AVIFAUNAL SPECIALIST REPORT

PROPOSED ZONNEBLOEM SWITCHING STATION (132/22KV) AND TWO LOOP-IN LOOP-OUT POWER LINES (132KV), MPUMALANGA PROVINCE

March 2018

Prepared by:

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DECLARATION OF CONSULTANT'S INDEPENDENCE

I, Gerhard Botha, as the appointed specialist hereby declare that I:

- » act/ed as the independent specialist in this application;
- » regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- » do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- » have and will not have no vested interest in the proposed activity proceeding;
- » have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- » am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- » have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- » am aware that a false declaration is an offence in terms of regulation 48 of GN No. R. 326.

Gerhard Botha Pr.Sci.Nat 400502/14 (Ecological Science)
February 2017

1 INTRODUCTION

1.1 Applicant

Eskom Holdings SOC Limited

1.2 Project

The project will be referred to as the two loop-in-loop-out (LILO) 132kV chickadee power lines from the existing Mafube/Pan Traction to the new Zonnebloem Switching Station.

1.3 Proposed Activity

Eskom Holdings SOC Ltd is proposing the establishment of the new Zonnebloem 132/22kV switching station and two loop-in loop-out power lines (132kV) connecting to the existing Mafube/Pan Traction power lines approximately 25km east of Middelburg. Each power line will be 500m in length. The infrastructure associated with the switching station will include a new access road and a communication tower.

1.4 Location

The proposed facility will be located on the:

- Remaining Extent of the Farm Patattafontein 412;
- Remaining Extent of the Farm Zevenfontein 415; and
- Portion 4 of the Farm Gemsbokfontein 411 (**Error! Reference source not ound.**).

The proposed site falls within the jurisdiction of the Steve Tshwete Local Municipality and within the greater Nkangala District Municipality in the Mpumalanga Province.

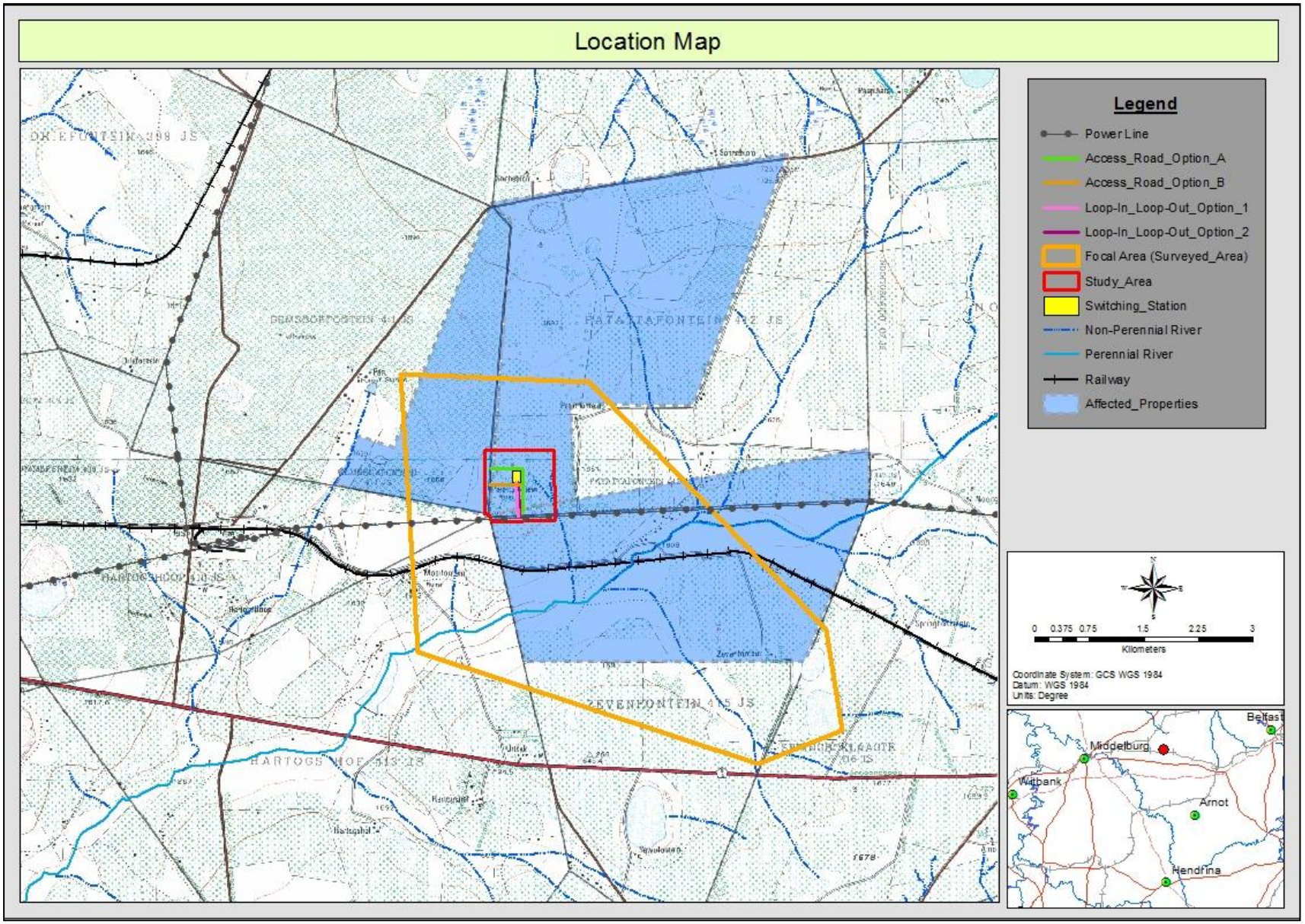

Figure 1: Location map of the proposed Zonnebloem Switching Station and associated infrastructure.

1.5 Terms of reference

The most important objective of this avifaunal impact assessment is to determine the impacts that the proposed activity may have on avifauna species. The following are the tasks/objectives of the study:

» Field visit to identify important avian habitats associated with the proposed development as well as avian micro-habitats and species that will potentially use these niches;
» A description of the current avifauna within the study area and the identification of Red Data Species potentially affected by the proposed development and associated infrastructure;
» Integration of the site data collected within avian atlases and counts within the area to develop a comprehensive avifaunal database likely to be present within the development footprint;
» Identify potential negative impacts on the avifaunal diversity and species composition at the site of the proposed development and assess the significance of these impacts;
» To provide recommended mitigation measures for the potential impacts in order to avert or lower the significance of the negative impacts on avifauna.

All avifaunal data was collected throughout all identified habitats using various methods including (see Section 2.2 for a description of methodology used):
» Walked-transects,
» Vehicles drive surveys,
» Power Line inspection, and
» Fixed point surveys

1.6 Conditions of this report

Findings, recommendations and conclusions provided in this report are based on the authors' best scientific and professional knowledge and information available at the time of compilation. No form of this report may be amended or extended without the prior written consent of the author. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or make reference to this report. Whenever such recommendations, statements or conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

1.7 Assumptions and Limitations

» This study assumes that the project proponent will always strive to avoid, mitigate and/or offset potentially negative project related impacts on the environment, with impact avoidance being considered the most successful approach, followed by mitigation and offset. It is further assumed that the project proponents will seek to enhance potential positive impacts on the environment.
» GIS spatial datasets used as part of the field surveys (site demarcation) and analyses are accurate.
» The project proponent will commission an additional study to assess the impact(s) if there is a change in the size, location and/or extent of the study area that is likely to have a potentially highly significant and/ or unavoidable impact on the natural environment.
» This study and the methodology used represents a sufficiently conservative and cautious approach which takes the study limitations into account.

It is difficult to apply pure scientific methods within a natural environment without limitations, and consequential assumptions need to be made. The following constraints may have affected this assessment:

» The faunal species lists for the site are those which were observed at the site, as well as those which may occur in the area based on distribution records and habitat requirements;
» In this instance, the 2722DC & DD QDGCs are covered by South African Bird Atlas Project (SABAP2), with data recorded on 20 (DC) and 15 (DD) data cards. This means that the species diversity and densities recorded by SABAP2 provides a limited interpretation of the avifauna potentially occurring in the study area;
» Conclusions of this report were based on experience of these recorded species and other species in different parts of South Africa. Bird behaviour cannot be entirely reduced to formulas that will hold true under all circumstances. By virtue of their mobility, avian species can rapidly adapt and relocate;
» It is important to note that, although the predicted impacts are mostly concerned with Red Data species, the non-Red Data species will also benefit from the proposed mitigation measures as they share the same habitat and face the same potential impacts; and
» Limited time in the field means that important components of the local avifauna (i.e. nest sites or localised areas of key habitats for rare or threatened species and time various species) could have been missed;
    - The site visit (15-17 March, 2018) was conducted in late summer.
» Accuracy of the maps, routes and desktop assessments is based on the current 1:50 000 topographical map series of South Africa;

» Accuracy of Global Positioning System (GPS) coordinates was limited to 4m accuracy in the field;
» Google Earth Imagery may not always reflect the true situation on ground, as some images may be outdated;
» Nest searches were not conducted.

2 METHODOLOGY

The main objective of the Avifauna Impact Assessment Report is to provide a description of the avifaunal, their interactions with their surrounding environment and how activities associated with the proposed development could potentially impact on the immediate as well as surrounding avifaunal character. To obtain the achieved results the following methodology was implemented.

2.1 Data scouring and review

Data sources from the literature were consulted and used where necessary in the study and include the following:

» Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.
» Bird distribution data of the Southern African Bird Atlas Project obtained from the Animal Demography Unit of the University of Cape Town, in order to ascertain species occurrence within the study area (Harrison et al. 1997);
» The Birds in Reserves Project database was used to augment bird counts data (Animal Demographic Unit 2015).
» The conservation status of all bird species occurring within the quarter degree square determined with the use of The Eskom Red Data book of birds of South Africa, Lesotho and Swaziland (Taylor 2014);
» The Important Bird Areas (IBA) programme according to BirdLife South Africa;
» The conservation status, endemism and biology of all species considered likely to occur within the study area was then determined from Hockey et al. (2005) and Taylor et al. (2015).

2.2 Field sampling and assessment methodology

Prior to the site visit a review of all available published and unpublished literature pertaining to bird interactions with plants, substations and power lines was undertaken, summarising the issues involved and the current level of knowledge in the field. Various information sources including data on the local avifauna of the area and previous studies of bird interactions with plants, substations and power lines were examined.

A site visit was conducted from the 15h to the 17th of March 2018 to determine the *in situ* local avifauna and avian habitats present on site. Walked transects, vehicle transects and vantage point surveys were conducted in various habitats across the site. During the survey, not only the development footprint area was surveyed, but a broader area was inspected. The site was thoroughly traversed to obtain a first-hand perspective of the proposed project and birdlife and to:

» Quantify aspects of the local avifauna (such as species diversity and abundance);
» Identify important avian features present on site (such as nesting and roosting sites);
» Confirm the presence, abundance, habitat preference and movements of priority species;
» Identify important flyways across the site; and
» Delineate any obvious, highly sensitive, no-go areas to be avoided by the development.

Data collection methods included the following:

» Vehicle drive surveys: Vehicle surveys were predominantly done along the farm dirt roads and twin tracks as well as the service road of Mafube/Pan Traction Power Lines and the Transnet Railway.
» Power Line inspection: The existing Mafube/Pan Traction power line was surveyed twice daily for the duration of the survey period for any possible raptors or other avifaunal species utilizing the line and pylons for perching. All nests located within the pylons were identified and monitored for a period of time during sunrise and sunset to determine if the nests are active and which species utilized these nests.
» Walked-transects: Walk-throughs were conducted within the study area as well as study area[1] (refer to Figure 1). These were done along pre-defined areas as well as along random selected areas.
» Fixed point surveys: During the last day of the survey period areas deemed potentially high in avifaunal species diversity was closely monitored for periods of 2 hours each. These areas included:
    - Wetland Flat and Valley-Bottom Wetland within the study area;

The flowing equipment were utilized during field work.

» Canon EOS 450D Camera,
» Swarovski SLC 10X42 WB Binoculars,

[1] Study area refers to the area including the study area and surroundings which provides the most accurate representation of available avifaunal habitats as well as diversity of the region whilst taking into account accessablility and time constraint.

» Roberts VII Multimedia Android Edition for Data Capturing and Bird Identification,
» Sasol's The Larger Illustrated Guide to Birds of Southern Africa (2005), and
» Roberts Bird Guide (2016)
» A simplified adaption of the Braun-Blanquet Data Form to capture habitat and other environmental data

The survey was primarily conducted by means of a Checklist survey supplemented with some notes on avifaunal movement (especially regarding the larger avifaunal species as well as identified nesting species and activities with the patches of higher tree covering). The surveys normally started just before sunrise and ended just after sunset in order to record all possible bird activities throughout the day.

Using the data collected during the desktop phase as well as during the site visit, avian micro-habitats and sensitive habitats for avifaunal communities were identified and mapped.

3 STUDY AREA

3.1 Climate and rainfall

The study area is situated in the subtropical high-pressure belt. The climate associated with the study area has been derived from recorded and extrapolated climatic data (https://en.climate-data.org/location/10646/) for Middelburg. The climate is regarded as mild, and generally warm and temperate. Rainfall for the region is relative moderate (683 mm) and peaks mainly during early to mid-summer months with very dry winters. Mean annual rainfall is as mentioned about 683 mm with November being the wettest month, averaging about 115 mm, and July being the driest, with an average of only 5 mm. The average annual temperature in Middelburg is 15.5°C with January being the warmest (Ave. 20.3°C) and June being the coldest (Ave 8.5°C). Frost is fairly infrequent (mean frost days around 13 days per year).

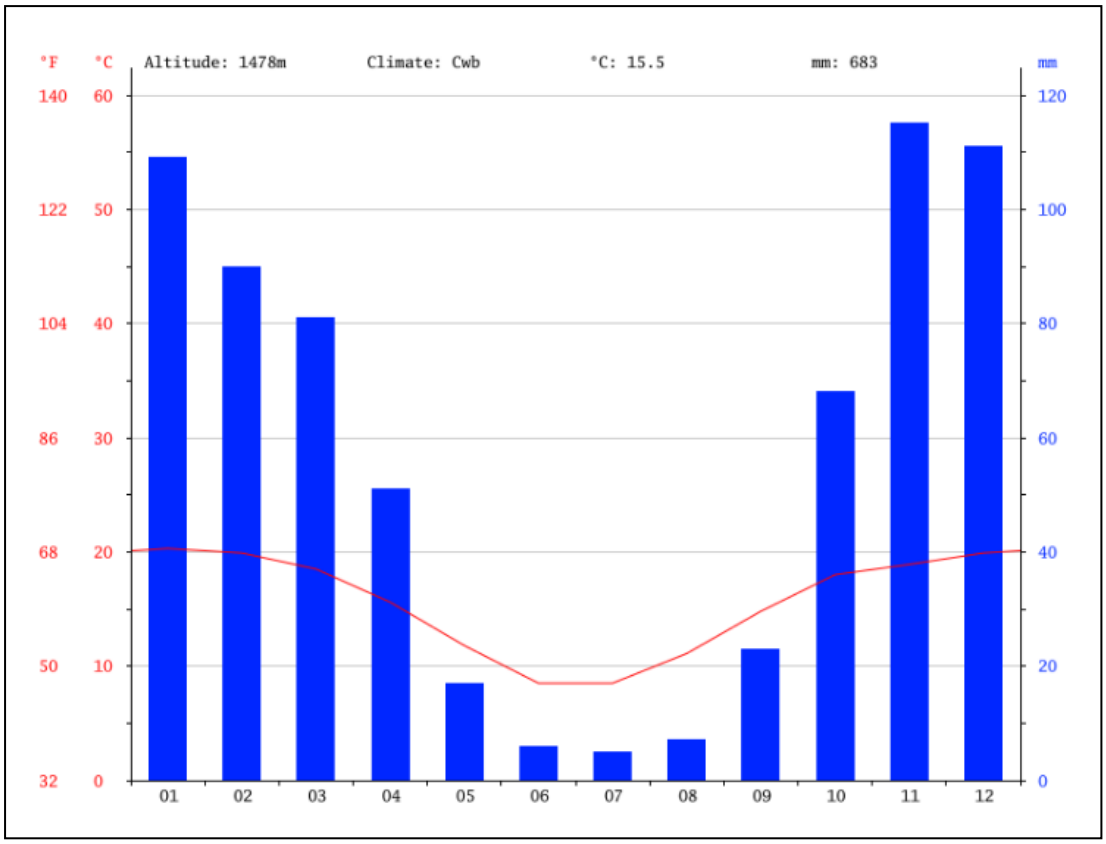

Figure 2: Climate graph of Middelburg (http://en.climate-data.org/location/57512/).

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	20.3	19.9	18.5	15.6	11.8	8.5	8.5	11.1	14.8	18	18.9	19.9
Min. Temperature (°C)	13.7	13.4	11.5	7.8	3	-1	-1	1.4	5.8	10.1	11.9	13.2
Max. Temperature (°C)	27	26.5	25.6	23.4	20.6	18.1	18.1	20.9	23.8	25.9	25.9	26.7
Avg. Temperature (°F)	68.5	67.8	65.3	60.1	53.2	47.3	47.3	52.0	58.6	64.4	66.0	67.8
Min. Temperature (°F)	56.7	56.1	52.7	46.0	37.4	30.2	30.2	34.5	42.4	50.2	53.4	55.8
Max. Temperature (°F)	80.6	79.7	78.1	74.1	69.1	64.6	64.6	69.6	74.8	78.6	78.6	80.1
Precipitation / Rainfall (mm)	109	90	81	51	17	6	5	7	23	68	115	111

Figure 3: Climate table of Middelburg (http://en.climate-data.org/location/57512/).

3.2 Existing Land Use

The study area is in a highly disturbed and transformed state due to both current and historical land use activities (Figure 12). Negligible natural grassland remains within the study area with barely semi-natural grasslands confined to small, isolated patches within and around wetland areas. Approximately 97.2% of the

study area is in a disturbed condition with only 2.38ha of the 83.9ha regarded as slightly disturbed to semi-natural. Most of the vegetation cover have undergone transformation, currently comprising of a dominant weed and alien cover with some pioneer and sub-climatic grasses. Woodlots of *Acacia mearnsii* and *Eucalyptus camaldulensis* are also a prominent feature of the study area. This current state can be attributed to mainly historical land use activities, primarily cultivation and afforestation (more extensive patches of woodlots).

Current land use includes existing woodlots as mentioned mainly comprising of *Acacia mearnsii* and *Eucalyptus camaldulensis* although *Acacia dealbata* and *Eucalyptus globulus* have also been recorded within these woodlots. These woodlots are actively utilised, with the wood mainly cut for building material and fence posts. Some of the woodlot patches have been aggressively utilized resulting in most of the trees occurring as shrubs that have resprouted from stumps with few species of usable size. A small portion to the south of the study area forms part of an extensive cultivated land (maize), however, this cultivated area is separated from the rest of the study area through a farm fence as well as a deep trench. The function of this trench is unclear, but likely functions as a drain for excessive moisture, in order to avoid over-saturation of the cultivated areas. This drain feature has had a significant impact on the hydrology of the down-stream portion of the valley-bottom wetland located along the eastern border of the study area. A similar trench feature is present in the north-eastern corner of the study area extending north-wards beyond the stud area. This trench extends into the upper reaches of the valley bottom-wetland. A small portion of the north-western corner of the study area forms part of a fallow land that was recently (up to 2010) utilised for Afforestation (*Pinus* plantations). Most farm fences to the west and north have been removed, although fences still persist along the southern and eastern boundary. Other features in the study area includes the existing Mafube / Pan Tracction Power Line and service road, farm dirt roads and smaller twin track.

Historical Satellite Imagery indicates that the current woodlots covered a much larger extent of the study area than the current situation. Furthermore, the bulk of the study area, not covered by woodlots and mostly outside wetland areas, was under cultivation (historical plough lines visible from satellite imagery). The study area was furthermore traversed by numerous additional farm roads and smaller twin tracks. Most of these historically disturbed areas have been reinstated with a weedy vegetation cover.

Surrounding land use activities mainly include activities associated with agricultural practices such as maize cultivation (extensive areas under cultivation to the north, south and east) and Afforestation (*Pinus* plantations) to the west and north west. Small patches of grazing land persist as fractured islands (isolated from each other by ploughed areas and plantations), and are mainly associated with lower lying wetland areas where ploughing mostly cannot occur. However most of the grazing

lands outside of wetlands have been historically subjected to some form of disturbance, mainly ploughing. Infrastructure include few small informal settlements, railway line, Casshome train station, power lines and numerous dirt roads.

3.3 Vegetation overview

The study area falls within the Mesic Highveld Grassland Bioregion (Grassland biome). The study area comprises the Rand Highveld Grassland (Gm11) vegetation type:

The Rand Highveld Grassland occupies areas between 1 300m and 1 635m, but may extend to altitudes of 1 760m. The typical landscape associated with this vegetation is highly variable, containing 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. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra, P. welwitschii, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus Searsia is most prominent Mucina and Rutherford (2006). The herbaceous layer is dominated by grasses.

This vegetation type is regarded as Endangered by Mucina and Rutherford (2006) and is listed as Vulnerable within The National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environment Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA). According to Mucina and Rutherford (2006) transformations within these units are mainly due to cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land-cover classifications and poor land management has led to degradation of significant portions of the remainder of the unit. Scattered aliens (most prominently *Acacia mearnsii*) occur in about 7% of this unit. About 7% of the area is subjected to moderate to high erosion levels (Mucina & Rutherford, 2006). This vegetation unit is furthermore poorly conserved, with only 1% conserved within statutory reserves as well as private conservation areas.

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3.4 Topography and drainage

The greater area can be described as predominantly open plains or plateaus with low hills or ridges (local relief: 90 – 150m). Flat low-lying areas and shallow depressions are typically filled (temporary) with water bodies supporting zoned

systems of aquatic and hydrophilous vegetation of temporarily flooded grassland and ephemeral herblands. The study area the area can be described as a plain, gradually sloping in a south-eastern direction with an average slope of 2% south-east. The study area is situated between elevations 1665m and 1636m.

» The western as well as north-western portion can be described as a higher lying area containing gentle, gradual slopes and moderate typographical variations. The general landscape shape of this section is largely convex to straight. A Wetland Flat located in the north-western corner contribute to this topographical variation and is situated within a shelf section of the slope.
» The eastern and south-eastern portion is characterised by a concave shape with a clear valley-bottom section. The slopes of this portion are more pronounced. Topographical features within this gradual sloping area includes seepages and a south to south-east flowing unchanneled valley-bottom wetland.

3.5 Avian micro-habitats

Most of the abundance and distribution of avian species can usually be attributed to the vegetation types and bioregions within an area. In determining the suitability of the study area for avian species, it is necessary to look at the habitats available to determine where the relevant species will most likely occur within the study area. These "micro habitats" do not always correspond to vegetation types and are determined by a combination of vegetation type, topography, land use, food sources and other various intrinsic factors.

During investigation of the study area and study area, the following important avian micro-habitats were identified.

» Degraded Grasslands
  - *Conyza sumatrensis – Senecio pentactinus* herbland
  - *Seriphium plumosum – Pollichia campestris* herbland
» Wetland Habitats
  - *Leersia hexandra – Kylinga erecta* permanent wet grassland
  - *Agrostis lachnantha – Juncus oxycarpus* seasonal to temporary wet grassland
» Alien tree clusters
  - *Acacia mearnsii – Eucalyptus camaldulensis* woodlots
» Artificial landscapes including:
  a) Existing Mafube/Pan Traction Power Line
  b) Cultivated lands

Additional micro-habitats assessed outside of the study area

» Secondary Plagioclimatic grassland
» Open water bodies (Dams)
» Railway line and associated bridges

In each case, some of the species likely to make use of the various micro-habitats have been described. It must be emphasised that birds will, by virtue of their mobility, utilise almost any area in a landscape from time to time.

Micro-Habitats within the Study Area

A. Degraded grassland

These areas are located on historical cultivated areas and have been re-vegetated with a vegetation cover that can rather be described as a herbland than grassland and is dominated by a tall weedy herb/forb layer also containing numerous alien plants. Grass species cover a relatively low percentage of this area and comprise mostly of pioneer and sub-climatic species. Typical species found within this area include weeds and alien plants; such as *Senecio petactinus, Serephium plumosum, Bidens pilosa, Conyza bonariensis, Conyza sumatrensis, Richardia brasiliensis, Tagetes minuta* and *Verbena brasiliensis*. Grass species found within this area include *Aristida bipartite, Aristida congesta, Eragrostis curvula, Eragrostis gummiflua* and *Eragrostis racemosa*. Alien trees are also scattered throughout this unit although they are more confined to the woodlots. Such alien trees include *Acacia mearnsii* and *Eucalyptus camaldulensis*. This degraded "herbland" is surrounded by human impacts, most notably agricultural impacts such as cultivation to the east, north and south and afforestation to the north-west and west. Regular human movement in the area also contribute to disturbances within the area with a small informal settlement located within the study are (adjacent to old homestead ruins).

Typically, grasslands represent significant foraging and/or hunting areas for many bird species and subsequently from important and extensive microhabitat within the region. Such grasslands may attract Blue Crane, Southern Bald Ibis, Blue Korhaan, Secretary bird, Abdim's Stork and White Stork. Pristine patches of grassland, near wet areas such as wetlands and streams, may provide breeding habitat for the African Grass Owl. The grassland patches are also a favourite foraging area for game birds such as francolins and Helmeted Guineafowl, as well as being hunting habitat for small raptors such as Lesser Kestrel, Amur Falcon and Black-shouldered kite. However, due to the highly degraded and transformed state of this area resources and habitat are severely limited and is furthermore impacted by the highly fractured nature of this area (surrounded by anthropogenic habitats) as well as regular human movement. Subsequently, avifaunal diversity has been severely affected within this area, comprising mostly a few highly adaptable species, especially smaller seed eaters (granivores) and insectivores (gleaning), that move regularly between the herbland and surrounding woodlots and wetland habitats. Such species includes: Levaillant's Cisticola, Wailing Cisticola, Zitting Cisticola, Black-chested Prinia, African Stonechat and Common Waxbill. Other

species less regularly noted within this habitat included Helmeted Guineafowl and Swainson's Spurfowl near clearings such as dirt roads fringed by the tall standing herblands, Black-winged Kite and Red-backed Shrike found on power-lines and fence posts used as perches (sally-gleaning) as well as European Bee-eater.

As mentioned, this habitat has been severely degraded and contain a low avifaunal diversity and is not regarded as an important microhabitat. No red data species or conservation worthy avifaunal populations were noted within this habitat type. Almost the entire proposed development will occur within this micro-habitat.

Figure 4: Highly degraded "herbland"

B. Wetlands and small watercourses

Due to the geomorphological setting of the extended (local drainage network), the area, is characterized by numerous small, short non-perennial streams flowing in a largely south-eastern and south western direction to join the Springbokspruit River (south of the study area). The Springbokspruit is approximately 25.9 km in length and flows in a south-westerly direction to terminate into the Klein Olifants River. Two such small non-perennial watercourses drain the eastern half of the study area and flow in a southern direction for approximately 2km to drain into the Springbokspruit. Associated with these non-perennial streams are valley-bottom wetlands and small lateral seepages. The upper portion of this hydrological system comprises a largely unchanneled valley-bottom wetland (covers an extensive area of the south-eastern portion of the study area) which transitions into a channelled valley-bottom wetland south of the service road for the Mafube/Pan Traction power lines. A few isolated wetland bodies are furthermore dotted throughout the region and include a small to medium sized depression wetland, seepages and wetland flats. Such a wetland flat is present north-west of the study area with the distal portion of the wetland extending into the study area. A highly transformed and impacted depression wetland (pan) is located in the centre of the western boundary of the study area. Most of these wetlands are seasonally to temporary saturated. The vegetation of these wetlands is dominated by grasses and sedges but also contain a high diversity of herbs/forbs, especially weedy species and alien plants. Key species includes *Leersia hexandra, Kylinga erecta, Eleocharis acutangularis* and the weed *Persicaria lapathifolia* for the permanent soil saturated areas and *Agrostis lachnantha, Juncus ocyscarpus, Aristida junciformis, Eragrostis curvula, Imperata cylindrica, Paspalum urvillei, Persicaria lapathifolia* and *Helichrysum aureonitens* for the seasonal to temporary soil saturated zones. Disturbances within these wetland zones include historical ploughing, afforestation, high density weed and alien plant invasion and regular human movement (with small packs of dogs).

Such microhabitats in their true form represent important habitats for many species such as storks, herons, egrets, warblers, kingfishers and a variety of other water birds, while such connected watercourses also provide important flight paths/corridors for many species. However, due to the numerous disturbances associated with these habitats, within the study area as well as study area, species diversity was greatly altered. Species recorded with these habitats (within study area) included Hadeda Ibis, Blacksmith Lapwing, Levaillant's Cisticola, Zitting Cisticola, Southern Masked Weaver, Common Waxbill and Cape Wagtail. An indication of the impacts that the above mentioned disturbances has on avifaunal activity was evident after surveying less disturbed habitats outside of the study area (south-west of study area) where seepages and valley-bottom wetlands contained all of the above-mentioned species as well as numerous Bishops (Yellow-crowned, Southern Red), Widowbirds (Long-tailed and Withe-winged), small

waders (Wood Sandpiper), various swallows and martins, African Snipe, Malachite Kingfisher, African Pipit and Black-throated Canary. Another contributing factor to the higher diversity "downstream" was the presence inundated areas and the fact that these wetland areas were surrounded by more natural grasslands.

These micro-habitats within the study area has been severely degraded and contain a low avifaunal diversity, however as mentioned the valley-bottom wetland and associated seepages forms part of an extended wetland system and may potentially form a corridor of movement for certain avifaunal species. No red data species or conservation worthy avifaunal populations were noted within this habitat type.

Figure 5: Wetland habitats found within the study area.

C. Alien Tree Woodlots

Woodlots of *Acacia mearnsii* and *Eucalyptus camaldulensis* are also a prominent feature of the study area. From historical satellite images it is evident that these woodlots covered more extensive areas of the study area in the past. Other alien trees within these woodlots include *Acacia dealbata* and *Eucalyptus globulus*. These woodlots are actively utilised, with the wood mainly cut for building material and fence posts. Some of the woodlot patches have been aggressively utilized resulting in some patches containing shrubs that have resprouted from stumps with few species of usable size. Furthermore, most of these woodlots were characterized by a low ground cover and as such food sources within these micro-habitats are limited. A very low diversity of avifaunal species was recorded within these woodlots and included African Cuckoo-Hawk, Speckled Pigeon, Red-eyed Dove, Southern Fiscal and Cape Robin-Chat. Where such woodlots encroached into wetland areas, the fringes of such woodlots contained some nests of Southern Masked Weavers and small flocks of Common Waxbills regularly moved between the wetland habitats and the cover of the woodlots.

Such alien tree stands may provide roosting and nesting habitat for various raptor species, larger birds such as francolins, Guineafowl, herons and Hadeda Ibises, as well as European Bee-eater. No Red Data species were recorded within this micro habitat. During the survey no large nests were noted as well as no important roosting sites.

Figure 6: *Eucalyptus camaldulensis and Acacia mellifera* woodlots

D. Cultivated lands

A small portion to the south of the study area forms part of an extensive cultivated land (maize), however, this cultivated area is separated from the rest of the study area through a deep trench. The function of this trench is unclear, but likely functions as a drain of excessive moisture, in order to avoid over-saturation of the cultivated areas. The greater surroundings are also characterized by extensive cultivated areas and form a prominent feature in the region and has resulted in

extensive loss of natural habitats, especially grasslands. As such, this impact can be described as the major factor, influencing a change in avifaunal composition, diversity and distribution within the region.

Arable or cultivated lands may potentially represent significant feeding areas for many avifaunal species in any landscape for the following reasons: through opening up the soil surface, land preparation make many insects, seeds, bulbs and other food sources readily accessible to birds and other predators; crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. Relevant bird species that may be attracted to these areas include most importantly Blue Crane, Southern Bald Ibis, Abdim's Stork and White Stork.

During the time of the inspection most fields contained tall standing maize crops. Between these cultivated areas and access dirt roads small island strips of tall grasslands persists comprising of *Cymbopogon nardus, Hyparrhenia tamba, H. hirta, H. dregeana* and *Hyperthelia dissoluta*. Weeds and alien herbs such as *Tagetes minuta, Bidens pilosa, Cosmos bipinnatus* and *Oenothera biennis* are also a common feature in these strips. This micro-habitat serves as important roosting and perching sites for smaller avifaunal species which regularly move between these micro-habitats and the cultivated areas. During the survey, species diversity was relatively low within these areas, however the species that were recorded, was relatively abundant with some forming regular, small to medium sized flocks. Species recorded within the cultivated areas as well as the grassland strips, included: Swainson's Spurfowl, Helmeted Guineafowl, Black-headed Heron, Speckled Pigeon, Red-backed Shrike, Southern Fiscal, Levaillant's Cisticola, Zitting Cisticola, African Stonechat, Cape Sparrow, Southern Masked Weaver, Red-billed Quelea, Yellow-crowned Bishop, Southern Red Bishop, Long-tailed Whydah, Common Waxbill, Pin-tailed Whydah and Black-throated Canary.

No red data species or conservation worthy avifaunal populations were noted within this habitat type.

Figure 7: Cultivated areas and roads fringed with strips of grassland

E. Overhead Power Lines (Mafube/Pan Transmission Line)

Overhead linear structures such as power lines and telephone lines are regularly used as perching sites for raptors and other avifaunal species such as some swallows, shrikes etc. Power lines and towers may also be utilized as roosting and nesting sites (e.g. swallows, Helmeted Guineafowl, various raptors).

The Mafube/Pan Transmission Power Line runs along the southern boundary of the study area and provides perching and potential roosting sites for species such as; Helmeted Guineafowl, Black-winged Kite, Steppe Buzzard, Red-eyed Dove,

Laughing Dove, Red-backed Shrike, Southern Fiscal, Cape Sparrow and Pin-tailed Whydah.

During the survey no large nests were noted as well as no important roosting sites.

Figure 8: Black-winged Kite perched on one of the Mafube/Pan power lines.

Micro-Habitats outside of the Study area

- » Secondary Plagioclimatic grassland
- » Open water bodies (Dams)
- » Railway line and associated bridges

To the south **fractured patches of grassland** persist mainly around wetland areas. Most of these grasslands are however secondary and have also been subjected to some form of disturbance such as ploughing and long-term overgrazing. Most of these secondary grasslands can furthermore be regarded as plagioclimatic (disturbance have prevented the grassland to develop further in terms of the successional process). A similar isolated patch is also present adjacent to the west of the study area. These grasslands are typically dominated by grasses with a less prominent herb/forb layer although forbs still contribute to the diversity of these areas. The dominant grass species and height structure of the grassland is greatly determined by the subjected grazing pressures. Severely grazed areas are characterised by a relative short grassland dominated by *Eragrostis plana, Aristida congesta, Sporobolus africanus* and *Eragrostis lehmanniana*. Those areas of grassland subjected to lower levels of grazing comprise of a taller grassland characterised by species such as *Hyparrhenia hirta, Trachypogon spicatus, Ctenium concinnum, Trachypogon leucothrix, Aristida junciformis, Eragrostis chloromelas* and *Eragrostis curvula*. These grasslands were slightly higher in species diversity although not as high as was expected. All of the species mentioned for the degraded grassland of the study area was recorded within these grasslands as well as a few passerines such as Sentinel Rock Thrush (Endemic), African Pipit, Cape

Longclaw (Endemic), Pin-tailed Whydah and Long-tailed Widowbird. Sand Martin, South African Cliff Swallow and Greater Striped Swallow was also regularly noted, crossing this micro-habitat in search of flying insects as prey. No red data species or conservation worthy avifaunal populations were noted within this habitat type.

A few **open water bodies** (Dams and perennial inundated pans) were located to the far south and south-east of the surveyed area. Dams have become important attractants to various bird species in the South African landscape. Various waterfowl, such as Spur-winged geese, Egyptian geese, and numerous duck species, may frequent these areas and are vulnerable to collision with power lines. More importantly, Blue Cranes use dams to roost in communally, and Flamingos may use these areas as stop over points while moving between larger water bodies. Various Storks may also frequent these water bodies. Of particular concern are the flamingos and Blue Cranes, both of which regularly fly at dusk and in low light, when electrical infrastructure may be more difficult for them to see. The only conservation worthy species noted was a flock of six species of Greater Flamingo (Near Threatened) recorded in one of the larger pans to the south-east of the study area (approximately 3.5km). The current development does not pose a threat to these species as there is no suitable habitat within the study area. It is more likely that these species will move between the larger water bodies, all of which is located south of the development. The height of the proposed power lines furthermore, are typically below the longer distance flight height of these species.

The **Railway line** runs mostly in an east to west direction south of the study area and overhead infrastructure and bridges (watercourse crossings) are regarded as notable artificial avifaunal micro-habitats. Bridge infrastructure, especially over watercourses provide valuable nesting sites for swallows and martins and the following avifaunal nests were observed underneath the surveyed bridges; Greater Striped Swallow, Sand martin, large colony of South African Cliff Swallow as well as a colony of Little Swift. The overhead infrastructure is very similar to that of the overhead power lines, as was the avifaunal species associated with this infrastructure and as such this aspect will not be dealt with.

Within **newly tilled firebreaks** around cultivated area approximately 1.2 km south-west of the study area, a number of Black-winged Pratincoles (Near Threatened) were recorded searching for exposed prey (insects) along the newly upturned paths. The proposed development will most likely have no impact on these birds.

Figure 9: Plagioclimatic grassland.

Figure 10: Railway bridge containing nests of a relative large colony of South African Cliff Swallow.

3.6 Important Bird Areas (IBA)

The proposed switching station and associated infrastructure is not located within or in close proximity to any Bird Area and will thus have no impact in this regard.

3.7 Avifauna species composition

A total of 328 species were recorded within the 2529DC Quarter Degree Grid SABAP1 & 2, whilst a total of 232 species were recorded within the affected Pentad (2545_2940) with 35 species (10.67%) classified as Red Data species (Barnes 2014) identified within the 2529DC Quarter Degree Grid. These include

» Critically Endangered (1 species): Wattled Crane;
» Endangered (6 species): Grey Crowned Crane, Yellow-billed Stork, African Marsh Harrier, Cape Vulture, Martial Eagle, Black Harrier;
» Near Threatened (12 species): Abdim's Stork, Marabou Stork, Greater Flamingo, Black-bellied Bustard, Half-collared Kingfisher, Lesser Flamingo, Maccoa Duck, Pallid Harrier, Red-footed Falcon, Chestnut-banded Plover, Black-winged Pratincole, Blue Crane;
» Vulnerable (12 species): Black Stork, Verreaux's Eagle, Lanner Falcon, African Finfoot, White-bellied Korhaan, Greater Painted-snipe, Caspian Tern, African Grass Owl, Southern Bald Ibis, Secretarybird, Yellow-breasted Pipit and Denham's Bustard. Furthermore, 53 species are southern African endemics (16.15%) and one species a South African breeding endemic.

Reporting rates are an indication of the relative density of a species on the ground in that it reflects the number of times that a species was recorded relative to the total number of cards that were completed for the pentad 1.

During the site survey a total of 58 bird species were recorded within the study and surrounding area with 5 species being endemic and 1 being a South African breeding endemic.

The most commonly recorded species within the study area were passerine of which Levaillant's Cisticola, Wailing Cisticola, Zitting Cisticola, Southern Masked Weaver, Red-billed Quelea, Common Waxbill, Pin-tailed Whydah, Black-chested Prinia, Barn Swallow, Greater Striped Swallow, African Stonechat, Common (Southern) Fiscal and Black-throated Canary, where the most common. Small raptors such as Black-winged Kite, Steppe Buzzard and Amur Falcon was also relatively abundant throughout the surveyed area, especially along overhead power lines. Other non-passerines that were regularly recorded within the study area as well as within the entire survey area included Helmeted Guineafowl, Swainson's Spurfowl, Speckled Pigeon and Red-eyed Dove.

Endemic species recorded during the site survey included Cape Shoveler, Black-chested Prinia, Sentinel Rock Thrush, Cape Sparrow and Cape Longclaw. South African Cliff Swallow was the only South African breeding endemic recorded.

No Red listed species were recorded within the study area. The following Red listed species were however, recorded within the study area; Greater Flamingo (Near Threatened) and Black-winged Pratincole (Near Threatened).

3.8 Avifauna species composition

Table 1 provides a guideline of the Red Data species that have and could potentially be encountered anywhere within the pentad where suitable habitat is available. This was based on observations of avifauna and micro-habitats during the site survey, in combination with documented records within the study area.

Report rates are the likelihood of a particular species occurring within the study site represented as a percentage. Due to the lack of atlas records and subsequent inaccuracies with regards to reporting rates within the proposed study site, these were not included in the analysis.

The specific habitat requirements for each species as well as the most likely associated impacts due to the development were recorded. Species that are in bold were recorded during the site survey.

Table 1: Red listed species that may potentially occur within the study area and surroundings (surveyed area). Species that have been recorded within the relevant pentad appears **Green** font, those recorded outside of the pentad but in the Quarter Degree Grid in **Black** and those species that have not been recorded with the Quarter Degree Grid but have a distribution that includes the study area in **Grey**. (NT = Near Threatened; VU = Vulnerable; EN = Endangered; LC = Least Concern)

Taxonomic name	Common Name	Red Data (Regional, Global)	Endemism	Habitat	Likelihood of occurrence	Susceptible to
Ciconia nigra	Stork, Black	VU, LC		Forages singly, occasionally in pairs/small groups in wetland habitats, dried up watercourses and small isolated pools. Roosts on cliff, tree or pylon.	Moderate	Collision / Electrocution
Ciconia abdimii	Stork, Abdim's	NT, LC		Gregarious and usually in flocks. Grassland, savanna woodland, pan edges, pastures and cultivated areas. Regularly found foraging on irrigated lands, pastures and ploughed fields. Roost in large trees (incl. *Eucalyptus*), or cliffs.	High	Collision / Electrocution
Leptoptilos crumeniferus	Stork, Marabou	NT, LC		Gregarious, sometimes singly. Open semi-arid grasslands, woodlands and wetlands. Roosts communally at traditional sites (large trees)	Moderate	Collision/ Electrocution
Mycteria ibis	Stork, Yellow-billed	EN, LC		Often in pairs or groups. Wide variety of wetland and aquatic habitats. Forages in shallow water free of emergent vegetation. Roosts communally on sandbanks, lake margins and large trees.	Low (High within surrounding area)	Collision / Electrocution
Geronticus calvus	Ibis, Southern Bald	VU, VU	E	Gregarious. High altitude grasslands, preferring short dense grasslands and areas recently burnt, ploughed, mowed or heavily grazed. Roosts communally, often with other ibises or herons and often in cliffs	High	Disturbance / Habitat loss / Collision

Phoenicopterus ruber	**Flamingo, Greater**	**NT, LC**		**Flocks greatly variable in size. Open water bodies (e.g. dams, sewage treatment works, ephemeral pans, river mouths and coastal mudflats). Breeds at recently flooded, large, eutrophic, shallow salt pans**	**Low (High within surrounding area)**	**Collision**
Phoenicopterus minor	Flamingo, Lesser	NT, NT		Flocks greatly variable in size. Open, eutrophic, shallow wetlands. Small, ephemeral freshwater wetlands important for smaller flocks. Colonial nester. Breeds on saline lakes and saltpans	Low (High within surrounding area)	Collision
Oxyura maccoa	Duck, Maccoa	NT, NT		Permanent wetlands in open grassland. Breeding habitat comprise of dense stands of emergent vegetation especially reeds, rushes and tall sedges.	Low (High within surrounding area)	Collision
Sagittarius serpentarius	Secretarybird	VU, VU		Pairs or sometimes solitary. Open grassland with scattered trees and shrubs. Roosts in crown of trees (mostly *Acacia* spp.).	High	Collision
Gyps coprotheres	Vulture, Cape	EN, VU	E	Roosts mostly in mountainous area but may utilize large trees and pylons. Very wide and varying foraging range (up to 121,655 km^2). Colonial nester.	Moderate (Foraging range)	Collision / Habitat loss / Disturbance / Electrocution
Aquila verreauxii	Eagle, Verreaux's	VU, LC		Usually in pairs. Mountains and rocky areas with cliffs. Roosts in cliffs or tall dead trees (e.g. *Eucalyptus*)	Low	Collision
Polemaetus bellicosus	Eagle, Martial	EN, VU		Open woodland in fairly flat country, also open shrubland with drainage line woodland or high-tension pylons, and open farmland with clumps of trees.	High	Collision / Electrocution

Circus ranivorus	Harrier, African Marsh	EN, LC		Usually solitary. Inland and coastal wetlands. May forage away from wetlands over moist grasslands, dried floodplains and croplands. Frequently raids weaver, heron and egret colonies (eggs and chicks). Nests typically in reed patches near water.	Low (High within surrounding area)	Collision / Disturbance
Circus macrourus	Harrier, Pallid	NT, NT		Usually solitary. Moist grasslands fringing open pans or floodplains; also, croplands and recently burnt areas. Roosts in rank grass. Non-breeding migrant.	Moderate (High within surrounding area)	Collision / Disturbance
Circus maurus	Harrier, Black	EN, VU	E	Usually solitary. Dry grassland, Karoo scrub and agricultural fields. Avoids burnt areas (for several years). Perching and roosting on ground, anthills, fence post, normally near nesting site. Nests placed just above ground, often in rank marsh grasses or sedges.	High	Disturbance
Falco biarmicus	Falcon, Lanner	VU, LC		Singly or in pairs. Open grassland, open or cleared woodland, and agricultural areas. Nesting sites includes; cliffs (normally), large trees, electricity pylons and buildings). May utilize existing nests of other species, e.g. crows and other raptor species.	High	Collision/ Disturbance / Habitat loss / Electrocution
Falco vespertinus	Falcon, Red-footed	NT, NT		Gregarious. Open habitat with some trees, including semi-forested areas, forest fringes, croplands and wetlands. Mostly associated with open, grassy, arid woodland. Often utilizes dead trees, telephone poles and wire and fence lines as perches. Roosts in small tree clumps (often *Eucalyptus* stands). Non-breeding migrant.	Moderate	Collision/ Disturbance / Habitat loss / Electrocution

Bugeranus carunculatus	Crane, Wattled	CR, VU		Fairly shallow wetlands (permanent) with extensive short, emergent vegetation, especially sedges and surrounded by grassland. May be observed around farm dams. Seldomly found foraging in cultivated fields and pastures.	High	Collision
Anthropoides paradiseus	Crane, Blue	NT, VU	E	Flocks of varying size. Open grassland but also wetlands, pastures and croplands. Frequently observed in cultivated fields. Roosts in shallow water bodies. Breeds in varies habitats including marshes, wet ground and grassland with a clear all-round visibility as the most important requirement.	Low (Moderate within surrounding area)	Collision
Balearica regulorum	Crane, Grey Crowned	EN, EN		Flocks of variable size. Breeds in marshes, pans and dams with fairly tall emergent vegetation. Forages in short to medium-height open grassland, sometimes lightly wooded; also, extensively in cultivated fields and pastures,	Moderate	Collision
Podica senegalensis	Finfoot, African	VU, LC		Quiet, wooded streams and rivers flanked by thick riparian vegetation and overhanging trees. Also dams with overhanging vegetation and/or dense reed cover. Avoids both stagnant and fast flowing water with a preference for clear water.	Low	Collision
Neotis denhami	Bustard, Denham's	VU, NT		Singly or in groups of varying sizes. Breeds in relative open grassland and fynbos. May forage into lightly wooded areas but prefers high-lying, open, sour grassland, often in rocky areas. Occasionally found in cultivated fields. Attracted to burnt areas. Avoids heavily grazed areas.	Moderate (High within surrounding grasslands and cultivated areas)	Collision

Eupodotis senegalensis	Korhaan, White-bellied	VU, LC		Fairly tall, dense grassland. Sometimes in open or lightly wooded, undulating to hilly areas. Seldomly found on modified pastures and burnt areas.	Low (High within surrounding tall grassland areas)	Collision
Eupodotis caerulescens	Korhaan, Blue	LC, NT	E	In pairs of family parties. Flat and undulating areas in grassland and Nama Karoo. Often in moist grasslands. Sometimes attracted to burned areas. Favours short vegetation. Group roosting (tight huddles) on open ground or in long grass.	High	Collision / Disturbance
Lissotis melanogaster	Bustard, Black-bellied	NT, LC		Solitary. Tall dense grassland and grassy savanna in hilly or flat areas. Often at wetland margins and occasionally in cultivated pastures, fields and fallow lands	Low	Collision / Disturbance
Rostratula benghalensis	Painted-snipe, Greater	VU, LC		Solitary, in pairs or small groups. Dams, pans and marshy river flood plains. Favours waterside habitats with substantial cover and receding water levels with exposed mud among vegetation	Low	Collision / Disturbance
Charadrius pallidus	Plover, Chestnut-banded	NT, NT		Singly or in pairs but may occur in large flocks outside breeding season. Natural and man-made saltpans. Rarely in freshwater habitats	Low	Collision
Limosa limosa	Godwit, Black-tailed	NA, NT		Singly or in small flocks. Wide variety of wet habitats including highveld pans. Prefers inland lake margins, marshes, swamps and irrigated lands.	High	Collision
Glareola nordmanni	**Pratincole, Black-winged**	**NT, NT**		**Highly gregarious forming large colonies. Always near water and damp grasslands or marshes overgrown with dense grass. In winter may prefer open grassland,**	**High**	**Collision / Disturbance**

				edges of pans and cultivated fields. Breeds mainly on alkaline flats and saltpans in river valleys and lake depressions, also on fields and fallow lands devoid of vegetation		
Sterna caspia	Tern, Caspian	VU, LC		Solitary or in family groups. Large water bodies (natural and man-made). Prefers saline pans and large impoundments. Breeds on small, low islets in pans and dams. Forages in clear, shallow water	Low (High within large pans and water bodies within surrounding area.	Collision
Tyto capensis	Owl, African Grass	VU, LC		Treeless, grassland with damp substrata. Mainly around marshes and vleis. Favours patches of tall, rank grass, sedges or weeds. Perches and roosts on ground.	High	Collision / Disturbance
Alcedo semitorquata	Kingfisher, Half-collared	NT, LC		Solitary or in pairs. Clear, fast flowing perennial streams, rivers and estuaries, usually narrow and secluded with dense marginal vegetation. Often near rapids.	Low	Disturbance
Anthus chloris	Pipit, Yellow-breasted	VU, VU	E	Dry to moist grassland and vlei margins. Sometimes in short, overgrazed or burnt grassland, but prefers medium to tall rank grass.	Low	Collision
Mirafra cheniana	Lark, Melodious	LC, NT	E	Solitary or in pairs. Grassland dominated by relative short tufted grasses with opens spaces between tussocks. Occasionally in planted pastures. Avoids wet lowlands	Moderate	Disturbance
Heteromirafra ruddi	Lark, Rudd's	EN, VU		High-rainfall grassland on hilltops, plateau and ridges. Avoids valley bottoms, steeper slopes and rocky areas. Favours sites with short,	Low	Disturbance

				dense grass cover. Optimal habitat formed by annual burning and heavy winter grazing.		
Spizocorys fringillaris	Lark, Botha's	EN, EN	E	Heavily-grazed upland grassland in sour grassveld. Avoids longer grass in valley bottoms, poorly drained areas, planted pastures, croplands and rocky areas.	Low	Disturbance

4 SENSITVITY ASSESSMENT

It is important to delineate sensitive avian habitats within the study area in order to ensure the development does not have a long term negative impact on these habitats. Important avian habitats play an integral role in their persistence within a landscape providing nesting, foraging and reproductive benefits.

A sensitivity map was compiled for the study area by making use of the results of the avifaunal micro-habitat assessment (refer to Figure 14).

The majority of the study area and surrounding surveyed area has been assessed as being of **LOW** sensitivity from an avifaunal perspective. The entire footprint area is located within a low sensitive area as a result of historical disturbances (cultivation) which has resulted in a severely altered and degraded area in turn resulting in some loss of appropriate habitat and foraging area. The surrounding temporary wetland has been classified as **Medium-Low** sensitivity as these habitats may temporary provide potential preferable habitat for waterfowl and waders (during periods of inundation). However, due to the layout, length and direction of the proposed power lines these power lines do not pose a potential threat to such species. The valley-bottom wetland and associated seepages have been classified as **Medium-High** sensitivity due to its connectivity to downstream wetland and aquatic habitats and due to the fact that this area may provide a corridor of movement / migration for several bird species. Furthermore, a buffer of 100m have been awarded and is applicable for power line as well as communication tower infrastructure (also **Medium-High**). The proposed power line routes (both options) is located outside of these buffer zones and will likely have very little impact on bird species using these watercourses and wetlands as flight paths. Acceptable change within the study area includes the alteration of habitat within the development footprint and servitude and some loss of potential nesting sites within these areas due to the clearing of large shrubs and tree species (alien trees), however most of these species will move into the surrounding unaffected habitats.

From the described sensitive areas and the location of the proposed development footprint area relative to these areas, it can be concluded that the majority of the proposed development will occur within a **LOW** sensitivity avifaunal area with no proposed impacts on Medium-Low and Medium-High sensitive avifaunal areas.

Overall, it was concluded that with the necessary mitigation measures implemented this **development will have little impact on the avifaunal character of the area with minimal loss due to collision.** Both power line corridor options traverse similar habitats and subsequently will have similar impacts. In terms of the access roads, both options will traverse similar low sensitive habitats and

subsequently any of the options is regarded as suitable from and avifaunal perspective.

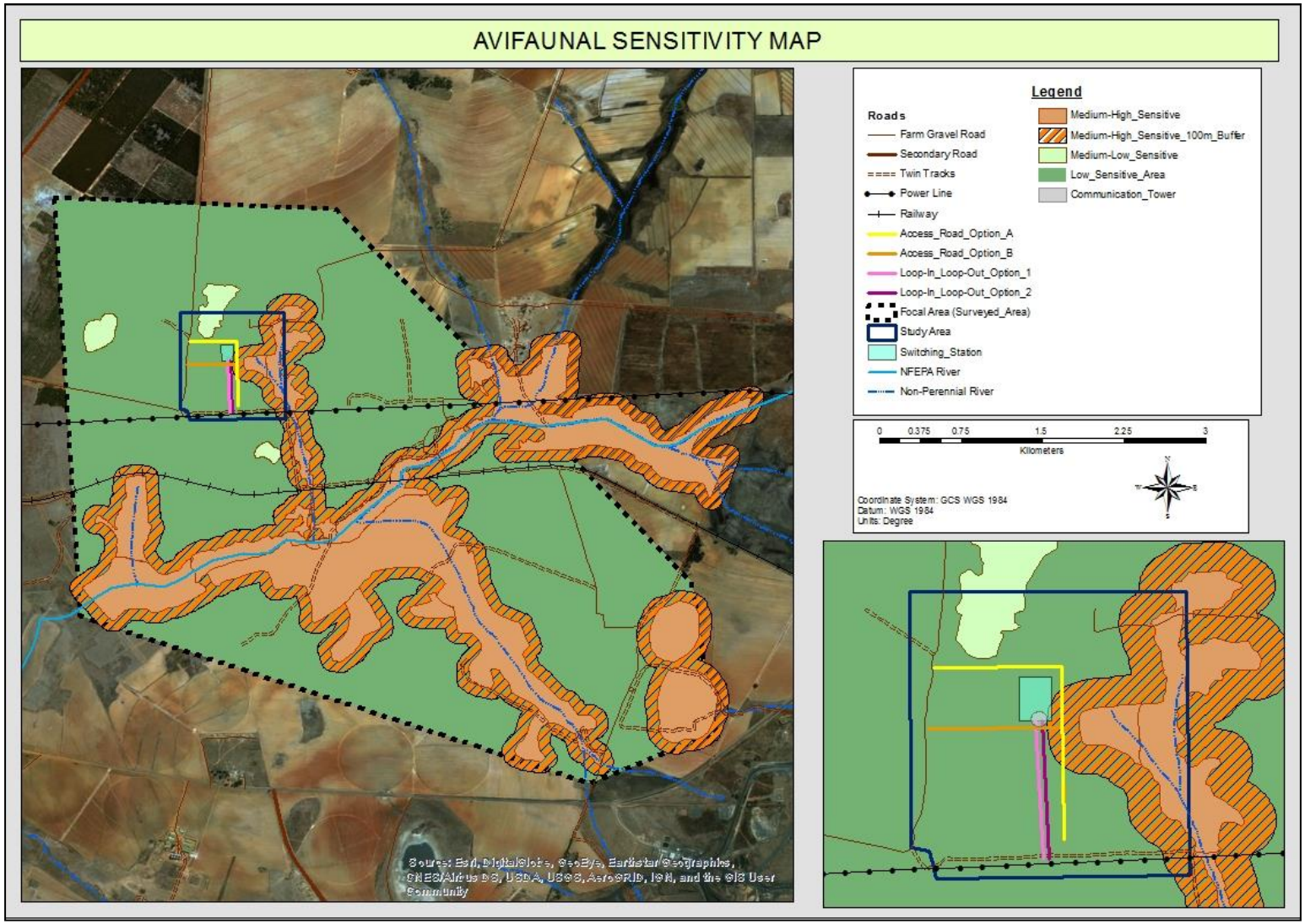

Figure 11: Avifaunal sensitivity map for the Zonnebloem Switching station and associated infrastructure.

5 IMPACT ASSESSMENT

5.1 Methodology used to assess the potential impacts

The Environmental Impact Assessment methodology assists in the evaluation of the overall effect of a proposed activity on the environment. This includes an assessment of the significant direct, indirect, and cumulative impacts. The significance of environmental impacts is to be assessed by means of the criteria of extent (scale), duration, magnitude (severity), probability (certainty) and direction (negative, neutral or positive).

» The **nature**, which includes a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being low and 5 being high).
» The **duration**, wherein it was indicated whether:
  - the lifetime of the impact will be of a very short duration (0 – 1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2 – 5 years) – assigned a score of 2;
  - medium-term (5 -15 years) – assigned a score of 3;
  - long term (> 15 years) – assigned a score of 4; or
  - permanent – assigned a score of 5;
» The **magnitude**, quantified on a scale from 0 – 10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability** *of occurrence*, which describes the likelihood of the impact actually occurring. Probability was estimated on a scale of 1 -5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
» The **significance**, was determined through a synthesis of the characteristics described above and can be assessed as **LOW**, **MEDIUM** or **HIGH**; and
» the **status**, which was described as either positive, negative or neutral.
» the degree of which the impact can be reversed,
» the degree to which the impact may cause irreplaceable loss of resources,

» the degree to which the impact can be mitigated.

The significance was calculated by combining the criteria in the following formula:

S=(E+D+M)P where;

» S = Significance weighting
» E = Extent
» D = Duration
» M = Magnitude
» P = Probability

The significance weightings for each potential impact are as follows;

» < 30 points: **LOW** (i.e. where the impact would not have a direct influence on the decision to develop in the area),
» 30 – 60 points: **MEDIUM** (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: **HIGH** (i.e. where the impact must have an influence on the decision process to develop in the area).

5.2 Impact Statement

The implications of the proposed development are as follows:

» Vegetation within the servitude which extends along the length of the power line, will be altered to some extent, although still deemed largely suitable to various avian species.
» Vegetation along the proposed access road will be cleared and will lead to a small percentage of habitat loss.
» During the construction phase of the switching station, power line and other associated infrastructure, disturbance levels will be significantly higher in the immediate vicinity than previously. This disturbance will result from machinery and vehicle disturbance as well as other construction activities.
» During the operational phase, there will be some vehicle activity during maintenance of the switching station and power line.
» The power line and potentially the communication tower, will potentially pose a collision risk to avifauna, particularly heavier birds with low manoeuvrability.
» The power line towers and the switching station infrastructure provide perching and nesting structures for various avifauna, particularly larger raptors.
» There is a possibility that species such as crows/owls could be electrocuted on switching station infrastructure.

The tables below provide an assessment of the potential impacts associated with the proposed project. As both power lines as well as access roads traverse, similar habitat the potential impacts will be the same for both power line options as well as access road options and subsequently the impact statements provided below are applicable for both options (for power lines and access roads). Furthermore, most impacts are applicable, and similar, for both the construction, operational as well as decommissioning phase and thus the statement will only be provided once (will be mentioned within statement to what phase it has relevance).

The impacts were assessed as follows:

A. PROPOSED LOOP-IN-LOOP-OUT POWER LINES AS WELL AS THE COMMUNICATION TOWER

I. Construction Phase Impacts

Impact 1: Habitat Destruction

Nature: Habitat Destruction

During the **construction** of the power lines (loop-in loop-out) as well as the communication tower, some habitat destruction and alteration will occur, although this will be limited due to the short distance. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed power line routes as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will loose valuable habitat. Furthermore, the limited displacement that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (28)**	**Low (15)**
Status	Negative	Negative

Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes.	
Mitigation	• The temporal and spatial footprint of the development should be kept to a minimum. • The boundaries of the development footprint are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Provide adequate briefing for site personnel on the possible important (Red Data) species occurring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of area until appropriate recommendations have been provided by a specialist). • The above measures must be covered in a site specific EMPr and monitored by an ECO.	
Residual	The residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.	
Cumulative	The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.	

Impact 2: Disturbance

Nature: Disturbance

The disturbance of avifauna during the **construction** of the power lines (loop-in loop-out) as well the communicatin tower may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories.

Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the

above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species. The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed substation is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (3)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (24)**	**Low (15)**
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	
Mitigation	• Strict control must be maintained over all activities during construction, in line with an approved construction EMPr. • During construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The construction equipment camps must be as close to the site as possible. • Contractors and working staff should remain within the development footprint and movement outside these	

	areas especially into avian micro-habitats must be restricted. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.
Residual	The residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.
Cumulative	Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.

II. Operation Phase Impacts

Impact 1: Disturbance

Nature: Disturbance during Operation Phase due to maintenance activities See description for construction disturbance impacts mentioned above.		
	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes.	

Mitigation	• Strict control must be maintained over all activities during operation, in line with an approved operation EMPr. • Vehicle movements must be restricted to existing roads and a speed limit of 30km/h must be implemented on all roads associated with the power line during the operation phase. • Contractors and working staff should remain within the development footprint and movement outside these areas, especially into avian micro-habitats, must be restricted.
Residual	The residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.
Cumulative	The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Impact 2: Electrocution of birds due to overhead power lines

Nature: Electrocution of birds on overhead power lines

Electrocution of birds on associated overhead power lines is an important cause of mortality for a variety of large bird species particularly storks, cranes and raptors in South Africa (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; Lehman et al. 2007).

Due to the short distance of the proposed loop-in loop-out power lines, limited space for perching is available. However, numerous small raptor species such as Black-winged Kite, Steppe Buzzard and Amur Falcon were recorded, using the existing Mafube/Pan traction line as perch and thus it is highly likely that some of these species may also use the new proposed loop-in loop-out lines. The impact of electrocution on avifauna may be of moderate significance before mitigation, and low significance after the mitigation (in the form of bird friendly structures).

	Without Mitigation	**With Mitigation**
Extent	Medium (2)	Medium (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)

Probability	Probable (3)	Improbable (2)
Significance	**Moderate (36)**	**Low (20)**
Status	Negative	Negative
Reversibility	Low (birds will be injured or killed)	Low (birds will be injured or killed)
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes.	
Mitigation	• A "Bird Friendly" structure, with a bird perch (as per standard Eskom guidelines) must be used for the tower structures. • All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002). • Installation of artificial bird space perches and nesting platforms should be installed, at a safe distance from energised components (Goudie 2006; Prinsen et al. 2012). • Line inspections should be ongoing for the operational life of the line.	
Residual	The power line infrastructure will be within the area over a long period of time, if not permanently. However, if the power line infrastructure is removed the impacts associated (avian injuries and mortalities) will cease	
Cumulative	Due to the fact that the larger area is characterised by numerous overhead power lines the cumulative impact of electrocution along with collision is probably the most potential significant impacts. However, due to the limited extent of the power lines as well the fact that the proposed alignment is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of the power line to this cumulative impact is small.	

Impact 3: Collisions of Birds with overhead power lines

Nature: Collision with the power line

Collisions are the biggest single threat posed by transmission power lines to birds in Southern Africa (van Rooyen 2004). Avian species most susceptible and impacted upon are bustards, storks and cranes. These species are heavy-bodied birds with limited manoeuvrability (as a result of high wing loading), which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (Van Rooyen 2004,

Anderson 2001). Many of the collision sensitive species are considered threatened in Southern Africa.

The Red Data species that are vulnerable to power line collisions are generally long living, slow reproducing species. Furthermore, various species require specific conditions for breeding, resulting in very few successful breeding attempts and breeding might be restricted to very small areas. Consistent high adult mortality over an extensive period could have serious long term effects on the population.

Potential collision impacts (risk) with the proposed power line by certain species such as Bustard, Cranes and Secretary birds are possible. This is particularly true for the Bustards which have low manoeuvrability once in flight. All three-species mentioned have been recorded within the top ten avian species in South Africa prone to collisions with overhead power lines.

No Red Data species were recorded within the immediate area of the proposed power line routes as well as within the surrounding area. Due to lack of suitable habitat, it is envisaged that very limited avifauna, especially Red Data species will utilise the area and subsequently overall, the impact are considered to be of moderate to low significance. This rating is related to the number and frequency of large avifaunal species such as bustard and korhaan inhabiting or visiting the traversed habitat.

	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (33)**	**Low (18)**
Status	Negative	Negative
Reversibility	Low (birds will be injured or killed)	Low (birds will be injured or killed)
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes.	
Mitigation	• Mark sections of line in high to medium-high sensitive areas with anti-collision marking devices (diurnal and nocturnal diverters) to increase the visibility of the power line and reduce likelihood of collisions. Marking devices should be spaced 10 m apart, and must be installed as soon as the conductors are strung.	

	• These line marking devices include spiral vibration dampers, strips, Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags and aviation balls (Prinsen et al. 2012). • Construction of the power lines in close proximity to the existing power line will reduce the cumulative impacts and collision risk. All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002). • Line inspections should be ongoing for the operational life of the line.
Residual	The power line infrastructure will be within the area over a long period of time, if not permanently. However, if the power line infrastructure is removed the impacts associated (avian injuries and mortalities) will cease
Cumulative	Due to the fact that the larger area is characterised by numerous overhead power lines the cumulative impact of electrocution along with electrocution is probably the most potential significant impacts. However, due to the limited extent of the power lines as well the fact that the proposed alignment is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of the power line to this cumulative impact is small.

III. Decommissioning Phase Impacts

Impact 1: Disturbance

Disturbance during Decommissioning Phase due to maintenance activities See description for potential disturbance during operational phase above.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (3)	Minor (2)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (24)**	**Low (15)**
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources

Can impacts be mitigated?	Impacts can be mitigated to a large extent.
Mitigation	• Strict control must be maintained over all activities during decommissioning, in line with an approved construction EMPr. • During decommissioning, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The decommissioning equipment camps must be as close to the site as possible. • Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.
Residual	Some disturbance during the decommissioning phase is inevitable. It is likely that some species will be disturbed and potentially displaced. However, most of these species will move to similar artificial habitats. Some species will likely return post decommission.
Cumulative	Refer to cumulative impacts for construction phase

B. PROPOSED ACCESS ROAD OPTIONS (BOTH ALTERNATIVES)

I. Construction Phase Impacts

Impact 1: Habitat Destruction

Nature: Habitat Destruction

During the **construction** of the access road, some habitat destruction and alteration will occur, although this will be limited due to the short distance. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed access road alignment options as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will lose valuable habitat. Furthermore, the limited displacement

that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.				
	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)	Minor (2)	Small (0)
Probability	Highly Probable (4)	Probable (3)	Highly Probable (4)	Probable (3)
Significance	**Low (28)**	**Low (15)**	**Low (28)**	**Low (15)**
Status	Negative	Negative	Negative	Negative
Reversibility	High	High	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes.			
Mitigation	• The temporal and spatial footprint of the development should be kept to a minimum. • The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Provide adequate briefing for site personnel on the possible important (Red Data) species occurring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of the area until appropriate recommendations have been provided by a specialist). • The above measures must be covered in a site specific EMPr and monitored by an ECO.			
Residual	The residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some habitat loss during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance			

	were recorded within the study area and have a low likelihood of utilizing this area. Furthermore, the vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place
Cumulative	The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the access road and the fact that both road options is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Impact 2: Disturbance

Nature: Disturbance

The disturbance of avifauna during the **construction** of the access route may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories.

Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern are may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed access route is anticipated to be of low significance as birds will temporarily move away from the area. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance) phases.

	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)

Duration	Short-term (2)	Very Short-term (1)	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)	Highly Probable (4)	Probable (3)
Significance	**Low (24)**	**Low (15)**	**Low (24)**	**Low (15)**
Status	Negative	Negative	Negative	Negative
Reversibility	High reversibility	High reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.			
Mitigation	• Strict control must be maintained over all activities during construction, in line with an approved construction EMPr. • During construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The construction equipment camps must be as close to the site as possible. • Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.			
Residual	Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as			

	nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.
Cumulative	Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.

II. Operation Phase Impacts

Impact 1: Disturbance

Nature: Disturbance during Operation Phase due to maintenance activities See description for construction disturbance impacts mentioned above.				
	Alternative A		**Alternative B**	
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Low (1)	Low (1)	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**	**Low (27)**	**Low (21)**
Status	Negative	Negative	Negative	Negative
Reversibility	High reversibility	High reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes.			
Mitigation	• Strict control must be maintained over all activities during operation, in line with an approved operation EMPr. • Vehicle movements must be restricted to existing roads and a speed limit of 30km/h must be implemented on			

	all roads associated with the power line during the operation phase. • Contractors and working staff should remain within the development footprint and movement outside these areas, especially into avian micro-habitats, must be restricted.
Residual	Some disturbance during the operational phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.
Cumulative	The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

III. Decommissioning Phase Impacts

Impact 1: Disturbance

Disturbance during Decommissioning Phase due to maintenance activities See description for potential disturbance during operational phase above.				
	Without Mitigation	**With Mitigation**	**Without Mitigation**	**With Mitigation**
Extent	Local (1)	Local (1)	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)	Highly Probable (4)	Probable (3)
Significance	**Low (24)**	**Low (15)**	**Low (24)**	**Low (15)**
Status	Negative	Negative	Negative	Negative
Reversibility	High reversibility	High reversibility	High reversibility	High reversibility

Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.			
Mitigation	• Strict control must be maintained over all activities during decommissioning, in line with an approved construction EMPr. • During decommissioning, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The decommissioning equipment camps must be as close to the site as possible. • Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.			
Residual	Some disturbance during the decommissioning phase is inevitable. It is likely that some species will be disturbed and potentially displaced. However, most of these species will move to similar artificial habitats. Some species will likely return post decommission.			
Cumulative	Refer to cumulative impacts for construction phase			

C. PROPOSED SWITCHING STATION

I. Construction Phase Impacts

Impact 1: Habitat Destruction

Nature: Habitat Destruction

During the **construction** of the switching station, some habitat destruction and alteration will occur, although this is will be limited. These activities may have a very slight impact on foraging, breeding and roosting ecology of avian species within the area through modification of habitat.

No Red Data species were recorded within the immediate area of the proposed power line routes , the switching station as well as within the surrounding area. Due to lack of suitable habitat it is envisaged that very limited avifauna will be impacted with the likelihood of no Red Data species that will lose valuable habitat. Furthermore, the limited displacement that may occur, will only be from a very restricted area. The impact on smaller, non-Red Data species that are potentially breeding in the area will be local and very restricted in extent, and will not have a significant effect on regional or national populations.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (15)**
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes.	
Mitigation	• The temporal and spatial footprint of the development should be kept to a minimum. • The boundaries of the development footprint areas are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Provide adequate briefing for site personnel on the possible important (Red Data) species occurring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of area until appropriate recommendations have been provided by an avifaunal specialist). • The above measures must be covered in a site specific EMPr and monitored by an ECO.	
Residual	The residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity. Furthermore, the vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place	

Cumulative	• The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the footprint and the fact that the switching station is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.

Impact 2: Disturbance

Nature: Disturbance

The disturbance of avifauna during the **construction** of the switching station may occur. Species sensitive to disturbance include ground-nesting species resident within the development footprint. Disturbance can also influence the community structure of avifauna within close proximity to the development as certain species will be displaced and forced to find alternative territories.

Disturbance could have a negative impact on the breeding activities of various species, particularly if this occurs during a sensitive period in the breeding cycle.

Species of concern may include Storks, Secretarybird, Black Harrier, Cranes, Korhaan and Bustard species. None of these species were recorded within the focal or larger surveyed area and due to a lack of suitable habitat within the study area it is unlikely that the above-mentioned species will utilise this area. Other small avian species do occur within the development footprint but these species are non-Red Data species.

The proposed site is located within an agricultural region with study area situated within a highly degraded and transformed habitat due to historical cultivation. Therefore, species within this landscape often experience disturbance. As a result, disturbance of birds by the proposed switching station is anticipated to be of low significance as birds will move away from the area temporarily. The relatively small scale of the development (in relation to the large agricultural landscape) is unlikely to have a significant impact on avifauna. However, species are particularly sensitive to disturbance during the breeding season and this must be borne in mind during both the construction and operational (maintenance).

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (24)**	**Low (15)**

Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	
Mitigation	• Strict control must be maintained over all activities during construction, in line with an approved construction EMPr. • During construction, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such a buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The construction equipment camps must be as close to the site as possible. • Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted.	
Residual	Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.	
Cumulative	Cumulative impacts are regarded as very low due to the fact that the footprint area which will be exposed to disturbance is very limited. Furthermore, no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.	

II. Operation Phase Impacts

Impact 1: Disturbance

Nature: Disturbance during Operation Phase due to maintenance activities See description for construction disturbance impacts mentioned above		
	Without Mitigation	**With Mitigation**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (18)**
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Very limited loss of resources	Very limited loss of resources
Can impacts be mitigated?	Yes.	
Mitigation	• Strict control must be maintained over all activities during operation, in line with an approved operation EMPr. • Contractors and working staff should remain within the development footprint and movement outside these areas, especially into avian micro-habitats, must be restricted.	
Residual	Some disturbance during the operational phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant as only limited habitat will be lost which in its current state already contain limited species diversity.	
Cumulative	The larger area is characterised by large scale habitat transformation (cultivation, plantations, historical cultivation, numerous power lines, railway and roads). However, the contribution of this development to the cumulative impacts is regarded as very small due to the limited extent of the power line and the fact that both the power line and communication tower is located within an already severely degraded and transformed habitat resulting little loss of natural habitat.	

Impact 2: Electrocution of Birds due to substation infrastructure

Nature: Electrocution of birds on substations infrastructure

Since there is live hardware in the switching station yard, the potential exists for birds to bridge the gap between a phase and earth resulting in electrocution. However, very few electrocutions have been recorded on switching stations. Species likely to be affected are crows, ravens and other species that are tolerant of disturbance. Small raptors such as Lanner Falcons, Amur Falcons and Lesser Kestrel are sometimes attracted into switching station yards in pursuit of species nesting there such as sparrows and canaries and may be susceptible to electrocutions.

The impact of electrocution from the switching station infrastructure are considered to be much lower of significance once mitigation in the form of bird friendly structures and bird deterrent measures have been put in place. Species likely to be affected are crows and other non-threatened species with the majority of threatened species avoiding the switching station yard as they are sensitive to disturbances.

	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (14)**
Status	Negative	Negative
Reversibility	Low (birds will be injured or killed)	Low (birds will be injured or killed)
Irreplaceable loss of resources	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation	• All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting, 2002). • Installation of artificial bird space perches and nesting platforms, at a safe distance from energised components (Goudie, 2006; Prinsen et al., 2012).	
Residual	The switching station and associated infrastructure will be within the area over a long period of time, if not permanently. However, if the facility and infrastructure is removed the impacts associated (avian injuries and mortalities) will cease	
Cumulative	Due to the fact that the larger area is characterised by numerous overhead power lines and other infrastructure posing similar threats, the cumulative impact of	

	electrocution is probably the most potential significant impact. However, due to the limited size of the switching station as well the fact that the proposed footprint is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of the power line to this cumulative impact is small.

III. Decommissioning Phase Impacts

Impact 1: Disturbance

Disturbance during Decommissioning Phase due to maintenance activities See description for potential disturbance during construction phase above.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Very Short-term (1)
Magnitude	Minor (3)	Minor (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (24)**	**Low (15)**
Status	Negative	Negative
Reversibility	High reversibility	High reversibility
Irreplaceable loss of resources	Only a slight loss of resources	Only a slight loss of resources
Can impacts be mitigated?	Impacts can be mitigated to a large extent.	
Mitigation	• Strict control must be maintained over all activities during decommissioning, in line with an approved construction EMPr. • During decommissioning, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such a buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The decommissioning equipment camps must be as close to the site as possible.	

	• Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.

D. CUMULATIVE IMPACTS

There are similar infrastructure within a 10km radius from the project site. These include:

- Mafube 13kV Substation situated ~7,9km south-east of the study area;
- Nitens 132kV Substation~7,8 km north of the study area
- 132kV Mafube/Pan Traction power line which traverses the southern boundary of the project site;
- 132kV Nitens Trac-Pan Traction power line ~4km west of the study area;
- 132kV Kleindam Traction/Nitens Traction power line ~7,9km south-east of the study area
- 132kV Arnot Traction/Mafube power line ~7,3km north of the study area;
- 275kV Arnot Simplon power line ~7,9km south-east of the study area;
- 400kV Arnot Merensky power line ~7,9km south-east of the study area; and
- 132 kV Derwent Trac-Pan Traction ~10km east of the study area.

The larger surrounding area is characterized by numerous disturbances including current cultivation, historical cultivation, plantations, numerous power line structures, as listed above, railway line and numerous roads and other infrastructure. Subsequently all of these disturbances have had a cumulative impact on avifaunal populations and it is expected that the proposed development will also contribute to these impacts including further loss of available habitat, disturbance of species most notably, Red Data Species, important populations and breeding populations. Red Data species and important bird populations of the region as well as a larger scale (national) may potentially by furthermore impacted through mortality due electrocution and collision with associated infrastructure. However, due to the limited size of the proposed development as well the fact that the proposed footprint is located in a severely degraded habitat with limited species diversity and no recorded red data species and important avifaunal population, the contribution of this development to such cumulative impacts are regarded as low to minor.

Impact 1: Habitat Destruction

The proposed development will be largely situated within an area characterized by numerous disturbances resulting in a severely altered and transformed landscape. The study area for the development itself is situated within such a severely degraded landscape (old cultivated area) and subsequently suitable habitat has been lost to a great extent with little avifaunal biodiversity recorded within the study area. Included within the study area are existing power line infrastructure (Mafube/Pan Traction Line etc.). Subsequently, due to above mentioned, the cumulative impact of the development will be low.

Minimal additional destruction and alteration of habitats will occur, cumulative and thus, will also have limited impact on foraging, breeding and roosting ecology of avian species.

	Cumulative impact of the project and other projects in the area	**Overall impact of the proposed project considered in isolation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (14)**	**Low (10)**
Status	Neutral to Slightly Negative	Neutral to Slightly Negative
Reversibility	High	
Irreplaceable loss of resources	Very limited loss of resources	
Can impacts be mitigated?	Yes.	
Mitigation	• The temporal and spatial footprint of the development should be kept to a minimum. • The boundaries of the development footprint are to be clearly demarcated and it must be ensured that all activities remain within the demarcated footprint area. • Provide adequate briefing for site personnel on the possible important (Red Data) species occurring and/or nesting in the area and the procedures to be followed (for example notification of ECO and avoidance of area until appropriate recommendations have been provided by ECO).	

	The above measures must be covered in a site specific EMPr and monitored by an ECO.
Residual Impacts	Although some habitat destruction will be unavoidable, the residual impact will be low as only limited habitat will be lost which in its current state already contain limited species diversity. Furthermore, the vegetation within the development area can be rehabilitated after the life time of the facility if proposed mitigation measures are put in place.

Impact 2: Disturbance

See above description of the condition of the study area and surroundings. Due to highly degraded condition, biodiversity was low and comprised of highly adaptable avifaunal species that will simply move away, following a disturbance and may in the future again utilize the newly created anthropogenic "habitats" (i.e. power line towers).

Due to a lack of suitable habitat within the study area minimal additional disturbance of avifaunal species will occur and will have very little impact on sensitive ground-nesting species, cumulative, as well as on the community structure of avifauna of the region.

	Cumulative impact of the project and other projects in the area	**Overall impact of the proposed project considered in isolation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (14)**
Status	Neutral to Slightly Negative	
Reversibility	High	
Irreplaceable loss of resources	Very limited loss of resources	
Can impacts be mitigated?	Yes.	
Mitigation	• Strict control must be maintained over all activities associated with the development, in line with an approved EMPr.	

	• During all phases associated with the development, if any of the Red Data species identified in this report are observed to be roosting and/or breeding in the vicinity, the ECO must be notified and were deemed necessary an appropriate buffer should be placed around the nests and/or roosting areas. If uncertain on the size of such buffer the Environmental Officer (EO) may contact an avifaunal specialist for advice. • The equipment camps must be as close to the site as possible. • Contractors and working staff should remain within the development footprint and movement outside these areas especially into avian micro-habitats must be restricted. • Driving must take place on existing roads and a speed limit of 30km/h must be implemented on all roads associated with the project during the construction phase.
Residual Impacts	Some disturbance during the construction phase is inevitable. It is likely that some species will be disturbed and potentially displaced by the development. However, the residual impact will be very low to almost insignificant due to the limited footprint which will be exposed to some form of disturbance during construction. As well as the fact that no important avifaunal species (Red Data) as well as nests and roosting areas of such species vulnerable to disturbance were recorded within the study area and have a low likelihood of utilizing this area.

Impact 3: Electrocution of Birds due to switching station infrastructure

Potential cumulative impacts are regarded as low due to the limited extent of infrastructure posing a potential electrocution threat, subsequently contributing a small to minor fraction to this cumulative impact within the larger region. Furthermore, due to limited suitable habitat and foraging, diversity of avifaunal species was low with no records of any Red Data species and important population with the study area and as such it can be concluded that the proposed development will contribute very little to this cumulative impact, especially regarding this threat towards Red Data species.		
	Cumulative impact of the project and other projects in the area	**Overall impact of the proposed project considered in isolation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Small (0)
Probability	Slightly Probable (2)	Improbable (2)

Significance	**Low (16)**	**Low (10)**
Status	Neutral	
Reversibility	High	
Irreplaceable loss of resources	No additional loss of resources expected	
Can impacts be mitigated?	Yes.	
Mitigation	• All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting, 2002). • Installation of artificial bird space perches and nesting platforms, at a safe distance from energised components (Goudie, 2006; Prinsen et al., 2012).	
Residual Impacts	The proposed development will be within the area over a long period of time, if not permanently. However, if the infrastructure is removed the impacts associated (avian injuries and mortalities) will cease	

Impact 4: Electrocution of birds due to overhead power lines

The proposed loop-in loop-out power lines are extremely short and covers a disturbed area with low avifaunal diversity. As such, the additional chickadee loop-in-loop-out power lines will not likely exponentially increase the risk of avian electrocutions as this risk already occurs.		
	Cumulative impact of the project and other projects in the area	**Overall impact of the proposed project considered in isolation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	**Low (27)**	**Low (10)**
Status	Neutral	
Reversibility	High	
Irreplaceable loss of resources	No additional loss of resources expected	
Can impacts be mitigated?	Yes.	

Mitigation	• A "Bird Friendly" structure, with a bird perch (as per standard Eskom guidelines) must be used for the tower structures. • All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002). • Installation of artificial bird space perches and nesting platforms should be installed, at a safe distance from energised components (Goudie 2006; Prinsen et al. 2012). • Line inspections should be ongoing for the operational life of the lines.
Residual Impacts	The proposed development will be within the area over a long period of time, if not permanently. However, if the infrastructure is removed the impacts associated (avian injuries and mortalities) will cease

Impact 5: Collisions of Birds with overhead powerlines

Potential cumulative impacts are regarded as low due to the limited extent of infrastructure posing a potential collision threat, subsequently contributing a small to minor fraction to this cumulative impact within the larger region. Furthermore, due to limited suitable habitat and foraging, diversity of avifaunal species was low with no records of any Red Data species and important population with the study area. Subsequently the presence of potential candidates to collide with infrastructure is limited. As such it can be concluded that the proposed development will contribute very little to this cumulative impact, especially regarding this threat towards Red Data species.

	Cumulative impact of the project and other projects in the area	**Overall impact of the proposed project considered in isolation**
Extent	Local (2)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Low (24)**	**Low (14)**
Status	Negative	Neutral to Slightly Negative
Reversibility	High	
Irreplaceable loss of resources	No additional loss of resources expected	
Can impacts be mitigated?	Yes.	
Mitigation	• Mark sections of the lines in High to Medium-High sensitive areas with anti-collision marking devices (diurnal and	

	nocturnal diverters) to increase the visibility of the power line and reduce likelihood of collisions. Marking devices should be spaced 10 m apart, and must be installed as soon as the conductors are strung. • These line marking devices include spiral vibration dampers, strips, Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags and aviation balls (Prinsen et al. 2012). • Construction of the power lines in close proximity to the existing power line will reduce the cumulative impacts and collision risk. All relevant perching surfaces should be fitted with bird guards and perch guards as deterrents (Hunting 2002). • Line inspections should be ongoing for the operational life of the line.
Residual Impacts	The proposed development will be within the area over a long period of time, if not permanently. However, if the infrastructure is removed the impacts associated (avian injuries and mortalities) will cease

5.3 Preferred VS alternative access road options

For the alternative access road options the proposed impacts and avifauna is expected to be similar as these options is located within similar habitat types characterized by a highly transformed vegetation cover (comprising of predominantly tall weeds and alien plants) providing habitat for a very limited amount of avifaunal species. As such both access routes are suitable and can, from an avifaunal perspective, be considered in the final layout.

6 DISCUSSION AND CONCLUSION

The proposed Zonnebloem Switching Station (132/22kV) and Loop-In Loop-Out Power Lines (132kV) and associated infrastructure will have a minimal impact on avifauna due to the extensive spatial requirements of the development, location within a highly degraded and transformed area, the study area being mostly uniform in vegetation composition as well as avifaunal composition (low diversity comprising of mostly adaptable species with no recorded Red Data species). Therefore, the proposed development is unlikely to have any long-term significant impacts on avifaunal species within the study area.

During the site survey a total of 52 bird species were recorded within the surveyed area. Endemic species recorded during the survey included Cape Shoveler, Black-chested Prinia, Sentinel Rock Thrush, Cape Sparrow and Cape Longclaw.

No Red listed species were recorded within the study area with two species recorded within the larger surveyed area; Greater Flamingo (Near Threatened) and Black-winged Pratincole (Neart Threatened). It is highly unlikely that the proposed development will impact on these populations. However, observations from SABAP 1 & 2 indicate that a total of 35 species were recorded within the Quarter Degree Grid. Due to a lack of suitable habitat it is unlikely for most of these species to utilise this area (study area).

Investigation of the study area revealed the following important avian micro-habitats.

<u>Within the Study area</u>

- » Degraded Grasslands
  - *Conyza sumatrensis – Senecio pentactinus* herbland
  - *Seriphium plumosum – Pollichia campestris* herbland
- » Wetland Habitats
  - *Leersia hexandra – Kylinga erecta* permanent wet grassland
  - *Agrostis lachnantha – Juncus oxycarpus* seasonal to temporary wet grassland
- » Alien tree clusters
  - *Acacia mearnsii – Eucalyptus camaldulensis* woodlots
- » Artificial landscapes including:
  c) Mafube/Pan Traction Power Line
  d) Cultivated lands

<u>Additional micro-habitats assessed outside of the study area</u>

- » Secondary Plagioclimatic grassland
- » Open water bodies (Dams)

The entire development footprint will be located within the highly degraded micro-habitat. This area is located on historical cultivated areas and have been re-vegetated with a vegetation cover that can rather be described as a herbland than grassland and is dominated by a tall weedy herb/forb layer also containing numerous alien plants. Grass species cover a relative low percentage of this area and comprise mostly of pioneer and sub-climatic species. Alien trees are also scattered throughout this unit although they are more confined to the woodlots. This degraded "herbland" is surrounded by human impacts, most notably agricultural impacts such as cultivation to the east, north and south and afforestation to the north-west and west. Regular human movement in the area also contribute to disturbances within the area with a small informal settlement located within the study area (adjacent to old homestead ruins). As a result of the highly degraded and transformed state of this area, resources and habitat is severely limited and is furthermore impacted by the highly fractured nature of this area (surrounded by anthropogenic habitats) as well as regular human movement. Subsequently, avifaunal diversity has been severely affected within this area, comprising mostly a few highly adaptable species, especially smaller seed eaters (granivores) and insectivores (gleaning), that move regularly between the herbland and surrounding woodlots and wetland habitats. This micro-habitat is regarded as a Low Sensitive area.

Also identified within the study area are a few wetland micro-habitats. Two small non-perennial systems drain the eastern portion of the study area towards the Springbokspruit Stream. Associated with these non-perennial streams are valley-bottom wetlands and small lateral seepages. The upper portion of this hydrological system comprises a largely unchanneled valley-bottom wetland (covers an extensive area of the south-eastern portion of the study area) which transitions into a channelled valley-bottom wetland south of the service road for the Mafube/Pan Traction power lines. A few isolated wetland bodies are furthermore dotted throughout the region and includes a small to medium sized depression wetland, seepages and wetland flats. Due to the numerous disturbances associated with these habitats, within the study area as well as surrounding study area, species diversity was greatly altered. All temporary wetland areas within the study area has been classified as Medium-Low Sensitive as these habitats may temporary provide potential preferable habitat for waterfowl and waders (during periods of inundation). However, due to the layout, length and direction of the proposed power lines these power lines do not pose a potential threat to such species. The valley-bottom wetland and associated seepages have been classified as Medium-High sensitive due to its connectivity to downstream wetland and aquatic habitats and due to the fact that this area may provide a corridor of movement / migration for several bird species. Furthermore, a buffer of 100m have been awarded and is applicable for power line infrastructure (also Medium-High). The proposed power

line routes are located outside of these buffer zones and will likely have very little impact on bird species using these watercourses and wetlands as flight paths.

The impacts associated with the development include displacement due to habitat loss and disturbance, electrocution of birds on overhead power lines and the switching station, as well as potential collision with the power lines. All of these impacts can be successfully mitigated and subsequently the development is regarded as a low threat impact and will not significantly affect the avifaunal character of the area or pose a threat to red data species.

For both access road options, the proposed impacts on avifauna is expected to be similar as these options is located within similar habitat types characterized by a highly transformed vegetation cover (comprising of predominantly tall weeds and alien plants) providing habitat for a very limited amount of avifaunal species. As such both access road alternatives are suitable and can, from and avifaunal perspective, be considered in the final layout.

From an avifaunal perspective the overall impacts (including cumulative) for the project is considered to be low and no objective or motives were identified which would hinder the development of the Switching Station and associated infrastructure on the affected properties. The development will be appropriate and acceptable from an avifaunal perspective and will not cause detrimental impacts to the avifauna species located within the affected properties. Therefore, it is the opinion that the development may be authorised, constructed and operated.

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Appendix 1. Avifaunal Species List (Identified within the surveyed area)

Common Name	Scientific Name	Status	Micro-Habitats within the surveyed area								
			Degraded Herbland	Wetland (Study area)	Wetland (Outside Study area)	Woodlot	Cultivated Land	Mafube/Pan Traction Line	Secondary Grassland	Open Water Bodies	Railway line
Helmeted Guineafowl	*Numida meleagris*		X					X	X		
Swainson's Spurfowl	*Pternistis swainsonii*		X				X		X		
Spur-winged Goose	*Plectropterus gambensis*									X	
Egyptian Goose	*Alopochen aegyptiaca*									X	
Yellow-billed Duck	*Anas undulata*									X	
Cape Shoveler	*Anas smithii*	Endemic								X	
Greater Flamingo	*Phoenicopterus*	Near Threatened								X	
Hadada Ibis	*Bostrychia hagedash*			X	X					X	
African Spoonbill	*Platalea alba*									X	
Black-headed Heron	*Ardea melanocephala*				X		X			X	
African Cuckoo-Hawk	*Aviceda cuculoides*					X					
Black-winged Kite	*Elanus caeruleus*		X					X			X
Steppe Buzzard	*Buteo buteo*							X			X
Amur Falcon	*Falco amurensis*										X
Common Moorhen	*Gallinula chloropus*									X	
Red-knobbed Coot	*Fulica cristata*									X	
Blacksmith Lapwing	*Vaneelus armatus*			X	X					X	
Three-banded Plover	*Charadrius tricollaris*									X	
African Snipe	*Gallinago nigripennis*				X						
Common Greenshank	*Tringa nebularia*									X	
Wood Sandpiper	*Tringa glareola*				X						
Whiskered Tern	*Chlidonia hybrida*									X	
Speckled Pigeon	*Columba guinea*					X	X				
Red-eyed Dove	*Streptopelia semitorquata*					X		X			X
Laughing Dove	*Spilopelia senegalensis*							X			X

Little Swift	*Apus affinis*										X
Malachite Kingfisher	*Corythornis cristata*				X					X	
European Bee-eeter	*Merops apiaster*		X								X
Red-backed Shrike	*Lanius collurio*		X				X	X			
Southern Fiscal	*Lanius collaris*					X	X	X			X
Eurasian Golden Oriole	*Oriolus oriolus*										
Sand Martin	*Riparia riparia*				X				X	X	X
Barn Swallow	*Hirundo rustica*				X					X	X
South African Cliff Swallow	*Pterochelidon spilodera*	South African Breeding Endemic			X				X		X
Greater Striped Swallow	*Cecropis cucullata*				X				X	X	X
Levaillant's Cisticola	*Cisticola tinniens*		X	X	X		X		X	X	
Wailing Cisticola	*Cisticola lais*		X						X		X
Zitting Cisticola	*Cisticola jucidis*		X	X	X		X		X		
Black-chested Prinia	*Prinia falvicans*	Endemic	X						X		
Red-winged Starling	*Onychognathus morio*										
Cape Robin-Chat	*Cossypha caffra*					X					
African Stonechat	*Saxicola torquatus*		X				X		X		
Sentinel Rock Thrush	*Monticola brevipes*	Endemic							X		
Cape Sparrow	*Passer melanurus*	Endemic					X	X			X
Southern Masked Weaver	*Ploceus intermedius*			X	X	X	X				
Red-billed Quelea	*Quelea quelea*						X				X
Yellow-crowned Bishop	*Euplectes afer*				X		X			X	
Southern Red Bishop	*Euplectes orix*				X		X			X	
Long-tailed Widowbird	*Euplectes progne*				X		X		X		
White-winged Widowbird	*Euplectes albonotatus*				X					X	
Common Waxbill	*Estrilda astrild*		X	X		X	X		X		X
Pin-tailed Whydah	*Vidua macroura*						X	X	X		X
Cape Wagtail	*Motacilla capensis*			X	X					X	
Cape Longclaw	*Macronyx capensis*	Endemic							X		
African Pipit	*Anthus cinnamomeus*				X				X		
Black-throated Canary	*Crithagra atrogularis*				X		X		X		
Black-winged Pratinicole	*Glareola nordmanni*	Near Threatened			X						

Appendix 2. Avifaunal Species List obtained from SABAP (South African Bird Atlass Project) – Birds recorded within the greater Quarter Degree Grid (SABAP 1 & 2) as well as within the affected Pentad (SABAP 2).

Number	Taxonomic name	Common Name	Status		QDG 2529DC		Pentad 2545_2940
			Red Data Status (Regional & Global)		SABAP1	SABAP2	
645	*Apalis thoracica*	Apalis, Bar-throated			✓		✓
294	*Recurvirostra avosetta*	Avocet, Pied			✓	✓	✓
560	*Turdoides jardineii*	Babbler, Arrow-marked			✓	✓	✓
465	*Tricholaema leucomelas*	Barbet, Acacia Pied		Endemic	✓	✓	✓
464	*Lybius torquatus*	Barbet, Black-collared			✓	✓	✓
473	*Trachyphonus vaillantii*	Barbet, Crested			✓	✓	✓
700	*Batis capensis*	Batis, Cape		Endemic	✓		
701	*Batis molitor*	Batis, Chinspot			✓		✓
438	*Merops apiaster*	Bee-eater, European			✓	✓	✓
444	*Merops pusillus*	Bee-eater, Little			✓		
443	*Merops bullockoides*	Bee-eater, White-fronted			✓		✓
824	*Euplectes orix*	Bishop, Southern Red			✓	✓	✓
827	*Euplectes capensis*	Bishop, Yellow			✓		
826	*Euplectes afer*	Bishop, Yellow-crowned			✓	✓	✓
79	*I✓obrychus minutus*	Bittern, Little			✓		
746	*Telophorus zeylonus*	Bokmakierie, Bokmakierie		Endemic	✓	✓	✓
736	*Laniarius ferrugineus*	Boubou, Southern		Endemic	✓	✓	✓
741	*Nilaus afer*	Brubru, Brubru			✓		
568	*Pycnonotus tricolor*	Bulbul, Dark-capped			✓	✓	✓
885	*Emberiza capensis*	Bunting, Cape		Endemic	✓		✓
886	*Emberiza tahapisi*	Bunting, Cinnamon-breasted			✓		✓
884	*Emberiza flaviventris*	Bunting, Golden-breasted			✓		✓
751	*Malaconotus blanchoti*	Bush-shrike, Grey-headed			✓	✓	

238	*Lissotis melanogaster*	Bustard, Black-bellied	Near Threatened, Least Concern		✓		
231	*Neotis denhami*	Bustard, Denham's	Vulnerable, Near Threatened		✓		✓
205	*Turnix sylvaticus*	Buttonquail, Kurrichane			✓		
152	*Buteo rufofuscus*	Buzzard, Jackal		Endemic	✓	✓	✓
149	*Buteo vulpinus*	Buzzard, Steppe			✓	✓	✓
870	*Crithagra atrogularis*	Canary, Black-throated			✓	✓	✓
872	*Serinus canicollis*	Canary, Cape		Endemic	✓	✓	✓
869	*Crithagra mozambicus*	Canary, Yellow-fronted			✓	✓	✓
595	*Myrmecocichla formicivora*	Chat, Anteating		Endemic	✓	✓	✓
588	*Oenanthe bifasciata*	Chat, Buff-streaked		Endemic	✓		
589	*Cercomela familiaris*	Chat, Familiar			✓	✓	✓
666	*Cisticola textrix*	Cisticola, Cloud		Endemic	✓	✓	✓
665	*Cisticola aridulus*	Cisticola, Desert			✓	✓	✓
679	*Cisticola aberrans*	Cisticola, Lazy			✓		✓
677	*Cisticola tinniens*	Cisticola, Levaillant's			✓	✓	✓
668	*Cisticola cinnamomeus*	Cisticola, Pale-crowned					
672	*Cisticola chiniana*	Cisticola, Rattling			✓		
670	*Cisticola lais*	Cisticola, Wailing			✓		✓
667	*Cisticola ayresii*	Cisticola, Wing-snapping			✓	✓	✓
664	*Cisticola juncidis*	Cisticola, Zitting			✓	✓	✓
593	*Thamnolaea cinnamomeiventris*	Cliff-chat, Mocking			✓		✓
528	*Hirundo spilodera*	Cliff-swallow, South African		South African Breeding Endemic	✓	✓	✓
228	*Fulica cristata*	Coot, Red-knobbed			✓	✓	✓
58	*Phalacrocorax africanus*	Cormorant, Reed			✓	✓	✓
55	*Phalacrocorax carbo*	Cormorant, White-breasted			✓	✓	✓
391	*Centropus burchellii*	Coucal, Burchell's			✓		
300	*Cursorius temminckii*	Courser, Temminck's			✓		✓
213	*Amaurornis flavirostris*	Crake, Black			✓	✓	✓
208	*Anthropoides paradiseus*	Crane, Blue	Near Threatnened, Vulnerable	Endemic	✓	✓	✓
209	*Balearica regulorum*	Crane, Grey Crowned	Endangered, Endangered		✓	✓	

207	*Bugeranus carunculatus*	Crane, Wattled	Critically Endangered, Vulnerable		✓		
651	*Sylvietta rufescens*	Crombec, Long-billed			✓		
547	*Corvus capensis*	Crow, Cape			✓	✓	✓
548	*Corvus albus*	Crow, Pied			✓	✓	✓
378	*Cuculus clamosus*	Cuckoo, Black			✓		
386	*Chrysococcyx caprius*	Cuckoo, Diderick			✓	✓	✓
382	*Clamator jacobinus*	Cuckoo, Jacobin			✓		
385	*Chrysococcyx klaas*	Cuckoo, Klaas's			✓		
377	*Cuculus solitarius*	Cuckoo, Red-chested			✓	✓	✓
60	*Anhinga rufa*	Darter, African			✓	✓	✓
355	*Streptopelia senegalensis*	Dove, Laughing			✓	✓	✓
356	*Oena capensis*	Dove, Namaqua			✓	✓	✓
352	*Streptopelia semitorquata*	Dove, Red-eyed			✓	✓	✓
348	*Columba livia*	Dove, Rock			✓	✓	✓
541	*Dicrurus adsimilis*	Drongo, Fork-tailed			✓		✓
105	*Anas sparsa*	Duck, African Black			✓	✓	✓
115	*Sarkidiornis melanotos*	Duck, Comb			✓	✓	✓
100	*Dendrocygna bicolor*	Duck, Fulvous			✓	✓	✓
117	*Oxyura maccoa*	Duck, Maccoa	Near Threatened, Near Threatened		✓	✓	✓
114.1	*Anas platyrhynchos*	Duck, Mallard	Introduced				
101	*Thalassornis leuconotus*	Duck, White-backed			✓	✓	✓
99	*Dendrocygna viduata*	Duck, White-faced			✓	✓	✓
104	*Anas undulata*	Duck, Yellow-billed			✓	✓	✓
139	*Lophaetus occipitalis*	Eagle, Long-crested					
400	*Bubo capensis*	Eagle-owl, Cape			✓		✓
401	*Bubo africanus*	Eagle-owl, Spotted			✓	✓	✓
71	*Bubulcus ibis*	Egret, Cattle			✓	✓	✓
66	*Egretta alba*	Egret, Great			✓	✓	✓
67	*Egretta garzetta*	Egret, Little			✓	✓	✓
68	*Egretta intermedia*	Egret, Yellow-billed			✓	✓	✓
180	*Falco amurensis*	Falcon, Amur			✓	✓	✓
172	*Falco biarmicus*	Falcon, Lanner	Vulnerable, Least Concerned		✓	✓	
820	*Anomalospiza imberbis*	Finch, Cuckoo			✓		
855	*Amadina fasciata*	Finch, Cut-throat			✓		✓

856	*Amadina erythrocephala*	Finch, Red-headed		Endemic	✓	✓	✓
806	*Sporopipes squamifrons*	Finch, Scaly-feathered		Endemic	✓		✓
229	*Podica senegalensis*	Finfoot, African	Vulnerable, Least Concerned		✓		
840	*Lagonosticta rubricata*	Firefinch, African			✓		
842	*Lagonosticta senegala*	Firefinch, Red-billed			✓	✓	
732	*Lanius collaris*	Fiscal, Common (Southern)			✓	✓	✓
148	*Haliaeetus vocifer*	Fish-eagle, African			✓	✓	✓
96	*Phoenicopterus ruber*	Flamingo, Greater	Near Threatened, Least Concerned		✓	✓	✓
97	*Phoenicopterus minor*	Flamingo, Lesser	Near Threatened, Near Threatened		✓	✓	✓
698	*Sigelus silens*	Flycatcher, Fiscal		Endemic	✓	✓	✓
694	*Melaenornis pammelaina*	Flycatcher, Southern Black			✓		✓
689	*Muscicapa striata*	Flycatcher, Spotted			✓	✓	✓
188	*Peliperdix coqui*	Francolin, Coqui			✓		
189	*Dendroperdix sephaena*	Francolin, Crested			✓		
192	*Scleroptila levaillantii*	Francolin, Red-winged			✓		
191	*Scleroptila shelleyi*	Francolin, Shelley's			✓		
373	*Corythaixoides concolor*	Go-away-bird, Grey			✓		
102	*Alopochen aegyptiacus*	Goose, Egyptian			✓	✓	✓
116	*Plectropterus gambensis*	Goose, Spur-winged			✓	✓	✓
661	*Sphenoeacus afer*	Grassbird, Cape		Endemic	✓		✓
7	*Podiceps nigricollis*	Grebe, Black-necked			✓	✓	✓
6	*Podiceps cristatus*	Grebe, Great Crested			✓	✓	✓
8	*Tachybaptus ruficollis*	Grebe, Little			✓	✓	✓
572	*Andropadus importunus*	Greenbul, Sombre			✓		
361	*Treron calvus*	Green-pigeon, African			✓		
270	*Tringa nebularia*	Greenshank, Common			✓	✓	✓
203	*Numida meleagris*	Guineafowl, Helmeted			✓	✓	✓
315	*Larus cirrocephalus*	Gull, Grey-headed			✓	✓	✓
81	*Scopus umbretta*	Hamerkop, Hamerkop			✓	✓	✓
165	*Circus ranivorus*	Harrier, African Marsh	Endangered, Least Concerned		✓		
167	*Circus macrourus*	Harrier, Pallid	Near Threatened, Near Threatened		✓		✓
169	*Polyboroides typus*	Harrier-Hawk, African			✓	✓	✓

128	*Aviceda cuculoides*	Hawk, African Cuckoo			✓		
753	*Prionops plumatus*	Helmet-shrike, White-crested			✓		
69	*Egretta ardesiaca*	Heron, Black			✓		
63	*Ardea melanocephala*	Heron, Black-headed			✓	✓	✓
64	*Ardea goliath*	Heron, Goliath			✓	✓	✓
74	*Butorides striata*	Heron, Green-backed			✓	✓	✓
62	*Ardea cinerea*	Heron, Grey			✓	✓	✓
65	*Ardea purpurea*	Heron, Purple			✓	✓	✓
72	*Ardeola ralloides*	Heron, Squacco			✓	✓	✓
474	*Indicator indicator*	Honeyguide, Greater			✓		
476	*Indicator minor*	Honeyguide, Lesser			✓		
451	*Upupa africana*	Hoopoe, African			✓	✓	✓
457	*Tockus nasutus*	Hornbill, African Grey			✓		
530	*Delichon urbicum*	House-martin, Common			✓	✓	✓
91	*Threskiornis aethiopicus*	Ibis, African Sacred			✓	✓	✓
93	*Plegadis falcinellus*	Ibis, Glossy			✓	✓	✓
94	*Bostrychia hagedash*	Ibis, Hadeda			✓	✓	✓
92	*Geronticus calvus*	Ibis, Southern Bald	Vulnerable, Vulnerable	Endemic	✓	✓	✓
864	*Vidua funerea*	Indigobird, Dusky			✓		
240	*Actophilornis africanus*	Jacana, African			✓	✓	✓
182	*Falco rupicoloides*	Kestrel, Greater			✓		✓
183	*Falco naumanni*	Kestrel, Lesser			✓	✓	✓
181	*Falco rupicolus*	Kestrel, Rock			✓	✓	✓
435	*Halcyon albiventris*	Kingfisher, Brown-hooded			✓	✓	✓
429	*Megaceryle maximus*	Kingfisher, Giant			✓	✓	✓
430	*Alcedo semitorquata*	Kingfisher, Half-collared	Near Threatened, Least Concerned		✓		
431	*Alcedo cristata*	Kingfisher, Malachite			✓	✓	✓
428	*Ceryle rudis*	Kingfisher, Pied			✓	✓	✓
433	*Halcyon senegalensis*	Kingfisher, Woodland			✓		✓
126	*Milvus migrans*	Kite, Black			✓		✓
127	*Elanus caeruleus*	Kite, Black-shouldered			✓	✓	✓
126.1	*Milvus aegyptius*	Kite, Yellow-billed			✓	✓	✓
234	*Eupodotis caerulescens*	Korhaan, Blue	Least Concerned, Near Threatened	Endemic	✓		✓
239.1	*Afrotis afraoides*	Korhaan, Northern Black		Endemic	✓	✓	✓

233	*Eupodotis senegalensis*	Korhaan, White-bellied	Vulnerable, Least Concerned		✓		✓
260	*Vanellus senegallus*	Lapwing, African Wattled			✓	✓	✓
258	*Vanellus armatus*	Lapwing, Blacksmith			✓	✓	✓
257	*Vanellus melanopterus*	Lapwing, Black-winged			✓		
255	*Vanellus coronatus*	Lapwing, Crowned			✓	✓	✓
495.2	*Mirafra fasciolata*	Lark, Eastern Clapper		Endemic	✓	✓	✓
500.2	*Certhilauda semitorquata*	Lark, Eastern Long-billed		Endemic	✓	✓	
496	*Mirafra rufocinnamomea*	Lark, Flappet			✓	✓	✓
508	*Spizocorys conirostris*	Lark, Pink-billed		Endemic	✓		
507	*Calandrella cinerea*	Lark, Red-capped			✓	✓	✓
494	*Mirafra africana*	Lark, Rufous-naped			✓	✓	✓
498	*Calendulauda sabota*	Lark, Sabota		Endemic	✓	✓	✓
506	*Chersomanes albofasciata*	Lark, Spike-heeled		Endemic	✓	✓	✓
727	*Macronyx capensis*	Longclaw, Cape		Endemic	✓	✓	✓
857	*Lonchura cucullatus*	Mannikin, Bronze			✓	✓	✓
534	*Riparia cincta*	Martin, Banded			✓	✓	✓
533	*Riparia paludicola*	Martin, Brown-throated			✓	✓	✓
529	*Hirundo fuligula*	Martin, Rock			✓	✓	✓
532	*Riparia riparia*	Martin, Sand					
814	*Ploceus velatus*	Masked-weaver, Southern			✓	✓	✓
226	*Gallinula chloropus*	Moorhen, Common			✓	✓	✓
426	*Urocolius indicus*	Mousebird, Red-faced			✓	✓	✓
424	*Colius striatus*	Mousebird, Speckled			✓	✓	✓
758	*Acridotheres tristis*	Myna, Common	Introduced		✓	✓	✓
681	*Cisticola fulvicapilla*	Neddicky, Neddicky			✓	✓	✓
76	*Nycticorax nycticorax*	Night-Heron, Black-crowned			✓	✓	✓
404	*Caprimulgus europaeus*	Nightjar, European			✓		
408	*Caprimulgus tristigma*	Nightjar, Freckled			✓		
350	*Columba arquatrix*	Olive-pigeon, African			✓		
545	*Oriolus larvatus*	Oriole, Black-headed			✓		✓
170	*Pandion haliaetus*	Osprey, Osprey					✓
1	*Struthio camelus*	Ostrich, Common			✓	✓	
393	*Tyto capensis*	Owl, African Grass	Vulnerable, Least Concerned		✓	✓	✓
392	*Tyto alba*	Owl, Barn			✓		✓
395	*Asio capensis*	Owl, Marsh			✓	✓	✓

398	*Glaucidium perlatum*	Owlet, Pearl-spotted			✓		
421	*Cypsiurus parvus*	Palm-swift, African			✓	✓	
710	*Terpsiphone viridis*	Paradise-flycatcher, African			✓		✓
862	*Vidua paradisaea*	Paradise-whydah, Long-tailed			✓		✓
805	*Petronia superciliaris*	Petronia, Yellow-throated			✓		
291	*Phalaropus fulicaria*	Phalarope, Red					
349	*Columba guinea*	Pigeon, Speckled			✓	✓	✓
716	*Anthus cinnamomeus*	Pipit, African			✓	✓	✓
719	*Anthus vaalensis*	Pipit, Buffy			✓		
717	*Anthus similis*	Pipit, Long-billed			✓	✓	
718	*Anthus leucophrys*	Pipit, Plain-backed			✓	✓	✓
725	*Anthus chloris*	Pipit, Yellow-breasted	Vulnerable, Vulnerable	Endemic	✓		
245	*Charadrius hiaticula*	Plover, Common Ringed			✓	✓	
248	*Charadrius pecuarius*	Plover, Kittlitz's			✓	✓	✓
249	*Charadrius tricollaris*	Plover, Three-banded			✓	✓	✓
113	*Netta erythrophthalma*	Pochard, Southern			✓	✓	✓
305	*Glareola nordmanni*	Pratincole, Black-winged	Near Threatened, Near Threatened		✓	✓	✓
685	*Prinia flavicans*	Prinia, Black-chested		Endemic	✓	✓	✓
686.1	*Prinia hypo✓antha*	Prinia, Drakensberg		Endemic	✓		
868	*Prinia maculosa*	Prinia, Karoo		Endemic	✓		
683	*Prinia subflava*	Prinia, Tawny-flanked			✓	✓	✓
740	*Dryoscopus cubla*	Puffback, Black-backed			✓		
834	*Pytilia melba*	Pytilia, Green-winged			✓		
200	*Coturnix coturnix*	Quail, Common			✓	✓	✓
201	*Coturnix delegorguei*	Quail, Harlequin			✓		
852	*Ortygospiza atricollis*	Quailfinch, African			✓	✓	✓
821	*Quelea quelea*	Quelea, Red-billed			✓	✓	✓
210	*Rallus caerulescens*	Rail, African			✓		
631	*Acrocephalus baeticatus*	Reed-warbler, African			✓	✓	
628	*Acrocephalus arundinaceus*	Reed-warbler, Great			✓	✓	
601	*Cossypha caffra*	Robin-chat, Cape			✓	✓	✓
602	*Cossypha humeralis*	Robin-chat, White-throated		Endemic	✓		
581	*Monticola rupestris*	Rock-thrush, Cape		Endemic	✓		✓
582	*Monticola explorator*	Rock-thrush, Sentinel		Endemic	✓		

446	*Coracias garrulus*	Roller, European			✓		✓
447	*Coracias caudatus*	Roller, Lilac-breasted			✓		✓
284	*Philomachus pugnax*	Ruff, Ruff			✓	✓	✓
638	*Bradypterus baboecala*	Rush-warbler, Little			✓		
264	*Actitis hypoleucos*	Sandpiper, Common			✓	✓	✓
272	*Calidris ferruginea*	Sandpiper, Curlew			✓	✓	✓
269	*Tringa stagnatilis*	Sandpiper, Marsh			✓	✓	✓
266	*Tringa glareola*	Sandpiper, Wood			✓	✓	✓
613	*Cercotrichas leucophrys*	Scrub-robin, White-browed			✓		
118	*Sagittarius serpentarius*	Secretarybird, Secretarybird	Vulnerable, Vulnerable		✓		✓
881	*Crithagra gularis*	Seedeater, Streaky-headed			✓	✓	
103	*Tadorna cana*	Shelduck, South African		Endemic	✓	✓	✓
112	*Anas smithii*	Shoveler, Cape		Endemic	✓	✓	✓
739	*Laniarius atrococcineus*	Shrike, Crimson-breasted		Endemic	✓		
731	*Lanius minor*	Shrike, Lesser Grey			✓		
733	*Lanius collurio*	Shrike, Red-backed			✓	✓	✓
143	*Circaetus pectoralis*	Snake-eagle, Black-chested			✓	✓	✓
142	*Circaetus cinereus*	Snake-eagle, Brown			✓		
286	*Gallinago nigripennis*	Snipe, African			✓	✓	✓
803	*Passer melanurus*	Sparrow, Cape		Endemic	✓	✓	✓
801	*Passer domesticus*	Sparrow, House	Introduced		✓	✓	✓
804.1	*Passer griseus*	Sparrow, Northern Grey-headed			✓		✓
804	*Passer diffusus*	Sparrow, Southern Grey-headed			✓	✓	✓
158	*Accipiter melanoleucus*	Sparrowhawk, Black			✓		
157	*Accipiter minullus*	Sparrowhawk, Little			✓		
156	*Accipiter ovampensis*	Sparrowhawk, Ovambo			✓		
155	*Accipiter rufiventris*	Sparrowhawk, Rufous-chested			✓		
515	*Eremopterix leucotis*	Sparrowlark, Chestnut-backed			✓		
799	*Plocepasser mahali*	Sparrow-weaver, White-browed			✓	✓	
95	*Platalea alba*	Spoonbill, African			✓	✓	✓
196	*Pternistis natalensis*	Spurfowl, Natal			✓	✓	✓

199	*Pternistis swainsonii*	Spurfowl, Swainson's			✓	✓	✓
764	*Lamprotornis nitens*	Starling, Cape Glossy			✓	✓	✓
759	*Spreo bicolor*	Starling, Pied		Endemic	✓	✓	✓
769	*Onychognathus morio*	Starling, Red-winged			✓	✓	✓
761	*Cinnyricinclus leucogaster*	Starling, Violet-backed			✓		
760	*Creatophora cinerea*	Starling, Wattled			✓	✓	
295	*Himantopus himantopus*	Stilt, Black-winged			✓	✓	✓
274	*Calidris minuta*	Stint, Little			✓	✓	✓
596	*Saxicola torquatus*	Stonechat, African			✓	✓	✓
85	*Ciconia abdimii*	Stork, Abdim's	Near Threatened, Least Concerned		✓		✓
84	*Ciconia nigra*	Stork, Black	Vulnerable, Least Concerned		✓	✓	✓
83	*Ciconia ciconia*	Stork, White			✓	✓	✓
90	*Mycteria ibis*	Stork, Yellow-billed	Endangerd, Least Concerned		✓		
792	*Chalcomitra amethystina*	Sunbird, Amethyst			✓	✓	✓
785	*Cinnyris afer*	Sunbird, Greater Double-collared		Endemic	✓		✓
775	*Nectarinia famosa*	Sunbird, Malachite			✓	✓	✓
779	*Cinnyris mariquensis*	Sunbird, Marico			✓		
787	*Cinnyris talatala*	Sunbird, White-bellied			✓		✓
518	*Hirundo rustica*	Swallow, Barn			✓	✓	✓
526	*Hirundo cucullata*	Swallow, Greater Striped			✓	✓	✓
527	*Hirundo abyssinica*	Swallow, Lesser Striped			✓	✓	
523	*Hirundo dimidiata*	Swallow, Pearl-breasted			✓		
524	*Hirundo semirufa*	Swallow, Red-breasted			✓		✓
520	*Hirundo albigularis*	Swallow, White-throated			✓	✓	✓
223	*Porphyrio madagascariensis*	Swamphen, African Purple			✓	✓	
635	*Acrocephalus gracilirostris*	Swamp-warbler, Lesser			✓	✓	✓
412	*Apus barbatus*	Swift, African Black			✓	✓	✓
418	*Tachymarptis melba*	Swift, Alpine			✓	✓	✓
416	*Apus horus*	Swift, Horus			✓	✓	✓
417	*Apus affinis*	Swift, Little			✓	✓	✓
415	*Apus caffer*	Swift, White-rumped			✓	✓	✓
744	*Tchagra senegalus*	Tchagra, Black-crowned			✓		✓

743	*Tchagra australis*	Tchagra, Brown-crowned			✓		
106	*Anas capensis*	Teal, Cape			✓	✓	
107	*Anas hottentota*	Teal, Hottentot			✓	✓	✓
108	*Anas erythrorhyncha*	Teal, Red-billed			✓	✓	✓
322	*Sterna caspia*	Tern, Caspian	Vulnerable, Least Concerned		✓		
338	*Chlidonias hybrida*	Tern, Whiskered			✓	✓	✓
339	*Chlidonias leucopterus*	Tern, White-winged			✓	✓	✓
297	*Burhinus capensis*	Thick-knee, Spotted			✓	✓	✓
580	*Psophocichla litsipsirupa*	Thrush, Groundscraper			✓	✓	✓
577.1	*Turdus smithi*	Thrush, Karoo		Endemic	✓	✓	✓
576	*Turdus libonyanus*	Thrush, Kurrichane			✓	✓	✓
577	*Turdus olivaceus*	Thrush, Olive			✓		✓
470	*Pogoniulus chrysoconus*	Tinkerbird, Yellow-fronted			✓		✓
554	*Parus niger*	Tit, Southern Black			✓		✓
621	*Parisoma subcaeruleum*	Tit-babbler, Chestnut-vented		Endemic	✓		
354	*Streptopelia capicola*	Turtle-dove, Cape			✓	✓	✓
711	*Motacilla aguimp*	Wagtail, African Pied			✓	✓	
713	*Motacilla capensis*	Wagtail, Cape			✓	✓	✓
637	*Chloropeta natalensis*	Warbler, Dark-capped Yellow			✓		
643	*Phylloscopus trochilus*	Warbler, Willow			✓		
844	*Uraeginthus angolensis*	Waxbill, Blue			✓		✓
846	*Estrilda astrild*	Waxbill, Common			✓	✓	✓
854	*Amandava subflava*	Waxbill, Orange-breasted			✓	✓	✓
850	*Coccopygia melanotis*	Waxbill, Swee		Endemic	✓		✓
845	*Granatina granatina*	Waxbill, Violet-eared			✓		
813	*Ploceus capensis*	Weaver, Cape		Endemic	✓	✓	✓
816	*Ploceus xanthops*	Weaver, Golden			✓		
819	*Anaplectes rubriceps*	Weaver, Red-headed			✓		
807	*Amblyospiza albifrons*	Weaver, Thick-billed			✓	✓	
811	*Ploceus cucullatus*	Weaver, Village			✓	✓	✓
587	*Oenanthe pileata*	Wheatear, Capped			✓	✓	✓
586	*Oenanthe monticola*	Wheatear, Mountain			✓		✓
796	*Zosterops virens*	White-eye, Cape		Endemic	✓	✓	✓
796.1	*Zosterops pallidus*	White-eye, Orange River		Endemic	✓		✓
860	*Vidua macroura*	Whydah, Pin-tailed			✓	✓	✓
828	*Euplectes axillaris*	Widowbird, Fan-tailed			✓	✓	✓

832	*Euplectes progne*	Widowbird, Long-tailed			✓	✓	✓
831	*Euplectes ardens*	Widowbird, Red-collared			✓	✓	✓
829	*Euplectes albonotatus*	Widowbird, White-winged			✓	✓	✓
358	*Turtur chalcospilos*	Wood-dove, Emerald-spotted			✓		✓
452	*Phoeniculus purpureus*	Wood-hoopoe, Green			✓	✓	✓
486	*Dendropicos fuscescens*	Woodpecker, Cardinal			✓		✓
489	*Jynx ruficollis*	Wryneck, Red-throated			✓	✓	✓