The Impact on Vertebrates and their Habitats of the three ESKOM's Alternative Powerlines on the Farm Boschmanskop 154 IS, Mpumalanga

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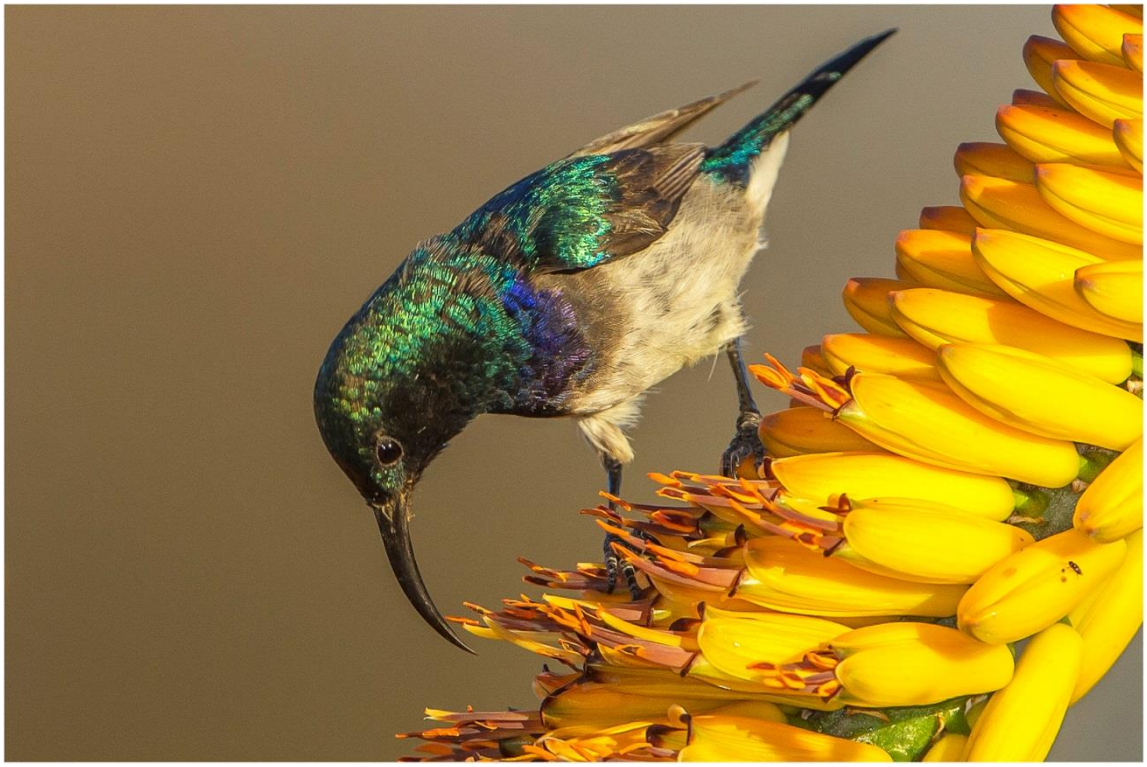
by

I.L. Rautenbach Ph.D., Pr.Sci.Nat., **J.C.P. Van Wyk** MSc., Pr.Sci.Nat.,
A.E. McKechnie Ph.D., Pr.Sci.Nat.

Commissioned by:

Limosella Consulting
www.limosella.co.za
Cell: 083 454 5454
For
Envirolution Consulting (Pty) Ltd
Tel: 0861 444 499
thabang@envirolution.co.za



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REGULATIONS

Requirements of Appendix 6 – GN R326 EIA Regulations 7 April 2017	
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	√
b) a declaration that the specialist 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;	√
(cA) an indication of the quality and age of base data used for the specialist report;	√
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	√
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	√
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	√
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	√
g) an identification of any areas to be avoided, including buffers;	√
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	√
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	√
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	√
k) any mitigation measures for inclusion in the EMPr;	√
l) any conditions for inclusion in the environmental authorisation;	√
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	√
n) a reasoned opinion- i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	√
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	√
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	√
q) any other information requested by the competent authority.	√
2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	√

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ABSTRACT

It is concluded that the impact of the proposed development on the environment will be minimal where the lines will cross the railway line and the maize fields, and similarly minimal where the new substation is being built or where the lines are to traverse transformed grasslands. The choice of which route to follow is incumbent on factors other than environmental concerns, or the comparative costs of the respective routes, although alternative 1 is preferred from an avifaunal standpoint

Considering on the nature of the development and the fact that it is not necessary to implement conservation measures, it is most likely that none of the terrestrial vertebrates with their habitat(s) will be displaced. Some mitigation measures (outlined above) are required to reduce the likelihood of impacts on birds through collisions and electrocutions.

Declaration of Professional Standing and Independence:

We,
Ignatius Lourens Rautenbach (SACNASP # 400300/05),
Jacobus Casparus Petrus van Wyk (SACNASP # 400062/09)
Andrew Edward McKechnie (SACNASP 400205/05)

declare that we:
hold higher degrees in the biological sciences, which allowed registration by S.A. Council for National Scientific Professions (SACNASP) as Professional Ecologist or Zoologists that sanction us to function independently as specialist scientific consultants;

- declare that as per prerequisites of the Natural Scientific Professions Act No. 27 of 2003 this project was our own work from inception and reflects exclusively our observations and unbiased scientific interpretations, and executed to the best of our abilities abide by the Code of Ethics of the SACNASP;
- are committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas we appreciate opportunities to learn through constructive criticism and debate, we reserve the right to form and hold our own opinions within the constraints of our training, experience and results and therefore will not submit willingly to the interests of other parties or change our statements to appease or unduly benefit them;
- are subcontracted as specialist consultants for the project "*The Impact on Vertebrates and their Habitats of the three ESKOM's Alternative Powerlines on the Farm Boschmanskop 154 IS, Mpumalanga*", as Described In This Report;
- have no financial interest in the proposed development other than remuneration for the work performed;
- do not have, and will not have in the future, any vested or conflicting interests in the proposed development;
- undertake to disclose to the consultant and its client(s) as well as to the competent authority any material information that may have the potential to influence any decisions by the competent authority, as required in terms of the Environmental Impact Assessment Regulations 2006;
- reserve the right to only transfer our intellectual property contained in this report to the client(s), (party or company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, we recognize that written consent from the client will be required for any of us to release of any part of this report to third parties.
- In addition, remuneration for services provided by us is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorizing this proposed project.

A.E. McKechnie

I.L. Rautenbach

J.C.P. van Wyk

1. INTRODUCTION

Limosella Consulting was appointed by Envirolution Consulting (Pty) Ltd to (on behalf of ESKOM) conduct a comparative assessment of vertebrate species richness as well as the habitat diversity and conservation ranking of three sites for a new substation and three proposed routes for a new high tension overhead powerline to connect to an existing high-tension powerline. The objective is to assess the impact of such a development on habitat(s) and vertebrate populations and to offer a suggestion re which route will have least environmental impact.

Mitigation measures to ameliorate the effect of the development are to be argued.

This assignment is in accordance with the 2014 EIA Regulations emanating from Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998

2. SCOPE AND OBJECTIVES OF THE STUDY

- To qualitatively and quantitatively assess the significance of the vertebrate habitat components and conservation status at three sites for a new substation and along each of three route;
- Identify and comment on ecological sensitive ecological components (if any);
- Comments on connectivity with natural vegetation and habitats on adjacent areas;
- To provide a list of vertebrates which occur or might occur, and to identify species of conservation importance;
- To highlight potential impacts of the proposed development on vertebrates;
- To, if possible, provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved.

3. STUDY AREA

ESKOM plans to construct a new high-tension powerline to connect a new (being-built substation [Figure 4]), with and existing high-tension powerline (Figures 1 & 4).

The three proposed alternatives identified by ESKOM are situated on Highveld plains directly west of the N11 road (Figure 1) and NNW of Hendrina in the Mpumalanga Province of the RSA. The coordinates of the new substation along the railway line are 26º 02' 43"S; 29º 34' 56"E (Figure 4).

Both the ca. 2.2km routes (the study site) are located on Farm Boschmanskop 154 IS). The new substation is being constructed south-east of the railway line (Figures 1 and 4). The three alternatives will cross the railway line and traverse grasslands, maize and other fields (Figures 1, 4, 5 & 6) where it connects to the existing line (Figure 1). The site falls within the quarter degree square 2629BA.

The topography of the site is typical Highveld plains without any trees. All arable land has been transformed by fields and therefore >95% of natural grassland has been transformed. A narrow strip of natural remained between the service road and the fence along the railway line, which is unable to support notable species richness or diversity.

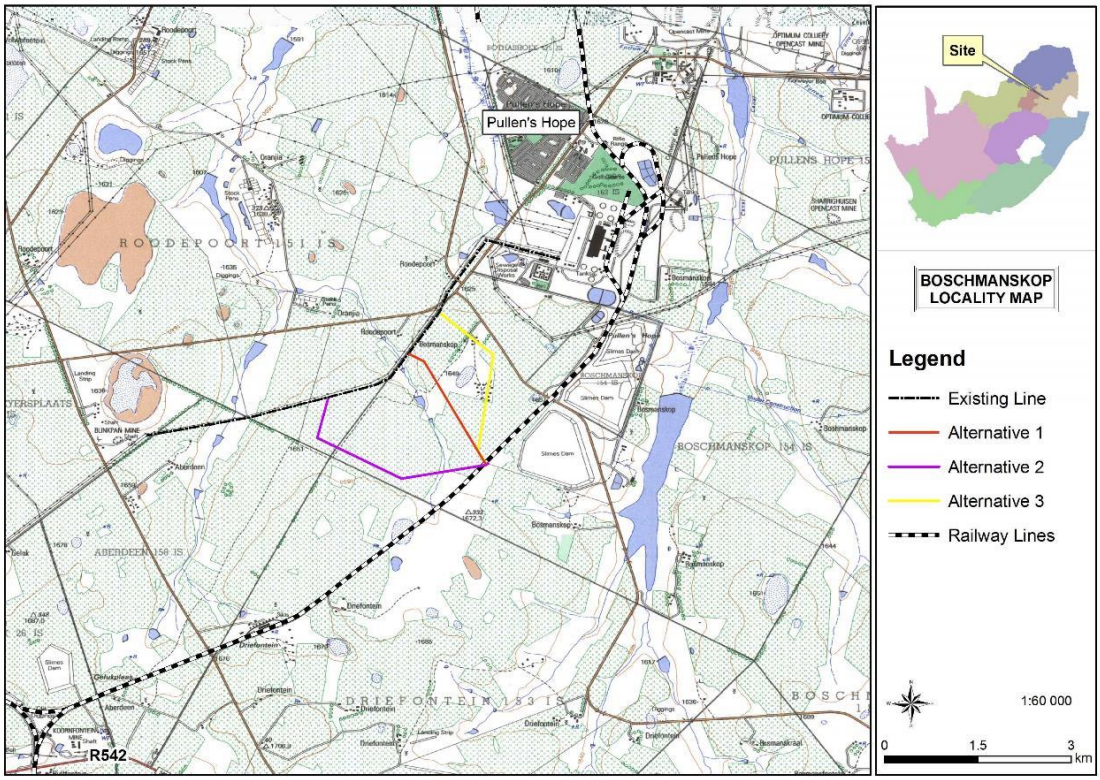

Figure 1: A topocadastral image illustrating the three proposed routes for the new ESKOM powerline.

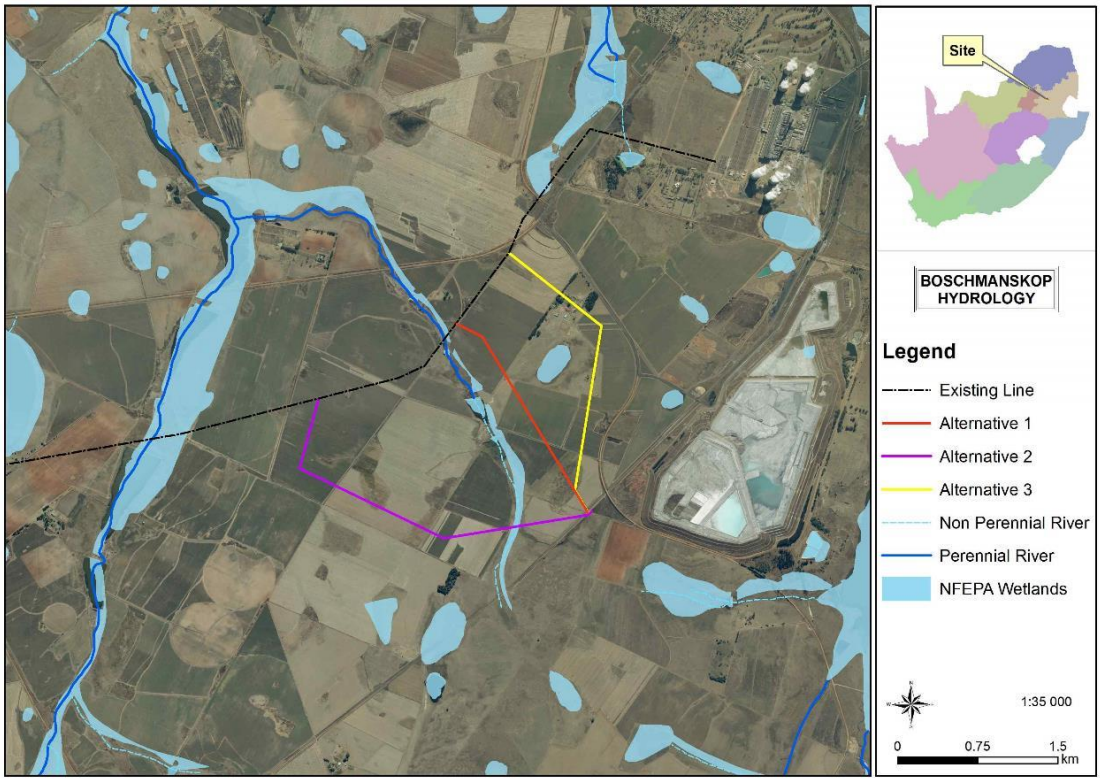

Figure 2: Only Alternative 2 will cross wetlands. Note the extent of cultivated fields.

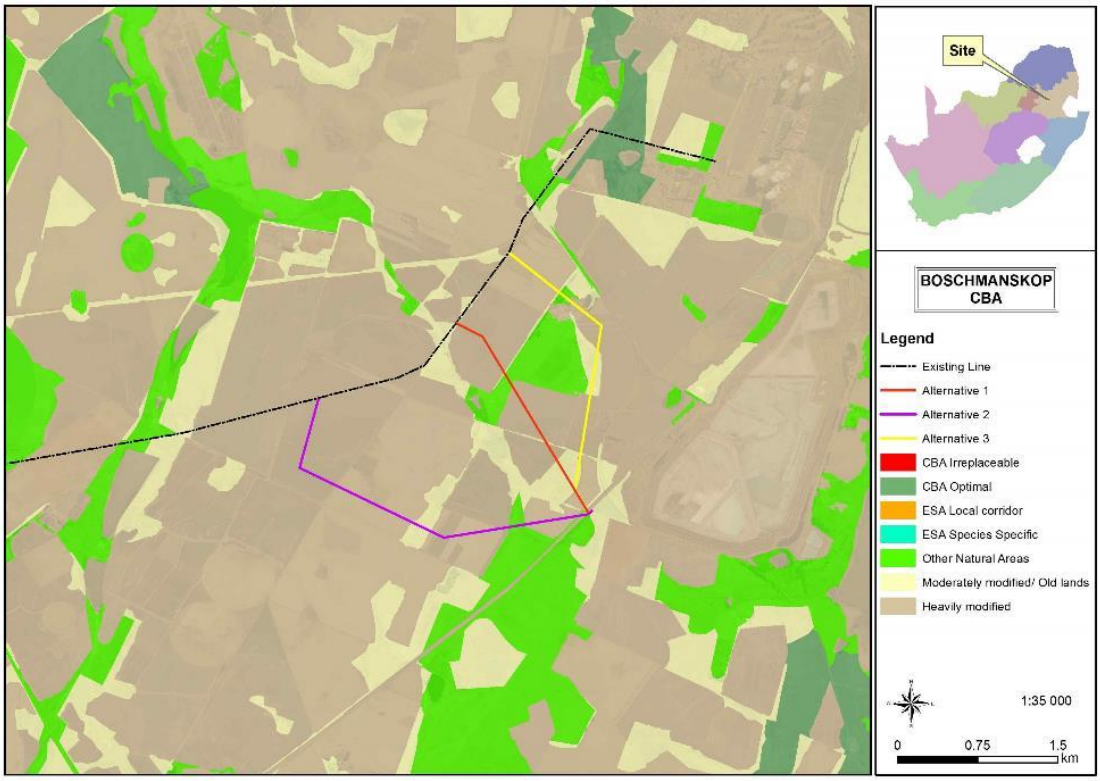

Figure 3: Most of the terrain where the new line will be built is ecologically transformed by agriculture.

Figure 4: The railway line and service road. Photographed at the site where the new substation is being constructed.

Figure 5: Cultivated grazing.

4. METHODS

A site visit was conducted on 28 November 2017. During this the observed and derived presence of vertebrates associated with the recognized habitat types of the study site, were recorded. This was done with due regard to the well recorded global distributions of Southern African mammals, birds, reptiles and frogs coupled to the qualitative and quantitative nature of recognized habitats.

Adjacent zones within 500 meters of the two proposed routes were scanned for vertebrates and natural habitats.

4.1 Field Surveys

A mammologist, ornithologist and herpetologist assessed the biota (Figures 1 – 5) on the 28th November 2017. During the fieldwork mammals, birds, reptiles and frogs were identified by visual sightings through random transect walks and patrolling with a vehicle. Habitats were qualitatively and quantitatively defined and also used to deduce species presences. No trapping or mist netting was conducted as the terms of reference did not require such intensive work. In addition, vertebrates were also identified by means of spoor, droppings, burrows, roosting sites or nests.

The weather during the visit was a pleasantly warm, clear summer day with little wind.

It is irrelevant in which vegetation units (as defined by Mucina and Rutherford [2006]) the site has historically been; it has since been entirely transformed by monocultures.

Three criteria were used to gauge the probability of occurrence of vertebrates on the study site. These include known distribution range, habitat preference and the qualitative and quantitative presence of suitable habitat.

4.2 Desktop Surveys

As the majority of mammals, reptiles and frogs are secretive, nocturnal, hibernators, migrators and/or seasonal, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of these species based on authoritative tomes, scientific literature, field guides, atlases and databases. This can be done irrespective of season. During the field work phase of the project, these derived lists of occurrences are audited.

The probability of occurrences of vertebrates was based on their respective geographical distributional ranges and the suitability of on-site habitats. In other words, *high* probability would be applicable to a species with a distributional range overlying the study site as well as the presence of prime habitat occurring on the study site. Another consideration for inclusion in this category is the inclination of a species to be common, i.e. normally occurring at high population densities.

Medium probability pertains to a mammal species with its distributional range peripherally overlapping the study site, or required habitat on the site being sub-optimal. The size of the site as it relates to its likelihood to sustain a viable breeding population, as well as its geographical isolation is also taken into consideration. Species categorised as *medium* normally do not occur at high population numbers, but cannot be deemed as rare.

A *low* probability of occurrence will mean that the species' distributional range is peripheral to the study site *and* habitat is sub-optimal. Furthermore, some mammals categorised as *low* are generally deemed rare.

4.3 Specific Requirements

Mammals: During the visit the site was surveyed and assessed for the potential occurrence of Red Data and/or wetland-associated species such as Juliana's golden mole (*Neamblosomus juliana*), Highveld golden mole (*Amblysomus septentrionalis*), Rough-haired golden mole (*Chrysospalax villosus*), African marsh rat (*Dasymys incomtus*), Angoni vlei rat (*Otomys angoniensis*), Vlei rat (*Otomys irroratus*), White-tailed rat (*Mystromys albicaudatus*), a nember of shrews such as the Forest shrew (*Myosorex varius*), Southern African hedgehog *(Atelerix frontalis), a number of bats such as the* Short-eared trident bat (*Cloeotis percivali*), African clawless otter (*Aonyx capensis*), Spotted-necked otter (*Lutra maculicollis*), Marsh mongoose (*Atilax paludinosus*), Brown hyena (*Parahyaena brunnea*), etc.

Birds: Species occurring at the site of the proposed development were assessed as detailed below. Red-listed species were identified using the recent (2015) Red Data Book for South Africa, Lesotho and Swaziland (Taylor et al. 2015).

A desktop study was undertaken in which bird species that potentially occur at the site and in the surrounding areas were identified using data from the first and second South African Bird Atlas Projects (SABAP 1 and 2). SABAP 2 data are based on records for pentads (i.e., 5' X 5'), where SABAP 1 data were based on quarter-degree grid cells (i.e., 15' X 15'). A list of species potentially occurring at the site was developed for the SABAP 2 pentad within which the site falls (2600_2930), as well as adjacent pentads covering the entire area of the Woestalleen, Reabetswe, Leeufontein power lines. This species list is thus based on an area much larger than the actual development site (Figure 8). This precautionary approach is adopted to ensure that all species potentially occurring at the site, whether resident, nomadic, or migratory, are identified, and that the cumulative impacts of all four power lines are considered in terms of avifaunal impacts.

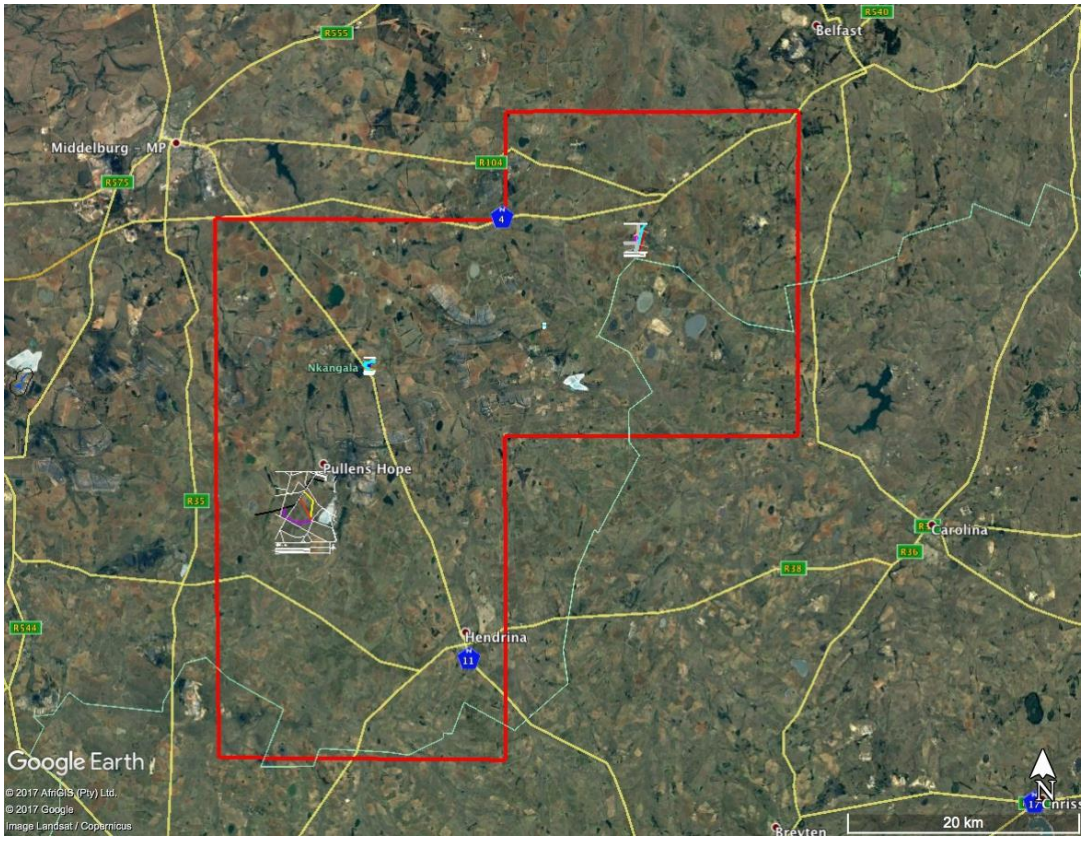

Figure 6: Approximate extent of area included (red square) when generating the list of birds potentially occurring at the site of the proposed Boschmanskop power line.

Herpetofauna: The site visit was conducted on 28 November 2017. During this the observed and derived presence of reptiles and amphibians associated with the recognised habitat types of the study site was recorded. This was done with due regard to the well-recorded global distributions of Southern African herpetofauna, coupled with the qualitative and quantitative nature of recognised habitats.

The 500 meters of adjoining properties were scanned for important fauna habitats.

4.4 Assessment criteria

Conservation status of habitats within the study site is subjectively assigned to one of five levels of sensitivity, i.e.

High: Ecologically sensitive and valuable land, with high species richness, sensitive ecosystems or Red Data species, that should be conserved and no development allowed.

Medium-high: Land where sections are disturbed but that is still ecologically sensitive to development/disturbance.

Medium: Land on which low-impact development with limited impact on the ecosystem could be considered, but where it is still recommended that certain portions of the natural habitat be maintained as open spaces.

Medium-low: Land on which small sections could be considered for conservation but where the area in general has little conservation value.

Low: Land that has little conservation value and that could be considered for developed with little to no impact on the habitats or avifauna.

This approach correlates highly with the empirical Significance ratings as defined below. In some instances the Medium-high, Medium and Medium-high categories are lumped as of Medium Conservation sensitivity.

These five conservation rankings correlate with the significance ratings for the development as discussed in Section 4.6 and are tabulated as follows:

RANKING	65-100	64-36	35-16	15-5	1-4
SIGNIFICANCE	Very High	High	Moderate	Low	Minor
CONSERVATION STATUS	High	Medium-high	Medium	Medium-low	Low

4.5 Significance (Consequence) Rankings

In order to quantitatively express the projected impact of a development, somewhat subjective weighted values of 0 - 5 in Table 1 are deployed. The environmental significance of a development is then calculated using the following formula that allows the development to be:

Significance (Consequence) = (Magnitude + Reversibility + Extent + Duration) X Probability.

Derived values derived are then translated as of Very High, High, Moderate, Low and Minor significance.

- Very High environmental significance 65 – 100 points
- High environmental significance 36 – 64 points
- Moderate environmental significance 16 - 35 points
- Low environmental significance 5 - 15 points
- Minor environmental significance 4 – 1 points

Depending on the nature of the proposed development, significance rankings may be calculated With Mitigation Measures (WMM) and Without Mitigation Measures (WOMM) to illustrate the predicted effectiveness of proposed mitigation measures.

This technique is more empirical and a useful quantitative tool to compare impacts on locations under consideration for development.

Table 1. Significance values depicting reigning environmental conditions at proposed development sites.

Significance ranking Matrix

Ranking	Magnitude	Reversibility	Extent	Duration	Probability
5	Very high/ don't know	Irreversible	International	Permanent	Certain/inevitable
4	High		National	Long term (impact ceases after operational life of asset	Almost certain
3	Moderate	Reversibility with human intervention	Provincial	Medium term (6-15 years)	Can occur
2	Low		Local	Short term (0 - 5 years)	Unusual but possible
1	Minor	Completely reversible	Site bound	Immediate	Extremely remote
0	None		None		None

The **Magnitude** of the impact: This will be quantified as either:

- Low: Will cause a low impact on the environment;
- Moderate: Will result in the process continuing but in a controllable manner;
- High: Will alter processes to the extent that they temporarily cease; and
- Very High: Will result in complete destruction and permanent cessation of processes.

Reversibility/ Replaceability: The degree at which the impact can be reversible or the lost resource can be replaced**.**

The Extent of the impact: This criterion expresses the spatial impact of the impact.

The duration (Exposure): wherein it will be indicated whether:

- The impact will be immediate;
- The impact will be of a short tem (Between 0-5 years);
- The impact will be of medium term (between 5-15 years);
- The impact will be long term (15 and more years); and
- The impact will be permanent.

The Probability: which shall describe the likelihood of impact occurring and will be rated as follows:

- Extremely remote: Which indicates that the impact will probably not happen;
- Unusual but Possible: Distinct possibility of occurrence;
- Can Occur: there is a possibility of occurrence;
- Almost Certain: Most likely to occur; and
- Certain/ Inevitable: Impact will occur despite any preventative measures put in place.

Depending on the nature of the proposed development, significance rankings may be calculated With Mitigation Measures (WMM) and Without Mitigation Measures (WOMM) to illustrate the predicted effectiveness of proposed mitigation measures.

This technique is more empirical and a useful quantitative tool to compare impacts on locations under consideration for development.

5. RESULTS

5.1 Mammals

5.1.1 Mammal Habitat Assessment

Mucina and Rutherford (2006) discuss the peculiar natural plant associations of the area in broad terms. It should be noted that botanical geographers have made immense strides in defining plant associations, whereas this cannot be said of zoologists. The reason is that vertebrate distributions are not very dependent on the minutiae of plant assemblages. Rautenbach (1978 & 1982) found that mammal groupings can at best correlated with botanically defined biomes, such as those by Low and Rebelo (1996 & 1998), and latterly by Mucina and Rutherford (2006). Hence, although the former's work has been superseded by the work of the latter, the definitions of biomes are similar and both remain valid for mammals and are therefore recognized as a reasonable determinant of mammal distribution.

The local occurrences of mammals are, on the other hand, closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupiculous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of mammal species by evaluating the habitat types within the context of global distribution ranges. Sight records and information from residents or knowledgeable locals audit such deductions.

From a mammal habitat perspective, small patches of terrestrial habitat remained; most has been transformed. The wetland habitat is modest and has not been altered, and is crossed only by Alternative 2. The terrestrial habitat type has largely been transformed by agriculture and only a narrow band of grassland persists along the edge of the wetland and along the railway line.

There are no bat caves on the site, although it must be emphasised that streams, wetlands and riparian zones are major attractions to bats that use it for drinking and for feeding on the relative abundance of aerial invertebrates.

5.1.2 Expected and Observed Mammal Species Richness

All large mammals (viz. elephants, black and white rhinos, plain's zebras, buffaloes, black wildebeests, herbivores, lions, and spotted and brown hyenas) have decades ago been hunted out for sport or to maximise farming practices. More recently intensive land-use practices (in particular growing crops) systematically displaced medium and smaller wildlife.

Connectivity is limited to narrow strips of natural grass along the railway line and the stream (Figure 2) and can be expected to maintain species richness and population densities (as they are in a transformed setting). Obviously common rupiculous and arboreal mammals are absent.

No mammals were sighted during the site visit. Table 2 lists 17 mammals which were deduced to reside in the grass strips along the railway line and the transformed grassland. No herbivores and carnivores larger than the yellow mongoose are deemed to be residents. All feral mammal species expected to occur on the study site (e.g. house mice, house rats, dogs and cats) were omitted from the assessment since these cannot be considered when assessing the conservation status nor the impact of the proposed the development along the routes.

The bats listed are common and widespread and considering the availability of suitable roosting sites in the form of farmsteads in the vicinity, can be expected to over fly the site while hunting for aerial invertebrate prey.

The species richness is low which is ascribed to a large (but transformed) terrestrial habitat.

Table 1: Mammal diversity. The species observed or deduced to occupy the site.

	SCIENTIFIC NAME	ENGLISH NAME
	Order Rodentia	
	Family Muridae	
√	*Mastomys natalensis*	Natal multimammate mouse
√	*Mastomys coucha*	Southern multimammate mouse
*	*Aethomys ineptus*	Tete veld rat
*	*Saccostomus campestris*	Pouched mouse
*	*Dendromus melanotis*	Grey pygmy climbing mouse
*	*Dendromus mesomelas*	Brants' climbing mouse
	Order Eulipotypha	
	Family Soricidae	
DD*	*Crocidura hirta*	Lesser red musk shrew
	Order Chiroptera	
	Family Embalonuridae	
?	*Taphozous mauritianus*	Mauritian tomb bat
	Family Molossidae	
√	*Tadarida aegyptiaca*	Egyptian free-tailed bat
	Family Vespertilionidae	
√	*Neoromicia capensis*	Cape serotine bat
√	*Scotophilus dinganii*	African yellow house bat
√	*Scotophilus viridis*	Greenish yellow house bat
	Family Rhinolophidae	
	Family Felidae	
*	*Felis silvestris*	African wild cat
	Family Viverridae	
*	*Genetta genetta*	Small-spotted genet
*	*Genetta tigrina*	SA large-spotted genet
	Family Herpestidae	
√	*Cynictis penicillata*	Yellow mongoose
√	*Galerella sanguinea*	Slender mongoose

√ Definitely there or have a *high* probability to occur;
* *Medium* probability to occur based on ecological and distributional parameters;
? *Low* probability to occur based on ecological and distributional parameters.

Red Data species rankings as defined in Friedmann and Daly's S.A. Red Data Book / IUCN (World Conservation Union) (2004) are indicated in the first column: CR= Critically Endangered, En = Endangered, Vu = Vulnerable, LR/cd = Lower risk conservation dependent, LR/nt = Lower Risk near threatened, DD = Data Deficient. All other species are deemed of Least Concern.

Note: Irrespective of the conservation ranking accorded to the Aardvark by Friedmann and Daly (2004), it is considered as Vulnerable in peri-urban conditions.

5.1.3 Threatened and Red Listed Mammal Species Flagged

- By the Scientific Community:

The ecology and population dynamics of "Data Deficient" (DD) the shrew listed in Table 2 has not been adequately studied to provide quantitative field data to empirically assign a conservation ranking, and are thus as a precaution considered as 'Data Deficient' Red Data species. Shrews operate at the apex of the food pyramid via an invertebrate trophic sublevel, which means that their population numbers are significantly lower than that of their prey species in order to maintain sustainable prey population levels. Because of their diet, they are furthermore not readily trapped with conventional bait or traps, which may mean that their numbers are under-estimated. Collecting shrews using drift fences and pitfalls invariable yield better acquisition

results than live-trapping, which reiterate the sentiment that shrews numbers are more often than not under-estimated and that many species' conservation status are misconstrued.

No other Red Data or sensitive species are deemed present on the site, either since the site is too disturbed, falls outside the distributional ranges of some species, or does not offer suitable habitat(s).

-By the IUCN Red Data List

The compilation of Red Data mammals (Friedman and Daly (editors) 2004) is in fact a contribution to the IUCN initiative. Opinions expressed therein are elucidated above in the overview of the scientific community.

-By the Biodiversity Act No 10 of 2004

Nil

-Endemism:

None of the species purported to be residents of the study site and surrounding areas are endemic to the Mpumalanga Province.

-Formally Prohibited Invasive and Prohibited Species

Nil.

5.2 Avifauna

The site of the proposed power line does not fall within an Important Bird Area (Marnewick *et al*. 2015).

5.2.1 Avifaunal Habitat Assessment

Avian habitats along the three proposed power line routes consist predominantly of highly transformed agricultural fields and disturbed grasslands. There are several dams in the area, with Alternative 1 running parallel to two small dams. The presence of water bodies at the site means that large-bodied waterfowl are likely to be present, a factor that has a bearing on the risk of collision with the proposed lines.

5.2.2 Expected Avifaunal Species Richness

A total of 270 species have been reported in the area considered for the desktop survey (Figure 8). Of these, 69 are considered highly likely to occur at the site of (Table 3), with a further 61 having a medium likelihood of occurrence. Most species occurring at the site are habitat generalists which can use highly disturbed landscapes, although a number of larger-bodied, and in some cases threatened, species may well move through the area.

Table 3: Bird species recorded in the area considered for the desktop survey (see Figure 8). The current (2015) status of each red-listed species ("RD") is provided (NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered), and the likelihood of each species occurring at the site is rated as confirmed, high, medium or low.

English name	Scientific name	RD	Likelihood
Apalis, Bar-throated	*Apalis thoracica*		Low
Avocet, Pied	*Recurvirostra avosetta*		High
Babbler, Arrow-marked	*Turdoides jardineii*		Low
Barbet, Acacia Pied	*Tricholaema leucomelas*		Low
Barbet, Black-collared	*Lybius torquatus*		Low
Barbet, Crested	*Trachyphonus vaillantii*		Low
Bee-eater, European	*Merops apiaster*		Medium
Bee-eater, White-fronted	*Merops bullockoides*		Low
Bishop, Southern Red	*Euplectes orix*		High
Bishop, Yellow-crowned	*Euplectes afer*		High
Bokmakierie	*Telophorus zeylonus*		Medium
Boubou, Southern	*Laniarius ferrugineus*		Low
Bulbul, Dark-capped	*Pycnonotus tricolor*		High
Bunting, Cape	*Emberiza capensis*		Low
Bunting, Cinnamon-breasted	*Emberiza tahapisi*		Low
Bunting, Golden-breasted	*Emberiza flaviventris*		Low
Bustard, Denham's	*Neotis denhami*	VU	Medium
Buttonquail, Kurrichane	*Turnix sylvaticus*		Low
Buzzard, Jackal	*Buteo rufofuscus*		Medium
Buzzard, Steppe	*Buteo vulpinus*		High
Canary, Black-throated	*Crithagra atrogularis*		High
Canary, Cape	*Serinus canicollis*		High
Canary, Yellow	*Crithagra flaviventris*		Low
Canary, Yellow-fronted	*Crithagra mozambicus*		Low
Chat, Anteating	*Myrmecocichla formicivora*		High
Chat, Familiar	*Cercomela familiaris*		Low
Cisticola, Cloud	*Cisticola textrix*		High
Cisticola, Desert	*Cisticola aridulus*		Low
Cisticola, Lazy	*Cisticola aberrans*		Low
Cisticola, Levaillant's	*Cisticola tinniens*		Medium
Cisticola, Pale-crowned	*Cisticola cinnamomeus*		Low
Cisticola, Wailing	*Cisticola lais*		Low
Cisticola, Wing-snapping	*Cisticola ayresii*		High
Cisticola, Zitting	*Cisticola juncidis*		High
Cliff-chat, Mocking	*Thamnolaea cinnamomeiventris*		Low
Cliff-swallow, South African	*Hirundo spilodera*		High
Coot, Red-knobbed	*Fulica cristata*		High
Cormorant, Reed	*Phalacrocorax africanus*		High

Cormorant, White-breasted	*Phalacrocorax carbo*		High
Coucal, Burchell's	*Centropus burchellii*		Low
Courser, Temminck's	*Cursorius temminckii*		Low
Crake, Black	*Amaurornis flavirostris*		Medium
Crane, Blue	*Anthropoides paradiseus*	NT	Medium
Crombec, Long-billed	*Sylvietta rufescens*		Low
Crow, Cape	*Corvus capensis*		Low
Crow, Pied	*Corvus albus*		High
Cuckoo, Diderick	*Chrysococcyx caprius*		Medium
Cuckoo, Red-chested	*Cuculus solitarius*		Low
Darter, African	*Anhinga rufa*		Medium
Dove, Laughing	*Streptopelia senegalensis*		High
Dove, Namaqua	*Oena capensis*		Low
Dove, Red-eyed	*Streptopelia semitorquata*		High
Dove, Rock	*Columba livia*		High
Drongo, Fork-tailed	*Dicrurus adsimilis*		Low
Duck, African Black	*Anas sparsa*		Low
Duck, Comb	*Sarkidiornis melanotos*		Low
Duck, Fulvous	*Dendrocygna bicolor*		Low
Duck, Maccoa	*Oxyura maccoa*	NT	Medium
Duck, Mallard	*Anas platyrhynchos*		Medium
Duck, White-backed	*Thalassornis leuconotus*		Medium
Duck, White-faced	*Dendrocygna viduata*		Medium
Duck, Yellow-billed	*Anas undulata*		High
Eagle-owl, Cape	*Bubo capensis*		Low
Eagle-owl, Spotted	*Bubo africanus*		High
Eagle, Long-crested	*Lophaetus occipitalis*		Low
Egret, Cattle	*Bubulcus ibis*		High
Egret, Great	*Egretta alba*		Low
Egret, Little	*Egretta garzetta*		Medium
Egret, Yellow-billed	*Egretta intermedia*		Medium
Falcon, Amur	*Falco amurensis*		Medium
Falcon, Lanner	*Falco biarmicus*	VU	Medium
Falcon, Red-footed	*Falco vespertinus*	NT	Low
Finch, Cuckoo	*Anomalospiza imberbis*		Low
Finch, Cut-throat	*Amadina fasciata*		Low
Finch, Red-headed	*Amadina erythrocephala*		Medium
Finch, Scaly-feathered	*Sporopipes squamifrons*		Low
Fiscal, Common (Southern)	*Lanius collaris*		High
Fish-eagle, African	*Haliaeetus vocifer*		Low
Flamingo, Greater	*Phoenicopterus ruber*	NT	Medium
Flamingo, Lesser	*Phoenicopterus minor*	NT	Medium
Flycatcher, Fiscal	*Sigelus silens*		Low
Flycatcher, Southern Black	*Melaenornis pammelaina*		Low

Flycatcher, Spotted	*Muscicapa striata*		Low
Goose, Egyptian	*Alopochen aegyptiacus*		High
Goose, Spur-winged	*Plectropterus gambensis*		Medium
Grass-owl, African	*Tyto capensis*	VU	Low
Grassbird, Cape	*Sphenoeacus afer*		Medium
Grebe, Black-necked	*Podiceps nigricollis*		Low
Grebe, Great Crested	*Podiceps cristatus*		Low
Grebe, Little	*Tachybaptus ruficollis*		High
Greenshank, Common	*Tringa nebularia*		Medium
Guineafowl, Helmeted	*Numida meleagris*		High
Gull, Grey-headed	*Larus cirrocephalus*		Medium
Hamerkop, Hamerkop	*Scopus umbretta*		Low
Harrier-Hawk, African	*Polyboroides typus*		Low
Harrier, Black	*Circus maurus*	EN	Low
Harrier, Montagu's	*Circus pygargus*		Low
Harrier, Pallid	*Circus macrourus*		Low
Helmet-shrike, White-crested	*Prionops plumatus*		Low
Heron, Black	*Egretta ardesiaca*		Low
Heron, Black-headed	*Ardea melanocephala*		High
Heron, Goliath	*Ardea goliath*		Low
Heron, Green-backed	*Butorides striata*		Low
Heron, Grey	*Ardea cinerea*		High
Heron, Purple	*Ardea purpurea*		Low
Heron, Squacco	*Ardeola ralloides*		Low
Hobby, Eurasian	*Falco subbuteo*		Low
Honeyguide, Lesser	*Indicator minor*		Low
Hoopoe, African	*Upupa africana*		Medium
House-martin, Common	*Delichon urbicum*		Medium
Ibis, African Sacred	*Threskiornis aethiopicus*		High
Ibis, Glossy	*Plegadis falcinellus*		Medium
Ibis, Hadeda	*Bostrychia hagedash*		High
Ibis, Southern Bald	*Geronticus calvus*	VU	Medium
Jacana, African	*Actophilornis africanus*		Medium
Kestrel, Greater	*Falco rupicoloides*		Low
Kestrel, Lesser	*Falco naumanni*		Medium
Kestrel, Rock	*Falco rupicolus*		Low
Kingfisher, Brown-hooded	*Halcyon albiventris*		Low
Kingfisher, Giant	*Megaceryle maximus*		Low
Kingfisher, Malachite	*Alcedo cristata*		Low
Kingfisher, Pied	*Ceryle rudis*		Medium
Kingfisher, Woodland	*Halcyon senegalensis*		Low
Kite, Black	*Milvus migrans*		Low
Kite, Black-shouldered	*Elanus caeruleus*		High
Kite, Yellow-billed	*Milvus aegyptius*		Low

Korhaan, Blue	*Eupodotis caerulescens*		Low
Korhaan, Northern Black	*Afrotis afraoides*		Low
Korhaan, White-bellied	*Eupodotis senegalensis*	VU	Low
Lapwing, African Wattled	*Vanellus senegallus*		Medium
Lapwing, Blacksmith	*Vanellus armatus*		High
Lapwing, Crowned	*Vanellus coronatus*		High
Lark, Botha's	*Spizocorys fringillaris*	EN	Low
Lark, Eastern Clapper	*Mirafra fasciolata*		Medium
Lark, Eastern Long-billed	*Certhilauda semitorquata*		Low
Lark, Flappet	*Mirafra rufocinnamomea*		Low
Lark, Pink-billed	*Spizocorys conirostris*		Low
Lark, Red-capped	*Calandrella cinerea*		High
Lark, Rufous-naped	*Mirafra africana*		High
Lark, Sabota	*Calendulauda sabota*		Low
Lark, Spike-heeled	*Chersomanes albofasciata*		Low
Longclaw, Cape	*Macronyx capensis*		High
Mannikin, Bronze	*Spermestes cucullatus*		Low
Marsh-harrier, African	*Circus ranivorus*	EN	Low
Martin, Banded	*Riparia cincta*		High
Martin, Brown-throated	*Riparia paludicola*		High
Martin, Rock	*Hirundo fuligula*		Medium
Martin, Sand	*Riparia riparia*		Low
Masked-weaver, Southern	*Ploceus velatus*		High
Moorhen, Common	*Gallinula chloropus*		High
Mousebird, Red-faced	*Urocolius indicus*		Low
Mousebird, Speckled	*Colius striatus*		Medium
Myna, Common	*Acridotheres tristis*		Medium
Neddicky, Neddicky	*Cisticola fulvicapilla*		High
Night-Heron, Black-crowned	*Nycticorax nycticorax*		Low
Oriole, Black-headed	*Oriolus larvatus*		Low
Ostrich, Common	*Struthio camelus*		Low
Owl, Barn	*Tyto alba*		Medium
Owl, Marsh	*Asio capensis*		Medium
Palm-swift, African	*Cypsiurus parvus*		High
Paradise-flycatcher, African	*Terpsiphone viridis*		Low
Paradise-whydah, Long-tailed	*Vidua paradisaea*		Low
Pigeon, Speckled	*Columba guinea*		High
Pipit, African	*Anthus cinnamomeus*		High
Pipit, Long-billed	*Anthus similis*		Medium
Pipit, Plain-backed	*Anthus leucophrys*		Low
Plover, Common Ringed	*Charadrius hiaticula*		Low
Plover, Kittlitz's	*Charadrius pecuarius*		Low
Plover, Three-banded	*Charadrius tricollaris*		Low
Pochard, Southern	*Netta erythrophthalma*		Medium

Pratincole, Black-winged	*Glareola nordmanni*	NT	Low
Prinia, Black-chested	*Prinia flavicans*		High
Prinia, Drakensberg	*Prinia hypoxantha*		Low
Prinia, Karoo	*Prinia maculosa*		Low
Prinia, Tawny-flanked	*Prinia subflava*		Medium
Quail, Common	*Coturnix coturnix*		Low
Quailfinch, African	*Ortygospiza atricollis*		High
Quelea, Red-billed	*Quelea quelea*		High
Reed-warbler, African	*Acrocephalus baeticatus*		Low
Reed-warbler, Great	*Acrocephalus arundinaceus*		Low
Robin-chat, Cape	*Cossypha caffra*		Medium
Rock-thrush, Cape	*Monticola rupestris*		Low
Roller, European	*Coracias garrulus*	NT	Low
Roller, Lilac-breasted	*Coracias caudatus*		Low
Ruff	*Philomachus pugnax*		Low
Rush-warbler, Little	*Bradypterus baboecala*		Low
Sandpiper, Common	*Actitis hypoleucos*		High
Sandpiper, Curlew	*Calidris ferruginea*		Low
Sandpiper, Marsh	*Tringa stagnatilis*		Low
Sandpiper, Wood	*Tringa glareola*		High
Secretarybird	*Sagittarius serpentarius*	VU	Medium
Seedeater, Streaky-headed	*Crithagra gularis*		Low
Shelduck, South African	*Tadorna cana*		Low
Shoveler, Cape	*Anas smithii*		Medium
Shrike, Red-backed	*Lanius collurio*		Low
Snake-eagle, Black-chested	*Circaetus pectoralis*		Low
Snipe, African	*Gallinago nigripennis*		Medium
Sparrow-weaver, White-browed	*Plocepasser mahali*		Low
Sparrow, Cape	*Passer melanurus*		High
Sparrow, House	*Passer domesticus*		High
Sparrow, Southern Grey-headed	*Passer diffusus*		High
Sparrowhawk, Black	*Accipiter melanoleucus*		Low
Sparrowlark, Chestnut-backed	*Eremopterix leucotis*		Low
Spoonbill, African	*Platalea alba*		Medium
Spurfowl, Natal	*Pternistis natalensis*		Low
Spurfowl, Swainson's	*Pternistis swainsonii*		High
Starling, Cape Glossy	*Lamprotornis nitens*		High
Starling, Pied	*Spreo bicolor*		High
Starling, Red-winged	*Onychognathus morio*		Medium
Starling, Wattled	*Creatophora cinerea*		Medium
Stilt, Black-winged	*Himantopus himantopus*		Medium
Stint, Little	*Calidris minuta*		Low
Stonechat, African	*Saxicola torquatus*		High
Stork, Abdim's	*Ciconia abdimii*	NT	Low

Stork, Black	*Ciconia nigra*	VU	Low
Stork, White	*Ciconia ciconia*		Low
Stork, Yellow-billed	*Mycteria ibis*	EN	Low
Sunbird, Amethyst	*Chalcomitra amethystina*		Low
Sunbird, Greater Double-collared	*Cinnyris afer*		Low
Sunbird, Malachite	*Nectarinia famosa*		Low
Sunbird, White-bellied	*Cinnyris talatala*		Low
Swallow, Barn	*Hirundo rustica*		High
Swallow, Greater Striped	*Hirundo cucullata*		High
Swallow, Lesser Striped	*Hirundo abyssinica*		Low
Swallow, Pearl-breasted	*Hirundo dimidiata*		Low
Swallow, Red-breasted	*Hirundo semirufa*		Low
Swallow, White-throated	*Hirundo albigularis*		High
Swamp-warbler, Lesser	*Acrocephalus gracilirostris*		Low
Swamphen, African Purple	*Porphyrio madagascariensis*		Low
Swift, African Black	*Apus barbatus*		Low
Swift, Alpine	*Tachymarptis melba*		Low
Swift, Horus	*Apus horus*		Low
Swift, Little	*Apus affinis*		High
Swift, White-rumped	*Apus caffer*		High
Tchagra, Black-crowned	*Tchagra senegalus*		Low
Teal, Cape	*Anas capensis*		Medium
Teal, Hottentot	*Anas hottentota*		Low
Teal, Red-billed	*Anas erythrorhyncha*		High
Tern, Whiskered	*Chlidonias hybrida*		Medium
Tern, White-winged	*Chlidonias leucopterus*		Medium
Thick-knee, Spotted	*Burhinus capensis*		High
Thrush, Groundscraper	*Psophocichla litsipsirupa*		Low
Thrush, Karoo	*Turdus smithi*		Medium
Thrush, Kurrichane	*Turdus libonyanus*		Low
Thrush, Olive	*Turdus olivaceus*		Medium
Tinkerbird, Yellow-fronted	*Pogoniulus chrysoconus*		Low
Tit, Southern Black	*Parus niger*		Low
Turtle-dove, Cape	*Streptopelia capicola*		High
Wagtail, African Pied	*Motacilla aguimp*		Low
Wagtail, Cape	*Motacilla capensis*		High
Warbler, Willow	*Phylloscopus trochilus*		Low
Waxbill, Blue	*Uraeginthus angolensis*		Low
Waxbill, Common	*Estrilda astrild*		High
Waxbill, Orange-breasted	*Amandava subflava*		Medium
Waxbill, Swee	*Coccopygia melanotis*		Low
Weaver, Cape	*Ploceus capensis*		Medium
Weaver, Thick-billed	*Amblyospiza albifrons*		Low
Weaver, Village	*Ploceus cucullatus*		Medium

Wheatear, Capped	*Oenanthe pileata*	Medium
Wheatear, Mountain	*Oenanthe monticola*	Low
White-eye, Cape	*Zosterops virens*	Low
Whydah, Pin-tailed	*Vidua macroura*	High
Widowbird, Fan-tailed	*Euplectes axillaris*	High
Widowbird, Long-tailed	*Euplectes progne*	High
Widowbird, Red-collared	*Euplectes ardens*	Low
Widowbird, White-winged	*Euplectes albonotatus*	Medium
Wood-dove, Emerald-spotted	*Turtur chalcospilos*	Low
Wood-hoopoe, Green	*Phoeniculus purpureus*	Low
Woodpecker, Cardinal	*Dendropicos fuscescens*	Low
Wryneck, Red-throated	*Jynx ruficollis*	Low

5.2.3 Threatened and Red Listed Bird Species

A total of 22 threatened or near threatened bird species have been recorded in the area considered for the desktop survey (Table 4). While none of these species are likely to be heavily reliant on such transformed habitat, several may occur here from time to time. These include Southern Bald Ibis, Secretarybird, Red-footed Falcon, Blue Crane and White-bellied Korhaan.

Table 4. Red-listed species whose possible presence at the site of the proposed substations and powerlines was evaluated during the assessment process.

Species	Scientific name	Red Data[1]	NEMBA[2]	Assessment of likelihood of presence at site
Stork, Yellow-billed	*Mycteria ibis*	EN		Unlikely. Habitat not suitable - generally inhabits open, shallow water.
Stork, Abdim's	*Ciconia abdimii*	NT		Possible. Occurs in grasslands, woodlands and cultivated fields in rural areas. Area too transformed to have highly likelihood of hosting this species.
Stork, Black	*Ciconia nigra*	VU	VU	Unlikely. Usually confined to mountainous areas.
Ibis, Southern Bald	Geronticus calvus	VU	VU	Medium - high. Occurs in area included in assessment, but not likely to occur in heavily transformed areas.
Flamingo, Greater	*Phoenicopterus ruber*	NT		Medium. Dams probably too small and surrounding areas too transformed to host this species.
Flamingo, Lesser	*Phoenicopterus minor*	NT		Medium. Dams probably too small and surrounding areas too transformed to host this species.
Duck, Maccoa	*Oxyura maccoa*	NT		Medium. Dams probably too small and surrounding areas too transformed to host this species.
Secretarybird	*Sagittarius serpentarius*	VU		Possible. Too little natural grassland for this area to be important habitat, but may nevertheless occur here from time to time.
Vulture, Cape	*Gyps coprotheres*	EN	EN	Unlikely. Ranges widely, but unlikely to venture into a heavily transformed urban landscape. However, occurs within 50-100 km of sites, and therefore possible that birds traverse the area from time to time.
Falcon, Lanner	*Falco biarmicus*	VU		Occurrence likely, but the area is too transformed to be important hunting habitat.
Falcon, Red-footed	*Falco vespertinus*	NT		Possible. Occurs in open savannas, and may roost in stands of eucalypts.

Marsh-harrier, African	*Circus ranivorus*	EN	PR	Possible, but highly transformed nature of the landscape and limited habitat (moist primary grassland and marshes) make occurrence unlikely.
Harrier, Black	Circus maurus	EN		Unlikely. Largely out of range for this species, and landscape too transformed.
Finfoot, African	*Podica senegalensis*	VU		Extremely unlikely – requires slow-flowing water in large river systems
Crane, Grey Crowned	*Balearica regulorum*	EN	EN	Possible, but landscape too transformed to regularly host this species.
Crane, Blue	*Anthropoides paradiseus*	NT	EN	Possible, as this species does often forage in agricultural fields.
Crane, Wattled	Bugeranus carunculatus	CR	CR	Possible. Regularly reported in Hendrina / Carolina area, although landscape at sites probably too transformed to host this species.
Bustard, Denham's	Neotis denhami	VU	PR	Likely. Regularly recorded in this area.
Korhaan, White-bellied	*Eupodotis senegalensis*	VU		Possible. Mainly occurs in pristine grasslands, but may venture into agricultural fields.
Pratincole, Black-winged	*Glareola nordmanni*	NT		Possible. May venture into agricultural fields, but landscape probably too transformed.
Grass-owl, African	*Tyto capensis*	VU	VU	Unlikely. Outside of core range, and habitats likely too transformed to hold this species.
Roller, European	*Coracias garrulus*	NT		Very unlikely. No suitable habitat.

[1]Current (2015) IUCN Red List Status for South Africa, Lesotho and Swaziland (Taylor et al. 2015). NT = *Near Threatened*; VU = *Vulnerable*; EN = *Endangered*; CR = *Critically Endangered*

[2]Indicates species listed as Protected ("PR"), Vulnerable ("VU"), Endangered ('EN") or Critically Endangered ("CR") in the National Environmental Management: Biodiversity Act, 2004 list of Threatened or Protected Species (2007 version)

5.3 Reptiles and amphibians

5.3.1 Herpetological Habitat Assessment

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupiculous (rock-dwelling) and wetland-associated vegetation cover. It is thus possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the context of global distribution ranges. From a herpetological habitat perspective, it was established that one of the four major habitats is present on the study site, namely terrestrial.

The natural grasslands of both Alternative 1 and 2 have been severely altered by maize fields. Both Alternatives have been also disturbed by exotic plants, gravel roads, and a railway line. No moribund termitaria were recorded. These structures are generally good indicators of the occurrence of small herpetofauna. Accordingly, it is estimated that the reptile and amphibian population density for the study site is lower. At the time of the site visit the basal cover was only at the fringes of the maize fieldS and would not provide adequate cover for small terrestrial herpetofauna.

There is no natural rupiculous habitat, but manmade rupiculous habitat exists in the form of a bridge and buildings. Due to the absence of natural rupiculous habitat, some species like yellow-throated plated lizard, common girdled lizard, the common crag lizard and rock agama were omitted from the species list in Table 5.

No indigenous trees grow on both Alternative 1 and 2. Due to the absence of natural arboreal habitat, some species like flap-neck chameleon and tree agama were omitted from the species list in Table 5. Near Alternatives 2 grow exotic *Eucalyptus* trees and there are a few dead logs which would provide shelter and food for some herpetofauna.

No aquatic habitat for herpetofauna occurs near Alternative 1 & 2.

Due to a N11 National road, railway line and maize fields, connectivity is poor for both Alternatives.

Sight records were also used to compile this herpetofauna section.

5.3.2 Expected and Observed Herpetofauna Species Richness

Of the 31 reptile species which may occur on the study site (Table **5**), none were confirmed during the site visit and of the 18 amphibian species which may possibly occur on the study site (Table 5); none were confirmed during the site visit. Table 5 lists the reptiles & amphibians which were observed on or deduced to occupy the site.

The American red-eared terrapin (*Trachemys scripta elegans*) and the Brahminy blind snake (*Ramphotyphlops braminus*) are the only two feral reptile or amphibian species known to occur in South Africa (De Moor and Bruton, 1988; Picker and Griffiths, 2011), but with only a few populations, they are not expected to occur on this particular site.

The species assemblage is typical of what can be expected of habitat that is severely disturbed, but with sufficient habitat to sustain populations. Most of the species of the resident diversity (Table 5) are fairly common and widespread (viz. rhombic night adder, common house snake, mole snake, rinkhals, variable skink, guttural toad and Boettger's caco).

The species richness is poor due to only one severely altered habitat type occurring on or in the buffer area around the study site.

Table 5: The Reptile and Amphibian species observed on or deduced to occupy the site.

	SCIENTIFIC NAME	ENGLISH NAME
	CLASS: REPTILIA	REPTILES
	Order: SQUAMATA	SCALE-BEARING REPTILES
	Suborder:LACERTILIA	LIZARDS
	Family: Gekkonidae	Geckos
?	*Lygodactylus capensis capensis*	Common Dwarf Gecko
√	*Pachydactylus capensisi*	Cape Gecko
?	*Pachydactylus vansoni*	Van Son's Gecko
	Family:Lacertidae	Old World Lizards or Lacertids
?	*Nucras lalandii*	Delalande's Sandveld Lizard
	Family: Gerrhosauridae	Plated Lizards
?	*Gerhosaurus flavigularis*	Yellow-throated Plated Lizard
	Family: Scincidae	Skinks
*	*Afroablepharus wahlbergii*	Wahlberg's Snake-Eyed Skink
?	*Machlus sundevallii sundevallii*	Sundevall's Writhing Skink
√	*Trachylepis capensis*	Cape Skink
√	*Trachylepis punctatissima*	Speckled Rock Skink
√	*Trachylepis varia*	Variable Skink
	Family: Agamidae	Agamas
√	*Agama aculeate distant*	Eastern Ground Agama
	Suborder: SERPENTES	SNAKES
	Family: Typhlopidae	Blind Snakes
*	*Afrotyphlops bibronii*	Bibron's Blind Snake
	Family: Leptotyphlopidae	Thread Snakes
√	*Leptotyphlops scutifrons conjunctus*	Peter's Thread Snake
	Family: Viperidae	Adders
?	*Bitis arietans*	Puff Adder
?	*Causus rhombeatus*	Rhombic Night Adder
	Family: Lamprophiidae	
?	*Aparallactus capensis*	Black-headed Centipede Eater
?	*Atractaspis bibronii*	Bibron's Stiletto Snake
?	*Homoroselaps lacteus*	Spotted Harlequin Snake
√	*Boaedon capensis*	Common House Snake
?	*Lycodonomorphus inornatus*	Olive Ground Snake
*	*Lycophidion capense*	Cape Wolf Snake
?	*Psammophis brevirostris*	Short-snouted Grass
√	*Psammophis crucifer*	Cross-Marked Grass Snake
*	*Psammophylax rhombeatus*	Spotted Grass Snake
?	*Psammophylax tritaeniatus*	Striped Grass Snake
?	*Amplorhinus multimaculatus*	Many–Spotted Snake
?	*Duberria lutrix*	Common Slug Eater
√	*Pseudaspis cana*	Mole Snake
	Family: Elapidae	Cobras, Mambas and Others
?	*Elapsoidea sundevallii*	Sundevall's Garter Snake
√	*Hemachatus haemachatus*	Rinkhals
	Family: Colubridae	
?	*Crotaphopeltis hotamboeia*	Red-Lipped Snake
√	*Dasypeltis scabra*	Rhombic Egg Eater
	CLASS: AMPHIBIA	AMPHIBIANS
	Order: ANURA	FROGS
	Family: Pipidae	Clawed Frogs
?	*Xenopus laevis*	Common Platanna
	Family: Bufonidae	Toads

	SCIENTIFIC NAME	ENGLISH NAME
√	*Sclerophrys gutturalis*	Guttural Toad
√	*Sclerophrys capensis*	Raucous Toad
?	*Vandijkophrynus gariepensis*	Karoo Toad
?	*Sclerophrys pusilla*	Flat-Backed Toad
√	*Schismaderma carens*	Red Toad
	Family: Hyperoliidae	**Reed Frogs**
?	*Kassina senegalesis*	Bubbling Kassina
?	*Semnodactylus wealii*	Rattling Frog
	Family: Microhylidae	**Rain Frogs**
?	*Breviceps mossambicus*	Mozambique Rain Frog
	Family Phrynobatrachidae	**Puddle Frog**
√	*Phrynobatrachus natalensis*	Snoring Puddle Frog
	Family: Ptychadenidae	**Grass Frogs**
?	*Ptychadena porosissima*	Striped Grass Frog
	Family: Pyxicephalidae	
?	*Amietia delalandii*	Common River Frog
√	*Cocosternum boettgeri*	Boettger's Caco
?	*Cocosternum nanum nanum*	Bronze Caco
?	*Cocosternum nanum parvum*	Mountain Caco
√	*Tomopterna cryptotis*	Tremolo Sand Frog
√	*Tomopterna natalensis*	Natal Sand Frog
?	*Tomopterna tandyi*	Tandy's Sand Frog

Systematic arrangement and nomenclature according to Bates, *et.al* (2014) & Du Preez & Carruthers (2017).

Red Data species rankings as defined in Branch, The Conservation Status of South Africa's threatened Reptiles': 89 – 103..In:- G.H.Verdoorn & J. le Roux (editors), 'The State of Southern Africa's Species (2002) and Minter, *et.al*, Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland (2004) are indicated in the first column: CR= Critically Endangered, En = Endangered, Vu = Vulnerable, NT = Near Threatened, DD = Data Deficient. All other species are deemed of Least Concern.

5.3.3 Threatened and Red listed Reptile and Amphibian Species

The current status of both the Swazi rock snake and Southern African python in the newest Red Data Book is *Least Concern* (Bates, 2014 *et.al*).

The current status of the giant bullfrog, whistling rain frog and plain stream frog in the newest Red Data list is *Least Concern* (Du Preez & Carruthers, 2017).

The study site falls outside the natural range of the spotted shovel-nosed frog, giant dragon lizard, Fitzsimons' flat lizard, striped harlequin snake and the Nile crocodile. These species should not occur on the study site.

The coppery grass lizard has been recorded near this quarter degree square according to the Records of the Ditsong Museum of Natural History (TVL Museum), but there is not suitable habitat for the coppery grass lizard on Alternative 1 & 2. This species should not occur on the study site at Alternative 1.

The large-scaled grass lizard is found in grassland, especially rocky, grassy hillsides (Branch, 1998). However, no such areas are found on the study site. This species should not occur on the study site.

Breyer's long-tailed seps is found in Montane and Highveld grasslands and takes shelter in soil under stones or in moribund termitaria (Bates, 2014). However, no such areas are found on the study site. This species should not occur on the study site.

6. FINDINGS AND POTENTIAL IMPLICATIONS

Species richness: This ecological facet is concluded to now be in stasis after having previously adapted to displacements by the tilled fields and the railway line.

Endangered species: We do not expect any additional impacts on endangered species. The minimal ecological damage caused by the construction of the overhead line will be restored by ecological processes.

Sensitive areas: No sensitive areas or systems were identified.

Habitat(s) quality and extent: The remaining terrestrial habitat has been compromised, whereas arboreal habitat is alien in character, but is utilized by birds and some reptiles.

Impact on species richness and conservation: After limited damage caused by construction, impact will be minimal, if not nil.

Connectivity: The proposed development will not alter the connectivity as it is.

Management recommendation: Nil.

6.1 Conservation status ranking:

The conservation status (see Section 4.4) of the strip of land to be affected by the new high-tension powerline is ranked as **Low** i.e. "*Land that has little conservation value and that could be considered for development with little to no impact on the habitats or vertebrate fauna".* The major consideration for this ranking is the fact that the crossing sites have been transformed by past developments.

6.2 Suggested route:

From an avifaunal standpoint, Alternative 1 is the preferred route, as it is the shortest of the three. Although it is the closest to the two small dams, the installation of bird flight diverters (see Table 9 below) will mitigate this impact, and the likelihood of collisions will not differ between the three routes.

6.2 Significance (Consequence) ranking:

See Section 4.6 (Significance (Consequence) Rankings) for the procedure to calculate ranking values.

Table 6: The impact of the proposed powerlines

Nature: The ecological conservation status of the crossings is rated as "Low". However, given the fact that the stream and its riparian zone serve as a dispersal route and habitat for a number of vertebrate species, it is warranted to avoid further environmental degradation as result of the new development.

These positive impacts of the proposed rehabilitation will be dependent on continued conservation measures and appropriate management.

In light of the positive impacts of the proposed rehabilitation, no mitigation measures are suggested.

	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Almost certain	4		
Duration	Immediate	1		
Extent	Site bound	1		
Reversability		1		
Magnitude	Minor	1		
Significance	**High**	**16**		
Status (positive or negative)	Positive			
OPERATIONAL PHASE				
Probability	Most likely	4		
Duration	Permanent	5		
Extent	Local	1		
Reversability		1		
Magnitude	Very high	1		
Significance	**High**	**32**		
Status (positive or negative)	Positive			
Reversibility	To avoid reversal of the rehabilitation, active conservation will be required.			
Irreplaceable loss of resources?	The intention is to avoid loss of important resources and functions			
Can impacts be mitigated?	No, only improved			

Mitigation:

- Rehabilitation will depend on effort and resources invested, and permanence will require continued conservation endeavours.

Cumulative impacts: Considerable should habitats and connectivity are fully restored.

Residual Risks: None

Table 7: Impact assessment – avifaunal habitat loss

Nature: Avian habitats will be lost in the areas cleared for the substation and servitude involved in this project. In the case of the Boschmanskop power line, this impact will be of low severity on account of the small area involved and disturbed nature of the habitats. Additional habitat loss may occur during the construction phase.

	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Highly probable	4	Probable	3
Duration	Short term	2	Short term	2
Extent	Limited to Site	1	Limited to Site	1
Magnitude	Low	2	Low	1
Significance	**Low**	**20**	**Low**	**12**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Probability	Probable	3	Improbable	2
Duration	Long-term	4	Long-term	4
Extent	Limited to Route	1	Limited to Route	1
Magnitude	Low	1	Low	1
Significance	**Low**	**18**	**Low**	**12**
Status (positive or negative)	Negative		Negative	
Reversibility	Low		Low	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

- Minimise areas cleared for towers, construction activities and access roads, and as far as possible use existing roads
- Restrict construction activities to area directly below power line

Cumulative impacts: Will result in additional loss of habitat in an area that is already highly transformed.

Residual Risks: None anticipated provided that the mitigation measures are implemented correctly.

Table 8: Impact assessment – avifaunal disturbance

Nature: The presence of vehicles and personnel during construction will create disturbance for birds along the route of the proposed line. This disturbance will be most likely manifested through increased stress levels modulated by the stress hormone corticosterone, with consequences for breeding success, immune function and foraging. Further disturbance will occur during the operational phase as a consequence of routine maintenance, but the magnitude of this impact will be lower than during the construction phase.

	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Highly probable	4	Probable	3
Duration	Short term	2	Short term	2
Extent	Limited to Site	1	Limited to Site	1
Magnitude	Low	2	Low	2
Significance	**Low**	**20**	**Low**	**15**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Probability	Improbable	2	Very improbable	1
Duration	Permanent	5	Permanent	5
Extent	Limited to Route	1	Limited to Route	1
Magnitude	Low	1	Low	1
Significance	**Low**	**14**	**Low**	**7**
Status (positive or negative)	Negative		Negative	
Reversibility	Moderate		Moderate	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

- Construction of the proposed power line should take place during winter, outside the breeding season of most birds and when migrants are absent.
- Construction workers must be instructed to minimise disturbance of birds at all times.
- Illegal hunting of birds must be strictly prevented
- All construction and maintenance should take place as per Eskom Transmission's environmental best practice standards.

Cumulative impacts: Construction activities, and to a lesser extent maintenance activities thereafter, will increase overall levels of human disturbance along the power line route.

Residual Risks: None anticipated provided that the mitigation measures are implemented correctly.

Table 9: Impact assessment – avian collisions

Nature: Avian mortalities and injuries as a result of birds colliding with power lines while in flight.

	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Probable	3	Very improbable	2
Duration	Short term	2	Short term	2
Extent	Limited to Route	1	Limited to Route	1
Magnitude	Low	2	Low	1
Significance	**Low**	**15**	**Low**	**8**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Probability	Probable	3	Improbable	2
Duration	Permanent	5	Permanent	5
Extent	Limited to Site	1	Limited to Site	1
Magnitude	Moderate	5	Moderate	3
Significance	**Moderate**	**33**	**Low**	**18**
Status (positive or negative)	Negative		Negative	
Reversibility	Low		Low	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

- The possibility that several large-bodied threatened species (e.g., Secretarybird, Blue Crane, Southern Bald Ibis) move through the area from time to time means that the risk of collision needs to be taken seriously.
- Bird flight diverters should be fitted to the line. Specifically, "Bird flappers" or double-loop flight diverters developed by the Eskom / Endangered Wildlife Trust (EWT) Strategic Partnership should be fitted to the line during initial construction. These devices must be attached to the centre 60% of the line between each pair of pylons, with the flappers 5 m apart in a staggered configuration.

Cumulative impacts: Collisions caused by power lines have had devastating impacts on the populations of a number of threatened bird species, but the risk posed by the proposed Boschmanskop powerline is unlikely to be significant if mitigation measures are employed as described above.

Residual Risks: None.

Table 10: Impact assessment - electrocutions

Nature: Avian mortalities and injuries as a result of birds creating short circuits between live wires, or between live wire and tower. Risk generally significant for 132 kV lines.

	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Improbable	2	Improbable	1
Duration	Short term	2	Short term	2
Extent	Limited to Route	1	Limited to Route	2
Magnitude	Low	4	Low	4
Significance	**Low**	**14**	**Low**	**8**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Probability	Probable	3	Improbable	1
Duration	Permanent	5	Permanent	5
Extent	Limited to Route	1	Limited to Route	1
Magnitude	Moderate	4	Low	3
Significance	**Moderate**	**30**	**Low**	**9**
Status (positive or negative)	Negative		Negative	
Reversibility	Low		Low	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	Yes			

Mitigation:

- Electrocutions are likely on 132 kV towers. In the interests of preventing short circuits caused by excreta, it is recommended that standard Eskom Bird Guards be fitted to all towers in the proposed line.

Cumulative impacts: Electrocutions are likely to be a cause of avian mortality unless adequately mitigated, and have contributed significantly to the declines of some threatened species.

Residual Risks: None.

Table 11: Impact assessment – electromagnetic fields

Nature: There is some evidence that the electromagnetic fields generated by power lines have negative effects on avian breeding, as well as on the ability of migrants to navigate				
	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Very Improbable	1	Very Improbable	1
Duration	Short term	1	Short term	1
Extent	Limited to Route	1	Limited to Route	1
Magnitude	Low	2	Low	2
Significance	**Low**	**4**	**Low**	**4**
Status (positive or negative)	Negative		Negative	
OPERATIONAL PHASE				
Probability	Improbable	2	Improbable	2
Duration	Permanent	5	Permanent	5
Extent	Limited to Route	1	Limited to Route	1
Magnitude	Low	2	Low	2
Significance	**Low**	**16**	**Low**	**16**
Status (positive or negative)	Negative		Negative	
Reversibility	Low		Low	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	No			
Mitigation: • None necessary beyond installation of insulators and shielding following Eskom's standard guidelines for best practice.				
Cumulative impacts: Will contribute to widespread EMFs generated by electrical infrastructure. Evidence of negative impacts is limited.				
Residual Risks: None.				

7. LIMITATIONS, ASSUMPTIONS AND GAPS INFORMATION

The Limosella team has sufficient experience and ample access to information sources to confidently compile lists of biota such as presented herein to support conclusions and suggested mitigation measures based on a site visit. In instances where doubt exists, a species is assumed to be a possible occupant (viz. *Suncus* species); -this approach renders the conclusions to be robust. In instances where the possible occurrence has significant ecological implications, an intensive survey is recommended. In view of the latter, it is highly unlikely whether an intensive survey to augment this site visit will add significantly to the data base, and the additional costs are unlikely to warrant the effort.

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

9. CONCLUSIONS

It is concluded that the impact of the proposed development on the environment will be minimal where the lines will cross the railway line and the maize fields, and similarly minimal where the new substation is being built or where the lines are to traverse transformed grasslands. The choice of which route to follow is incumbent on factors other than environmental concerns, or the comparative costs of the respective routes, although alternative 1 is preferred from an avifaunal standpoint

Considering on the nature of the development and the fact that it is not necessary to implement conservation measures, it is most likely that none of the terrestrial vertebrates with their habitat(s) will be displaced. Some mitigation measures (outlined above) are required to reduce the likelihood of impacts on birds through collisions and electrocutions.

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