



Proposed construction and alignment of 132kV lines at the existing Eskom Watershed substation



**AVIFAUNAL SPECIALIST REPORT
FOR THE BASIC ASSESSMENT PROCESS
REV 02: MARCH 2014**

EXECUTIVE SUMMARY

Environmental Impact Management Services (Pty) Ltd (EIMS) has been appointed by Eskom Holdings SOC Limited (Eskom) (The Applicant) to apply for Environmental Authorisation (EA) for the proposed re-aligning of four existing 132kV lines and associated infrastructure at the existing Watershed Substation (SS) all within the footprint of the surrounding Eskom property near Lichtenburg, North West Province. The Endangered Wildlife Trust (EWT) was subsequently appointed as an avifaunal specialist 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; destruction of habitat; and disturbance of birds.

General habitats were identified in the broader area which may attract various bird species, with bushveld and grassland patches however limited micro-habitat was found within the small site. The area in general has been surveyed and the South African Bird Atlas Project data (SABAP2) recorded a total of 59 species to date comprising 4 Vulnerable and 1 Near-threatened species to date. Following a site visit and examination of all available data, the following species were identified as Focal Species for this study: White-backed Vulture, Lesser Kestrel, Cape Vulture, Lappet-faced Vulture and Marabou Stork. No birds or bird carcasses were observed during the site visit.

It is foreseen that the proposed activities will not significantly increase the risk on the avifauna any more than the infrastructure that is currently on site. We recommend that to decrease the overall risk of bird mortalities that the proposed mitigations be incorporated into the Environmental Management Plan. Line marking will be required particularly in the less disturbed grassland areas. Avifaunal input in to the EMP (in the form of a site "walk down") is recommended in order to, "fine tune" these sensitive zones, and to identify the spans of line for marking to mitigate for bird collisions, once the alignment is chosen and the tower positions have been pegged. Electrocutions can be successfully mitigated by ensuring that a bird-friendly monopole structure is used.

TABLE OF CONTENTS

1.	INTRODUCTION	4
2.	TERMS OF REFERENCE	1
3.	METHODOLOGY	1
4.	SOURCES OF INFORMATION	2
5.	LIMITATIONS & ASSUMPTIONS	2
6.	DESCRIPTION OF AFFECTED ENVIRONMENT	2
7.	RELEVANT BIRD POPULATIONS	6
8.	ASSESSMENT OF IMPACTS	7
9.	MITIGATIONS	9
10.	MODIFICATION OF BIRD UNSAFE STRUCTURES	10
11.	SENSITIVITY	12
12.	COMPARISON OF ALTERNATIVES	12
2.	CONCLUSION	13
2.	BACKGROUND REFERENCES	14
3.	DECLARATION OF INDEPENDENCE	16

TABLE OF FIGURES

Figure 1: Project Locality map supplied by EIMS	4
Figure 2: Image indicating the re-alignment within the substation footprint	1
Figure 3: Indicating level of disturbance	3
Figure 4: Grasslands with isolated woodland / bushveld observed on site.....	4
Figure 5: Current infrastructure on the site	5
Figure 6: Disturbed grassland at the site	5
Figure 7: An example of a bird friendly monopole, adapted with bird perch, currently used for several of the existing lines around Watershed sub-station.....	12

1. INTRODUCTION

Eskom Holdings (SOC) Limited is applying for authorisation for the diversion of four 132kV lines within the footprint of the existing Watershed substation and the existing lines. A Basic Assessment (BA) process for this project is currently being undertaken as per by EIMS, and the Endangered Wildlife Trust (EWT) was subsequently appointed as an avifaunal specialist for the project.

In order to provide a high quality supply of electricity to meet the ever increasing needs of its end users and to support annual load growth, Eskom proposes to divert the 132kV overhead power lines within the foot print of the existing Watershed substation. Due to space restrictions within the property, there are no alternative options that would make a significant difference to the location of the infrastructure.

A site visit was conducted in December 2013. The avifaunal study used a set methodology (discussed elsewhere) as well as various data sets. The focal species for the study were determined, and then, by looking at the focal species which could occur in the area, as well as assessing the availability of bird micro habitats, the possible impacts of the development were then assessed and rated according to a set of pre-determined criteria.

Anticipated impacts that could be associated with a project of this nature usually include:

- The collision of birds with the overhead cables;
- electrocution;
- destruction of habitat; and
- disturbance of birds.

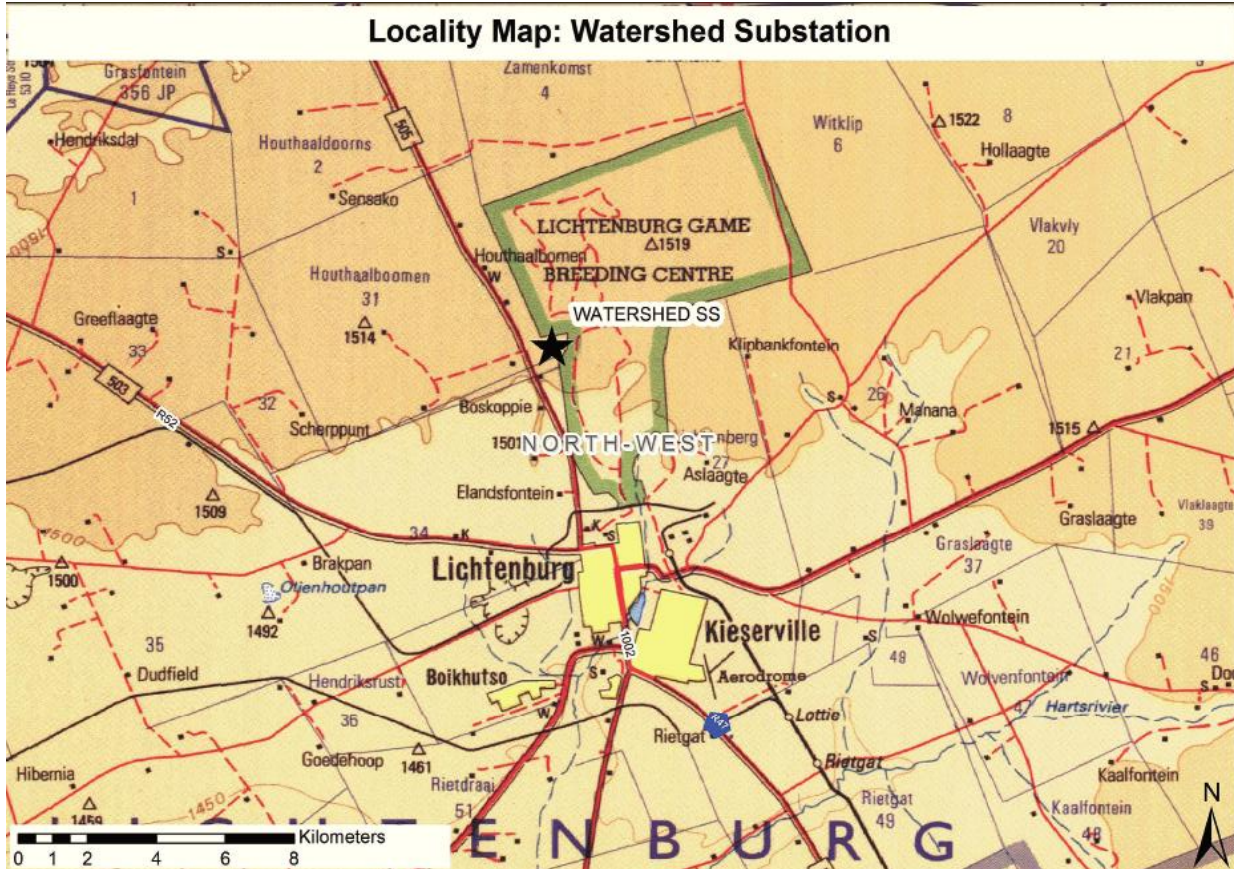


Figure 1: Project Locality map supplied by EIMS

Watershed MTS Phase 1

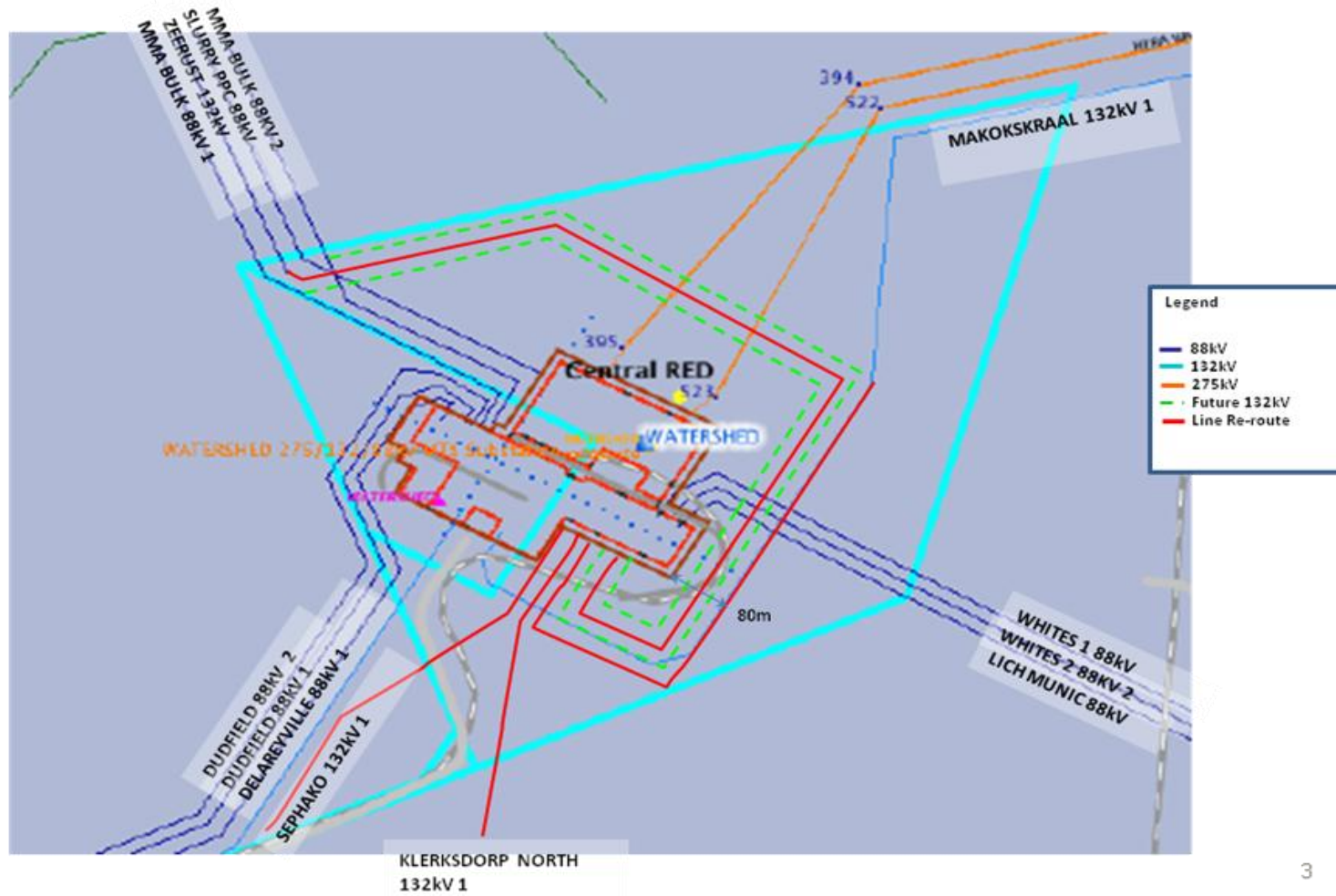


Figure 2: Image indicating the re-alignment within the substation footprint (red lines)

The figure above indicates the diversion of the following four lines on the site:

- Sephako 132kV – 110m
- Klerksdorp North 132kV – 85m
- Makokskraal 132kV – 310m
- Zeerust 132kV – 1.1km

2. TERMS OF REFERENCE

The following terms of reference were utilized for this study:

- 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 key Red List species potentially affected by the proposed power lines.
- Identify potential impacts (positive and negative, including cumulative impacts if relevant) of the proposed development on avifauna during construction and operation.
- Rate the significance of the impacts.
- 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.
- Identify and address any other aspects related to avifauna in the study area that should be incorporated into the reports.

3. METHODOLOGY

In predicting the impacts of a proposed power line on birds, a combination of science, field experience and common sense is required. More specifically the methodology used to predict impacts in the current study was as follows:

- The various data sets discussed below under “sources of information” were collected and examined.
- The data was examined to determine the location and abundance of power line sensitive Red List species as well as non-Red List power line sensitive species in the study area.
- A desk top examination, using Google Earth imagery was done to compare alternatives.
- The area was visited, and thoroughly traversed, to obtain a first-hand perspective of the proposed routes and birdlife, and to determine which bird micro-habitats are present and relevant to the study.
- The impacts of the power lines on birds were predicted on the basis of experience in gathering and analysing data on wildlife impacts with power lines throughout southern Africa since 1996 (see van Rooyen & Ledger 1999 for an overview of methodology), supplemented with first hand data.

- Recommended mitigation measures for significant impacts were proposed.

4. SOURCES OF INFORMATION

The study made use of the following data sources:

- Bird distribution data of the Southern African Bird Atlas Project (SABAP – Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997) obtained from the Avian Demography Unit of the University of Cape Town, in order to ascertain which species occur in the study area.
- The Southern African Bird Atlas Project 2 data for certain pentads in the study area was examined.
- The conservation status of relevant all bird species was then determined with the use of The Eskom Red Data book of Birds of South Africa, Lesotho and Swaziland (Barnes, 2000).
- The Important Bird Areas of southern Africa (IBA) project data (Barnes 1998) was consulted to determine its relevance to this project.
- A classification of the vegetation types in the study area was obtained from Mucina and Rutherford (2006).
- Information on the micro-habitat level was obtained through visiting the area and obtaining a firsthand perspective.
- The powerline incident mortality register of the Eskom-EWT Strategic Partnership was consulted to determine which species in the area is typically impacted by power line infrastructure.
- Electronic 1:50 000 maps were obtained from the Surveyor General.
- Satellite Imagery of the area was studied using Google Earth ©2013 for an aerial desktop study.

5. LIMITATIONS & ASSUMPTIONS

This study made the assumption that the above sources of information are reliable. The following factors may potentially detract from the accuracy of the predicted results:

- The SABAP-1 data covers the period 1986-1997. Bird distribution patterns fluctuate continuously according to availability of food and nesting substrate. (For a full discussion of potential inaccuracies in SABAP data, see Harrison, Allan, Underhill, Herremans, Tree, Parker & Brown, 1997). It was found that SABAP-2 did contained sufficient information.
- The site visit was conducted over one day in summer over which time various species may not have been present in the study area. No long term monitoring was conducted and the length of the line outside the footprint was not investigated. It is presumed that the relevant authorisations have been received/applied for the remaining infrastructure.
- Google Earth Imagery may not always reflect the true situation on the ground, as some images may be outdated.
- Predictions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can not be reduced to formulas that will hold true under all circumstances.

6. DESCRIPTION OF AFFECTED ENVIRONMENT

1) Vegetation and Land Use

While this report is an avifaunal specialist report, vegetation and micro habitats are very important in determining avifaunal abundances and likelihood of occurrences. The vegetation around the site was predominantly grasslands with isolated clumps of woodland or bushveld habitat.

The site in question has a certain level of disturbance as it is predominantly utilised by the sub-station and the associated network of lines. In close proximity to the site is the Lichtenburg Game Breeding Centre. There was previously a vulture restaurant located on this property however it is understood that this is no longer the case.

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, food sources and man-made factors. Investigation of this study area revealed the limited presence of bird micro habitats within the footprint of the substation due to the currently disturbed environment.



Figure 3: Indicating level of disturbance

Bushveld/Woodland:

“Bushveld” is a term loosely applied to smaller-tree woodland, comprised of mixed trees and bushes, with the substrate often being well grassed. Plant species present are related to soil type, but usually include both broad-leafed and thorn trees. This habitat type may be utilized by various raptors including Martial Eagle, Tawny Eagle, Greater Kestrel, African Harrier-hawk and occasionally White-backed Vultures; however, it will mostly be important

to physically smaller bird species, which are less likely to interact directly with the proposed power lines.

Grasslands:

Grasslands, in their true form, represent a significant foraging and/or hunting area for many bird species. There are extensive open “grassy” areas in the study area, the majority of which seem to be slightly disturbed to some degree as a result from servitude roads and previous construction of lines however areas of true grassland were still present. These open grassland patches could attract species such as the Northern Black Korhaan which has been observed in the area. However, the close proximity to various anthropogenic disturbances means that disturbance levels in the majority of these areas are likely to be high. The grassland patches are also a favourite foraging area for game birds such as Francolins and Guinea fowl, as well as being hunting and foraging habitat for raptors, such as the Lesser Kestrel, because of both the presence and accessibility of prey. Although unlikely, White-backed Vulture may also forage over these patches.



Figure 4: Grasslands with isolated woodland / bushveld observed on site.



Figure 5: Current infrastructure on the site



Figure 6: Disturbed grassland at the site

Rivers, drainage lines and pans:

No rivers, drainage lines or pans were observed in the immediate vicinity of the sub-station.

TABLE 1 below shows the micro habitats that each Red List bird species 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 1 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.

7. RELEVANT BIRD POPULATIONS

3) Southern African Bird Atlas Project 2

SABAP 2 data for the pentads (which are roughly 8km x 8km squares, and are smaller than the QDS's used in SABAP1) in the broader area was also examined. The table below shows the pentad number, number of counts, and number of species observed in that pentad, as well as the report rate for the relevant species. The majority of pentads covering the site have not been counted, and in general the area is poorly covered by SABAP2.

Table 1: Relevant species recorded by SABAP2 in the selected pentad as of 30th Dec 2013.

	Status	Pentad Report Rate (%)	Microhabitat
		2600_2605	
<i>No Cards</i>		159	
<i>Total Species</i>		59	
Relevant Species			
White-backed Vulture	VU	57.1	
Cape Vulture	VU	42.9	Grassland, Savannah, Hills and Ridges
Marabou Stork	NT	14.9	
Lappet – faced Vulture	VU	42.9	
Lesser Kestrel	VU	14.3	Grasslands, Open Savannah, Cultivated lands
Northern Black Korhaan			

V = Vulnerable; NT = Near-threatened; The report rates are essentially percentages of the number of times a species was recorded in the square, divided by the number of times that square was counted. It is important to note that these species were recorded in the entire square in each case and may not actually have been recorded on the proposed site for this study.

No birds were observed during the site visit however other bird sightings in this area Pentad include:

- Francolin, Orange River
- Korhaan, Northern Black
- Lark, Eastern Clapper
- Lark, Rufous-naped
- Lark, Spike-heeled

- Penduline-Tit, Cape
- Scrub-Robin, Kalahari
- Shrike, Crimson-breasted

4) Coordinated Avifaunal Road-count (CAR) data

There are no CAR routes in the vicinity of the proposed project.

5) Coordinated Waterbird count (CWAC) data

There are no CWAC sites in the vicinity of the proposed project.

6) Important Bird Areas (IBA's)

The site is not situated within an IBA, and there are no IBA's in close proximity.

7) Focal Species List

Determining the focal species for this study, i.e. the most important species to be considered, is a four step process. Firstly, the micro-habitats available on site were identified. An analysis of the above existing avifaunal data represents the second step, i.e. which species occur historically in the area at significant abundances. The third step is to identify those species which have a high likelihood of being present on, and/or utilizing, the site, based on the above two steps and are more likely to be impacted upon by the power-line and associated development. This step called on the vast experience of the EWT in evaluating and investigating electrical infrastructure impacts on birds (these impacts are discussed in more detail below). In general, large, heavy flying birds are more vulnerable to collision with over-head powerlines, while perching Raptors are more vulnerable to electrocution. The fourth and final step was to consider the species conservation status or other reasons for protecting the species. This involved primarily consulting the Red List bird species (Barnes 2000).

The resultant list of 'focal species' for this study is as follows: White-backed Vulture, Lesser Kestrel, Cape Vulture, Lappet-faced Vulture, Marabou Stork and Northern Black Korhaan.

In many cases, these species serve as surrogates for other similar species (as mitigation will be effective for both). Assorted more common species will also be relevant to this study, but it is believed that the above target species will to a large extent serve as surrogates for these in terms of impact assessment and management.

8. ASSESSMENT OF IMPACTS

General description of impacts of power lines on birds

As a result of its' size and prominence, electrical infrastructure constitutes 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 1983; Verdoorn

1996; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000). Other problems are electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure, (Van Rooyen & Taylor 1999) and disturbance and habitat destruction during construction and maintenance activities.

The proposed activities will be taking place within an existing footprint of similar infrastructure and therefore the overall impacts are anticipated to be low. However a review of the EWT powerline incident register indicates that the lines in this area have had reports of White-backed and Cape Vulture collisions and therefore it must be assumed that although the chances may not be increased, these incidents still have the potential to occur.

Electrocutions

Electrocution of birds on overhead lines is 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 & Ledger 1999). 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). Electrocution is possible on 132V power lines, especially where large raptors and vultures feature prevalently. As previously mentioned, records indicate that there have been vulture incidents in the study area in the past and ***the impact of electrocution is likely to be of Moderate Significance*** for the proposed power line if the proposed mitigations are implemented.

Collisions

Collisions are the biggest single threat posed by over-head power lines to birds in southern Africa (van Rooyen 2004). In general, large lines with earth wires that are not always visible to birds can have the largest impact in terms of collisions. Most heavily impacted upon are korhaans, bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. The 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 the vulture species in the area with the proposed lines is a possibility, and ***this impact is predicted to be of Moderate Significance***.

Habitat destruction

During the construction phase and maintenance of power lines some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, and the clearing of servitudes, as well as clearing vegetation at the substation site. Servitudes

have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat. As previously identified the study site is previously disturbed as a result of the sub-station and the large number of existing lines within the property. **Habitat destruction is anticipated to be of Low Significance**, in this study area.

Disturbance

Similarly, the construction and maintenance activities impact on bird through disturbance, particularly during bird breeding activities. **Disturbance of birds is anticipated to be of Low Significance.**

9. MITIGATIONS

Potential mitigations for the identified impacts are shown in TABLE 2 below.

Table 2: Potential mitigations for the identified impacts

Construction Phase	
Impact	Mitigation
Habitat destruction	Strict control should be maintained over all activities during construction, in particular heavy machinery and vehicle movements, and staff. It is important to ensure that the construction Environmental Management Plan incorporates guidelines as to how best to minimize this impact specifically on existing natural grasslands. It is understood that this phase will be short, temporary phase and localised in its impacts. It is recommended that a "walk down" take place to address any infrastructure siting issues that may occur.
Disturbance	Strict control should be maintained over all activities during construction. During the construction, if any of the Focal Species identified in this report are observed to be roosting and/or breeding in the vicinity (within 500m of the power lines), the EWT is to be contacted for further instruction. It is understood that this phase will be short, temporary phase and localised in its impacts. It is recommended that a "walk down" take place to address any infrastructure siting issues that may occur.

Operational Phase	
Impact	Mitigation
Collision	Mark the relevant sections of line with appropriate marking devices. These sections of line, and the exact spans, should be finalised by a "walk down" as part of the Environmental Management Programme (EMP) phase, once power-line routes are finalised and pylon positions

	are pegged. Any bird collisions identified should be reported to ESKOM as well as to the EWT Toll Free line for an investigation and possible additional recommendations and mitigation. It is recommended that ESKOM communicate with the Lichtenburg Breeding Centre regarding the vulture restaurant and determine if this restaurant will be re-opened as this may increase the risk of collisions and electrocutions.
Electrocution	It is highly recommended that bird friendly structures are utilised such as the steel monopole design (Figure 7) and that this incorporates the standard bird perch. If this is the case then most raptors and birds of high electrocution risk will perch well above the conductors and out of harm's way. In addition it is critical that all clearances between live and earth components are greater than 1.8 meters. If this is the case then the impact of bird electrocution will be very minimal. Electrocutions in the proposed substation yard should not affect the sensitive bird species as they are unlikely to use the substation yards for perching or roosting. Should this become an issue the impact can be mitigated reactively using a range of insulation devices that exist and are approved by ESKOM. Any bird electrocutions identified should be reported to ESKOM as well as to the EWT Toll Free line for an investigation and possible additional recommendations and mitigation.
Disturbance during routine maintenance.	No nests may be removed, without first consulting the EWT's Wildlife and Energy Program (WEP). During maintenance, if any of the "Focal Species" identified in this report are observed to be roosting and/or breeding in the vicinity, the EWT is to be contacted for further instruction.

10. MODIFICATION OF BIRD UNSAFE STRUCTURES

Large birds of prey are the most commonly electrocuted on powerlines. The large transmission lines (220 kV to 765 kV) structures are usually not a threat to large raptors, because the pylons are designed in such a manner that the birds do not perch in close proximity the potentially lethal conductors. Unfortunately, the same cannot be said of the smaller sub-transmission and reticulation lines of 11kV to 132kV. Raptors and vultures instinctively seek out the highest vantage point as suitable perches from where they scan the surrounding area for prey or carrion. In flat, treeless habitat power pylons often provide ideal vantage points for this purpose. Depending on the design of the pole, a large raptor can potentially touch two live components or a live and earthed component simultaneously. This causes an electrical short circuit through the bird, bridging the gap between live components (called phases) and/or other live and grounded components, almost inevitably resulting in instant electrocution and a concomitant disruption in the electrical supply. Burn marks and contracted claws are typical signs of electrocution.

There are several factors that increase the risk of electrocution:

- Wet feathers, which increase conductivity;

- Fighting, mating and gregarious roosting increases the risk of electrocution in that the birds could lose their footing and plunge between conductors, while birds sitting close together, between live parts, increase the risk of them bridging clearances;
- The age of birds is another contributing factor. Young and inexperienced birds are particularly vulnerable as they are generally clumsy at flying and perching on structures, losing their footing and making contact with live components;
- Lethal poles on higher topographic relief afford greater views of the surrounding terrain, making them more attractive as perches;
- Food outbreaks (e.g. grasshoppers or rodents) or other sources of food (i.e. open air abattoirs) draw birds to an area increasing the risk of electrocution.

Vultures are particularly at risk, due to their large wingspan, which can easily bridge the horizontal distance between phase-to-earth or phase-to-ground components of reticulation and sub-transmission networks. The gregarious nature of the species and their habit of roosting together lends it to multiple electrocutions.

Bird-unsafe structures can be modified in a variety of ways. The most common way is to insulate dangerous live components, and to cut a gap in the earthwire. Sometimes perch deterrents are installed to keep birds away from dangerous areas on the structure.

Eskom, the South African national electricity utility, and the Endangered Wildlife Trust (EWT), entered into a joint venture in 1996 to address the problem of birds and powerlines in a systematic manner. Landowners can play a vital role in protecting both their birds and their electricity supply by reporting any problems involving birds and powerlines on their property to the Eskom-EWT Partnership helpline, on 0860 111 535 or 011 4861102.



Figure 7: An example of a bird friendly monopole, adapted with bird perch, currently used for several of the existing lines around Watershed sub-station.

11. SENSITIVITY

In general the proposed activities have been determined to have a low-medium sensitivity in terms of avifauna. This is based on the nature of the activities in the area, the concentrated level of disturbance as well on the small site and the limited micro-habitats or avifaunal features. However the occurrence of certain listed species in the study area (especially vulture species) and the historical incidents as well as the potential re-establishment of a vulture restaurant increases the cumulative risk associated with the site as a whole.

12. COMPARISON OF ALTERNATIVES

As can be seen from the discussions above, the area for the proposed activity is localised to the footprint of existing infrastructure. This route is highly recommended to reduce impacts on the surrounding environment and therefore alternatives were not proposed or investigated.

13. CONCLUSION

In conclusion, it is foreseen that the proposed activities will not significantly increase the risk on the avifauna any more than the infrastructure that is currently on site. We recommend that to decrease the overall risk of bird mortalities that the proposed mitigations be incorporated into the Environmental Management Plan. Line marking will be required particularly in the less disturbed grassland areas. Avifaunal input in to the EMP (in the form of a site "walk down") is recommended in order to, "fine tune" these sensitive zones, and to identify the spans of line for marking to mitigate for bird collisions, once the alignment is chosen and the tower positions have been pegged. The proposed steel monopole structure should be safe for most birds in terms of phase – phase electrocution. However it is possible for phase – earth electrocutions to occur, particularly with gregarious species such as vultures. It is therefore recommended that the standard Eskom Bird Perch be fitted to all pole tops on the line. This will provide ample safe perching space well clear of any dangerous hardware. In addition, the existing lines are likely to be the preferred perch for most birds since they are higher.

14. BACKGROUND REFERENCES

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15. DECLARATION OF INDEPENDENCE

I, STEPHANIE AKEN, declare that I –

- act as an independent consultant 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.
- Should I 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.
- The specialist investigator withholds the right to amend 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 and all of the information contained herein remain the intellectual property of the Endangered Wildlife Trust.
- 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.



Signed on the 20th Jan 2014 by Stephanie Aken in her capacity as Program Manager for the Endangered Wildlife Trust's Wildlife and Energy Programme.

Stephanie Aken is employed by the Endangered Wildlife Trust's Wildlife and Energy Programme as the Program Manager. Stephanie has a Four Year BSc Hons in Zoology as well as seven years experience in the environmental management field. 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.