AVIFUANAL SPECIALIST ASSESSMENT FOR THE **PROPOSED WAG 'n BIETJIE MAIN TRANSMISSION** SUBSTATION AND GRID CONNECTION CORRIDOR, NEAR DE AAR IN THE NORTHERN CAPE PROVINCE

For

Mulilo Renewable Project Developments (Pty) Ltd

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1 INTRODUCTION

Mulilo Renewable Energy Developments (Pty) Ltd (Mulilo) is applying for Environmental Authorisation (EA) for the Wag n Bietjie Main Transmission Substation (MTS) and a transmission line corridor in the De Aar region of the Northern Cape Province. Arcus Consultancy Services South Africa (Pty) Ltd (Arcus) was appointed to conduct the avifaunal specialist assessment for the proposed developments. The specialist has surveyed the area of interest extensively for various other developments, and is therefore very familiar with the avifauna in the area.

1.1 Project Background

The proposed MTS is located on Remaining extent of the Farm Wag ten Bietjie, No 5, De Aar, Northern Cape Province (Figure 1).

The development will consist of the following components:

- A 400 kV Main Transmission Substation (Figure 2);
- Loop in Loop Out (LILO) lines connecting the new MTS to an existing 400 kV power line (Figure 2); and
- A 132 kV powerline to connect the Wag 'n Bietjie MTS (this application) and the Vetlaagte MTS[1] (200 m corridor) (Figure 2).

1.2 Terms of Reference

The terms of reference for this study are to identify and assess all potential impacts of the proposed development on the avifauna in the area and to provide recommended mitigation measures for all identified impacts.

The scope of the study included the following activities:

- A description of the avifaunal status quo, including a description of avifaunal microhabitats available on and around the project site;
- The results from the desk-based study;
- A description of potential predicted impacts to avifauna as well as a significance rating and impact assessment; and
- Design recommendations and/or methods of mitigation which may be required to reduce the potential impacts of the project on avifauna.

2 METHODOLOGY

2.1 Desktop Study

The Screening Tool was used to generate the potential environmental sensitivity of the site. The outputs were compared with satellite imagery and GIS maps of the project site.

The lists of avifauna were collated from interrogating multiple databases and sources including the various atlassing projects of the Virtual Museum[2] and the GBIF[3] network, the South African Bird Atlas Project 2 (SABAP2)[4], the Co-ordinated Avifaunal Road Count (CAR) project[5], Co-ordinated Water-bird Count (CWAC) project[6], The Important Bird

[1] Vetlaagte MTS is subject to a separate environmental authorisation process and not part of this application.

[2] http://vmus.adu.org.za/vm_projects.php (QDS 3024C) accessed January 20 2020.

[3] http://gbif.org accessed January 20 2020.

[4] http://sabap2.birdmap.africa/ Accessed 18 February 2020.

[5] Young, D.J., Harrison, J.A, Navarro, R.A., Anderson, M.A., & Colahan, B.D. (Eds). 2003. Big birds on farms: Mazda CAR Report 1993-2001. Avian Demography Unit: Cape Town.

Areas of southern Africa (IBA) project[7] as well as several available assessments for neighbouring projects.

The species list was used to highlight any habitats or taxa that may be particularly sensitive to impacts from the development and indicate any features that could occur on the project site.

2.2 Site Visit

A site visit was not deemed necessary for this study, as Arcus have been involved in a number of avifaunal assessments surrounding the proposed development. The data collected from a previous site visit to the study area in September 2021 for De Aar Grid Connection, MTHS Pre-construction Avifauna Monitoring is considered still relevant to this study.

2.3 Assumptions and Limitations

The following assumptions and limitations were identified for this study:

- The likely potential impacts on species identified in this survey are based on the experience of these and similar species in different parts of South Africa. Bird behaviour may vary across geographical locations;
- The pentads in and around the project site have not been thoroughly assessed by the Southern African Bird Atlas Project 2 (SABAP2), with only a single card having been submitted for some of the pentads examined. While reporting rates for each species were therefore not considered to be a useful reflection of density these data were useful for generating a species list of the area, to overcome this limitation a wider search (of 8 pentads) was conducted and data was supplemented by interrogating additional studies in the area
- Important Bird Area (IBA) criteria assessment for the Platberg-Karoo Conservancy was conducted in 1998 and populations of important species may have changed since the assessment; and
- Co-ordinated Avifaunal Road counts (CAR) and Co-ordinated Waterbird Counts (CWAC) sites are counted irregularly and this information is potentially out-dated.

3 RESULTS

3.1 Description of the Receiving Environment

Vegetation and micro habitats are very important in determining avifaunal abundances and likelihood of occurrences. Vegetation and micro habitats are very important in determining avifaunal abundances and likelihood of occurrences. Two main vegetation types occur in the broader study area, namely the Northern Upper Karoo (NKu3) and Besemkaree Koppies Shrubland (Gh4). Northern Upper Karoo occurs in the lowland areas where the new grid connection infrastructure is proposed, and is dominated by dwarf karoo shrubs, scattered grasses and occasional low trees (Figure 2).

Multiple existing transmission lines are already present in the vicinity of the proposed development as they converge on the nearby Eskom Hydra Substation (Figure 2).

[6] Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. Coordinated waterbird Counts in South Africa, 1992-1997. Avian Demography Unit, Cape Town.

[7] Marnewick MD, Retief EF, Theron NT, Wright DR, Anderson TA. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa.

3.2 Avifaunal Microhabitats of the Study Area

Microhabitats occur at a smaller spatial scale than vegetation types and are shaped by factors including vegetation type, topography, land use, food sources and man-made factors (e.g. the introduction of livestock and alien vegetation as well as the construction of infrastructure). Investigation of the project site revealed the following bird micro habitats either on or within approximately 2 km of the project site.

3.2.1 Lowland Plains

The dwarf karoo shrubs and scattered grasses found on the lowland plains provide habitat for open-country species such as korhaans, bustards, coursers, larks, cisticolas, Blue Cranes and potentially Secretarybirds amongst others. These areas support a relatively high diversity of endemic species and many large-bodied, ground-dwelling species that are particularly vulnerable to habitat destruction and/or disturbance impacts.

3.2.2 Cultivated Vegetation

Cultivated land potentially attract species vulnerable to disturbance and/or habitat destruction such as Blue Crane, korhaans and bustards.

3.2.3 Rivers, Drainage Lines and Dams

Perennial rivers, dams, seasonally inundated areas and various drainage lines occur across the project site and are important features as they have a different vegetation composition to surrounding areas and provide habitat for various birds such as the teals, ducks, Hamerkop, darter and kingfishers. Storks favour wet areas, as do Geese and Ibises. Floodplain areas surrounding meandering rivers are often utilised by Blue Cranes while incised or eroded sand banks provide nesting opportunities to birds such as kingfishers and bee-eaters. Furthermore, any stream, river or drainage line may represent an important flight path for many bird species. Small farm dams provide foraging areas for various waterbird species vulnerable to power line collision as well as potential roosting sites for Blue Crane. Erosion control berms in watershed areas can also temporarily impound water and create areas that could attract birds during the wet season (summer). A drainage system runs outside the eastern boundary of the project site.

3.2.4 Rocky Ridges, Slopes and Outcrops

Slopes and ridges are important for various raptors, e.g. Rock Kestrel, Jackal Buzzard and Verreaux's Eagle, that may use the slopes for soaring and to gain lift. Rocky outcrops and cliffs may be important nesting habitat for various raptors, most importantly Verreaux's Eagle, which is likely to spend time hunting along rocky outcrops and ridges. Rocky ridges and outcrops are also home to Rock Hyrax (Dassie), an important prey species of Verreaux's Eagle. Some small rocky outcrops occur in the south-western section of the project site.

3.2.5 Plateaux

The slopes and flat areas at higher elevations are dominated by abundant grasses, dwarf small-leaved shrubs and taller shrubs typical of Besemkaree Koppies Shrubland (Gh4). Elevated areas in the landscape may be utilised by Ludwig's Bustard for displaying. While no plateaux occur on the project site a slightly higher elevated area exists in the south-western section of the project site.

3.2.6 Power Lines

Multiple existing overhead power lines occur on the site. Power lines offer a man-made habitat to multiple species of birds as various raptor species, e.g. Rock Kestrel and Martial Eagle utilise transmission towers as roosts or nesting sites, particularly in areas where large trees are uncommon. No active raptor nests have been recorded on the power lines to date.

3.3 General Avifaunal Community of the Study Area

The various databases and previous field work in the area were used to get a good understanding of the potential bird species that occur in and around the project site and to determine which species are particularly at risk of impact from the development.

3.3.1 South African Bird Atlas Project 2 (SABAP2)

SABAP2 data were examined for the pentads (which are approximately 8 km x 8 km squares) in and around the study area (Figure 1). A total of 141 species were recorded by SABAP2 in the pentads 3030_2400 (70 species, 3 cards), 3035_2400 (137 species, 10 cards), (77 species, 2 cards), 3030_2405 (90 species, 4 cards), 3035_2405 (44 species, 1 card), 3040_2405 (30 species, 1 card), 3030_2410 (81 species, 5 cards), 3035_2410 (48 species, 1 card) and 3040_2410 (22 species, 1 card).

This includes 11 species classified as *Endangered*, *Near Threatened* or *Vulnerable* and 16 endemic or near-endemic species (Table 1). Due to the relatively few surveys conducted in some of the pentads (indicated by the number of cards submitted) several species which are likely to occur in the area have not been recorded by SABAP2, e.g. Kori Bustard (*Near Threatened*) which was previously observed on site during a walk-through are notably absent from the data.

Table 1: Red-data and endemic or near-endemic species listed by SABAP2

Species	Red Data Status	Endemic or Near-endemic	Priority Score
Bustard, Ludwig's	EN, EN		320
Eagle, Tawny	EN, LC		290
Eagle, Martial	EN, VU		350
Korhaan, Blue	LC, NT	*	270
Flamingo, Greater	NT, LC		290
Korhaan, Karoo	NT, LC		240
Pipit, African Rock	NT, LC	*	200
Crane, Blue	NT, VU		320
Eagle, Verreauxs'	VU, LC		360
Falcon, Lanner	VU, LC		300
Stork, Black	VU, LC		330
Buzzard, Jackal		*	250
Canary, Black-headed		*	
Chat, Sickle-winged		*	
Flycatcher, Fairy		*	
Flycatcher, Fiscal		*	
Lark, Karoo		*	
Lark, Large-billed		*	
Prinia, Karoo		*	

Species	Red Data Status	Endemic or Near-endemic	Priority Score
Thrush, Karoo		*	
Tit, Grey		*	
Warbler, Cinnamon-breasted		*	

3.3.2 Co-ordinated Avifaunal Road Counts (CAR)

CAR counts were pioneered in 1993 in the Western Cape and since then have spread rapidly to other provinces. Citizen scientists now monitor 36 species of large terrestrial birds (e.g. cranes, bustards, korhaans, storks, Secretarybird etc.) along 350 fixed routes across South Africa covering over 19 000km. Twice a year, in midsummer and midwinter, road counts are carried out using a standardised method. Data from three CAR routes surrounding the project site (NK131, NK041 and NK352) indicate that Ludwig's Bustard was the most commonly recorded species on these routes combined, followed by White Stork, Blue Crane, Northern Black Korhaan, Karoo Korhaan, Kori Bustard and Secretarybird.

3.3.3 Co-ordinated Waterbird Counts (CWAC)

Five CWAC sites are situated within 50 km of the project site. De Aar Sewage Works (30412402) is located approximately 15 km northwest from the project site and important species recorded at this site include low numbers of Greater Flamingo and South African Shelduck. Important species recorded at Kafferspoort Dam (30552416), located approximately 30 km to the south of the project site, include African Spoonbill, African Fish-eagle, Black Stork, Lesser Flamingo and large numbers of Greater Flamingo and South African Shelduck. Faugh A Ballagh (30522438) is a large farm dam on the Seekoei River located approximately 50 km to the southeast of the project site where important species such as African Fish-eagle, African Spoonbill, Greater Flamingo, Lesser Flamingo, Osprey, Great White Pelican and South African Shelduck have been recorded. Nuwejaarsfontein Farm Dam (30512359) and Nuwejaarsfontein House Dam (30532401) are located approximately 20 km to the southwest of the project site and records of African Spoonbill and South African Shelduck have been made at both of these dams.

3.3.4 Important Bird Areas (IBAs)

The entire project site falls within the large Platberg-Karoo Conservancy (ZA028). The conservancy covers the entire districts of De Aar, Philipstown and Hanover in the south-eastern portion of the Northern Cape Province. Although the land in the IBA is primarily used for grazing and agriculture, it includes the suburban towns of De Aar, Philipstown, Petrusville and Hanover. This huge area lies in the plains of the central Great Karoo, forming part of the South African plateau and holds vitally important populations of two globally threatened species (Blue Crane and Lesser Kestrel), several biome-restricted species and important populations of other arid-zone birds[8].

Lesser Kestrel have roosts throughout the area, including large roosts (5 000 – 10 000 individuals) in the towns of De Aar, Hanover and Philipstown; they are frequently seen foraging in the conservancy in summer, when close to 10% of the global population of Lesser Kestrels roost in this IBA[9]. Some of the dams are important roosts; during summer 1996/97, more than 850 Blue Crane were counted on a dam in the IBA[8].

[8] http://datazone.birdlife.org/site/factsheet/platberg-karoo-conservancy-iba-south-africa/text

[9] https://www.birdlife.org.za/iba-directory/platberg-karoo-conservancy/

The lowland karroid plains are particularly good for Ludwig's Bustard, Kori Bustard and large numbers of Karoo Korhaan, Karoo Lark, Karoo Chat, Tractrac Chat, Sickle-winged Chat, Lark-like Bunting and Karoo Long-billed Lark. In the grassier areas Blue Korhaan are common. Black Harrier are occasionally seen quartering the plains, where huge numbers of Blue Crane regularly congregate. Tawny Eagle and Martian Eagle breed on the power lines in the area. The belts of riverine Vachellia (Acacia) woodland support Namaqua Warbler, Layard's Tit-babbler and Grey Tit. Pale-winged Starling and African Rock Pipit occur in rocky gorges and kloofs. Other arid-zone species occurring within the conservancy are Pale Chanting Goshawk, Pririt Batis, Fairy Flycatcher and White-throated Canary.

Arcus (2019) conducted four seasons of monitoring in 2018 during the pre-construction phase of the proposed Zingesele Wind Energy Facility, located approximately 15 km to the east of the project site. The scoping report identified that a few large birds (such as White-backed Vulture, Verreaux's Eagle and Martial Eagle), susceptible to electrocution (particularly in the absence of safe and mitigated structures), occur in the area. Ludwig's Bustard were the most regularly encountered species recorded during the drive transects, while Blue Crane accounted for the highest number of individuals recorded, the report noted that Blue Crane and Ludwig's Bustard are abundant on the low lying plains in the area. Apart from summer, when there is an influx of Amur Falcons and Lesser Kestrel, raptor activity on the site was found to be relatively low and there was only a single flight of White-backed Vulture reported.

Arcus (2021) conducted a five-day site walkthrough in summer 2020 along the proposed De Aar 2 South Grid Connection during which several species relevant to this study was identified, including Ludwig's Bustard, African Rock Pipit, Karoo Korhaan, Verreaux's Eagle Lanner Falcon and Jackal Buzzard.

3.3.5 The Endangered Wildlife Trust (EWT) Powerline Mortality Data

Powerline mortality data from around De Aar were obtained from the EWT to determine which species have suffered mortalities as a result of electrical distribution infrastructure in the area. The data received was collected between 2001 and 2018 and included collision mortality incidents of Ludwig's Bustard, Kori Bustard, Blue Crane, Verreaux's Eagle and an unidentified flamingo species. Electrocution mortalities included Verreaux's Eagle, Cape Eagle-owl, Lanner Falcon and Pale-chanting Goshawk.

Records of mortalities associated with the expansive stretches of transmission lines from the Hydra substation between 2008 and 2016 revealed that the top ten affected species by transmission lines in the larger area included Ludwig's Bustard, Blue Crane, Northern Black Korhaan, unidentified sp., White Stork, Pied Crow, Secretarybird, Kori Bustard, Karoo Korhaan and Blue Korhaan. No calculations regarding mortalities per km were performed as the data include power lines which cross areas that may pose a greater risk to birds and the numbers may therefore be misleading. These data were nevertheless useful to assist in the identification of species shown to be at risk in the area.

3.3.6 Focal Species

From the above data and microhabitats available on the project site, focal species were identified for this study by identifying species most likely to potentially be negatively affected by the proposed development. In general, large, terrestrial species are particularly vulnerable to displacement and/or disturbance impacts. While large, heavy flying birds are more vulnerable to collision with overhead power lines, these species could potentially be impacted upon while traversing the project site to and from these areas. Smaller passerines are also likely to be impacted upon through habitat destruction and disturbance. The resultant list of focal species for this study is as follows: Ludwig's Bustard (*Endangered*), Martial Eagle (*Endangered*), Tawny Eagle (*Endangered*),

Verreaux's Eagle (*Vulnerable*), Lanner Falcon (*Vulnerable*), Black Stork (*Vulnerable*), Secretarybird (*Vulnerable*), Burchell's Courser (*Vulnerable*), Blue Korhaan (*Least Concern*), Blue Crane (*Near Threatened*), Kori Bustard (*Near Threatened*), Karoo Korhaan (*Near Threatened*), Greater Flamingo (*Near Threatened*), African Rock Pipit (*Near Threatened*) and Double-banded Courser (*Near Threatened*). Although this impact assessment focuses on Red Data species, the impact on non-Red Data species is also assessed.

3.4 Avifaunal Sensitivity Assessment

The project site in general is of low avifaunal sensitivity, with large areas of very low sensitivity for the construction of novel infrastructure (Figure 3). The primary reason for the difference between low and very low sensitivity areas is that the slightly elevated areas may be utilised by Ludwig's Bustard for displaying (albeit with a low likelihood). Ideally, the development footprint should be placed within the very low sensitivity areas and avoid the low sensitivity areas as this would reduce the impact, but from an avifaunal perspective it would not be of concern if this is not practically possible.

4 IMPACT ASSESSMENT

4.1 Identification of Potential Impacts

During the construction phase and maintenance of substations, some habitat destruction and alteration inevitably takes place. This happens with the levelling of substation yards. These activities have an impact on birds breeding, foraging and roosting in or in close proximity of the servitude through modification of habitat. Similarly, the above mentioned construction and maintenance activities could potentially impact on birds through disturbance, particularly during the birds' breeding activities.

The key potential impacts on avifauna associated with power line and grid connection infrastructure include:

- Displacement of priority or Red Data avifauna due to habitat destruction and transformation associated with the construction of the substation, grid connection corridor and associated infrastructure;
- Displacement of avifauna due to disturbance associated with the construction of the substation, grid connection corridor and associated infrastructure;
- Mortality of priority or Red Data avifauna due to collisions with the overhead powerlines; and
- Mortality of priority or Red Data avifauna due to electrocutions within the on-site substations.

4.2 Assessment of Potential Impacts

4.2.1 Construction Phase Impacts

4.2.1.1 Impact 1: Habitat Destruction during Construction

During the construction phase and maintenance of the substation and associated infrastructure, some habitat destruction and alteration inevitably takes place. The clearing of vegetation will result in the permanent loss of habitats for birds, although to a limited extent. These activities also have an impact on birds breeding, foraging and roosting in or in close proximity of the proposed developments through modification of habitat, and may also result in species being displaced from the immediate area.

The use of existing access roads associated with the existing infrastructure will reduce the impact associated with the proposed development, as the total area of natural habitat

that needs to be cleared will be relatively small. Most of the novel clearing will therefore be transient in nature and for a short duration, as recovery will take place once the construction phase is completed.

While the clearing of some habitat during construction is inevitable, the probability that the clearing associated with the proposed development will have a negative impact on the avifaunal populations in terms of their long-term viability and persistence in the area is low. The extent of the site is relatively small and the habitat present on the site is not unique in the area. The area surrounding the project site is widespread, contiguous and largely untransformed natural habitat and the impact therefore represents a low significance. Mitigation measures beyond generally accepted environmental best-practices to reduce the destruction of natural vegetation are limited.

Main Transmission Substation and Loop in Loop Out

Impact Description

The clearing of vegetation will result in the permanent loss of habitats for birds. There will also be temporary loss of habitats (that may be rehabilitated following construction) for the construction of access roads and construction camps/laydown areas etc. This may have an impact on birds breeding, foraging and roosting, and may also result in species being displaced, from the immediate area.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- Existing roads should be used where possible. The minimum footprint areas of infrastructure should be used wherever possible;
- Infrastructure should be placed in areas with the lowest sensitivity ratings where practically possible;
- Temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, and all vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed;
- A site specific Construction Environmental Management Plan ('CEMP') must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction; and
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be included within the CEMP.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Habitat Destruction during Construction	Site	Long Term	Definite	High	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)		
During the construction phase of the substation, some habitat destruction	YES	NO

and alteration inevitably takes place. However, the habitats associated with the development footprint can be rehabilitated.		

Cumulative impact rating (*after* mitigation) Much of the cumulative impact risk already exists in the area and it is unlikely that the proposed development will significantly contribute to the negative impact on bird habitat. The development footprint is relatively small and the habitats present are widespread in the area and not unique to the site. Therefore the cumulative impact of habitat destruction is therefore expected to be of Low significance.	Low	Medium	High

132kV Overhead Power Line Grid Connection

Impact Description

The clearing of vegetation will result in the permanent loss of habitats for birds. There will also be temporary loss of habitats (that may be rehabilitated following construction) for the construction of access roads and construction camps/laydown areas etc. This may have an impact on birds breeding, foraging and roosting, and may also result in species being displaced, from the immediate area.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- Existing roads should be used where possible. The minimum footprint areas of infrastructure should be used wherever possible;
- Infrastructure should be placed in areas with the lowest sensitivity ratings where practically possible;
- Temporary access roads should be kept to a minimum in order to limit direct vegetation loss and habitat fragmentation, and all vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed;
- A site specific Construction Environmental Management Plan ('CEMP') must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction; and
- Following construction, rehabilitation of all areas disturbed (e.g. temporary access tracks and laydown areas) must be undertaken and to this end a habitat restoration plan is to be included within the CEMP.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Habitat Destruction during Construction	Site	Long Term	Definite	High	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation) During the construction phase of the pylon bases, some habitat destruction	YES	NO

and alteration inevitably takes place. The development footprint is however relatively small and the habitats present can be rehabilitated.			
Cumulative impact rating (*after* mitigation) Much of the cumulative impact risk already exists in the area (e.g. servitudes) and it is unlikely that the proposed development will significantly contribute to the negative impact on bird habitat. The development footprint is relatively small and the habitats present are widespread in the area and not unique to the site. Therefore the cumulative impact of habitat destruction is therefore expected to be of Low significance.	Low	Medium	High

4.2.1.2 Impact 2: Disturbance and Displacement during Construction

Disturbances and noise from staff and construction activities may result in species being displaced, either temporarily (i.e. for some period during the construction activity) or permanently (i.e. they are disturbed and do not return), into less suitable habitat which may reduce their ability to survive and reproduce. Disturbances and noise can also impact certain sensitive species whilst feeding and breeding, resulting in effective habitat loss through a perceived increase in predation risk. There are various potentially sensitive species occurring on the project site including Ludwig's Bustard, Kori Bustard, Verreaux's Eagle, Northern Black Korhaan, Blue Korhaan, Karoo Korhaan and Blue Crane. Disturbance of priority raptor species at nest sites, may result in failed breeding attempts.

The disturbance and displacement impacts associated with the construction phase are generally temporary in nature. The area surrounding the project site is largely untransformed, contiguous, suitable natural habitat and therefore displacement distances should not incur a great energetic cost and should allow for rapid return to the site once the disturbance concludes. The probability of significant disturbance and displacement occurring is reduced by adhering to mitigation measures such as appropriate timing of construction activities near sensitive sites, such as nests. The displacement of avifauna by construction activities associated with the proposed development is therefore considered to be of low significance if mitigation measures are adhered to.

<u>Main Transmission Substation and Loop in Loop Out</u>

Impact Description Disturbances and noise from staff and construction activities can impact on certain sensitive species, both on and beyond the project site, particularly whilst feeding and breeding. This may result in these species being displaced, either temporarily (i.e. for some period during the construction activity) or permanently (i.e. they are disturbed and do not return), from the project site.
Cumulative impact description A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).
Mitigation • A site-specific CEMP must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to

adhere to the CEMP and should apply good environmental practice during construction;

- The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during his/her regular audits/site visits, make a concerted effort to look out for breeding activities of Red Data species, and such effort may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species; and
- If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found) within 500 m of construction activities, an avifaunal specialist is to be contacted and called to site immediately for further assessment of the situation and instruction on how to proceed.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Disturbance and Displacement during Construction	Local	Short Term to Permanent	Probable	High	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)	YES	NO

Cumulative impact rating (*after* mitigation)			
As the species likely to be disturbed and displaced have suitable habitat beyond the project site, the cumulative impact of disturbance and displacement of birds is therefore expected to be of Low significance.	Low	Medium	High

132kV Overhead Power Line Grid Connection

Impact Description

Disturbances and noise from staff and construction activities can impact on certain sensitive species, both on and beyond the project site, particularly whilst feeding and breeding. This may result in these species being displaced, either temporarily (i.e. for some period during the construction activity) or permanently (i.e. they are disturbed and do not return), from the project site.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- A site-specific CEMP must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat. All contractors are to adhere to the CEMP and should apply good environmental practice during construction;
- The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential Red Data species as well as the signs that indicate possible breeding by these species. The ECO must then, during his/her regular audits/site visits, make a concerted effort to look out for breeding activities of Red Data species, and such effort may include the training of construction staff (e.g. in Toolbox talks) to

identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species; and

- If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found) within 500 m of construction activities, an avifaunal specialist is to be contacted and called to site immediately for further assessment of the situation and instruction on how to proceed.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Disturbance and Displacement during Construction	Local	Short Term to Permanent	Probable	High	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)	YES	NO

Cumulative impact rating (*after* mitigation)			
As the species likely to be disturbed and displaced have suitable habitat beyond the project site, the cumulative impact of disturbance and displacement of birds is therefore expected to be of Low significance.	Low	Medium	High

4.2.2 Operational Phase Impacts

4.2.2.1 Impact 3: Disturbance and Displacement during Operation

Disturbance and displacement of birds may occur during daily operational activity of the MTS as well as during the periodic maintenance that is required of the servitude and power line infrastructure. The grid connection infrastructure may also require aerial inspection or maintenance. The disturbance of avifauna during the operational phase, while ongoing, is not continuous and is therefore considered to be of low significance if mitigation measures are adhered to.

Main Transmission Substation and Loop in Loop Out

Impact Description

Displacement of priority species or Red Data species due to disturbance associated with operational activities such as maintenance.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- A site specific Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how the running of activities must be conducted to reduce

unnecessary disturbance to birds;
- Environmental manager to oversee activities and ensure that the site-specific operation environmental management plan (OEMP) is implemented and enforced;
- All vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed;
- Speed limits (30 km/h) should be strictly enforced to reduce unnecessary noise;
- The movement of personnel should be restricted to the access roads on the project site; and
- No dogs or cats other than those of the landowners should be allowed on site.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Disturbance and Displacement during Operation	Local	Long term	Possible	High	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)		
Disturbance will remain an impact for the duration of the operational life-time of the facility. Priority species that will either habituate to operational activity of the substation or avoid the substation yard. This may lead to indirect habitat loss but given the small size of the facility relative to the surrounding habitat available this will likely have a Low significance.	YES	NO

Cumulative impact rating (*after* mitigation)			
The majority of the species that occur across the development site already experience disturbance and displacement due to ongoing operational and maintenance activities of the existing transmission infrastructure. The contribution of the substation to the cumulative impact of disturbance and displacement associated with the existing and approved infrastructure across the site will likely be of Low significance.	Low	Medium	High

132kV Overhead Power Line Grid Connection

Impact Description

Displacement of priority species or Red Data species due to disturbance associated with operational activities such as maintenance.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- A site specific Operational Environmental Management Plan (OEMP) must be implemented, which gives appropriate and detailed description of how the running of activities must be conducted to reduce unnecessary disturbance to birds;
- Environmental manager to oversee activities and ensure that the site-specific operation environmental

management plan (OEMP) is implemented and enforced;
- All vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed;
- Speed limits (30 km/h) should be strictly enforced to reduce unnecessary noise;
- The movement of personnel should be restricted to the access roads on the project site; and
- No dogs or cats other than those of the landowners should be allowed on site.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Disturbance and Displacement during Operation	Local	Long term	Possible	High	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)		
Disturbance and displacement will remain an impact for the duration of the operational life-time of the facility. Disturbance and displacement due to operational activity associated with overhead power line is not expected to be significant as routine maintenance of existing transmission infrastructure already occurs along the existing servitude and any birds that remain in the area are likely to be habituated to the operational activity associated with the approved solar PV facilities across the site.	YES	NO

Cumulative impact rating (*after* mitigation)			
The majority of the species that occur across the development site already experience disturbance and displacement due to ongoing operational and maintenance activities of the existing transmission infrastructure. The contribution of overhead power line to the cumulative impact of disturbance and displacement associated with the existing and approved infrastructure across the site will likely be of Low significance.	Low	Medium	High

4.2.2.2 Impact 4: Electrocution during Operation

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[10]. Overhead power line infrastructure with a capacity of 132 kV or more do not generally pose a risk of electrocution due to the large size of the clearances between the electrical infrastructure components. Electrocutions are therefore more likely for larger species whose wingspan is able to bridge the gap such as eagles or vultures. Various large raptors (such as Martial Eagle, Verreaux's Eagle and potentially vultures), susceptible to electrocution (particularly in the absence of safe and mitigated structures) may occur in the broader project area. Electrocutions within the proposed substation are possible but should not affect the more sensitive Red Data species, as these species are unlikely to use the infrastructure within the substation yard for perching, nesting or roosting. The electrocution risk is considered to be of low probability and therefore low significance, the impact can be further reduced if mitigation measures are adhered to.

Main Transmission Substation and Loop in Loop Out

Impact Description

Electrocution of avifauna by powered infrastructure, usually resulting in mortality.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- Bird perch deterrents and physical exclusion barriers, frames and covers may reduce incidence of birds perching and nesting on infrastructure;
- Insulating, covering or isolating hardware may reduce electrocutions and outages;
- Electrocutions to be monitored and recorded, and reported to the Endangered Wildlife Trust's (EWT) Wildlife and Energy Programme (WEP) to determine if further mitigation action is required;
- No nests may be removed, without first consulting EWT; and
- Any mortalities must be reported to the EWT.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Electrocution during Operation	Site	Long term	Possible	Low	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)	YES	NO
Priority species are unlikely to utilise the substation.		

Cumulative impact rating (*after* mitigation)	Low	Medium	High
As effective mitigations are available and assuming all new electrical infrastructure associated with the surrounding developments will be constructed using safe 'bird friendly' design, the cumulative impact of electrocution is expected to be of Low significance.			

132kV Overhead Power Line Grid Connection

Impact Description

Electrocution of avifauna by powered infrastructure, usually resulting in mortality.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- Bird perch deterrents and physical exclusion barriers, frames and covers may reduce incidence of birds perching and nesting on infrastructure;
- Insulating, covering or isolating hardware may reduce electrocutions and outages;
- Electrocutions to be monitored and recorded, and reported to the Endangered Wildlife Trust's (EWT) Wildlife and Energy Programme (WEP) to determine if further mitigation action is required;
- No nests may be removed, without first consulting EWT; and
- Any mortalities must be reported to the EWT.

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Electrocution during Operation	Site	Long term	Possible	Low	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)	YES	NO

Cumulative impact rating (*after* mitigation)	Low	Medium	High
As effective mitigations are available and assuming all new electrical infrastructure associated with the surrounding developments will be constructed using safe 'bird friendly' design, the cumulative impact of electrocution is expected to be of Low significance.			

4.2.2.3 Impact 4: Collisions with Power Lines during Operation

Collisions with the earth wire are probably the biggest single threat posed by the proposed grid connection to priority species in the study area. Collisions with large (>132 kV) power lines are a well-documented threat to avifauna in southern Africa[10] while smaller lines pose a higher threat of electrocution but can still be responsible for collision. Collisions with overhead power lines occur when a flying bird does not see the cables, or is unable to take effective evasive action, and is killed by the impact or impact with the ground. Heavy-bodied birds such as bustards, cranes and waterbirds, with limited manoeuvrability are especially susceptible to this impact[10]. Species that may be particularly affected on the proposed development site include Ludwig's Bustard, Kori Bustard, Karoo Korhaan, Northern Black Korhaan and Secretarybird. Ludwig's Bustard and Kori bustard are known to be particularly prone to collision[11]. A Verreaux's Eagle mortality has also been attributed to collision with power lines in the area (EWT data, recorded in 2005). The corridors for both overhead power line alternatives cross a non-perennial watercourse, a feature which may act as flyways for larger bird species commuting across the landscape. The installation of flappers and bird flight diverters (BFDs) may increase the visibility of the proposed power line and while this has been shown to reduce the number of collisions for many species it does not appear to be effective at preventing bustard collisions[12]. Placing novel overhead power lines parallel and adjacent to existing overhead power lines may increase the visibility of both lines to

[10] van Rooyen, C.S. 2004. The Management of Wildlife Interactions with over-headlines. In The fundamentals and practice of Over-head Line Maintenance (132kV and above), pp217-245. Eskom Technology, Services International, Johannesburg.

[11] Shaw, J.M., Reid, T.A, Shutgens, M.G., Jenkins, A.R. and Ryan PG. 2018. High power line collision mortality of threatened bustards at a regional scale in the Karoo, South Africa. Ibis 160:431-446 doi:10.1111/ibi.12553.

[12] Shaw, J.M., Reid, T.A., Gibbons, B.K., Pretorius, M., Jenkins, A.R., Visagie, R., Michael, M.D. and Ryan, P.G. 2021. A large-scale experiment demonstrates that line marking reduces power line collision mortality for large terrestrial birds, but not bustards, in the Karoo, South Africa, Ornithological Applications, Volume 123, Issue 1, 1 February 2021, duaa067, https://doi.org/10.1093/ornithapp/duaa067

bustards and *reduce* collision mortality compared to either line considered separately, particularly if novel pylons are staggered in placement between existing pylons.

Main Transmission Substation and Loop in Loop Out

Impact Description
Birds in flight collide with overhead cables (conductors or earth wires) whilst in midflight. This occurs when birds don't see the cables until it is too late to take evasive action.
Cumulative impact description
A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).
Mitigation
• There is opportunity to potentially reduce the risk of collision with the LILO lines by attaching flappers and bird flight diverters (BFDs) where practically possible; • Flappers and BFDs must be maintained and replaced where necessary, for the life span of the project; • An operational monitoring programme must be implemented and include regular monitoring (i.e. quarterly) of the entire length of the power lines for collision incidents for the lifespan of the project; and • Collision incidents must be recorded and reported to the Endangered Wildlife Trust (EWT).

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Collisions with Power Lines during Operation	Local	Long Term	Possible	Low	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation)		
The wider area is important for the conservation of some Red Data species and some collisions by Red Data species is possible, even with the implementation of mitigation measures. The presence of the substation may however increase the overall visibility of obstructions already present in the landscape (e.g. existing overhead power lines) and reduce the collision risk at least along the spans adjacent to the development.	YES	NO

Cumulative impact rating (*after* mitigation)			
The position of the substation and LILO infrastructure	Low	Medium	High

may increase the overall visibility of the spans of existing overhead power lines and reduce the probability of collisions with adjacent lines, acting effectively as a large bird flight diverter that birds may more easily avoid.			

132kV Overhead Power Line Grid Connection

Impact Description

Birds in flight collide with overhead cables (conductors or earth wires) whilst in midflight. This occurs when birds don't see the cables until it is too late to take evasive action.

Cumulative impact description

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF).

Mitigation

- There is opportunity to potentially reduce the risk of collision associated with the proposed and adjacent, existing power line by attaching flappers and bird flight diverters (BFDs) to the proposed line;
- The most appropriate and up-to-date marking devices (such as flappers and BFDs) must be selected in consultation with the Endangered Wildlife Trust (EWT);
- Attach appropriate marking devices on all spans of all new power lines in accordance with installation guidelines to increase visibility;
- Flappers and BFDs must be maintained and replaced where necessary, for the life span of the project;
- Pylon positions of the proposed line should be staggered between the pylon positions of the existing, adjacent overhead power line where practically possible to increase visibility of both lines;
- An operational monitoring programme must be implemented and include regular monitoring (i.e. quarterly) of the entire length of the power lines for collision incidents for the lifespan of the project; and
- Collision incidents must be recorded and reported to the Endangered Wildlife Trust (EWT).

Impact Assessment

Name of Impact	Extent	Duration	Probability	Reversibility of impact	Significance without mitigation	Significance after mitigation
Collisions with Power Lines during Operation	Local	Long Term	Possible	Low	Moderate	Low

Impact on Irreplaceable Resources (*after* mitigation) The wider area is important for the conservation of some Red Data species and some collisions by Red Data species is possible, even with the implementation of mitigation measures. However, the position of the proposed overhead power line adjacent and parallel to the existing line may however increase the overall visibility of both overhead power lines and reduce the risk of collision.	YES	NO

Cumulative impact rating (*after* mitigation) The position of the proposed overhead power line adjacent and parallel to the existing line may however increase the overall visibility of both overhead power lines and reduce the risk of collision.	Low	Medium	High

4.3 Cumulative Assessment

A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other nearby activities as a result of the proposed development. The cumulative impact of habitat destruction was considered together with habitat destruction associated with the approved Vetlaagte solar PV facilities nearby as well as other renewable energy facilities in the broader area. Two operational wind energy facilities occur in the vicinity, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW), located approximately 13 km west of the project site, and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW) located approximately 20 km to the north. All of these consist of additional electrical infrastructure including facility substations and power lines. There is also at least one other proposed wind energy facility nearby (e.g. Zingesele WEF). The addition of the proposed overhead power line and substation, however, is unlikely to significantly increase the cumulative impact on birds if mitigation measures are adhered to, and may decrease it in some scenarios (e.g. through reducing collision risk of existing overhead power lines). This is largely due to the proximity of the study site to an existing substation (Eskom's Hydra Substation), and the large number of associated transmission lines that already exist in the area.

4.4 Alternative Assessment

The MTS has two alternative locations, given the proximity and location of the alternatives, either one is acceptable from an avifaunal perspective.

The 132kV grid connection overhead power line has two alternative corridors and either one is acceptable from an avifaunal perspective. Alternative 2 is however preferable from an avifaunal perspective as it runs adjacent to an existing overhead power line for a greater distance and therefore an opportunity exists to increase the visibility of both the novel and existing lines to birds potentially reducing the probability of collisions. Staggering novel pylon positions between those of the existing, adjacent overhead power line may further increase visibility.

The 'No-Go' alternative is not considered to be the preferred alternative as the majority of the potential impacts identified are already in effect on the proposed site. The proposed project site seems well suited to the development and any potential additional displacement of species such as bustards that may occur as a result of increased daily activity may actually reduce the risk of collisions by these species on the existing infrastructure if they utilise the area less frequently. Suitable habitat is widespread in the

surrounding area and so displacement distances should not incur a significant cost to collision prone species.

5 CONCLUSIONS

The area of habitat destruction associated with the footprint of the substation and the grid connection corridor are relatively small in extent compared to the proportion of untransformed habitat available in the area, and do not represent a fatal flaw that would prevent the proposed development from proceeding.

A number of Red Data species, and species vulnerable to collisions with power lines exist in the area broader area of the proposed power line corridor and the impact of collisions to birds has a low significance even with the implementation of mitigation measures. Many existing power lines traverse the area, therefore most of the potential impacts already exist in and around the project site. The proposed grid connection corridor is therefore unlikely to significantly contribute to the negative impacts that already exist in the area and unlikely to have a significant negative impact on species of conservation concern or the functioning and goals of the IBA. Appropriate bird flight diverters, or flappers should be attached to the full length of the proposed power line to increase its visibility. A recent study on the efficacy of line marking devices to reduce power line collision mortality for large terrestrial birds in the Karoo[12] found that line markings, such as bird flight diverters (BFDs) reduced overall bird mortality by 51% and Blue Crane mortality by 92%, but was not effective for bustards. The study concluded that line marking should be widely deployed, but alternative mitigation measures are urgently required for bustards that are threatened all over the world by collisions. One mitigation measure that may reduce the probability of collisions includes the placement of novel overhead power lines adjacent and parallel to existing overhead power lines to increase the overall visibility of both lines, this may be more effective if the support pylons are placed in a staggered manner between those of the adjacent line.

While a number of Red Data species, and species vulnerable to habitat destruction and displacement exist in the area of the proposed development, the relatively small size of the development footprint makes it highly unlikely that the proposed development will have a significant negative impact on the avifauna in the area following the implementation of mitigation measures.

Impact Statement

Overall, the impacts of the substation and grid connection are unlikely to generate significant negative impacts on avifauna, therefore from an avifaunal perspective the proposed project can be authorised if the recommendations and mitigation measures are implemented accordingly.

APPENDIX I: IMPACT SIGNIFICANCE RATING SYSTEM

Impacts are evaluated and assessed in terms of the following criteria:

Extent of impact	*Explanation of extent*
Site	*Impacts limited to construction site and direct surrounding area*
Local	*Impacts affecting environmental elements within the local area / district*
Regional	*Impacts affecting environmental elements within the province*
National	*Impacts affecting environmental elements on a national level*

Duration of impact	*Explanation of duration*
Short term	*0 - 5 years. The impact is reversible in less than 5 years.*
Medium term	*5 - 15 years. The impact is reversible in less than 15 years.*
Long term	*>15 years, but where the impacts will cease if the project is decommissioned*
Permanent	*The impact will continue indefinitely and is irreversible.*

Probability of impact	*Explanation of Probability*
Unlikely	*The chance of the impact occurring is extremely low*
Possible	*The impact may occur*
Probable	*The impact will very likely occur*
Definite	*Impact will certainly occur*

Reversibility of impact	*Explanation of Reversibility Ratings*
Low	*The affected environment will not be able to recover from the impact - permanently modified*
Medium	*The affected environment will only recover from the impact with significant intervention*
High	*The affected environmental will be able to recover from the impact*

Significance of impact	*Explanation of Significance*
None	*There is no impact at all*
Low	*Impact is negligible or is of a low order and is likely to have little real effect*
Moderate	*Impact is real but not substantial*
High	*Impact is substantial*
Very high	*Impact is very high and can therefore influence the viability of the project*

APPENDIX II: SABAP2 Species List

Species	Red Data Status	Endemic or Near-endemic	Priority Score	Reporting Rate (%)							
				3030_2400	3035_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410
Barbet, Acacia Pied				66.7	70.0	25.0			60.0	100.0	
Batis, Pririt									20.0		
Bee-eater, European				33.3	60.0	25.0		100.0	20.0		0.0
Bishop, Southern Red				66.7	60.0	75.0	100.0		20.0	100.0	
Bulbul, African Red-eyed				66.7	70.0	75.0		100.0	60.0	100.0	
Bunting, Cape					10.0	50.0	100.0		20.0		
Bunting, Cinnamon-breasted					0.0						
Bunting, Lark-like					10.0	50.0	100.0		20.0	100.0	
Bustard, Ludwig's	EN, EN		320	66.7	20.0	25.0	100.0				100.0
Buzzard, Jackal		(*)	250					100.0	40.0		
Canary, Black-headed		(*)							0.0		
Canary, Black-throated					40.0	25.0			20.0		
Canary, White-throated				100.0	40.0	75.0			0.0		100.0
Canary, Yellow						50.0			20.0		
Chat, Familiar				33.3	70.0	25.0		100.0	20.0		100.0
Chat, Karoo				66.7		25.0	100.0		0.0	100.0	
Chat, Sickle-winged		(*)		33.3	0.0			100.0	40.0		
Cisticola, Desert				66.7	40.0	75.0	100.0		40.0	100.0	
Cisticola, Grey-backed				66.7	30.0	50.0	100.0		80.0		100.0
Cisticola, Levaillant's					20.0						
Cisticola, Zitting				100.0	50.0	50.0	100.0	100.0		100.0	
Coot, Red-knobbed					20.0	75.0					
Cormorant, White-breasted					10.0	25.0					
Crake, Black					10.0						

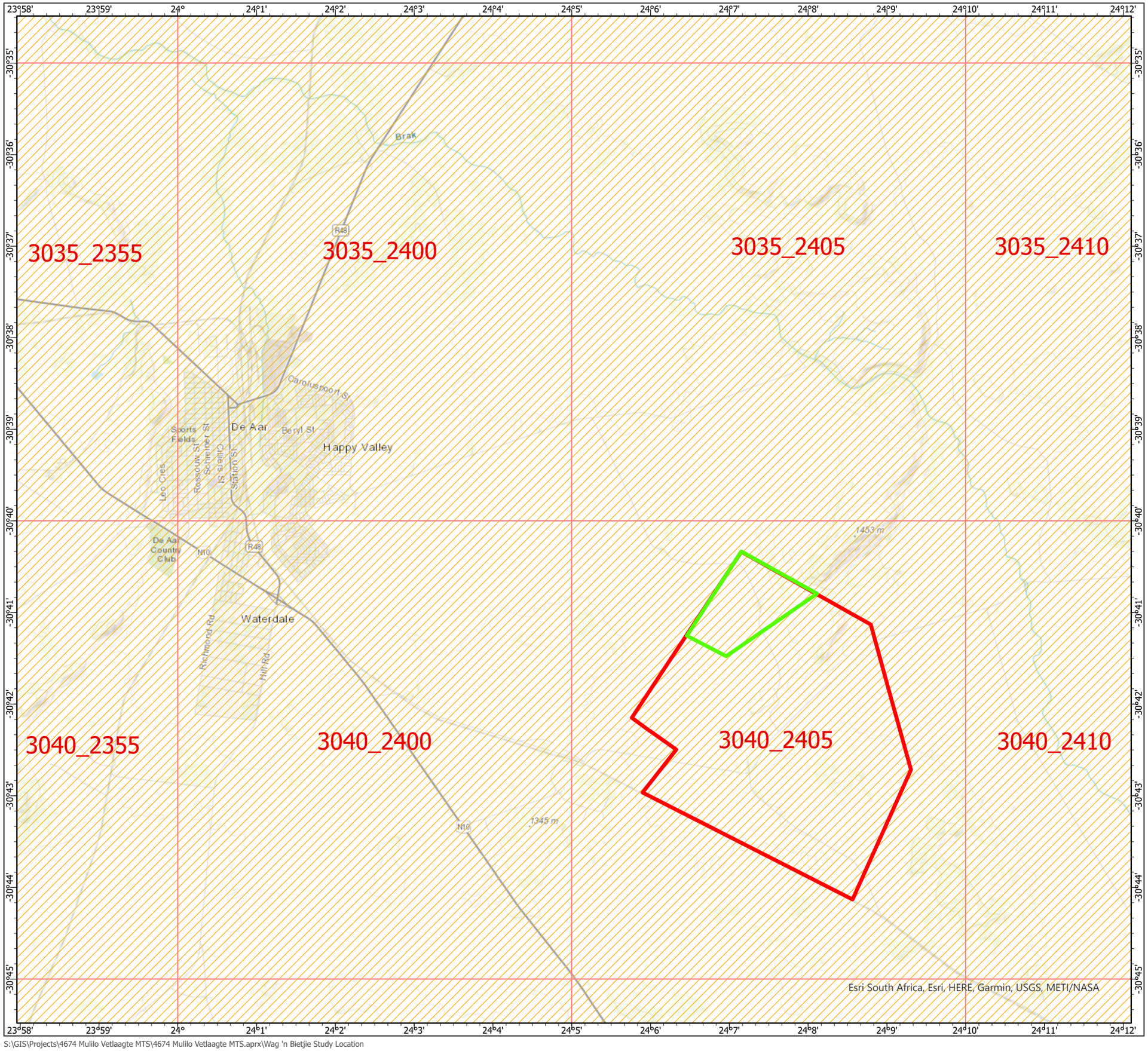
Species	Red Data Status	Endemic or Near-endemic	Priority Score	Reporting Rate (%)							
				3030_2400	3035_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410
Crane, Blue	NT, VU		320		30.0		100.0	100.0			
Crombec, Long-billed									20.0		
Crow, Cape									20.0		
Crow, Pied				100.0	90.0	100.0	100.0	100.0	40.0	100.0	100.0
Dove, Laughing				66.7	100.0	25.0		100.0	20.0	100.0	
Dove, Namaqua				66.7	30.0				20.0	100.0	
Dove, Red-eyed					60.0						
Dove, Rock					20.0						
Duck, African Black					10.0						
Duck, Yellow-billed					30.0	25.0					
Eagle, Booted			230		30.0				20.0		
Eagle, Martial	EN, VU		350				100.0		20.0		
Eagle, Tawny	EN, LC		290		10.0	0.0			20.0		
Eagle, Verreaux's	VU, LC		360	33.3		25.0			60.0		
Egret, Little					10.0						
Eremomela, Yellow-bellied				33.3	20.0		100.0				
Falcon, Amur			210	33.3	20.0	25.0					
Falcon, Lanner	VU, LC		300		10.0		100.0				
Finch, Red-headed				33.3	10.0						
Flamingo, Greater	NT, LC		290		30.0	25.0					
Flycatcher, Chat				100.0	10.0	25.0	100.0		40.0	0.0	
Flycatcher, Fairy		(*)							40.0		
Flycatcher, Fiscal		(*)			20.0				60.0		
Flycatcher, Spotted					20.0						
Francolin, Grey-winged		SLS	190		0.0				20.0		

Species	Red Data Status	Endemic or Near-endemic	Priority Score	Reporting Rate (%)							
				3030_2400	3035_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410
Goose, Egyptian				33.3	80.0	75.0	100.0		0.0	100.0	
Goose, Spur-winged					40.0	50.0	100.0				
Goshawk, Gabar					10.0						
Grebe, Little					10.0	50.0					
Greenshank, Common					30.0						
Guineafowl, Helmeted					70.0	25.0	100.0				
Gull, Grey-headed					10.0						
Hawk, African Harrier-			190		10.0						
Heron, Black-headed				33.3	30.0						
Heron, Grey					40.0	25.0					
Hoopoe, African					40.0				20.0		
Ibis, African Sacred					80.0	50.0				100.0	
Ibis, Glossy					60.0						
Kestrel, Greater			174	33.3		50.0					
Kestrel, Lesser			214	100.0	50.0	100.0	100.0	100.0	40.0	100.0	
Kestrel, Rock					20.0	25.0	100.0		20.0		
Kingfisher, Malachite					10.0						
Korhaan, Blue	LC, NT	SLS	270	33.3	20.0						
Korhaan, Karoo	NT, LC		240	66.7		25.0			20.0		
Korhaan, Northern Black			180	100.0	90.0	100.0	100.0		60.0	100.0	
Lapwing, Blacksmith					70.0	50.0			20.0	100.0	
Lapwing, Crowned					20.0						
Lark, Eastern Clapper				100.0	60.0	100.0	100.0		40.0	100.0	
Lark, Karoo		(*)			10.0				20.0		
Lark, Karoo Long-billed				66.7		50.0	100.0		60.0	100.0	

Species	Red Data Status	Endemic or Near-endemic	Priority Score	Reporting Rate (%)							
				3030_2400	3035_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410
Lark, Large-billed		(*)		100.0	20.0	50.0		100.0	40.0		
Lark, Sabota				66.7	40.0	75.0	100.0	100.0	0.0	100.0	
Lark, Spike-heeled				66.7	50.0	75.0	100.0	100.0	40.0	100.0	100.0
Martin, Brown-throated				66.7	20.0	25.0					
Martin, Rock					50.0	50.0			40.0	100.0	
Moorhen, Common					50.0						
Mousebird, Red-faced					40.0						
Mousebird, White-backed				33.3	90.0	50.0			20.0	100.0	
Ostrich, Common					20.0	25.0					
Owl, Spotted Eagle-			170		10.0						
Pigeon, Speckled				66.7	60.0	75.0	100.0	100.0	20.0	20.0	
Pipit, African				66.7	70.0	75.0	100.0	100.0	40.0	100.0	100.0
Pipit, African Rock	NT, LC	SLS	200						60.0	60.0	
Pipit, Long-billed									0.0	0.0	
Plover, Kittlitz's					10.0	25.0					
Plover, Three-banded				33.3	70.0	25.0	100.0				
Prinia, Black-chested				66.7	10.0	25.0			0.0	0.0	
Prinia, Karoo		(*)		33.3	20.0	50.0	100.0		40.0	40.0	
Quelea, Red-billed				33.3	30.0				0.0	0.0	
Raven, White-necked					10.0				40.0	40.0	
Robin-chat, Cape					60.0	75.0		100.0	40.0	100.0	
Sandgrouse, Namaqua					10.0				20.0	20.0	
Sandpiper, Common					0.0						
Sandpiper, Curlew					10.0						
Sandpiper, Wood					10.0						

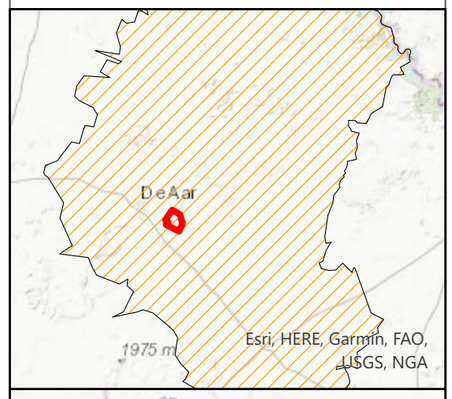
Species	Red Data Status	Endemic or Near-endemic	Priority Score	Reporting Rate (%)							
				3030_2400	3035_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410
Shelduck, South African				66.7	50.0	75.0			40.0	40.0	
Shoveler, Cape					10.0						
Sparrow, Cape				100.0	100.0	100.0	100.0	100.0	40.0	100.0	100.0
Sparrow, House				66.7	60.0	50.0					
Sparrow, Southern Grey-headed				66.7		25.0			20.0	100.0	
Sparrow-weaver, White-browed				66.7	10.0						
Spoonbill, African						25.0					
Starling, Cape Glossy					10.0	25.0					
Starling, Common					50.0						
Starling, Pale-winged					30.0				40.0	100.0	
Starling, Pied		SLS		33.3	50.0	100.0			40.0	100.0	
Starling, Red-winged						25.0					
Starling, Wattled					10.0	0.0					
Stilt, Black-winged					70.0	25.0			20.0	20.0	
Stint, Little					20.0						
Stonechat, African				66.7	50.0						100.0
Stork, Black	VU, LC		330		20.0	50.0					
Stork, White			220	33.3	10.0						
Sunbird, Dusky					10.0	50.0			20.0	20.0	
Swallow, Barn				100.0	50.0	75.0	100.0	100.0	40.0	100.0	100.0
Swallow, Greater Striped				100.0	30.0	100.0	100.0	100.0	40.0	100.0	100.0
Swallow, White-throated				66.7	20.0	25.0	100.0			100.0	
Swift, African Black				33.3							
Swift, Alpine									20.0	20.0	
Swift, Common				33.3	10.0	25.0					

Species	Red Data Status	Endemic or Near-endemic	Priority Score	Reporting Rate (%)							
				3030_2400	3035_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410
Swift, Little				33.3	70.0	50.0		100.0	20.0	100.0	
Swift, White-rumped				66.7	40.0	50.0			20.0	20.0	100.0
Teal, Cape					30.0						
Teal, Red-billed					20.0	50.0					
Thick-knee, Spotted					20.0	0.0			20.0	20.0	
Thrush, Karoo		(*)		33.3	80.0	25.0			20.0	100.0	
Thrush, Short-toed Rock					0.0				40.0	40.0	
Tit, Grey		(*)							20.0	20.0	
Wagtail, Cape				33.3	70.0	50.0	100.0	100.0	40.0	100.0	
Warbler, Cinnamon-breasted		(*)							0.0	0.0	
Warbler, Rufous-eared				100.0	80.0	100.0	100.0	100.0	60.0	100.0	100.0
Waxbill, Common					30.0						
Wheatear, Capped					40.0		100.0	100.0	20.0	20.0	100.0
Wheatear, Mountain					0.0	25.0			60.0	100.0	100.0
White-eye, Cape		(*)			40.0						
White-eye, Orange River					30.0				40.0	40.0	
Whydah, Pin-tailed					20.0	25.0				100.0	



ARCUS

- Wag 'n Bietjie Farm RE/5
- Wag 'n Bietjie Assessment Area
- Pentads
- Platberg-Karoo Conservancy



Scale @ A3

0 110 220 km

NORTH

Produced By: MdP	Ref: 4674-REP-006
Checked By: AB	Date: 2022/01/07

Wag 'n Bietjie
Study Location
Figure 1

Avifaunal Specialist Assessment
Wag 'n Bietjie MTS Project

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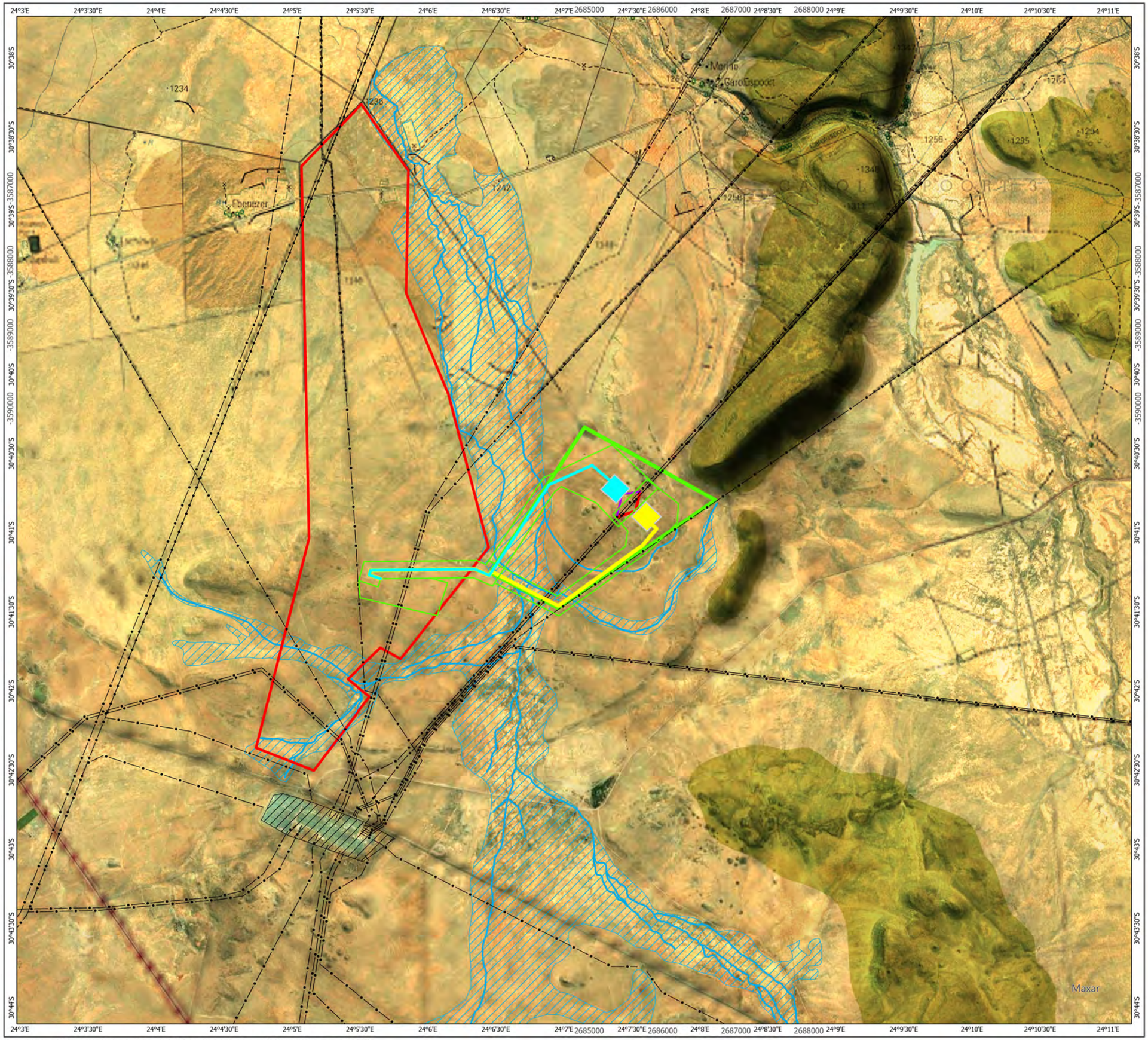

ARCUS

- Existing Eskom Hydra Substation
- Existing Lines
- Assessment Area
- 132kV Double Circuit Wag 'n Bietjie MTS - Vetlaagte MTS Alternative 1
- MTS - Alternative 1
- 132kV Double Circuit Wag 'n Bietjie MTS to Vetlaagte MTS Alternative 2
- MTS - Alternative 2
- 400 kV LiLo Alternative 1
- 400 kV LiLo - Alternative 2
- Aquatic Sensitivity
- Besemkaree Koppies Shrubland
- Northern Upper Karoo
- Vetlaagte Solar PV

1:50 000 Scale @ A3

0 1 2 km

NORTH

Produced By: OD	Ref: 4674-REP-0011
Checked By: AB	Date: 2022/01/14

Vegetation Type and Assessment Area
Figure 2

Wag 'n Bietjie MTS and Grid Connection
Avifaunal Specialist Assessment

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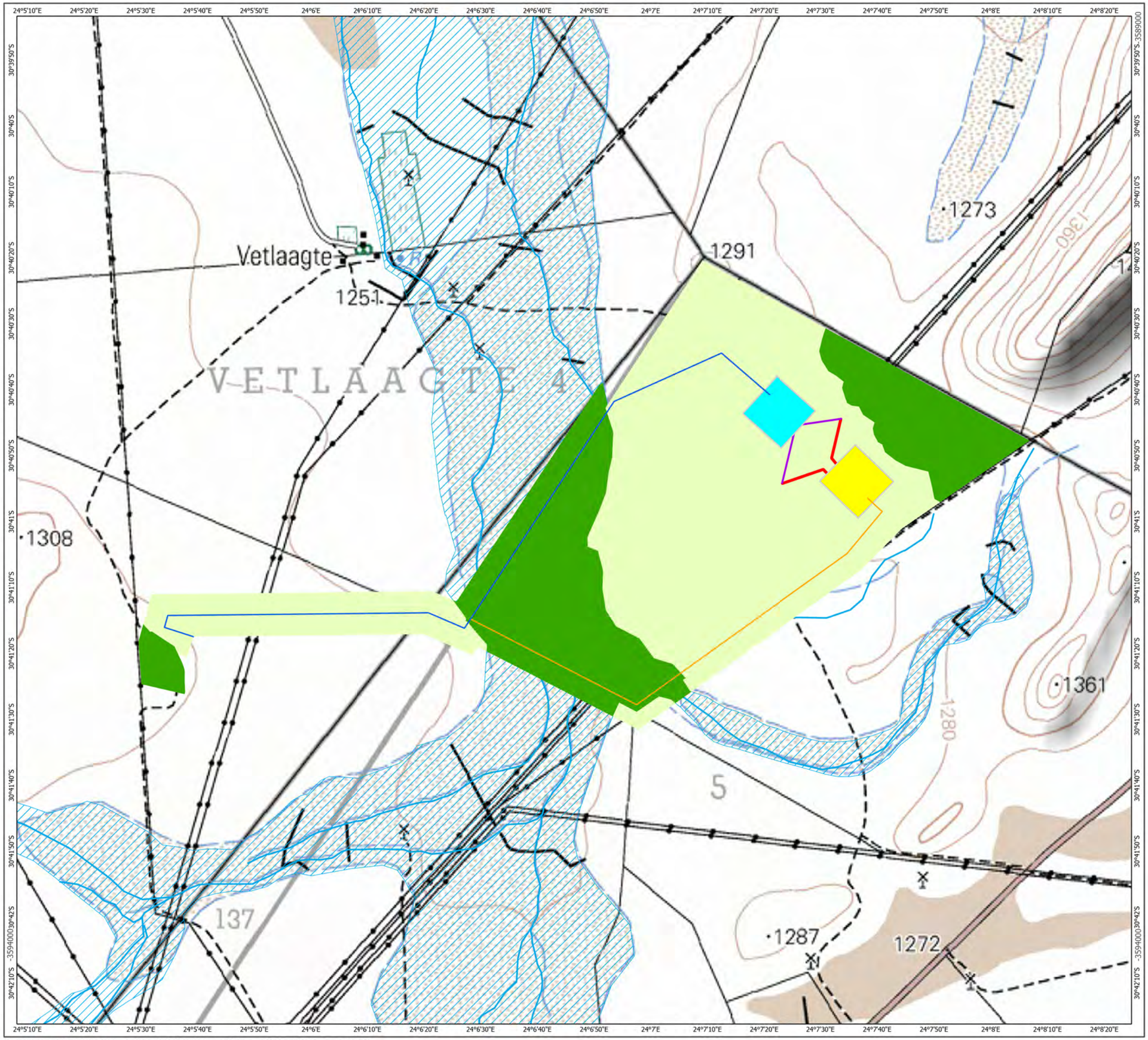

ARCUS

- Existing Eskom Hydra Substation
- 132kV Double Circuit Wag 'n Bietjie MTS - Vetlaagte MTS Alternative 1
- MTS - Alternative 1
- 132kV Double Circuit Wag 'n Bietjie MTS to Vetlaagte MTS Alternative 2
- MTS - Alternative 2
- 400 kV LiLo Alternative 1
- 400 kV LiLo - Alternative 2
- Very Low Avifaunal Sensitivity
- Low Avifaunal Sensitivity
- Aquatic Sensitivity

1:20 000 Scale @ A3

0 0.5 1 km NORTH

Produced By: OD	Ref: 4674-REP-0012
Checked By: AB	Date: 2022/01/14

Avifaunal Sensitivity
Figure 3

Wag 'n Bietjie MTS and Grid Connection
Avifaunal Specialist Assessment

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