

**ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED  
BANTAMSKLIP TRANSMISSION LINES**



**Environmental Scoping Report  
Bird Impact Assessment Study**

J28087

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## EXECUTIVE SUMMARY

This report endeavoured to assess the potential impact of nine new proposed transmission lines in the Western Cape on birds, and specifically Red Data species.

The study concentrated firstly on identifying and describing the different micro-habitats that are utilised by birds in the study area. These habitats were classified as follow:

- Fynbos in the Overberg
- Fynbos outside Overberg
- Fynbos-karoo ecotone
- Mountains
- Wetlands and dams
- Rivers
- Afro-montane forest
- Cultivated fields and pastures in the Overberg and “Swartland”
- Cultivated fields and pastures outside the Overberg and “Swartland”, but excluding the fynbos-karoo ecotone
- Cultivated fields in the fynbos – karoo ecotone
- Plantations, mining, bare rock and soil, urban development

An analysis of these habitats was conducted with regard to their potential importance for Red Data bird species in the study area. The analysis showed that there are significant differences in terms of importance for these species, resulting in the following descending order of importance:

1. Wetlands and water bodies
2. Cultivated fields and pastures in the Overberg and “Swartland”
3. Fynbos in the Overberg
4. Fynbos-karoo ecotone
5. Cultivated fields in the fynbos – karoo ecotone
6. Fynbos outside the Overberg
7. Mountains
8. Afro-montane forest
9. Rivers
10. Cultivated fields and pastures outside the Overberg, but excluding the fynbos-karoo ecotone and “Swartland”
11. Plantations, mining, bare rock and soil, urban development

All these micro-habitats were divided in three sensitivity classes:

- Lower sensitivity (sensitivity score = 1): Habitats where few impacts of low significance are envisaged due to the avifaunal species composition and use of habitat.
- Medium sensitivity (sensitivity score = 2): Habitats where irregular impacts of moderate significance are envisaged due to the avifaunal species composition and use of habitat.
- Higher sensitivity (sensitivity score = 3): Habitats where regular impacts of high significance are envisaged due to the avifaunal species composition and habitat use.

The analysis gave a useful guideline as to where the majority of impacts are likely to be expected from a bird habitat perspective. In the Overberg, a high density combination of cultivated fields, pastures and water bodies creates the biggest risk of collisions. In addition, the presence of species such as Black Harrier, Denham's Bustard and Secretarybird in the fynbos in the Overberg ensures that overall the Overberg comes out as the most sensitive

region for potential impacts. The fynbos-karoo ecotone rates as medium sensitive due to the presence of species such as Martial Eagle and Ludwig's Bustard. The wine growing areas of the study area have a relatively low sensitivity for power lines sensitive species, due to it being unsuitable for most power line sensitive species. It is important to note that within each geographic region, there are areas of high risk micro-habitat, regardless of the overall risk of the geographic region. For example although the wine growing geographical area is not overall as highly rated from a risk perspective than for example the Overberg, wetlands and dams within the former is still rated as high risk due to the potential presence of species such as flamingos and pelicans.

Having established which micro-habitats holds the most risks of bird interactions with the proposed power lines, the next step was to analyse the individual corridors from a bird impact assessment perspective. In order to do this a simple formula was used:

- The length of corridor that traversed a specific micro-habitat was measured.
- Wetlands and water bodies (within 500m of the centre line of a corridor) and river crossings were counted.
- In the Overberg, Blue Crane congregation areas as determined by Kotoane (2003) within 1km of the centre line of a corridor were also counted.

The total length of power line that crossed a specific micro-habitat was multiplied with the sensitivity class score for that specific habitat. In the case of wetlands, water bodies and river crossings, the total count of these micro-habitats along a given alignment was multiplied with the sensitivity class score for that specific habitat. The same was done for Blue Crane congregation points, which were treated as a special type of high sensitivity "micro-habitat" and given a sensitivity class score of 3. In this manner, a sensitivity rating for each corridor was calculated.

From the analysis it emerged that there are definite preferred corridors from a bird impact perspective. For **Bantamsklip – Bacchus**, it emerged that **option 2 is the preferred option** by a clear margin (i.e. carries the least risk) from a bird impact assessment perspective. This is followed by option 3 and 1 in quick succession, with option 4 and the PPP option (suggested by stakeholders in the Overberg) being respectively second least and least preferred. For **Bantamsklip – Kappa** it is clear that **option 1 is the preferred option** (i.e. carries the least risk) from a bird impact assessment perspective. This is followed by option 2, then option PPP, and finally option 4 and 3 in quick succession. Lastly, for **Bacchus – Muldersvlei**, **option 1 is the preferred option** (i.e. carries the least risk) from a bird impact assessment perspective by a clear margin.

It is therefore recommended that the less favoured/desired options are not taken into the EIA phase for further analysis, as the preferred options have been identified by a clear margin. Further analysis of the preferred options on a species level should be conducted in the EIA phase, with specific emphasis on the mitigation of impacts.

# ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED BANTAMSKLIP TRANSMISSION LINES

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## **ABBREVIATIONS**

<b>NEMA</b>	<b>National Environmental Act 1998</b>
<b>ASAB</b>	<b>Atlas of southern African Birds</b>
<b>EWT</b>	<b>Endangered Wildlife Trust</b>
<b>PPP</b>	<b>Public Participation Process</b>

# 1 INTRODUCTION

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## 1.1 Background

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Eskom Holdings Limited (Eskom) provides 95% of the electricity that is consumed in South Africa, thus making it the primary supplier of electricity. The role of Eskom as a state owned enterprise is to contribute to infrastructure development within the country. In order to ensure a steady supply of electricity in South Africa, Eskom initiated Nuclear Power Station projects. The Bantamsklip Nuclear 400 kV Transmission Integration Project is necessary for the integration of the proposed new power station at Bantamsklip (if approved). The project includes nine 400 kV lines and the extension of the Bacchus Substation. The lines are as follow:

- 4 x 765 kV lines from Bantamsklip – Kappa
- 4 x 400 kV lines from Bantamsklip – Bacchus
- 1 x 400 kV line from Bacchus – Muldersvlei

Eskom has recommended that at least two separate servitude corridors should be identified or that the servitudes must allow for the lines to be separated as far as practicable, to ensure Nuclear Safety and reliability of supply considerations. The minimum size of Bantamsklip 400 kV HV yard must accommodate six outgoing feeders and four 400 kV Transformer bays. No consideration are to be given for future expansion at this stage.

Acrus GIBB was appointed by Eskom to conduct the Environmental Impact Assessment for the proposed power lines and substation. Chris van Rooyen Consulting was in turn appointed by Arcus GIBB to assess the potential impacts of the proposed power lines on birds.

This study was conducted within the framework of the principles of the National Environmental Act of 1998 (NEMA), and specifically those that have a direct bearing on the assessment of avifaunal impacts. The following principles have particular relevance for this report:

- that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions;
- that responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle;
- that global and international responsibilities relating to the environment must be discharged in the national interest;

- that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment; and
  - that sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.
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## 1.2 Scope and Limitations

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The terms of reference for this scoping report are as follows:

- description of existing environment, bird communities and micro habitats;
- description of potential impacts;
- indication of confidence levels and gaps in baseline data;
- compilation of a sensitivity map; and
- the identification of issues that require further investigation during the EIA phase.

The following limitations need to be pointed out:

- In some areas, little long term, verified data is available of species distribution on micro-habitat level along the proposed power line corridors.
  - This study made extensive use of data from the Atlas of southern African Birds (ASAB) (Harrison *et al.*, 1997). For a full discussion of potential inaccuracies in ASAB data, see Harrison *et al.* (1997). It is important to note that the quarter degree squares in the study area were not equally well covered during the bird atlas period, which means that the reporting rate of species should not be seen as an accurate representation of densities on the ground as it was at the time of the atlas project. Reporting rates were therefore approached with appropriate caution, especially those squares that were not extensively covered during the atlas period.
  - Predictions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will hold true under all circumstances. However bird interactions with electrical infrastructure can be predicted with a fair amount of certainty based on experience gained by the author through the investigation since 1996 of hundreds of localities in southern Africa where birds have interacted with electrical infrastructure.
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## 1.3 Methodology

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- Detailed satellite imagery from Google Earth as well as the CSIR Landcover Database (2000) with the proposed corridors overlaid, was used in order to view the study area on a landscape level and to help identify bird habitat on the ground.
- Atlas of southern African Birds (ASAB) (Harrison *et al.*, 1997) species lists and vegetation classifications of each of the quarter degree squares (or 1: 50 000 map units), within which the corridors are located were obtained from the Avian

Demography Unit at the University of Cape Town. These were used to determine which power line sensitive species could potentially occur in the study area.

- The area was visited to obtain a first-hand perspective of the proposed corridors and birdlife. An attempt was made to travel the corridors as far as was practically possible, and to visit potential sensitive areas identified from Google Earth imagery.
- The South African Crane Working Group field worker in the Overberg was consulted in order to gain more information on crane movement and habitat preferences.
- Relevant literature was consulted on the habitat preferences of the species occurring in the area, as well as on the envisaged impacts of the proposed power lines on these species and birds in general (see section 10: References).
- The conservation status of all recorded bird species occurring in these two squares was determined with the help of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Barnes, 2000).
- The power line bird mortality incident database of the Eskom - Endangered Wildlife Trust Strategic Partnership (1996 to 2007) was consulted to determine which of the species occurring in the study area are typically impacted upon by electrical infrastructure such as substations and power lines.
- A classification of the vegetation types in each quarter degree square was obtained from Harrison *et al.* (1997).
- The impacts were predicted on the basis of experience in gathering and analysing data on wildlife impacts with power lines throughout southern Africa since 1996 supplemented with local knowledge and first hand data.

### 1.3.1 Alternative Sensitivity Analysis

The sensitivity categories used in this study are defined in TABLE 1.1 below:

**Table 1.1:** Sensitivity categories

Risk	Description
Lower sensitivity	Habitats where few impacts of low significance are envisaged due to the avifaunal species composition and use of habitat
Medium sensitivity	Habitats where irregular impacts of moderate significance are envisaged due to the avifaunal species composition and use of habitat
Higher sensitivity	Habitats where regular impacts of high significance are envisaged due to the avifaunal species composition and habitat use

## 2 REGIONAL OVERVIEW

The study area comprises a vast area which includes approximately 34 quarter degree squares (i.e. 1:50 000 maps). As can be seen in Table 2.1, the quarter degree squares that are bisected by the proposed power lines fall predominantly in fynbos vegetation. However, the study area also exhibits characteristics of both the succulent and nama karoo, as well as a small percentage of afro-montane forest.

It is widely accepted that vegetation structure is more critical in determining bird habitat, than the actual plant species composition (Harrison *et al.*, 1997). The description of vegetation presented in this study therefore concentrates on factors relevant to the bird species present, and is not an exhaustive list of plant species present. The description of the vegetation types occurring in the study area makes extensive use of information presented ASAB (Harrison *et al.*, 1997). The criteria used by the ASAB authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations.

**Table 2.1:** The percentage area of each quarter degree square in the study area that is classified as each vegetation type according to ASAB (Harrison *et al.*, 1997).

Vegetation type	Succulent karoo	Nama Karoo	Fynbos	Afromontane Forest
3319CB	3%		97%	
3319CA			100%	
3319AC			100%	
3318DB			100%	
3319BB	92%		8%	
3319BA	47%		53%	
3319BD	40%		60%	
3319CD	13%		87%	1%
3319DB	46%		54%	
3319DC	41%		59%	
3319DD	31%		69%	
3320AC	76%	1%	24%	
3320AD	40%	2%	58%	
3320CA	45%		55%	
3320CB	60%		40%	
3320CC	4%		96%	
3320CD			100%	
3320DC	3%		96%	1%
3419AB			100%	1%
3419AC			100%	
3419AD			100%	
3419BA			98%	2%
3419BB	4%		95%	1%
3419BC			100%	
3419BD			100%	
3419CB			100%	
3419DA			100%	
3419DB			100%	
3420AA	1%		100%	

3420AB			100%	
3420AC			100%	
3420AD			100%	
3420BA			100%	
3420CA			100%	

**Fynbos** is dominated by low shrubs and can be divided into two categories, fynbos proper and renosterveld. There are considerable areas of natural fynbos left in the study area in between cultivated activity, particularly on the steeper slopes which are unsuitable for cultivation, some of which are formally conserved such as the Haweqwas State Forest between Paarl and Worcester. Despite having a high diversity of plant species, fynbos and renosterveld has a relatively low diversity of bird species. The only Red Data species that are closely associated with fynbos in this study area, are the Black Harrier (which may breed in fynbos), and the Knysna Warbler (Harrison *et al.*, 1997). Other Red Data species that use this habitat are Secretarybirds and Denham's Bustard which are occasionally found in fynbos and renosterveld (pers. obs.), and Martial Eagles on occasion forage in this habitat. Much of the fynbos and renosterveld in the study area have been transformed for agriculture. Whilst this obviously resulted in substantial natural habitat being destroyed, several species have in fact adapted rather well to this transformation. One such species, which is highly relevant to this study, is the Blue Crane. This species has thrived on the (predominantly) wheat lands in the southern and western Cape. This will be further discussed when the micro-habitats are explored below.

**Succulent karoo** occurs predominantly in the far west of the country, generally at altitudes of less than 800m. In the study area the succulent karoo is known as the Little Karoo and differs from the rest of the succulent karoo in having a rather well developed tree cover. The succulent karoo is primarily characterised by low winter rainfall (20 to 290mm per annum). It consists of flat to undulating plains with some hilly and broken veld. This vegetation type is characterised by dwarf succulent plants and an almost total absence of trees. Grasses are rare, except in some sandy areas. The number of plant species is high in this biome (Harrison *et al.*, 1997). The **nama karoo** vegetation largely consists of low shrubs and grasses. Trees such as *Acacia karoo* and the exotic mesquite *Prosopis glandulosa* are largely restricted to the watercourses, where they often form dense stands. The nama karoo generally has a much higher proportion of grasses and trees than the succulent karoo (Harrison *et al.*, 1997). As far as power lines sensitive birds in the study area are concerned, succulent karoo and the nama karoo (or Great Karoo) are both suitable habitats for the same species, and the same impacts on these species are likely to occur in both areas, they are therefore jointly referred to on this report as the karoo. It must be noted that the karoo in the study area exhibits many characteristics of fynbos, and should be more accurately described as an eco-tonal zone between succulent karoo and fynbos. This is evidenced by the low reporting numbers of typical karroid species such as the Ludwig's Bustard, and the absence of Blue Cranes in natural veld, while they are commonly found in the nama karoo east of the study area. It is known that Blue Cranes avoid areas of natural fynbos (Kotoane 2003).

The tree-canopy cover in **afro-montane forest** is continuous, with mainly evergreen tree species present. Below the canopy, the vegetation is multilayered, with little ground vegetation as a result of the dense canopy blocking sunlight out. Forests are found only in frost-free regions, with relatively high rainfall and protection from fire (Harrison *et al.*, 1997). Afro-montane forest occurs at sea level in the south of the country, but at progressively higher altitude towards the east and north of the country. Several bird species associated mainly with afro-montane forest are endemic to South Africa, Lesotho and Swaziland. The Knysna Woodpecker and Knysna Warbler are the only Red Data species present in this study area that is associated with forest habitat to any extent. The relative lack of species associated with forest in this study area, correlates with the low representation of forest in these squares (see TABLE 2.1).

Whilst much of the bird species distribution in the study area can be explained in terms of the above broad vegetation description (based on the quarter degree square level), there are many differences in bird species distribution and density that correspond to differences in habitat at the micro level. These bird micro-habitats are evident at a much smaller spatial scale than the broader vegetation types or biomes, and can largely only be identified through a combination of field investigation and experience. Furthermore, as mentioned above, large portions of the study area has been highly transformed, making the above vegetation description less valid. It was therefore extremely important to visit the study area first hand.

The following bird micro-habitats were identified during the field investigation. Examples of these can be seen in Appendix A:

## 2.1 Cultivated lands

The cultivated land transformation in the study area consists mostly of vineyards, cereal crops, canola, pastures and irrigated crops e.g. lucerne.

- Grape cultivation

Vineyards result in a total transformation of the natural habitat resulting in the cultivated area becoming unusable for the majority of birds. This habitat is definitely not suitable habitat for large birds, especially the large terrestrial, power line sensitive species. Vineyards are most prevalent in valleys and flat topographical areas between the mountains in the east of the study area, and are the dominant land-use in the area between the towns of Paarl, Worcester, Robertson and up to Villiersdorp where the agriculture becomes more varied with pastures, fruit orchards and derelict lands more often encountered between the orchards. The pastures in this area hold some attraction for large terrestrial species such as Black-headed Heron, White Stork and Blue Crane. Notwithstanding, generally speaking cultivated areas dominated by vineyards is unlikely to act as draw card for large power line sensitive species.

- Cereal crops, canola, pastures and irrigated fields

The mosaic of wheat, barley and canola fields interspersed with pastures that comprises the area known as the Overberg Wheatbelt, is classified as an Important Bird Area (Barnes 1998), and is of specific importance to the endemic, Red listed Blue Crane, as well as the Red listed Denham's Bustard. This large agricultural district stretches from Caledon to Riversdale and encompasses the area south of these two towns, running between the coastal towns of Hermanus and Stilbaai. The topography consists of low-lying coastal plains and consists primarily of cereal croplands. The Overberg holds the largest population of Blue Cranes in the world. At times the Overberg can hold nearly 20% of this species' global population, as well as containing large numbers of Denham's Bustard and White Stork during the summer (Barnes 1998). The Blue Crane has relatively recently expanded its range into the Overberg, where it feeds on *inter alia* fallen grain and recently germinated crops. They also feed on supplementary food put out for small stock, and can congregate in huge numbers around these feed lots. The Black Harrier is also found frequently in the modified agricultural matrix of the Overberg region, where several pairs breed (Barnes 1998), although it prefers the natural renosterveld in between the cereal crops. Some typical karroid birds such as the endemic Karoo Korhaan is also found in the wheat matrix (Barnes 1998). All of these species are power line sensitive, specifically with regard to collisions with power lines.

One of the potential alignments between Muldersvlei and Bacchus crosses marginally into habitat very similar to the Overberg wheatfields namely the extreme southern portion of what

becomes the Swartland Wheatbelt further to the north. This habitat is also being colonized extensively by Blue Cranes (Young 2003). Due to the similarity in species composition and utilization, this area has been grouped with the Overberg in the sensitivity analysis in section 8 below.

In the fynbos – karoo ecotone, the irrigated crops (mostly lucerne) that are found near to water sources (mostly drainage lines), could attract a variety of species such as Black-headed Heron, Ludwig's Bustard, White Stork and Spur-winged Goose.

## **2.2 Mountains**

The study area contains several rugged mountain ranges which all form part of the Cape Fold Belt. These mountains are regarded as important bird habitat, which is emphasised by the fact that two Important Bird Areas in the study area, namely SA107 Eastern False Bay Mountains and SA113 Southern Langeberg Mountains, have their cores centred on mountain ranges.

Apart from being important refuges for fynbos and supporting many restricted-range and biome-restricted assemblage species, the rugged mountain habitat is suitable for many medium-sized and large raptors such as Black (Verreaux's) Eagle, Lanner Falcon, Peregrine Falcon, Jackal Buzzard and Booted Eagle. These species may occasionally venture out of the mountains and hunt in the adjoining fynbos. On such occasions the birds may interact with the power line; mostly by perching on it, as large trees are generally sparse. In some areas the line could create a risk of collisions for example where it crosses a steep slope, mountain crest or a steep valley which acts as a natural flight path. Although not directly threatened by the proposed new lines, the Cape Vultures breeding at Potberg in the De Hoop Nature Reserve close to Bredasdorp might perch on the towers when they encounter them while foraging. This could lead to bird streamer induced faulting on certain tower types, depending on the design of the towers. Black Storks also breed in some of the mountains and would be subject to the same collision risks as the raptors.

## **2.3 Dams, wetlands and rivers**

The most important wetland habitat along the alignment consists of man-made dams, some of which are huge such as the Greater Brandvlei Dam and the Theewaterskloof Dam. The dams serve as important draw cards for a variety of waterbirds, as well as Blue Cranes. This creates a potential collision risk for several species in a variety of habitats. In the karoo, farm dams could attract power line sensitive Red Data species such as Blue Cranes, Greater Flamingo and Black Stork and a variety of non Red Data species such as White Stork, Spur-winged Goose, Egyptian Goose and African Fish Eagle. In the Overberg the small farm dams are key roosting areas for Blue Cranes and a variety of non Red Data species such as White Stork, Spur-winged Goose and Egyptian Goose. Any alignment that skirts or crosses a dam will create a serious collision risk. The study contains many rivers, including some larger ones such as the Breede River. The riverine vegetation in the area is generally heavily impacted by alien invasive plant species, particularly Australian *Acacia* and *Eucalyptus* species, which reduces the suitability of the habitat for many birds. Power line sensitive species that use the rivers are various non Red data herons, ducks, coots and waders. Several large wetlands with open water bodies are situated in the south of the study area in 3419DB, which serve as a draw card for many waterbirds as well as Blue Crane and African Marsh Harrier. Smaller natural wetlands are also used by Blue Cranes in the Overberg to roost in.

## 2.4 Other habitats

The study area contains many other micro-habitats which are not important for Red Data species e.g. plantations, urban areas and mining activity. Copses of exotic *Eucalyptus* do create attractive habitat for raptors such as Black Sparrowhawk, Rufous-chested Sparrowhawk and Forest Buzzard, none of which are presently Red listed.

## 2.5 Power line sensitive bird species in the study area

The study area comprises approximately 34 quarter degree squares. Within this study area, a total of 22 Red Data species (excluding marine and coastal species, which are not relevant to this report) have been recorded during the bird atlas period. TABLE 2.2 below lists the Red Data species relevant to this report that have been recorded in the study area by ASAB. It also states the conservation status, habitat preferences as well the primary potential type of impact that the proposed power line (collisions, habitat destruction and disturbance) could have on the species.

**Table 2.2:** Red Data species recorded in the study area by ASAB (Harrison *et al.*, 1997)

Common Name	Scientific Name	Conservation Status (Barnes 2000)	Collision	Habitat destruction and disturbance	Habitat requirements (Barnes 1998; Barnes 2000; Hockey <i>et.al.</i> 2005; Young <i>et.al.</i> 2003; Harrison <i>et.al.</i> 1997; personal observations)
Black Stork	<i>Ciconia nigra</i>	NT	x	-	Cliffs for roosting and breeding, and rivers and dams for foraging. Occurs in the Cape Fold mountains and recorded from almost all the squares.
Yellow-billed Stork	<i>Mycteria ibis</i>	NT	x	-	Always associated with water – dams, wetlands, rivers, marshes, even small pools. Recorded only from one square, rare vagrant to the Western Cape.
Greater Flamingo	<i>Phoenicopterus ruber</i>	NT	x	-	Open shallow, eutrophic wetlands. Could be present at some of the larger water bodies and farm dams in the study area.
Lesser Flamingo	<i>Phoenicopterus minor</i>	NT	x	-	Open shallow, eutrophic wetlands. Can tolerate more saline and alkaline conditions than the Greater Flamingo. Could be present at some of the larger water bodies and farm dams in the study area.
Secretarybird	<i>Sagittarius serpentarius</i>	NT	x	-	Grassland, old lands, open woodland. Most

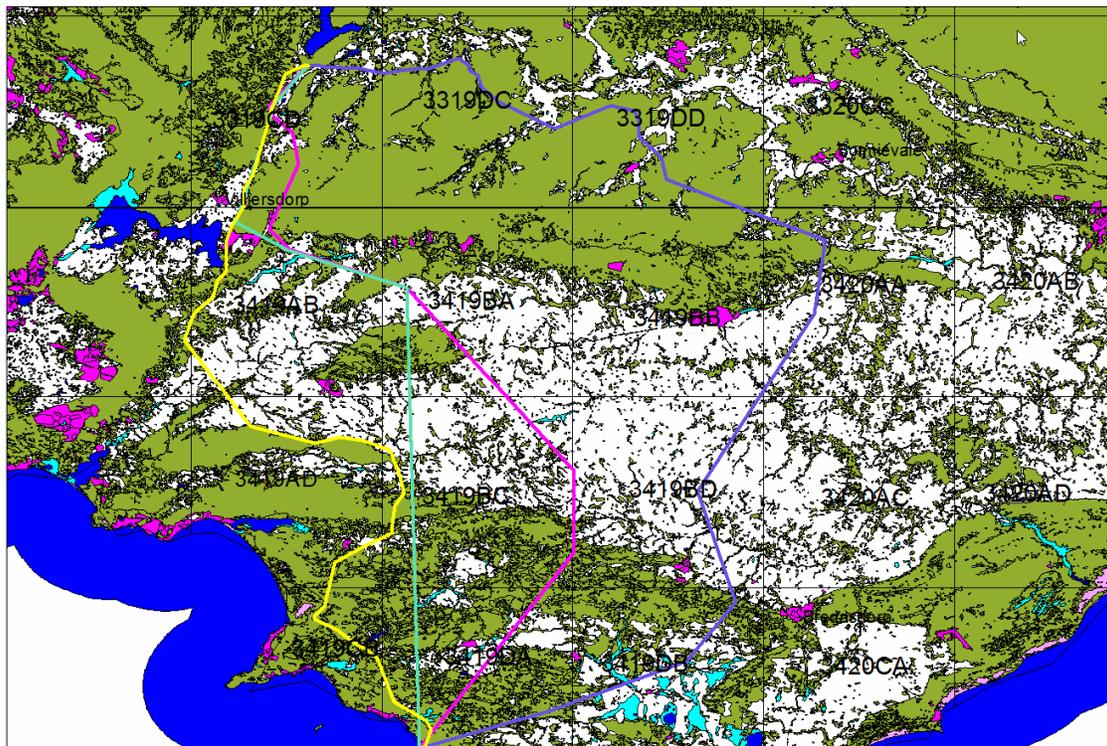
					likely to be encountered in the Overberg, in fynbos, pastures and fallow lands.
Cape Vulture	<i>Gyps coprotheres</i>	VU	x	-	Large cliffs for breeding and roosting, open woodland and grassland. Roosts on transmission lines. Likely to be encountered in the Overberg all the way up to Swellendam, but particularly near Potberg.
Martial Eagle	<i>Polemaetus bellicosus</i>	VU	x	-	Diverse habitats, from open grassland and scrub to woodland. Typically found in flat country. Sparsely recorded from almost all squares.
African Marsh-Harrier	<i>Circus ranivorus</i>	VU	x	x	Large permanent wetlands with dense reed beds. Sometimes forages over smaller wetlands and grassland. Recorded mostly from the Overberg, especially 3419DB.
Black Harrier	<i>Circus maurus</i>	NT	x	-	Recorded in almost all the squares, but highest densities in remnant patches of renosterveld in the Overberg
Peregrine Falcon	<i>Falco peregrinus</i>	NT	x	-	A wide range of habitats, but cliffs (or tall buildings) are a prerequisite for breeding.
Lanner Falcon	<i>Falco biarmicus</i>	NT	x	-	Generally prefers open habitat, but exploits a wide range of habitats. Recorded from most squares.
Lesser Kestrel	<i>Falco naumanni</i>	VU	-	-	No interactions are expected with the proposed power lines.
Hottentot Buttonquail	<i>Turnix hottentotus</i>	EN	-	-	No interactions are expected with the proposed power lines.
Blue Crane	<i>Anthropoides paradiseus</i>	VU	x	-	Cereal crops, old lands, pastures, wetlands, dams and pans for roosting. Overberg is the biggest risk area.
Denham's Bustard	<i>Neotis denhami</i>	VU	x	-	Cereal crops, fynbos and pastures in the Overberg.
Ludwig's Bustard	<i>Neotis ludwigii</i>	VU	x	-	Occurs in the Karoo areas of the study area, although not in large numbers, as the habitat still contains strong

					elements of fynbos, which is not suitable habitat.
Greater Painted-snipe	<i>Rostratula benghalensis</i>	NT	-	-	No interactions are expected with the proposed power lines.
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	NT	-	x	Fast-flowing streams with clear water and well-wooded banks.
Knysna Woodpecker	<i>Campethera notata</i>	NT	-	x	Occurs in fynbos forest patches, or on the edges of afro-montane forest.
Knysna Warbler	<i>Bradypterus sylvaticus</i>	VU	-	x	It typically occurs in thick, tangled vegetation along the banks of watercourses, or covering drainage lines in fynbos forest patches, or on the edges of afro-montane forest.

## 2.6 Bantamsklip - Bacchus

### 2.6.1 Description of study area

The various Bantamsklip-Bacchus options all traverse roughly similar bird habitat. The corridors are mostly situated in the Overberg, and generally cross fynbos and the Overberg Wheatbelt. Only one alternative crosses into the fynbos-karoo ecotone, for a considerable distance. The various bird species occurring in these habitats have been described above. See FIGURE 2.1 below for a map indicating the different bird habitats that the options cross.

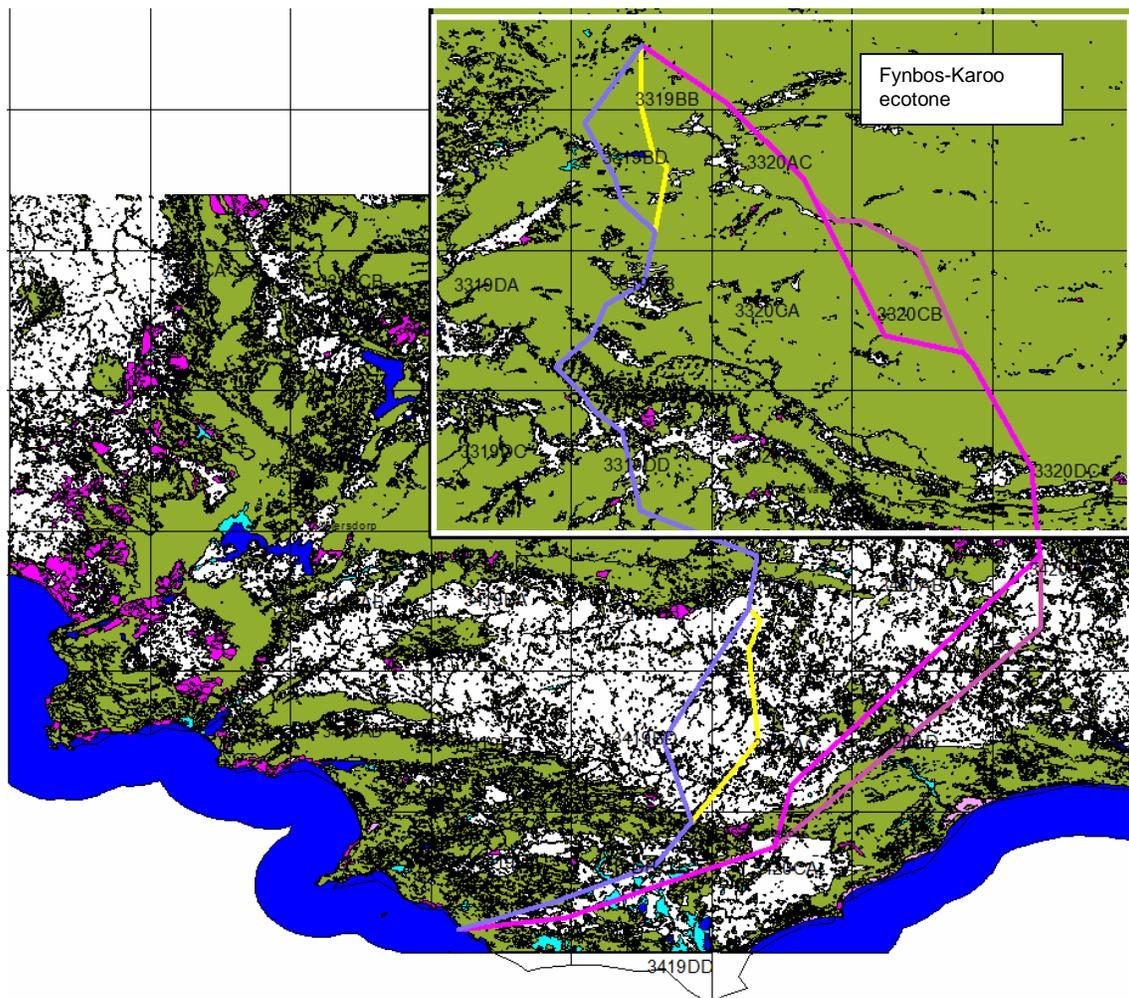


**Figure 2.1:** The various habitats that are traversed by the Bantamsklip-Bacchus corridors (the yellow, green, purple and blue lines). The green areas represent fynbos, except in 3319DC and DD, where it represents Fynbos-Karoo ecotone. The blue areas represent water bodies and wetlands, and the white areas cultivated fields. The purple areas are mostly urban areas. The coloured lines are the different corridor options.

## 2.7 Bantamsklip - Kappa

### 2.7.1 Description of study area

The various Bantamsklip–Kappa options likewise cross similar habitat. The corridors start off in the Overberg, where it crosses fynbos and the Overberg Wheatbelt. North of the Overberg it crosses into fynbos-karoo ecotone and run in this habitat all the way to Kappa. Two alternatives also cross the important Southern Langeberg Mountain IBA. The various bird species occurring in these habitats have been described above. See FIGURE 2.2 below for a map indicating the different bird habitats that the options cross.



**Figure 2.2:** The various habitats that are traversed by the Bantamsklip-Kappa corridors. The green areas represent fynbos and fynbos-karoo ecotone (the green areas in the white

square). The blue areas represent water bodies and wetlands, and the white areas cultivated fields. The purple areas are mostly urban areas.

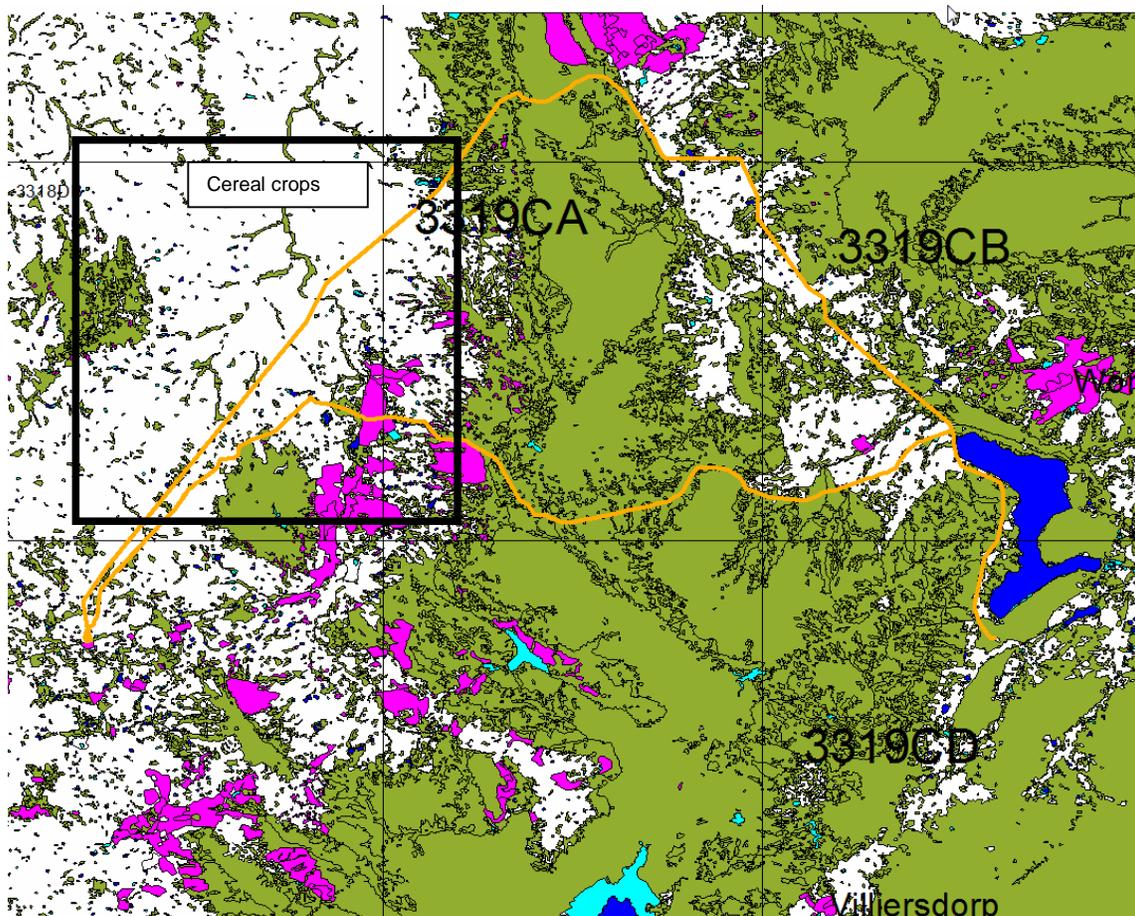
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## 2.8 Bacchus - Muldersvlei

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### 2.8.1 Description of study area

Both the two Bacchus-Muldersvlei corridors cross large areas of fynbos and cultivated fields. However, the northern option crosses extensive wheatfields, which is the beginning of the Swartland Wheatbelt. The cultivated fields that Option 1 crosses are mostly vineyards and other, non-cereal crops. The various bird species occurring in these habitats have been described above. See FIGURE 2.3 below for a map indicating the different bird habitats that the options cross.



**Figure 2.3:** The various habitats that are traversed by the Muldersvlei-Bacchus corridors. The green areas represent fynbos. The blue areas represent water bodies and wetlands and the white areas cultivated fields. The purple areas are mostly urban areas.

## 3 IMPACTS AND ISSUES IDENTIFICATION

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### 3.1 Typical impacts of power lines on birds

According to information received from Arcus GIBB, four different types of structures are currently considered for potential use for the proposed lines. However, a decision on the final structure types had not been finalized at the time of writing, therefore the assumption that these structures will be used is conditional on final confirmation from Eskom. However, from a bird impact perspective, the major potential impacts of a large transmission line on birds is habitat destruction, disturbance and, by far the most serious, collisions with the earth wires. These impacts are present irrespective of the tower design; therefore the actual tower design is generally not a crucial factor in determining the risk to birds. It is important to note that electrocutions is not an envisaged impact in the present scenario, as the clearances on the large 400kV transmission structures, irrespective of the design used, are too big for any bird to bridge and cause a short circuit. However, the design of the structures will play an important role in the risk of bird induced faulting on the proposed line, in that certain tower types are more at risk of bird streamer induced faults because the conductors are more exposed to birds perching on the tower. However, this should not have an impact on the birds themselves.

Because of their size and prominence, electrical infrastructures constitute an important interface between wildlife and man. Negative interactions between wildlife and electricity structures take many forms, but two common problems in southern Africa are (a) electrocution of birds (and other animals) and (b) birds colliding with power lines (Hobbs and Ledger 1986a; Hobbs and Ledger 1986b; Kruger 1999; Kruger and Van Rooyen 1998; Ledger 1983; Ledger 1984; Ledger and Annegarn 1981; Ledger, Hobbs and Smith, 1992; Van Rooyen 1998; Van Rooyen 1999; Van Rooyen 2000; Verdoorn 1996). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen and Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities.

**Electrocution** of birds on overhead lines is an emotional issue as well as an important cause of unnatural mortality of raptors and storks. It has attracted plenty of attention in Europe, USA and South Africa (APLIC 1994; Van Rooyen and Ledger 1999). However, in the context of overhead lines above 132kV, electrocutions are not a major issue. Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen 2004). Due to the large size of the clearances on most overhead lines of above 132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. In fact, transmission lines have proven to be beneficial to many birds, including species such as Southern Bald Ibis, Martial Eagle, Tawny Eagle, White-backed Vultures, and even occasionally Verreaux's Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce (Van Rooyen 2004). Cape Vultures have also taken to roosting in large numbers on transmission in certain areas (e.g. in Gauteng and North-West) especially in areas where large trees are absent (pers. obs.).

**Collisions** are the biggest single threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (Van Rooyen 2004, Anderson 2001).

Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The five species most affected by transmission line collisions namely the Blue Crane, White Stork, Greater Flamingo, Ludwig's Bustard and Cape Vulture (Van Rooyen 2007), are all present in this study area. It should be noted that these are only the reported mortalities, it is suspected that a large number of mortalities go unreported. In one instance, where bi-monthly monitoring by the Endangered Wildlife Trust (EWT) did take place, a single 10 km section of 132kV distribution line killed 59 Blue Cranes, 29 Ludwig's Bustard, and 13 White Storks in a three year period (EWT unpubl. data). In 2004, fifty-four Blue Crane carcasses were discovered near Graaf-Reinett in the Northern Cape province under 3.7km of distribution line (EWT unpubl. data).

Data collected in the Northern Cape Province between 1997 and 1999 provides further evidence of the gravity of the problem in some areas. During an initial clearing of transects, a total of 194 large bird carcasses were found under 40km of transmission line (220kV and 400kV) near De Aar in the Northern Cape. Subsequent monitoring of 140km of power lines (transects of 10km each from 22kV up to 400kV) in the same area over a period of 12 months produced another 196 carcasses (mostly cranes and bustards), the majority under transmission lines (Anderson 2001).

The Red Data species vulnerable to power line collisions are often long-lived, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. A good example of this is the two flamingo species that occur in southern Africa, which have experienced hardly any successful breeding attempts at Etosha Pan in Namibia for several decades. Another example is the Great White Pelican that only breeds successfully at Dassen Island in the Western Cape. Others, such as the Blue Crane, typically experience large infant mortality, but this is counter-balanced by having a long reproductive life. These species have not evolved to cope with high adult mortality, with the result that consistent high adult mortality over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, poisonings, disturbance and power lines) and therefore contribute to adult mortality, and it is not known what the cumulative effect of these impacts could be over the long term.

From the figures quoted above, it is clear that power lines can be a major cause of avian mortality among power line sensitive species, especially Red Data species. Furthermore, the cumulative effects of power lines and other sources of unnatural mortality might only manifest itself decades later, when it might be too late to reverse the trend. It is therefore imperative to reduce any form of unnatural mortality in these species, regardless of how insignificant it might seem at the present moment in time. This is especially the case with regionally threatened species such as the Blue Crane in the present study area.

During the construction phase and maintenance of power lines and substations, some **habitat destruction and transformation** inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line, which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat. Similarly, the above mentioned construction and maintenance activities impact on bird through disturbance, particularly during breeding activities. This could lead to breeding failure if the disturbance happens during a critical part of the breeding season.

### 3.2 Sensitivity classification of the habitat

One of the objectives of this study is to provide a high level sensitivity map indicating where the most sensitive areas are located **within the study area** as far as the avifauna of the area is concerned. The first step towards that is the creation of a sensitivity index in order to classify the different microhabitats that have been identified in terms of importance for power line sensitive Red Data species. In order to achieve that, the different bird micro-habitats were first listed. Thereafter the species identified in TABLE 2.2 were allocated a score according to their Red Data status. The species were then placed in the habitat category where they are most likely to occur. Lastly the total Red Data score for each habitat category were calculated as the sum of the species scores for species placed in that category. It must be stressed that this method is only a crude indication of sensitivity, but it does provide a rough guideline as to what areas are the most important from an avifaunal perspective.

### 3.3 Classes of bird micro-habitat

Below the bird micro-habitats that have been identified in the study area are classified:

- Fynbos in the Overberg
- Fynbos outside Overberg
- Fynbos-karoo ecotone
- Mountains
- Wetlands and dams
- Rivers
- Afro-montane forest
- Cultivated fields and pastures in the Overberg and “Swartland”
- Cultivated fields and pastures outside the Overberg and “Swartland”, but excluding the fynbos-karoo ecotone
- Cultivated fields in the fynbos – karoo ecotone
- Plantations, mining, bare rock and soil, urban development

In order to score the species listed in TABLE 2.2, the following system was used:

- Near threatened: 2
- Vulnerable: 3
- Endangered: 4
- Critically endangered: 5

TABLE 3.1 below lists the Red Data scores of the different species in TABLE 2.2, as well as the habitat that it will primarily utilise.

**Table 3.1:** Red Data scores for the power line sensitive Red Data species in the study area (vagrants excluded)

Common Name	Habitat	Score
Great White Pelican	Large waterbodies	2
Black Stork	Mountains Wetlands and waterbodies Rivers	2
Greater Flamingo	Dams and other large waterbodies	2
Lesser Flamingo	Dams and other large waterbodies	2
Secretarybird	Fynbos in the Overberg Fynbos outside the Overberg	2

	Cultivated fields and pastures in the Overberg and "Swartland"	
Cape Vulture	Cultivated fields and pastures in the Overberg and "Swartland" Fynbos in the Overberg	3
Martial Eagle	Fynbos-Karoo ecotone	3
African Marsh-Harrier	Wetlands	3
Black Harrier	Fynbos in the Overberg Fynbos outside the Overberg Fynbos-karoo ecotone	2
Peregrine Falcon	Mountains	2
Lanner Falcon	Fynbos in the Overberg Fynbos outside the Overberg Fynbos-karoo ecotone Mountains Cultivated fields and pastures in the Overberg and "Swartland" Cultivated fields in the fynbos – karoo ecotone	2
Blue Crane	Cultivated fields and pastures in the Overberg and "Swartland" Cultivated fields in the fynbos – karoo ecotone Wetlands and dams Cultivated fields and pastures outside the Overberg and "Swartland", but excluding the fynbos-karoo ecotone	3
Denham's Bustard	Cultivated fields and pastures in the Overberg and "Swartland" Fynbos in the Overberg	3
Ludwig's Bustard	Fynbos-karoo ecotone Cultivated fields in the fynbos – karoo ecotone	3
Half-collared Kingfisher	Rivers	2
Knysna Woodpecker	Afro-montane forest	2
Knysna Warbler	Afro-montane forest	3

TABLE 3.2 below lists the totals for the different habitat categories, which is equal to the sum of the species scores for that habitat category. The totals were then divided into three sensitivity classes: higher sensitivity (3), medium sensitivity (2) and lower sensitivity (1).

**Table 3.2:** The scores for the different habitat categories, and the sensitivity classes

Habitat	Total	Sensitivity class	Sensitivity class score
Wetlands and waterbodies	14	Higher sensitivity	3
Cultivated fields and pastures in the Overberg and "Swartland"	13	Higher sensitivity	3
Fynbos in the Overberg	12	Higher sensitivity	3
Fynbos-karoo ecotone	10	Higher sensitivity	3
Cultivated fields in the fynbos – karoo ecotone	8	Higher sensitivity	3
Fynbos outside the Overberg	6	Medium sensitivity	2
Mountains	6	Medium sensitivity	2
Afro-montane forest	5	Medium sensitivity	2
Rivers	4	Medium sensitivity	2
Cultivated fields and pastures outside the Overberg, but excluding the fynbos-karoo ecotone and "Swartland"	3	Lower sensitivity	1
Plantations, mining, bare rock and soil, urban development	0	Lower sensitivity	1

The above analysis gives a useful guideline as to where the majority of impacts are likely to be expected from a bird habitat perspective. In the Overberg, a high density combination of cultivated fields, pastures and water bodies creates the biggest risk of collisions. In addition, the presence of species such as Black Harrier, Denham's Bustard and Secretarybird in the Fynbos in the Overberg ensures that overall the Overberg ranks as the most sensitive region for potential impacts. The fynbos-karoo ecotone rates as medium sensitive due to the presence of species such as Martial Eagle and Ludwig's Bustard. The wine growing areas of the study area have a relatively low sensitivity for power lines sensitive species, due to it being unsuitable for most power line sensitive species. It is important to note that within each geographic region, there are areas of high risk micro-habitat, regardless of the overall risk of the geographic region, e.g. although the wine growing geographical area is not as overall as highly rated from a risk perspective than for example the Overberg, wetlands and dams within the former is still rated as high risk due to the potential presence of species such as flamingos and pelicans.

APPENDICES B1, B2, B3 and B4 are sensitivity maps that give a visual perspective on the high sensitivity habitats in the overall study area. APPENDIX B1 and B2 shows the sensitivity areas in the Overberg and "Swartland", B3 presents the sensitivity areas in the karoo-ecotone and B4 presents the sensitivity map of the predominantly grape growing areas of the study area.

Having established which micro-habitats holds the most risks of interactions with the proposed power lines, the next step was to analyse the individual corridors from bird impact assessment perspective. In order to do this a simple formula was used:

- The length of corridor that traversed a specific micro-habitat was measured using the GIS package ArcView 3.2.

- Wetlands and waterbodies (within 500m of the centre line of a corridor) and river crossings were counted.
- In the Overberg, Blue Crane congregation areas as determined by Kotoane (2003) within 1km of the centre line of a corridor were also counted.

The total length of power line that crossed a specific micro-habitat was then multiplied with the sensitivity class score (see TABLE 3.2 above) for that specific habitat. In the case of wetlands, water bodies and river crossings, the total count of these micro-habitats along a given alignment was multiplied with the sensitivity class score (see TABLE 3.2 above) for that specific habitat. The same was done for Blue Crane congregation points, which were treated as a special type of high sensitivity “micro-habitat” and given a sensitivity class score of 3. In this manner, a sensitivity rating for each corridor was calculated.

Sections 3.4 to 3.6 below table the results of the analyses that were performed on the different proposed corridors.

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### 3.4 Bantamsklip – Bacchus

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#### 3.4.1 Comparative measurements of Bantamsklip – Bacchus alternative corridors

TABLE 3.4.1 below reflects the result of the measurements for each corridor for the Bantamsklip-Bacchus alternatives, including the so-called PPP option. The PPP option is an option that was suggested by some of the stakeholders in the Overberg. All the totals are in kilometre except (a) water bodies and wetlands (b) river crossings and (c) Blue Crane congregation points, where the total count of these micro-habitats along a given alignment is given.

**Table 3.4.1:** Total measurements for all the Bantamsklip-Bacchus corridors

Habitat	Option 1	Option 2	Option 3	Option 4	PPP Option
Wetlands and waterbodies	75	48	65	44	105
Cultivated fields and pastures in the Overberg and “Swartland”	37.81	39.84	58.37	76.83	63.15
Fynbos in the Overberg	59.17	49.31	39.81	32.71	43.82
Fynbos-karoo ecotone	0	0	0	49.64	0
Cultivated fields in the fynbos – karoo ecotone	0	0	0	8.63	0
Fynbos outside the Overberg	8.71	10.1	14.59	4.68	5.47
Mountains	0	0	0	0	0
Afro-montane forest	0	0	0	0	0
Rivers	8	10	14	18	11
Cultivated fields and pastures outside the Overberg, but	11.57	10.77	9.11	3.17	24.06

excluding the fynbos-karoo ecotone and "Swartland"					
Plantations, mining, bare rock and soil, urban development	3.88	0.59	0.78	0	4.76
Blue Crane congregation points	3	1	1	3	1

The total sensitivity ratings for the five options are reflected in TABLE 3.3.2 below i.e. the totals after the measurements were multiplied with the habitat sensitivity class scores.

**Table 3.4.2:** Total sensitivity ratings per corridor for Bantamsklip-Bacchus

Habitat	Option 1	Option 2	Option 3	Option 4	PPP Option
Wetlands and waterbodies	225	144	195	132	315
Cultivated fields and pastures in the Overberg and "Swartland"	113.43	119.52	175.11	230.49	189.45
Fynbos in the Overberg	177.51	147.93	119.43	98.13	131.46
Fynbos-Karoo ecotone	0	0	0	148.92	0
Cultivated fields in the Fynbos – Karoo ecotone	0	0	0	25.89	0
Fynbos outside the Overberg	17.42	20.2	29.18	9.36	10.94
Mountains	0	0	0	0	0
Afro-montane forest	0	0	0	0	0
Rivers	16	20	28	36	22
Cultivated fields and pastures outside the Overberg, but excluding the Fynbos-Karoo ecotone and "Swartland"	11.57	10.77	9.11	3.17	24.06
Plantations, mining, bare rock and soil, urban development	3.88	0.59	0.78	0	4.76
Blue Crane congregation points	9	3	3	9	3
<b>Totals</b>	<b>573.81</b>	<b>466.01</b>	<b>559.61</b>	<b>692.96</b>	<b>700.67</b>

From the analysis above, it is clear that option 2 is the preferred option (i.e. carries the least risk) from a bird impact assessment perspective by a clear margin. This is followed by option 3 and 1 in quick succession, with option 4 and the PPP option being respectively second least and least preferred.

### 3.5 Bantamsklip - Kappa

#### 3.5.1 Comparative measurements of Bantamsklip – Kappa alternative corridors

TABLE 3.5.1 below reflects the result of the measurements for each corridor for the Bantamsklip-Kappa alternative options, including the so-called PPP (Public Participation Process) option. The PPP option is an option that was suggested by some of the stakeholders in the Overberg. All the totals are in kilometre except (a) waterbodies and wetlands (b) river crossings and (c) Blue Crane congregation points, where the total count of these micro-habitats along a given alignment is given.

**Table 3.5.1:** Total measurements for all the Bantamsklip-Kappa corridors

Habitat	Option 1	Option 2	Option 3	Option 4	PPP Option
Wetlands and waterbodies	48	70	77	79	72
Cultivated fields and pastures in the Overberg and "Swartland"	80.84	78.64	107.41	86.29	91.16
Fynbos in the Overberg	35.99	31.54	23.68	45.2	41.21
Fynbos-karoo ecotone	98.79	94.14	122.18	115.32	98.31
Cultivated fields in the fynbos – karoo ecotone	20.11	34.29	4.5	5.92	17.85
Fynbos outside the Overberg	0	0	0	0	0
Mountains	0	0	6.01	9.67	0
Afro-montane forest	0	0	0	0	0
Rivers	25	26	29	26	27
Cultivated fields and pastures outside the Overberg, but excluding the fynbos-karoo ecotone and "Swartland"	0	0	0	0	0
Plantations, mining, bare rock and soil, urban development	0.79	1.28	1.18	0.2	4.75
Blue Crane congregation points	3	1	4	3	4

The total sensitivity ratings for the five options are reflected in TABLE 3.5.2 below i.e. the totals after the measurements have been multiplied with the habitat sensitivity class scores.

**Table 3.5.2:** Total sensitivity ratings per corridor for Bantamsklip-Kappa

Habitat	Option 1	Option 2	Option 3	Option 4	PPP Option
Wetlands and waterbodies	144	210	231	237	216
Cultivated fields and pastures in the Overberg and “Swartland”	242.52	235.92	322.23	258.87	273.48
Fynbos in the Overberg	107.97	94.62	71.04	135.6	123.63
Fynbos-karoo ecotone	296.37	282.42	366.54	345.96	294.93
Cultivated fields in the fynbos – karoo ecotone	60.33	102.87	13.5	17.76	53.55
Fynbos outside the Overberg	0	0	0	0	0
Mountains	0	0	12.02	19.34	0
Afro-montane forest	0	0	0	0	0
Rivers	50	52	58	52	54
Cultivated fields and pastures outside the Overberg, but excluding the fynbos-karoo ecotone and “Swartland”	0	0	0	0	0
Plantations, mining, bare rock and soil, urban development	0.79	1.28	1.18	0.2	4.75
Blue Crane congregation points	9	3	12	9	12
<b>Total</b>	<b>910.98</b>	<b>982.11</b>	<b>1087.51</b>	<b>1075.73</b>	<b>1032.34</b>

From the analysis above, it is clear that option 1 is the preferred option (i.e. carries the least risk) from a bird impact assessment perspective by a clear margin. This is followed by option 2, then option PPP, and finally option 4 and 3 in quick succession.

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### 3.6 Bacchus – Muldersvlei

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#### 3.6.1 Comparative measurements of Bantamsklip – Kappa alternative corridors

TABLE 3.6.1 below reflects the result of the measurements for each corridor for the Bacchus-Muldersvlei alternatives. All the totals are in kilometre except (a) waterbodies and wetlands (b) river crossings and (c) Blue Crane congregation points, where the the total count of these micro-habitats along a given alignment is given.

**Table 3.6.1:** Total measurements for all the Bacchus-Muldersvlei corridors

Habitat	Option 1	Option 2
Wetlands and waterbodies	12	27
Cultivated fields and pastures in the Overberg and "Swartland"	15	40.02
Fynbos in the Overberg	0	0
Fynbos-karoo ecotone	0	0
Cultivated fields in the fynbos – karoo ecotone	0	0
Fynbos outside the Overberg	4.31	3.29
Mountains	15.43	8
Afro-montane forest	0	0
Rivers	6	11
Cultivated fields and pastures outside the Overberg, but excluding the fynbos-karoo ecotone and "Swartland"	12.28	32.57
Plantations, mining, bare rock and soil, urban development	5.20	0
Blue Crane congregation points	0	0

The total sensitivity ratings for the five options are reflected in TABLE 3.6.2 below i.e. the totals after the measurements have been multiplied with the habitat sensitivity class scores.

The analysis in TABLE 3.6.2 below shows that option 1 is the preferred option (i.e. carries the least risk) from a bird impact assessment perspective by a clear margin.

**Table 3.6.2:** Total sensitivity ratings per corridor for Bacchus-Muldersvlei

Habitat	Option 1	Option 2
Wetlands and waterbodies	36	81
Cultivated fields and pastures in the Overberg and "Swartland"	45	120.06
Fynbos in the Overberg	0	0
Fynbos-Karoo ecotone	0	0
Cultivated fields in the Fynbos – Karoo ecotone	0	0
Fynbos outside the Overberg	8.62	6.58
Mountains	30.86	16
Afro-montane forest	0	0
Rivers	12	22
Cultivated fields and pastures outside the Overberg, but excluding the Fynbos-Karoo ecotone and "Swartland"	12.28	32.57
Plantations, mining, bare rock and soil, urban development	5.2	0
Blue Crane congregation points	0	0
<b>Total</b>	<b>149.96</b>	<b>278.21</b>

## 4 TERMS OF REFERENCE FOR IMPACT ASSESSMENT PHASE

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In the EIA phase, the analyses will be taken further with regard to the corridors that are taken into the EIA phase. The envisaged impacts on the birds will be analysed on an **individual species level for Red Data species**, using the following set of criteria below, both before and after mitigation. If need be, additional field work will be conducted.

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### 4.1 Significance of impacts

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The significance of the impacts will be described as follows:

**Low:** Where the impact would not have an influence on the design or require to be significantly accommodated in the project design.

**Medium:** Where the impact could have an influence on the environment, which would require modification of the project design or alternative mitigation.

**High:** Where it could have a no-go implication for the project irrespective of any possible mitigation.

The impact significance will be determined through the following criteria:

- **Nature of Impact:** This includes a brief description of how the proposed activity will impact on the environment and includes whether it is a direct, indirect or cumulative impact.
  - **Extent:** This refers to the geographic area to which the activity will have an influence and can be limited to the immediate location of the activity, the site and/or route corridor, the area within a 5 km radius of the activity or the entire region.
  - **Duration:** This refers to the expected timeframe of an impact and can be expressed as short term (0 – 5 years), medium (5 – 15 years), long term (> 15 years, but where the impact ceases after operation is stopped) or permanent.
  - **Intensity or severity:** This will describe the level of intensity of the impact in terms of its potential for causing either negative or positive effects and can be expressed as low (where no environmental functions and processes are affected), medium (where the environment continues to function but in a modified manner) or high (where environmental functions and processes are altered such that they temporarily or permanently cease).
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### 4.2 Status of impacts

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The status of the impact will be stated as positive (a benefit), negative (a cost) or neutral.

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### 4.3 Degree of confidence

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The degree of confidence in the predictions, based on the availability of information and specialist knowledge will be stated. Other aspects that will be taken into consideration are the following:

- Impacts both before and after the proposed mitigation and management measures have been implemented;

- All impacts will be evaluated for their full life cycle for the proposed development, including construction and operational phases;
  - The impact evaluation will take into account the cumulative effects of other activities which have occurred or are in the process of occurring within the study area; and
  - Legal requirements will be identified and specific legal and permit requirements that could be relevant to the proposed project will be listed.
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#### **4.4 Mitigation and monitoring**

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Where negative impacts are identified, mitigation measures (ways of reducing impacts) will be proposed. Where no mitigation is feasible, this will be stated and the reasons given. Where positive impacts are identified, ways of enhancing these impacts will also be mentioned. An attempt will be made to set quantifiable standards to which the effectiveness of the mitigation can be measured. This might include input into monitoring and management programmes.

## 5 CONCLUSIONS AND RECOMMENDATIONS

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This report endeavoured to assess the potential impact of nine new proposed transmission lines in the Western Cape on birds, and specifically Red Data species.

The study concentrated firstly on identifying and describing the different micro-habitats that are utilised by birds in the study area. These habitats were classified as follow:

- Fynbos in the Overberg
- Fynbos outside Overberg
- Fynbos-karoo ecotone
- Mountains
- Wetlands and dams
- Rivers
- Afro-montane forest
- Cultivated fields and pastures in the Overberg and “Swartland”
- Cultivated fields and pastures outside the Overberg and “Swartland”, but excluding the fynbos-karoo ecotone
- Cultivated fields in the fynbos – karoo ecotone
- Plantations, mining, bare rock and soil, urban development

An analysis of these habitats was conducted with regard to their potential importance for Red Data bird species in the study area. The analysis showed that there are significant differences in terms of importance for these species, resulting in the following descending order of importance:

12. Wetlands and water bodies
13. Cultivated fields and pastures in the Overberg and “Swartland”
14. Fynbos in the Overberg
15. Fynbos-karoo ecotone
16. Cultivated fields in the fynbos – karoo ecotone
17. Fynbos outside the Overberg
18. Mountains
19. Afro-montane forest
20. Rivers
21. Cultivated fields and pastures outside the Overberg, but excluding the fynbos-karoo ecotone and “Swartland”
22. Plantations, mining, bare rock and soil, urban development

All these micro-habitats were then divided in three sensitivity classes:

- Lower risk (sensitivity score = 1): Habitats where few impacts of low significance are envisaged due to the avifaunal species composition and use of habitat.
- Medium risk (sensitivity score = 2): Habitats where irregular impacts of moderate significance are envisaged due to the avifaunal species composition and use of habitat.
- Higher risk (sensitivity score = 3): Habitats where regular impacts of high significance are envisaged due to the avifaunal species composition and habitat use.

The analysis gave a useful guideline as to where the majority of impacts are likely to be expected from a bird habitat perspective. In the Overberg, a high density combination of cultivated fields, pastures and water bodies creates the biggest risk of collisions. In addition, the presence of species such as Black Harrier, Denham’s Bustard and Secretarybird in the

fynbos in the Overberg ensures that overall the Overberg rates as the most sensitive region for potential impacts. The fynbos-karoo ecotone rates as medium sensitive due to the presence of species such as Martial Eagle and Ludwig's Bustard. The wine growing areas of the study area have a relatively low sensitivity for power lines sensitive species, due to its unsuitability for most power line sensitive species. It is important to note that within each geographic region, there are areas of high risk micro-habitat, regardless of the overall risk of the geographic region, e.g. although the wine growing geographical area is not as overall as highly rated from a risk perspective than for example the Overberg, wetlands and dams within the former is still rated as high risk due to the potential presence of species such as flamingos and pelicans.

Having established which micro-habitats holds the most risks of bird interactions with the proposed power lines, the next step was to analyse the individual corridors from bird impact assessment perspective. In order to do this a simple formula was used:

- The length of corridor that traversed a specific micro-habitat was measured.
- Wetlands and waterbodies (within 500m of the centre line of a corridor) and river crossings were counted.
- In the Overberg, Blue Crane congregation areas as determined by Kotoane (2003) within 1km of the centre line of a corridor were also counted.

The total length of power line that crossed a specific micro-habitat was then multiplied with the sensitivity class score for that specific habitat. In the case of wetlands, waterbodies and river crossings, the total count of these micro-habitats along a given alignment was multiplied with the sensitivity class score for that specific habitat. The same was done for Blue Crane congregation points, which were treated as a special type of high sensitivity "micro-habitat" and given a sensitivity class score of 3. In this manner, a sensitivity rating for each corridor was calculated.

From the analysis it emerged that there are definite preferred corridors from a bird impact perspective. For **Bantamsklip – Bacchus**, it emerged that **option 2 is the preferred option** by a clear margin (i.e. carries the least risk) from a bird impact assessment perspective. This is followed by option 3 and 1 in quick succession, with option 4 and the PPP option (suggested by stakeholders in the Overberg) being respectively second least and least preferred. For **Bantamsklip – Kappa** it is clear that **option 1 is the preferred option** (i.e. carries the least risk) from a bird impact assessment perspective by a clear margin. This is followed by option 2, then option PPP, and finally option 4 and 3 in quick succession. Lastly, for **Bacchus – Muldersvlei**, **option 1 is the preferred option** (i.e. carries the least risk) from a bird impact assessment perspective by a clear margin.

It is therefore recommended that the less favourable options are not taken into the EIA phase for further analysis, as the preferred options have been identified by a clear margin. Further analysis of the preferred options on a species level should be conducted in the EIA phase, with specific emphasis on the mitigation of impacts.

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