ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED ESKOM MAPHUTHA-WITKOP 400KV POWERLINE, LIMPOPO PROVINCE:

FAUNA & FLORA SPECIALIST REPORT FOR EIA

PRODUCED FOR NSOVO

ON BEHALF OF ESKOM DISTRIBUTION

BY

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CONTENTS

NEMA 2014 CHECKLIST

Section		*NEMA 2014 Regulations for Specialist Studies*	Position in report (pg.)	check
1	1	A specialist report prepared in terms of these Regulations must contain—		
	(a)	details of-		
		(i) the specialist who prepared the report; and	4-5	✓
		(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;		
	(b)	a declaration that the person is independent in a form as may be specified by the competent authority;		✓
	(c)	an indication of the scope of, and the purpose for which, the report was prepared;	6	✓
	(d)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	8-10	✓
	(e)	a description of any assumptions made and any uncertainties or gaps in knowledge;	8	✓
	(f)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;	10-17	✓
	(g)	recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;	20-23	✓
	(h)	a description of any consultation process that was undertaken during the course of carrying out the specialist report;	See main EIA report	✓
	(i)	a summary and copies of any comments that were received during any consultation process; and	See main EIA report	✓
	(j)	any other information requested by the competent authority.		
	2	Where a proposed development and the geographical area within which it is located has been subjected to a pre-assessment using a spatial development tool, and the output of the pre-assessment in the form of a site specific development protocol has been adopted in the prescribed manner, the content of a specialist report may be determined by the adopted site specific development protocol applicable to the specific proposed development in the specific geographical area it is proposed in.	N/A	✓

PROFESSIONAL PROFILE OF CONSULTANT:

Simon Todd is Director of 3Foxes Biodiversity Solutions and has extensive experience in biodiversity assessment, having provided ecological assessments for more than 150 different developments including a large number of power line developments. Simon Todd is a recognised ecological expert and is a past chairman of the Arid-Zone Ecology Forum and has 20 years' experience working throughout the country. Simon Todd is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Recent experience and relevant projects include the following:

- Vryheid Grid Strengthening Project, near Swellendam. Nsovo Environmental Consultants. 2016.
- Juno-Gromis 400kV Power Line. Ecological Walk-Through study for EMPr. Nsovo Environmental Consultants. 2017.
- Proposed Weskusfleur Substation at Koeberg. Lidwala Consulting Engineers. 2015.
- Proposed Juno-Aurora 765kV Power Line in the Western Cape: Fauna & Flora Specialist Report for Impact Assessment. Nzumbululo Heritage Solutions 2015.
- The proposed Mookodi Integration Phase 2 132kV Power Lines and Ganyesa Substation near Vryburg, North West Province: Fauna & Flora Specialist Basic Assessment Report. Sivest 2014.
- Burchell-Caprum-Mooidraai 132kV Power Line - Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2014.
- Proposed Re-Alignment of The Koeberg – Ankerlig VPower Line: Fauna & Flora Specialist Report for Basic Assessment. Savannah Environmental 2014.
- Grid Connection for Mainstream South Africa Perdekraal Wind Energy Facility. Fauna & Flora Specialist Report for Basic Assessment. ERM 2014.
- Karoshoek Grid Integration Infrastructure. Fauna & Flora Specialist Report for Basic Assessment. Specialist Report for Savannah Environmental. 2012.
- Proposed Kappa-Omega 765 kV Transmission Line. Fauna, Flora & Ecology Walk-Through Report. Specialist Report for ACER Africa. 2013.

1 INTRODUCTION

Eskom Distribution proposes the construction of the Maphutha-Witkop 400kV powerline and associated infrastructure in order to meet growing electricity demand in eastern Limpopo Province. Due to developments in platinum and ferrochrome mines the forecasted high growth rate between 2013 and 2030 is expected to exceed the maximum transfer capability of the existing transmission network supplying the area. Consequently, Eskom proposes the development of Maphutha-Witkop 400kV powerline in order to mitigate the short term network reliability constraints and also to create additional capacity for the forecasted load in the Tubatse area. The fundamental aim of the proposed development is to increase the transfer capacity of the network beyond the forecasted 2030 load under all N-1 contingencies in Limpopo province and the country as a whole. The proposed development will directly and indirectly improve the standard of living for Limpopo communities as it will create employment opportunities, generate income and contribute to the local economy and to a larger extent the country as a whole.

Nsovo Environmental Consultants are conducting the required EIA process for the above development and has appointed 3Foxes Biodiversity Solutions to contribute the terrestrial biodiversity component of the EIA. As part of this process, this ecological specialist study details the ecological characteristics of the power line corridors and provides an assessment of the likely ecological impacts likely to be associated with the development of the proposed power supply development. Impacts are assessed for the preconstruction, construction, operation, and decommissioning phases of the development. A variety of avoidance and mitigation measures associated with each identified impact are recommended to reduce the likely impact of the development which should be included in the EMPr for the development. The full scope of study is detailed below.

1.1 SCOPE OF STUDY

The scope of the study includes the following activities

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (including using direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential environmental impacts
- an assessment of the significance of direct indirect and cumulative impacts in terms of the following criteria :
    - the nature of the impact, which shall include a description of what causes the

effect, what will be affected and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity) or permanent
    - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
    - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit) severe/beneficial (long-term impact that could be mitigated/long-term benefit) moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight or have no effect
    - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
    - the status which will be described as either positive, negative or neutral
    - the degree to which the impact can be reversed
    - the degree to which the impact may cause irreplaceable loss of resources
    - the degree to which the impact can be mitigated

- a description and comparative assessment of all alternatives
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
- a description of any assumptions uncertainties and gaps in knowledge
- an environmental impact statement which contains :
    - a summary of the key findings of the environmental impact assessment;
    - an assessment of the positive and negative implications of the proposed activity;
    - a comparative assessment of the positive and negative implications of identified alternatives

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the 2017 amended EIA Regulations as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should:

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NE MA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);
    - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.

- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The development would consist of the following elements:

- Three different power line alternatives are being considered, which are illustrated below.

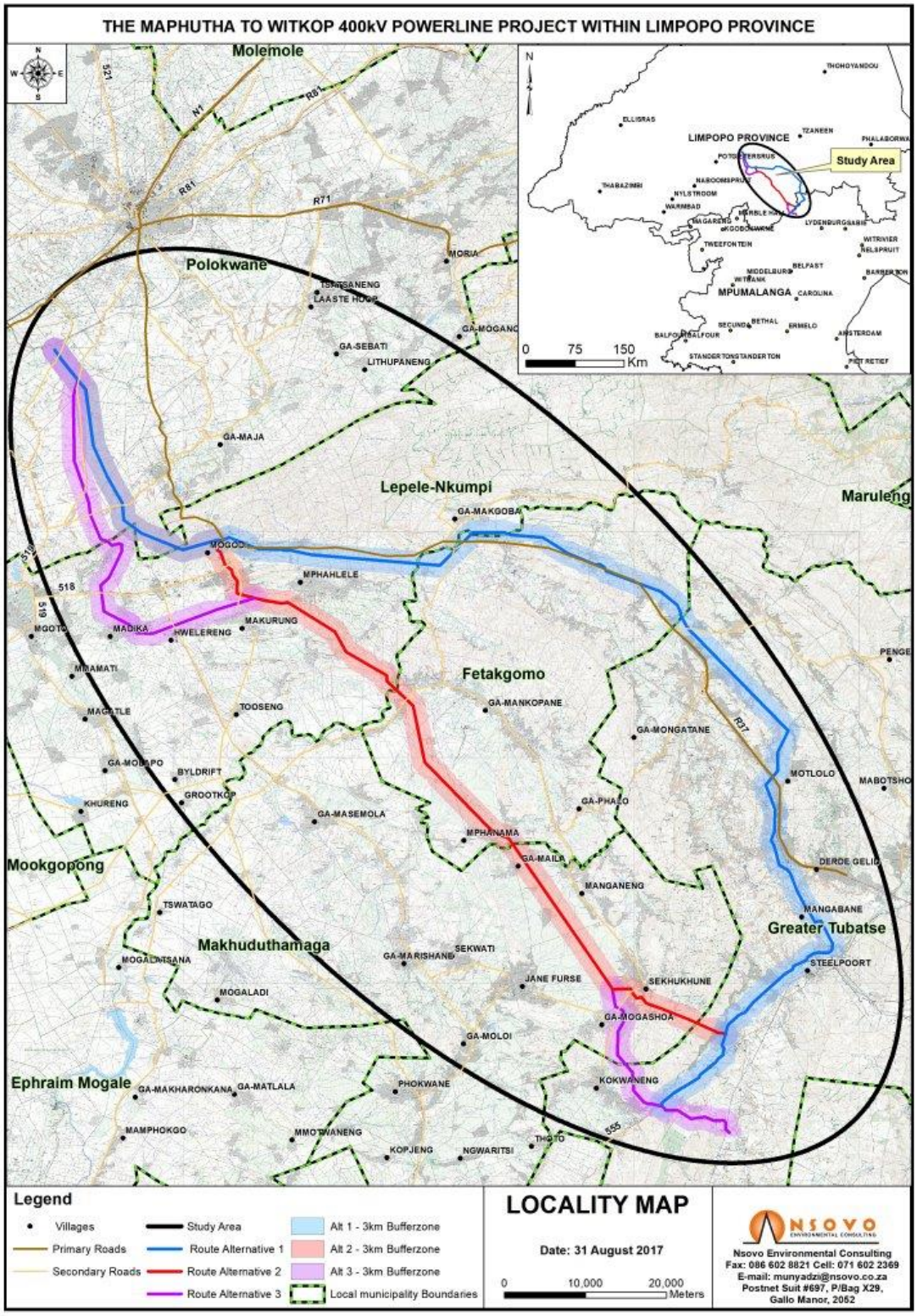

Figure 1. Map of the Mphutha-Witkop study area, showing the 3 corridor alternatives, with Alternative 1 in Blue, Alternative 2 in Red and Alternative 3 in Purple. Alternative 1 overlaps with Alternative 2 towards Witkop Substation, while Alternative2 shares the middle section of the corridor with Alternative 3.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

The data sources consulted and used where necessary in the study includes the following:

- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 2429AB, 2429AD, 2429BC, 2429BD, 2429DB, 2430AC, 2430CA, 2429DD and 2430CC was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach given the development's length stretches across the QDSes.
- Critical Biodiversity Areas for the site and surroundings were extracted from the Limpopo Conservation Plan (2016)
- The IUCN conservation status (Table 1) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2016).
- Threatened Ecosystem data was extracted from the NEM:BA listed ecosystems layer (SANBI 2008).
- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006 and Powrie 2012 update) as well as the National List of Protected Ecosytems (2011).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystems Protection Assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (ADU, SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004), EWT & SANBI (2016) for the South African Red Data List of mammals, and Skinner and Chimimba (2005) for mammals.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.

- The conservation status of each species is also listed, based on the EWT 2016 Red Listing for mammals, based on the IUCN Criteria (See Figure 2).

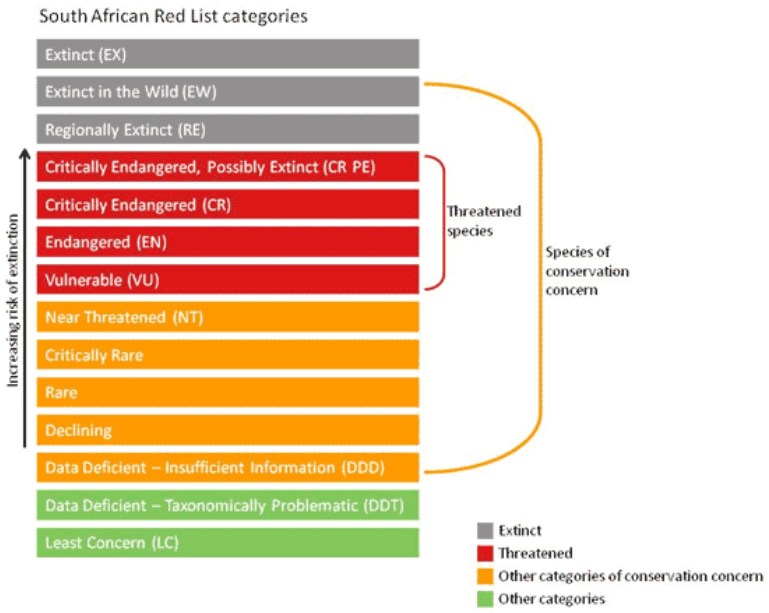

Figure 2. Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

2.2 Site Visit

The site was visited in early November 2017 during early summer, following some early rains leading to reasonably favourable conditions at the time of the site visit. Three days were spent in the field, during which time, each of the power line corridors was driven and inspected at numerous points along the route. Specific attention was paid to sensitive features along the routes such as drainage crossings, rocky hills and other rare or unique habitats that are present along the routes. Plant species present along the routes were recorded and the presence and abundance of listed and protected species were also recorded where present. Sensitive features were mapped and characterised in the field where present.

2.3 Sampling Limitations and Assumptions

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated. The site was however sampled during a favourable season and each route was covered in sufficient detail to ensure that it is highly unlikely that there are any significant

features present along the routes that were not observed and mapped. The lists of amphibians, reptiles and mammals for the study area are based on those observed in the vicinity of the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

2.4 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as Medium High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories. However, it is important to note that these are **not** ranged categories such as Medium to High as this creates uncertainty as to whether an area falls at the top or the bottom of such scales.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1 BROAD-SCALE VEGETATION PATTERNS

There are six vegetation types along each of the power line corridors, with Sekhukhune Plains Bushveld and Sekhukhune Mountain Bushveld being the dominant vegetation types which occupy the majority of the proposed routes, with less dominant or localized vegetation types being Polokwane Plateau Bushveld, Springbokvlakte Thornveld, Poung Dolomite Mountain Bushveld, Mamabolo Mountain Bushveld and Ohrigstad Mountain Bushveld. The vegetation types present along each corridor are listed below in decreasing order of significance. In general, the first three vegetation types listed occupy more than 90% of the corridor, with the remaining types covering very short sections of the corridor, usually less than 10km. The different vegetation types are described below and illustrated in the following section.

Corridor Alternative 1

- Sekhukhune Plains Bushveld
- Polokwane Plateau Bushveld
- Sekhukhune Mountain Bushveld
- Poung Dolomite Mountain Bushveld
- Ohrigstad Mountain Bushveld
- Mamabolo Mountain Bushveld

Corridor Alternative 2

- Sekhukhune Plains Bushveld
- Sekhukhune Mountain Bushveld
- Polokwane Plateau Bushveld
- Poung Dolomite Mountain Bushveld
- Mamabolo Mountain Bushveld
- Ohrigstad Mountain Bushveld

Corridor Alternative 3

- Sekhukhune Plains Bushveld
- Sekhukhune Mountain Bushveld
- Polokwane Plateau Bushveld
- Springbokvlakte Thornveld
- Poung Dolomite Mountain Bushveld
- Mamabolo Mountain Bushveld

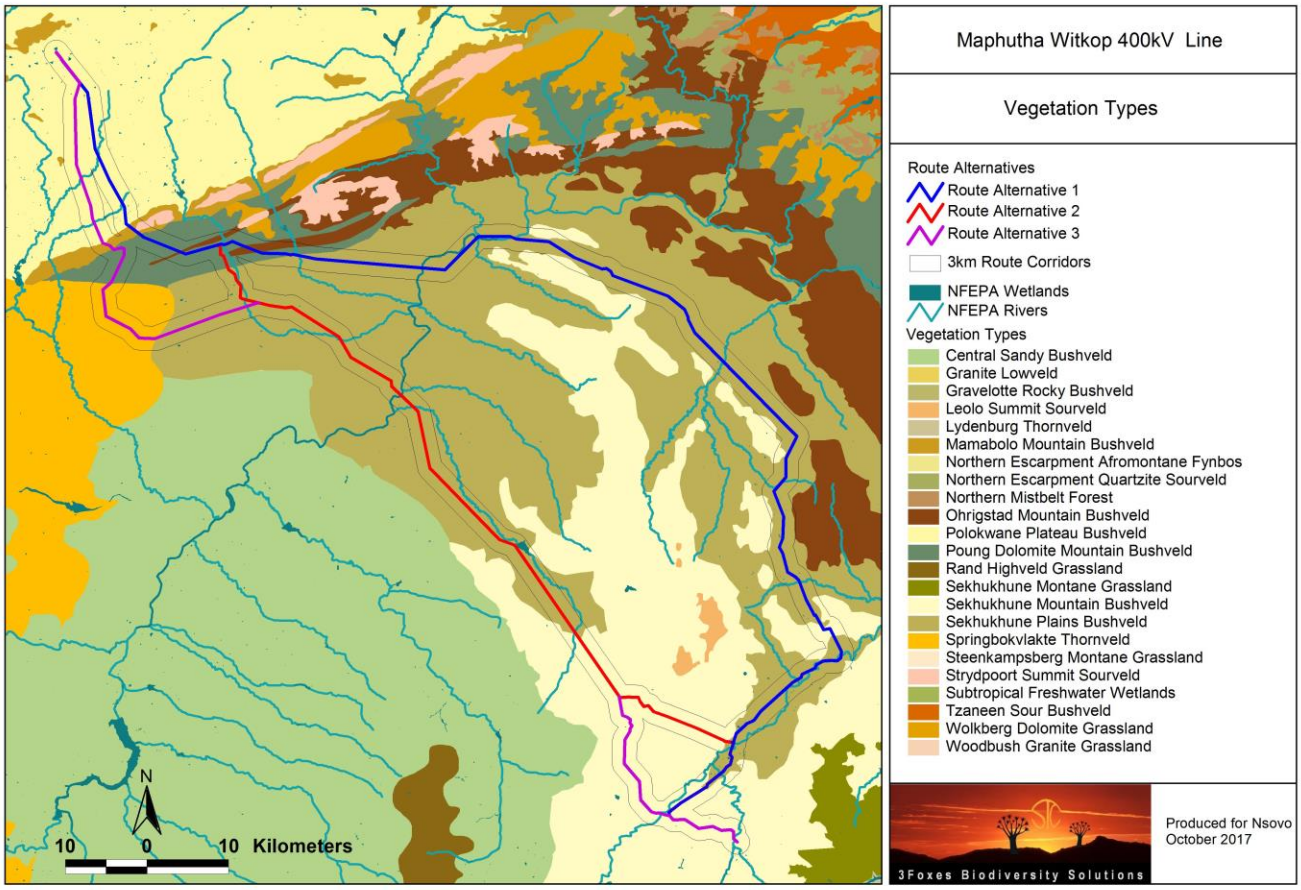

Figure 3. Vegetation map (Mucina and Rutherford 2006/2012) of the Maphutha Witkop study area.

3.1.1 DOMINANT VEGETATION TYPES

The central part of the three corridors is dominated by the **Sekhukhune Plains Bushveld** vegetation type. This unit occupies the lower-lying plains of the corridor aternative s, and occupies the vast majority of Corridor 3. Sekhukhune Plains Bushveld occurs in Limpopo and Mpumalanga Provinces and occupies lowland areas from Burgersfort and the lower basin of the Steelpoort River in the south, northwards through the plains of the Motse River basin to Jobskop and Legwareng (south of the Strydpoort Mountains). It also continues up the basin of the Olifants River to around Tswaing and the valleys of the Lepellane and Mohlaletsi Rivers. Sekhukhune Plains Bushveld occupies mainly semi-arid plains and open valleys between chains of hills and small mountains running parallel to the escarpment. It is predominantly short, open to closed thornveld with an abundance of *Aloe* species and other succulents. It is heavily degraded in places and overexploited by man for cultivation, mining and urbanisation. Encroachment by indigenous microphyllous trees and invasion by alien species is common throughout the area.

Although it was considered to be Vulnerable by Mucina and Rutherford (2006), it is not currently considered endangered and is listed as Least Concern despite 25% of the area being lost to transformation largely for subsistence cultivation, with additional threats coming from chrome and platinum mining activities and urbanization. Within the context of the corridor alternatives, large tracts of this unit along Alternative 1 and 2 have been transformed for cultivation or degraded through heavy grazing. Although there is some transformation and urbanization along Alternative 3, a relatively greater proportion of the corridor is still intact, especially in the middle section of the corridor, with much higher levels of impact in the south-east towards Steelpoort. There are high levels of alien invasion in many parts of the corridor, which is exacerbated by disturbance for cultivation as well as overgrazing. Common alien species include *Agave* spp., *Caesalpinia decapetala*, *Lantana camara*, *Melia azedarach*, *Nicotiana glauca*, *Opuntia* spp., *Verbesina encelioides* and *Xanthium strumarium* amongst others.

Sekhukhune Mountain Bushveld is especially prominent along Alternatives 1 and 2 in the south of the corridor alternatives. This vegetation type occurs in Limpopo and Mpumalanga Provinces on the mountains and undulating hills above the lowlands of the Sekhukhune Plains Bushveld, which includes the majority of the Leolo Mountains, Dwars River Mountains and Thaba Sekhukhune, as well as a number of isolated smaller mountains and the undulating small hills in the valley of the Steelpoort River up to and along the Klip River flowing past Roossenekal. Sekhukhune Mountain Bushveld is a dry, open to closed microphyllous and broad-leaved savanna on hills and mountain slopes. The vegetation of the mountain slopes is generally taller than in the valleys, with a well-developed herb layer. While the bushveld of valleys and dry northern aspects is usually dense, with a herb layer comprising many short-lived perennials. Dry habitats contain a number of species with xerophytic adaptations, such as succulence and underground storage organs. Sekhukhune Mountain Bushveld is considered to be Least Threatened, but there is very little formally conserved. About 15% is currently transformed due to cultivation and urbanization.

Sekhukhune Mountain Bushveld is part of the Sekhukhuneland Center of Endemism (Van Wyk & Smith 2001), more specifically the Steelpoort Subcentre. This vegetation unit is not heavily disturbed or degraded and its vast range of habitat still harbours high plant diversity with many endemics. It is related to Sekhukhune Plains Bushveld, Norite Koppies Bushveld and Ohrigstad Mountain Bushveld in terms of floristic diversity, species richness and vegetation structure.

The section of the corridor alternatives towards the Witkop substation occur within the **Polokwane Plateau Bushveld** vegetation type. This vegetation type is restricted to Limpopo Province in the higher-lying plains around Polokwane, north of the Strydpoort Mountains and south of the Makhado Sweet Bushveld vegetation unit. Polokwane Plateau Bushveld occurs on moderately undulating plains with a short open tree layer, with a well-developed grass layer to grass plains with occasional trees at higher altitudes. Although this unit is considered to be Least Threatened, 17% is transformed and over one third of the

remaining vegetation can be regarded as degraded. Within the power line corridors, the areas of this vegetation are still largely intact and apart from some areas of cultivation, there is little transformation in the affected area.

Springbokvlakte Thornveld occurs in Limpopo, Mpumalanga, North-West and Gauteng Provinces on the flats from Zebediela in the northeast to Hammanskraal and Assen in the southwest as well as from Bela-Bela and Mookgophong in the northwest to Marble Hall and Rust de Winter in the southeast. It is an open to dense, low thorn savanna dominated by *Acacia* species or shrubby grassland with a very low shrub layer. It is classified as Vulnerable and at least 49% has been lost to cultivation and other sources of transformation. This unit is only present along a relatively short section of Alternative 1 and does not occur within the other Alternatives.

Poung Dolomite Mountain Bushveld occurs in Limpopo and Mpumalanga Provinces on mountain slopes from the area of the Abel Erasmus Pass in the south, more or less continuously north-wards long the western rainshadow side of the escarpment, including Poung Mountain near Penge becoming discontinuous towards the Wolkberg and westwards along the Strydpoort Mountains to Chuniespoort and Mokopane. It is an open to closed woodland with well-developed shrub layers and occurs on low to high mountain slopes. It is considered to be Least Threatened and only about 6% is currently transformed.

Apart from the above vegetation types there are very small extents of Ohrigstad Mountain Bushveld and Mamabolo Mountain Bushveld along the corridors, which are less than 10km in extent and not described in detail here, but are essentially similar to the other vegetation types described above that are associated with mountainous terrain.

Although Mucina and Rutherford (2006) provide lists of the dominant and characteristic species associated with each of the above vegetation types, these are not repeated here. However, the actual species observed to be present along the different sections of the corridors are described in Section 3.4 and the different vegetation types observed along the corridors illustrated.

3.2 CRITICAL BIODIVERSITY AREAS & BROAD SCALE ECOLOGICAL PROCESSES

The Limpopo Conservation Plan (2013) for the study area is illustrated below in Figure 4. There are several CBAs along the different corridors, with all alternatives going through an extensive area of the CBA 1 and CBA 2 towards the Witkop substation and then CBAs along the major drainage lines such as Olifants and Hlakaro Rivers. Alternative 3 passes along the edge of the Potlake Nature Reserve in the middle section and then several areas of CBA 2 along the Steelpoort River in the southeast. Alternative 1 and 2 have relatively few CBAs in the middle section, but traverse a fairly large area of CBA 2 in the south where the corridors traverse some mountainous areas. The final section of the corridors in the south fall within a Tier 1 CBA associated with the Sekhukhuneland Center of Endemism.

Impacts of the development on the CBAs are of potential concern, especially where this would affect Tier 1 CBAs or formal conservation areas. Alternative 3 traverses the Potlake Nature Reserve and this is considered a significant potential impact and is one of the major drivers leading to the low acceptability of this alternative as a viable alternative. Although the corridor potentially allows for the Potlake Nature Reserve to be avoided, it is not clear that this is possible in reality as the area to the south is within an active mining area and may not be available for the power line routing. In many areas where there are CBAs, a mitigating factor is the presence of an existing power line along the proposed corridor, with the result that the new power line would be adjacent to an existing line which would reduce the overall extent of new disturbance associated with the line and reduce the impact along these sections compared to areas where there is no existing line and a novel disturbance corridor would need to be created. Overall, the major impact of the development on the CBAs would be the partial transformation of the power line servitude due to woody vegetation clearing. This results in some habitat degradation and loss, but in general, the affected area remains relatively intact and still useable for most fauna.

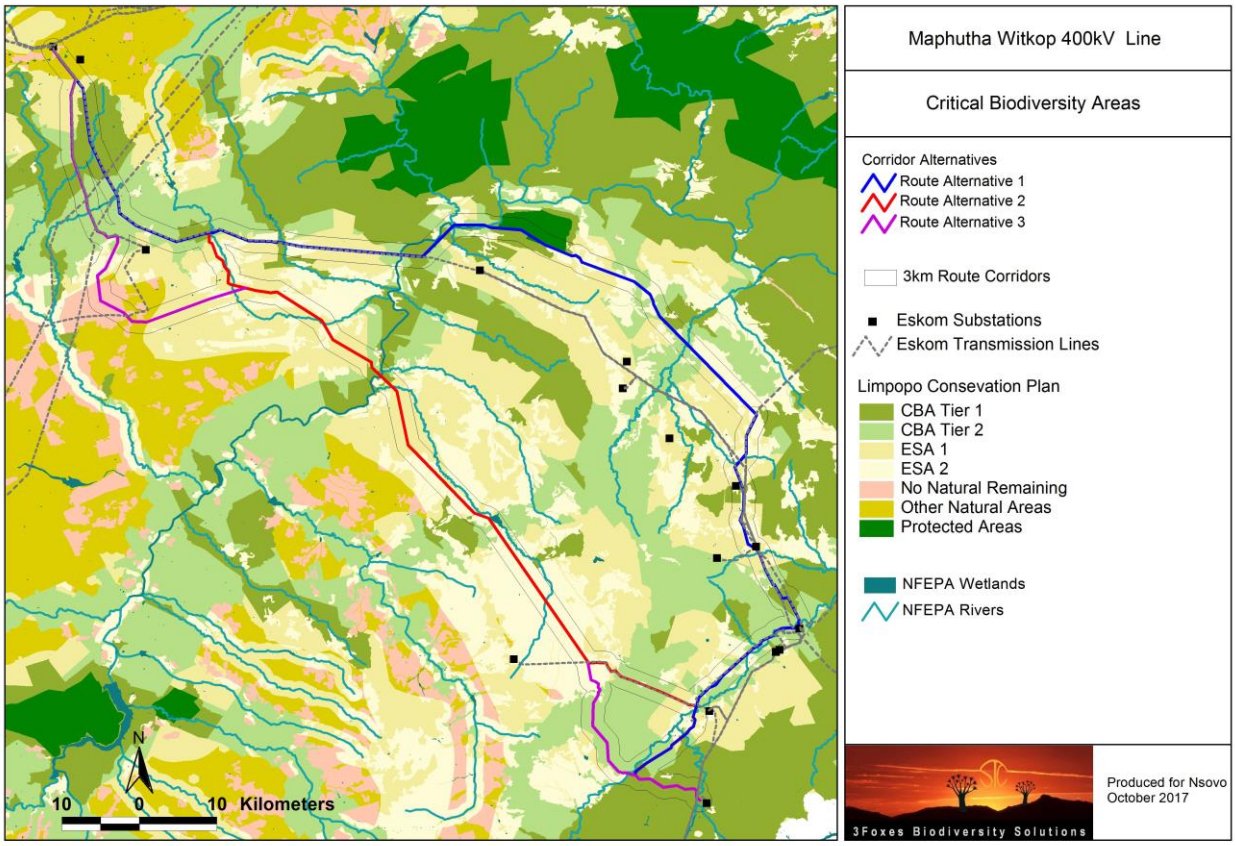

Figure 4. Critical Biodiversity Areas map of the areas within and around the Maphutha Witkop study area.

3.3 LISTED & PROTECTED PLANT SPECIES

According to the SANBI SIBIS database, more than 1200 indigenous species have been recorded from the quarter degree squares distributed along the power line corridors. This includes 24 species of conservation concern (Annex 1). The majority of these species are associated with the mountainous areas and habitats of the study area and as such specific attention should be paid to the possible presence of these species along the chosen corridor at the preconstruction stage during the walk-through to ensure that impact on such species can be minimized. Protected tree species are however abundant across large parts of the study area and it is likely that hundreds if not thousands of individuals of protected species such as Marula *Sclerocarya birrea* could be potentially lost as a result of the development. *Boscia albitrunca* and *Acacia erioloba* are also locally abundant in some areas. However, many of these trees occur in impacted environments where there is little grass cover and where fire risk is consequently low and as such, these trees do not represent a fire risk and should be tolerated beneath the power line.

3.4 SITE DESCRIPTION

The different habitats and features observed along the power line corridor alternatives are described below. Photographs of the various features are provided and their distribution within the different power line corridors described along with associated species and issues of potential concern. The description starts in the north at the Witkop Substation and works its way down the line to Maphutha.

Polokwane Plateau Bushveld

Looking southeast down the existing power line servitudes from near the Witkop Substation, showing the common section of the proposed power line corridor which would run adjacent to the existing lines. The vegetation is Polokwane Plateau Bushveld, showing some signs of bush encroachment by acacias and a fairly high abundance of alien plant species, especially in disturbed places.

The vegetation along the power line Corridor Alternative 3, about 15km from the Witkop Substation. The vegetation generally has a high density of trees and woody species and has a higher diversity of species than the initial section towards Witkop Substation, which can be ascribed to changes in soil conditions. There are more protected tree species present in this section of the corridor than in the initial section, with Marula *Sclerocarya birrea* and *Boscia albitunca* being prominent.

Common and dominant species observed in the areas of Polokwane Plateau Bushveld include trees such as *Senegalia caffra*, *Vachellia tortilis* subsp. *heteracantha*, *Terminalia sericea*, *Peltophorum africanum*, *Ziziphus mucronata*, *Euphorbia ingens*, *Dombeya rotundifolia*, *Combretum molle*, *Faurea saligna*, *Sclerocarya birrea*, large shrubs and smaller trees including *Grewia flava*, *Aloe marlothii* subsp. *marlothii*, *Acacia hebeclada* subsp. *hebeclada*, *Gymnosporia senegalensis*, *Diospyros lycioides* subsp. *sericea*, *Euclea crispa* subsp. *crispa*, *Lopholaena coriifolia*, *Dichrostachys cinerea*, *Lippia javanica*, *Rhus pyroides* var. *pyroides*, *Lantana rugosa*, *Sida rhombifolia*, *Solanum panduriforme* and the climbers *Clematis hirsuta* and *Momordica balsamina*, with grasses such as *Eragrostis curvula*, *Cymbopogon caesius*, *Aristida congesta*, *Aristida diffusa*, *Brachiaria nigropedata*, *Digitaria eriantha* subsp. *eriantha*, *Themeda triandra*, *Cynodon dactylon*, *Diheteropogon amplectens*, *Panicum maximum*, *Pogonarthria squarrosa* and herbs and low shrubs such as *Hermbstaedtia odorata*, *Pollichia campestris*, *Hypoxis hemerocallidea* and *Aloe greatheadii* var. *greatheadii*. Although there are not a lot of significant features in the landscape of this section of the corridor, the vegetation is generally considered to be of moderate sensitivity as the Polokwane Plateau Bushveld vegetation type has experienced significant impact from transformation and degradation. Within the study area, this unit is however generally intact with little loss to transformation and generally in a fair condition. The abundance of protected tree species in this section of the corridors is low near to Witkop Substation but picks up as one moves east out of the grassland-dominated areas and into more typical bushveld areas with higher tree diversity.

Poung Dolomite Mountain Bushveld

Poung Dolomite Mountain Bushveld along Alternative 2 near to Matome, showing the area where Alternative 2 will come over the ridge, adjacent to the existing line.

The Poung Dolomite Mountain Bushveld vegetation type is generally considered to be associated with ecologically sensitive areas which have a high value for fauna and flora. These areas contain areas of exposed bedrock which are important for reptiles in particular, and there are also numerous small densely vegetated kloofs and drainage systems coming off the mountains.

Although there is not a large extent of Poung Dolomite Mountain Bushveld along the power line alternatives, this is considered to be a sensitive unit as it is associated with large ridges and mountains with a high biodiversity value. The footprint in these areas should be minimized as much as possible and existing alignments used wherever possible. The vegetation of the lower slopes of the hills is largely similar to the adjacent units, but becomes increasingly unique as one rises in elevation. Characteristic and common species include *Hippobromus pauciflorus*, *Boscia albitrunca*, *Combretum hereroense*, *Croton gratissimus*, *Dombeya autumnalis*, *Vitex obovata*, *Euphorbia tirucalli*, *Pouzolzia mixta* and *Senna petersiana*. Common grasses include *Bewsia biflora*, *Brachiaria serrata*, *Eragrostis lehmanniana*, *Loudetia simplex*, *Melinis repens*, *Panicum maximum*, *Themeda triandra*, *Enneapogon scoparius* and *Heteropogon contortus*. Although this is not a very extensive vegetation unit, it has a relatively large number of associated endemics indicating the specialized nature of the vegetation of this unit.

Sekhukhune Plains Bushveld

Large tracts of all the alternatives s lie within the Sekhukhune Plains Bushveld vegetation type. In some areas, especially along the central section of Alternative 2 and 3 and the central and southern sections of Alternative 1, there has been extensive impact to this unit due to agricultural activities and there are few places left where this unit can be considered intact and in a good condition. Although some areas on more stony soils have not been

impacted to the same degree, these areas do not have the same vegetation composition as the areas on deeper soils and are transitional with Sekhukhune Mountain Bushveld.

Secondary vegetation on old fields along Corridor Alternative 1 near to Maake. The majority of the low-lying areas have been ploughed for cultivation in the past and may still be used on a regular or occasional basis. Such transformed areas are of low sensitivity and development in these areas is not of ecological concern.

Intact Sekhukhune Plains Bushveld along Corridor Alternative 1, showing the vegetation clearing along the existing line that would also likely be required beneath the current proposed line and which is the major source of impact on terrestrial systems that result from power line developments. The prominent aloe in the cleared areas is *Aloe cryptopoda*.

Intact Sekhukhune Plains Bushveld south of Tiekiedraai along Alternative 2 and 3. The vegetation is in a relatively poor condition with a lot of bush encroachment as a result of overgrazing. The large trees are mostly the protected tree *Boscia albitrunca*.

Looking north along the Alternative 2 and 3 corridor near to Schoonoord, showing the impacted nature typical of large tracts of the corridors on the plains of the Sekhukhune Plains Bushveld vegetation type

Common and characteristic species present within the areas of Sekhukhune Plains Bushveld include trees such as *Vachellia erioloba*, *Philenoptera violacea*, *Senegalia mellifera* subsp. *detinens*, *Vachellia nilotica*, *Vachellia tortilis* subsp. *heteracantha*, *Boscia foetida* subsp.

rehmanniana, *Acacia grandicornuta*, *Albizia anthelmintica*, *Balanites maughamii*, *Commiphora glandulosa*, *Maerua angolensis*, *Ptaeroxylon obliquum*, *Schotia brachypetala*, *Ziziphus mucronata* and smaller trees and shrubs such as *Euphorbia tirucalli*, *Cadaba termitaria*, *Dichrostachys cinerea*, *Ehretia rigida* subsp. *rigida*, *Grewia bicolor*, *Rhigozum brevispinosum*, *Triaspis glaucophylla*, *Gnidia polycephala*, *Gossypium herbaceum* subsp. *africanum*, *Jamesbrittenia atropurpurea*, *Jatropha latifolia* var. *latifolia*, *Lantana rugosa*, *Melhania rehmannii*, *Monechma divaricatum*, *Aloe cryptopoda*, *Kleinia longiflora*, *Sarcostemma viminale*. Common grasses include *Cenchrus ciliaris*, *Enneapogon cenchroides*, *Panicum maximum*, *Urochloa mosambicensis*, *Aristida adscensionis*, *Aristida congesta*, *Schmidtia pappophoroides* and *Tragus berteronianus*. Forbs are also fairly common and include *Becium filamentosum*, *Blepharis integrifolia*, *Corchorus asplenifolius*, *Hibiscus praeteritus* and *Sansevieria pearsonii*. Protected trees are relatively common in this vegetation unit and include species such as *Boscia albitrunca*, *Vacheliia erioloba* especially along Alternatives 2 and 3 and *Sclerocarya birrea* along the majority of the Alternative 1 corridor.

Sekhukhune Mountain Bushveld

The southern sections of Alternative 1 and 2 lie largely within the Sekhukhune Mountain Bushveld vegetation type. As the name suggests, this unit is associated with the ridges and mountains of the area and is replaced by Ohrigstad Mountain Bushveld to the east of Corridor Alternative 1. This vegetation type is still largely intact as it is associated with mountains and rocky terrain. As with the other Bushveld vegetation types, it is considered to be relatively sensitive on account of the high biodiversity value of these areas for both fauna and flora. At very high elevations, the vegetation may give way to sourveld grasslands, but such areas would not be affected by the current development. Common and characteristic species include trees such as *Acacia nigrescens*, *Acacia ataxacantha*, *Combretum apiculatum*, *Kirkia wilmsii*, *Terminalia prunioides*, *Vitex obovata* subsp. *wilmsii*, *Ziziphus mucronata*, *Bolusanthus speciosus*, *Boscia albitrunca*, *Brachylaena ilicifolia*, *Combretum molle*, *Croton gratissimus*, *Cussonia transvaalensis*, *Dodonaea viscosa*, *Hippobromus pauciflorus*, *Ozoroa sphaerocarpa*, *Pappea capensis*, *Schotia latifolia*, *Sterculia rogersii*. Shrubs and succulents include *Aloe marlothii* subsp. *marlothii*, *Dichrostachys cinerea*, *Euclea crispa* subsp. *crispa*, *Combretum hereroense*, *Pavetta zeyheri*, *Triaspis glaucophylla*, *Elephantorrhiza praetermissa*, *Asparagus intricatus*, *Commiphora africana*, *Jatropha latifolia* var. *angustata*, *Melhania prostrata*, *Phyllanthus glaucophyllus*, *Aloe cryptopoda* and climbers such as *Clematis brachiata*, *Rhoicissus tridentata* and *Sarcostemma viminale*. Grasses present include *Aristida canescens*, *Heteropogon contortus*, *Panicum maximum*, *Themeda triandra*, *Cymbopogon pospischilii*, *Diheteropogon amplectens* and *Enneapogon scoparius*.

The study areas within the Sekhukhune Mountain Bushveld vegetation type are considered relatively sensitive and the larger extent of this unit along Alternative 2 and 3 are seen as negative properties of these two alternatives compared to Alternative 1. However the

affected areas are relatively low sensitivity on account of existing disturbance along the proposed alignments and as a result, this does not outweigh the other benefits of these alternatives compared to Alternative 1. The abundance of protected species is relatively high in some parts of this unit, but the proposed alignments are within areas that have been impacted to some degree and impacts on protected tree species would be relatively low through this section.

Sekhukhune Mountain Bushveld along Corridor Alternative 1 before Steelpoort, showing the diversity of the vegetation on the slopes and the intact nature of the vegetation compared to the adjacent plains which have generally been heavily impacted by human use.

Sekhukhune Mountain Bushveld near to Schoonoord along Corridor Alternative 3. The lower hillslopes in the foreground are degraded and dominated almost entirely by *Dodonea viscosa*.

Sekhukhune Mountain Bushveld along Corridor Alternative 2 where the corridor exists the Leolo mountains at Senakangwedi, showing the existing 132kV power line that comes through on this same alignment.

3.5 FAUNAL COMMUNITIES

Mammals

According to the MammalMap database (Annex 2), more than 100 terrestrial mammals are known from the broader study area. At least 18 of these are conservation dependent ungulates or carnivores and are not considered to be free-ranging species that would be affected by the development. The broader area has been relatively well sampled as illustrated by the fact that the list includes nearly 40 small mammals, which are not usually well represented in fauna species lists derived from the MammalMap database. Apart from the terrestrial mammals, 28 bat species are also known from the area. The overall mammalian diversity of the area is therefore high and while not all of the species in the list would occur within the affected area, the potential diversity remains relatively high. Large sections of the corridor do however fall within communal farming areas where larger ungulates and predators have likely been eliminated through hunting and diversity in these areas is likely to be reduced as a result.

Listed mammals likely or potentially present along the corridor include Serval *Leptailurus serval* (Near Threatened), Brown Hyena *Hyaena brunnea* (Near Threatened), Cape Clawless Otter *Aonyx capensis* (Near Threatened), Southern African Hedgehog *Atelerix frontalis* (Near Threatened), Ground Pangolin *Smutsia temminckii* (Vulnerable), Stairs's White-collared Monkey *Cercopithecus albogularis erythrarchus* (Near Threatened), Grassland Vlei Rat *Otomys auratus* (Near Threatened), Red Duiker *Cephalophus natalensis* (Near Threatened), Oribi *Ourebia ourebi* (Endangered) and Mountain Reedbuck *Redunca fulvorufula* (Endangered). There are also four listed bat species known from the area which includes Percival's Short-eared Trident Bat *Cloeotis percivali* (Endangered), Blasius's Horseshoe Bat *Rhinolophus blasii* (Near Threatened), Cohen's Horseshoe Bat *Rhinolophus cohenae* (Vulnerable) and Swinny's Horseshoe Bat *Rhinolophus swinnyi* (Vulnerable). This is a relatively large number of listed mammals and raises a potential concern regarding the impact of the development on these species. However, none of these species have their distribution centered on the site and none are known to have significant populations within the affected area. Where they occur within the site, they are associated with specific habitats such as forest patches, wetlands and riparian areas or occur more broadly across the area at a low density. Due to the linear nature of the development, the local impact in any of these area is relatively low and provided that sensitive features such as forest patches are avoided, then the overall impact on listed species would be low as there are no species that appear to be particularly vulnerable to the development,

In terms of the different alternative s, there is not a large difference in terms of potential impacts on mammals. Alternative 1 is seen as the least preferred alternative because it is the longest and traverses a greater extent of intact habitat than the other alternatives and includes sensitive features such as the Potlake Nature Reserve. Alternative 2 and 3 are

largely similar, with the greatest potential impact associated with areas where the corridors traverse mountainous areas such as south of Schoonoord.

Reptiles

According to the ReptileMap database, 60 reptile species have been recorded from the quarter degrees covering the site (Annex 3), which is likely an underestimate as some areas have not been well sampled in the past. This includes only one listed species, FitzSimons' Flat Lizard *Platysaurus orientalis fitzsimonsi* (Near Threatened) which occurs largely to the south of the site in the mountains around Groblersdal. Although there are a number of other listed species known from the broader area, these are largely restricted to the mountains to the north of the site and in particular the Wolkberg and Magoebaskloof areas. These species would not be affected by the current development and impacts on listed reptiles resulting from the power line development would be low.

In general, the most important habitats in the area for reptiles are likely to be forest patches, riparian areas and rocky outcrops along mountains and river valleys. The major potential impact of the development on reptiles is likely to be habitat loss or degradation as a result of the power line development. However, in the long-term, impacts on reptiles are likely to be relatively low as the extent of habitat loss would be low and the majority of the power line servitude would still be available for use by most reptiles.

The Serrated Tent Tortoise *Psammobates oculifer* is common in the less-densely vegetated hills and plains of the site. This individual was observed near to the Potlake Nature Reserve along Corridor 1.

The Speckled Rock Skink *Trachylepis punctatissima* is common across the site, wherever there are rocks or similar structure for cover.

Amphibians

Twenty nine frog species are known from the area, indicating a moderate amphibian diversity. Only one listed species is known from the area, the Giant Bull Frog *Pyxicephalus adspersus* (Near Threatened). This species breeds in pans and vegetated farm dams and is likely to occur across the majority of the lowlands of the study area. However, provided that impact on these features can be avoided, then impacts on the Giant Bullfrog are likely to be low. In addition, as this species is widespread in the Savanna Biome, it is not likely that the development would have a significant impact on the broader population of this species. The power line corridor traverse numerous drainage lines of various size as well as some wetlands and other freshwater features that are of significance for amphibians. However, the pylons can be spaced as much as 500m or more apart and as a result, drainage features and wetlands can be spanned without significant impact on these features. Consequently, impacts on amphibians are likely to be relatively low and no very high impacts are likely.

3.6 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the study area is illustrated below in Figure 5. Large tracts of the corridors have either been transformed for crop production or heavily degraded as a result of overgrazing which has reduced the potential sensitivity of these areas. The extent of more sensitive features within each corridor does not vary a lot and includes drainage features, wetlands, rocky ridges and areas of good condition bushveld or grassland vegetation. The sections of the corridors towards Witkop substation are all considered moderately sensitive on account of the intact nature of the Polokwane Plateau Bushveld vegetation present and the relatively high conservation value of this unit which has been significantly impacted by transformation and degradation. There are also numerous minor and several major drainage systems which cross the corridors including the Olifants and Steelpoort Rivers, with associated forest and riparian vegetation and which are considered to be very high sensitivity. Some of the ridges along the corridors are also considered to be sensitive and vulnerable to disturbance including Schuinsrand, Potlake and the Leolo Mountains near Schoonoord. Most sections of the study area also have relatively high numbers of protected tree species present, with Marula *Sclerocarya birrea* being dominant across most of the study area and other species such as *Boscia albitrunca* and *Acacia erioloba* being locally abundant. The protected trees are often present even in transformed landscapes and the power line is likely to result in the loss of large numbers of such trees if these are cleared for the power line servitude during construction.

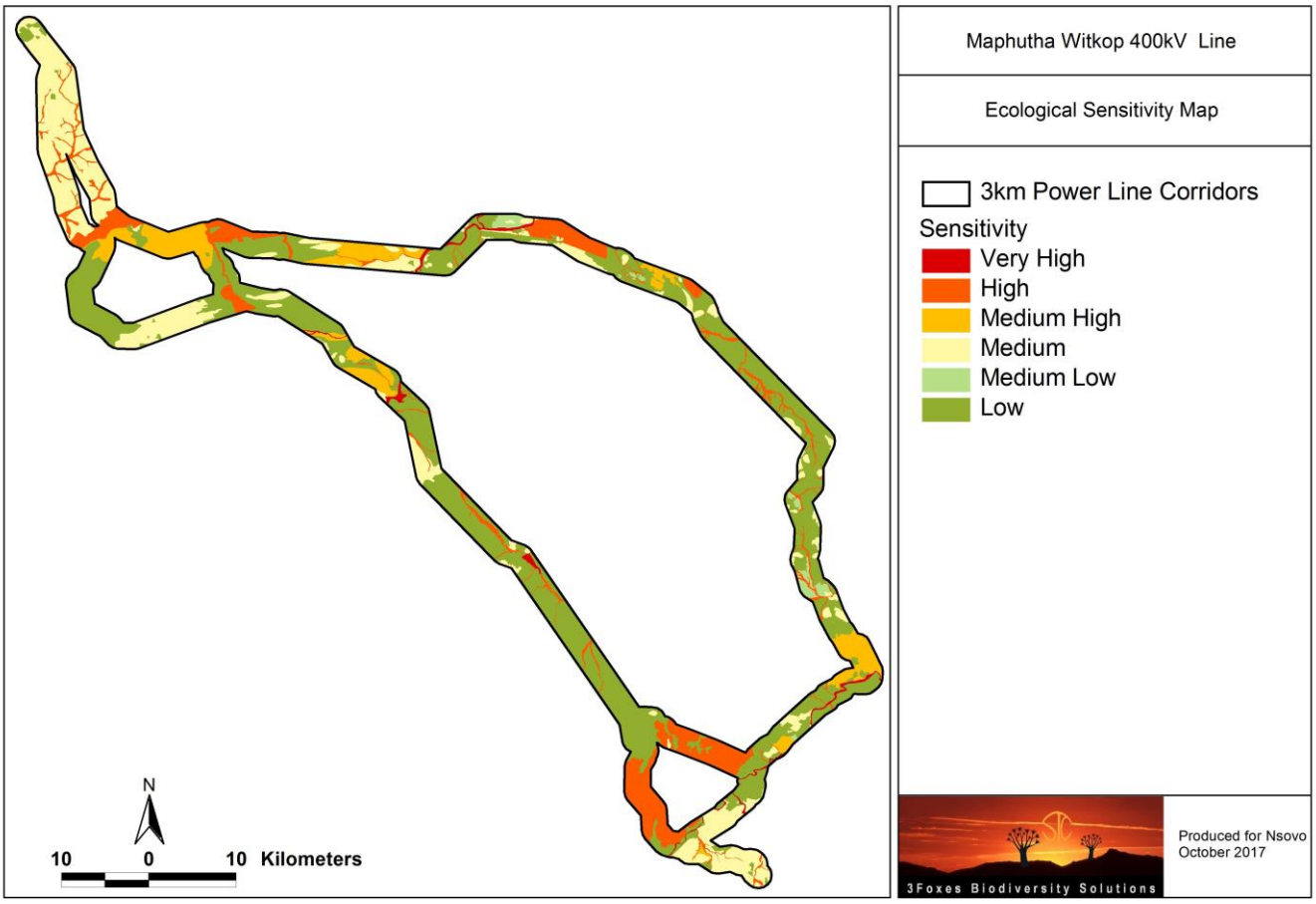

Figure 4. Ecological sensitivity map of the Maphutha Witkop corridor alternatives.

4 IDENTIFICATION & NATURE OF IMPACTS

4.1 CONSTRUCTION PHASE IMPACTS

The likely impacts on the terrestrial ecology of the site resulting from the development of the Maphutha-Witkop powerline are identified and discussed below with reference to the characteristics and features of the study area.

Impacts on vegetation and listed or protected plant species

Vegetation clearing for pylons, servitude roads and other infrastructure would result in loss of currently intact vegetation and on plant species of conservation concern. Although this impact can be reduced through a preconstruction walk-through, some impact on currently intact areas is inevitable and cannot be avoided.

Direct Faunal Impacts.

Increased levels of noise, pollution, disturbance and human presence during construction of the powerline will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Slower types such as tortoises, snakes and amphibians would be most susceptible and the impact would be largely concentrated to the construction phase when vehicle activity is high. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

4.2 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

The large amount of disturbance created during construction would leave some of the areas in the footprint vulnerable to soil erosion. The eroded material may enter streams and rivers and may have significant impact on these systems through siltation of pools and changes in the chemistry and turbidity of the water. As this is a potential impact of the development, it is assessed for the operational phase.

Faunal Impacts

During the operational phase of the development, impacts on fauna are likely to be very low and with standard mitigation and avoidance, no significant impacts on fauna during operation are anticipated. This impact is therefore not assessed for the Operational Phase.

Impact on Critical Biodiversity Areas

The footprint potentially includes areas that have been demarcated as CBAs and the loss of habitat within the CBAs would potentially result in a loss of biodiversity as well as a potential loss in ecosystem function within the CBA, with negative consequences for biodiversity maintenance in the long-term.

4.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

Habitat loss due to construction of the power line would result in cumulative impacts on listed vegetation types. This would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.

5 ASSESSMENT METHODOLOGY

Assessment & Significance Criteria

Direct, indirect and cumulative impacts of the issues identified in this report are assessed in terms of the following criteria:

- The **nature** which includes a description of what causes the effect what will be affected and how it will be affected.
- The **extent** wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 is assigned as appropriate (with 1 being low and 5 being high):
- The **duration** wherein it is indicated whether:
    - the lifetime of the impact will be of a very short du ration (0- 1 years) - assigned a score of 1.
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2.
    - medium-term (5-15 years) - assigned a score of 3
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5
- The **magnitude** quantified on a scale from 0-10 where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way 8 is high (processes are altered to the extent that they temporarily cease) and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which shall describe the (likelihood of the impact actually occurring. Probability will be estimated on a scale of 1-5 where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but of low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).

The **significance** which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;
and;
the status, which will be described as either positive, negative or neutral.
the degree to which the impact can be reversed.
the degree to which the impact may cause irreplaceable loss of resources.
the degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

S = (E + D + M)P
Where
S = significance weighting
E = Extent
D = Duration
M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- **<30** points : **Low** (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- **30-60** points : **Medium** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- **>60** points: **High** (i.e. where the impact must have an influence on the decision process to develop in the area).

6 IMPACT ASSESSMENT

6.1 CONSTRUCTION PHASE IMPACTS

Impacts are assessed below for the construction and operational phases of the development.

Impacts on vegetation and protected plant species

Vegetation clearing for powerlines and the service areas will impact on vegetation and species of conservation concern.

Issue	Alternatives	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Vegetation Impacts During Construction	Corridor 1	No	Negative	3	4	7	4	56 = Medium
		Yes	Negative	3	4	6	4	52 = Medium
	Corridor 2	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	2	4	3	3	27 = Low
	Corridor 3	No	Negative	3	4	6	4	52 = Medium
		Yes	Negative	3	4	5	4	48 = Medium
Corrective Actions	• The corridor should be designed so as to avoid areas of high sensitivity and CBAs. • There should be a preconstruction walk-through of the power line corridor to identify species of conservation concern that should be avoided or translocated. • Existing roads and access routes should be used wherever possible. • Ensure that lay-down and other temporary infrastructure is within low sensitivity areas, preferably previously transformed areas if possible.							

	• Minimise the development footprint as far as possible and rehabilitate disturbed areas that are no longer required by the operational phase of the development. • Preconstruction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. • Demarcate all areas to be cleared with construction tape or other appropriate and effective means. However caution should be exercised to avoid using material that might entangle fauna.

Faunal Impacts During Construction

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to fauna resident or utilising the site. Sensitive and shy fauna would move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals and reptiles would also be vulnerable to illegal collection or poaching.

Issue	Alternative	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Fauna Impacts During Construction	Corridor 1	No	Negative	3	1	5	4	36 = Medium
		Yes	Negative	3	1	4	4	32 = Medium
	Corridor 2	No	Negative	2	1	4	4	28 = Low
		Yes	Negative	2	1	3	3	18 = Low
	Corridor 3	No	Negative	3	1	5	4	36 = Medium
		Yes	Negative	3	1	4	4	32 = Medium
Corrective Actions	• Preconstruction walk-through of the powerline corridor to identify areas of faunal sensitivity. • Any fauna threatened by construction activities should be removed to safety by the ECO or other suitably qualified person. • Existing roads and access routes should be used wherever possible. • During construction all vehicles should adhere to demarcated tracks or roads and the speed limit should not exceed 40km/h on larger roads and should be 20-30km/h on smaller access tracks. • All construction staff should undergo environmental induction before construction commences in order to raise awareness and reduce potential faunal impacts. • To avoid impacts on amphibians, all spills of hazardous material should be cleared in the appropriate manner according to the nature and identity of the spill and all contaminated soil removed from the site. • Avoid sensitive faunal habitats such as drainage lines and wetlands.						

	• No fires should be allowed within the site as there is a risk of runaway veld fires. • If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs) as far as practically possible, which do not attract insects and which should be directed downwards. • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.

6.2 OPERATIONAL PHASE IMPACTS

Increased Erosion Risk

Operational phase disturbance may result in large amounts of erosion and silt movement into drainage lines with negative consequences for fauna and flora in these areas. Disturbance along the power line corridor is likely to increase the vulnerability of the disturbed areas to erosion.

Issue	Alternative	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Erosion risk during Operation Phase	Corridor 1	No	Negative	3	3	6	4	48 = Medium
		Yes	Negative	2	3	5	4	40 = Medium
	Corridor 2	No	Negative	3	3	4	4	40 = Medium
		Yes	Negative	2	3	4	3	27 = Low
	Corridor 3	No	Negative	3	3	6	4	48 = Medium
		Yes	Negative	2	3	4	4	36 = Medium
Corrective Actions	• Disturbance within or near the drainage lines should be kept to a minimum. No pylons should be located within drainage lines or the adjacent floodplains. • Any roads along slopes should have water diversion structures placed at regular intervals to ensure that they do not capture overland flow and become eroded. • Any erosion problems observed along the power line servitude should be rectified as soon as possible using the appropriate revegetation and erosion control works.							

Impact on Critical Biodiversity Areas

The development includes several areas of CBAs and the loss of habitat in these areas may impact the ecological functioning of the CBAs and reduce biodiversity within the affected areas.

Issue	Alternative	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Impacts on CBAs	Corridor 1	No	Negative	3	4	6	5	65 = High
		Yes	Negative	3	4	5	4	48 = Medium
	Corridor 2	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	2	4	3	3	27 = Low
	Corridor 3	No	Negative	3	4	5	4	48 = Medium
		Yes	Negative	2	4	5	3	33 = Medium
Corrective Actions	• CBAs should be avoided by the final power line corridor as much as possible, especially where these related to sensitive habitats such as forest or wetlands. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas as far as possible. • The taller woody vegetation should only be cleared where this is necessary for operational safety of the power line. Taller succulent species such as euphorbias should be left in place as they do not pose a fire risk as such species do not burn.							

6.3 CUMULATIVE IMPACTS

Cumulative impacts on broad-scale ecological processes

Habitat loss due to construction of the power line would result in cumulative impacts on listed vegetation types. This would also increase habitat fragmentation and potentially result in a loss of broad-scale landscape connectivity.

Issue	Alternative	Corrective measures	Impact rating criteria					Significance
			Nature	Extent	Duration	Magnitude	Probability	
Impacts on CBAs	Corridor 1	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	3	4	4	3	33 = Medium
	Corridor 2	No	Negative	3	4	4	3	33 = Medium
		Yes	Negative	3	4	2	3	27 = Low
	Corridor 3	No	Negative	3	4	4	4	44 = Medium
		Yes	Negative	3	4	3	3	30 = Medium
Corrective Actions	• Avoid development within the High sensitivity parts of the site. • The development footprint should be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. • Avoid impact to potential corridors such as the riparian corridors associated with the larger drainage lines within the area.							

7 IDENTIFICATION OF PREFERRED ALTERNATIVES

The comparative assessment of the three power line corridor alternatives is provided below.

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Maphutha-Witkop 400kV power line Alternatives

Alternative	Preference	Reasons (incl. potential issues)
GRID LINE CORRIDOR ALTERNATIVES		
Alternative 1	NOT PREFERRED	The Alternative is not preferred due the greater length of this alternative compared to the other Alternatives as well as the presence of some sensitive features along the corridor, such as the Potlake Nature Reserve, which is considered a significant negative attribute of this alternative.

Alternative	Preference	Reasons (incl. potential issues)
		Overall impacts associated with this Alternative are likely to be higher than the other two alternatives.
Alternative 2	PREFERRED	This is considered to be the preferred alternative as it is likely that it would generate the lowest overall impacts compared to the other alternatives. Although there are some sensitive features along the power line corridor, impacts on these features can generally be mitigated to acceptable levels.
Alternative 3	FAVOURABLE	Corridor 1 and Corridor 2 share a significant proportion of their corridors and as such there is not a large difference between the two alternatives. Although there are some sensitive features along the corridor, major impacts can be mitigated and reduced to acceptable levels. Overall, this is considered to be a favourable corridor alternative and either this alternative or Alternative 2 are considered the preferred alternatives.

8 CONCLUSIONS & RECOMMENDATIONS

The three alternatives for the Maphutha-Witkop 400kV power line traverse a wide range of habitats and environments. Large tracts of the corridors have however been transformed for crop production or heavily degraded as a result of overgrazing. As a result, the affected sections are considered low sensitivity, with little scope for significant ecological impact. There are however a number of more sensitive features present within each corridor including drainage features, wetlands, rocky ridges and areas of good condition bushveld or grassland vegetation. There is however not a large discrepancy in the abundance of such features between the different corridor alternatives.

The sections of the corridors towards Witkop substation are all considered moderately sensitive on account of the intact nature of the Polokwane Plateau Bushveld vegetation present and the relatively high conservation value of this unit which has been significantly impacted by transformation and degradation. There are also numerous minor and several major drainage systems which cross the corridors including the Olifants and Steelpoort Rivers, with associated forest and riparian vegetation and which are considered to be very high sensitivity. Some of the ridges along the corridors are also considered to be sensitive and vulnerable to disturbance including Schuinsrand, Potlake and the Leolo Mountains near

Schoonoord. The development footprint within such areas should be minimized as far as possible and existing disturbance alignments used where present.

Most sections of the study area also have relatively high numbers of protected tree species present, with Marula *Sclerocarya birrea* being dominant across most of the study area and other species such as *Boscia albitrunca* and *Acacia erioloba* being locally abundant. The protected trees are often present even in transformed landscapes and the power line is likely to result in the loss of large numbers of such trees if these are cleared from the power line servitude during construction. Within the transformed landscapes, these trees do not pose a threat to the power line and should be left in place where possible.

Overall, Alternative 2 is identified as the preferred alternative and likely to generate the lowest overall impact. Alternative 3 is not significantly different from Alternative 2 and is also considered to be an acceptable alternative. Alternative 1 is considered the least preferred alternative because it is significantly longer than the other alternatives and also includes several areas of high sensitivity where mitigation would be difficult. This includes the Potlake Nature Reserve that is considered to be a locally and regionally significant. If this area can be avoided, then this alternative would also be considered potentially acceptable.

Overall and with the suggested mitigation measures applied, the development of the Maphutha-Witkop 400kV power line would generate low impacts on fauna, but moderate impacts on flora and in particular protected tree species. However, the abundance of protected tree species in the wider area is high and the loss of the trees from the development would not impact the local populations of these species. The impact of the power line on protected trees species could also be significantly reduced through reducing the vegetation clearing requirements of the power line servitude as these trees do not generally pose a significant fire risk to the power line in many sections of the corridor.

The impacts of the power line on terrestrial ecosystems can be reduced to an acceptable level and as such, the development is deemed acceptable from the ecological perspective and as such should not be prevented from proceeding based on the ecological considerations.

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10 ANNEX 1. LIST OF PLANT SPECIES

List of plant species of conservation concern which are known to occur in the broad vicinity of the Maphutha Witkop study area, according to the SANBI POSA database.

Family	Species	Threat status
ASPARAGACEAE	*Asparagus sekukuniensis* (Oberm.) Fellingham & N.L.Mey.	EN
ACANTHACEAE	*Dicliptera fruticosa* K.Balkwill	NT
PASSIFLORACEAE	*Adenia fruticosa* Burtt Davy subsp. fruticosa	NT
COMMELINACEAE	*Aneilema longirrhizum* Faden	NT
CELASTRACEAE	*Lydenburgia cassinoides* N.Robson	NT
CELASTRACEAE	*Elaeodendron transvaalense* (Burtt Davy) R.H.Archer	NT
FABACEAE	*Vachellia ormocarpoides* P.J.H.Hurter	NT
FABACEAE	*Psoralea repens* L.	NT
HYACINTHACEAE	*Drimia sanguinea* (Schinz) Jessop	NT
SCROPHULARIACEAE	*Jamesbrittenia macrantha* (Codd) Hilliard	NT
ANACARDIACEAE	*Searsia sekhukhuniensis* (Moffett) Moffett	Rare
EUPHORBIACEAE	*Euphorbia sekukuniensis* R.A.Dyer	Rare
LAMIACEAE	*Plectranthus venteri* Van Jaarsv. & Hankey	Rare
ASPHODELACEAE	*Aloe hardyi* H.F.Glen	Rare
IRIDACEAE	*Gladiolus rufomarginatus* G.J.Lewis	Rare
LAMIACEAE	*Plectranthus porcatus* Van Jaarsv. & P.J.D.Winter	VU
ANACARDIACEAE	*Searsia batophylla* (Codd) Moffett	VU
ARACEAE	*Zantedeschia jucunda* Letty	VU
ORCHIDACEAE	*Eulophia speciosa* (R.Br. ex Lindl.) Bolus	Declining
AMARYLLIDACEAE	*Boophone disticha* (L.f.) Herb.	Declining
AMARYLLIDACEAE	*Crinum macowanii* Baker	Declining
AMARYLLIDACEAE	*Crinum stuhlmannii* Baker	Declining
MYRSINACEAE	*Rapanea melanophloeos* (L.) Mez	Declining
AQUIFOLIACEAE	*Ilex mitis* (L.) Radlk. var. mitis	Declining

11 ANNEX 2. LIST OF MAMMALS

List of mammals which have been recorded in the region of the Maphutha Witkop study area.

Family	Genus	Species	Common name	Red list category	No. records	Conservation Dependent
Orycteropodidae	*Orycteropus*	*afer*	Aardvark	Least Concern	3	
Canidae	*Canis*	*adustus*	Side-striped Jackal	Least Concern	13	
Canidae	*Canis*	*mesomelas*	Black-backed Jackal	Least Concern	25	
Canidae	*Lycaon*	*pictus*	African wild dog	**Endangered**	8	1
Canidae	*Vulpes*	*chama*	Cape Fox	Least Concern	2	
Felidae	*Acinonyx*	*jubatus*	Cheetah	**Vulnerable**	12	1
Felidae	*Caracal*	*caracal*	Caracal	Least Concern	18	
Felidae	*Felis*	*nigripes*	Black-footed Cat	Least Concern	2	
Felidae	*Felis*	*silvestris*	African Wildcat	Least Concern	1	
Felidae	*Leptailurus*	*serval*	Serval	**Near Threatened**	17	
Felidae	*Panthera*	*leo*	Lion	Least Concern	30	1
Felidae	*Panthera*	*pardus*	Leopard	**Vulnerable**	198	
Herpestidae	*Helogale*	*parvula*	Common Dwarf Mongoose	Least Concern	18	
Herpestidae	*Herpestes*	*sanguineus*	Slender Mongoose	Least Concern	10	
Herpestidae	*Ichneumia*	*albicauda*	White-tailed Mongoose	Least Concern	2	
Herpestidae	*Mungos*	*mungo*	Banded Mongoose	Least Concern	2	
Herpestidae	*Rhynchogale*	*melleri*	Meller's Mongoose	Least Concern	2	
Hyaenidae	*Crocuta*	*crocuta*	Spotted Hyena	**Near Threatened**	22	1
Hyaenidae	*Hyaena*	*brunnea*	Brown Hyena	**Near Threatened**	67	
Hyaenidae	*Proteles*	*cristata*	Aardwolf	Least Concern	2	
Mustelidae	*Aonyx*	*capensis*	African Clawless Otter	**Near Threatened**	1	
Mustelidae	*Mellivora*	*capensis*	Honey Badger	Least Concern	27	
Viveridae	*Genetta*	*maculata*	Common Large-spotted Genet	Least Concern	14	
Viverridae	*Civettictis*	*civetta*	African Civet	Least Concern	25	
Viverridae	*Genetta*	*genetta*	Common Genet	Least Concern	1	
Elephantidae	*Loxodonta*	*africana*	African Bush Elephant	Least Concern	412	1
Leporidae	*Lepus*	*saxatilis*	Scrub Hare	Least Concern	2	
Leporidae	*Pronolagus*	*randensis*	Jameson's Red Rock Hare	Least Concern	8	
Leporidae	*Pronolagus*	*rupestris*	Smith's Red Rock Hare	Least Concern	7	
Hippopotamidae	*Hippopotamus*	*amphibius*	Common Hippopotamus	Least Concern	17	1
Erinaceidae	*Atelerix*	*frontalis*	Southern African Hedgehog	**Near Threatened**	2	
Manidae	*Smutsia*	*temminckii*	Ground Pangolin	**Vulnerable**	11	
Suidae	*Phacochoerus*	*africanus*	Common Warthog	Least Concern	69	
Suidae	*Potamochoerus*	*larvatus*	Bush-pig	Least Concern	1	
Cercopithecidae	*Cercopithecus*	*albogularis*	Samango Monkey (subsp. erythrarchus)	**Near Threatened**	7	
Cercopithecidae	*Cercopithecus*	*pygerythrus*	Vervet Monkey	Least Concern	8	
Cercopithecidae	*Papio*	*ursinus*	Chacma Baboon	Least Concern	44	
Galagidae	*Galago*	*moholi*	Moholi Bushbaby	Least Concern	9	

Galagidae	*Otolemur*	*crassicaudatus*	Brown Greater Galago	Least Concern	3	
Bathyergidae	*Cryptomys*	*hottentotus*	Southern African Mole-rat	Least Concern	2	
Hystricidae	*Hystrix*	*africaeaustralis*	Cape Porcupine	Least Concern	21	
Muridae	*Acomys*	*spinosissimus*	Southern African Spiny Mouse	Least Concern	3	
Muridae	*Aethomys*	*ineptus*	Tete Veld Aethomys	Least Concern	11	
Muridae	*Aethomys*	*namaquensis*	Namaqua Rock Mouse	Least Concern	21	
Muridae	*Gerbilliscus*	*leucogaster*	Bushveld Gerbil	Least Concern	22	
Muridae	*Grammomys*	*dolichurus*	Common Grammomys	Least Concern	1	
Muridae	*Lemniscomys*	*rosalia*	Single-Striped Lemniscomys	Least Concern	4	
Muridae	*Mastomys*	*coucha*	Southern African Mastomys	Least Concern	1	
Muridae	*Mastomys*	*natalensis*	Natal Mastomys	Least Concern	14	
Muridae	*Mus*	*minutoides*	Southern African Pygmy Mouse	Least Concern	12	
Muridae	*Mus*	*neavei*	Neave's Mouse	Data Deficient	1	
Muridae	*Mus*	*sorella*	Thomas's Mouse	Not listed	2	
Muridae	*Otomys*	*angoniensis*	Angoni Vlei Rat	Least Concern	4	
Muridae	*Otomys*	*auratus*	Southern African Vlei Rat	**Near Threatened**	7	
Muridae	*Otomys*	*laminatus*	KwaZulu Vlei Rat	Least Concern	1	
Muridae	*Rhabdomys*	*pumilio*	Xeric Four-striped Grass Rat	Least Concern	8	
Muridae	*Thallomys*	*paedulcus*	Acacia Thallomys	Least Concern	6	
Nesomyidae	*Dendromus*	*melanotis*	Gray African Climbing Mouse	Least Concern	4	
Nesomyidae	*Dendromus*	*mesomelas*	Brants's African Climbing Mouse	Least Concern	1	
Nesomyidae	*Dendromus*	*mystacalis*	Chestnut African Climbing Mouse	Least Concern	4	
Nesomyidae	*Saccostomus*	*campestris*	Southern African Pouched Mouse	Least Concern	4	
Nesomyidae	*Steatomys*	*pratensis*	Common African Fat Mouse	Least Concern	1	
Pedetidae	*Pedetes*	*capensis*	South African Spring Hare	Least Concern	1	
Procaviidae	*Procavia*	*capensis*	Rock Hyrax	Least Concern	3	
Sciuridae	*Paraxerus*	*cepapi*	Smith's Bush Squirrel	Least Concern	17	
Thryonomyidae	*Thryonomys*	*swinderianus*	Greater Cane Rat	Least Concern	3	
Soricidae	*Crocidura*	*flavescens*	Greater Red Musk Shrew	Least Concern	26	
Soricidae	*Crocidura*	*hirta*	Lesser Red Musk Shrew	Least Concern	4	
Soricidae	*Crocidura*	*silacea*	Lesser Gray-brown Musk Shrew	Least Concern	4	
Soricidae	*Myosorex*	*cafer*	Dark-footed Mouse Shrew	Least Concern	4	
Soricidae	*Myosorex*	*varius*	Forest Shrew	Least Concern	68	
Soricidae	*Suncus*	*lixus*	Greater Dwarf Shrew	Least Concern	1	
Soricidae	*Suncus*	*varilla*	Lesser Dwarf Shrew	Least Concern	3	
Macroscelididae	*Elephantulus*	*brachyrhynchus*	Short-snouted Elephant Shrew	Least Concern	6	
Macroscelididae	*Elephantulus*	*intufi*	Bushveld Elephant Shrew	Least Concern	1	
Macroscelididae	*Elephantulus*	*myurus*	Eastern Rock Elephant Shrew	Least Concern	7	
Gliridae	*Graphiurus*	*murinus*	Forest African Dormouse	Least Concern	7	
Gliridae	*Graphiurus*	*platyops*	Flat-headed African Dormouse	Least Concern	1	
Bovidae	*Aepyceros*	*melampus*	Impala	Least Concern	48	1
Bovidae	*Alcelaphus*	*buselaphus*	Red Hartebeest	Least Concern	2	1
Bovidae	*Cephalophus*	*natalensis*	Red Duiker	**Near Threatened**	1	
Bovidae	*Connochaetes*	*taurinus*	Blue Wildebeest	Least Concern	17	1
Bovidae	*Damaliscus*	*lunatus*	Common Tsessebe	**Vulnerable**	6	1
Bovidae	*Damaliscus*	*pygargus*	Blesbok	Least Concern	2	1

Bovidae	*Hippotragus*	*equinus*	Roan Antelope	**Vulnerable**	8	1
Bovidae	*Hippotragus*	*niger*	Sable Antelope	**Vulnerable**	1	1
Bovidae	*Kobus*	*ellipsiprymnus*	Waterbuck	Least Concern	22	1
Bovidae	*Oreotragus*	*oreotragus*	Klipspringer	Least Concern	19	
Bovidae	*Ourebia*	*ourebi*	Oribi	**Endangered**	3	
Bovidae	*Pelea*	*capreolus*	Vaal Rhebok	Least Concern	6	
Bovidae	*Raphicerus*	*campestris*	Steenbok	Least Concern	15	
Bovidae	*Redunca*	*arundinum*	Southern Reedbuck	Least Concern	4	
Bovidae	*Redunca*	*fulvorufula*	Mountain Reedbuck	**Endangered**	12	
Bovidae	*Sylvicapra*	*grimmia*	Bush Duiker	Least Concern	48	
Bovidae	*Syncerus*	*caffer*	African Buffalo	Least Concern	12	1
Bovidae	*Tragelaphus*	*angasii*	Nyala	Least Concern	22	
Bovidae	*Tragelaphus*	*oryx*	Common Eland	Least Concern	15	1
Bovidae	*Tragelaphus*	*scriptus*	Bushbuck	Least Concern	26	
Bovidae	*Tragelaphus*	*strepsiceros*	Greater Kudu	Least Concern	55	
Equidae	*Equus*	*quagga*	Plains Zebra	Least Concern	48	1
Giraffidae	*Giraffa*	*camelopardalis*	The South African Giraffe	Least Concern	28	1
Molossidae	*Chaerephon*	*pumilus*	Little Free-tailed Bat	Least Concern	1	
Molossidae	*Mops*	*condylurus*	Angolan Free-tailed Bat	Least Concern	1	
Molossidae	*Tadarida*	*aegyptiaca*	Egyptian Free-tailed Bat	Least Concern	6	
Hipposideridae	*Cloeotis*	*percivali*	Percival's Short-eared Trident Bat	**Endangered**	7	
Hipposideridae	*Hipposideros*	*caffer*	Sundevall's Leaf-nosed Bat	Least Concern	15	
Nycteridae	*Nycteris*	*macrotis*	Large-eared Slit-faced Bat	Not listed	3	
Nycteridae	*Nycteris*	*thebaica*	Egyptian Slit-faced Bat	Least Concern	30	
Pteropodidae	*Epomophorus*	*crypturus*	Epomophorus crypturus	Least Concern	4	
Pteropodidae	*Epomophorus*	*wahlbergi*	Epomophorus wahlbergi	Least Concern	1	
Pteropodidae	*Rousettus*	*aegyptiacus*	Egyptian Rousette	Least Concern	2	
Rhinolophidae	*Rhinolophus*	*blasii*	Blasius's Horseshoe Bat	**Near Threatened**	5	
Rhinolophidae	*Rhinolophus*	*clivosus*	Geoffroy's Horseshoe Bat	Least Concern	66	
Rhinolophidae	*Rhinolophus*	*cohenae*	Cohen's Horseshoe Bat	**Vulnerable**	60	
Rhinolophidae	*Rhinolophus*	*darlingi*	Darling's Horseshoe Bat	Least Concern	11	
Rhinolophidae	*Rhinolophus*	*hildebrandtii*	Hildebrandt's Horseshoe Bat	Not listed	2	
Rhinolophidae	*Rhinolophus*	*simulator*	Bushveld Horseshoe Bat	Least Concern	10	
Rhinolophidae	*Rhinolophus*	*smithersi*	Smithers' Horseshoe Bat	Near Threatened	5	
Rhinolophidae	*Rhinolophus*	*swinnyi*	Swinny's Horseshoe Bat	**Vulnerable**	10	
Vespertilionidae	*Eptesicus*	*hottentotus*	Long-tailed Serotine	Least Concern	7	
Vespertilionidae	*Miniopterus*	*fraterculus*	Lesser Long-fingered Bat	Least Concern	8	
Vespertilionidae	*Miniopterus*	*natalensis*	Natal Long-fingered Bat	Not listed	49	
Vespertilionidae	*Miniopterus*	*schreibersii*	Schreibers's Long-fingered Bat	Not listed	14	
Vespertilionidae	*Myotis*	*tricolor*	Temminck's Myotis	Least Concern	11	
Vespertilionidae	*Neoromicia*	*capensis*	Cape Serotine	Least Concern	10	
Vespertilionidae	*Pipistrellus*	*hesperidus*	Dusky Pipistrelle	Least Concern	2	
Vespertilionidae	*Pipistrellus*	*rusticus*	Rusty Pipistrelle	Least Concern	7	
Vespertilionidae	*Pipistrellus*	*zuluensis*	Zulu Serotine	Least Concern	3	
Vespertilionidae	*Scotophilus*	*dinganii*	Yellow-bellied House Bat	Least Concern	10	

12 ANNEX 3. LIST OF REPTILES

List of reptiles which are likely to occur in the vicinity of the Maphutha Witkop study area. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Gekkonidae	*Afroedura*	*leoloensis*		Sekhukhuneland Flat Gecko	Not listed	17
Gekkonidae	*Hemidactylus*	*mabouia*		Common Tropical House Gecko	Least Concern	2
Gekkonidae	*Homopholis*	*wahlbergii*		Wahlberg's Velvet Gecko	Least Concern	2
Gekkonidae	*Lygodactylus*	*capensis*	*capensis*	Common Dwarf Gecko	Least Concern	9
Gekkonidae	*Lygodactylus*	*nigropunctatus*		Black-spotted Dwarf Gecko	Least Concern	15
Gekkonidae	*Pachydactylus*	*capensis*		Cape Gecko	Least Concern	1
Gekkonidae	*Pachydactylus*	*vansoni*		Van Son's Gecko	Least Concern	5
Gekkonidae	*Chondrodactylus*	*turneri*		Turner's Gecko	Least Concern	11
Chamaeleonidae	*Bradypodion*	*transvaalense*		Wolkberg Dwarf Chameleon	Least Concern	3
Chamaeleonidae	*Chamaeleo*	*dilepis*	*dilepis*	Common Flap-neck Chameleon	Least Concern	1
Agamidae	*Agama*	*aculeata*	*distanti*	Distant's Ground Agama	Least Concern	8
Agamidae	*Agama*	*atra*		Southern Rock Agama	Least Concern	14
Agamidae	*Acanthocercus*	*atricollis*	*atricollis*	Southern Tree Agama	Least Concern	5
Lacertidae	*Heliobolus*	*lugubris*		Bushveld Lizard	Least Concern	5
Lacertidae	*Ichnotropis*	*capensis*		Ornate Rough-scaled Lizard	Least Concern	2
Lacertidae	*Meroles*	*squamulosus*		Common Rough-scaled Lizard	Least Concern	1
Lacertidae	*Nucras*	*holubi*		Holub's Sandveld Lizard	Least Concern	1
Lacertidae	*Nucras*	*intertexta*		Spotted Sandveld Lizard	Least Concern	2
Lacertidae	*Nucras*	*ornata*		Ornate Sandveld Lizard	Least Concern	1
Lacertidae	*Pedioplanis*	*lineoocellata*	*lineoocellata*	Spotted Sand Lizard	Least Concern	3
Scincidae	*Mochlus*	*sundevallii*	*sundevallii*	Sundevall's Writhing Skink	Least Concern	1
Scincidae	*Trachylepis*	*capensis*		Cape Skink	Least Concern	5
Scincidae	*Trachylepis*	*margaritifer*		Rainbow Skink	Least Concern	22
Scincidae	*Trachylepis*	*punctatissima*		Speckled Rock Skink	Least Concern	3
Scincidae	*Trachylepis*	*varia*		Variable Skink	Least Concern	43
Scincidae	*Scelotes*	*mirus*		Montane Dwarf Burrowing Skink	Least Concern	2
Cordylidae	*Cordylus*	*vittifer*		Common Girdled Lizard	Least Concern	5
Cordylidae	*Smaug*	*vandami*		Van Dam's Girdled Lizard	Least Concern	17
Cordylidae	*Platysaurus*	*orientalis*	*orientalis*	Sekhukhune Flat Lizard	Least Concern	61
Cordylidae	*Platysaurus*	*orientalis*	*fitzsimonsi*	FitzSimons' Flat Lizard	**Near Threatened**	24
Cordylidae	*Platysaurus*	*intermedius*	*intermedius*	Common Flat Lizard	Least Concern	8
Gerrhosauridae	*Gerrhosaurus*	*flavigularis*		Yellow-throated Plated Lizard	Least Concern	5
Gerrhosauridae	*Matobosaurus*	*validus*		Common Giant Plated Lizard	Least Concern	5
Typhlopidae	*Rhinotyphlops*	*lalandei*		Delalande's Beaked Blind Snake	Least Concern	1
Leptotyphlopidae	*Myriopholis*	*longicauda*		Long-tailed Thread Snake	Least Concern	1

Leptotyphlopidae	*Leptotyphlops*	*jacobseni*		Jacobsen's Thread Snake	Least Concern	1
Pythonidae	*Python*	*natalensis*		Southern African Python	Least Concern	2
Lamprophiidae	*Atractaspis*	*duerdeni*		Duerden's Stiletto Snake	Least Concern	1
Lamprophiidae	*Lamprophis*	*guttatus*		Spotted House Snake	Least Concern	1
Lamprophiidae	*Boaedon*	*capensis*		Brown House Snake	Least Concern	1
Lamprophiidae	*Gonionotophis*	*nyassae*		Black File Snake	Least Concern	1
Colubridae	*Crotaphopeltis*	*hotamboeia*		Red-lipped Snake	Least Concern	1
Colubridae	*Philothamnus*	*natalensis*	*occidentalis*	Western Natal Green Snake	Least Concern	1
Colubridae	*Philothamnus*	*semivariegatus*		Spotted Bush Snake	Least Concern	3
Colubridae	*Telescopus*	*semiannulatus*	*semiannulatus*	Eastern Tiger Snake	Least Concern	1
Colubridae	*Thelotornis*	*capensis*	*capensis*	Southern Twig Snake	Least Concern	1
Colubridae	*Dasypeltis*	*scabra*		Rhombic Egg-eater	Least Concern	1
Lamprophiidae	*Psammophis*	*mossambicus*		Olive Grass Snake	Least Concern	2
Lamprophiidae	*Psammophis*	*brevirostris*		Short-snouted Grass Snake	Least Concern	4
Lamprophiidae	*Psammophis*	*subtaeniatus*		Western Yellow-bellied Sand Snake	Least Concern	3
Lamprophiidae	*Psammophylax*	*tritaeniatus*		Striped Grass Snake	Least Concern	2
Elapidae	*Naja*	*annulifera*		Snouted Cobra	Least Concern	2
Elapidae	*Naja*	*mossambica*		Mozambique Spitting Cobra	Least Concern	3
Viperidae	*Causus*	*defilippii*		Snouted Night Adder	Least Concern	1
Viperidae	*Causus*	*rhombeatus*		Rhombic Night Adder	Least Concern	1
Viperidae	*Bitis*	*arietans*	*arietans*	Puff Adder	Least Concern	8
Testudinidae	*Stigmochelys*	*pardalis*		Leopard Tortoise	Least Concern	1
Testudinidae	*Kinixys*	*lobatsiana*		Lobatse Hinged Tortoise	Least Concern	2
Testudinidae	*Psammobates*	*oculifer*		Serrated Tent Tortoise	Least Concern	5
Pelomedusidae	*Pelusios*	*sinuatus*		Serrated Hinged Terrapin	Least Concern	1

13 ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of the Maphutha Witkop study area.

Family	Genus	Species	Common name	Red list category	No. records
Arthroleptidae	*Leptopelis*	*mossambicus*	Brownbacked Tree Frog	Least Concern	2
Brevicepitidae	*Breviceps*	*adspersus*	Bushveld Rain Frog	Least Concern	21
Bufonidae	*Poyntonophrynus*	*fenoulheti*	Northern Pygmy Toad	Least Concern	2
Bufonidae	*Sclerophrys*	*garmani*	Olive Toad	Least Concern	9
Bufonidae	*Sclerophrys*	*gutturalis*	Guttural Toad	Least Concern	22
Bufonidae	*Sclerophrys*	*pusilla*	Flatbacked Toad	Least Concern	3
Bufonidae	*Sclerophrys*	*capensis*	Raucous Toad	Least Concern	2
Bufonidae	*Schismaderma*	*carens*	Red Toad	Least Concern	15
Hyperoliidae	*Hyperolius*	*marmoratus*	Painted Reed Frog	Least Concern	7
Hyperoliidae	*Hyperolius*	*pusillus*	Water Lily Frog	Least Concern	2
Hyperoliidae	*Kassina*	*senegalensis*	Bubbling Kassina	Least Concern	16
Microhylidae	*Phrynomantis*	*bifasciatus*	Banded Rubber Frog	Least Concern	4
Phrynobatrachidae	*Phrynobatrachus*	*mababiensis*	Dwarf Puddle Frog	Least Concern	2
Phrynobatrachidae	*Phrynobatrachus*	*natalensis*	Snoring Puddle Frog	Least Concern	4
Pipidae	*Xenopus*	*laevis*	Common Platanna	Least Concern	3
Ptychadenidae	*Ptychadena*	*anchietae*	Plain Grass Frog	Least Concern	13
Ptychadenidae	*Ptychadena*	*mossambica*	Broadbanded Grass Frog	Least Concern	1
Ptychadenidae	*Ptychadena*	*oxyrhynchus*	Sharpnosed Grass Frog	Least Concern	2
Ptychadenidae	*Ptychadena*	*porosissima*	Striped Grass Frog	Least Concern	2
Pyxicephalidae	*Cacosternum*	*boettgeri*	Common Caco	Least Concern	1
Pyxicephalidae	*Pyxicephalus*	*adspersus*	Giant Bull Frog	**Near Threatened**	2
Pyxicephalidae	*Pyxicephalus*	*edulis*	African Bull Frog	Least Concern	2
Pyxicephalidae	*Amietia*	*delalandii*	Delalande's River Frog	Least Concern	7
Pyxicephalidae	*Strongylopus*	*grayii*	Clicking Stream Frog	Least Concern	1
Pyxicephalidae	*Tomopterna*	*cryptotis*	Tremelo Sand Frog	Least Concern	9
Pyxicephalidae	*Tomopterna*	*krugerensis*	Knocking Sand Frog	Least Concern	1
Pyxicephalidae	*Tomopterna*	*marmorata*	Russetbacked Sand Frog	Least Concern	1
Pyxicephalidae	*Tomopterna*	*natalensis*	Natal Sand Frog	Least Concern	12
Rhacophoridae	*Chiromantis*	*xerampelina*	Southern Foam Nest Frog	Least Concern	5