulnerable species).</li> </ul>	<ul style="list-style-type: none"> <li>• CBA 2 “critical biodiversity areas”.</li> <li>• Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records).</li> <li>• Confirmed habitat for species of lower threat status (near threatened,</li> </ul>

	<ul style="list-style-type: none"> <li>Moderate ability to respond to disturbance (moderate resilience, dominant species of intermediate age).</li> <li>Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk).</li> <li>Moderate to high value ecological goods &amp; services (e.g., water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value).</li> </ul> <p>And may also be positive for the following:</p> <ul style="list-style-type: none"> <li>Protected habitats (areas protected according to national / provincial legislation, e.g., National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act).</li> </ul>	<p>rare).</p> <ul style="list-style-type: none"> <li>Habitat containing individuals of extreme age.</li> <li>Habitat with low ability to recover from disturbance.</li> <li>Habitat with exceptionally high diversity (richness or turnover).</li> <li>Habitat with unique species composition and narrow distribution.</li> <li>Ecosystem providing high value ecosystem goods and services.</li> </ul>
<p>MEDIUM-HIGH</p>	<p>Indigenous natural areas that are positive for one or two of the factors listed above, but not a combination of factors.</p>	<ul style="list-style-type: none"> <li>CBA 2 "corridor areas".</li> <li>Habitat with high diversity (richness or turnover).</li> <li>Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records).</li> </ul>
<p>MEDIUM</p>	<p>Other indigenous natural areas in which factors listed above are of no particular concern. May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural</p>	<p>N/A</p>

	habitat is still ecologically functional.	
MEDIUM-LOW	Degraded or disturbed indigenous natural vegetation. May also include secondary vegetation in an advanced stage of development in which habitat is still ecologically functional.	N/A
LOW	No natural habitat remaining.	N/A

Any natural vegetation within which there are features of conservation concern will be classified into one of the high sensitivity classes (MEDIUM-HIGH, HIGH, or VERY HIGH. The difference between these three high classes is based on a combination of factors and can be summarised as follows:

1. Areas classified into the **VERY HIGH** class are vital for the survival of species or ecosystems. They are either known sites for threatened species or are ecosystems that have been identified as being remaining areas of vegetation of critical conservation importance. CBA1 areas would qualify for inclusion into this class.
2. Areas classified into the **HIGH** class are of high biodiversity value, but do not necessarily contain features that would put them into the VERY HIGH class. For example, a site that is known to contain a population of a threatened species would be in the VERY HIGH class, but a site where a threatened species could potentially occur (habitat is suitable), but it is not known whether it does occur there or not, is classified into the HIGH sensitivity class. The class also includes any areas that are not specifically identified as having high conservation status, but have high local species richness, unique species composition, low resilience or provide very important ecosystem goods and services. CBA2 "irreplaceable biodiversity areas" would qualify for inclusion into this class, if there were no other factors that would put them into the highest class.
3. Areas classified into the **MEDIUM-HIGH** sensitivity class are natural vegetation in which there are one or two features that make them of biodiversity value, but not to the extent that they would be classified into one of the other two higher categories. CBA2 "corridor areas" would qualify for inclusion into this class.

### 3.5 IMPACT ASSESSMENT METHODOLOGY

The potential environmental impacts can be identified and evaluated according to their severity, duration, extent, and significance. The following sections will describe the various aspects in detail.

Nature of impact/risk: The type of effect that a proposed activity will have on the environment.

#### 3.5.1 DIRECT, INDIRECT & CUMULATIVE

DESCRIPTOR	DEFINITION
Direct Impact	Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
Indirect Impact	Indirect impacts of an activity are indirect or induced changes that may occur because of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place because of the activity.
Cumulative Impact	Cumulative impacts are impacting that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably near future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

#### 3.5.1 IMPACT DIRECTION

DESCRIPTOR	DEFINITION
Positive	Environment overall will benefit from the impact/risk
Negative	Environment overall will be adversely affected by the impact/risk
Neutral	Environment overall will not be affected

### 3.5.2 SPATIAL EXTENT OF IMPACT

EXTENT DESCRIPTOR	DEFINITION	RATING
Site	Impact footprint remains within the boundary of the site.	1
Local	Impact footprint extends beyond the boundary of the site to the adjacent surrounding areas.	2
Regional	Impact footprint includes the greater surrounds and may include an entire municipal or provincial jurisdiction.	3
National	The scale of the impact is applicable to the Republic of South Africa.	4
Global	The impact has global implications	5

### 3.5.3 DURATION OF IMPACT

DURATION SCRIPTOR	DEFINITION	RATING
Construction / Decommissioning phase only	The impact endures for only as long as the construction or the decommissioning period of the project activity. This implies that the impact is fully reversible.	1
Short term	The impact continues to manifest for a period of between 3 and 5 years beyond construction or decommissioning. The impact is still reversible.	2
Medium term	The impact continues between 6 and 15 years beyond the construction or decommissioning phase. The impact is still reversible with relevant and applicable mitigation and management actions.	3
Long term	The impact continues for a period in excess of 15 years beyond construction or decommissioning. The impact is only reversible with considerable effort in implementation of rigorous mitigation actions.	4
Permanent	The impact will continue indefinitely and is not reversible.	5



### 3.5.4 POTENTIAL INTENSITY OF IMPACT

Criteria for impact rating of potential intensity of a negative impact.

POTENTIAL INTENSITY DESCRIPTOR	DEFINITION OF NEGATIVE IMPACT	RATING
Low	Negative change with no associated consequences.	1
Moderate-Low	Nuisance impact	2
Moderate	Substantial alteration and/or reduction in environmental quality/loss of habitat/loss of heritage/loss of welfare amenity	4
Moderate-High	Severe alteration to faunal or floral populations/loss of livelihoods/individual economic loss.	8
High	Extreme alteration to human health linked to mortality/loss of a species/endemic habitat.	16

Criteria for the impact rating of potential intensity of a positive impact.

POTENTIAL INTENSITY DESCRIPTOR	DEFINITION OF POSITIVE IMPACT	RATING
Low	Positive change with no other consequences.	1
Moderate-Low	Economic development	2
Moderate	Improved environmental quality/improved individual livelihoods.	4
Moderate-High	Net improvement in human welfare	8

### 3.5.5 PROBABILITY / LIKELYHOOD OF IMPACT

LIKELIHOOD DESCRIPTOR	DEFINITION	RATING
Improbable	The possibility of the impact occurring is negligible and only under exceptional circumstances.	0.1

Very Unlikely	The possibility of the impact occurring is low with a less than 30% chance of occurring.	0.2
Unlikely	The impact has a 30% to 50% chance of occurring.	0.5
Likely	The impact has a 51% to 90% chance of occurring.	0.75
Definite	The impact has a >90% chance of occurring regardless of preventative measures.	1

### 3.5.6 SIGNIFICANCE RATING SCALE

Score	Implications for Decision-making	Rating
< 3	The risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures and will not have an influence on decision-making. Project can be authorized with low risk of environmental degradation	Low
3 - 9	The risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures and will only have an influence on the decision-making if not mitigated. Project can be authorized but with conditions and routine inspections. Mitigation measures must be implemented.	Moderate
10 - 20	The risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making. Project can be authorized but with strict conditions and high levels of compliance and enforcement. Monitoring and mitigation are essential.	High
21 - 26	The risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making. The project cannot be authorized unless major changes to the engineering design are carried out to reduce the significance rating.	Fatally Flawed

### 3.5.7 Reversibility of the Impacts.

The extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):

Descriptor	Definition
High reversibility	Impact is highly reversible at end of project life.
Moderate reversibility	Moderate reversibility of impacts.
Low reversibility	Low reversibility of impacts.
Impacts are non-reversible	The impact is permanent, i.e., this is the least favorable assessment for the environment.

### 3.5.8 Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks.

The degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):

Descriptor	Definition
High irreplaceability	The project will destroy unique resources that cannot be replaced, i.e., this is the least favorable assessment for the environment
Moderate irreplaceability	Moderate irreplaceability of resources
Low irreplaceability	Low irreplaceability of resources.
Resources are replaceable	The affected resource is easy to replace/rehabilitate, i.e., this is the most favorable assessment for the environment.

### 3.5.9 Confidence.

The degree of confidence in predictions based on available information and specialist knowledge.

Descriptor	Definition
Low	EAP / Specialist has low confidence in assessment due to significant limitations such as unavailability of data or information
Medium	EAP / Specialist has medium confidence in assessment due to some limitations such as unavailability of data or information
High	EAP / Specialist has high confidence in assessment.

## 4 RESULTS

### 4.1 BROAD VEGETATION TYPES

According to the Mucina and Rutherford (2006) vegetation map of the country, the study area falls partially within two main vegetation types of namely **Central Sandy Bushveld** and **Waterberg Mountain Bushveld** which falls into the Savannah Biome.

A list of expected common and dominant species in undisturbed **Central Sandy Bushveld** includes the following (those with a "d" are dominant):

- **Tall Trees:** *Acacia burkei* (d), *A. robusta*, *Sclerocarya birrea subsp. caffra*.
- **Small Trees:** *Burkea africana* (d), *Combretum apiculatum* (d), *C. zeyheri* (d), *Terminalia sericea* (d), *Ochna pulchra*, *Peltophorum africanum*, *Rhus leptodictya*.
- **Tall Shrubs:** *Combretum hereroense*, *Grewia bicolor*, *G. monticola*, *Strychnos pungens*. **Low Shrubs:** *Agathisanthemum bojeri* (d), *Indigofera filipes* (d), *Felicia fascicularis*, *Gnidia sericocephala*. **Geoxylic Suffrutex:** *Dichapetalum cymosum* (d).
- **Woody Climber:** *Asparagus b Buchananii*.
- **Graminoids:** *Brachiaria nigropedata* (d), *Eragrostis pallens* (d), *E. rigidior* (d), *Hyperthelia dissoluta* (d), *Panicum maximum* (d), *Perotis patens* (d), *Antheophora pubescens*, *Aristida scabrivalvis subsp. scabrivalvis*, *Brachiaria serrata*, *Elionurus muticus*, *Eragrostis nindensis*, *Loudetia simplex*, *Schmidtia pappophoroides*, *Themeda triandra*, *Trachypogon spicatus*.
- **Herbs:** *Dicerocaryum senecioides* (d), *Barleria macrostegia*, *Blepharis integrifolia*, *Crabbea angustifolia*, *Evolvulus alsinoides*, *Geigeria burkei*, *Hermannia lancifolia*, *Indigofera daleoides*, *Justicia anagalloides*, *Kyphocarpa angustifolia*, *Lophiocarpus tenuissimus*, *Waltheria indica*, *Xerophyta humilis*.
- **Geophytic Herb:** *Hypoxis hemerocallidea*.
- **Succulent Herb:** *Aloe greatheadii var. davyana*.

A list of expected common and dominant species in undisturbed **Waterberg Mountain Bushveld** includes the following (those with a "d" are dominant):

- **Tall Tree:** *Acacia robusta*.
- **Small Trees:** *Acacia caffra* (d), *Burkea africana* (d), *Combretum apiculatum* (d), *Croton gratissimus* (d), *Cussonia transvaalensis* (d), *Faurea saligna* (d), *Heteropyxis natalensis* (d), *Ochna pulchra* (d), *Protea caffra* (d), *Albizia tanganyicensis*, *Combretum molle*, *Englerophytum magalimontanum*, *Ficus burkei*, *F. glumosa*, *Ochna pretoriensis*,

*Pseudolachnostylis maprouneifolia*, *Rhus lancea*, *Terminalia sericea*, *Vangueria infausta*, *V. parvifolia*.

- **Tall Shrubs:** *Diplorhynchus condylocarpon* (d), *Elephantorrhiza burkei* (d), *Combretum moggii*, *C. nelsonii*, *Dichrostachys cinerea*, *Euclea crispa* subsp. *crispa*, *Gnidia kraussiana*, *Olea capensis* subsp. *enervis*, *O. europaea* subsp. *africana*, *Rhus pyroides* var. *pyroides*, *Strychnos pungens*, *Vitex rehmannii*.
- **Low Shrubs:** *Anthospermum rigidum* subsp. *rigidum*, *Barleria affinis*, *Felicia muricata*, *Helichrysum kraussii*, *Protea welwitschii* subsp. *welwitschii*, *Rhus rigida* var. *dentata*.
- **Geoxylic Suffrutices:** *Dichapetalum cymosum*, *Parinari capensis* subsp. *capensis*.
- **Succulent Shrubs:** *Aloe chabaudii*, *Lopholaena coriifolia*.
- **Woody Climbers:** *Ancylobotrys capensis* (d), *Rhoicissus revoilii*.
- **Graminoids:** *Loudetia simplex* (d), *Schizachyrium sanguineum* (d), *Trachypogon spicatus* (d), *Brachiaria serrata*, *Digitaria eriantha* subsp. *eriantha*, *Elionurus muticus*, *Enneapogon scoparius*, *Setaria sphacelata*, *Themeda triandra*, *Tristachya leucothrix*.
- **Herbs:** *Berkheya insignis*, *Chamaecrista mimosoides*, *Geigeria elongata*, *Hibiscus meyeri* subsp. *transvaalensis*, *Xerophyta retinervis*.
- **Geophytic Herbs:** *Haemanthus humilis* subsp. *humilis*, *Hypoxis rigidula*.

## 4.2 HABITAT ASSESSMENT

The study area is situated within a savannah setting with undulating hills and flat areas along the route. A large portion of the study site has been historically altered by means of cultivation, transformation for development purposes, farms, and access roads. The road reserve of the R33 have been cleared historically except for some individual trees, leaving the road reserve with mostly a grass vegetation cover as illustrated in Figure 11 and 12 below.

The habitat assessment included indigenous vegetation, transformed areas due to cultivation, roads and homesteads, Eucalyptus stands and wet areas.

The habitat assessment noted a clear transformation of vegetation within the current road reserve for the R33 that is not currently applied to bioregional spatial plans of the area. The road reserve has been cleared and tree stands were gradually replaced with grass species. The road reserve at the mountain pass section (roughly km 4.5-6.0) is narrower than at other areas along the route resulting in more natural vegetation being vulnerable for the road upgrade.

The results of an edge effect could clearly be observed within the dynamics between the road reserve and adjacent natural vegetation as more grass species and other plants encroached onto the vegetation units.

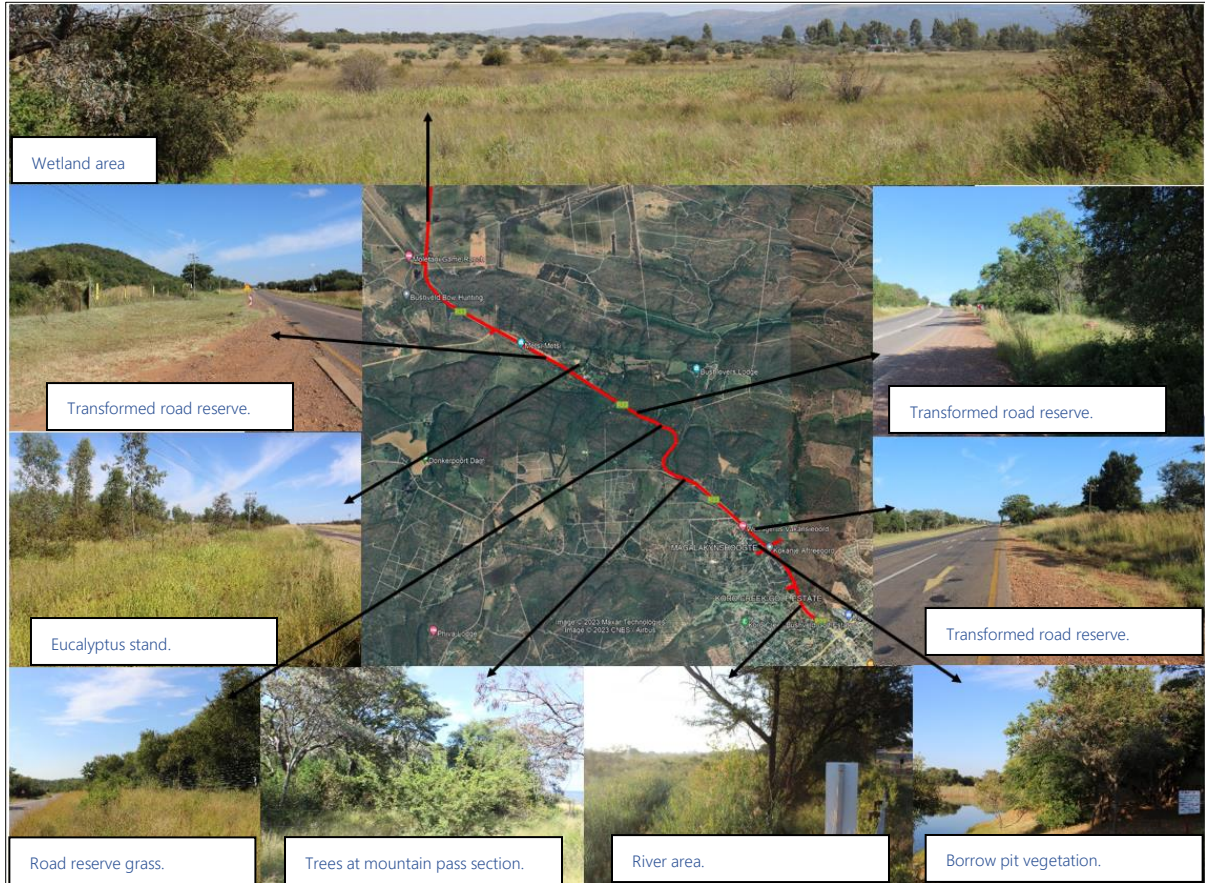


Figure 11: Site Characteristics

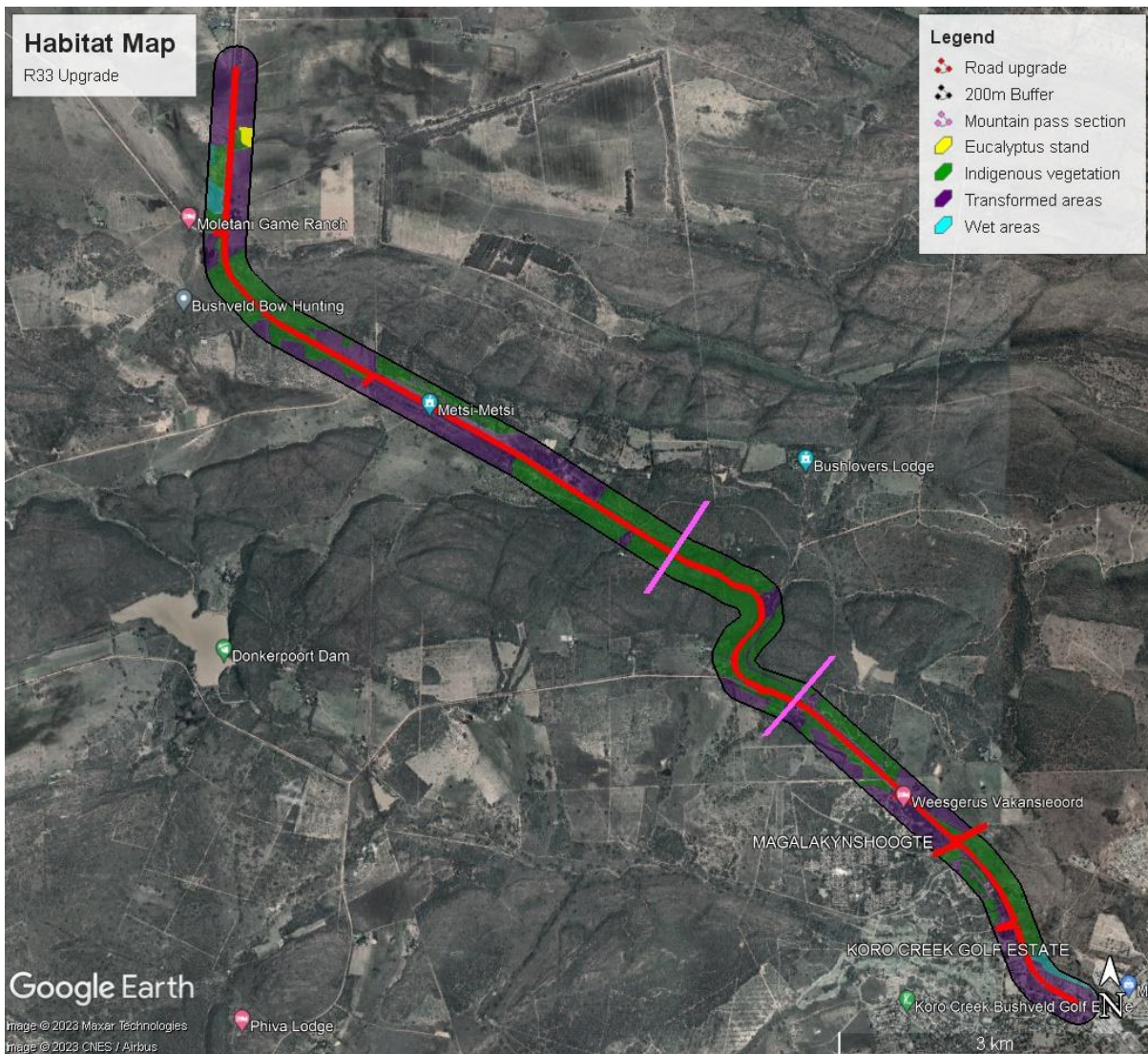


Figure 12: Habitat Assessment

### 4.3 PLANTS OF THE STUDY AREA

#### 4.3.1 Protected trees found on site.

One species of protected trees is found within the road reserve. 12 Maroela tree specimens (*Sclerocarya birrea*) were found within the road reserve. It is from the *Anacardiaceae* family. Although this tree species is of Least concern in terms of South African distribution (SANBI), it is protected in terms of the National Forests Act (Act No. 84 OF 1998). The trees can be found at the following coordinates:

Table 5: Coordinates of protected trees found within the development footprint area.

Protected tree	Coordinates
1. <i>Sclerocarya birrea</i>	-24.682049° 28.388703°
2. <i>Sclerocarya birrea</i>	-24.678651° 28.384578°
3. <i>Sclerocarya birrea</i>	-24.658541° 28.362859°
4. <i>Sclerocarya birrea</i>	-24.654509° 28.355758°
5. <i>Sclerocarya birrea</i>	-24.653715° 28.354447°
6. <i>Sclerocarya birrea</i>	-24.642886° 28.333329°
7. <i>Sclerocarya birrea</i>	-24.642675° 28.332906°
8. <i>Sclerocarya birrea</i>	-24.642576° 28.332732°
9. <i>Sclerocarya birrea</i>	-24.642552° 28.332609°
10. <i>Sclerocarya birrea</i>	-24.644116° 28.335772°
11. <i>Sclerocarya birrea</i>	-24.643926° 28.335428°
12. <i>Sclerocarya birrea</i>	-24.643616° 28.334831°

#### 4.3.2 Vegetation found on site.

Species encountered directly adjacent to the existing road is listed below from the study conducted in March 2023. It must be noted that this list is not a comprehensive list of all species that occurs along the route. The purpose of this list was to determine if the species present can be associated with the specific vegetation type as described in Mucina and Rutherford (2006).

Table 6: Vegetation found on site.

GENUS	SPECIES	SUB SPECIE	Plant status	AREA AND SPECIAL NOTE
<b>TREES AND SHRUBS</b>				
<i>Burkea</i>	<i>africana</i>		Indigenous	Widespread
<i>Combretum</i>	<i>apiculatum</i>		Indigenous	Mountain pass outside road reserve
<i>Combretum</i>	<i>molle</i>		Indigenous	Mountain pass outside road reserve
<i>Eucalyptus</i>	<i>grandis</i>		Alien invasive Category 1b	



<i>Ficus</i>	<i>burkei</i>		Indigenous	Mountain pass outside road reserve
<i>Gleditsia</i>	<i>triacanthos</i>		Alien invasive Category 1b	River areas
<i>Grewia</i>	<i>bicolor</i>		Indigenous	Widespread
<i>Lantana</i>	<i>camara</i>		Alien invasive Category 1b	Widespread
<i>Melia</i>	<i>azedarach</i>		Alien invasive Category 1b	River crossings
<i>Morus</i>	<i>nigra</i>		Alien invasive Category 2	River areas
<i>Ochna</i>	<i>pulchra</i>		Indigenous	Mountain pass outside road reserve
<i>Vachellia</i>	<i>caffra</i>		Indigenous	Mountain pass outside road reserve Along route just outside road reserve
<i>Sclerocarya</i>	<i>birrea</i>	<i>caffra.</i>	Indigenous	Widespread also <u>inside</u> road reserve
<i>Searsia</i>	<i>lancea</i>		Indigenous	Mountain pass outside road reserve
<i>Searsia</i>	<i>leptodictya</i>		Indigenous	Widespread
<i>Terminalia</i>	<i>sericea</i>		Indigenous	Widespread mostly outside Mountain pass
<b>SUCCULANTS</b>				
<i>Aloe</i>	<i>greatheadii</i>	<i>var. davyana.</i>	Indigenous	Wetland area
<i>Cereus</i>	<i>jamacaru</i>		Alien invasive Category 1b	Widespread
<i>Opuntia</i>	<i>Ficus-indica</i>		Alien invasive Category 1b	Widespread
<i>Vangueria</i>	<i>infausta</i>		Indigenous	Mountain area
<b>HERBS</b>				
<i>Alternanthera</i>	<i>pungens</i>		Indigenous	Widespread

<i>Alysicarpus</i>	<i>rugosus</i>		Indigenous	Widespread
<i>Amaranthus</i>	<i>spinosus</i>		Indigenous	River areas
<i>Bidens</i>	<i>pilosa</i>		Indigenous	River areas/ widespread
<i>Canna</i>	<i>indica</i>		Alien invasive Category 1b	Within properties along the route
<i>Cirsium</i>	<i>vulgare</i>		Alien invasive Category 1b	River areas
<i>Flaveria</i>	<i>bidens</i>		Alien invasive Category 1b	River areas
<i>Gomphrena</i>	<i>celosioides</i>		Indigenous	Widespread in road reserve
<i>Ipomoea</i>	<i>purpurea</i>		Alien invasive Category 1b	Widespread/river area
<i>Richardia</i>	<i>brasiliensis</i>		Indigenous	River areas
<i>Solanum</i>	<i>nigrum</i>		Indigenous	Widespread
<i>Solanum</i>	<i>elaeagnifolium</i>		Alien invasive Category 1b	River areas
<i>Tagetes</i>	<i>minuta</i>		Indigenous	Widespread inside road reserve
<i>Taraxacum</i>	<i>officinale</i>		Indigenous	Road reserve
<i>Richardia</i>	<i>brasiliensis</i>		Indigenous	Widespread
<i>Verbena</i>	<i>aristigera</i>		Indigenous	Road reserve
<i>Verbena</i>	<i>bonariensis</i>		Alien invasive Category 1b	River areas
<i>Xanthium</i>	<i>strumarium</i>		Alien invasive Category 1b	River area
<b>GRASSES AND SEDGES</b>				
<i>Aristida</i>	<i>congesta</i>		Indigenous	Road reserve
<i>Arundo</i>	<i>donax</i>		Alien invasive Category 1b	River areas
<i>Chloris</i>	<i>virgata</i>		Indigenous	Widespread
<i>Cymbopogon</i>	<i>excavatus</i>		Indigenous	Widespread
<i>Cyperus</i>	<i>esculentus</i>		Indigenous	River area

<i>Cynodon</i>	<i>dactylon</i>		Indigenous	Widespread
<i>Eragrostis</i>	<i>chloromelas</i>		Indigenous	Grassland
<i>Eragrostis</i>	<i>curvula</i>		Indigenous	Widespread
<i>Eragrostis</i>	<i>plana</i>		Indigenous	Widespread
<i>Eragrostis</i>	<i>plana</i>		Indigenous	Widespread
<i>Heteropogon</i>	<i>contortus</i>		Indigenous	Widespread and in the road reserve
<i>Hyparrhenia</i>	<i>hirta</i>		Indigenous	Road reserve
<i>Imperata</i>	<i>cylindrica</i>		Indigenous	River area
<i>Kyllinga</i>	<i>alba</i>		Indigenous	River area
<i>Melinis</i>	<i>repens</i>		Indigenous	Widespread
<i>Pennisetum</i>	<i>clandestinum</i>		Alien invasive Category 1b	River areas
<i>Phragmites</i>	<i>australis</i>		Indigenous	Dams
<i>Themeda</i>	<i>triandra</i>		Indigenous	Widespread
<i>Thypha</i>	<i>capensis</i>		Indigenous	River areas
<i>Trachyandra</i>	<i>salitii</i>		Indigenous	Grassland

The above-mentioned species were recorded directly adjacent to the study site with a drive through site visit. Out of 58 species observed on the site, 16 of the plants were NEMBA listed Alien Invasive plants (AIP) and are subject to actions as stipulated under the NEMBA Act.

- 15 NEMBA Category 1b AIP plants were identified and must be controlled.
- 1 NEMBA Category 2 AIP plant was recorded and must be controlled.
- No prohibited species were recorded on or around the site.

The above table was used to make some conclusions in terms of the study area.

The species list produced confirmed that areas of natural vegetation do correspond with the vegetation associated with the two vegetation types namely Central Sandy Bushveld and Waterberg Mountain Bushveld.

## 5 IMPACT ASSESSMENT

Potential issues relevant to potential impacts on the terrestrial ecology of the study area include the following:

- **Impacts on terrestrial biodiversity:** this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- **Impacts on sensitive habitats:** this includes impacts on any sensitive or protected habitats, including indigenous forest, and wetland vegetation that leads to direct or indirect loss of such habitat.
- **Impacts on ecosystem function:** this includes impacts on any processes or factors that maintain ecosystem health and character.
- **Potential of increase of erosion:** this includes impacts due to clearance of vegetation.
- **Potential increase in alien invasive species:** this impact is due to the aggressive competing nature of alien invasive species in an area where natural vegetation is disturbed.

### 5.1 DESCRIPTION OF POTENTIAL IMPACTS

#### Impact 1: Loss or fragmentation of indigenous natural vegetation

**Nature:** Construction of infrastructure may lead to direct loss of vegetation.

This may lead to localised or more extensive reduction in the overall extent of vegetation. There are factors that may aggravate this potential impact. For example, where this vegetation has already been stressed due to degradation and transformation at a regional level, the loss may lead to increased vulnerability (susceptibility to future damage) of the habitat and a change in the conservation status (current conservation situation).

Consequences of the potential impact of loss of indigenous natural vegetation occurring may include:

1. Negative change in conservation status of habitat (Driver et al. 2005).
2. Increased vulnerability of remaining portions to future disturbance.
3. General loss of habitat for sensitive species.
4. Loss in variation within sensitive habitats due to loss of portions of it.

5. General reduction in biodiversity.
6. Increased fragmentation (depending on location of impact).
7. Disturbance to processes maintaining biodiversity and ecosystem goods and services; and
8. Loss of ecosystem goods and services.

The vegetation types on site are based in the classification of Munica and Rutherford (2006) as the Central Sandy Bushveld and Waterberg Mountain Bushveld which are both classified as "least concerned". The vegetation type is not listed in the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004). The road does transverse through CBA 1, CBA2 and ESA 2 areas in accordance with the 2018 Limpopo Integrated CBA map.

#### **Impact 2: Loss of individuals of threatened plants**

**Nature:** Plant species are especially vulnerable to development since they cannot move out of the path of the construction activities but are also affected by overall loss of habitat.

Threatened species include those classified as critically endangered, endangered, or vulnerable. For any other species, a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened plant species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations.

Consequences may include:

1. Fragmentation of populations of affected species.
2. Reduction in area of occupancy of affected species; and
3. Loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chance of survival of the species. No red data plants were recorded within the road study area. One protected tree species (12 samples of Maroela trees) were recorded in the road reserve that may likely be impacted on due to the road upgrade. The impact assessment specifically included the impact on protected trees in the Assessment.

### **Impact 3: Loss of individuals of protected tree species.**

**Nature:** Some tree species in South Africa is protected in terms of the National Forest Act (Act No. 84 of 1998). These tree species require special permits to remove.

Consequences may include:

1. Change in age profile of trees in the area.
2. Reduction in area of occupancy of affected species; and
3. Loss of genetic variation within affected species.

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 or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated.

### **Impact 4: Establishment and spread of declared weeds and alien invader plants.**

Major factors contributing to invasion by alien invader plants includes *inter alia* high disturbance (such as clearing for construction activities) and negative grazing practices. Exotic species are often more prominent near infrastructural disturbances than further away.

Consequences of this may include:

1. Loss of indigenous vegetation.
2. Change in vegetation structure leading to change in various habitat characteristics.
3. Change in plant species composition.
4. Change in soil chemical properties.
5. Loss of sensitive habitats.
6. Loss or disturbance to individuals of rare, endangered, endemic and/or protected species.
7. Fragmentation of sensitive habitats.
8. Change in flammability of vegetation, depending on alien species.
9. Hydrological impacts due to increased transpiration and runoff; and
10. Impairment of wetland function.

There are several alien species that may become problematic in the study area. There is therefore the potential for alien plants to spread or invade following disturbance on site.

#### **Impact 5: Potential increase in erosion due to clearance of vegetation.**

Vegetation cover establishes areas of soil stability. Clearance of vegetation may lead to rapid soil erosion.

Consequences of this may include:

1. Loss of indigenous vegetation.
2. Change in plant species composition.
3. Change in soil chemical properties.
4. Fragmentation of sensitive habitats.
5. Hydrological impacts due to increased transpiration and runoff; and
6. Loss of soil layers.

#### **Impact 6: Fragmentation of vegetation continuity**

Vegetation continuity is needed to ensure that fragmentation is avoided. Fragmented vegetation is susceptible to change from invasive plant species and the edge effect.

Consequences of this may include:

1. Loss of indigenous vegetation.
2. Change in plant species composition.
3. Fragmentation of sensitive habitats.

## 5.2 ASSESSMENT OF IMPACTS

The following was considered:

- Loss or fragmentation of indigenous natural vegetation due to clearance of vegetation for the road upgrade and upgrade of culverts and bridges.
- Loss of individuals of threatened plants.
- Loss of protected tree species.
- Establishment and spread of alien invasive plant species.
- Potential increase in erosion due to clearance of vegetation.
- Disruption of continuity of vegetation communities.

Mitigation measures are proposed to ensure that the rating of significance could be reduced into a more acceptable rating. The six identified impacts were adopted into Table 7 to Table 12 below.



Table 7: Impact Assessment for Loss and Fragmentation of indigenous natural vegetation.

Impact Description		Impact type	Extent (E)	Duration (D)	Potential	Likelihood	Impact Rating & Significance	Mitigation & Management Measures
Impact	Direct Impact:	Significance without Mitigation						<p>Clearance of vegetation to be limited to areas detrimental for the road upgrade. No unnecessary expanded areas to be cleared due to misinformation or a lack of project scope. Areas historically cleared due to the existing R33 road reserve must be used as far as possible without extending outside of the road reserve. No unnecessary vehicle movement within the river and natural areas must be allowed. Vehicle movements must be limited to specific construction roads and vehicles may not drive into any natural vegetated areas that is not part of the project scope. Any spillages of hydrocarbon materials must be prevented from reaching drainage ways as this may affect the broader vegetation communities.</p> <p>Rehabilitation must be undertaken for</p>
Impact Direction:	Negative	Existing Impact	2	2	4	0.75	6 - MOD	
Aspect:	Clearance of vegetation within a CBA area	Project Impact	2	1	4	0.75	5 - MOD	
Potential Impact:		Significance with Mitigation						
Loss or fragmentation of indigenous natural vegetation due to clearance of vegetation for the road upgrade and upgrade of culverts and bridges.	Residual Impact		2	1	2	0.2	1 - LOW	
	Reversibility		Moderate reversibility					
	Irreplaceability		Moderate irreplaceability					

							affected areas. He use of indigenous vegetation and grasses must be prioritized.
	Cumulative Impact					Description of Cumulative Impact	
	Cumulative Impact	2	1	4	0.75	5 - MOD	The current road reserve shows signs of secondary vegetation growth mainly consisting of grass vegetation which is a buffer for the edge effect that impacts adjacent indigenous vegetation. Clearance of vegetation adjacent to the existing R33 will lead to an extension of the edge effect and will impact on the bushveld vegetation cumulatively.
	Confidence	High					

Table 8: Impact Assessment for Loss of individuals of threatened plants.

Impact Description		Impact type	E	D	P	L	IR&S	Mitigation & Management Measures
Impact	Direct Impact:	Significance without Mitigation						<p>The current transformed status of the road reserve makes it very unlikely that and plants of conservation concern resides within the study area. Any plants with distinct character found on site during construction must be reported to the ECO and inspected.</p>
Impact Direction:	Negative	Existing Impact	2	1	2	0.2	1 - LOW	
Aspect:	Clearance of vegetation	Project Impact	2	1	2	0.2	1 - LOW	
Potential Impact:		Significance with Mitigation						
Loss of individuals of threatened plants.	Residual Impact	2	1	2	0.2	1 - LOW		
	Reversibility	Moderate reversibility						
	Irreplaceability	Moderate irreplaceability						
	Cumulative Impact						Description of Cumulative Impact	
	Cumulative Impact	1	1	1	0.1	0 - LOW	<p>Loss of plants of conservational concern will lead to pressure in the conservation status of those plants and could increase its protection status.</p>	
Confidence	High							

Table 9: Impact Assessment for Loss of protected tree species.

Impact Description		Impact type	E	D	P	L	IR&S	Mitigation & Management Measures
Impact	Direct Impact:	Significance without Mitigation						<p>All Maroela trees found on site must be surveyed and recorded. Maroela trees removal are subject to a permit application. Prior to construction, a vegetation ecologist or ECO with the applicable experience and knowledge must undertake a walk-down of the road upgrade section to tag Maroela trees to be removed. Each Maroela tree to be removed must be included in a permit application. Permit applications must be lodged with the Department of Forestry, Fisheries, and the Environment (DFFE). Small Maroela trees must be considered as landscaping an any areas to be landscaped.</p>
Impact Direction:	Negative	Existing Impact	2	3	8	1	13 - HIGH	
Aspect:	Clearance of vegetation	Project Impact	2	3	8	1	13 - HIGH	
Potential Impact:		Significance with Mitigation						
Loss of protected tree species	Residual Impact	2	1	4	0.75	5 - MOD		
	Reversibility	Low reversibility						
	Irreplaceability	Low irreplaceability						
	Cumulative Impact							Description of Cumulative Impact
	Cumulative Impact	1	1	1	0.1	0 - LOW		
Confidence	High						<p>Maroela trees are Least Concerned, but they are protected trees. These trees can easily be grown from seed and the loss of clearance of vegetation impacts the age factor of the trees in the area.</p>	

Table 10: Impact Assessment for Establishment and spread of declared weeds and alien invader plants.

Impact Description		Impact type	E	D	P	L	IR&S	Mitigation & Management Measures		
Impact	Direct Impact:	Significance without Mitigation						12 - HIGH	Alien Invasive plants on site must be controlled by physical or chemical control. Physical removal is advised and when chemical removal is considered, only registered herbicides must be used. Use of herbicides close to watercourses must be avoided and if needed, only approved herbicides for use close to water may be used. An on-going monitoring programme should be implemented to detect and quantify any alien invasive plants that may establish on site. Patches of Giant Spanish reeds that infested the river areas must be controlled by means of an alien invasive management programme. This plan must set specific targets for treatment and follow-ups.	
Impact Direction:	Negative	Existing Impact	2	2	8	1				
Aspect:	Clearance of vegetation	Project Impact	2	2	8	1				
Potential Impact:		Significance with Mitigation						0 - LOW	Alien invasive plants left unmanaged will eventually outcompete indigenous vegetation in the direct area and neighboring areas.	
Establishment and spread of declared weeds and alien invader plants		Residual Impact	1	1	1	0.1				
		Reversibility	High reversibility							
		Irreplaceability	Low irreplaceability							
		Cumulative Impact								Description of Cumulative Impact
		Cumulative Impact	2	1	4	0.75	5 - MOD			
		Confidence	Medium							

Table 11: Impact Assessment for Increased erosion.

Impact Description		Impact type	E	D	P	L	IR&S	Mitigation & Management Measures	
Impact	Direct Impact:	Significance without Mitigation							Do not clear large areas of indigenous vegetation at a time without work being conducted in that specific area. Erosion control must be implemented where vegetation cover is removed by strict monitoring and implementing erosion control measures where needed. Use of siltation bags, berms or gabions can reduce erosion by slowing the run of water. Revegetation of cleared areas must be undertaken as soon as possible. Topsoil stockpiles must be protected from erosion. Topsoil must be protected from getting washed into drainage ways.
Impact Direction:	Negative	Existing Impact	2	1	4	0.75	5 - MOD		
Aspect:	Clearance of vegetation	Project Impact	2	1	4	0.75	5 - MOD		
Potential Impact:		Significance with Mitigation							Erosion of topsoil will lead to difficulty of establishment of vegetation cover as Topsoil contains seeds and organic materials needed for cover establishment.
Increased erosion due to clearance of vegetation as soils are highly erodible especially in the absence of vegetation cover.	Residual Impact	1	1	1	0.5	2 - LOW			
	Reversibility	Moderate reversibility							
	Irreplaceability	Low irreplaceability							
	Cumulative Impact							Description of Cumulative Impact	
	Cumulative Impact	1	1	1	0.1	0 - LOW			
Confidence	Medium								

Table 12: Impact Assessment for Disruption of continuity of vegetation communities

Impact Description		Impact type	E	D	P	L	IR&S	Mitigation & Management Measures	
Impact	Direct Impact:	Significance without Mitigation						Ensure that new temporary access roads are not established parallel to the existing R33 within indigenous vegetation that may contribute to fragmentation of existing intact vegetation communities.	
Impact Direction:	Negative	Existing Impact	2	1	4	0.75	5 - MOD		
Aspect:	Clearance of vegetation	Project Impact	2	1	4	0.75	5 - MOD		
Potential Impact:		Significance with Mitigation							
Disruption of continuity of vegetation communities.	Residual Impact	1	1	1	0.1	0 - LOW			
	Reversibility	Moderate reversibility							
	Irreplaceability	Low irreplaceability							
	Cumulative Impact								Description of Cumulative Impact
	Cumulative Impact	1	1	1	0.1	0 - LOW			
Confidence	High						Geographical distribution of vegetation communities will be disrupted on a regional scale if continuous disruption of vegetation communities is allowed to take place		

## 6 SENSITIVITY ASSESSMENT

Within this section, the sensitivity of the study area is determined and discussed. The sensitivity assessment determines which parts of the study area have a high conservation value and / or may be sensitive to disturbance caused by the proposed project.

Areas containing untransformed natural vegetation of conservation concern, high diversity, habitat complexity, red list organisms and / or systems vital to sustaining ecological function are considered sensitive. In contrast, areas that are transformed and have little importance for ecological functioning are of low sensitivity.

Using the methodology as indicated in in Section 2.6, a sensitivity rating of **High sensitivity** was given to areas outside of the existing road reserve in Figure 13. This is due to the following:

- CBA 2 “critical biodiversity areas”.
- Habitat with low ability to recover from disturbance as indicated in green in Figure 12.
- Habitat with exceptionally high diversity (richness or turnover) as indicated in green in Figure 12.
- Ecosystem providing high value ecosystem goods and services.

Transformed areas within the road reserve has a Low sensitivity due to the following:

- The proposed widening of the road will mostly be undertaken within the existing road reserve of the existing R33 road. The road reserve has previously been cleared when the road was constructed, leaving mostly grass species and regrowth in the road reserve.
- The 12 recorded Maroela trees in the road reserve has a protected tree status. These tree species was avoided by contractors when the R33 was constructed. These tree species do not form part of the red list of plant species in South Africa and has a national status of “Least Concern”.
- No natural habitat remaining.



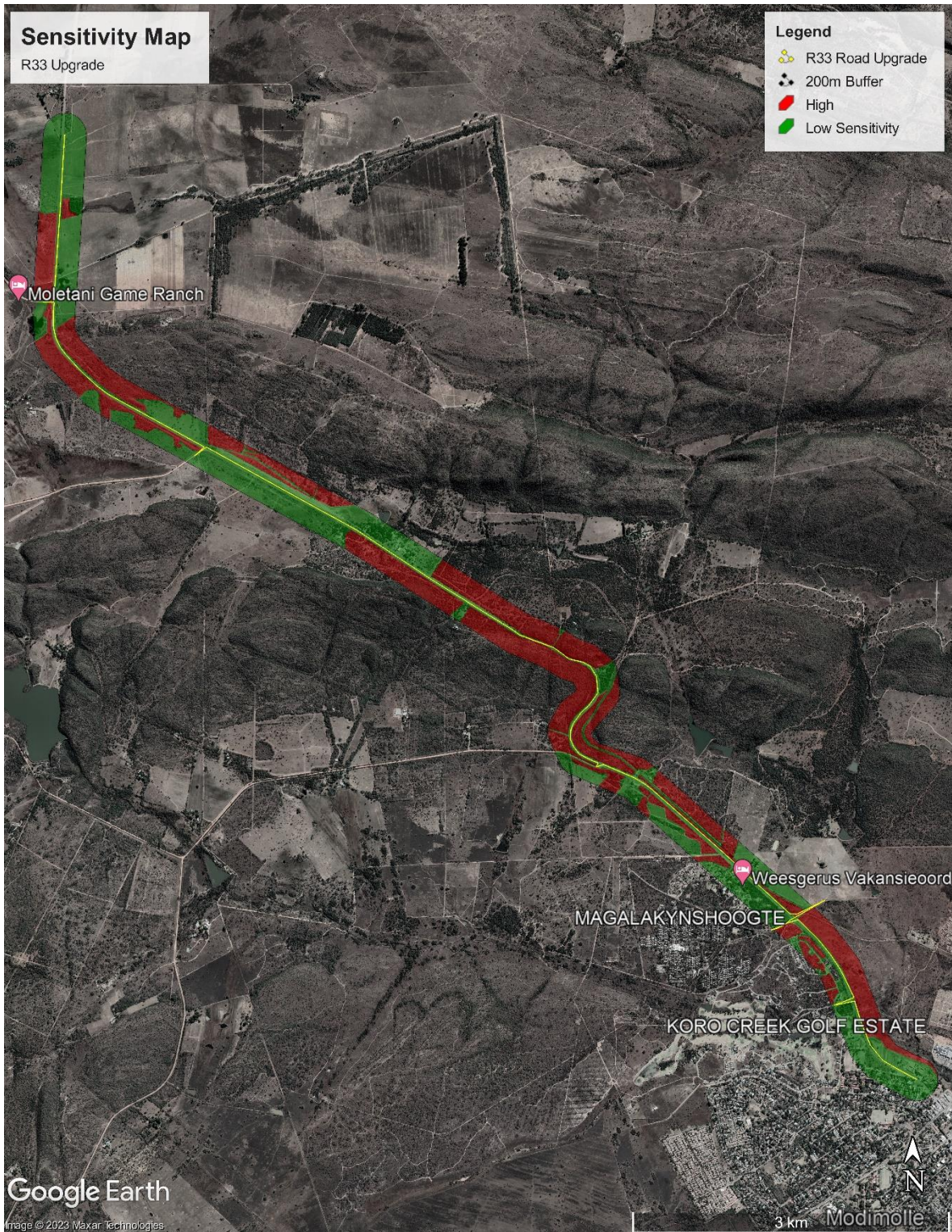


Figure 13: Sensitivity Map

## 7 DISCUSSION & CONCLUSION

The project area lies within the Savanna Biome. Two vegetation types, according to the National Vegetation Map (SANBI, 2006 – 2018), occur in the project area, namely Waterberg Mountain Bushveld and the Central Sandy Bushveld.

Site Ecological characteristics:

- The Waterberg Mountain Bushveld and Central Sandy Bushveld are both not listed in the “National List of Ecosystems that are Threatened and in need of protection” and are classified as Least Concern by the 2018 National Biodiversity Assessment.
- The study area is situated in an area categorized as a Critical Biodiversity Area (CBA1 and CBA2), Ecological Support Area (ESA 1 and ESA 2) in terms of the Limpopo bio-sector plan.
  - CBA 1 areas are deemed irreplaceable and are required to meet biodiversity patterns and ecological processes targets.
  - CBA2 areas selected to meet biodiversity targets.
  - ESA 1 areas - Natural, near natural and degraded areas supporting CBAs by maintaining Ecological processes.
  - ESA 2 areas - Areas with no natural habitat that is important for supporting ecological processes.

Two broad vegetation units were identified to occur mostly outside of the proposed project footprint, i.e., Waterberg Mountain Bushveld and Central Sandy Bushveld. The planned upgrades are largely focused on the existing road reserve where the two vegetation units have already been impacted and mostly transformed.

Areas associated with the mountain pass (as illustrated in the habitat map in Figure 12 in pink) has more concentrated indigenous vegetation closer to the road reserve due to historical road cuts into the mountain sides, which will probably be impacted on most.

Although the site is located within designated CBA areas in accordance with bioregional information of Limpopo (LCPv2), the existing R33 road impact was not considered in these maps which would have resulted in a lower conservation status. The road reserve did contribute to an edge effect on adjacent vegetation compositions historically and the existing road reserve is mostly transformed.

Summary of Floral species findings:

- A total of 58 plant species were recorded in the study area during the time of the study and indicates moderate species diversity. The purpose of the species assessment was to identify any SCC plants and to determine vegetation unit association.
- 12 specimens of the protected tree species *Sclerocarya birrea* (Marula) was found to occur on the project footprint where the road upgrade will most likely have an impact. These tree species are protected in terms of the National Forest Act 84 of 1998. These trees are of Least Concern but protected. The coordinates of these trees are provided below:

Table 13: Coordinates of protected trees found within the development footprint area.

Protected tree	Coordinates
1. <i>Sclerocarya birrea</i>	-24.682049° 28.388703°
2. <i>Sclerocarya birrea</i>	-24.678651° 28.384578°
3. <i>Sclerocarya birrea</i>	-24.658541° 28.362859°
4. <i>Sclerocarya birrea</i>	-24.654509° 28.355758°
5. <i>Sclerocarya birrea</i>	-24.653715° 28.354447°
6. <i>Sclerocarya birrea</i>	-24.642886° 28.333329°
7. <i>Sclerocarya birrea</i>	-24.642675° 28.332906°
8. <i>Sclerocarya birrea</i>	-24.642576° 28.332732°
9. <i>Sclerocarya birrea</i>	-24.642552° 28.332609°
10. <i>Sclerocarya birrea</i>	-24.644116° 28.335772°
11. <i>Sclerocarya birrea</i>	-24.643926° 28.335428°
12. <i>Sclerocarya birrea</i>	-24.643616° 28.334831°

- No SCC was identified to occur on the project footprint during the site survey.
- 16 NEMBA listed Alien Invasive plants were listed that need to be controlled.

The impact assessment indicated that all impacts in terms of terrestrial biodiversity and plant species is of medium to low significance after mitigation. The impact on threatened plants is deemed to be low as most of the site has been disturbed historically and no SCC plants were found.

All areas identified as part of the development is suitable for development. Areas within the mountain pass section as illustrated in pink in Figure 12, contains concentrated bushveld vegetation as the road reserve is narrow due to cutting of the road into the mountain sides.

It is the opinion of the specialist that the proposed upgrade of the R33 could be approved by the competent authority. The findings of the specialist study, for impacts on terrestrial biodiversity and plants, would be within acceptable limits if all mitigation measures are implemented. Conditions of this statement would require permit applications for all protected trees that would be affected by the proposed R33 upgrade.

## 8 RECOMMENDATIONS

The following recommendations are made with regards to the proposed development:

1. An Environmental Control Officer must be appointed to oversee mitigation measures during construction and will be responsible for the monitoring and auditing of the contractor's compliance with the conditions of the Environmental Impact Management Plan and mitigation measures imposed in the terrestrial biodiversity Assessment Report.
2. Work should be limited to the existing road reserve where possible.
3. Areas of natural vegetation associated with CBA 1 areas must be Maintained in a natural state with limited or no biodiversity loss.
4. Rehabilitate degraded areas to a natural or near natural state and manage to ensure no further degradation.
5. CBA 2 areas must be maintained in a natural state with limited or no biodiversity loss.
6. Ensure that land use is not intensified and that activities are managed to minimize impact on threatened species.
7. Areas to be disturbed by construction activity as well as areas for ancillary activities such as stockpiles, storage yards or site offices must be clearly demarcated in already disturbed areas or areas where they will cause minimal disturbance.
8. No construction camps should be allowed within any areas marked as Highly sensitive in the Sensitivity map.
9. All mitigation measures described in this report must be adopted into a legal Environmental Management Programme to be used during construction of the planned project.

## 9 REFERENCES

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