AGGENEIS ORANJEMOND PROJECT
SPECIALIST AVIFAUNAL ASSESSMENT

EIA PHASE

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Specialist Investigator

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)

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Declaration of Independence

All specialist investigators specified above declare that:

- We act as independent specialists for this project.
- We consider ourselves bound by the rules and ethics of the South African Council For Natural Scientific Professions.
- We 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, 2006.
- We will not be affected by the outcome of the environmental process, of which this report forms part of.
- We do not have any influence over the decisions made by the governing authorities.
- We 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.
- We 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, 2006.
- Should we consider ourselves to be in conflict with any of the above declarations, we shall formally submit a Notice of Withdrawal to all relevant parties and formally register as an Interested and Affected Party.

Terms and Liabilities

- This report is based on a short term investigation using the available information and data related to the site to be affected. No long term investigation or monitoring was conducted.
- The Precautionary Principle has been applied throughout this investigation.

- The specialist investigator, and the Endangered Wildlife Trust, for whom he/she works, does not accept any responsibility for the conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from these assessments or requests made to them for the purposes of this assessment.
- 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.
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Signed on the 3rd December 2010 by Luke Strugnell in his capacity as specialist investigator for the Endangered Wildlife Trust's Wildlife and Energy Programme, and on the 11 July 2011 by Jon Smallie.

EXECUTIVE SUMMARY

Eskom Transmission propose to construct a 400kV transmission line from the existing Aggeneis Substation to the existing Oranjemond Substation as well as upgrading these two substations.

The Endangered Wildlife Trust (EWT) was contracted by Savannah Environmental to conduct the Avifaunal Specialist study on the above project. A site visit was conducted in December 2010. This report forms the EIA phase study for the project.

In general terms, the impacts that could be associated with a project of this nature include: collision of birds with the overhead cables; electrocution of birds whilst perched on the tower structures; destruction of habitat; disturbance of birds; impact of birds on the power line performance through the streamer and pollution mechanisms and nesting on tower structures.

The most significant of these impacts will be that of collision of birds with the overhead cables, specifically the earth wires. Large terrestrial birds such as Ludwig's Bustard are prevalent in the area, and are known to be hugely vulnerable to power line collision. Unfortunately, determining where these collisions could occur along the route is not yet an exact science, and cannot really be used to differentiate between the alternative corridors at this stage. It is anticipated that a high proportion of the proposed power line will require line marking in order to mitigate for bird collisions. These sections of line will be identified during an avifaunal walk through once the line route is finalized and tower positions pegged, as part of the construction and operational Environmental Management Programme. Due to the significant length of line, and relative uniformity of the study area in terms of collision risk, the avifaunal walk through will be an essential component of impact management on this project. Only once exact tower positions are finalized, and time can be spent on the servitude by an avifaunal specialist will it be possible to identify patterns of bird occurrence and movement at this fine spatial scale.

In terms of avifauna, the preferred corridor is Corridor 1, followed by 2 and 4, for reasons explained in the main report.

1. INTRODUCTION & BACKGROUND

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1.1 Terms of reference

The following terms of reference were utilised for this study:

Scoping phase:
A scoping study of the identified alternatives for all components of the project must be undertaken. The scoping report must compare the alternatives identified and make a recommendation in terms of the preferred alternative. The scoping report must include:

- A description of the environment that may be affected by the activity and the manner in which it will be affected
- A comparative evaluation of the identified feasible alternatives and nomination of a preferred alternative for consideration in the EIA phase
- Identification of potentially significant impacts to be investigated in the EIA phase and details of the methodology to be used to assess these impacts. This should be detailed enough to include in the Plan of Study for the EIA

EIA Phase:
- To include an indication of the methodology used in determining the significance of potential environmental impacts
- To provide a description of all environmental impacts that were identified during the environmental impact assessment process
- To provide an assessment of the direct, indirect and cumulative impacts according to a standard set of criteria supplied by Savannah Environmental
- To provide a description and comparative assessment of all alternatives identified during the environmental impact assessment process and nomination of a preferred alternative

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

1.2 Description of proposed activities

- Construct a 400kV transmission line from Aggeneis to Oranjemond.
- Upgrade of the existing substations to accommodate the new power line

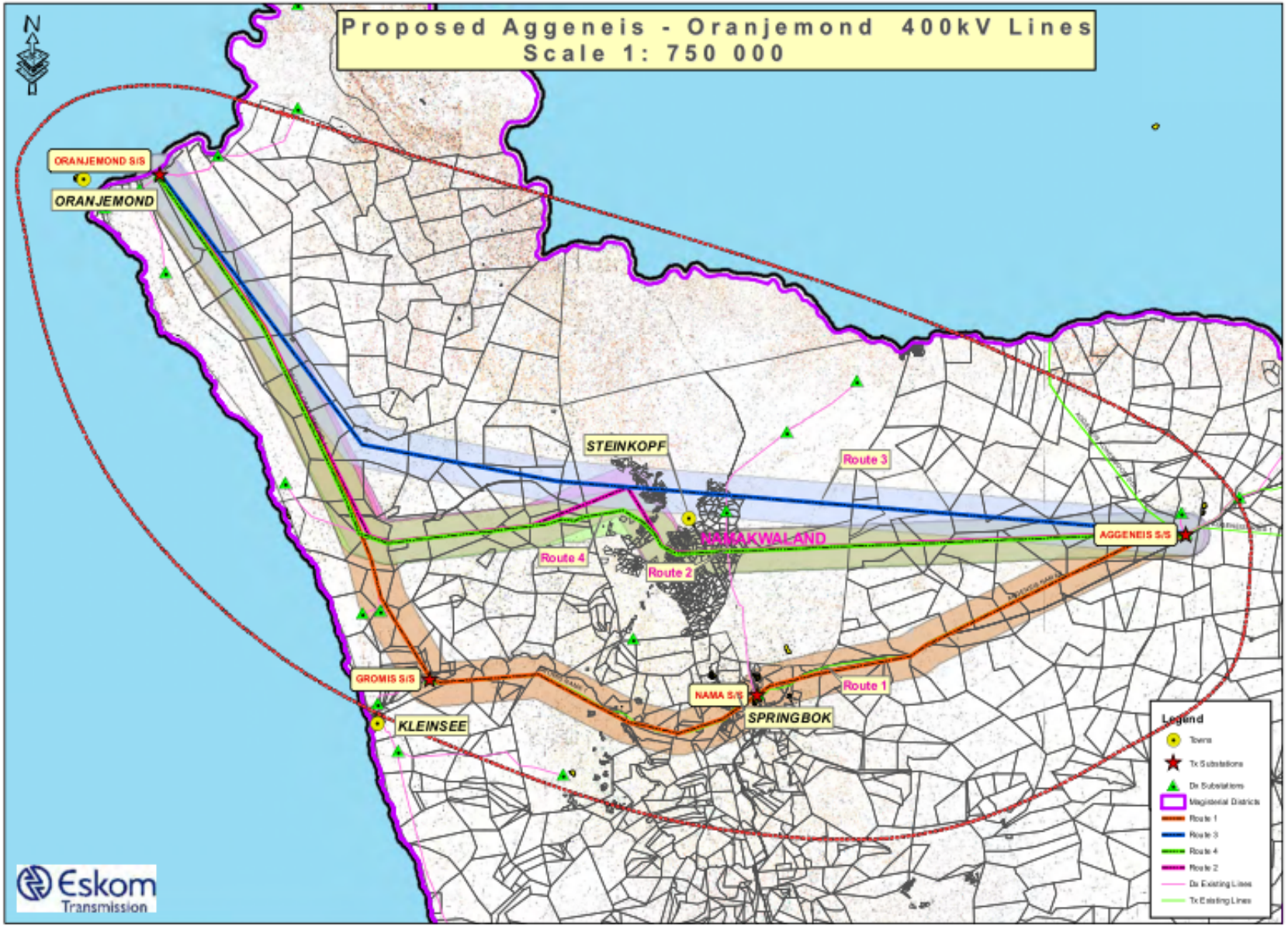

Figure 1. Study area layout showing existing infrastructure and line options (Map supplied by Savannah).

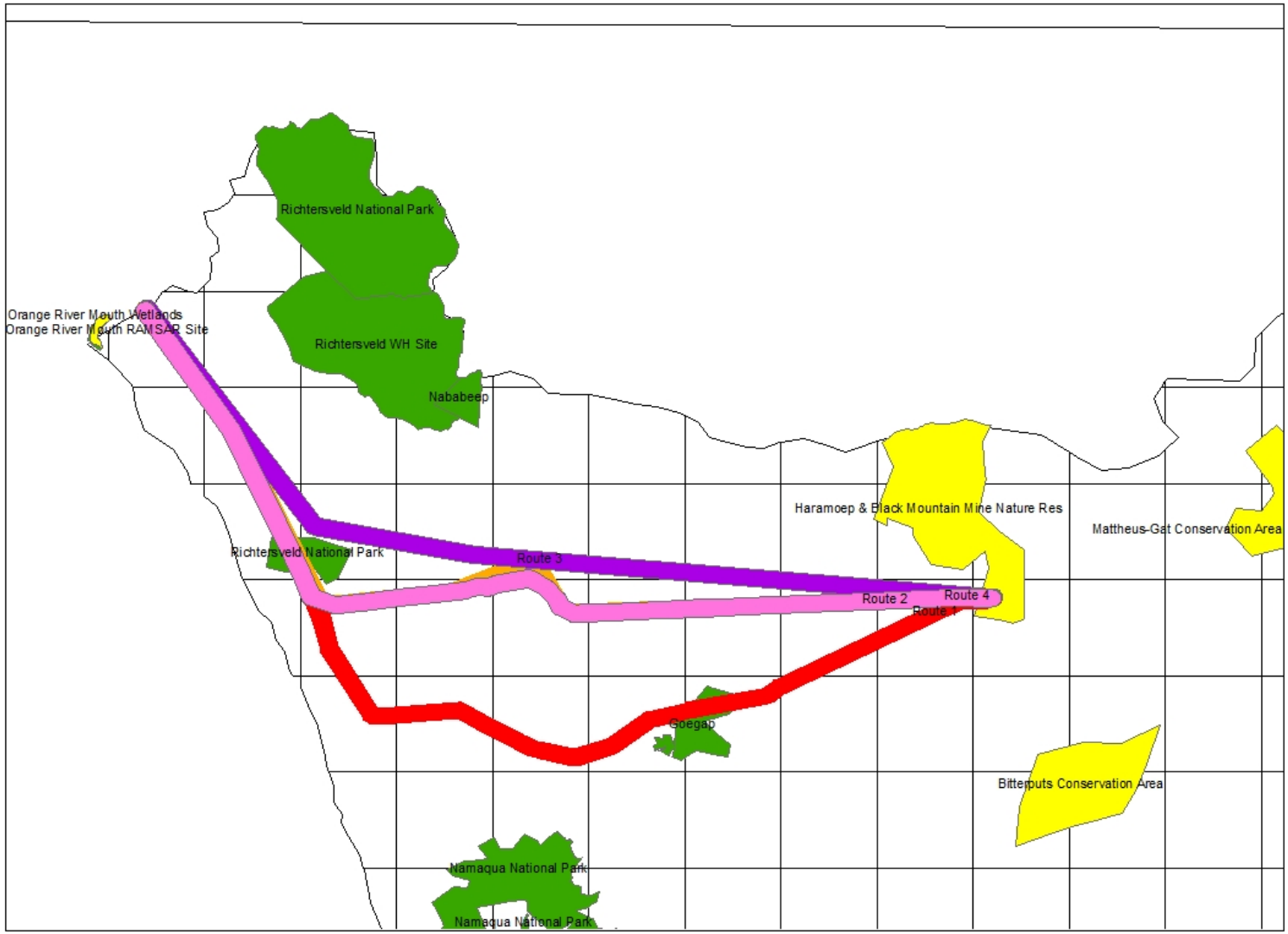

Figure 2- Study area showing important avifaunal factors such as Important Bird Areas (yellow) and protected areas (green)(Map-EWT).

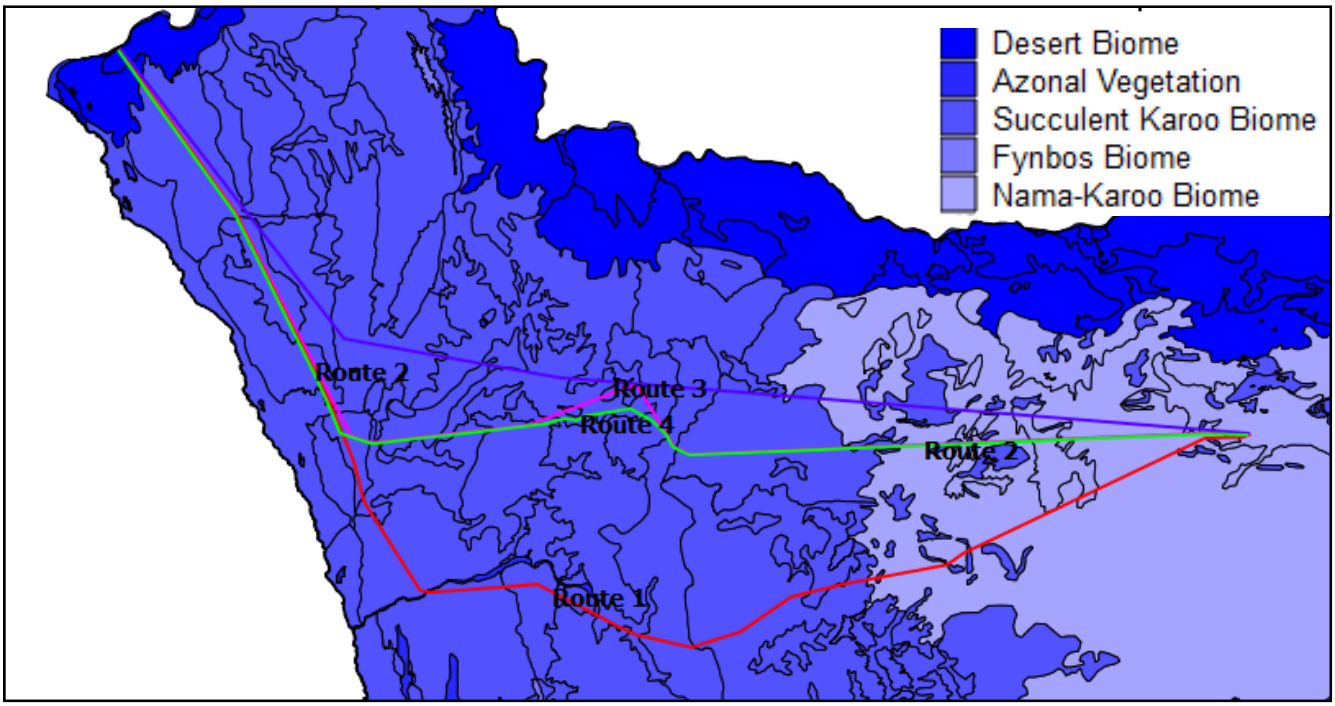

Figure 3- Vegetation classification of the study area (Mucina & Rutherford, 2005, Map-EWT)

2 GENERAL DESCRIPTION OF AVIAN INTERACTIONS WITH ELECTRICAL INFRASTRUCTURE

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 the electrocution of birds (and other animals) and birds colliding with power lines. Other problems include: electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure; and disturbance and habitat destruction during the construction and maintenance activities associated with electrical infrastructure.

2.1 Electrocution

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 of major concern. 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

above 132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. It is possible for birds to be electrocuted in electrical substations. There are a wide variety of specific sites within a substation that could pose an electrocution risk, depending on exact dimensions and species involved.

2.2 Collision

Collision is the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Collision refers to the scenario where a bird collides with the conductors or earth wires of overhead power lines. This occurs because the birds cannot see the cables whilst in flight. Most heavily impacted upon are bustards, storks, cranes and various species of water birds. 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. Unfortunately, many of the collision sensitive species are considered threatened (Red Data status) in southern Africa. The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. These species have not evolved to cope with high adult mortality, with the result that consistently high adult mortalities over an extensive period could have a serious effect on a population's ability to sustain itself in the long or even medium term. 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.

2.3 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.

2.4 Disturbance

During the construction and maintenance of electrical infrastructure a certain amount of disturbance inevitably occurs. For shy, sensitive species this can impact on their usual daily activities, particularly whilst breeding.

2.5 Impact of the birds on the proposed power line

There are a number of mechanisms through which birds are able to cause electrical faults on power lines. A bird streamer is a continuous stream of faeces released by a bird which can constitute an air gap intrusion between the conductor and the earthed structure. Bird species capable of producing large or long streamers are more likely to cause streamer faults. Bird stomach volume is important in this respect. Larger birds such as vultures and eagles are capable of holding larger quantities of food and therefore defecating larger volumes. 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. Since this involves a build-up of bird faeces or bird pollution and not a once off event such as a streamer, the size of the bird is less important, although still a factor. Larger birds and congregations of birds are likely to result in heavy pollution of insulator strings. 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.

3 METHODOLOGY

3.1 Information sources used

The following information sources were consulted in order to conduct this study:

- Bird distribution data of the Southern African Bird Atlas Project 2 (www.sabap2.adu.org.za) was obtained for relevant quarter degree squares which cover the study area, from the Avian Demography Unit of the University of Cape Town, as a means to ascertain which species occur within the study area.
- The conservation status of all bird species occurring in the aforementioned quarter degree squares was determined with the use of The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Barnes, 2000).
- A classification of the vegetation types in the study area was obtained from (Mucina and Rutherford, 2006)
- A classification of the land use of the area was obtained from CSIR and consulted.
- Google Earth was used to examine the study area.

This study made the assumption that the above sources of information are reliable. A limitation exists with regard to the amount of data available in the area, as most of the area is very arid, remote and unoccupied.

4. DESCRIPTION OF RECEIVING ENVIRONMENT

4.1. Vegetation

As can be seen in Figure 3, the vegetation is reasonably uniform throughout the study area when examined at the biome level. Two vegetation types, the 'Nama Karoo' and 'Succulent Karoo' biomes dominate the broader area. There is little difference if any in the avifauna to be expected to associate with either of these vegetation types.

In addition to vegetation type, bird micro habitats are also informative in determining where certain bird species occur and their abundance.

The three main types of microhabitat available to avifauna within the study area are the open plains which are very arid, the mountainous terrain which is also very arid and the major river systems which are lush, have large scale agriculture and attract lots of birds. Pictures of the various microhabitats can be seen below as seen from the air.

Since the most significant impact of this project is anticipated to be bird collision with the earth wire of the power line, the open flat areas of natural vegetation are probably the most sensitive parts of the study area, since this is where sensitive species such as bustards will occur. The arable areas close to rivers will concentrate various bird species, but these are less likely to be sensitive species, and would probably comprise mostly waterfowl. The mountainous areas will be sensitive for certain species, possibly including various raptors, but since these are not priority collision species, these areas would not be considered as sensitive for this study as the flat areas.

Sensitivity of the broader study area has not been explicitly mapped in this study. At a relatively coarse spatial scale, the above three distinctions can be made, however within these three categories no further distinction in sensitivity can be made on the basis of work done to date. The avifaunal walk through will identify these finer spatial scale distinctions. This arid region is a difficult regions within which to identify patterns of sensitivity, since it is so uniform, and driven by rainfall events (stochastic). In addition, due to its remoteness and low human population, little work on avifauna has been conducted previously.

River microhabitat, note the agriculture which will attract birds.

General study area, note the existing 220kV line

General study area, note the mountainous terrain in the background.

4.2. Relevant bird populations

The SABAP 2 data is presented below in Tables 1 to 3.

Table 1- Southern African Bird Atlas Project 2 data for degree square 2816

Common name	Scientific name	Status	Reporting rate
Caspian Tern	Sterna caspia	NT	39.1
Greater Flamingo	Phoenicopterus ruber	NT	34.8
Lesser Flamingo	Phoenicopterus minor	NT	30.4
African Marsh-Harrier	Circus ranivorus	VU	17.4
Great White Pelican	Pelecanus onocrotalus	NT	17.4
Cape Cormorant	Phalacrocorax capensis	NT	17.4
Barlow's Lark	Calendulauda barlowi	NT	8.7
Lanner Falcon	Falco biarmicus	NT	8.7
Bank Cormorant	Phalacrocorax neglectus	VU	8.7
Peregrine Falcon	Falco peregrinus	NT	4.3
Martial Eagle	Polemaetus bellicosus	VU	4.3
Pallid Harrier	Circus macrourus	NT	4.3
Black Harrier	Circus maurus	NT	4.3
African Black Oystercatcher	Haematopus moquini	NT	4.3
Chestnut-banded Plover	Charadrius pallidus	NT	4.3
Damara Tern	**Sterna balaenarum**	**EN**	**4.3**

EN= Endangered; VU=Vulnerable; NT= Near Threatened

Table 2- Southern African Bird Atlas Project 2 data for degree square 2918

Common name	Scientific name	Status	Reporting rate
Red Lark	Calendulauda burra	VU	37.0
Ludwig's Bustard	Neotis ludwigii	VU	22.2
Lanner Falcon	Falco biarmicus	NT	3.7
Martial Eagle	Polemaetus bellicosus	VU	3.7

VU=Vulnerable; NT= Near Threatened

Table 3- Southern African Bird Atlas Project 2 data for degree square 2917

Common name	Scientific name	Status	Reporting rate
Crowned Cormorant	Phalacrocorax coronatus	NT	48.1
African Black Oystercatcher	Haematopus moquini	NT	44.3
Cape Cormorant	Phalacrocorax capensis	NT	42.2
Caspian Tern	Sterna caspia	NT	29.5
Greater Flamingo	Phoenicopterus ruber	NT	21.1
Lesser Flamingo	Phoenicopterus minor	NT	18.6
Great White Pelican	Pelecanus onocrotalus	NT	16.9

Common name	Scientific name	Status	Reporting rate
Ludwig's Bustard	Neotis ludwigii	VU	12.7
Lanner Falcon	Falco biarmicus	NT	6.3
Black Harrier	Circus maurus	NT	4.2
Martial Eagle	Polemaetus bellicosus	VU	3.0
Bank Cormorant	Phalacrocorax neglectus	VU	3.0
Secretarybird	Sagittarius serpentarius	NT	2.1
Kori Bustard	Ardeotis kori	VU	1.3
Greater Painted-snipe	Rostratula benghalensis	NT	0.8
Cape Gannet	Morus capensis	VU	0.8
Red Lark	Calendulauda burra	VU	0.4
Black Stork	Ciconia nigra	NT	0.4

VU=Vulnerable; NT= Near Threatened

Report rates are essentially an expression of the number of times a species was recorded in a square, as a percentage of the number of times that square was counted. A report rate of zero means that the species was recorded in the square, but at a very low frequency. It is important to note that these species could have been recorded anywhere in each square, and not necessarily in the exact study area.

The most important of these species for this study, in other words the focal species, are as follows: Lesser Flamingo, Greater Flamingo, Ludwig's Bustard, Secretarybird and Kori Bustard.

These species are all present in the study area, are threatened, and known to be vulnerable to collision with overhead cables.

In addition, various non Red Data species could also be impacted on by the power line. Although these have not been mentioned individually it is believed that mitigation based on the above threatened species will to a large extent also mitigate for the other non Red Data species.

4.3. Important Bird Areas (IBA's)

Two Important Bird Areas (IBAs) exist in the study area and are located along or near the four route alternatives. These are described below:

SA030 -Orange River Mouth Wetland

This IBA is important as it is considered the sixth most important coastal wetland in South Africa in terms of the overall numbers of wetland birds that it supports. Bird numbers can be as high as 26 000 individuals comprising 56 species. These numbers diminish substantially during winter suggesting that the vast majority of species are migratory. Important species in this IBA include: African Marsh Harrier, Caspian Tern, Lesser and Greater Flamingo, Black Harrier, African Black

Oystercatcher, Damara Tern, White Pelican, Peregrine Falcon, and Chestnut banded Plover. For a full description of this IBA see Barnes 1998 page 109. This IBA is some distance from the proposed power line corridors, and many of the species occurring in the IBA would not be expected within the corridors.

SA035 - Haramoep and Black Mountain Mine Nature Reserve

This IBA is located near the Aggeneis Substation, and is unavoidable by any of the four corridors. This area is important to avifauna as it is one of the few areas protecting the globally threatened Red Lark and the Near Threatened Sclaters Lark. This area also holds 16 of the 23 Nama-Karoo biome restricted bird species. Important species include the two lark species as well as: African White-backed Vulture, Tawny Eagle, Martial Eagle, Kori and Ludwig's Bustard, Black Harrier, Ground Woodpecker, Black Stork, Secretarybird, Peregrine Falcon and Lanner Falcon. For a full description of this IBA see Barnes 1998 page 117.

These IBAs give us a better understanding of the species found in the area and should if at all possible be avoided by the proposed transmission line.

5 ASSESSMENT OF IMPACTS

Electrocutions

Electrocutions are not possible on the larger transmission lines such as this line as the relevant clearances between live parts and live and earthed components exceed the wingspan of any bird. It is possible for birds to be electrocuted in electrical substations. There are a wide variety of specific sites within a substation that could pose an electrocution risk, depending on exact dimensions and species involved. This impact is not anticipated to be significant for birds as sensitive and threatened species are unlikely to frequent the substations. Thus the impact of electrocution will not be discussed any further here.

Collisions

Collisions will potentially be one of the major impacts of the proposed transmission line. Collisions will mainly impact on the larger slower flying birds, the Bustards, flamingoes and storks for example. This impact will in all likelihood be the largest impact of this project and one that needs to be carefully considered and mitigated for to ensure minimal impact.

Habitat destruction

The area is very arid and as such the vegetation is very short and in some areas almost non-existent. This will mean that very little vegetation will be affected by the construction as it will not be necessary to clear servitudes. The only impact will thus be at the tower itself and any access roads that are required.

Disturbance

Again this impact is likely to be very low considering the area.

Faulting caused by birds

The tower design is directly related to the risk of bird induced faulting and these need to be obtained in order to quantify and determine the risk. The towers will be taller than any of the natural vegetation and thus will be an attractive site for avifauna to perch and roost.

Nature of the Impact: Disturbance of birds during construction and maintenance								
	Corridor 1		Corridor 2		Corridor 3		Corridor 4	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Spatial Extent	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local
Duration	2- short duration	2 – short duration	2- short duration	2 – short duration	2- short duration	2 – short duration	2- short duration	2 – short duration
Magnitude	4 – low	3 – low	4 – low	3 – low	4 – low	3 – low	4 – low	3 – low
Probability	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable
Significance	21 - low	18 – low	21 - low	18 – low	21 - low	18 – low	21 - low	18 – low
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Reversible	Reversible	Reversible	Reversible	Reversible	Reversible	Reversible	Reversible
Irreplaceable loss of resources?	No	No	No	No	No	No	No	No
Can impacts be mitigated?	To a minimal extent through correct management							
Mitigation? Follow environmental best practice during construction and maintenance activities. This includes: the timing of construction in sensitive areas to avoid impacts on sensitive features during particular seasons; avoiding using heavy machinery and vehicles in sensitive habitats; minimizing the use of machinery and vehicles off the servitude; restricting construction camps and batching plants to already impacted areas; identifying any sensitive breeding species at onset of construction and managing them appropriately; and any other management options that may be identified by the avifaunal walk through.								
Cumulative impacts: Not significant in this area, it is vast and largely undisturbed.								
Residual impacts: Low – once construction stops, and in between maintenance activities this impact will not occur.								

Nature of the Impact: Destruction of habitat during construction and maintenance								
	Corridor 1		Corridor 2		Corridor 3		Corridor 4	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation

Spatial Extent	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local
Duration	5-permanent	5- permanent	5-permanent	5-permanent	5-permanent	5-permanent	5-permanent	5-permanent
Magnitude	4 – low	3 – low	4 – low	3 – low	4 – low	3 – low	4 – low	3 – low
Probability	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable
Significance	30 – low to medium	27 – low	30 – low to medium	27 – low	30 – low to medium	27 – low	30 – low to medium	27 – low
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can impacts be mitigated?	To a minimal extent							
Mitigation Follow environmental best practice during construction and maintenance activities. This includes: the timing of construction in sensitive areas to avoid impacts on sensitive features during particular seasons; avoiding using heavy machinery and vehicles in sensitive habitats; minimizing the use of machinery and vehicles off the servitude; minimizing individual tower footprints; rehabilitating roads after construction; restricting construction camps and batching plants to already impacted areas; identifying any sensitive breeding species at onset of construction and managing them appropriately; and any other management options that may be identified by the avifaunal walk through.								
Cumulative impacts: Not significant, this area is vast and relatively undisturbed currently								
Residual impacts: high								

Nature of the Impact: Collision of birds with earth wire								
	Corridor 1		**Corridor 2**		**Corridor 3**		**Corridor 4**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**	**Without Mitigation**	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Spatial Extent	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local	1 - Local
Duration	5- permanent	5-permanent	5-permanent	5- permanent	5- permanent	5-permanent	5-permanent	5-permanent

Magnitude	6 – moderate	4 – low	6 – moderate	4 – low	6 – moderate	4 – low	6 – moderate	4 – low
Probability	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable	3 – probable
Significance	36 - moderate	30 - moderate	36 - moderate	30 - moderate	36 - moderate	30 - moderate	36 - moderate	30 - moderate
Status (positive or negative)	Negative	Negative	Negative	Negative	Negative	Negative	Negative	Negative
Reversibility	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible	Irreversible
Irreplaceable loss of resources?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Can impacts be mitigated?	Yes – partially, although will not reduce the probability from 3 as mitigation							
Mitigation: High risk sections of line will have to be installed with line marking devices as per Eskom Transmission guidelines, in order to make the line more visible to flying birds. These sections of line will need to be identified during an avifaunal walk through, once the final route has been decided, and tower positions have been surveyed and pegged. Due to the relative uniformity of the study area and its stochastic (rainfall driven) nature, it is exceptionally difficult to identify flight paths at this point. This will need to be done once tower positions are finalized and the route can be driven, and a 'feel' obtained for where birds are likely to occur and move. It is likely that this will result in more than half of the length of the power line requiring marking. If this walk through cannot be conducted, the specialist will likely need to identify almost the entire line for marking as a precautionary approach.								
Cumulative impacts: Not significant for much of the study area due to the relative lack of existing power lines in the area.								
Residual impacts: High								

6 COMPARISON OF ALTERNATIVES

Four corridors for the proposed power line are available for evaluation during this EIA phase.

Corridor 1:

- This is the southernmost corridor and follows an existing 220kV transmission line for the entire route from Aggeneis to Oranjemond. This is an advantage from an avifaunal perspective as it helps to decrease the collision risk (grouping lines makes them more visible to birds – APLIC 1994).
- This is the longest alternative, measured in kilometres.
- The corridor passes close to a protected area, the Goegab Nature Reserve.

Corridor 2:

- This is the central corridor and follows a more direct route from Aggeneis to Oranjemond.
- This route does not follow an existing transmission line and does not pass near any protected areas.
- This corridor is shorter in kilometres than alternative 1.

Corridor 3:

- This is the northern most alternative and follows a direct line from Aggeneis towards the west, then turning north towards Oranjemond.
- This route does not follow an existing transmission line and does not pass near any protected areas.
- It must be noted that it does not seem as if this alternative has been looked at from a technical perspective at all as it traverses the mountainous region discussed above and does not look technically feasible from an Eskom perspective.

Corridor 4:

- This route is very similar to Corridor 2 with a deviation to the north in the vicinity of Steinkopf.

In order to rank these alternatives a table was compiled and the four corridors given a rating on a scale of 1 to 5, with 1 being the least preferred and 5 being the most highly preferred option. This ranking was done on the basis of what was seen during field work, and factors explained above, such as proximity to existing infrastructure. Most of these factors do not result in a large enough difference on the impacts scale used in the impact assessment tables shown above. This is due to the ranking system used, rather than a lack of difference in significance of impacts. An example is the proximity of existing power line. Whilst this is a significant difference at the level of route selection it is unlikely to reduce the significance of collision from medium to low, in the rating system.

Table 4- Preference rating for the 4 corridors

Corridor	Preference Rating
1	5
2	3
3	1
4	3

As can be seen above, Corridor 1 is the most preferred as it is adjacent to an existing transmission line. This will help to mitigate for many of the impacts and in particular the impacts of collision and habitat destruction. Corridor 2 or 4 could also be considered provided the recommended mitigation is implemented.

Even though Corridor 3 has been identified as being the least preferred option, it could still be considered due to no fatal flaws having been identified, provided that the necessary mitigation measures are implemented.

Note that with the scales used for the formal impact assessment in the tables above, the differences between corridors are not significant enough to warrant different ratings for magnitude or significance.

7 IMPACT STATEMENT

This project has the potential to impact significantly on certain bird species through collision. It is imperative that the recommendations contained in this report are followed and implemented in order to mitigate these impacts as far as possible.

8 ENVIRONMENTAL MANAGEMENT PROGRAMME

The following tables encompass a generic Environmental Management Programme. This should not be mistaken for the site-specific Environmental Management Plan, which will be compiled later in the process and will identify actions on an individual tower or span basis once these positions have been identified and surveyed.

OBJECTIVE: To reduce the impact of construction and operation of the proposed power lines on birds in the area.	
Project component/s	Construction activities associated with the power line establishment, substations, and power line once established.

Potential Impact	Habitat destruction during construction and maintenance, disturbance of birds during construction and maintenance, collision of birds with wires from substations and earth wires once lines are operational.
Activity/risk source	Construction, maintenance, operational life span
Mitigation: Target/objective	Reduce these impacts as far as possible

Mitigation: Action/control	**Responsibility**	**Timeframe**
Control all activities so as to impact on natural vegetation as little as possible and create as little as possible noise and disturbance on site	Construction team, enforced by ECO	Duration of construction
Install suitable anti collision marking devices on earth wires as per Eskom Transmission guidelines, on high risk sections of line as identified during the avifaunal walk through.	Contractor, avifauna specialist, enforced by ECO	Must be done immediately after stringing of earth wires. Avifaunal walk through to be done as part of site specific EMP.

Performance Indicator	A site specific EMP will detail specific conditions of construction along the proposed power line. The performance indicator will be the number of instances of non-compliance with these instructions.
Monitoring	Monitoring during construction activities should be conducted by the Environmental Control Officer (ECO). Once the lines are operational, monitoring of the collision impact will be achieved through routine Eskom line patrols.

9 CONCLUSION

In conclusion no fatal flaws have been discovered on this project and as such the project may proceed from an avifaunal perspective. The avifaunal preference in terms of corridors is Corridor 1, followed by 2 or 4.

Even though Corridor 3 has been identified as being the least preferred option, it could still be considered due to no fatal flaws having been identified, provided that the necessary mitigation measures are implemented.

Collisions are expected to be the largest impact of this project on avifauna. In order to mitigate effectively for this, the least sensitive alternative would need to be selected, and whichever route is chosen, the high collision risk sections of line will need to be identified by an avifaunal walk through and marked with an effective line marking device.

10 REFERENCES

AVIAN POWER LINE INTERACTION COMMITTEE (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute. Washington D.C.

ANDERSON, M.D. 2001. The effectiveness of two different marking devices to reduce large terrestrial bird collisions with overhead electricity cables in the eastern Karoo, South Africa. Draft report to Eskom Resources and Strategy Division. Johannesburg. South Africa.

BARNES, K.N. (ED.) 2000. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa: Johannesburg.

HARRISON, J.A., ALLAN, D.G., UNDERHILL, L.G., HERREMANS, M., TREE, A.J., PARKER, V AND BROWN, C.J. (EDS). 1997. The atlas of southern African birds. Vol. 1&2. BirdLife South Africa: Johannesburg.

MUCINA, L; RUTHERFORD, C. 2006. The Vegetation of South Africa, Lesotho and Swaziland, South African National Biodiversity Institute, Pretoria.

SMALLIE, J. 2007. Strategic Environmental Assessment for Electrification Master Plan
Greater Randburg & Sandton areas - Avifaunal assessment.

VAN ROOYEN, C.S. AND LEDGER, J.A. 1999. “Birds and utility structures: Developments in southern Africa” in Ferrer, M. & G..F.M. Janns. (eds.) Birds and Power lines. Quercus: Madrid, Spain, pp 205-230

VAN ROOYEN, C.S. 1998. Raptor mortality on power lines in South Africa. (5th World Conference on Birds of Prey and Owls: 4 - 8 August 1998. Midrand, South Africa.)

VAN ROOYEN, C.S. 1999. An overview of the Eskom - EWT Strategic Partnership in South Africa. (EPRI Workshop on Avian Interactions with Utility Structures 2-3 December 1999, Charleston, South Carolina.)

VAN ROOYEN, C.S. 2000. “An overview of Vulture Electrocutions in South Africa.” Vulture News, 43, pp 5-22. Vulture Study Group: Johannesburg, South Africa.

VAN ROOYEN, C.S. 2003. Mitigation programme for Avian Collisions with Eskom Transmission Lines. Unpublished Progress Report, September 2003. Endangered Wildlife Trust, Johannesburg, South Africa.

VAN ROOYEN, C.S. 2004. The Management of Wildlife Interactions with overhead lines. In The fundamentals and practice of Overhead Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.

VAN ROOYEN, C.S. AND TAYLOR, P.V. 1999. Bird Streamers as probable cause of electrocutions in South Africa. (EPRI Workshop on Avian Interactions with Utility Structures 2-3 December 1999. Charleston, South Carolina)