

April 2023

**SPECIALIST CONFIRMING STATEMENT:
Ecological Assessment of the
Proposed Merensky-Uchoba 132kV Deviation 2,
2023**

A report commissioned
by



ENVIROGUARD ECOLOGICAL SERVICES CC

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SPECIALIST STATEMENT

The contents of this specialist report comply with the legislated requirements as described in the “Standard for the Development and Expansion of Power Lines and Substations within Identified Geographical Areas (revision 2 – June 2022) by the Department of Forestry, Fisheries and the Environment (2022).

NUMBER	STATEMENT													
1	<p><i>A statement on the duration, date and season of the site verification inspection and walkthrough as well as the relevance of the season to the outcome of the confirming statement.</i></p>													
	<p>The survey was conducted during a once-off site visit on 29 March 2023 which is within the middle of the growing season with most plants flowering and identifiable.</p>	<p>See pages 6-8</p>												
2	<p><i>Confirmation that the terrestrial ecology (flora and fauna) within the final pre-negotiated route and/or the substation location is low based on the most recently available desktop data, site verification inspection and walk through.</i></p>													
	<p>Seven vegetation units were identified in the proposed deviation corridor. The correspondent Biodiversity Importance (environmental sensitivity) is as follows:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Vegetation Unit</th> <th style="text-align: center;">Biodiversity Importance</th> </tr> </thead> <tbody> <tr> <td>Unit 1: <i>Vachellia tortilis</i> shrubland</td> <td style="text-align: center;">Low</td> </tr> <tr> <td>Unit 2: <i>Senegalia grandicornuta-Terminalia prunoides</i> woodland</td> <td style="text-align: center;">Medium (to be mitigated)</td> </tr> <tr> <td>Unit 3: Tributaries</td> <td style="text-align: center;">High (to be avoided)</td> </tr> <tr> <td>Unit 4: Degraded areas</td> <td style="text-align: center;">Very low</td> </tr> <tr> <td>Unit 5: Developed areas</td> <td style="text-align: center;">Very Low</td> </tr> </tbody> </table> <p>Pylon placement will NOT take place within the areas identified as having ‘n High Biodiversity Importance (indicated as to be avoided – unit 3). These areas may however be spanned by the power line conductors because the impact to the ecological sensitivity will be minimal / zero.</p>	Vegetation Unit	Biodiversity Importance	Unit 1: <i>Vachellia tortilis</i> shrubland	Low	Unit 2: <i>Senegalia grandicornuta-Terminalia prunoides</i> woodland	Medium (to be mitigated)	Unit 3: Tributaries	High (to be avoided)	Unit 4: Degraded areas	Very low	Unit 5: Developed areas	Very Low	<p>See Section 3 & Figures 12-14</p>
Vegetation Unit	Biodiversity Importance													
Unit 1: <i>Vachellia tortilis</i> shrubland	Low													
Unit 2: <i>Senegalia grandicornuta-Terminalia prunoides</i> woodland	Medium (to be mitigated)													
Unit 3: Tributaries	High (to be avoided)													
Unit 4: Degraded areas	Very low													
Unit 5: Developed areas	Very Low													
3	<p><i>Identification of terrestrial ecological areas to be avoided within the final pre-negotiated route, including buffers and/or the substation location.</i></p>													
	<p>The Tributaries (vegetation unit 3) should be avoided due to their water channelling functions.</p>	<p>See Section 3 & Figures 12-14</p>												
4	<p><i>A terrestrial biodiversity sensitivity map, generated by the screening tool and enhanced by any relevant additional information including the walkthrough, overlaid with the proposed development footprint (i.e. pylon placement and power line route, as well as supporting infrastructure).</i></p>													
	<p>The sensitivity map shows that the largest part of the proposed deviation route has a low ecological sensitivity except for vegetation unit 3 which comprises small sections of the route and 100m corridor. Pylon placement within vegetation unit 2 (medium Ecological sensitivity) need to be ground-truthed during the final design phase to ensure that no threatened species is affected.</p>	<p>See Figures 12-16 Sections 3.2.2 & 3.2.3</p>												

5	<i>A description on how the identified environmental sensitivity, relating to terrestrial ecology, has been considered in determining the final pre-negotiated route and/or the substation location.</i>	
	The sensitivity map (Figures 12-14) indicates the areas to be avoided in the final placement of the pylons. It is not thought that the proposed deviation route would have any negative effect on the ecosystems provided that no placement of pylons is done within the Tributaries (vegetation unit 3) and that placement in the <i>Senegalia grandicornuta-Terminalia prunoides</i> woodland (vegetation unit 2) is mitigated and ground-truthed.	See Section 4 & See Figures 14-16
6	<i>A description on how the identified engineering constraints, relating to terrestrial ecology, have been considered in determining the preferred route.</i>	
	The pylons should easily be able to span the sensitive tributary areas, while it would be able to move pylons within vegetation unit 2 should it impact threatened species.	See Section 4
7	<i>A description of the implementation of the mitigation hierarchy in order to determine the final pre-negotiated route and/or substation location.</i>	
	<p>The mitigation hierarchy includes the following steps (in order of decreasing desirability): Avoid, Minimise, Rehabilitate, and Offset. In the case of this project, the following applies:</p> <ul style="list-style-type: none"> • <u>Avoid</u> <i>The High Biodiversity Areas (environmental sensitive areas – unit 3) will be avoided (pylon placement will not take place within these areas).</i> • <u>Minimise</u> <i>Impact to the biodiversity of the site will be minimised in all other units especially unit 2, by implementing the site-specific mitigation measures, read together with the Eskom Generic EMPr.</i> • <u>Rehabilitate</u> <i>Rehabilitation of disturbed areas will be done according to the Eskom Generic EMPr.</i> • <u>Offset</u> Offsets are not applicable to this project. 	See Section 4
8	<i>How the comments from interested and affected parties on the proposed route and/or substation location were incorporated.</i>	
	This Specialist Confirming Statement is being distributed together with the Draft Environmental Sensitivity Report (ESR) for public comment. Should any input from the public change the content / outcome of this report, amendments will be made and submitted with the Final ESR. The Final ESR will be submitted to DFFE for decision making and registration of the project.	

9a	<p>A statement confirming that:</p> <p>a). impact management actions as contained in the pre-approved Generic EMPr template are sufficient for the avoidance, management and mitigation of impacts and risks; or</p> <p>b). where required, specific impact management outcomes and actions are required and have been provided as part of the site specific EMP</p>	
	<p>The impact management actions in the pre-approved Generic EMPr template are sufficient for the avoidance, management and mitigation of impacts and risks are mostly sufficient, but additional site-specific mitigation measures are provided and also needs to be applied.</p>	<p>See Sections 3 & 4</p>

CONDITIONS RELATING TO THIS REPORT

Declaration of interest

Enviroguard Ecological Services cc and its members/co-workers:

- Have no vested interest in the property studied nor is it affiliated with any other person/body involved with the property and/or proposed development.
- Is not a subsidiary, legally or financially of the proponent.
- 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 No. 107 of 1998) (NEMA).
- Declare that remuneration for services provided by Enviroguard Ecological Services cc and its members/co-workers is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.
- 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 NEMA.
- Reserve the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field.
- Is committed to biodiversity conservation but concomitantly recognize the need for economic development. We reserve the right to form and hold our own opinions within the constraints of our specialities and experience, and therefore will not submit willingly to the interests of other parties or change our statements to appease them.

The study was undertaken by Prof. LR Brown (PhD UP). He is registered as a Professional Natural Scientist with the following details:

Prof LR Brown: Reg. No. 400075/98 (Botanical Science and Ecological Science).

He has the following qualifications:

SPECIALIST	QUALIFICATION
Prof. L.R. Brown	PhD Terrestrial plant ecology MSc. Water ecology BSc Hons (Botany) BSc (Ed) (Botany, Zoology, Education) Wetland and Riparian Delineation (<i>DWAF Accredited Course</i>) Soil Classification and Wetland Delineation Short Course – TERRASOIL Science Wetland Legislation Course - Wetrest

Indemnity

Although Enviroguard Ecological Services cc exercises due care and diligence in rendering services and preparing documents, the client takes full responsibility for this report and its implementation in terms of the National Environmental Management Act of 1998, and exempt Enviroguard Ecological Services cc and its associates and their sub-contractors from any legal responsibility based on the timing of the assessment, the result and the duration thereof, which has an influence on the credibility and accuracy of this report. Enviroguard Ecological Services cc accepts no liability, and the client, by receiving this document, indemnifies Enviroguard Ecological Services cc and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Enviroguard Ecological Services cc and by the use of the information contained in this report.

Factors limiting the quality of this study

A once off survey was conducted during the summer (wet) season on 29 March 2023. Thus, only those flowering plants that flowered at the time of the visit could be identified with high levels of confidence. Some of the more rare and cryptic species may have been overlooked due to their inconspicuous growth forms. Many of the rare and endangered succulent species can only be distinguished (in the veld) from their very similar relatives on the basis of their reproductive parts. These plants flower during different times of the year. Multiple visits to any site during the different seasons of the year could therefore increase the chances to record a larger portion of the total species complex associated with the area. A broad assessment of the habitat for the threatened faunal species was done based on literature and the site visit. The survey of the study site is considered as successful with a correct identification of the different vegetation units.

General assumptions

This report is a combination of desktop based and field data collected on the site. Although the surrounding areas were observed and important features noted, no formal survey of any kind was conducted in such areas. Thus, the descriptions of the various ecosystems are based on limited fieldwork as specified above and available literature. However, the data collected, and time spent in the field were sufficient and provided enough information to make a decision on the status of the study area.

Copyright

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- The results of the project.
- The technology described in any report.
- Recommendations delivered to the Client.

Approach

Conclusions reached, and recommendations made are based not only on occurrence of individual species, but more appropriately on habitats and ecosystem processes. Planning must therefore allow for the maintenance of species, habitats and ecosystem processes, even if Red Data or endemic plant or animal species are absent.



**Prof LR Brown *Pr.Sci.Nat*; MGSSA
Enviroguard Ecological Services cc**

1. TERMS OF REFERENCE

Enviroguard Ecological Services cc was appointed by Landscape Dynamics to conduct a vegetation ecological assessment of, and also provide a specialist statement for the proposed Eskom Merensky-Uchoba 132kV Deviation route 2023, Steelpoort, Limpopo.

The following is a summary of the project and areas assessed:

- An approximately 10,6km route is applicable
- A 100m corridor width was investigated and assessed.
- The 132kv Overhead Power Line will have a capacity of 132kV and monopole steel pylons will be used.
- Existing access roads to the powerline will be used. A new approximately 6m wide access road will be developed for construction, maintenance and inspection purposes within the servitude area along the powerline, but outside the identified High and Very High Sensitive Areas).

The proposed deviation route is indicated in Figure 1.

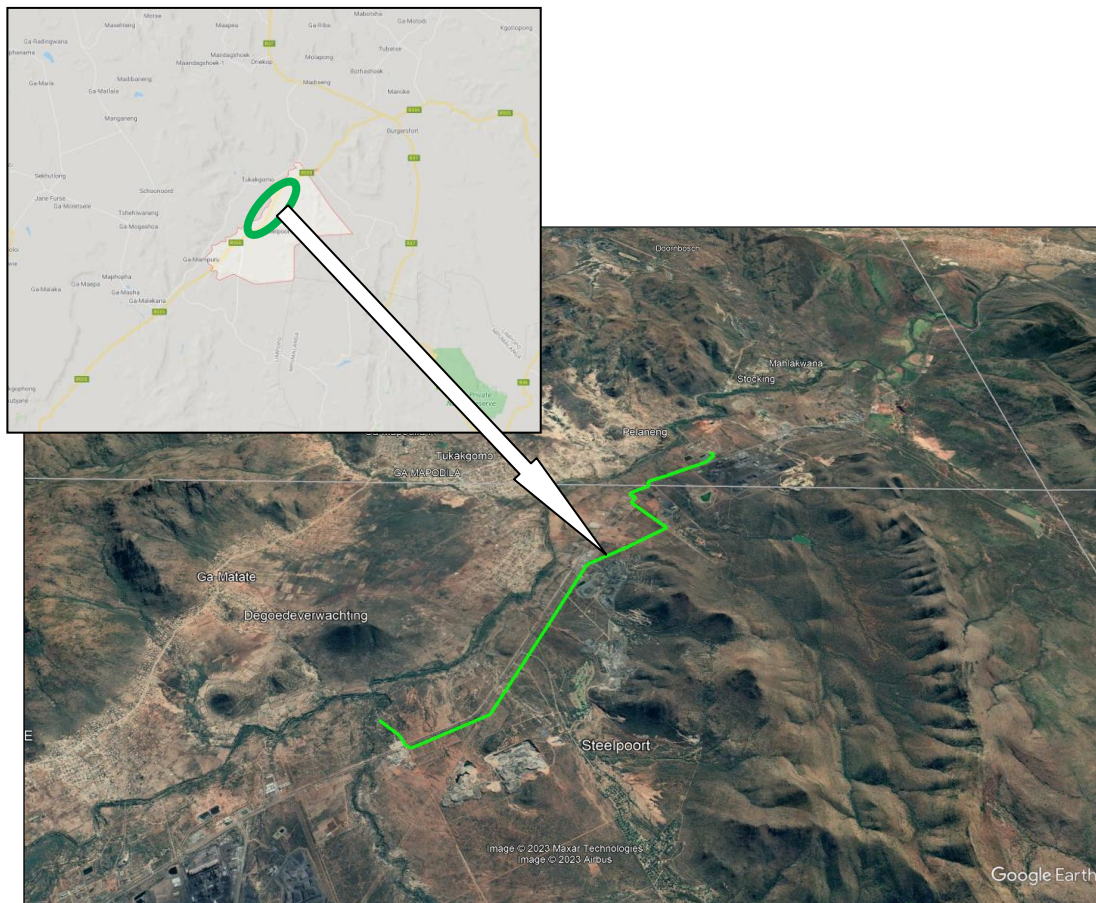


Figure 1. Location of study site (green circle – top figure) and the proposed deviation route (green line) (Source: Map data 2020, AfriGIS Pty, Ltd & Google Earth, 2023).

2. METHODS

In accordance with the Protocol (Department of Forestry, Fisheries and the Environment, 2022) the following approach was followed:

2.1 Desktop study

Prior to the site visit a desktop study was undertaken using literature, satellite imagery and other information available on the internet. The following sources were used:

- Department of Forestry, Fisheries & the Environment (DFFE) screening tool (Accessed 7 & 14 January and 30 March 2023).
- South African National Biodiversity Institute's website (SANBI GIS) (Accessed 7 January 2023 and 30 March 2023).
- Limpopo Conservation Plan v.2: Technical Report. Limpopo Department of Economic Development, Environment & Tourism (Desmet *et al.*, 2013).
- Enviroguard Ecological Services cc. 2020. An ecological assessment of the flora and watercourses: Eskom Merensky-Uchoba Project. Enviroguard Ecological Services, pp. 98.
- National Red List of Threatened Plants of South Africa (Raimondo *et al.*, 2009).
- Google Earth Aerial photographs (Accessed 7 & 14 January 2023 and 30 March 2023)
- South African National Biodiversity Institute (SANBI) & Department of Environmental Affairs and Tourism (DEAT). 2009. Threatened Ecosystems in South Africa: Descriptions and Maps. Draft Report May 2009.
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): Publication of Lists of Critically Endangered, Endangered, Vulnerable and Protected Species. Government Notices (Department of Environmental Affairs and Tourism, 2007).
- The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. SANBI, Pretoria (Mucina & Rutherford, 2006).

2.2 Site visit

The proposed route was visited, and all accessible areas walked on foot and a 100m corridor investigated. Various sample plots were placed along the proposed route and corridor area to verify the various ecosystems (plant communities) and their ecological status.

Data recorded included:

Data pertaining to the vegetation physiognomy and floristic composition was gathered. A list of all plant species present, including trees, shrubs, grasses, forbs, geophytes and succulents were compiled. All identifiable plant species were listed. Notes were additionally made of any other features that might have an ecological influence.

No formal faunal surveys were undertaken, however the presence of animals or dung was noted when conducting the vegetation surveys. This broad field observation for the site was restricted to one day site visit. No specialist survey techniques were used during the broad field verification, though habitat suitability analysis for specific faunal species were analysed for the study sites and potential impacts to fauna that could potentially occur in the area, were recommended in the mitigation measures.

Red data species

An investigation was also carried out on rare and protected plants that might possibly occur in the region. For this investigation the National Red List of Threatened Plants of South Africa, Lesotho & Swaziland, compiled by the Threatened Species Programme, South African National Biodiversity Institute (SANBI) (Raimondo *et al.*, 2009) was used. The International Union for Conservation of Nature (IUCN) conservation status categories on as described by Raimondo *et al.* (2009) was used. Internet sources were also consulted on the distribution and habitat of these species in the area as well as available literature.

The presence of rare and protected species or suitable habitat was recorded during the field visit.

Data processing

Site Ecological Importance (SEI)

For the SEI the criteria as specified in the South African National Biodiversity Institute (2020) Species Environmental Assessment Guideline document was used and is listed below. The SEI allows for rapid spatial inspection and the evaluation of the envisaged impacts of the study area to be developed. It has been set up within the context of on-site habitat and Species of Conservation Concern (SCC). Where the site-specific assessment produces a lower or higher classification than the “environmental sensitivity” as produced by the DFFE screening tool a justification for the difference must be provided by the specialist. The SEI is considered to be a function of the Biodiversity Importance (BI) of the ecosystem and its resilience to impacts. The BI is in turn a function of Conservation Importance (CI) and the Functional Integrity (FI) of the study area/ecosystem (South African National Biodiversity Institute 2020) (Tables 1, 2; & 3). According to South African National Biodiversity Institute (2020) CI is defined as “*The importance of a site for supporting biodiversity features of conservation concern present e.g. populations of IUCN Threatened and Near-Threatened species (CR, EN, VU & NT), Rare, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes*” and FI as “*A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts*”.

Table 1. Conservation Importance Criteria (adapted from the South African National Biodiversity Institute, 2020).

Conservation Importance	Criteria (Definition)
Very High	Area with natural vegetation with a high species richness and habitat diversity. Presence of viable populations of red data plant species OR confirmed or highly likely occurrence of CR, EN, VU, Extremely Rare or Critically Rare species that have a global Extent of Occurrence of < 10 km ² . Presence of unique habitats (CR or EN ecosystem in natural condition); viable populations of protected species present; less than 1% pioneer/alien plant species present. Globally significant populations of congregatory species (>10% of global population).
High	Natural area with a relatively high species richness and diversity. Confirmed or highly likely occurrence of CR, EN, VU species that have a global Extent of Occurrence of > 10 km ² . IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. Populations of protected species present. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (>0.01% but < 0.1 % of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1 %) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (>1% but <10% of global population).
Medium	An area with a relatively natural species composition; not a threatened or unique ecosystem; moderate species diversity; between 11-20% pioneer/alien plant species present; that would need moderate to major financial input to rehabilitate to an improved condition. Highly likely occurrence of populations of NT, LC and protected species, unlikely occurrence of threatened species (CR, EN,). Single individuals of VU species. Any area of natural habitat of threatened ecosystem type with status of VU

	Presence of range-restricted species > 50 % of receptor contains natural habitat with potential to support SCC
Low	No confirmed populations of Species of Conservation Concern and no suitable habitat for such species. Area with relatively natural vegetation, though a common vegetation type; moderate to low species richness and habitat diversity; previously or currently degraded or in secondary successional phase; between 20-40% pioneer and/or alien plant species; low ecosystem functioning; low rehabilitation potential. No confirmed or highly likely populations of range-restricted species < 50 % of receptor contains natural habitat with limited potential to support SCC.
Very Low	A totally degraded and transformed area with a low habitat diversity and ecosystem functioning; no viable populations of natural vegetation of the original ecosystem; >40% pioneer and/or alien plant species present; very low habitat uniqueness; whose recovery potential is extremely low. No confirmed and highly unlikely populations of SCC No confirmed and highly unlikely populations of range-restricted species No natural habitat remaining

Table 2. Functional Integrity Criteria (South African National Biodiversity Institute, 2020).

Functional integrity	Criteria (Definition)
Very High	Very large (>100 ha) intact area for any conservation status of ecosystem type or >5 ha for CR ecosystem types High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches No or minimal current negative ecological impacts with no signs of major past disturbance (e.g. ploughing)
High	Large (>20 ha but <100 ha) intact area for any conservation status of ecosystem type or >10 ha for EN ecosystem types Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches Only minor current negative ecological impacts (e.g. few livestock utilising area) with no signs of major past disturbance (e.g. ploughing) and good rehabilitation potential
Medium	Medium (>5 ha but <20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches Mostly minor current negative ecological impacts with some major impacts (e.g. established population of alien and invasive flora) and a few signs of minor past disturbance; moderate rehabilitation potential
Low	Small (>1 ha but <5 ha) area Almost no habitat connectivity but migrations still possible across some transformed or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential Several minor and major current negative ecological impacts
Very Low	Very small (<1 ha) area No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts

Table 3. Biodiversity Matrix (South African National Biodiversity Institute, 2020).

BIODIVERSITY IMPORTANCE		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

3. RESULTS & DISCUSSION

3.1 Vegetation units

A total of five (5) distinct vegetation units could be identified and are indicated in Figures 2 - 7 namely:

1. *Vachellia tortilis* shrubland
2. *Senegalia grandicornuta*-*Terminalia prunoides* woodland
3. Tributaries
4. Degraded areas
5. Developed areas



Figure 2. Proposed deviation route and corridor (Green line = proposed powerline; Red line = 100m corridor) (Image obtained from Google Earth 2023).

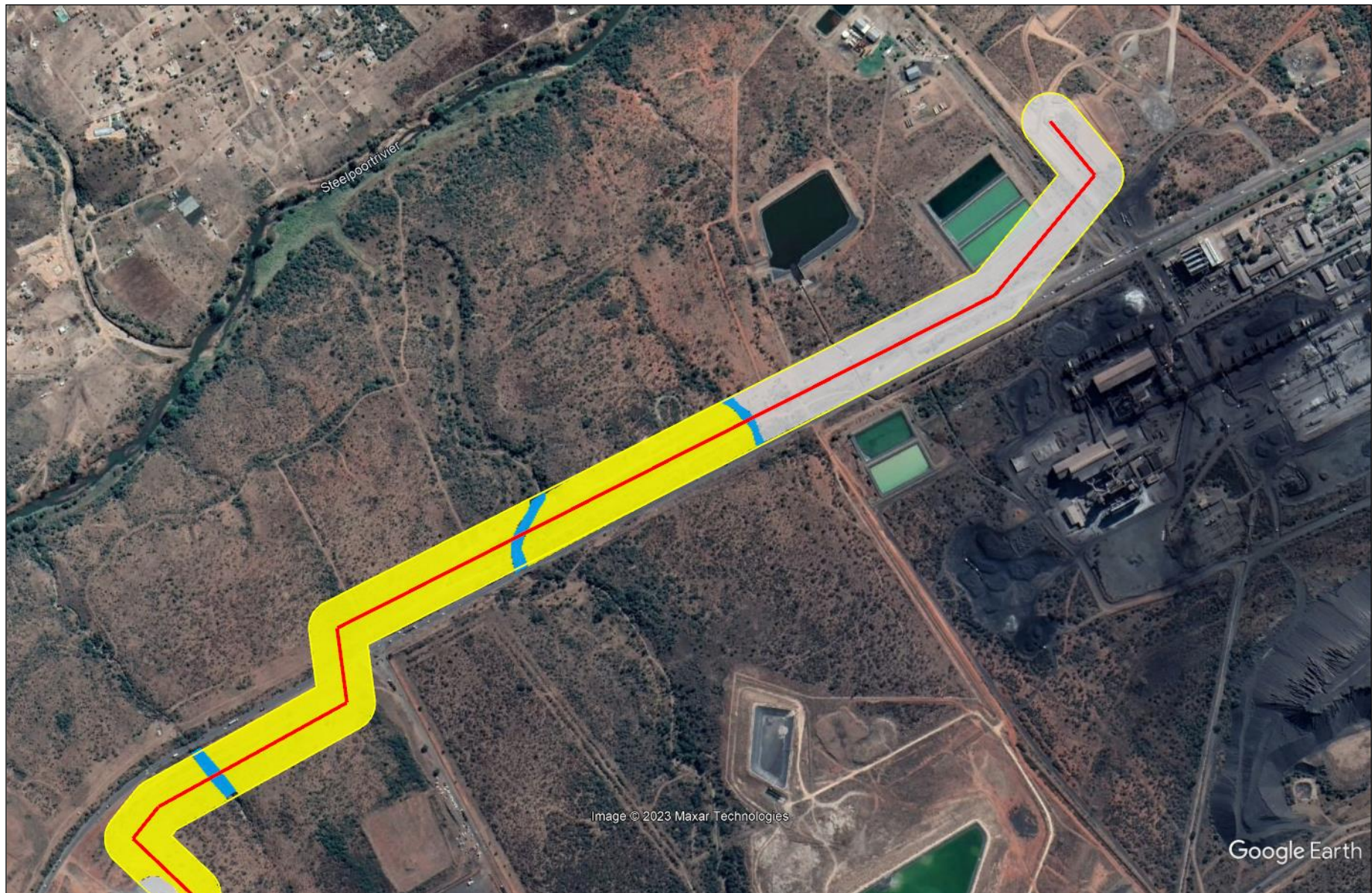


Figure 3. Vegetation units of the proposed deviation route (Yellow=unit 1; Blue=unit 3; White=unit 5) (Image obtained from Google Earth 2023).

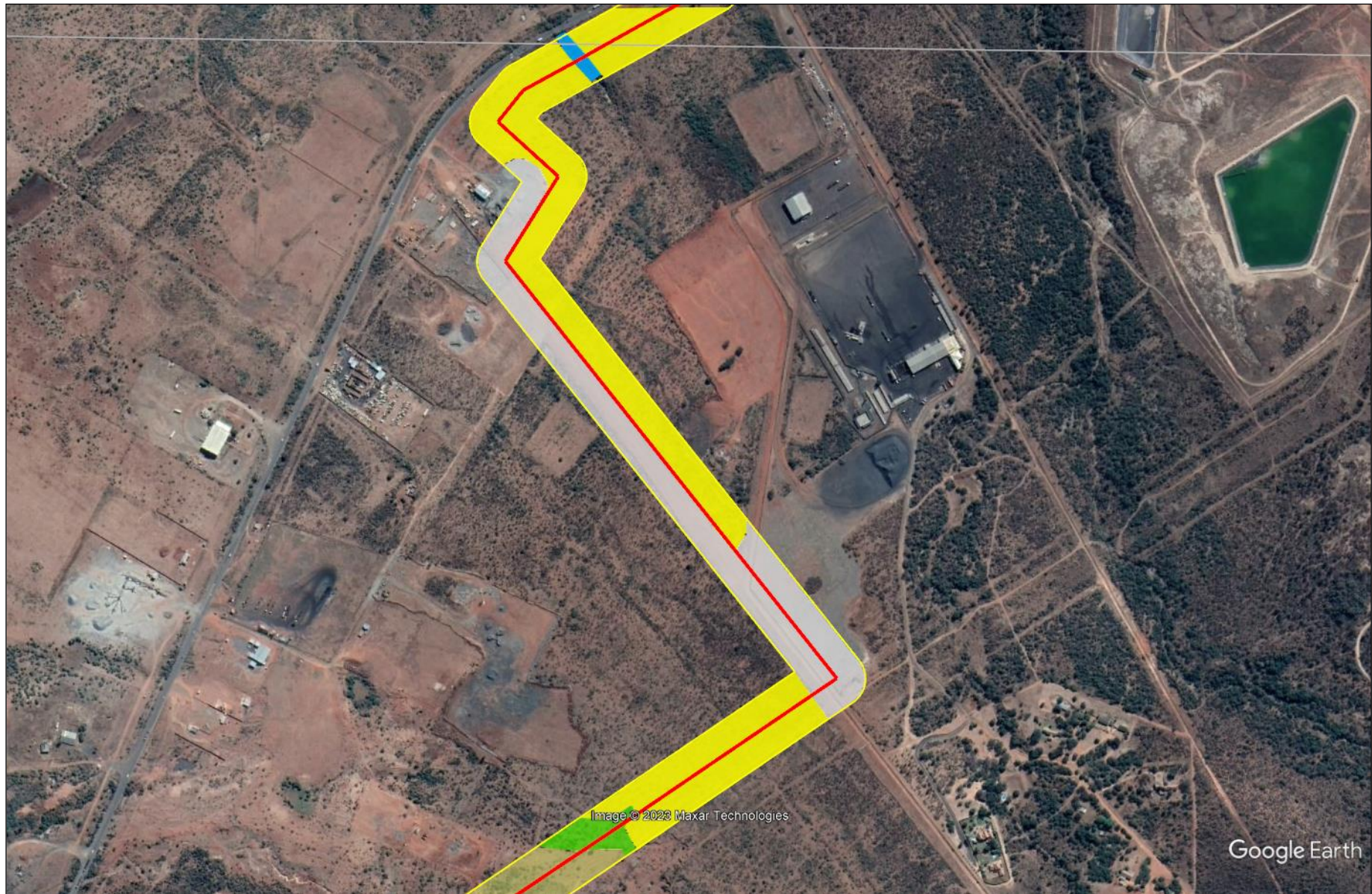


Figure 4. Vegetation units of the proposed deviation route (Yellow=unit 1; Green=unit 2; Blue=unit 3; Light yellow=unit 4; White=unit 5) (Image obtained from Google Earth 2023).



Figure 5. Vegetation units of the proposed deviation route (Yellow=unit 1; Green=unit 2; Light yellow=unit 4; White=unit 5) (Image obtained from Google Earth 2023).



Figure 6. Vegetation units of the proposed deviation route (Green=unit 2; Blue=unit 3; Light yellow=unit 4; White=unit 5) (Image obtained from Google Earth 2023).



Figure 7. Vegetation units of the proposed deviation route (Yellow=unit 1; Green=unit 2; Blue=unit 3; Light yellow=unit 4; White=unit 5) (Image obtained from Google Earth 2023).

1. *Vachellia tortilis-Dichrostachys cinerea* shrubland



Soil	Red sandy to clay soil	Tree cover	1-3%
Topography	Level with slight western slope	Shrub cover	55-65%
Land use	Livestock and mining	Herb cover	10-15%
Unit status	Degraded	Grass cover	45-60%
Faunal spp	Birds, insects, small mammals, domestic animals	Rock cover	4-5%
		Erosion	4%

Dominant spp	<i>Vachellia tortilis</i> , <i>Dichrostachys cinerea</i> , <i>Terminalia prunoides</i> , <i>Tragus berteronianus</i>
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Threatened/Endemic/Protected spp	<i>Aloe globuligemma</i> ; <i>Sclerocarya birrea</i> ; <i>Balanites maughamii</i>
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Alien spp	<i>Solanum sisymbriifolium</i> ; <i>Datura stramonium</i> ; <i>Xanthium spinosum</i>
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Comments	These areas have been mostly exposed to high intensity grazing while some have been ploughed and left fallow. The vegetation has a moderate species richness though a large number are pioneer weedy species are present.
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Table 4. Biodiversity Matrix for vegetation unit 1 (South African National Biodiversity Institute, 2020).

BIODIVERSITY IMPORTANCE		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

2. *Senegalia grandicornuta*-*Terminalia prunoides* woodland



Soil	Clay to loam reddish in colour	Tree cover	8%
Topography	Plains	Shrub cover	50%
Land use	Game and small wild ungulates	Herb cover	10%
Unit status	Natural to degraded	Grass cover	15-40%
Faunal spp	Various birds & insects	Rock cover	8%
		Erosion	3%

Dominant spp	<i>Terminalia prunoides</i> ; <i>Vachellia grandicornuta</i> , <i>Euclea linearis</i> ; <i>Searsia keetii</i> , <i>Boscia foetida</i>
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Threatened/Endemic/Protected spp	<i>Boscia foetida subsp minima</i> ; <i>Boscia albitrunca</i> ; <i>Aloe cryptopoda</i> ; <i>Aloe castanea</i> ; <i>Aloe fosteri</i> , <i>Balanites maughamii</i> ; <i>Stapelia spp.</i>
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Alien spp	<i>Opuntia ficus-indica</i> ; <i>Cereus jamacaru</i> ; <i>Solanum sisymbriifolium</i> ; <i>Datura stramonium</i> ; <i>Ricinus communis</i> ;
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Comments	The area is relatively natural with various indigenous woody species. Large sections have become densified due to past grazing practices resulting in a degraded herbaceous layer.
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Table 5. Biodiversity Matrix for vegetation unit 2 (South African National Biodiversity Institute, 2020).

BIODIVERSITY IMPORTANCE		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

3. Tributaries



Soil	Clay to sandy reddish in colour	Tree cover	10%
Topography	Drainage channels	Shrub cover	15%
Land use	Grazing	Herb cover	10%
Unit status	Natural	Grass cover	20%
Faunal spp	Birds & insects	Rock cover	25-45%
		Erosion	n/a

Dominant spp	<i>Spirostachys africana</i> , <i>Combretum hereroense</i> , <i>Mundulea sericea</i> , <i>Euclea linearis</i> , <i>Andropogon shirensis</i> , <i>Eragrostis superba</i>
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Threatened/Endemic/Protected spp	<i>Searsia batophylla</i> ; <i>Sclerocarya birrea</i>
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Alien spp	<i>Solanum sisymbriifolium</i> ; <i>Datura stramonium</i> ; <i>Opuntia ficus-indica</i> ; <i>Cereus jamacaru</i>
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Comments	Numerous tributaries are present in the area. These areas are only wet during high rainfall events and channel water towards the Steelpoort River
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Table 6. Biodiversity Matrix for vegetation unit 4 (South African National Biodiversity Institute, 2020).

BIODIVERSITY IMPORTANCE		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

4. Degraded areas



Soil	Clay to loam reddish in colour	Tree cover	<1%
Topography	Undulating plains	Shrub cover	5-25%
Land use	Cattle and small wild ungulates	Herb cover	10%
Unit status	Degraded	Grass cover	25-65%
Faunal spp	Birds & insects	Rock cover	1-8%
		Erosion	3%
Dominant spp	<i>Vachellia tortilis</i> ; <i>Dichrostachys cinerea</i> ; <i>Tragus berteronianus</i> ; <i>Chloris virgata</i> ; <i>Enneapogon cenchroides</i>		
Threatened/Endemic/Protected spp	<i>Aloe castanea</i>		
Alien spp	<i>Solanum sisymbriifolium</i> ; <i>Datura stramonium</i> ; <i>Xanthium spinosum</i>		
Comments	This unit include previously cleared areas, eroded areas, Cultivated lands, servitudes and Bush densified areas.		

Table 7. Biodiversity Matrix for vegetation unit 5 (South African National Biodiversity Institute, 2020).

BIODIVERSITY IMPORTANCE		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

5. Developed areas



Soil	Various	Tree cover	n/a
Topography	Plains	Shrub cover	n/a
Land use	Infrastructure, mining, agriculture	Herb cover	n/a
Unit status	Transformed	Grass cover	n/a
Faunal spp	n/a	Rock cover	n/a
		Erosion	n/a
Dominant spp	n/a		
Threatened/Endemic/Protected spp	n/a		
Alien spp	<i>Cereus jamacaru, Datura stramonium</i>		
Comments	These areas have been developed with various buildings (houses, sheds, offices etc.), roads, cleared land, mining operations etc.		

Table 8. Biodiversity Matrix for vegetation unit 7 (South African National Biodiversity Institute, 2020).

BIODIVERSITY IMPORTANCE		Conservation Importance				
		Very High	High	Medium	Low	Very Low
Functional Integrity	Very High	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

3.2 Ecosystem classification

3.2.1 Vegetation type

The proposed route is located within the Sekhukhune Plains Bushveld (SVcb27) vegetation type (Mucina & Rutherford 2006) (Figure 8).

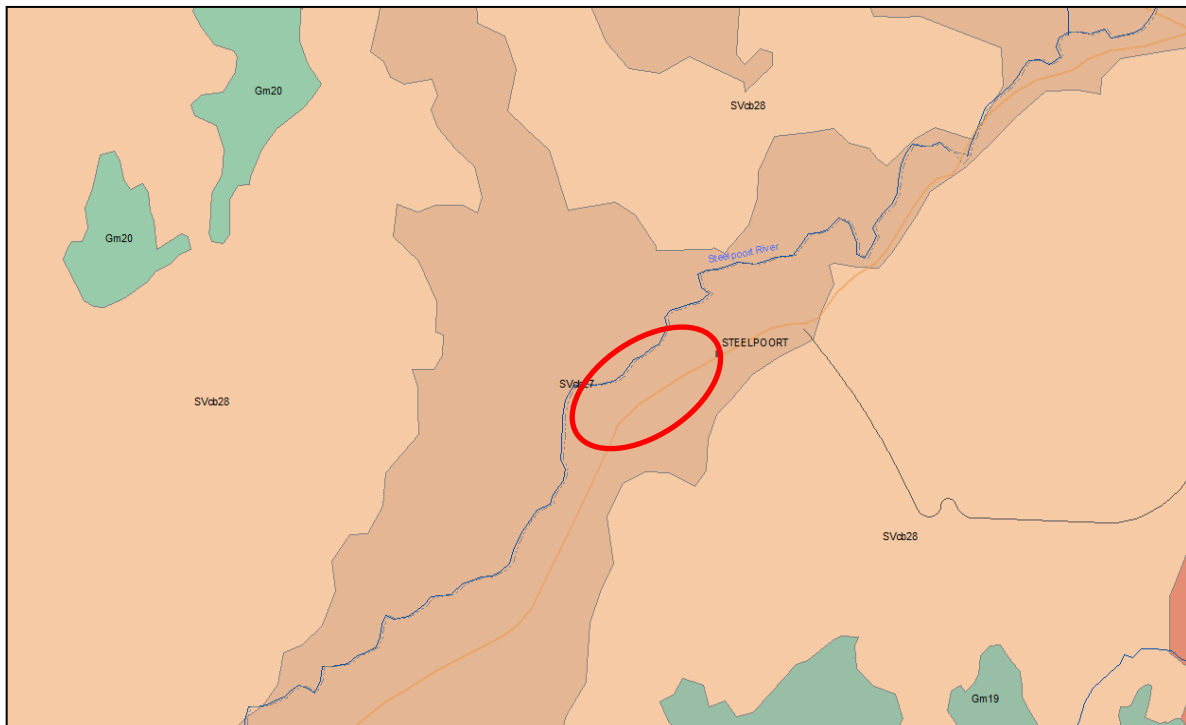


Figure 8. Location of the proposed route within the Sekhukhune Plains Bushveld (SVcb27) vegetation type (red line) (Source: Mucina & Rutherford 2006)

Sekhukhune Plains Bushveld (SVcb27) vegetation type

The vegetation type is located in the lowland areas and the lower basing of the Steelpoort River. Altitude is mostly low ranging between 700-1 100 m.a.s.l. The vegetation is mainly semi-arid plains and open valley areas between the various hills and small mountains and consists of short open to closed thornveld. Important taxa include the woody species *Vachellia erioloba*, *Philenoptera violacea*, while the dominant species include the trees *Senegalia mellifera*, *Senegalia nilotica*, *Vachellia tortilis*, *Boscia foetida*, *Vachellia grandicornuta*, the shrubs *Searsia engleri*, *Dichrostachys cinerea*, *Seddera suffruticosa*, *Gnidia polycephala*, the succulents *Aloe cryptopoda*, *A. castanea*, *A. globuligemma*, *Euphorbia enormis*, the grasses *Enneapogon cenchroides*, *Panicum maximum*, *Urochloa*

mosambicensis, and the forbs *Blepharis integrifolia*, *Corchorus asplenifolius*, *Hibiscus praeteritus* and *Phyllanthus maderaspatensis*.

Important taxa: *Lydenburgia cassinoides*; *Nuxia gracilis*; *Amphiglossa triflora*; *Asparagus fourei*; *Hibiscus barnardii*; *Orthosiphon fruticosus*; *Petalidium oblongifolium*; *Searsia batophylla*; *Asparagus sekukuniensis*; *Aneilema longirrhizum*; *Chlorophytum cyperaceum*; *Piaranthus atrosanguineus*.

This vegetation type is considered as vulnerable with only 2% of the target of 19% formally conserved. The vegetation is under pressure from mining and agriculture with up to 25% already transformed.

3.2.2 Ecosystem classification

According to the Limpopo Conservation Plan 2 (LCPv2) (Desmond *et al.*, 2013) the purpose of the plan is to develop the spatial component of the bioregional plan that facilitate biodiversity conservation and also inform natural resource management plans, land-use planning, environmental impact assessments and authorisations. The plan is consistent with NEMA principles and the National Biodiversity Act. Bioregional plans are intended to support and streamline environmental decision making. Since the plan and associated maps are done on a relatively coarse scale it is important to note that it does not replace site assessments for Environmental Impact Assessment purposes and still requires specialist interpretation and assessment (Desmond *et al.*, 2013). It is furthermore important to note that the classification of an ecosystem within a specific category is based on various aspects including, birds, vegetation, herpetological data, rivers, wetlands, birds, conservation areas etc.

A CBA is regarded as an area that need to be maintained in as natural condition as possible to meet the region's biodiversity target. An ESA is an area that has been subjected to some degradation and although no longer intact, it is largely natural and important to support CBA's and to maintain landscape connectivity (Desmond *et al.*, 2013).

According to the Limpopo Conservation Plan 2 (LCPv2) the study area falls within Critical Biodiversity Area 1, Critical Biodiversity Area 2, Ecological Support Area, and No natural Area Remaining (Figure 9). The "No Natural Areas" remaining corresponds mostly to the Degraded areas (vegetation unit 4) and the Developed Areas (vegetation unit 5). The CBA area 1 corresponds with a section of vegetation unit 1 (*Vachellia tortilis* shrubland) as well

as the Developed areas (vegetation unit 5). This area has some natural vegetation, however, is not considered as being a CBA area 1 due to past and current anthropogenic influences. The CBA area 2 corresponds with vegetation units 1, 2, and 3. From the results of this study the only unit that correspond to such a classification is unit 3 (Tributaries). Small sections of vegetation unit 4 in the south are classified as an ESA but have been found to be degraded with a low conservation value based on the findings of this report. Both vegetation units 1 and 2 although natural with natural species are degraded and shows signs of bush densification due to various anthropogenic influences (mainly due to overgrazing by cattle).

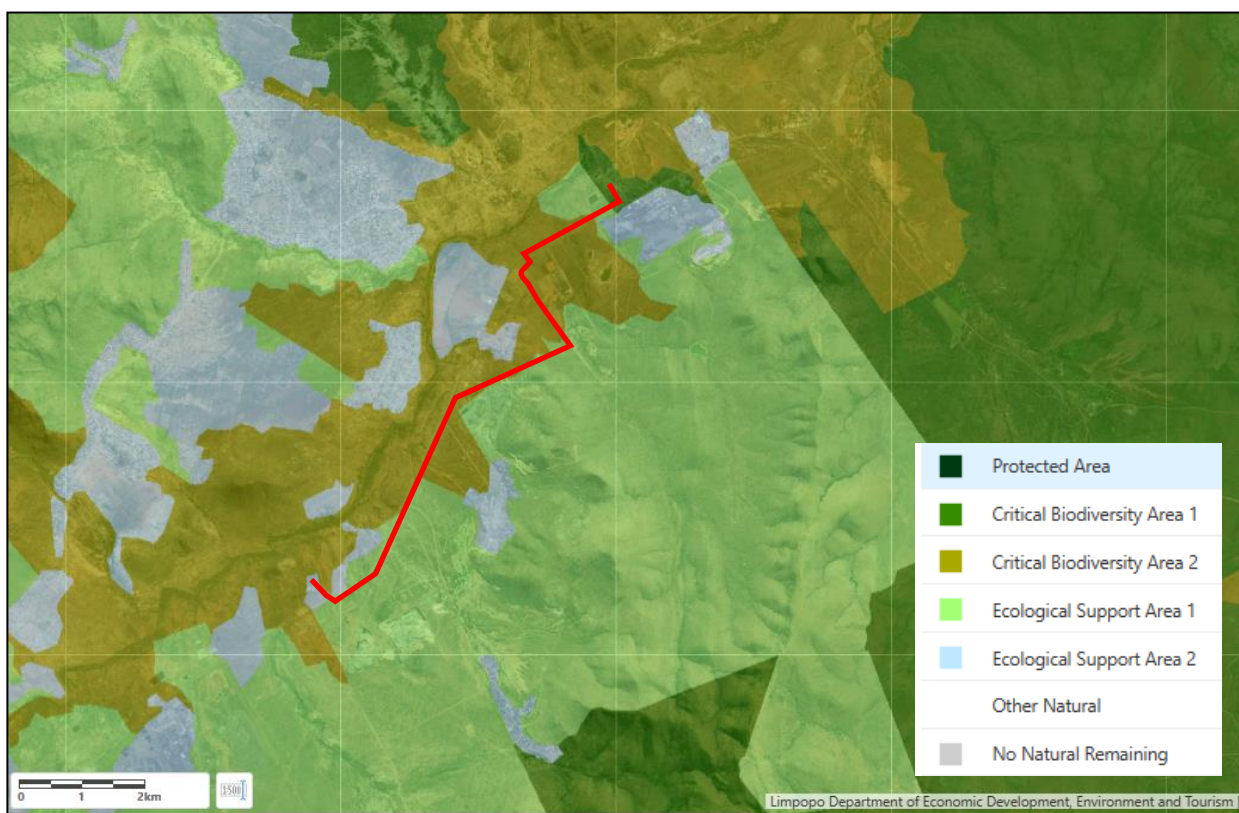


Figure 9. CBA and ESA areas for the study area (Source: SANBI GIS, Limpopo Department of Economic Development, Environment & Tourism).

3.2.3 Department of Forestry, Fishery & the Environment (DFFE)

Fauna

According to the DFFE screening tool the study area has an overall Low faunal sensitivity with smaller sections regarded as having a Medium faunal sensitivity.

Due to the fences and development as well as land degradation within the proposed route the habitat is not regarded as being suitable for this species.

Robert's shaggy rat (*Dasymys robbertsii*) is dependent on intact rivers and wetland areas. They have not been recorded in degraded wetland areas or degraded rivers and therefore have a patch distribution. Although they have been recorded in savanna areas the area would be close to an intact wetland system. They prefer reedbeds and swampy areas along rivers and streams. No suitable habitat for this species was found along the proposed route.

The Lobatse hinge-back tortoise (*Kinixys lobatsiana*) is regarded as a vulnerable species that inhabits rocky hillsides in habitats of mixed *Acacia* and *Combretum* woodland. It mainly feeds on feeding on herbaceous plants, fruits and mushrooms, although its diet can include beetles, snails, and millipedes (Branch 2008). Sections of vegetation unit 3 provides marginally suitable habitat.

Flora

According to the DFFE screening tool the vegetation of the study area has an overall Low floral sensitivity with smaller sections regarded as having a Medium to Low floral sensitivity.

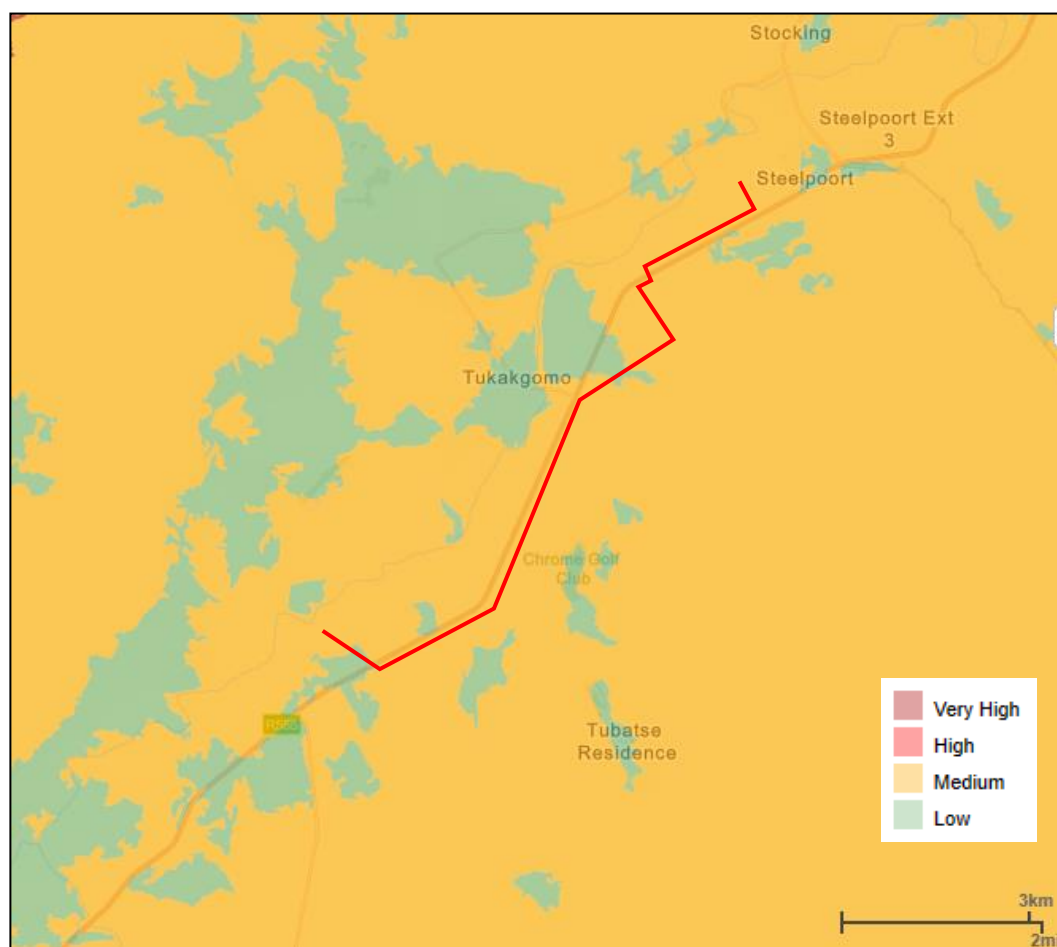


Figure 11. Map of relative plant sensitivity (red line=proposed powerline route) (Source: Department of Forestry Fishery & Environment, 2023).

A total of five sensitive species were listed by DFFE namely *Asparagus fouriei*, *Polygala sekhukhuniensis*, *Searsia batophylla*, *Searsia sekhukhuniensis* and *Combretum petrophilum*. No individuals of *Asparagus fouriei*, *Polygala sekhukhuniensis*, *Searsia sekhukhuniensis* and *Combretum petrophilum* were identified and no suitable habitat exists. The woody *Searsia batophylla* was found within the tributaries (vegetation unit 3).

Based on the findings of this report the largest part of the proposed deviation route has a low conservation value with smaller sections (vegetation units 2 and 3) having medium and medium-high conservation values.

3.2.4 Red data species

Only one red data species which is also a protected species namely *Searsia batophylla* was found to be present in the study area (Table 9) within vegetation unit 3. This species has a conservation status of “vulnerable” due to habitat destruction and other mining activities.

Table 9. Red data species previously recorded in the quarter degree grid of the study area (Raimondo *et al.* 2009).

Genus	species	National Status	Recorded in study area
<i>Acacia</i>	<i>erioloba</i>	Declining	Not found
<i>Acacia</i>	<i>ormocarpoides</i>	NT	No suitable habitat
<i>Acacia</i>	<i>sekhukhuniensis</i>	CR	Habitat not suitable
<i>Asparagus</i>	<i>fouriei</i>	VU	Habitat not suitable
<i>Asparagus</i>	<i>sekukuniensis</i>	EN	Habitat not suitable
<i>Asparagus</i>	sp. nov. ' <i>hirsutus</i> '	VU	Habitat not suitable
<i>Boophone</i>	<i>disticha</i>	Declining	Not found
<i>Bowiea</i>	<i>volubilis</i>	VU	Habitat not suitable
<i>Cucumis</i>	<i>humifructus</i>	VU	Habitat not suitable
<i>Elaeodendron</i>	<i>transvaalense</i>	NT	Habitat not suitable
<i>Encephalartos</i>	<i>dolomiticus</i>	CR	Habitat not suitable
<i>Euphorbia</i>	<i>barnardii</i>	EN	No suitable habitat
<i>Euphorbia</i>	<i>sekukuniensis</i>	Rare	No suitable habitat
<i>Plectranthus</i>	<i>porcatus</i>	VU	No suitable habitat
<i>Plectranthus</i>	<i>venteri</i>	Rare	No suitable habitat
<i>Polygala</i>	<i>sekhukhuniensis</i>	VU	Not found, no suitable habitat
<i>Searsia</i>	<i>batophylla</i>	VU	Unit 4
<i>Searsia</i>	<i>sekhukhuniensis</i>	Rare	Not found, no suitable habitat
<i>Zantedeschia</i>	<i>jucunda</i>	VU	No suitable habitat

3.2.5 Protected species

The Department of Water Affairs and Forestry (now Department of Forestry and Fisheries) developed a list of protected tree species. The Limpopo Environmental Management Act (Act no. 7 of 2003) also has a list of protected plant species. In terms of Section 15(1) of the National Forests Act, 1998, as well as the Limpopo Environmental Management Act (Act no. 7 of 2003) no person may cut, disturb, damage or destroy any protected tree/plant or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree/plant or any forest product derived from a protected tree/plant, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Trees/plants are protected for a variety of reasons, and some species require strict protection while others require control over harvesting and utilization. The Department of Agriculture, Forestry and Fisheries (DAFF) as well as the Department of Nature Conservation (Limpopo) will have to be approached to obtain the required permits for the removal of any protected tree/plant species.

A total of nine (9) protected species have been recorded during the survey and are listed below in tables 10 and 11 below:

Table 10. Protected species of the study area according to DWAF (ACT 10 of 2004).

Species name	Recorded in study area	Unit/s	National tree number
<i>Boscia albitrunca</i>	✓	2	122
<i>Sclerocarya birrea</i> (Marula)	✓	1; 3	360
<i>Balanites maughamii</i>	✓	1; 2	251

Table 11. Protected species of the study area according to Limpopo Environmental Management Act (Act no. 7 of 2003)

Species name	Recorded in study area	Unit/s	National tree number
<i>Aloe cryptopoda</i>	✓	2	n/a
<i>Aloe globuligemma</i>	✓	1	n/a
<i>Aloe fosteri</i>	✓	2	n/a
<i>Aloe castanea</i>	✓	2; 4	n/a
<i>Stapelia spp.</i>	✓	2	n/a
<i>Boscia foetida minima</i>	✓	2	123

4. IMPACT STATEMENT & MITIGATION

Based on the results of this study as well as the Site Ecological Importance classification (Figures 14-16) DEFF (2020), the following specific mitigation measures are recommended.

Ecological Importance*	Vegetation Unit	Impact/mitigation Statement
High	Unit 3 (Tributaries)	<ul style="list-style-type: none"> • Pylons must not be placed within these areas and associated buffer zones (as per aquatic report), but the areas may be spanned. • Threatened/endemic/protected species present. • No threatened plant species may be removed or trimmed without obtaining the necessary permits from the Conservation authorities. • No person must be allowed to enter the tributary areas unless for crossing the area on foot or by using existing access roads. • Alien invasive plants present within the vegetation unit must be removed and eradicated throughout all stages of the project. • Also refer to the Eskom Generic EMP
Medium	Unit 2 (<i>Senegalia grandicornuta</i> - <i>Terminalia prunoides</i> woodland)	<ul style="list-style-type: none"> • Placement of pylons permitted but with mitigation. • Final pylon placement within this vegetation unit must be confirmed by conducting a walkdown by a qualified ecologist/botanist to ensure that no Threatened/Endemic/Protected will be negatively affected. Where such species are encountered the pylon placement should be adjusted • Suitable habitat for threatened species. • No threatened plant species may be removed or trimmed without obtaining the necessary permits from the Conservation authorities. • If a road has to be developed to gain access to construction within vegetation unit 3 it has to be confirmed that there are no Threatened/Endemic/Protected present. • Alien invasive plants present within the various vegetation units must be removed and eradicated throughout all stages of the project. • Also refer to the Eskom Generic EMP.
Low	Unit 1 (<i>Vachellia tortilis</i> shrubland)	<ul style="list-style-type: none"> • Alien invasive plants present within the various vegetation units must be

		<p>removed and eradicated throughout all stages of the project.</p> <ul style="list-style-type: none"> • Where a protected plant is encountered, it must be avoided and the pylon placement adjusted. • Also refer to the Eskom Generic EMP.
Very Low	<p>Unit 4 (Degraded areas)</p> <p>Unit 5 (Developed areas)</p>	<ul style="list-style-type: none"> • Alien invasive plants present within the various vegetation units must be removed and eradicated throughout all stages of the project. • Also refer to the Eskom Generic EMP.
Site specific mitigation	Vegetation unit	Impact/mitigation Statement
	All vegetation units	<ul style="list-style-type: none"> • To minimise the effect on the vegetation, insects, small mammals, and environment it is recommended that the construction be done within the winter period as far as possible, when most plants are dormant and animals less active. • Vegetation clearance should be restricted to the approved development areas allowing remaining animals the opportunity to move away from the disturbance. • No collection or gathering of firewood and medicinal plants must be allowed. • Where vegetation needs to be “opened” to gain access it is recommended that the herbaceous species are cut short rather than removing them. • Current servitude roads must be used as far as possible, and no unnecessary roads developed. • Regular monitoring (monthly) for damage to the environment as well as establishment of alien plant species must be conducted. • No animals should be intentionally killed or destroyed and poaching and hunting should not be permitted on the site. • No hunting with firearms (shotguns, air rifles or pellet guns) or catapults should be permitted on the property as well as neighbouring areas. • Any animals encountered in the development areas must be relocated away from the development site. • Where lighting is required for safety or security reasons, this should be targeted at the areas requiring attention. Yellow sodium lights should be prescribed as they do not attract invertebrates at night and will not disturb the existing wildlife. Sodium lamps require a third less energy than conventional light bulbs.

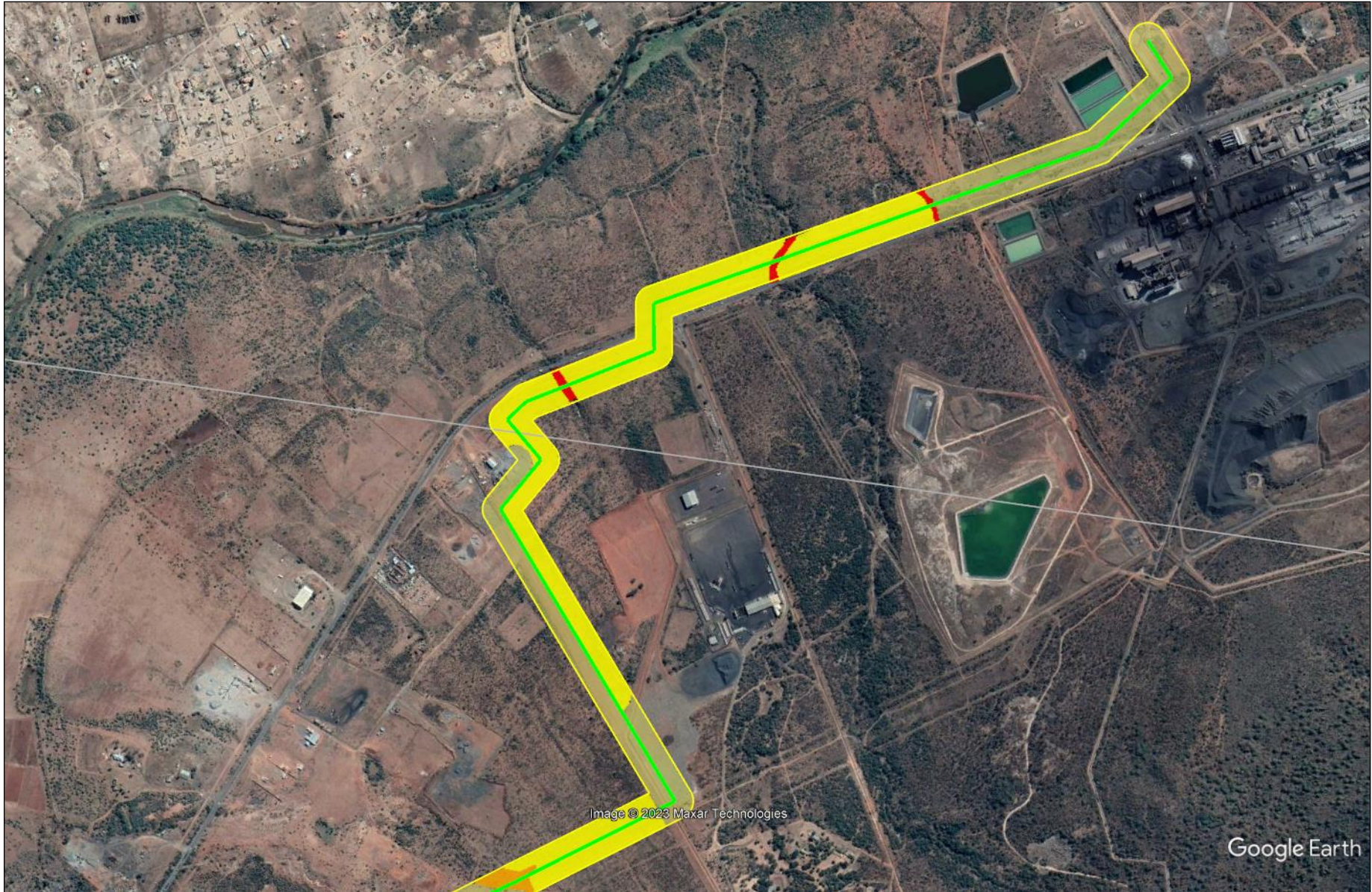


Figure 12. Map of relative plant sensitivity (Red=High; Orange=Medium; Yellow=Low; Light yellow=Very low;) (Source: Google Earth, 2023).

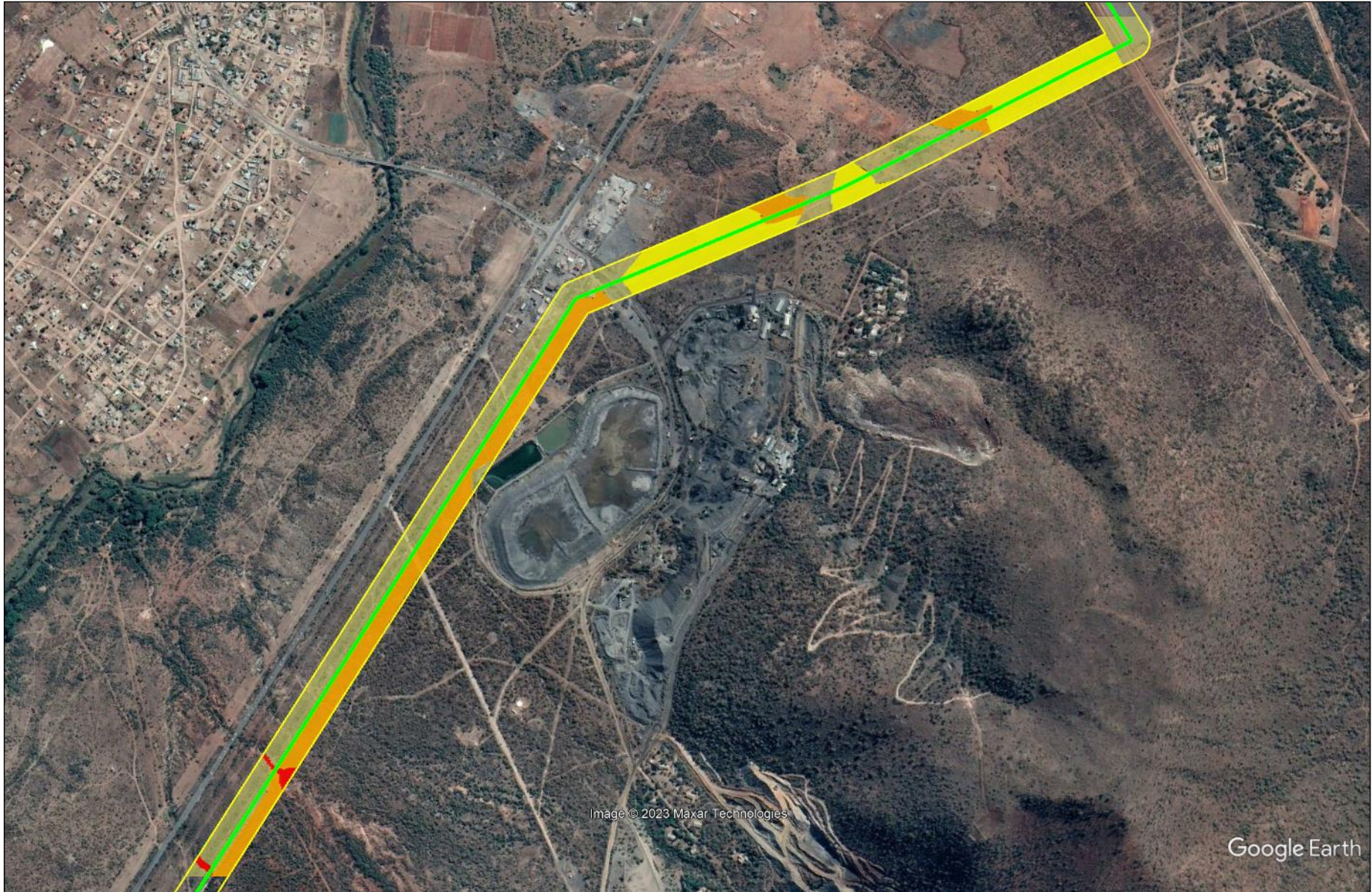


Figure 13. Map of relative plant sensitivity (Red=High; Orange=Medium; Yellow=Low; Light yellow=Very low) (Source: Google Earth, 2023).



Figure 14. Map of relative plant sensitivity (Red=High; Orange=Medium; Yellow=Low; Light yellow=Very low) (Source: Google Earth, 2023)F.

5. COMPLIANCE STATEMENT

The proposed Deviation route comprises various vegetation units that have different Site ecological importance values as listed and explained in the report and the table below. It is not thought that the proposed deviation route would have a long-term negative impact on the terrestrial biodiversity if all mitigation methods are implemented. The high conservation areas can easily be avoided as discussed in Section 4:

Sensitivity Theme	Screening Tool Site Sensitivity	Specialist Site Sensitivity	Reasons why the Screening Tool Sensitivity is disputed / confirmed												
Animal Species	<p>Medium & High</p> <p>A rating of <u>High</u> was given due to the possible existence of the following animals (not avifauna) within a specific area within the proposed 100m corridor</p> <table border="1"> <tr> <td>Medium</td> <td>Mammalia-Crocidura maquassiensis</td> </tr> <tr> <td>Medium</td> <td>Mammalia-Dasymys robertsii</td> </tr> <tr> <td>Medium</td> <td>Mammalia-Lycaon pictus</td> </tr> <tr> <td>Medium</td> <td>Reptilia-Kinixys lobatsiana</td> </tr> </table>	Medium	Mammalia-Crocidura maquassiensis	Medium	Mammalia-Dasymys robertsii	Medium	Mammalia-Lycaon pictus	Medium	Reptilia-Kinixys lobatsiana	High, Medium & Low	Based on the field visit & habitat assessment vegetation units 2 & 3 (<i>Senegalia grandicornuta-Terminalia prunoides</i> woodland & Tributaries) provide marginal habitat for the animal species of concern as described in section 3.2.3. The other areas along the proposed deviation route are degraded with no suitable habitat for these species. The main reasons as indicated in the report are anthropogenic activities, mining, infrastructure, urban developments, fences that resulted in habitat degradation.				
Medium	Mammalia-Crocidura maquassiensis														
Medium	Mammalia-Dasymys robertsii														
Medium	Mammalia-Lycaon pictus														
Medium	Reptilia-Kinixys lobatsiana														
Plant Species	<p>Medium & Low</p> <table border="1"> <thead> <tr> <th>Sensitivity</th> <th>Feature(s)</th> </tr> </thead> <tbody> <tr> <td>Medium</td> <td>Asparagus fourei</td> </tr> <tr> <td>Medium</td> <td>Polygala sekhukhuniensis</td> </tr> <tr> <td>Medium</td> <td>Searsia batophylla</td> </tr> <tr> <td>Medium</td> <td>Searsia sekhukhuniensis</td> </tr> <tr> <td>Medium</td> <td>Combretum petrophilum</td> </tr> </tbody> </table> <p>A rating of <u>Medium</u> was given due to the possible existence of the following plants within two specific areas within the proposed 100m corridor.</p>	Sensitivity	Feature(s)	Medium	Asparagus fourei	Medium	Polygala sekhukhuniensis	Medium	Searsia batophylla	Medium	Searsia sekhukhuniensis	Medium	Combretum petrophilum	High, Medium & Low	Based on the identification and field assessment of the different vegetation units (see Section 3 for descriptions & Specialist statement on page 3) all units except the <i>Senegalia grandicornuta-Terminalia prunoides</i> woodland (unit 2 – Medium) and unit 4 (Tributaries – High) achieved a Low-Very low sensitivity. Only one sensitive species was found, to be present within vegetation unit 4 (Tributaries – see section 3.2.4). Also see an extensive list of possible species of concern that were assessed in section 3.2.4 for more detail. The vegetation of the largest part of the proposed deviation has a Very Low to Low sensitivity as indicated in Figure 9 due to habitat degradation and various anthropogenic activities.
Sensitivity	Feature(s)														
Medium	Asparagus fourei														
Medium	Polygala sekhukhuniensis														
Medium	Searsia batophylla														
Medium	Searsia sekhukhuniensis														
Medium	Combretum petrophilum														
Terrestrial Biodiversity	<p>Very High</p> <p>A rating of Very High was given due to the site falling within a ESA 1 and ESA 2</p> <table border="1"> <thead> <tr> <th>Sensitivity</th> <th>Feature(s)</th> </tr> </thead> <tbody> <tr> <td>Low</td> <td>Low Sensitivity</td> </tr> <tr> <td>Very High</td> <td>Ecological support area 1</td> </tr> <tr> <td>Very High</td> <td>Ecological support area 2</td> </tr> </tbody> </table>	Sensitivity	Feature(s)	Low	Low Sensitivity	Very High	Ecological support area 1	Very High	Ecological support area 2	Medium & Low	Overall, vegetation unit 4 (Tributaries) has a medium terrestrial diversity while the other units have a low terrestrial diversity. This is based on the low to moderate species richness in terms of plants and animal species with the largest part of the proposed deviation corridor consisting of degraded habitats to extreme human activities (mining, infrastructure, industrial developments, urban development, roads and fences etc) as described in section 3 of this report.				
Sensitivity	Feature(s)														
Low	Low Sensitivity														
Very High	Ecological support area 1														
Very High	Ecological support area 2														

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ANNEXURE 1 Additional specialist info

LR BROWN

Personal details

Title: Professor
Nationality: South African
SACNASP registration: 400075/98 (Ecological Science & Botanical Science)
Name of Consulting Firm: Enviroguard Ecological Services cc.
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Personal profile

He is and an applied ecologist with a particular interest in plant communities. His research focuses on the classification and description of southern African ecosystems as the basis for the appropriate management of natural areas. His research is directed at long-term studies of plant communities and wetlands (classification, description and assessment of conservation status) in relation to local climate, the identification of different environmental gradients within and between communities, and the reaction of communities to different patterns of land use and management practices. He is the main author of a publication setting the guidelines for vegetation phytosociological (classification) surveys in southern Africa. He was on the editorial board of the *South African Journal of Botany* and is currently on the editorial board of the international journal *Vegetation Classification & Description*, while also serving as a section editor for *Koedoe, CABI & Royal Society Open Science*. He has collaborative research projects with various organisations/institutions nationally and internationally. He is a member of both the Quality Assurance Committee of SACNASP and the International Association of Vegetation Scientists Vegetation Classification Working Group. He has served as an evaluator of qualifications in the botanical sciences for the South African Council for Scientific Professions, been an advisory committee member of the African Vegetation and Plant Diversity Research Centre at the University of Pretoria, an executive board member of the Institute of Environment and Recreation Management of SA, and secretary of the SAASA (2002-2004), chairperson of the Professional Affairs Committee for the Grassland Society of southern Africa and also the past President of the Grassland Society of southern Africa. He is also a board member of Elephants Alive: South Africa, the chairperson of the evaluating committee of the Senior Captain Scott Memorial Medal for Biology for the SAASA.

Specialisation

- Vegetation impact assessments (Grassland, Savanna & Nama-karoo Biomes)
- Botanical surveying
- Vegetation mapping
- Wetland delineation
- Veld management & restoration
- Veld condition & grazing capacity
- Bush encroachment/ densification monitoring
- Game farm planning & vegetation management

Scientific involvement

Author of:

- 240+ impact assessment reports on natural resources and utilisation.
- 68 scientific papers published in accredited and non-accredited scientific/other journals.
- 72 papers/posters at national and international congresses
- 11 invited talks as workshops, interest groups, societies etc.
- 2 Scientific reports published by WRC.
- 12 commissioned research projects
- Co-author of the book titled "The story of Life and the Environment: and African perspective"
- 5 chapters in scientific books