AUGUST 2015

TWEEDRACHT 88KV POWER LINE DEVELOPMENT

SPECIALIST AVIFAUNAL IMPACT ASSESSMENT

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DECLARATION OF INDEPENDENCE

I, **Megan Diamond**, in my capacity as a specialist consultant, hereby declare that I:

* Act as an independent specialist to Nsovo Environmental Consulting for this project.
* Do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2010.
* Will not be affected by the outcome of the environmental process, of which this report forms part of.
* Do not have any influence over the decisions made by the governing authorities.
* Do not object to or endorse the proposed developments, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
* Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Environmental Impact Assessment Regulations, 2010.

PROFESSIONAL REGISTRATION

The Natural Scientific Professions Act of 2003 aims to "Provide for the establishment of the South African Council of Natural Scientific Professions (SACNASP) and for the registration of professional, candidate and certified natural scientists; and to provide for matters connected therewith."

"Only a registered person may practice in a consulting capacity" – Natural Scientific Professions Act of 2003 (20(1)-pg. 14)

Investigator:	Megan Diamond (*Cert.Sci.Nat)*
Qualification:	BSc Environmental Management – UNISA
Affiliation:	South African Council for Natural Scientific Professions
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Fields of Expertise:	Environmental Science
Registration:	Certificated Natural Scientist Member

PROFESSIONAL EXPERIENCE

Megan has been involved in conservation for 17 years and holds a BSc in Environmental Management. She has nine years experience in the field of bird interactions with electrical infrastructure. In various roles (including Programme Manager) with the Endangered Wildlife Trust's Wildlife & Energy Programme and the Programme's primary project (Eskom-EWT Strategic Partnership) from 2006 to 2013, Megan was responsible for assisting the energy industry and the national utility in minimising the negative impacts (associated with electrical infrastructure) on wildlife through the provision of strategic guidance, risk and impact assessments, training and research. Megan also works outside the electricity industry and had done a range of bird impact assessment studies associated with various industrial developments.

Megan is a co-author of various papers related to bird and power line interactions as well as the *BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* and the *Avian Wind Farm Sensitivity Map for South Africa* and played an instrumental role in facilitating the endorsement of these two products by the South African Wind Energy Association (SAWEA), IAIAsa (International Association for Impact Assessment South Africa) and Eskom. In 2011/2012, Megan chaired the Birds and Wind Energy Specialist Group in South Africa.

INDEMNITY

* This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
* This report is based on a desktop investigation using the available information and data related to the site to be affected and a one day site visit to the study area on 22 August 2015. No long term investigation or monitoring has been conducted.
* The Precautionary Principle has been applied throughout this investigation.
* The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study.
* Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
* The specialist investigator reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
* Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
* This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
* Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.

27 August 2015

EXECUTIVE SUMMARY

Eskom proposes to construct an 88kV power line, extending from the existing SAR Kameel-SAR Kleinfontein 88kV power line to the Tweedracht substation located in the City of Tshwane Metropolitan Municipality area, near Bronkhorstspruit. Feathers Environmental Services was appointed to compile a specialist avifaunal assessment to for the site earmarked for the proposed power line development.

The study area is located within the Grassland Biome and is comprised entirely of the Rand Highveld Grassland vegetation type. Investigation of the immediate study area revealed the presence of dense indigenous woodland, residential properties (both well-established suburban housing and derelict buildings that are now occupied by vagrants), stands of Eucalyptus trees and small industrial properties. The most sensitive of the micro habitats within the study area is the woodland vegetation which provides foraging and roosting habitat for the large diversity of passerine species recorded in the area.

A fairly wide diversity of species (over 250 species) could be found in the broader area within which this site falls based on existing data sources. Although 16 Red List species have been recorded in the broader study area, most of the site is already relatively highly impacted upon by human activities and the likelihood of these species utilizing the site is considered to be low for most species. This is particularly true of the Red List species, of which only a handful are likely to frequent the site itself. Current South African Bird Atlas Project data is far more representative of the species likely to occur within the study area.

In general terms, the impacts that could be associated with a project of this nature are: collision of birds on certain sections of the lines, particularly in the open grassland-type habitat and wetland areas; electrocution of large birds perched on the poles; Destruction of habitat, and disturbance of birds are both likely to be of relatively low significance in this study area, as a result of relatively high existing levels of habitat degradation and disturbance.

Taking the above information into account, given the presence of existing habitat degradation and disturbance, it is anticipated that the proposed Tweedracht 88kV power line development can proceed with acceptable levels of impact on the resident avifauna. From an avifaunal perspective, **Route Alternative 3** is considered to have least impact due to its orientation alongside the road and railway networks in the study area. Collision poses the biggest potential risk to avifauna, based on the micro habitat available in the study area. Small sections of power line marking will be required to mitigate for the collision impact should Alternatives 1 or 2 be selected. Electrocutions can be successfully mitigated by ensuring that a bird-friendly monopole structure is used.

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1. INTRODUCTION

1.1 BACKGROUND

In order to provide a high quality supply of electricity to meet the ever increasing needs of its end users, to support annual load growth and improve the inadequate operational flexibility (back feeding) of the existing network, Eskom proposes to construct a 88kV power line (approximately five kilometres in length), extending from the existing SAR Kameel-SAR Kleinfontein 88kV power line to the Tweedracht substation as well as the installation of 2 x 132kV isolators on 5,5m 4-pole supports (located at point A – FIGURE 1). The project is located in Gauteng in the City of Tshwane Metropolitan Municipality area, near Bronkhorstspruit (FIGURE 1). Three power line route alternatives have been proposed.

The National Environmental Management Act (NEMBA) (Act 107 of 1998) requires that environmental assessments be conducted for any development which could have a significant effect on the environment, with the objective to identify, predict and evaluate the actual and potential impacts of these activities on ecological systems; identify alternatives; and provide recommendations for mitigation to minimize the negative impacts. In order to meet these requirements, Eskom Distribution has appointed Nsovo Environmental Consulting as independent environmental assessment practitioners to manage the Basic Assessment process for the proposed development. Feathers Environmental Services was subsequently appointed to compile a specialist avifaunal assessment report (based on a desktop review and a one-day site visit, conducted on 22 August 2015) which uses a set methodology and various data sets (discussed elsewhere) to determine which avian species regularly occur within the study area, the availability of bird micro habitats (i.e. avifaunal sensitive areas) and the possible impacts of the proposed development. In general terms, the impacts that could be associated with a project of this nature include: The collision of birds with the overhead cables; electrocution; destruction of habitat; and disturbance of birds.

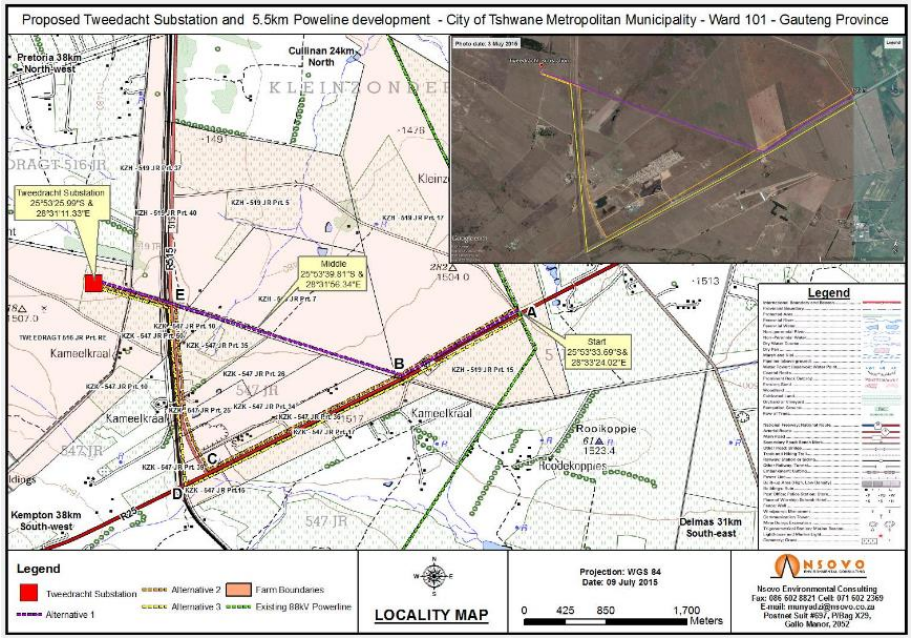

FIGURE 1: Geographical location of the proposed Tweedracht 88kV power line project.

1.2 RELEVANT LEGISLATION

The following pieces of legislation are applicable to the proposed activities:

1.3.1 The Convention on Biological Diversity

The Convention on Biological Diversity is an international convention (to which South Africa is a signatory) and represents a commitment to sustainable development. The Convention has three main objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources (http://www.cbd.int/convention/guide/). Although the convention has not developed specific recommendations or guidelines pertaining to birds and energy infrastructure interactions and impacts, it does make provision (in a general policy guideline) for keeping and restoring biodiversity. In addition to this the CBD is an ardent supporter of thorough assessment procedures (Strategic Environmental Assessments (SEA) and Environmental Impact Assessments (EIA)) and requires that Parties apply these processes when planning activities that will have a biodiversity impact. An important principle encompassed by the CBD is the precautionary principle which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used a reason for delaying management of these risks. The burden of proof that the impact will *not* occur lies with the proponent of the activity posing the threat. In addition, the Aichi Biodiversity Targets (CBD 2011) address several priority issues i.e. the loss of biodiversity and its causes; reducing direct pressure on biodiversity; safeguarding ecosystems, species and genetic diversity and participatory planning to enhance implementation of biodiversity conservation. Each of these is relevant in the case of energy infrastructure and bird conservation through all project phases from planning to the implementation of mitigation measures for existing developments.

1.2.2 The Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is the most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impacts associated with man-made infrastructure. CMS requires that Parties (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species (Art III, par. 4b and 4c). At CMS/CoP7 (2002) Res. 7.2 on Impact Assessment and Migratory Species was accepted, requesting Parties to apply appropriate SEA and EIA procedures for all proposed developments, including power lines. An agreement developed in the framework of CMS, in force since November 1999, brings the 119 Range States of the Africa Eurasian Waterbird Agreement (AEWA) region together in a common policy to protect migratory waterbirds that use the flyway from the Arctic to southern Africa.

1.2.3 The Agreement on the Conservation of African-Eurasian Migratory Water Birds

The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguin. The core activities carried out under AEWA are described in its Action Plan, which is legally binding for all countries that have joined the Agreement. The AEWA Action Plan details the various measures to be undertaken by Contracting Parties (South Africa included) to guarantee the conservation of migratory waterbirds within their national boundaries. These include species and habitat protection and the management of human activities as well as legal and emergency measures.

1.2.4 The National Environmental Management: Biodiversity Act

The National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) regulations on Threatened and Protected Species (TOPS) provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities. The national Act and several sets of provincial conservation legislation provide for among other things, the management and conservation of South Africa's biodiversity; protection of species and ecosystems that necessitate national protection and the sustainable use of indigenous biological resources.

1.3 TERMS OF REFERENCE

The avifaunal specialist has conducted this assessment according to the following generic terms of reference:

* Describe the current state of avifauna in the study area, outlining important characteristics which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
* Identify Red List species potentially affected by the proposed by the proposed power line.
* Identify potential impacts (positive and negative, including cumulative impacts (if relevant) of the proposed development on avifauna during construction and operation.
* Provide a statement regarding the potential significance of the identified issues based on the evaluation of the impacts associated with the proposed development.
* Identify mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks.
* Identify information gaps, limitations and additional information required.
* Ranking and identification of most and least suitable alternatives for the proposed project.

1.4 APPROACH

The following methodology was employed to compile this avifaunal assessment report:

* Various avifaunal data sets (listed below) were collected and examined to determine the location and abundance of sensitive Red List (as well as non-Red List) species that may be vulnerable to the impacts associated with the proposed activities.
* Avifaunal sensitive areas within the study area, where the above impacts are likely to occur, were identified using various GIS (Geographic Information System) layers, Google Earth imagery and personal observations made during the site visit (FIGURES 2 and 3).
* The impacts of the proposed activities on the avifaunal community were predicted on the basis of experience in gathering and analysing data on avian impacts with various forms of developments in southern Africa and supplemented with first hand data.
* Recommendations are made for the management and mitigation of significant impacts.

1.5 DATA SOURCES USED

The following data sources and reports were used in varying levels of detail for this study:

» The Southern African Bird Atlas Project 1 (Harrison *et al*, 1997) - Quarter Degree Squares 2528DC.
» The Southern African Bird Atlas Project 2 (http://sabap2.adu.org.za/v1/index.php) - Pentad 2550_2830.
» The Important Bird Areas report (IBA - Barnes 1998) was consulted to determine the location of the nearest IBA's and their importance for this study.
» The Co-ordinated Avifaunal Roadcount project (CAR – Young *et al*, 2003) data was consulted to obtain relevant data on large terrestrial bird report rates in the area.
» The Co-ordinated Waterbird Count (CWAC – Taylor *et al*, 1999) data was consulted determine if large concentrations of water birds, associated with South African wetlands, may occur within the study area.
» The conservation status of all bird species occurring in the aforementioned degree squares was then determined with the use of The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor, 2014), and the IUCN 2013 Red List.
» The latest vegetation classification of South Africa (Mucina & Rutherford, 2006) was consulted in order to determine which vegetation types occur on site.
» Satellite Imagery of the area was studied using Google Earth ©2015.
» KMZ. shapefiles detailing the location of the proposed study area were obtained from Nsovo Environmental Consulting.

FIGURE 2: Track log (red line) of the site visit conducted on 22 August 2015

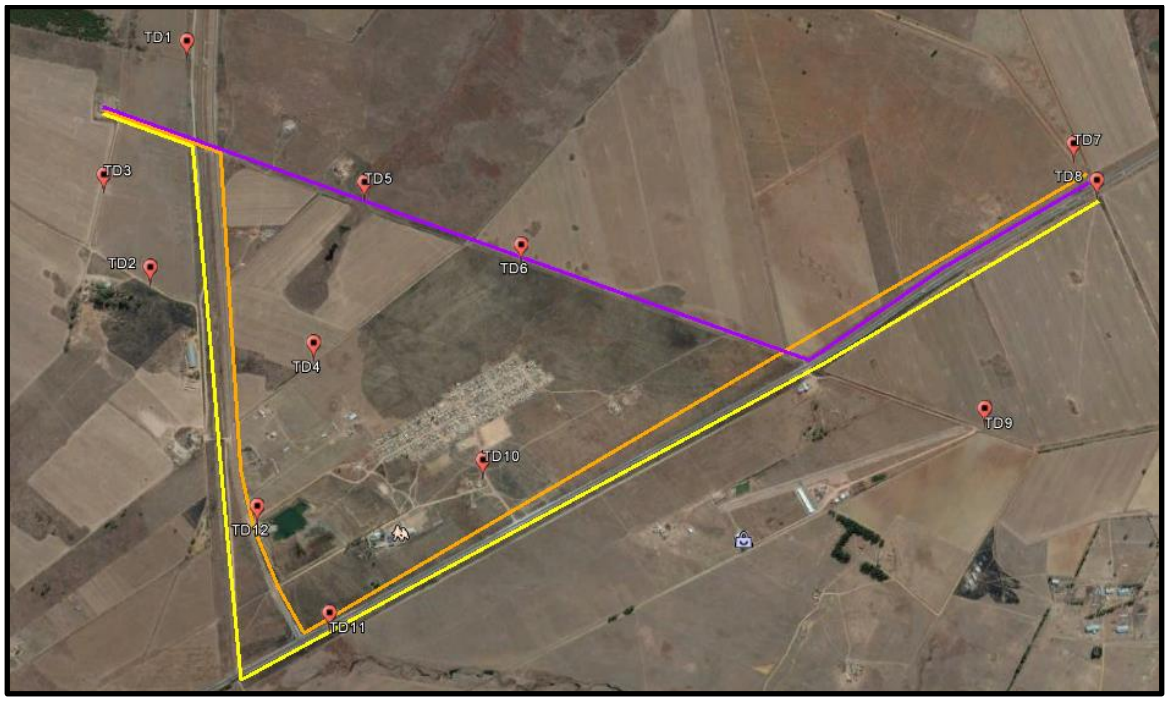

FIGURE 3: Survey points (red markers) within the study area

1.6 LIMITATIONS & ASSUMPTIONS

The author made the assumption that the sources of information used are reliable. However, it must be noted that there are limiting factors and these may potentially detract from the accuracy of the predicted results.

This assessment relies heavily upon secondary data sources with regards to bird abundances such as the SABAP1 and SABAP2 (Harrison *et al*, 1997, www.sabap2.adu.org.za). Any inaccuracies in these sources of information could limit this study. In particular, the SABAP1 data is more than two decades old, but this comprehensive dataset provides a valuable baseline against which any changes in species presence; abundance and distribution can be monitored (Harrison *et al*, 1997). However, primary information on bird habitat was collected during the site visit and is used directly in determining which species are likely to occur where on site.

The site visit was conducted in late winter, over which time various species may not have been present in the study area and breeding activities/attempts could not be identified.

Predictions in this study are based on experience of these and similar species in different parts of South Africa, through the authors' experience working in the avifaunal specialist field since 2006. However bird behaviour can't be reduced to formulas that will hold true under all circumstances. It must also be noted that, it is often not possible to entirely eliminate the risk of the disturbance and displacement impacts associated with the activities proposed. Studies such as this attempt to minimise the risk as far as possible, and although the impacts will be unavoidable, they are likely to be temporary.

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The proposed Tweedracht 88kV power line development is located on the Kleinzonderhout 519JR, Tweedracht 516JR, Kameel Zyn Kraal 519JR and 547JR farm portions in the Gauteng Province, approximately 20kms southwest of Bronkhorstspruit within the jurisdiction of the City of Tshwane Metropolitan Municipality.

2.1 VEGETATION

Vegetation is one of the primary factors determining bird species distribution and abundance in an area. The following description of the vegetation on the site focuses on the vegetation structure and not species composition since it is widely accepted within ornithological circles that vegetation structure is more important in determining which bird species will occur there. The classification of vegetation types is from Mucina & Rutherford (2006).

The study area is located within the Grassland Biome and is comprised entirely of the Rand Highveld Grassland vegetation type (FIGURE 4). The vegetation type occurs on a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. There is a high diversity of herbs. Rocky hills and ridges carry sparse (savannoid) woodlands accompanied by a rich suite of shrubs. Poorly conserved, only small patches (1%) are protected. Almost half has been transformed mostly by cultivation,

plantations, urbanisation or dam-building. Of South Africa's 841 bird species, 350 occur in the Grassland Biome. This includes 29 species of conservation concern (i.e. declining in numbers), 10 endemics, and as many as 40 specialist species that are exclusively dependent on grassland habitat. Threatened grassland bird species range from the smaller passerine species such as Yellow-breasted Pipit *Anthus chloris*, Rudd's Lark *Heteromirafra ruddi* and Botha's Lark *Spizocorys fringillaris*, to the larger charismatic species such as Secretarybird *Sagittarius serpentarius*, Denham's Bustard *Neotis denhami*, African Grass-Owl *Tyto capensis* and Southern Bald Ibis *Geronticus calvus*.

Other vegetation types that occur within a 2km radius of the study area include Marikana Thornveld and Andesite Mountain Bushveld. Marikana Thornveld occurs on plains from Rustenburg in the west, through Marikana and Brits to Pretoria in the east. It is comprised of open *Acacia karroo* woodland, occurring in valleys and slightly undulating plains, and some lowland hills. Shrubs are denser along drainage lines and rocky outcrops or in other habitat protected from fire (Mucina & Rutherford 2006). Nearly half (48%) of this vegetation type has undergone considerable transformation mainly as a result of cultivation, urbanization and industrialization. Alien invasive plants occur in high densities, especially along the drainage lines. The most pristine examples of Marikana Thornveld can be found in the Magaliesberg Nature Area and in other reserves, i.e. the Onderstepoort Nature Reserve.

Andesite Mountain Bushveld occurs across Gauteng, North-West, Mpumalanga and Free State Provinces. Several separate occurrences have been recorded, one of which is located to the west of the study area i.e. the Bronberg Ridge in eastern Pretoria extending to Welbekend (FIGURE 4). Similarly to the Marikana Thornveld, this vegetation type has been transformed as a result of cultivation and urbanization.

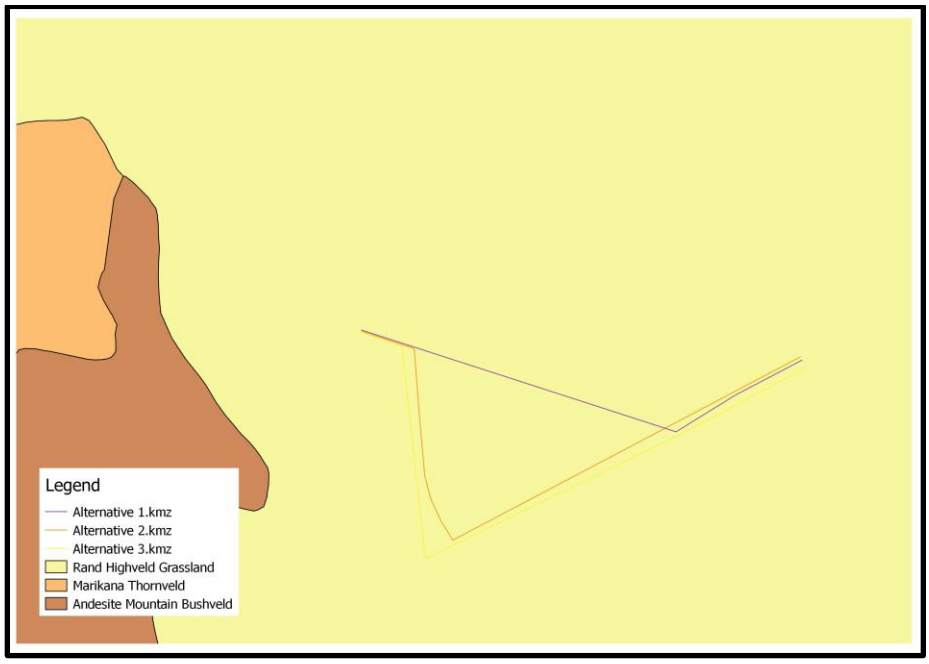

FIGURE 4: Vegetation map (Mucina & Rutherford 2006) indicating the location of the three power line route alternatives in relation to the surrounding vegetation types.

2.2 BIRD MICRO HABITATS

In addition to the description of vegetation, it is important to understand the habitats available to birds at a smaller spatial scale, i.e. micro habitats. Micro habitats are shaped by factors other than vegetation, such as topography, land use (CSIR, 2009), food sources and anthropogenic factors are critically important in mapping the site in terms of avifaunal sensitivity and ultimately informing the mitigation requirements. Investigation of the immediate study area revealed the presence of degraded grassland, cultivated lands, old agricultural lands, wetlands systems, dams, drainage lines, residential properties (farm houses and Kameelkraal township) and stands of Eucalyptus trees (FIGURE 5).

Ordinarily, the most sensitive of the micro habitats within the study area would be the open, grassland-type habitat associated with old agricultural lands as well as the wetland systems, dams and drainage lines. Although the small accumulations of water (dams) are capable of attracting a variety of waterbird species i.e. geese, ducks, herons, ibis and egrets, it must be noted that these and the other water sources mentioned above are likely to be degraded to a fairy large extent and subject to significant existing disturbance. Therefore these features are less likely to attract species of conservation concern. Although stands of Eucalyptus are strictly speaking invader species, these stands have become important refuges for certain species of raptors. Black Sparrowhawk *Accipiter melanoleucus*, Little Sparrowhawk *Accipiter minullus* and Ovambo Sparrowhawk *Accipiter ovampensis* in particular are species that use these trees for roosting and breeding purposes. Large Eucalyptus trees are also used by the migratory Lesser Kestrel *Falco naumanni* for roosting purposes. These species have all been previously recorded in the broader study area as part of the South African Bird Atlas Projects.

TABLE 1 below shows the micro habitats that each Red List bird species (recorded in SABAP1 & SABAP2 data) typically frequents in the study area. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in TABLE 2 represents each species' most preferred or normal habitats. These locations are where most of the birds of that species will spend most of their time – so logically that is where impacts on those species will be most significant. TABLE 1 makes use of the authors' extensive experience gained through personal observations of the relevant bird species.

FIGURE 5: Examples of the micro habitats available to avifauna in the study area.

2.3 RELEVANT BIRD POPULATIONS

2.3.1 Southern African Bird Atlas Project 1

This data was collected over an 11 year period and although it is now more than two decades old, this comprehensive dataset provides a valuable baseline against which any changes in species presence; abundance and distribution can be monitored. This data was collected on the basis of quarter degree squares (QDS), which is also a relatively large spatial scale. The species recorded in the relevant QDS could have been recorded anywhere within this square and not necessarily on the exact site of the proposed developments (Harrison et al, 1997*)*. It does however provide a good indication of what could be found in the study area. A total of 255 species have been recorded within the 2528DC quarter degree square, 15 of which are Red List species.

2.3.2 Southern African Bird Atlas Project 2

SABAP2 is the follow up project to SABAP1 and was started in 2007. Similarly to SABAP 1, this project aims to map the distribution and relative abundance of birds in South Africa, Lesotho and Swaziland. SABAP 2 data for the pentads (which are roughly 8km x 8km squares, smaller than the QDS's used in SABAP 1) in the study area was also examined. The site falls within the 2550_2830 pentad with 161 species having been recorded within the pentad to date. Three Red List species (Pallid Harrier *Circus macrourus*, Abdim's Stork *Ciconia abdimii* and Secretarybird) have been recorded in the study area to date, according to SABAP 2.

A full list of approximately 277 bird species, recorded by the abovementioned atlas projects, is shown in APPENDIX 2. TABLE 1 details the Red List bird species (16) amongst these. APPENDIX 2 and TABLE 1 should be viewed as the species that could potentially occur on the site, provided that conditions and habitat are favourable. In addition to the Red List species, the White Stork *Ciconia ciconia* has also been included, as they are afforded international protection under the Bonn Convention on Migratory Species. Many species in TABLE 1 are large birds (i.e. the Secretarybird, storks and korhaans) and could potentially be impacted on directly by the proposed power line, through collision.

It is important to note that due to the already disturbed nature of the study area, the likelihood of the species in TABLE 1 frequenting the site is considered to be low. As a result, the impacts of the proposed project could be more important for the more common bird species, which are generally more tolerant of human disturbance and hence more likely to regularly make use of this site. These include waterfowl such as ibises, geese, ducks, herons and many others. Although this impact assessment focuses on Red List species, the impact on non-Red List species is also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red List species will also protect non-Red List species in the study area. The non-Red List species that have been considered for this assessment include large eagles, buzzards, kestrels, herons, korhaans, geese, ibis and various water bird species. They are included as their physical size and behaviour make them likely candidates for interaction with overhead power lines.

Of the species that could possibly occur on the site, the most important are: White Stork, Abdim's Stork, Secretarybird, White-bellied Korhaan *Eupodotis senegalensis* and Red-footed Falcon *Falco vespertinus*.

Red List species were not observed during the site visit. Other non-Red List species that were observed during the site visit, include Black-shouldered Kite *Elanus caeruleus*, Helmeted Guineafowl *Numida meleagris*, Crowned Lapwing *Vanellus coronatus*, Blacksmith Lapwing *Vanellus armatus* Red-knobbed Coot *Fulica cristata*, Cape Longclaw *Macronyx capensis,* Grey Go-away-bird *Corythaixoides concolor*, Laughing Dove *Streptopelia senegalensis,* Cape Turtle-Dove *Streptopelia capicola* and Long-tailed Widowbird *Euplectes progne*.

2.3.3 Important Bird Areas (IBA's)

Some sites are exceptionally important for maintaining the taxa dependent upon the habitats and ecosystems in which they occur. Vigorous protection of the most critical sites is one important approach to conservation. Many species may be effectively conserved by this means. Patterns of bird distribution are such that, in most cases, it is possible to select sites that support many species. These sites, carefully identified on the basis of the bird numbers and species complements they hold, are termed Important Bird Areas (IBAs). IBAs are selected such that, taken together, they form a network throughout the species' biogeographic distributions. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network. There are no IBAs within the confines of the study area. This data will therefore not be assessed further.

2.3.4 Coordinated Avifaunal Road-count (CAR) data

Cranes, bustards, storks and other large birds that spend most of their time on the ground, need wide, open spaces and are certainly not restricted to protected areas. Agricultural habitats are used extensively for feeding, roosting and breeding, often because no natural, pristine habitats are available, and sometimes because the agricultural habitats are especially attractive to birds. The Co-ordinated Avifaunal Roadcounts (CAR) project monitors the populations of 21 species of large 'terrestrial' birds in agricultural habitats (Young *et.al.* 2003). Although CAR road counts do not give an absolute count of all the individuals in a population, they do provide a measure of relative abundance in a particular area. There are no CAR routes within the confines of the study area. This data will therefore not be assessed further.

2.3.4 Coordinated Waterbird count (CWAC) data

A CWAC site is any body of water, other than the oceans, which supports a significant number (set at approximately 500 individual waterbirds, irrespective of the number of species) of birds which use the site for feeding, and/or breeding and roosting (Harrison and Harebottle, 2002). This definition includes natural pans, vleis, marshes, lakes, rivers, as well as a range of manmade impoundments (i.e. sewage works). The presence of a CWAC site within the study area is an indication of a large number of bird species occurring there and the overall sensitivity of the area. Two CWAC sites i.e. Elandsvlei and the Bronkhorstspruit Dam occur approximately 15km to the southwest and east of the study area respectively. The proposed power line development will not impact on the bird species utilising these sites. This data will therefore not be assessed further.

TABLE 1: Red Data species that have been recorded during both the SABAP 1 and 2 atlas projects.

SPECIES	SCIENTIFIC NAME	Global Status 2013	Regional Status 2014	PREFERRED HABITAT
Wattled Crane	*Bugeranus carunculatus*	VU	CR	Wetlands
African Marsh-Harrier	*Circus ranivorus*	LC	EN	Wetlands and adjacent moist grasslands
Verreaux's Eagle	*Aquila verreauxii*	LC	VU	Mountainous rocky areas
African Grass-Owl	*Tyto capensis*	LC	VU	Tall rank grassland
Caspian Tern	*Sterna caspia*	LC	VU	Dams and pans
White-bellied Korhaan	*Eupodotis senegalensis*	LC	VU	Tall grassland and open woodland
Greater Painted-snipe	*Rostratula benghalensis*	LC	VU	Dams and wetlands
Secretarybird	*Sagittarius serpentarius*	VU	VU	Grassland patches, open woodland
Black Stork	*Ciconia nigra*	LC	VU	Mountainous areas, wetlands
Abdim's Stork	*Ciconia abdimii*	LC	NT	Grassland, open woodland and cultivated lands
Pallid Harrier	*Circus macrourus*	LC	NT	Grassland associated with open pans/floodplains and croplands
Blue Crane	*Anthropoides paradiseus*	VU	NT	Grassland patches, arable land, dams, wetlands
Greater Flamingo	*Phoenicopterus ruber*	LC	NT	Open shallow wetlands, salt pans, mudflats, dams
Lesser Flamingo	*Phoenicopterus minor*	LC	NT	Open shallow wetlands, salt pans, mudflats, dams
Red-footed Falcon	*Falco vespertinus*	NT	NT	Stands of *Eucalyptus sp.*
Maccoa Duck	*Oxyura maccoa*	NT	NT	Dams and lakes
White Stork	*Ciconia ciconia*	BONN		Grassland, open woodland, cultivated lands, dams and wetlands

CR = Critically Endangered EN = Endangered; VU = Vulnerable; NT = Near-threatened; LC = Least Concern; Bonn = Protected Internationally under the Bonn Convention on Migratory Species.

3. GENERAL DESCRIPTION OF THE POTENTIAL IMPACTS

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 electrocution of birds (and other animals) and birds colliding with power lines (Ledger & Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs & Ledger 1986a; Hobbs & Ledger 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn 1996; Kruger & Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000). Other impacts include disturbance and habitat destruction during construction and maintenance (operational) activities.

3.1 ELECTROCUTIONS

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. Electrocution is possible on the proposed 88kV power line; therefore electrocution impact is rated to be of medium significance for the proposed power line but can be reduced to a low significance if the proposed mitigations are implemented (APPENDIX 2).

Electrocutions on the 4-pole support structure housing the 2 x 132kV isolators and within the existing Tweedracht substation could potentially have a negative impact on a variety of bird species, which may be attracted to the electrical infrastructure as it may provide a suitable substrate on which to nest.

3.2 COLLISIONS

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 maneuverability, 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 Red Data species vulnerable to power line collisions are generally long living, 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. These species have not evolved to cope with high adult mortality, with the results 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, 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. Collision of certain large flying bird species such as korhaans, ibises, egrets and herons with the proposed power line, is possible, particularly along sections of route Alternative 1 and to a lesser extent route Alternative 2 and is therefore rated to be of medium significance. The significance of the rating can be reduced substantially by constructing the power line along route Alternative 3.

3.3 HABITAT DESTRUCTION

During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the leveling 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 to the servitude, through the modification of habitat. The new line will undoubtedly modify a certain amount of habitat. However at a landscape level, is it unlikely to have a major impact on Red List species recorded in the area.

3.4 DISTURBANCE

Similarly, the above mentioned construction 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. Early in the breeding season the risk of desertion by the adults if disturbed are bigger than later, when the young bird is on the nest and being fed by the adults. At the end of the breeding season the young bird may be tempted to jump out of the nest and fly prematurely if disturbed, resulting in injury or even death. If nests are identified during an avifaunal walk down of the power line prior to construction, every attempt will have to be made to restrict the disturbance of these birds to a minimum during construction. In general the disturbance that will be caused by the construction activities will be temporary and this, coupled with the fact that there is currently considerable disturbance in the area, the construction of the power line should not lead to a species being permanently displaced from the area.

3.5 IMPACT ON THE QUALITY OF SUPPLY

Although this does not form part of the brief, it is important to mention that birds could have an impact on the power lines. Through the mechanisms described below, birds are able to cause electrical faults on power lines. The more faults that occur on a line, the poorer the quality of electrical supply to the end customers.

In the case of a bird streamer induced fault, the fault is caused by the bird releasing a “streamer” of faeces which can constitute an air gap intrusion between the conductor and the earthed structure. The fault appears to flash across the air gap and *does not* follow an insulator creepage path as observed on pollution faults (See Taylor *et al* 1999 for an exhaustive analysis of the propagation characteristics of the bird streamer mechanism).

Bird pollution is a form of pre-deposit pollution. A flashover occurs when an insulator string gets coated with pollutant, which compromises the insulation properties of the string. When the pollutant is wetted, the coating becomes conductive, insulation breakdown occurs and a flashover results.

Both bird streamers and bird pollution occur as a result of birds perching on pylons or towers, often directly above live conductors. If the new power line is constructed using the steel monopole tower structure, the anti-perching mitigation built into this tower design will ensure that the perching space above the conductor strings is eliminated. Therefore the impact on the quality of supply through streamer induced faulting is not anticipated to be significant.

3.6 NESTING

Bird nests may also cause faults through nest material protruding and constituting an air gap intrusion. Crows in particular often incorporate wire and other conductive material into their nests. When nests cause flashovers, the nesting material may catch fire. This in turn can lead to equipment damage or a general veld fire. Apart from the cost of replacing damaged equipment, the resultant veld fire can lead to claims for damages from landowners. Power line towers in turn provide *nesting substrate* for certain bird species, some of which might benefit through the increased availability of nesting substrates, particularly in largely treeless areas. Again, the use of the steel monopole tower design will in all likelihood mitigate for the nesting impact as it is unlikely to provide a suitable nesting substrate for the more sensitive raptor species in the study area.

4. SENSITIVITY ANALYSIS

In general the site has been determined to have a **low** sensitivity in terms of avifauna, based on the level of existing disturbance and habitat degradation present within the study area.

4.1 ROUTE SELECTION

One of the main objectives of this study is to determine a preferred route alignment for the proposed Tweedracht 88kV power line extending from the existing. Generally, in order to arrive at a preferred route alignment, the following factors are taken into account:

- Red Data diversity in the study area.
- Red Data density in the study area.
- The distance of each route alignment in each quarter degree square/pentad that comprises the study area.

In this instance, this method could not be used as all three of the proposed route alternatives occur within the same quarter degree square/pentad, are located within close proximity to one another, comprised of similar vegetation and micro habitat and are subjected to similar land use practices. With this in mind, a comparison of each route alignment has been drawn up using observations (of available micro habitat, land use types and the location of the proposed alignments in relation to existing infrastructure) as a means of determining the route alternative that would have the least impact on the avifauna occurring there. Since all three route alternative traverse very similar vegetation and micro habitat the only factors that can be used to determine preference, is the location of the proposed alignments in relation to existing infrastructure (roads, railways and existing power lines) since these would be considered risk reducing factors due to the disturbance associated with each. The

preference rating that has been assigned to each route alternative is based on a subjective rating of 1 to 5 (1 being the least preferred and 5 being the most highly preferred option), based on the specialists experience with regards to bird and power line interactions (TABLE 2).

TABLE 2: Preference rating for the three 88kV power line alternatives.

ROUTE ALTERNATIVE	PREFERENCE RATING
Alternative 1	1
Alternative 2	3
Alternative 3	4

As can be seen from the discussions and table above, **Route Alternative 3 is preferred.** The anticipated impacts will be undoubtedly be less significant because key avifaunal habitat (i.e. open grassland-type vegetation and water features) will be avoided thereby minimising the collision impact.

4.2 ASSESSMENT TABLES

The assessment of each impact is rated and presented in tabular format (TABLES 3 to 6) as shown below for both "pre" and "post" mitigation according to the criteria shown in APPENDIX 1. Mitigation measures to minimize the potential impacts are also provided.

TABLE 3. Assessment of electrocution of birds on the proposed power line and in the substation.

Electrocution – likely to affect large raptors, and species such as storks, and herons.		
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Spatial extent	Medium, birds from surrounding area affected	Medium, birds from surrounding area affected
Duration	High – as long as the line is operational	Low
Intensity	Medium	Low
Irreplaceable loss of resources?	High – yes, birds are killed	Low
Reversibility	Low – birds are killed	High
Consequence	High	Low
Probability	Medium	Low
Significance	**Medium**	**Low**
Can impacts be mitigated?	Yes	
Mitigation: An Eskom approved bird friendly pole design must be used (APPENDIX 2). The Distribution Technical Bulletin must be used in this regard. In addition, if a monopole structure is used, as this report has assumed, a Bird Perch must be installed on top of all poles, to provide safe perching substrate for birds well above the dangerous hardware. With regards to the 4-pole support structure housing the 2 x 132kV isolators and within the substation yard, the hardware is too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if ongoing impacts are recorded once operational, site specific mitigation be applied reactively. This is an acceptable approach because Red Listed bird species are unlikely to frequent the substation and be electrocuted.		
Cumulative impacts: The cumulative impacts of power lines on birds through electrocution are significant nationally. This particular area already has several existing distribution power lines. No effort should be spared to ensure that the new power line is built bird friendly and results in no additional impact on birds in the area.		
Residual Impacts: None – if the power line is decommissioned the impact will cease.		

TABLE 4. Assessment of collision of birds with the proposed power line.

Collision of birds **– likely to affect water birds, korhaans, storks and possible Secretarybird.**		
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Spatial extent	Medium, birds from surrounding area affected	Medium, birds from surrounding area affected
Duration	High – as long as the lines are operational	Low
Intensity	Medium	Low
Irreplaceable loss of resources?	High – birds killed	Low
Reversibility	Low – birds killed	High
Consequence	Medium	Low
Probability	High	Low
Significance	**Medium**	**Low**
Can impacts be mitigated?	Yes	
Mitigation: The primary means of mitigating this impact is through the selection of the optimal route for the line through this area, explained in Section 4.1. In the event that route Alternative 3 (preferred alternative) is **not** selected there will be a need to install anti bird collision line marking devices on the power line (earth wire) on certain sections of line identified as posing a high collision risk to birds as per Eskom Distribution guidelines for this aspect. These sections of line have been broadly identified in this report. The above mitigation is extremely important as without it this impact will be of high significance.		
Cumulative impacts: The cumulative impacts of power lines on birds through collision are significant. This area already has several existing distribution power lines. No effort should be spared to ensure that the new power line is built bird friendly and results in no additional impact on birds in the area.		
Residual Impacts: None – if the power line is decommissioned the impact will cease.		

TABLE 5. Assessment of habitat destruction caused by the construction of the power line.

***Destruction of bird habitat* – likely to affect Red List species and grassland habitat specialists, such as Melodious Lark, White-bellied Korhaan and others.**		
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Spatial extent	Medium, birds from surrounding area affected	Medium, birds from surrounding area affected
Duration	Low	Low
Intensity	Low	Low
Irreplaceable loss of resources?	Medium	Low
Reversibility	Medium	High
Consequence	Low	Low
Probability	Medium	Low
Significance	**Low**	**Low**
Can impacts be mitigated?	Yes – partially, a certain amount of habitat alteration is unavoidable	
Mitigation: The primary means of mitigating this impact is through the selection of the optimal route for the line through this area, explained in Section 4.1. This will ensure that sensitive habitats (wetland and open grassland-type vegetation) are avoided as far as possible. In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible. This is particularly important in the wetland areas.		
Cumulative impacts: Although each power line probably affects a relatively small proportion of the landscape, there are already several existing power lines in this area, and additional lines will add further cumulative impact. It is important therefore to try to limit the effects of this new power line as much as possible, by applying the mitigations described above.		
Residual Impacts: Yes – a certain amount of habitat will remain altered even after the line is decommissioned		

TABLE 6. Assessment of disturbance caused by the construction of the proposed 88kV power line

***Disturbance of birds* – likely to affect breeding birds in particular.**		
	Without mitigation	**With mitigation**
Nature	Negative	Negative
Spatial extent	Medium, birds from surrounding area affected	Medium, birds from surrounding area affected
Duration	Low	Low
Intensity	Low	Low
Irreplaceable loss of resources?	Low	Low
Reversibility	High	High
Consequence	Low	Low
Probability	Low	Low
Significance	**Low**	**Low**
Can impacts be mitigated?	Yes	
Mitigation: It is unlikely that any species of conservation concern will be breeding within the study area and given the level of existing disturbance in the area, no additional mitigation measures are recommended.		
Cumulative impacts: Probably relatively low from disturbance specifically.		
Residual Impacts: None – if the power line is decommissioned the impact will cease.		

5. CONCLUSION & IMPACT STATEMENT

In conclusion, given the presence of existing habitat degradation and disturbance, it is anticipated that the proposed Tweedracht 88kV power line development can proceed with acceptable levels of impact on the resident avifauna. From an avifaunal perspective, **Route Alternative 3** is considered to have least impact due to its orientation alongside the road and railway networks in the study area. Collision poses the biggest potential risk to avifauna, based on the micro habitat available in the study area. Small sections of power line marking will be required to mitigate for the collision impact should Alternatives 1 or 2 be selected. Electrocutions can be successfully mitigated by ensuring that a bird-friendly monopole structure is used, as discussed elsewhere in the report.

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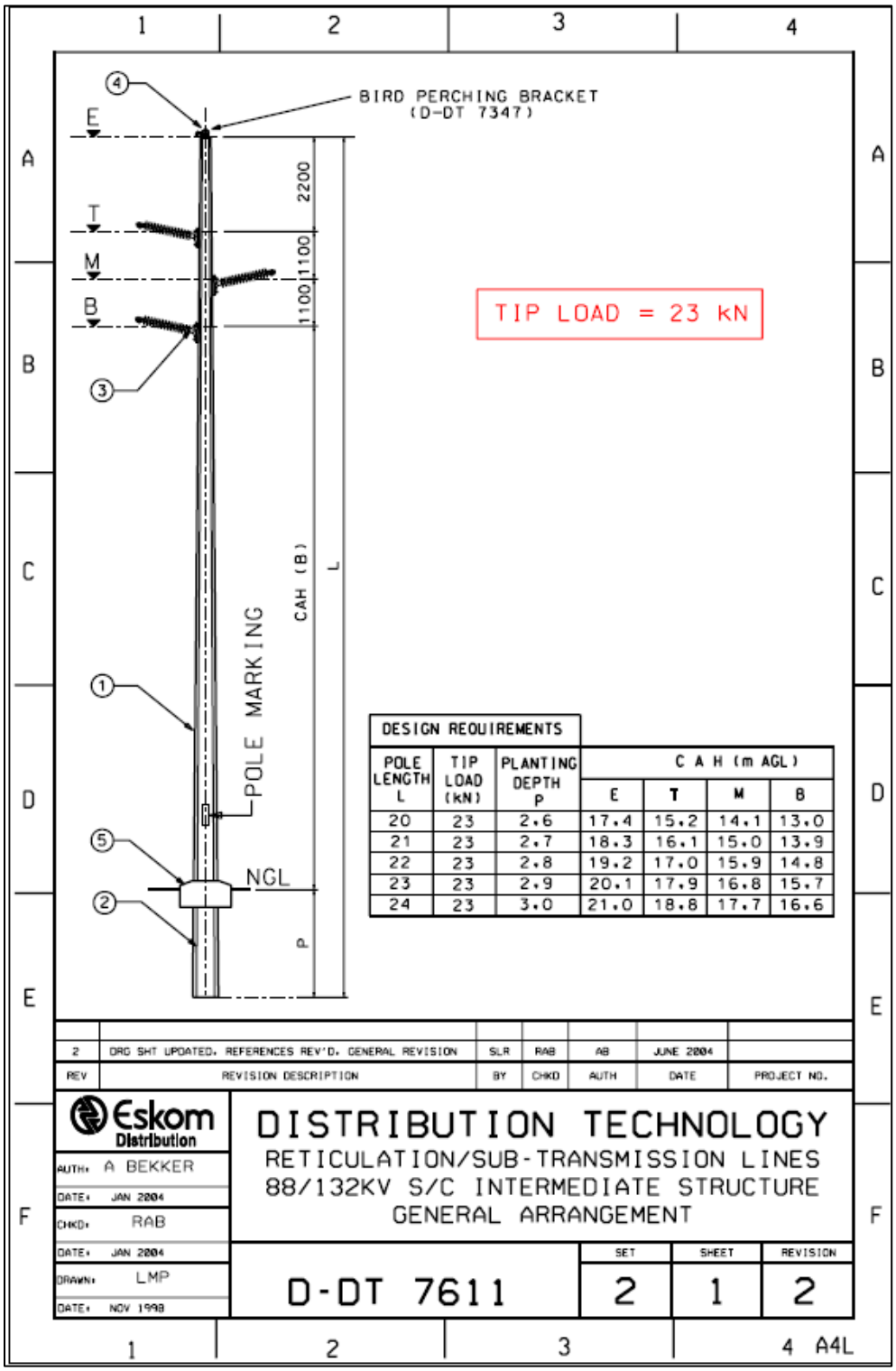
APPENDIX 1
METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

CRITERIA	RATING SCALES	NOTES
Nature	Positive	This is an evaluation of the overall impact of the construction, operation and management that the proposed power line would have on the affected environment (social, biophysical and economic)
	Negative	
	Neutral	
Spatial Extent	Low	Site-specific, affects only the development footprint
	Medium	Local (<2 km from site)
	High	Regional (within 30 km of site) to national
Duration	Very Low	Temporary (less than 1 year)
	Low	Short term (1-4 years, i.e. duration of construction phase)
	Medium	Medium term (5-10 years)
	High	Long term (impact will only cease after the operational life of the activity) to permanent
Intensity	Low	Negligible alteration of natural systems, patterns or processes
	Medium	Noticeable alteration of natural systems, patterns or processes
	High	Severe alteration of natural systems, patterns or processes
Irreplaceability of resource caused by impact	Low	No irreplaceable resources will be impacted (the affected resource is easy to replace/rehabilitate)
	Medium	Resources that will be impacted can be replaced, with effort
	High	Project will destroy unique resources that cannot be replaced
Reversibility of impacts	Low	Low reversibility to non-reversible
	Medium	Moderate reversibility of impacts
	High	High reversibility of impacts
Consequence (a combination of spatial extent, duration, intensity and irreplaceability of impact on resources)	Low	A combination of any of the following: Intensity, duration, extent and impact on irreplaceable resources are all rated low; Intensity is low and up to two of the other criteria are rated medium; or Intensity is medium and all three other criteria are rated low
	Medium	Intensity is medium and at least two of the other criteria are rated medium
	High	Intensity and impact on irreplaceable resources are rated high, with any combination of extent and duration; or Intensity is rated high, with all of the other criteria being rated medium or high

Probability (the likelihood of the impact occurring)	Low	It is highly unlikely or there is a less than 50%chance that the impact will occur
	Medium	It is between 50 and 70%cetain that the impact will occur
	High	It is more than 75% certain that the impact will occur or it is definite that the impact will occur.
Significance (all impacts including potential cumulative impacts)	Low	Low consequence and low probability Low consequence and medium probability Low consequence and high probability
	Medium	Medium consequence and low probability Medium consequence and medium probability Medium consequence and high probability High consequence and low probability
	High	High consequence and medium probability High consequence and high probability

APPENDIX 2

STEEL MONOPOLE STRUCTURE TYPE



DESIGN REQUIREMENTS						
POLE LENGTH L	TIP LOAD (kN)	PLANTING DEPTH P	C A H (m AGL)			
			E	T	M	B
20	23	2.6	17.4	15.2	14.1	13.0
21	23	2.7	18.3	16.1	15.0	13.9
22	23	2.8	19.2	17.0	15.9	14.8
23	23	2.9	20.1	17.9	16.8	15.7
24	23	3.0	21.0	18.8	17.7	16.6

REV	REVISION DESCRIPTION	BY	CHKD	AUTH	DATE	PROJECT NO.
2	DRG SHT UPDATED. REFERENCES REV'D. GENERAL REVISION	SLR	RAB	AB	JUNE 2004	

Eskom Distribution

AUTH: A BEKKER
DATE: JAN 2004
CHKD: RAB
DATE: JAN 2004
DRAWN: LMP
DATE: NOV 1998

DISTRIBUTION TECHNOLOGY
RETICULATION/SUB-TRANSMISSION LINES
88/132KV S/C INTERMEDIATE STRUCTURE
GENERAL ARRANGEMENT

	SET	SHEET	REVISION
D-DT 7611	2	1	2

A4L

APPENDIX 3

SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP 1 &2) FOR THE PROJECT SITE

SPECIES NAME	RED DATA (2014)	SCIENTIFIC NAME
Apalis, Bar-throated		*Apalis thoracica*
Avocet, Pied		*Recurvirostra avosetta*
Babbler, Arrow-marked		*Turdoides jardineii*
Barbet, Acacia Pied		*Tricholaema leucomelas*
Barbet, Black-collared		*Lybius torquatus*
Barbet, Crested		*Trachyphonus vaillantii*
Bee-eater, European		*Merops apiaster*
Bee-eater, Little		*Merops pusillus*
Bee-eater, White-fronted		*Merops bullockoides*
Bishop, Southern Red		*Euplectes orix*
Bishop, Yellow		*Euplectes capensis*
Bishop, Yellow-crowned		*Euplectes afer*
Bittern, Little		*Ixobrychus minutus*
Bokmakierie		*Telophorus zeylonus*
Boubou, Southern		*Laniarius ferrugineus*
Brubru		*Nilaus afer*
Bulbul, Dark-capped		*Pycnonotus tricolor*
Bunting, Cinnamon-breasted		*Emberiza tahapisi*
Bunting, Golden-breasted		*Emberiza flaviventris*
Bunting, Lark-like		*Emberiza impetuani*
Buzzard, Steppe		*Buteo vulpinus*
Canary, Black-throated		*Crithagra atrogularis*
Canary, Yellow-fronted		*Crithagra mozambicus*
Chat, Anteating		*Myrmecocichla formicivora*
Chat, Familiar		*Cercomela familiaris*
Cisticola, Cloud		*Cisticola textrix*
Cisticola, Desert		*Cisticola aridulus*
Cisticola, Lazy		*Cisticola aberrans*
Cisticola, Levaillant's		*Cisticola tinniens*
Cisticola, Rattling		*Cisticola chiniana*
Cisticola, Wailing		*Cisticola lais*
Cisticola, Wing-snapping		*Cisticola ayresii*
Cisticola, Zitting		*Cisticola juncidis*
Cliff-chat, Mocking		*Thamnolaea cinnamomeiventris*
Cliff-swallow, South African		*Hirundo spilodera*
Coot, Red-knobbed		*Fulica cristata*
Cormorant, Reed		*Phalacrocorax africanus*
Cormorant, White-breasted		*Phalacrocorax carbo*
Coucal, Burchell's		*Centropus burchellii*

Coucal, White-browed		*Centropus superciliosus*
Courser, Temminck's		*Cursorius temminckii*
Crake, African		*Crecopsis egregia*
Crake, Black		*Amaurornis flavirostris*
Crane, Blue	NT	*Anthropoides paradiseus*
Crane, Wattled	CR	*Bugeranus carunculatus*
Crow, Cape		*Corvus capensis*
Crow, Pied		*Corvus albus*
Cuckoo, Diderick		*Chrysococcyx caprius*
Cuckoo, Jacobin		*Clamator jacobinus*
Cuckoo, Red-chested		*Cuculus solitarius*
Darter, African		*Anhinga rufa*
Dove, Laughing		*Streptopelia senegalensis*
Dove, Namaqua		*Oena capensis*
Dove, Red-eyed		*Streptopelia semitorquata*
Dove, Rock		*Columba livia*
Drongo, Fork-tailed		*Dicrurus adsimilis*
Duck, African Black		*Anas sparsa*
Duck, Maccoa	NT	*Oxyura maccoa*
Duck, White-backed		*Thalassornis leuconotus*
Duck, White-faced		*Dendrocygna viduata*
Duck, Yellow-billed		*Anas undulata*
Eagle, Long-crested		*Lophaetus occipitalis*
Eagle, Verreaux's	VU	*Aquila verreauxii*
Eagle, Wahlberg's		*Aquila wahlbergi*
Eagle-owl, Spotted		*Bubo africanus*
Eagle-owl, Verreaux's		*Bubo lacteus*
Egret, Cattle		*Bubulcus ibis*
Egret, Great		*Egretta alba*
Egret, Little		*Egretta garzetta*
Egret, Yellow-billed		*Egretta intermedia*
Falcon, Amur		*Falco amurensis*
Falcon, Red-footed	NT	*Falco vespertinus*
Finch, Cut-throat		*Amadina fasciata*
Finch, Red-headed		*Amadina erythrocephala*
Finch, Scaly-feathered		*Sporopipes squamifrons*
Firefinch, African		*Lagonosticta rubricata*
Fiscal, Common		*Lanius collaris*
Fish-eagle, African		*Haliaeetus vocifer*
Flamingo, Greater	NT	*Phoenicopterus ruber*
Flamingo, Lesser	NT	*Phoenicopterus minor*
Flycatcher, Fiscal		*Sigelus silens*
Flycatcher, Southern Black		*Melaenornis pammelaina*

Flycatcher, Spotted		*Muscicapa striata*
Francolin, Coqui		*Peliperdix coqui*
Francolin, Orange River		*Scleroptila levaillantoides*
Go-away-bird, Grey		*Corythaixoides concolor*
Goose, Egyptian		*Alopochen aegyptiacus*
Goose, Spur-winged		*Plectropterus gambensis*
Goshawk, Gabar		*Melierax gabar*
Grassbird, Cape		*Sphenoeacus afer*
Grass-owl, African	VU	*Tyto capensis*
Grebe, Great Crested		*Podiceps cristatus*
Grebe, Little		*Tachybaptus ruficollis*
Greenshank, Common		*Tringa nebularia*
Guineafowl, Helmeted		*Numida meleagris*
Gull, Grey-headed		*Larus cirrocephalus*
Hamerkop		*Scopus umbretta*
Harrier, Pallid	NT	*Circus macrourus*
Harrier-Hawk, African		*Polyboroides typus*
Heron, Black		*Egretta ardesiaca*
Heron, Black-headed		*Ardea melanocephala*
Heron, Goliath		*Ardea goliath*
Heron, Green-backed		*Butorides striata*
Heron, Grey		*Ardea cinerea*
Heron, Purple		*Ardea purpurea*
Heron, Squacco		*Ardeola ralloides*
Hobby, Eurasian		*Falco subbuteo*
Honeyguide, Greater		*Indicator indicator*
Honeyguide, Lesser		*Indicator minor*
Hoopoe, African		*Upupa africana*
House-martin, Common		*Delichon urbicum*
Ibis, African Sacred		*Threskiornis aethiopicus*
Ibis, Glossy		*Plegadis falcinellus*
Ibis, Hadeda		*Bostrychia hagedash*
Jacana, African		*Actophilornis africanus*
Kestrel, Greater		*Falco rupicoloides*
Kestrel, Lesser		*Falco naumanni*
Kestrel, Rock		*Falco rupicolus*
Kingfisher, Brown-hooded		*Halcyon albiventris*
Kingfisher, Giant		*Megaceryle maximus*
Kingfisher, Malachite		*Alcedo cristata*
Kingfisher, Pied		*Ceryle rudis*
Kingfisher, Woodland		*Halcyon senegalensis*
Kite, Black		*Milvus migrans*
Kite, Black-shouldered		*Elanus caeruleus*

Kite, Yellow-billed		*Milvus aegyptius*
Korhaan, Blue		*Eupodotis caerulescens*
Korhaan, Northern Black		*Afrotis afraoides*
Korhaan, White-bellied	VU	*Eupodotis senegalensis*
Lapwing, African Wattled		*Vanellus senegallus*
Lapwing, Blacksmith		*Vanellus armatus*
Lapwing, Crowned		*Vanellus coronatus*
Lark, Agulhas Clapper		*Mirafra marjoriae*
Lark, Cape Clapper		*Mirafra apiata*
Lark, Eastern Clapper		*Mirafra fasciolata*
Lark, Fawn-coloured		*Calendulauda africanoides*
Lark, Melodious		*Mirafra cheniana*
Lark, Pink-billed		*Spizocorys conirostris*
Lark, Red-capped		*Calandrella cinerea*
Lark, Rufous-naped		*Mirafra africana*
Lark, Sabota		*Calendulauda sabota*
Lark, Spike-heeled		*Chersomanes albofasciata*
Longclaw, Cape		*Macronyx capensis*
Mannikin, Bronze		*Spermestes cucullatus*
Marsh-harrier, African	EN	*Circus ranivorus*
Martin, Banded		*Riparia cincta*
Martin, Brown-throated		*Riparia paludicola*
Martin, Rock		*Hirundo fuligula*
Martin, Sand		*Riparia riparia*
Masked-weaver, Southern		*Ploceus velatus*
Moorhen, Common		*Gallinula chloropus*
Mousebird, Red-faced		*Urocolius indicus*
Mousebird, Speckled		*Colius striatus*
Myna, Common		*Acridotheres tristis*
Neddicky, Neddicky		*Cisticola fulvicapilla*
Night-Heron, Black-crowned		*Nycticorax nycticorax*
Nightjar, Fiery-necked		*Caprimulgus pectoralis*
Nightjar, Freckled		*Caprimulgus tristigma*
Oriole, Black-headed		*Oriolus larvatus*
Osprey, Osprey		*Pandion haliaetus*
Ostrich, Common		*Struthio camelus*
Owl, Barn		*Tyto alba*
Owl, Marsh		*Asio capensis*
Painted-snipe, Greater	VU	*Rostratula benghalensis*
Palm-swift, African		*Cypsiurus parvus*
Paradise-flycatcher, African		*Terpsiphone viridis*
Paradise-whydah, Long-tailed		*Vidua paradisaea*
Pigeon, Speckled		*Columba guinea*

Pipit, African		*Anthus cinnamomeus*
Pipit, Buffy		*Anthus vaalensis*
Pipit, Long-billed		*Anthus similis*
Plover, Common Ringed		*Charadrius hiaticula*
Plover, Kittlitz's		*Charadrius pecuarius*
Plover, Three-banded		*Charadrius tricollaris*
Pochard, Southern		*Netta erythrophthalma*
Prinia, Black-chested		*Prinia flavicans*
Prinia, Tawny-flanked		*Prinia subflava*
Puffback, Black-backed		*Dryoscopus cubla*
Pytilia, Green-winged		*Pytilia melba*
Quail, Common		*Coturnix coturnix*
Quailfinch, African		*Ortygospiza atricollis*
Quelea, Red-billed		*Quelea quelea*
Reed-warbler, African		*Acrocephalus baeticatus*
Reed-warbler, Great		*Acrocephalus arundinaceus*
Robin-chat, Cape		*Cossypha caffra*
Robin-chat, White-throated		*Cossypha humeralis*
Ruff		*Philomachus pugnax*
Rush-warbler, Little		*Bradypterus baboecala*
Sandpiper, Common		*Actitis hypoleucos*
Sandpiper, Curlew		*Calidris ferruginea*
Sandpiper, Marsh		*Tringa stagnatilis*
Sandpiper, Wood		*Tringa glareola*
Scimitarbill, Common		*Rhinopomastus cyanomelas*
Secretarybird	VU	*Sagittarius serpentarius*
Seedeater, Streaky-headed		*Crithagra gularis*
Shoveler, Cape		*Anas smithii*
Shrike, Crimson-breasted		*Laniarius atrococcineus*
Shrike, Lesser Grey		*Lanius minor*
Shrike, Red-backed		*Lanius collurio*
Snake-eagle, Black-chested		*Circaetus pectoralis*
Snake-eagle, Brown		*Circaetus cinereus*
Snipe, African		*Gallinago nigripennis*
Sparrow, Cape		*Passer melanurus*
Sparrow, House		*Passer domesticus*
Sparrow, Northern Grey-headed		*Passer griseus*
Sparrow, Southern Grey-headed		*Passer diffusus*
Sparrowhawk, Black		*Accipiter melanoleucus*
Sparrowhawk, Little		*Accipiter minullus*
Sparrowhawk, Ovambo		*Accipiter ovampensis*
Sparrowlark, Chestnut-backed		*Eremopterix leucotis*
Sparrow-weaver, White-browed		*Plocepasser mahali*

Spoonbill, African		*Platalea alba*
Spurfowl, Swainson's		*Pternistis swainsonii*
Starling, Cape Glossy		*Lamprotornis nitens*
Starling, Pied		*Spreo bicolor*
Starling, Red-winged		*Onychognathus morio*
Starling, Violet-backed		*Cinnyricinclus leucogaster*
Stilt, Black-winged		*Himantopus himantopus*
Stint, Little		*Calidris minuta*
Stonechat, African		*Saxicola torquatus*
Stork, Abdim's	NT	*Ciconia abdimii*
Stork, Black	VU	*Ciconia nigra*
Stork, White		*Ciconia ciconia*
Sunbird, Amethyst		*Chalcomitra amethystina*
Sunbird, Malachite		*Nectarinia famosa*
Sunbird, Marico		*Cinnyris mariquensis*
Sunbird, White-bellied		*Cinnyris talatala*
Swallow, Barn		*Hirundo rustica*
Swallow, Greater Striped		*Hirundo cucullata*
Swallow, Lesser Striped		*Hirundo abyssinica*
Swallow, Pearl-breasted		*Hirundo dimidiata*
Swallow, Red-breasted		*Hirundo semirufa*
Swallow, White-throated		*Hirundo albigularis*
Swamphen, African Purple		*Porphyrio madagascariensis*
Swamp-warbler, Lesser		*Acrocephalus gracilirostris*
Swift, African Black		*Apus barbatus*
Swift, Horus		*Apus horus*
Swift, Little		*Apus affinis*
Swift, White-rumped		*Apus caffer*
Tchagra, Black-crowned		*Tchagra senegalus*
Tchagra, Brown-crowned		*Tchagra australis*
Teal, Cape		*Anas capensis*
Teal, Hottentot		*Anas hottentota*
Teal, Red-billed		*Anas erythrorhyncha*
Tern, Caspian	VU	*Sterna caspia*
Tern, Whiskered		*Chlidonias hybrida*
Tern, White-winged		*Chlidonias leucopterus*
Thick-knee, Spotted		*Burhinus capensis*
Thrush, Groundscraper		*Psophocichla litsipsirupa*
Thrush, Karoo		*Turdus smithi*
Thrush, Kurrichane		*Turdus libonyanus*
Thrush, Olive		*Turdus olivaceus*
Tinkerbird, Yellow-fronted		*Pogoniulus chrysoconus*
Turtle-dove, Cape		*Streptopelia capicola*

Wagtail, Cape		*Motacilla capensis*
Wagtail, Yellow		*Motacilla flava*
Warbler, Dark-capped Yellow		*Chloropeta natalensis*
Warbler, Willow		*Phylloscopus trochilus*
Waxbill, Blue		*Uraeginthus angolensis*
Waxbill, Common		*Estrilda astrild*
Waxbill, Orange-breasted		*Amandava subflava*
Weaver, Cape		*Ploceus capensis*
Weaver, Village		*Ploceus cucullatus*
Wheatear, Capped		*Oenanthe pileata*
Wheatear, Mountain		*Oenanthe monticola*
White-eye, Cape		*Zosterops virens*
White-eye, Orange River		*Zosterops pallidus*
Whydah, Pin-tailed		*Vidua macroura*
Whydah, Shaft-tailed		*Vidua regia*
Widowbird, Fan-tailed		*Euplectes axillaris*
Widowbird, Long-tailed		*Euplectes progne*
Widowbird, Red-collared		*Euplectes ardens*
Widowbird, White-winged		*Euplectes albonotatus*
Wood-hoopoe, Green		*Phoeniculus purpureus*
Woodpecker, Bennett's		*Campethera bennettii*
Woodpecker, Cardinal		*Dendropicos fuscescens*
Wryneck, Red-throated		*Jynx ruficollis*