TERRESTRIAL ANIMAL SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED MULILO TOTAL HYDRA STORAGE PROJECT: GRID CONNECTION NEAR DE AAR, NORTHERN CAPE PROVINCE

For

Mulilo Total Hydra Storage (Pty) Ltd

February 2021

Prepared By:

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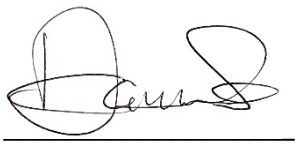
1 SPECIALIST DETAILS

- Dr Owen Rhys Davies (Phone: +27 (0) 72 558 0080; Email: OwenD@arcusconsulting.co.za)
- SACNASP registration for Ecological Science (member # 117555).
- Experience: 5 years of consulting, primary expertise in Avifauna.
- *Curriculum vitae* attached.

2 STATEMENT OF INDEPENDENCE

I, Owen Rhys Davies, as the appointed Terrestrial Biodiversity Specialist, hereby declare/affirm the correctness of the information provided in this compliance statement, and that I: meet the general requirements to be independent and have no business, financial, personal or other interest in the proposed development and that no circumstances have occurred that may have compromised my objectivity; and am aware that a false declaration is an offence in terms of regulation 48 of the EIA Regulations (2014).



Signature

12 February 2021

Date

3 INTRODUCTION

3.1 Background

Mulilo Total Hydra Storage (Pty) Ltd ('MTHS') is applying for environmental authorisation for a self-build grid interconnection project which will consist of a short overhead powerline, switching station and access road ('proposed development') as part of the Mulilo Total Hydra Storage Project.

The Mulilo Total Hydra Storage Project is a hybrid electricity generation plant comprising of solar photovoltaic (PV) technology, a battery energy storage system (BESS) and emergency backup Diesel / Gas generator installations (Gensets). The Mulilo Total Hydra Storage Project was bid in the Risk Mitigation Independent Power Producers Procurement Program (RMI4P), and if selected as a preferred bidder, the project would obtain SIP1 status. The Mulilo Total Hydra Storage Project is located 5km South East of De Aar in the Northern Cape and roughly 8km north of the Eskom Main Transmission Substation (MTS), Hydra.

In terms of the Self-Build agreement for the proposed development, Eskom has provided an indicative Cost Estimate Letter to connect MTHS to the national electricity network (Grid). All environmental approvals for MTHS are in place however the Grid connection works had to be adjusted and a separate Environmental Authorisation is required to be issued for all the infrastructure which is handed over to Eskom on completion.

The following Self-Build works are proposed as part of this Environmental Application.

3.1.1 MTHS Self Build Grid Interconnection (Overhead power line):

The overhead powerline (OHPL) will evacuate electricity generated from the Mulilo Total Hydra Storage Project and is to be approximately 8 km in length, with a capacity of up to 132 kV. The proposed OHPL follows the existing 132 kV Eskom Hydra-Bushbuck OHPL for the most part, and will run in a south easterly direction to the Eskom Hydra Main

Transmission Substation (MTS). A single track service road will be required for the construction and maintenance of the OHPL and would run directly below the OPHL. The intended end-user for this project is Eskom, and responsibility will be handed over to Eskom should favourable environmental authorisation be granted and the project successfully commissioned.

The grid connection route considered in this application was previously assessed as a 200m wide corridor (100m on either side of the line) for the 400 kV grid connection associated with the Mulilo De Aar 2 South Wind Energy Facility ('DA2S WEF') (Arcus, 2021). The specialist assessments conducted for this route have been used to inform the baseline environment and impacts for this proposed development

- Design and construct ±8 km of single circuit 132 kV overhead power line (OHPL), between the Hydra MTS and Mulilo Total Hydra Storage Project;
- The overhead power line is to be strung with twin tern conductor;
- Preferred technology to be that of bird friendly steel monopole structures. These are to be used with a maximum height of 25m.
- Telecommunication via fibre optic is required on the 8km HV Line.

Associated infrastructure will include:

- Foundations and insulators;
- Existing access roads and jeep tracks; and
- Line and servitude clearances to meet the statutory requirements.

3.1.2 MTHS Self-Build Associated Infrastructure:

This associated infrastructure is being mentioned as part of this report as they form part of the Grid Interconnection Project to be handed over to Eskom for commissioning responsibility.

3.1.2.1 Switching Station Access Road:

A 6km long, 12 m wide access road is required for construction and maintenance of the self-build switching station. Access begins off the N10 highway and terminates at the self-build switching station. A <6m service road continues along the proposed OHPL route within the servitude, and as far as possible, this road will be used.

3.1.2.2 Self-Build Switching Station:

A 132 kV, double busbar switching station, is required to be constructed at the Mulilo Total Hydra Storage Project site. The switching station is named the Self Build Switching Station, and will house the required metering and protection equipment inside various substation buildings. In addition, there will be spatial provision to establish at least four additional outgoing feeder bays with access to the property for at least two additional incoming line bays to cater for future expansions. The switching station will eventually contain six bays but would start with the initial two bays as required by the Mulilo Total Hydra Storage project. The land required would be 100 m x 100 m for the 2-bay phase, increasing to 200 m x 100 m for six bays and with a maximum height of 25 m.

3.1.3 Additional Project Considerations:

The following two project considerations have been proposed by MTHS as part of the self-build agreement with Eskom. These will be commissioned in terms of Eskom's Build guidelines and preference.

3.1.3.1 Upgrades at Hydra MTS:

As part of the above-mentioned self-build, MTHS intend on extending the existing 132kV double busbars by one bay and establishing a new 132kV feeder bay at the Eskom Hydra MTS. This upgrade will also include protection and metering components.

3.1.4 Alternatives Considered:

Should an alternative powerline route be required, MTHS have identified a possible solution and have engaged with the Eskom Grid Access Unit to establish its viability.

MTHS are proposing to perform a "loop in loop out" onto one circuit of the existing Eskom Hydra-Bushbuck double circuit 132kV OHPL and to restring the remaining portion of that circuit (if required) between the Project and the Hydra Substation. The purpose of the proposed restring is provide additional electricity evacuation option to Eskom and to the Mulilo Total Hydra Storage Project and to minimise any potential servitude or feeder bay constraints at the Hydra Substation. This proposed commission will not trigger any additional activities other than those being applied for.

3.2 Previous Assessment

The proposed grid connection route considered in this application and specialist assessment was one of the connection route options previously assessed for the grid connection associated with the Mulilo De Aar 2 South Wind Energy Facility ('DA2S WEF'). The proposed grid connection route follows the route of an existing power line throughout its length.

3.3 Scope of Study

The scope of this assessment included:

- Confirmation of findings of the 200 m corridor previously assessed as part of the DA2S WEF Grid Connection report and a determination of their suitability for this assessment;
- Updating the description of habitats and terrestrial animal species that may occur within the area applicable to this assessment;
- Updating of GIS and sensitivity maps applicable to this assessment;
- Updating of potential impacts on Terrestrial Animal Species applicable to this assessment;
- Updating of potential mitigation measures required to reduce the impacts of the development; and
- A substantiated statement, based on the findings of this specialist assessment regarding the acceptability, or not, of the proposed development, if it should receive approval or not and any conditions to which the statement is subjected.

3.4 Assumptions and Limitations

The resolution and reliability of distribution records and available databases is largely dependent on the sampling effort conducted in the area. Private property is often poorly sampled and therefore database queries may not adequately represent the actual fauna present on the site. The two main approaches taken to reduce the effect of this limitation were; 1) the desk-top database search was expanded beyond the immediate project site to cover a larger area with similar vegetation and habitat types, and 2) an extended site visit was conducted on the proposed development site and included a much larger area sharing the same vegetation types and habitats as those found in the grid connection corridor considered for this application. The site work was concluded prior to the publication of the Species Environmental Assessment Guidelines[2] and therefore some of the

[2] South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 1.2020.

methodologies outlined and recommended therein were not employed. This limitation is not however considered to compromise the outcome of the impact assessment as the on-site experience gathered during the assessment of the larger DA2S WEF grid connection corridor (that included the grid connection corridor considered for this application) offered the specialist a greater understanding of the biodiversity relevant to the broader area and the development footprint considered for this application. This complies with the precautionary approach prescribed the National Environmental Management Act, Act No. 107 of 1998 (NEMA).

3.5 Legislative Context

The applicable legislation relevant to this assessment is provided in more detail in Appendix I, however the Government Gazette, No. 43855 (Published in Government Notice No. 1150) of 30 October, 2020: "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species" is of particular relevance to the production of this report. The assessment and minimum reporting requirements are associated with a level of environmental sensitivity identified by the national web-based screening tool[3].

The proposed project site falls within an area identified by the screening tool as 'medium sensitivity' in the Terrestrial Animal Species Theme and this classification was assessed during site-sensitivity verification (Terrestrial Animal Species Site Sensitivity Verification Report attached), which concluded that a Terrestrial Animal Species Specialist Assessment was applicable.

4 METHODOLOGY

Various databases of distribution records were consulted during a desk-top study to determine the potential species of flora that could occur on the site, these are described in more detail below. The methodology used to assess the impacts follows Hacking (2001)[4] outlined in Appendix II. In addition to the desk-top study a five-day site walkthrough was conducted between 10 and 14 February 2020. Important habitats and species present or potentially present (i.e. suitable habitat was identified) within approximately 200 m of the proposed line were assessed through a site walk-through, the different habitats, biodiversity features and landscape units were investigated and their position and sensitivity were mapped in the field. Field notes were transcribed onto publically available satellite imagery and mapped in GIS. Active searches for reptiles and amphibians were also conducted within habitats likely to be important for such species such as around rocky outcrops and wetlands.

4.1 Desk-top Study

4.1.1 Site Screening

Following the protocol listed in the Government Gazette, No. 43855 (Published in Government Notice No. 1150) of 30 October, 2020: "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species" the information presented by the online screening tool[3] was consulted to determine the sensitivity of the project site prior to the field site visit and ground-truthing.

4.1.2 Existing Studies

Several existing ecological studies in the area were consulted in the formulation of this assessment report, including:

[3] https://screening.environment.gov.za/

[4] Hacking, T. 2001. An innovative approach to structuring environmental impact assessment reports; Part 2: Ranking the significance of environmental aspects and impacts. 19. 56-59.

- The Proposed 132kV Power line associated with the Castle Wind Energy Facility on a site near De Aar, Northern Cape Province (Savannah Environmental, 2015),
- The Environmental Impact Assessment for the Proposed Castle Wind Energy Facility and Associated Infrastructure near De Aar, Northern Cape. DEA Ref No. 14/12/16/3/3/2/278 Fauna & Flora Specialist Impact Assessment Report compiled by Todd (2014) for Savannah Environmental,
- Appendix F: Assessment of Potential Impacts and Possible Mitigation Measures for the Proposed 132 kV transmission line corridor adjacent to the existing Eskom transmission line from Longyuan Mulilo De Aar 2 North Wind Energy Facility (WEF) to the Hydra Substation in De Aar, Northern Cape (Aurecon 2013),
- Bird Impact Assessment Study Longyuan Mulilo De Aar 2 North Wind Energy Facility DEFF REF. NO. 12/12/20/2463/2 (Chris van Rooyen Consulting. 2014),
- Castle Wind Energy Facility Avifaunal Impact Assessment (WildSkies Ecological Services, 2014, Unpublished Report),
- Operational phase bird monitoring at the Longyuan Mulilo De Aar 2 North Wind Energy Facility, Year 1 (Chris van Rooyen Consulting, 2018 Unpublished Report),
- Operational phase bird monitoring at the Longyuan Mulilo De Aar 2 North Wind Energy Facility, Year 2 Quarters 1-3 (Chris van Rooyen Consulting, 2018, Unpublished Report), and
- Zingesele Wind Energy Facility Final Pre-construction Bird Monitoring and Avifaunal Impact Assessment Scoping Report (Arcus Consulting, 2019, Unpublished Report).

4.1.3 Species

The lists of fauna were collated from interrogating multiple databases and sources including the various atlassing projects of the Virtual Museum[5] and the GBIF[6] network. Road mortality records were obtained from the Endangered Wildlife Trust (EWT) Wildlife and Roads Project[7]. Bird data were obtained from the Southern African Bird Atlas Project 2 (SABAP-2) from the Avian Demography Unit of the University of Cape Town[8], Co-ordinated Avifaunal Road Count (CAR) project[9], Co-ordinated Water-bird Count (CWAC) project[10] and The Important Bird Areas of southern Africa (IBA) project[11].

4.1.4 Ecosystems

Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment[12]. Important catchments and protected expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES). Critical Biodiversity Areas were extracted from the SANBI BGIS Database[13]. These data incorporate biodiversity features (both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation. Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan,

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

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

[7] https://www.ewt.org.za/resources/resources-biodiversity-data/ accessed 04 March 2020.

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

[9] 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.

[10] 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.

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

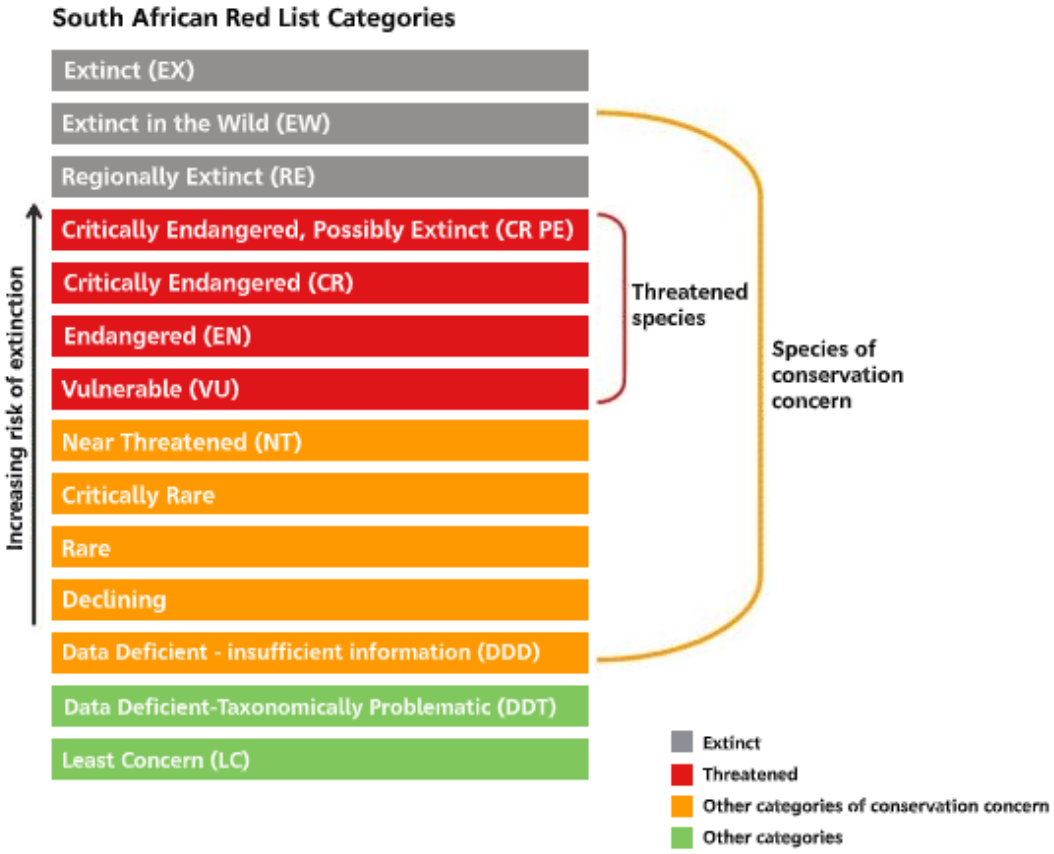
[12] Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L., Nienaber, S. (2011). Technical Report for the National Freshwater Eosystem Priority Areas project. WRC Report No. K5/1801.

[13] Northern Cape Department of Environment and Nature Conservation. 2016 Northern Cape Critical Biodiversity Areas. http://bgis.sanbi.org/SpatialDataset/Detail/658 accessed January 20 2020.

National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

4.1.5 Species of Concern

Species of concern were considered to be those listed by conservation authorities as being on a 'Red List' and at risk of extinction and those listed by National or Regional legislation as being protected. National and regional legislation was evaluated to determine which species that may occur on site are protected species. Regional threat status was obtained for mammals[14], reptiles[15], frogs[16], dragonflies[17] and butterflies[18]. Avian conservation status was determined by referencing The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland[19]. The IUCN[20] threat status was used for species where no regional assessment was available.



[14] Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. 2016. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[15] Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. 2014. Edited by Michael F. Bates, William R. Branch, Aaron M. Bauer, Marius Burger, Johan Marais, Graham J. Alexander & Marienne S. de Villiers. SANBI, Pretoria.

[16] Minter LR, Burger M, Harrison JA, Braack HH, Bishop PJ & Kloepfer D (eds). 2004. Atlas and Red Data book of the frogs of South Africa, Lesotho and Swaziland. SI/MAB Series no. 9. Smithsonian Institution, Washington, D.C.

[17] Samways, M.J. & Simaika, J.P. 2016. Manual of Freshwater Assessment for South Africa: Dragonfly Biotic Index. Suricata 2. South African National Biodiversity Institute, Pretoria.

[18] Mecenero, S., J.B. Ball, D.A. Edge, M.L. Hamer, G.A. Hening, M. Krüger, E.L. Pringle, R.F. Terblanche & M.C. Williams (eds). 2013. Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red List and atlas. Saftronics (Pty) Ltd., Johannesburg and Animal Demography Unit, Cape Town.

[19] Taylor, M.R., Peacock, F., and Wanless, R.M. 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. (BirdLife South Africa Checklist of Birds in South Africa updated 2020).

[20] http://iucnredlist.org accessed 24 November 2019.

4.1.6 Modelling

No modelling was required.

4.2 Site inspection details

- Date: 10 February 2020 – 14 February 2020
- Duration: 5 Days
- Season: Summer
- Season Relevance: As a summer rainfall region, the conditions during the site visit were excellent for the field assessment as the area had received a good amount of rainfall allowing for a thorough assessment of features such as temporary wetlands, vleis, drainage lines, seeps and water-filled depressions to be conducted. Plant species such as grasses and herbs were flourishing during the site visit increasing the abundance of insects and animals such as granivorous and insectivorous birds.

5 RESULTS

This statement is to confirm the results of the study conducted for the area assessed as part of the DA2S WEF Grid Connection report. The findings contained herein are suitable and applicable for this assessment of impacts of the proposed Mulilo Total Hydra Storage Project: Grid Interconnection.

5.1 Baseline Description of Biodiversity and Habitats

5.1.1 Ecosystem and Biodiversity

5.1.1.1 Existing Biodiversity Areas

The Northern Cape Critical Biodiversity Area (CBA) Map was published in 2016[21] and it "updates, revises and replaces all older systematic biodiversity plans and associated products for the province". This includes the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008), from which the Northern Cape CBA Map derived identified CBA1 and CBA2 areas (and added additional CBA1 and CBA2 areas). The rationale for defining the recent CBA areas is derived from the earlier (2008) conservation plan. Areas in the 2016 map include the following areas:

- Important Bird Areas (IBAs);
- Succulent Karoo Ecosystem Plan (SKEP) expert identified areas;
- Threatened species locations;
- Features from previous conservation plans (including CBA1 and CBA2 areas from the Namakwa District Biodiversity Sector Plan);
- Areas supporting climate change resilience, e.g. areas of high diversity, topographic diversity, strong biophysical gradients, climate refugia, including kloofs, south-facing slopes and river corridors;
- Conservation Plans from adjacent provinces; and
- Landscape structural elements, e.g. rocky outcrops, koppies, dolerite dykes, boulder fields, woody vegetation on outwash plains.

The Northern Cape CBA map classifies the natural vegetation of the province according to conservation value in decreasing value, as follows:

- Protected Areas;
- Critical Biodiversity Area 1 (Irreplaceable Areas);
- Critical Biodiversity Area 2 (Important Areas);
- Ecological Support Areas; and

[21] Oosthuysen, E. & Holness, S. 2016. Northern Cape Critical Biodiversity Areas (CBA) Map. Department of Environment and Nature Conservation & Nelson Mandela Metropolitan University.

- Other Natural Areas.

The proposed grid connection corridor considered here does not include any CBA1 or CBA2 areas but is positioned wholly within an area classified as an ESA. This ESA is largely due to the presence of the Platberg-Karoo Conservancy IBA. 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.

The position of the proposed development alongside multiple existing power lines converging on the Hydra MTS and the relatively small size of the development footprint makes it highly unlikely that the proposed development will have a significant negative impact on the functioning and goals of the ESA, IBA or the biodiversity in the area.

5.1.2 Habitats

The broad vegetation type that occurs in the study area represents the Nama-Karoo biome. The Nama-Karoo flora is not particularly species rich with a very low local endemism, it is dominated by low dwarf shrubs intermixed with grasses, succulents, geophytes and annual forbs on extensive plains. The Nama-karoo is largely homogenous with few notable different habitat categories.

5.1.2.1 Lowland Plains Vegetation

The low lying areas are dominated by dwarf karoo shrubs scattered grasses and occasional large shrubs typical of the Northern Upper Karoo**Error! Bookmark not defined.** vegetation type. This vegetation type dominated the whole project site and surrounding area (Figure 2). The vegetation exhibited signs of overgrazing to various degrees across the development footprint. Faunal species such as Aardvark *(Orycteropus afer)*, African Mole Rat *(Cryptomys hottentotus)*, Bat-eared Fox *(Otocyon megalotis)*, Cape Fox *(Vulpes chama)*, Black-footed Cat, Yellow Mongoose *(Cynictis penicillata)*, Meerkat *(Suricata suricatta)*, Aardwolf *(Proteles cristata),* Scrub Hare *(Lepus saxatilis)*, Springhare and South African Ground Squirrel *(Xerus inauris)* are among those species which show preference to the lowland plains.

This habitat type represents the majority of the proposed development footprint and it is widespread and contiguous across the broader area.

5.1.2.2 Rocky Ridges and Outcrops

Cliffs and rocky outcrops are associated with sediment layers more resistant to weathering and are associated with outcrops in the low lying plains. They are characterised by the presence of boulders and loose rocks with an open canopy of medium to tall woody shrubs above a sparse layer of grasses. The common woody shrubs include *Searsia*, *Euclea* and *Diospyros* species. These features provide potential habitat for animals such as Spectacled Dormouse *(Graphiurus ocularis)*, Hewitt's Red Rock Hare *(Pronolagus saundersiae)*, Cape Elephant Shrew *(Elephantulus edwardii)*, Eastern Rock Elephant Shrew *(Elephantulus myurus)*, Round-Eared Elephant Shrew *(Macroscelides proboscideus)*, Western Rock Elephant Shrew *(Elephantulus rupestris)*, Cape Dassie *(Procavia capensis)*, Southern Rock Agama *(Agama atra)*, Western Rock Skink *(Trachylepis sulcata)*, Karoo Girdled Lizard *(Karusasaurus polyzonus)* and Common Banded Gecko *(Pachydactylus mariquensis)* amongst others.

These habitats and microhabitats are widespread in the area and only occur on a small section of the proposed development, therefore the localised impact associated with the footprint would be negligible.

5.1.2.3 Washes & Drainage Lines

The proposed grid connection corridor traverses two lower lying areas which direct water towards drainage lines through which water is channelled during rainfall events. These areas are important for maintaining downstream habitats through the supply of water and sediment. Larger drainage lines downstream are often associated with deeper, looser soils which offer burrowing opportunities for various species and the larger downstream depressions collect sufficient water during the wet season to provide habitat, refuge, shelter and an increase in palatable vegetation for a variety of species that rely on such features in an otherwise arid landscape. These habitats are susceptible to impacts associated with erosion and the invasion of alien plant species, however these impacts can be very effectively mitigated.

5.1.2.4 Habitat Sensitivity

Slopes and rocky ridges have a higher sensitivity than the surrounding lowland areas. The footprint of the power lines would be relatively small and no highly significant impacts to habitats are likely to result from the development if mitigation measures are adhered to.

Erosion poses a significant threat to habitats in arid environments, with both terrestrial and aquatic habitats being susceptible to the removal, transportation and deposition of topsoil and silt following rainfall events. It is critical that erosion control measures are implemented.

5.1.3 Vertebrate Species

The only Terrestrial Animal Species of Conservation Concern listed by the Screening Tool was Ludwig's Bustard *(Neotis ludwigii)*, an Endangered bird species, which resulted in the classification of medium sensitivity for the project area. This, combined with the position of the proposed development within an IBA has resulted in the potential impacts to avifauna, particularly Ludwig's Bustard, being the primary focus of this assessment. However the potential impacts to other terrestrial animal species have also been thoroughly considered.

Vertebrate species (birds, mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix III, IV, V and VI. All threatened (*Critically Endangered, Endangered* or *Vulnerable*), near threatened[22] or important vertebrate species that could occur in the study area and have habitat preferences that include habitats available in the study area, are discussed further below.

5.1.3.1 Avian Species

Important Bird Areas (IBAs)

The proposed development corridor falls within the large Platberg-Karoo Conservancy (SA037, Figure 1). 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, *Anthropoides paradiseus* and Lesser Kestrel, *Falco naumanni*), several biome-restricted species and important populations of other arid-zone birds[23].

South African Bird Atlas Project 2 (SABAP2)

[22] As listed in Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The 2016 Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.
[23] http://datazone.birdlife.org/site/factsheet/platberg-karoo-conservancy-iba-south-africa/text

SABAP2 data were examined for the pentads (which are approximately 8 km x 8 km squares) in the study area (Figure 1). A total of 195 species (Appendix III) were recorded by SABAP2 in the pentads 3030_2400 (70 species, 3 cards), 3035_2400 (137 species, 10 cards), 3040_2400 (77 species, 2 cards), 3030_2405 (90 species, 4 cards), 3035_2405 (44 species, 1 card), 3040_2405 (30 species, 1 card), 3030_2410 (89 species, 3 cards), 3035_2410 (48 species, 1 card), 3040_2410 (22 species, 1 card), 3030_2415 (140 species, 7 cards), 3035_2415 (84 species, 3 cards), 3040_2415 (43 species, 1 card), 3030_2420 (98 species, 3 cards), 3035_2420 (124 species, 5 cards) and 3040_2420 (112 species, 5 cards).

This includes 13 species classified as *Endangered, Near Threatened* or *Vulnerable* and 25 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, Kori Bustard *(Near Threatened)* which was observed on site during the walk-through is notably absent from the data.

Table 1: Red-data and endemic or near-endemic species listed by SABAP2 and observed during the site walk-through.

Species	Red Data	Endemic or Near-endemic	Observed
Bustard, Ludwig's	EN		*
Eagle, Martial	EN		
Eagle, Tawny	EN		
Pipit, African Rock	NT	*	*
Courser, Double-banded	NT		
Crane, Blue	NT		
Flamingo, Greater	NT		
Korhaan, Karoo	NT		*
Courser, Burchell's	VU		
Eagle, Verreaux's'	VU		*
Falcon, Lanner	VU		*
Secretarybird	VU		
Stork, Black	VU		
Buzzard, Jackal		*	*
Canary, Black-headed		*	
Chat, Sickle-winged		*	
Eremomela, Karoo		*	*
Flycatcher, Fairy		*	*
Flycatcher, Fiscal		*	*
Francolin, Grey-winged		*	*
Korhaan, Blue		*	
Lark, Black-eared Sparrow-		*	*
Lark, Eastern Long-billed		*	*
Lark, Karoo		*	*
Lark, Large-billed		*	*
Lark, Melodious		*	
Prinia, Karoo		*	
Starling, Pied		*	*
Sunbird, Southern Double-collared		*	*
Swallow, South African Cliff		*	
Thrush, Karoo		*	
Tit, Grey		*	
Tit-Babbler, Layard's		*	*
Warbler, Cinnamon-breasted		*	
Warbler, Namaqua		*	
Weaver, Cape		*	*
White-eye, Cape		*	*

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, Figure 1) 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.

Co-ordinated Waterbird Counts (CWAC)

Five CWAC sites are situated within 50 km of the project site (Figure 1). 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. Any species moving between this site, the Brakrivier and the Kafferspoort Dam (30552416) or Faugh A Ballagh (30522438) to the southeast of the project site would cross the proposed power line route. Important species recorded at Kafferspoort Dam, 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 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 (Appendix II of the Bonn Convention), 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. Lesser Flamingo, Osprey and Great White Pelican were not recorded in the SABAP2 data for the pentads investigated, they are however species vulnerable to collisions with power lines and have been taken into account when assessing the impact of the proposed project.

Studies on Neighbouring Projects

Chris van Rooyen Consulting conducted an Avifaunal Impact Assessment Study in 2014 on the Longyuan Mulilo De Aar 2 North (Pty) Ltd 132kV overhead power line to connect the Longyuan Mulilo De Aar 2 North Wind Energy Facility (DEFF REF. NO. 12/12/20/2463/2) to the national transmission grid via Hydra Substation. The proposed power line connection assessed in this study runs adjacent to the power line assessed by van Rooyen (2014) for approximately 12 km. van Rooyen (2014) identified 11 Red Data species that could potentially occur in the area but concluded that with mitigation risks associated with collisions and habitat destruction would be low.

WildSkies Ecological Services conducted an Avifaunal Impact Assessment Study on the nearby Castle Wind Energy Facility (Smallie 2014). Smallie (2014) scored the risk of the WEF for 15 target species (including Egyptian Goose) but also observed several notable species on site including Lanner Falcon, Amur Falcon, Secretarybird, Booted Eagle and Black-chested Snake Eagle. In discussing the mitigation of the grid connection Smallie (2014) recommended that the power line will need to conform to all Eskom standards in terms of bird friendly pole monopole structures with Bird Perches on every pole-top (to mitigate for bird electrocution), and anti-bird collision line marking devices (to mitigate for bird collision) on the earth wires of high risk sections. Applicable mitigation measures included in these studies have been included in the current assessment.

Data relating to the avifaunal baseline was made available from the operational phase bird monitoring at the Longyuan Mulilo De Aar 2 North Wind Energy Facility conducted by van Rooyen (2018, 2019) during which several species relevant to the current assessment were observed, including Blue Crane, Booted eagle, Greater Kestrel, Grey-winged Francolin,

Jackal Buzzard, Kori Bustard, Lesser Kestrel, Ludwig's Bustard, Martial Eagle, Northern Black Korhaan, Secretarybird, Southern Pale Chanting Goshawk and Verreaux's Eagle.

Arcus (2019) conducted four seasons of monitoring in 2018 during the pre-construction phase of the proposed Zingesele Wind Energy Facility. The scoping report identified that a few large birds (such as White-backed Vulture, Verreauxs' Eagle and Martial Eagle), susceptible to electrocution (particularly in the absence of safe and mitigated structures), occur in the area. The report identified that Blue Crane, Blue Korhaan, Ludwig's Bustard, Kori Bustard, Karoo Korhaan and Northern Black Korhaan, as well as Verreaux's Eagle, Tawny eagle, Martial Eagle, Secretarybird and White-backed Vulture may be affected by collisions with power lines at the site. 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.

The Endangered Wildlife Trust (EWT) Powerline Mortality Data

Power lines in the district have been identified as a high threat to large terrestrial birds such as cranes and bustards, which collide with them, and to raptors, which have been electrocuted while perching on them. Power lines can, however, also be beneficial to large raptors such as Martial Eagle *(Polemaetus bellicosus)* which breed on them in areas where large trees are uncommon.

Power line 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.

Avian Focal Species

Based on the baseline avifaunal data from the various data sources outlined above and evidence that large bodied birds such as cranes, flamingos, storks, korhaans and bustards (known to be particularly prone to collisions with power lines) have suffered collision mortalities in the area and that various raptor species have been electrocuted by transmission infrastructure the potential impacts of the proposed development on these types of birds was considered. The potential impacts to smaller passerine species is not likely to be significant as they are more susceptible to habitat loss and the total area of the development footprint is small relative to the available habitat in the area, these impacts are therefore not assessed further.

Particular attention has been given to the potential impact on Ludwig's Bustard in this assessment as some areas around the project site are known to be important breeding and 'lekking' grounds. 'Lekking' is a mating system where males congregate in an area to display to females, Ludwig's Bustards exhibit an 'exploded' or 'dispersed' lekking system in which the displaying males are more widely spread over an area than typical of more conventional

lekking arenas observed in other species[24]. While the project site is not directly within these areas, the species could potentially be impacted upon while traversing the project site to and from these areas.

Many existing power lines traverse the area (Figures 3 and 4) and therefore most of the potential impacts already exist in and around the project site and the proposed power line route is adjacent to existing power lines. The proposed development is therefore unlikely to significantly contribute to the negative impacts that 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.

Figure 4: Multiple electricity transmission lines exist in the area, converging on the Hydra Main Transmission Substation.

A recent study on the efficacy of line marking devices to reduce power line collision mortality for large terrestrial birds in the Karoo (Shaw *et al.* 2021)[25] 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.

The proposed power line presents an opportunity to increase the visibility of the existing power line and potentially reduce collisions of heavy-bodied birds, including bustards. The installation of flappers and other BFDs may effectively increase the visibility of both the proposed and the existing power lines. Similarly, should it be feasible to stagger the pylons of the proposed power line in relation to the existing power line this may also increase the visibility to birds susceptible to power line collisions.

5.1.3.2 Mammal Species

There are 61 mammal species that could occur in the study area, 12 of which are listed as threatened or near threatened (Appendix IV). Based on the habitats present in the grid connection corridor and surrounding areas, it is considered likely that some of these species could potentially occur on site. Given the habitats present the listed species with a geographical range that include the site (and therefore may be present) are Riverine Rabbit *(Bunolagus monticularis)* listed as Critically Endangered, Southern Mountain Reedbuck *(Redunca fulvorufula fulvorufula)* listed as Endangered, Black-footed Cat *(Felis nigripes)* and White-tailed Rat *(Mystromys albicaudatus)* listed as Vulnerable with Grey Rhebok *(Pelea capreolus)*, South African Hedgehog *(Atelerix frontalis)*, Spectacled Dormouse

[24] Allan DG: Ludwig's Bustard. In Roberts Birds of Southern Africa. 7th edition. Edited by: Hockey PAR, Dean WJR, Ryan PG. Trustees of the John Voelcker Bird Book Fund, Cape Town; 2005:293–294.

[25] Shaw, J.M., Reid., T.A., Gibbons, B.K., Pretorius, M., Jenkins, A.R., Visagie, R., Michael, M.D., Ryan, P.G. 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, 2021;, duaa067, https://doi.org/10.1093/ornithapp/duaa067

(Graphiurus ocularis) and African Striped Weasel *(Poecilogale albinucha)* listed as Near-threatened. Listed species with a geographical range that includes the site are discussed in more detail below to evaluate the potential for them to occur on site.

Riverine Rabbit (Critically Endangered)

Subpopulations of Riverine Rabbit in the northern part of their distribution are associated with alluvial floodplains and narrow belts of riverine vegetation adjacent to seasonal rivers. However, they are not restricted to the alluvial floodplains in the southern Cape and can also occur in old lands not associated with riverine vegetation[26]. Riverine Rabbits are nevertheless dependent on soft and deep alluvial soils along river courses and no major rivers are present along the grid connection corridor. As the type locality of the species (Deelfontein) is less than 50 km to the southwest, this species could potentially occur in the broader project area and precautions must be taken to mitigate the impact on ecological processes such as sediment transport and deposition downstream. This species may be susceptible to vehicle collisions, particularly at night.

Southern Mountain Reedbuck (Endangered)

This species is widely but patchily distributed and restricted to rocky and grassy hillsides. Populations seem to have declined dramatically in the recent past. Major threats include increased rates of poaching, disturbance by human presence such as cattle herders and illegal hunting by dogs[27]. This species is unlikely to frequent the development corridor as they are sensitive to disturbance and are likely to already avoid the area due to the proximity of the site to De Aar and the Hydra MTS. If they were to occur on the development corridor, as mobile species they would temporarily move away from any disturbance associated with the development and would unlikely be negatively affected by the project.

Black-footed Cat (Vulnerable)

The Black-footed Cat is endemic to the arid grasslands, dwarf shrub, and savannah of the Karoo and Kalahari in southern Africa. They have the most restricted distribution of any of the African felid species with the majority of the range occurring within the boundaries of South Africa[28]. The proposed project is located within the core of their range, a study site approximately 20 km to the southwest (Nuwejaarsfontein) of the project site may represent an area of exceptionally high densities of Black-footed Cat due to favourable climate and other factors such as habitat quality. The most serious long-term threats for Black-footed Cats are the loss of key resources, such as den sites and prey, from anthropogenic disturbance or habitat degradation (for example, from overgrazing). While some areas along the corridor have experienced overgrazing this species could potentially occur on the project site. As they are unable to create or maintain their own dens or burrows they rely on those made by other species such as Springhare. As it is possible that this species occurs on the project site, negative impacts on the preferred habitat of Black-footed Cats and Springhare must be mitigated against. An interesting observation made during the site visit was the presence of active burrow systems dug in close proximity to existing power line pylons (Figure 5). This observation indicates that these structures did not exclude burrowing animals, which appear to potentially take advantage of the disturbed/loosened soil and short grasses surrounding the pylons. The possibility therefore exists that the

[26] Collins K, Bragg C, Birss C, Child MF. 2016. A conservation assessment of *Bunolagus monticularis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[27] Taylor A, Avenant N, Schulze E, Viljoen P, Child MF. 2016. A conservation assessment of the *Redunca fulvorufula fulvorufula*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[28] Wilson B, Sliwa A, Drouilly M. 2016. A conservation assessment of *Felis nigripes*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

development may provide a benefit to certain burrowing species such as Springhare, and therefore potentially Black-footed Cats.

Figure 5: Active burrows in close proximity to power line infrastructure, indicating that the presence of these structures did not deter burrowing animals from the site. Springhare potentially take advantage of the disturbed soil and short grasses surrounding the pylons.

White-tailed Rat (Vulnerable)

Very little is known about this rare species in the wild and although conservationists have been concerned with it for over forty years, it still persists at low densities. While no empirical population estimates or trends are available, they are consistently one of the rarest species encountered[29]. The habitat requirements and ecology of White-tailed Rats merits further research. They are often associated with calcrete soils within grasslands. They are never found on soft, sandy substrate, rocks, wetlands or river banks. However, they have been found on open areas between dolerite slopes and ridges as well as on burned patches suggesting that a fire mosaic habitat with both burned and unburned patches in an area may be an important habitat feature for this species. This habitat type only occurs in a small section of the grid connection corridor and is more prevalent in the surrounding areas therefore the development is unlikely to have a significant negative impact on these species. This habitat type has nevertheless been classified as high sensitivity on the sensitivity map. South African Hedgehog may be especially susceptible to vehicle collisions, particularly at night.

Grey Rhebok (Near Threatened)

This species is endemic to South Africa and Lesotho, occurring in rocky hills, grassy, mountain slopes, and plateau grasslands. The population has had an estimated decline of c. 20% over three generations (1999–2014) in 13 formally protected areas across its range[30]. While listed as Near Threatened it is considered to be close to meeting *Vulnerable* status as subpopulations are suspected to be faring poorly outside of protected areas[30]. The primary threat is suspected to be increased levels of bush-meat and illegal sport hunting with dogs. As with Southern Mountain Reedbuck, this species is unlikely to frequent the development corridor as they are sensitive to disturbance and are likely to already avoid the area due to the proximity of the site to De Aar and the Hydra MTS. If they were to occur on the development corridor, as mobile species they would temporarily move away from any disturbance associated with the development and would unlikely be negatively affected by the project.

South African Hedgehog (Near Threatened)

[29] Avenant N, Wilson B, Power RJ, Palmer G, Child MF. 2016. A conservation assessment of *Mystromys albicaudatus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[30] Taylor A, Cowell C, Drouilly M, Schulze E, Avenant N, Birss C, Child MF. 2016. A conservation assessment of *Pelea capreolus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa

The distribution of this species mainly falls within savannah and grassland vegetation types, within which it is found in a wide variety of semi-arid and sub-temperate habitats, including scrub brush, western Karoo, grassland and suburban gardens. The Northern Upper Karoo vegetation as found on the project site is one of the important vegetation types for the species. On a local scale, the species appears to prefer dense vegetation habitats and rocky outcrops that may provide food, cover and nesting materials[31]. This habitat type only occurs in a small section of the development corridor and is more prevalent in the surrounding areas therefore the development is unlikely to have a significant negative impact on this species. This habitat type has nevertheless been classified as high sensitivity on the sensitivity map. South African Hedgehog may be especially susceptible to vehicle collisions, particularly at night.

Spectacled Dormouse (Near Threatened)

This species is endemic to South Africa, where it occurs widely in the Northern Cape, Eastern Cape, and Western Cape provinces. It is associated with rock piles, outcrops, crevices and stone kraals[32]. In the Northern Cape Province, three specimens were caught in *Setaria lindenbergiana* grassland community, a grass species that occurs on the project site mostly growing around rocks. This dormouse is confined to rocky outcrops and its habitat is mostly well protected. This habitat type only occurs in a small section of the development corridor and is more prevalent in the surrounding areas therefore the development is unlikely to have a significant negative impact on this species. This habitat type has nevertheless been classified as high sensitivity on the sensitivity map.

African Striped Weasel (Near Threatened)

This species is rare to uncommon throughout South Africa, in the Northern Cape, there are two historical records (from the Kalahari and from Schmidtsdrif) and only three other records added in the last eight years. However, this may be an artefact of increased research effort as well as increased awareness around the species in the farming communities. As such, the status of the species in the Northern Cape remains unclear[33]. The highest densities of African Striped Weasel are reached in moist high rainfall grasslands in the east of the country, although this species may have a wide habitat tolerance as the few records from arid southwestern Africa are associated with semi-desert grassland. In the dry, western-most range of the species, it appears to lead an increasingly subterranean existence. This may be a behavioural response to avoid extreme temperatures and reduce water requirements. Almost without exception, the few records that have been reported from this region indicate the presence of mole-rats, loss of any habitat for mole-rats is therefore likely to result in the loss of habitat and available prey base for the weasels in arid areas. This species could potentially occur on the project site and individuals could be affected by the project if suitable habitats (such as mole-rat colonies) are damaged. No mole-rat colonies were observed along the proposed development corridor, however some were observed nearby while commuting to the project site. Micrositing of infrastructure prior to construction to avoid any active mole-rat colonies will mitigate potential impacts to this species.

[31] Light J, Pillay N, Avenant NL, Child MF 2016. A conservation assessment of *Atelerix frontalis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[32] Wilson B, MacFadyen D, Palmer G, Child MF. 2016. A conservation assessment of *Graphiurus ocularis*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[33] Child MF, Rowe-Rowe D, Birss C, Wilson B, Palmer G, Stuart C, Stuart M, West S, Do Linh San E. 2016. A conservation assessment of *Poecilogale albinucha*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

5.1.3.3 Amphibian Species

There are 13 amphibian species (Appendix V) that have a geographical distribution that includes the project site. The Giant Bullfrog *(Pyxicephalus adspersus)* is listed by NEMBA as a *Protected Species*. This species was located on the project site (Figure 6). They can tolerate habitat alteration, but not urbanization[34]. The potential impacts of the development to this species are therefore considered to be low despite their potential presence on the project site if sensitive areas and associated mitigation measures are adhered to.

Figure 6: The Giant Bullfrog (left) and Common Caco *(Cacosternum boettgeri)* (right) were observed on site near temporary vleis and wetland habitats. These pictures were taken in the proposed development corridor, Common Caco were observed calling at most of the temporary vleis while only a single observation of Giant Bullfrog was recorded during the site-walkthrough. This nevertheless confirms their presence on the project site.

5.1.3.4 Reptiles Species

There are 23 reptile species (Appendix VI) recorded in various databases or observed from in or around the area project site that could occur in the area. The Karoo Padloper (*Chersobius [Homopus] boulengeri*) is listed as *Near Threatened* in the Regional Red List[35], however a more recent assessment[36] lists the species as *Endangered* as most localities where populations previously occurred no longer harbour viable populations and that the species is no longer being found by farmers. The Karoo Padloper is associated with dolerite ridges and rocky-outcrops in dwarf shrubland containing succulent and grassy elements. Such habitat is present on the project site and it could potentially occur in the area, albeit with a low probability. The development therefore has a low probability of having a negative impact on this species. More common reptile species, such as the Namaqua Sand Lizard (*Pedioplanis namaquensis, Least Concern*) observed most frequently in the lowland plains, and Western Rock Skink *(Trachylepis sulcata, Least Concern)* observed amongst the rocky outcrops, were encountered in suitable habitat along the proposed development corridor. As these species are widespread through the area and their habitats are largely contiguous and undisturbed it is unlikely that the proposed development will have a significant negative impact on these, and other common reptile species on the project site.

[34] IUCN (International Union for Conservation of Nature), Conservation International. 2013. Pyxicephalus adspersus. The IUCN Red List of Threatened Species. Version 2019-3.

[35] Boycott, R.C. 2014. *Homopus boulengeri* (Duerden, 1906), In M.F. Bates, W.R. Branch, A.M. Bauer, J. Marais., G.J. Alexander & M.S. de Villiers (eds.) Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Suricata 1. Pg. 73. South African National Biodiversity Institute, Pretoria.

[36] Hofmeyr, M.D., Loehr, V.J.T., Baard, E.H.W. & Juvik, J.O. 2018. *Chersobius boulengeri*. The IUCN Red List of Threatened Species 2018: e.T170521A115656360. http://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T170521A115656360.en.

Figure 7: Namaqua Sand Lizard (left) and Western Rock Skink (right) were regularly encountered on the project site.

5.1.3.5 Vertebrate Sensitivity

The habitats present in the proposed development corridor are widespread and contiguous in the broader area. This, combined with the relatively small size of the development footprint and its route adjacent to an existing power line makes it highly unlikely that the development will have a significant negative impact on these species. The potential impacts can be further reduced through the implementation of mitigation measures such as the avoidance of particularly sensitive habitat features, the maximal utilisation of existing access roads, strict observance to speed limits and the avoidance of night time driving. Habitats that may be particularly sensitive have been identified and assigned elevated sensitivity in the sensitivity map such as rocky outcrops, slopes and areas that may be temporarily inundated.

5.1.4 Invertebrate Species

There are 159 invertebrate species recorded from various databases that could occur on the project site (Appendix VII). While this list cannot be considered to be complete, a single species with a distribution range that potentially overlaps the project site is listed by the IUCN as *Vulnerable*, namely the Harlequin Sprite *(Pseudagrion newtoni).* This damselfly is currently known from only a single location in Mpumalanga, the probability for this species to occur on site is low.

5.1.4.1 Invertebrate Sensitivity

The overall sensitivity of the invertebrate species that could occur in the project area is considered to be low.

5.2 Sensitivity Assessment

An ecological sensitivity map was produced through the integration of the information collected during the site visit with the available biodiversity data in the literature and available resources previously listed (Figure 8). The objective of the sensitivity assessment was is to produce a finer-scale sensitivity map for terrestrial animals than that produced by the Screening Tool, taking the context of the proposed development corridor in the broader area into account including the habitats available, the position of the proposed grid connection corridor adjacent to existing electricity transmission infrastructure, the proximity of the proposed project site to the town of De Aar and the relative size of the proposed development footprint. Sensitive features such as rocky outcrops and drainage ditches were mapped and rated. The ecological sensitivity rating of landscape features were categorised as follows:

- **Low** – Areas with a low sensitivity where there is likely to be a low impact on terrestrial biodiversity and ecological processes. The impact of development is likely to be local in extent and of low significance. Mitigation measures are still applicable within these areas.

- **Medium** – Areas with a medium sensitivity where there is a possibility of a medium impact on terrestrial biodiversity and ecological processes. The impact of development in these areas is likely to be largely local in extent but of medium significance as there exists a risk of secondary impact such as erosion which could potentially degrade surrounding areas. Development within these areas can proceed provided that appropriate mitigation measures are adhered to.
- **High** – Areas with a high sensitivity where there is a possibility of high impact on terrestrial biodiversity and ecological processes. The impact of development in these areas is likely to extend beyond the immediate development footprint and be of higher significance as there exists a direct risk of impact to ecological processes and critical or unique habitats for species of conservation concern. These areas are essentially no-go areas from a development perspective in terms of the construction of new infrastructure such as towers or pylons. Spans may cross these areas. Existing infrastructure such as access roads and servitudes must be used when traversing these areas.

6 IDENTIFICATION OF POTENTIAL IMPACTS

Potential impacts of developments on the Terrestrial Animal Species of the area include the following:

- Impacts on biodiversity: Any impacts on populations of Terrestrial Animal species of concern and on overall species richness, genetic variability, population dynamics and habitats important for species of concern;
- Impacts on ecosystem functions: Any impacts on processes or factors that maintain ecosystem health and character, including the following:
  - Habitat fragmentation;
  - Disruption to ecological corridors;
  - Changes to abiotic environmental conditions;
  - Changes to disturbance regimes, e.g. increased or decreased incidence of fire; and
  - Impedance of movement of material or water;
- Cumulative impacts: this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.

6.1.1 Construction Phase Impacts

Construction phase impacts for this project will include the following:

- Loss and/or fragmentation of faunal habitat and refugia due to clearing and contamination of the environment by construction vehicles and machinery;
- Displacement and/or disturbance of fauna due to increased activity and noise levels; and
- Direct mortality of fauna due to machinery, construction and increased traffic or increased poaching and/or illegal collecting due to increased access to the area.

6.1.2 Operational Phase Impacts

Ongoing operational impacts for this project will include the following:

- Reduction in habitat quality due to the establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance;
- Reduction in habitat quality from erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;
- Indirect impact to fauna through disturbance or displacement; and
- Direct impact of fauna through increased traffic, illegal collecting, poaching, electrocution and collisions and/or entanglement with infrastructure; and

6.1.3 Cumulative Impacts

Impacts on terrestrial animal populations, particularly of species of conservation concern due to the cumulative effects of developments in the surrounding area.

7 ASSESSMENT OF IMPACTS

The proposed grid connection corridor is adjacent to existing overhead power lines along the majority of the proposed route. There are no alternative route options to assess.

7.1 Construction Phase Impacts

7.1.1 Impact 1: Habitat Destruction during Construction

Small sections of natural habitat will be destroyed during the construction phase for the upgrading of servitudes and access roads and for clearing of pylon bases, switching station, lay-down areas and temporary construction facilities.

The vegetation type associated with the development corridor is largely intact and contiguous in the broader area the impact is considered to be of low significance. Pylon bases have a relatively small footprint and therefore do not pose a significant impact of habitat loss. The use of existing access roads and servitudes associated with the adjacent, existing power line will significantly 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. The potential risks to habitats also includes pollution and contamination, particularly wetland and aquatic environments, from construction activities (e.g. oil leaks or chemical spills).

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 faunal populations in terms of their long-term viability and persistence in the area is low, and therefore the impact significance is low. These impacts can be further reduced following the implementation of mitigation measures.

Impact Phase: Construction							
Potential impact description: Habitat loss associated with the clearing of vegetation for pylon bases, switching station, lay-down areas and temporary construction facilities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	L	Negative	L	L	H
With Mitigation	L	M	L	Negative	L	L	H
Can the impact be reversed?			Mostly. Destruction of habitat will largely be transient in nature.				
Will impact cause irreplaceable loss of resources?			No. The habitats on site are widespread and the footprint of the power line pylons is relatively small.				
Can impact be avoided, managed or mitigated?			Mostly. The use of existing servitudes will mitigate most of the residual impact.				
Mitigation measures to reduce residual risk or enhance opportunities: • Preconstruction walk-though of the development footprint (pylon bases, new servitudes, lay-down areas and temporary infrastructure) must be conducted for micrositing to ensure that sensitive features such as burrow systems are avoided where possible; • No construction of pylon towers in high sensitivity areas; • Ensure that lay-down and other temporary infrastructure are within low sensitivity areas; • Existing roads and servitudes to be used wherever possible;							

• Minimise the development footprint as far as possible and rehabilitate disturbed areas that are not required by the operational phase of the development such as lay-down areas and temporary construction facilities (i.e. a Habitat Rehabilitation Programme is required); • No construction activity must occur within seasonally inundated areas during the peak rainfall period in summer to reduce the potential impact on wetland habitats; • All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed; • Ensure that sufficient erosion control measures are constructed on all servitudes and access roads in the project area; • Rehabilitate existing servitude and access roads in the project area with sufficient erosion control measures to prevent the loss of soil and the degradation of habitats; • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill; and • No open fires should be permitted outside of designated areas.	
Impact to be addressed/ further investigated	Yes. Micrositing of infrastructure is required after finalization of locations and prior to construction to ensure that no active burrow systems are destroyed.

7.1.2 Impact 2: Disturbance and Displacement of Fauna during Construction

Disturbances and noise from staff and construction activities can impact certain sensitive species, resulting in effective habitat loss through a perceived increase in predation risk. There are various sensitive species that could potentially occur on the project site including Ludwig's Bustard, Kori Bustard, Northern Black Korhaan, Karoo Korhaan and Blue Crane. Disturbance can cause these species to be displaced, either temporarily (i.e. for some period during the construction activity) or permanently (i.e. they do not return), into less suitable habitat which may reduce their ability to survive and reproduce. However, as the area surrounding the project site is largely untransformed, contiguous, suitable natural habitat, displacement distances should not incur a great energetic cost and should allow for rapid return to the site once the disturbance concludes. The probability that disturbance or displacement of terrestrial animal species associated with the construction of the proposed development will have a negative impact on the faunal populations in terms of their long-term persistence and viability in the area is low, and therefore the impact significance is low. These impacts can be further reduced following the implementation of mitigation measures.

Impact Phase: Construction							
Potential impact description: Displacement of priority species, particularly Red Data species, due to disturbance associated with construction activities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	M	Negative	L	L	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			Yes. Disturbance associated with construction is transient in nature and the impact will cease once construction has been completed.				
Will impact cause irreplaceable loss of resources?			No. Faunal communities will recolonize the area once construction has been completed.				
Can impact be avoided, managed or mitigated?			Yes. The probability and intensity of disturbance can be reduced with mitigation measures.				
Mitigation measures to reduce residual risk or enhance opportunities: • Maximize the use of existing access road and servitudes; • No off-road driving should be permitted; • Speed limits (30 km/h) should be strictly enforced for heavy vehicles on the project site to reduce unnecessary noise;							

• Construction camps should be lit with as little light as practically possible, with the lights directed downwards where appropriate to reduce disturbance of nocturnal fauna; • The movement of construction personnel should be restricted to the construction areas on the project site; • No dogs or cats other than those of the landowners should be allowed on site; • An appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify ground nesting species such as bustards as well as the signs that indicate possible breeding by these species; • The ECO must make a concerted effort to look out for such breeding activities especially of Red Data species (e.g. Ludwig's Bustard); • If any Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.	
Impact to be addressed/ further investigated	Yes. Observations by the ECO for breeding activity to continue throughout the construction period.

7.1.3 Impact 3: Direct Impact to Fauna during Construction

Sensitive and shy fauna are likely to move away from the affected areas during construction, while some slow-moving species would not be able to avoid the construction activities and might be killed. Increased traffic during construction will pose a risk of collisions with susceptible fauna. Tortoises, snakes and amphibians are particularly susceptible to collisions, however many other species are also at risk such as Aardwolf, Bat-eared Foxes, rabbits/hares, Steenbok *(Raphicerus campestris)* and Cape Porcupine *(Hystrix africaeaustralis)*, particularly at night. Black-footed Cats, African Striped Weasel, Riverine Rabbits and South African Hedgehog may also potentially be at risk to nocturnal vehicle collisions. Some mammals and reptiles would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present. Many of these impacts can however be effectively managed or mitigated against. Giant Bullfrog bury themselves deeply during the dry season, it is unlikely that construction activities will have a negative impact on this species if mitigation measures are adhered to.

The probability of direct faunal mortalities associated with construction activities having a negative impact on the viability of terrestrial animal populations persisting in the area over the long term is low given the small scale of the development footprint relative to the largely undisturbed habitat available in the surrounding area, therefore this impact is considered to be of low significance. The impact can be further reduced following the implementation of mitigation measures.

Impact Phase: Construction							
Potential impact description: Direct impact to fauna caused by construction activities, such as increased risk of injury or mortality from collision with vehicles due to increased traffic, the increased possibility of illegal hunting, poaching, persecution or harvesting of fauna.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	L	M	Negative	L	L	H
With Mitigation	L	L	L	Negative	L	L	H
Can the impact be reversed?			No.				
Will impact cause irreplaceable loss or resources?			Potentially. If rare or threatened species suffer direct mortality.				
Can impact be avoided, managed or mitigated?			Yes. The probability and intensity of this impact can be reduced through mitigation.				
Mitigation measures to reduce residual risk or enhance opportunities:							

• Construction of infrastructure within the prescribed buffers of the aquatic environments must be conducted during the dry season; • All construction vehicles should adhere to clearly defined and demarcated roads, no off-road driving should be allowed; • All construction vehicles should adhere to a low speed limit (30km/h) on the project site to avoid collisions with susceptible species; • Night driving must be avoided where possible; • Any holes dug e.g. for foundations of pylons should not be left open for extended periods of time to prevent entrapment of ground dwelling fauna and only be dug when required and filled in soon thereafter; • Site access should be controlled and no unauthorised persons should be allowed onto the site; • Personnel should not be allowed to wander off the construction site; • All personnel should undergo an initial environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes or tortoises; • The illegal collection, hunting or harvesting of animals at the site should be strictly forbidden; • No animals such as dogs or cats to be allowed on site other than those of the landowners; • No open fires should be permitted outside of designated areas; • Any fauna directly threatened by the construction activities should be removed to a safe location by the ECO or other suitably qualified person.	
Impact to be addressed/ further investigated	No.

7.2 Operational Phase Impacts

7.2.1 Impact 4: Reduction in Faunal Habitat Quality during Operation

The clearing and disturbance of areas during the construction phase of the project can result in an increased and ongoing risk of invasion of alien plant species, particularly pioneer species, along the power line route and underneath pylon towers during the operational phase. Disturbance created during construction could also leave the disturbed areas vulnerable to soil erosion and the presence of upgraded roads may increase water flow off hard surfaces which can contribute to erosion. The establishment of alien vegetation and increased soil erosion has the potential to degrade habitat quality if left unchecked. Due to the episodic high rainfall events during the wet season the probability of erosion is high. However given the relatively small scale of the development footprint the probability that erosion will lead to a measurable deterioration in habitat quality is medium, resulting in an impact significance of medium. Alien plant control and erosion can be effectively mitigated against and therefore the impact significance of the proposed development on terrestrial animal habitat quality is of low significance following mitigation.

Impact Phase: Operational							
Potential impact description: Following construction, the site will be vulnerable to alien plant invasion and soil erosion.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	H	M	Negative	M	M	H
With Mitigation	L	H	L	Negative	L	L	H
Can the impact be reversed?	No. Once erosion takes place some irreversible damage occurs.						
Will impact cause irreplaceable loss or resources?	Yes. Without mitigation the loss of topsoil would result in an irreversible loss of resources.						
Can impact be avoided, managed or mitigated?	Yes. Erosion and Alien plant control measures can be very effective.						
Mitigation measures to reduce residual risk or enhance opportunities: • Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan included in the EMPr;							

• All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate energy in the water stream which may pose an erosion risk; • Existing servitudes and access roads along the existing, adjacent power line must be utilised wherever possible; • Existing servitudes and access roads along the existing, adjacent power line must be upgraded with appropriate and effective erosion control measures; • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance; • Disturbed areas such as road verges, lay-down areas and areas utilised by temporary construction facilities must be regularly monitored to detect the establishment of alien species and those species should be eradicated before they spread; • Regular alien clearing should be conducted, as needed, using the best-practice methods for the species concerned, the use of herbicides should be avoided as far as possible; and • The use of herbicides (if absolutely required) for the control and eradication of alien grasses should be done in accordance with the alien eradication programme in the EMPr to reduce unintended ecological impacts.	
Impact to be addressed/ further investigated	Yes. Existing servitude and access roads to be surveyed with problem areas identified for erosion restoration and additional erosion control.

7.2.2 Impact 5: Disturbance and Displacement of Fauna during Operation

Periodic maintenance is required of the servitude and grid connection infrastructure, including the regular clearing of excess vegetation to allow for unrestricted movement along the service and access roads and to minimize the risk of fires. The power line may also require aerial inspection or maintenance. The disturbance of fauna during the operational phase, while ongoing, is not continuous and as the position of the proposed development footprint is adjacent to existing transmission infrastructure the individuals of species that persist in this area are likely to already experience levels of disturbance associated with these activities. The probability that the disturbance or displacement of individuals of species during the operation phase, particularly those species of conservation concern, will negatively impact the viability and persistence of the species in the area for the long term is low, therefore the significance of the impact is considered to be low. These impacts can be further reduced following mitigation measures.

Impact Phase: Operation							
Potential impact description: Displacement of species, particularly Red Data species, due to disturbance associated with operational activities such as power line assessment and maintenance.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	L	M	M	Negative	L	L	High
With Mitigation	L	M	L	Negative	L	L	High
Can the impact be reversed?			Yes. Fauna will move back into the area after a disturbance event.				
Will impact cause irreplaceable loss of resources?			No.				
Can impact be avoided, managed or mitigated?			Yes. The probability and intensity of disturbance can be reduced with mitigation measures.				
Mitigation measures to reduce residual risk or enhance opportunities: • 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 servitudes and access roads on the project site; and • No dogs or cats other than those of the landowners should be allowed on site to reduce disturbance of fauna.							

Impact to be addressed/ further investigated	No.

7.2.3 Impact 6: Direct Impact to Fauna during Operation

Collisions with large (>132 kV) power lines are a well-documented threat to avifauna in southern Africa[37] 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. 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[38].

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. 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. Electrocutions within the proposed switching station are possible but should not affect the more sensitive Red Data species, as these species are unlikely to use the infrastructure within the switching station yard for perching, nesting or roosting.

Direct mortality through road fatalities also poses a direct risk to many animal species.

The electrocution risk is considered to be of low probability, however mitigation measures such as bird-friendly monopole structures and perches will further reduce the impact. The position of the proposed power line adjacent to existing power lines presents an opportunity to increase the visibility of both the proposed and existing power line and potentially reduce collisions of heavy-bodied birds, including bustards. The installation of flappers and other BFDs may effectively reduce the probability of collisions by increasing the visibility of both the proposed and the existing power lines. Similarly, should it be feasible to stagger the pylons of the proposed power line in relation to the existing power line this may also increase the visibility of obstacles in the landscape to birds susceptible to collisions.

The position of the proposed grid connection adjacent to existing power lines makes it unlikely that the proposed development will significantly increase the probability of collisions for species of conservation concern beyond that which already exists on the site and indeed may have the potential to reduce it. Following the implementation of mitigation measures the impacts of direct mortality from the proposed development during the operation phase can be reduced to acceptable levels and the development is unlikely to threaten the long-term viability or persistence of species in the area. The post-mitigation impact significance is therefore likely to be low.

Impact Phase: Operation							
Potential impact description: Direct faunal impacts as a result of collision of birds with power lines, electrocution of fauna on electrical infrastructure and roadkill mortalities.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	M	M	H
With Mitigation	M	M	M	Negative	L	L	M

[37] 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.

[38] Shaw J, Reid T, Shutgens M.G., Jenkins A.R. & Ryan P.G. 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.

Can the impact be reversed?	No. Some collisions by species of conservation concern is possible.
Will impact cause irreplaceable loss of resources?	Potentially. The wider area is important for the conservation of some species of conservation concern.
Can impact be avoided, managed or mitigated?	Partially. Flappers and other bird flight diverters are not 100% effective at preventing collisions.
Mitigation measures to reduce residual risk or enhance opportunities: • Pylons must conform to Eskom standards using bird friendly monopole structures fitted with appropriate bird perches on every pole to reduce the probability of electrocutions; • There is opportunity to potentially reduce the risk of collision associated with the both the existing line and the new 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; • An operational monitoring programme must be implemented and include regular monitoring (e.g. during maintenance activities) of the entire length of the power lines for collision and electrocution incidents for the lifespan of the project; • Any collision incidents must be recorded and reported to the Endangered Wildlife Trust EWT; and • The potential to stagger pylon towers in relation to the existing power line should be investigated as this may increase the visibility of both existing and new power lines to heavy-bodied flying birds such as bustards; • All vehicles should adhere to a low speed limit (30km/h) on the project site to avoid collisions with susceptible species; • General maintenance should be conducted during the dry season where possible; • Night driving must be avoided where possible; • Site access should be controlled and no unauthorised persons should be allowed onto the site; • All personnel should undergo an initial environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes or tortoises; • The illegal collection, hunting or harvesting of animals at the site should be strictly forbidden; and • No animals such as dogs or cats to be allowed on site other than those of the landowners.	
Impact to be addressed/ further investigated	Yes. The most appropriate and up-to-date flappers and BFDs must be determined in consultation with EWT and installed according to installation guidelines.

7.3 Cumulative impacts

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. Two operational wind energy facilities occur in the broader area, Longyuan Mulilo De Aar 1 Wind Energy Facility (100MW) and Longyuan Mulilo De Aar 2 North Wind Energy Facility (140MW). When assessed together with other proposed wind energy facilities nearby (e.g. Zingesele WEF) the risks of collisions of birds with infrastructure and electrocution increases the potential to have a cumulatively negative impact on the avifauna of the area.

The addition of the proposed grid connection is however unlikely to significantly increase the cumulative impact on terrestrial fauna, particularly birds if mitigation measures are adhered to.

This is largely due to the proximity of the study site to an existing Hydra MTS, and the large number of associated transmission lines that already exist in the area. The probability that the addition of the proposed development will contribute to an increased cumulative negative impact on the long-term viability of the populations of terrestrial fauna and their persistence in the area is therefore low. This can be further reduced following the implementation of mitigation measures. There is potential for the proposed grid connection to increase the visibility of obstacles in the landscape thereby reducing the potential for avifaunal collisions along the route.

Impact Phase: Operation							
Potential impact description: Cumulative impact of habitat destruction, collisions and electrocution, in the context of existing power lines in the area.							
	Extent	**Duration**	**Intensity**	**Status**	**Significance**	**Probability**	**Confidence**
Without Mitigation	M	M	M	Negative	L	L	M
With Mitigation	M	M	M	Negative	L	L	M
Can the impact be reversed?			Unlikely. Reversal would require the decommissioning of all the transmission infrastructure in the area.				
Will impact cause irreplaceable loss of resources?			Unlikely. The impacts associated with the proposed grid connection are already present along the route.				
Can impact be avoided, managed or mitigated?			Partially. Much of the cumulative impact risk already exists along the route and it is unlikely that the proposed development will significantly increase the negative impact on terrestrial animals. The intensity of the cumulative impact can be further reduced if mitigation measures are adhered to.				
Mitigation measures to reduce residual risk or enhance opportunities: • The various mitigation and management plans associated with the development outlined above should be followed and implemented effectively to reduce the cumulative contribution of the current development and enhance opportunities.							
Impact to be addressed/ further investigated			Yes. Bird flight diverters as well as optimum pylon positioning and design should be further investigated.				

7.4 No-go Alternative

The no-go alternative is that the activity does not go ahead, implying a continuation of the current situation or the status quo. The no-go alternative is not necessarily the most ecologically attractive alternative with respect to terrestrial animals (particularly birds) in the area, as opportunities exist to improve the visibility of existing infrastructure to birds with the 'go' alternative. The no-go alternative is therefore not the preferred alternative. The no-go alternative will limit the potential associated with renewable energy developments that require connection to the grid, the potential of the area as a whole for ensuring local energy security and the realisation of renewable energy targets on a provincial and national scale, ultimately limiting the potential to mitigate climate change impacts on terrestrial animals.

8 ADDITIONAL REQUIREMENTS

Micrositing of infrastructure such as pylon bases is required after finalization of locations and prior to construction to ensure any sensitive features are avoided.

9 IMPACT STATEMENT

The proposed grid connection, access road and switching station are unlikely to generate significant negative impacts on Terrestrial Animal Species following mitigation. It is the specialist opinion that the proposed development will have an overall low potential impact to terrestrial animal species in the area, including those of conservation concern and therefore the proposed development can be approved from a Terrestrial Animal Species perspective.

APPENDIX I: LEGISLATIVE REQUIREMENTS

Relevant legislation is provided below to provide a description of the applicable legal considerations of relevance to the proposed project.

Convention on Biodiversity (CBD)

The CBD requires signatory states to implement objectives of the Convention, which are the conservation of biodiversity; the sustainable use of biological resources and the fair and equitable sharing of benefits arising from the use of genetic resources. South Africa became a signatory to the CBD in 1993, which was ratified in 1995. Article 14 (a) of the CBD states that *"Each Contracting Party, as far as possible and as appropriate, shall: (a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures".*

National Environmental Management Act (Act No. 107 of 1998, NEMA)

Section 24 of the Constitution of the Republic of South Africa provides the right to every person for a non-harmful environment and simultaneously mandates the government to protect the environment. NEMA is the framework to enforce Section 24 of the Constitution.

NEMA requires, amongst others, that:

- Development must be socially, environmentally, and economically sustainable;
- Disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; and
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.

Government Notice No. 40733 of 2017: Draft National Biodiversity Offset Policy published under NEMA is to ensure that significant residual impacts of developments are remedied, thereby ensuring sustainable development as required by section 24 of the Constitution of the Republic of South Africa, 1996. This policy should be taken into consideration with every development application that still has significant residual impact after the mitigation has been followed. The mitigation sequence entails the consecutive application of avoiding or preventing loss, then at minimizing or mitigating what cannot be avoided, rehabilitating where possible and, as a last resort, offsetting the residual impact.

Government Gazette, No. 43855 (Published in Government Notice No. 1150) of 30 October, 2020: "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species" is of particular relevance to the production of this report. The assessment and minimum reporting requirements are associated with a level of environmental sensitivity identified by the national web-based screening tool.

The proposed project site falls within an area identified by the screening tool as 'medium sensitivity' in the Terrestrial Animal Species Theme and this classification was assessed during site-sensitivity verification (Terrestrial Animal Species Site Sensitivity Verification Report attached), which concluded that a Terrestrial Animal Species Specialist Assessment was applicable.

National Environmental Management: Biodiversity Act (Act No. 10 of 2004, NEMBA)

NEMBA is the principal national act that regulates biodiversity protection, and is concerned with the management and conservation of biological diversity, as well as the use of indigenous biological resources in a sustainable manner. Section 57 (1) states that a person may not carry out a restricted activity involving a specimen of a listed threatened or

protected species without a permit issued in terms of Chapter 7 (2) The Minister may, by notice in the Gazette, prohibit the carrying out of any activity- (a) which is of a nature that may negatively impact on the survival of a listed threatened or protected species. Restricted activities include damaging, uprooting or destroying specimens of listed threatened or protected species as well as movement and possession of these species. NEMBA also aims to, inter alia, (a) prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur; (b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular and (c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

National Water Act (Act No. 36 of 1998)

This act defines a watercourse as: "*a river or spring; natural channel in which water flows regularly or intermittently; wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks".* This act regulates certain activities in and around a watercourse and aims, amongst others to protect aquatic and associated ecosystems and their biological diversity and reduce and prevent pollution of water resources.

Conservation of Agricultural Resources Act (Act No. 43 of 1983 as amended in 2001)

This act lists declared weed and invader species of plants and prescribes the required actions to combat their spread depending on their listed category, the three categories are:

- Category 1 plants: prohibited and must be controlled;
- Category 2 plants: may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread; and
- Category 3 plants: may not be planted; existing plants may remain as long as reasonable steps are taken to prevent their spread, except within the flood line of watercourses and wetlands.

National Veld and Forest Fire Act (Act No. 101 of 1998)

The purpose of the National Veld and Forest Fire Act, as amended by the National Fire Laws Amendment Act, is to prevent and combat veld, forest and mountain fires throughout South Africa. The Act applies to the open countryside beyond the urban limit and puts in place a range of requirements. It also specifies the responsibilities of land owners. The term 'owners' includes lessees, people in control of land, the executive body of a community, the manager of State land, and the chief executive officer of any local authority. The requirements include, but are not limited to, the maintenance of firebreaks and availability of firefighting equipment to reasonably prevent the spread of fires to neighbouring properties.

Northern Cape Nature Conservation Act (Act No. 9 of 2009)

This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: Aquatic habitats may not be destroyed or damaged and lists restricted activities involving protected animals and plants. The Act provides lists of species offered protection in the Province.

APPENDIX II: IMPACT SIGNIFICANCE RATING SYSTEM

The impact significance rating system used in this assessment follows Hacking (2001)[4]. The significance of the impacts associated with the significant aspects can be determined by considering the risk:

Significance of Environmental Impact (Risk) = Probability x Consequence

The consequence of impacts can be described by considering the severity, spatial extent and duration of the impact.

Table 2: Ranking the Duration and Spatial Scale of impacts

	Ranking Criteria		
	L	**M**	**H**
Duration	Quickly reversible Less than the project life Short-term	Reversible over time Life of the project Medium-term	Permanent Beyond closure Long-term
Spatial Scale	Localised	Fairly widespread Beyond site boundary Local	Widespread
	Within site boundary Site		Far beyond site boundary Regional/national

Table 3: Criteria for ranking the Severity of negative impacts on the bio-physical environment

Environment	Ranking Criteria		
	L-	**M-**	**H-**
Soils and land capability	Minor deterioration in land capability. Soil alteration resulting in a low negative impact on one of the other environments (e.g. ecology).	Partial loss of land capability. Soil alteration resulting in a moderate negative impact on one of the other environments (e.g. ecology).	Complete loss of land capability. Soil alteration resulting in a high negative impact on one of the other environments (e.g. ecology).
Ecology (Plant and animal life)	Disturbance of areas that are degraded, have little conservation value or are unimportant to humans as a resource. Minor change in species variety or prevalence.	Disturbance of areas that have some conservation value or are of some potential use to humans. Complete change in species variety or prevalence.	Disturbance of areas that are pristine, have conservation value or are an important resource to humans. Destruction of rare or endangered species.
Surface and Groundwater	Quality deterioration resulting in a low negative impact on one of the other environments (ecology, community health etc.)	Quality deterioration resulting in a moderate negative impact on one of the other environments (ecology, community health etc.).	Quality deterioration resulting in a high negative impact on one of the other environments (ecology, community health etc.).

Consequence of Impacts

Having ranked the severity, duration and spatial extent, the overall consequence of impacts can be determined using the following qualitative guidelines:

Table 4: Ranking the Consequence of an impact

SEVERITY = L					
DURATION	Long-term	**H**			

	Medium-term	M			MODERATE
	Short-term	L	LOW		
SEVERITY = M					
DURATION	Long-term	H			HIGH
	Medium-term	M		MODERATE	
	Short-term	L	LOW		
SEVERITY = H					
DURATION	Long-term	H			
	Medium-term	M			HIGH
	Short-term	L	MODERATE		
			L	M	H
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/national
			SPATIAL SCALE		

Significance of Impacts

Combining the consequence of the impact and the probability of occurrence, as shown by Table 5, provides the overall significance (risk) of impacts.

Table 5: Ranking the Overall Significance of impacts

PROBABILITY	Definite Continuous	H	MODERATE		HIGH
	Possible Frequent	M		MODERATE	
	Unlikely Seldom	L	LOW		MODERATE
			L	M	H
			CONSEQUENCE (from Table 4)		

APPENDIX III: SABAP2 SPECIES LIST

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Avocet, Pied			0	40	0	0	0	0	33	0	0	29	0	0	0	0	20
Barbet, Acacia Pied			67	70	100	25	0	0	67	100	0	71	100	0	67	80	100
Barbet, Crested			0	0	0	0	0	0	0	0	0	71	33	0	0	0	0
Batis, Pririt			0	0	0	0	0	0	33	0	0	29	67	0	0	0	0
Bee-eater, European			33	60	0	25	0	100	33	0	0	14	0	0	0	40	40
Bishop, Southern Red			67	60	50	75	100	0	33	100	0	0	33	0	33	80	100
Bokmakierie			67	70	100	75	100	0	67	100	0	100	100	0	67	100	80
Bulbul, African Red-eyed			67	70	50	75	0	100	67	100	0	100	100	0	100	80	100
Bunting, Cape			0	10	0	50	100	0	33	0	0	100	100	0	100	60	20
Bunting, Cinnamon-breasted			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bunting, Lark-like			0	10	50	50	100	0	0	100	0	86	67	0	67	60	80
Bustard, Ludwig's	EN		67	20	0	25	100	0	0	0	100	71	0	0	67	80	40
Buzzard, Common (Steppe)			0	10	0	0	0	100	0	0	0	14	33	0	33	0	40
Buzzard, Jackal		*	0	0	0	0	0	100	33	0	0	57	67	0	0	60	40
Canary, Black-headed		*	0	0	0	0	0	0	0	0	0	57	0	0	33	80	0
Canary, Black-throated			0	40	0	25	0	0	33	0	0	57	33	0	0	60	60
Canary, White-throated			100	40	50	75	0	0	0	0	100	86	100	0	100	100	60
Canary, Yellow			0	0	0	50	0	0	33	0	0	29	67	100	67	100	60
Chat, Ant-eating			33	90	0	75	100	100	33	0	100	71	100	100	33	100	80
Chat, Familiar			33	70	0	25	0	100	33	0	100	100	100	0	67	100	100
Chat, Karoo			67	0	0	25	100	0	0	100	0	0	0	0	33	20	60

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Chat, Sickle-winged		*	33	0	50	0	0	100	33	0	0	100	33	100	67	80	60
Chat, Tractrac			0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
Cisticola, Desert			67	40	0	75	100	0	33	100	0	86	67	0	67	80	80
Cisticola, Grey-backed			67	30	0	50	100	0	100	0	100	100	100	0	33	80	80
Cisticola, Levaillant's			0	20	0	0	0	0	0	0	0	0	0	0	0	20	40
Cisticola, Zitting			100	50	50	50	100	100	0	100	0	0	33	0	0	40	0
Coot, Red-knobbed			0	20	0	75	0	0	0	0	0	14	0	100	0	0	0
Cormorant, Reed			0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Cormorant, White-breasted			0	10	0	25	0	0	0	0	0	14	0	100	0	0	0
Courser, Burchell's	VU		0	0	0	0	0	0	0	0	0	0	0	0	33	0	0
Courser, Double-banded	NT		0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
Crake, Black			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Crane, Blue	NT		0	30	50	0	100	100	0	0	0	29	0	100	67	40	100
Crombec, Long-billed			0	0	0	0	0	0	33	0	0	43	33	0	0	20	0
Crow, Cape			0	0	0	0	0	0	33	0	0	0	33	0	0	20	20
Crow, Pied			100	90	100	100	100	100	33	100	100	86	100	100	33	60	100
Cuckoo, Diederik			67	20	50	50	0	0	0	100	0	29	33	0	0	20	20
Dove, Cape Turtle			100	90	100	75	100	100	67	100	0	100	100	0	100	100	80
Dove, Laughing			67	100	100	25	0	100	33	100	0	100	67	0	67	80	80
Dove, Namaqua			67	30	0	0	0	0	33	100	0	14	33	100	67	60	20
Dove, Red-eyed			0	60	50	0	0	0	0	0	0	71	33	0	0	20	80
Dove, Rock			0	20	50	0	0	0	0	0	0	0	0	0	0	0	0
Drongo, Fork-tailed			0	0	0	0	0	0	0	0	0	14	0	0	0	0	0

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Duck, African Black			0	10	0	0	0	0	0	0	0	14	0	100	0	0	0
Duck, White-faced Whistling			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Duck, Yellow-billed			0	30	50	25	0	0	0	0	0	14	0	100	0	20	20
Eagle, African Fish			0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Eagle, Black-chested Snake			0	0	0	0	0	0	0	0	0	14	0	0	0	20	0
Eagle, Booted			0	30	0	0	0	0	33	0	0	0	0	0	0	20	40
Eagle, Martial	EN		0	0	0	0	100	0	33	0	0	43	0	0	0	20	0
Eagle, Tawny	EN		0	10	0	0	0	0	33	0	0	14	0	0	0	0	80
Eagle, Verreauxs'	VU		33	0	0	25	0	0	67	0	0	14	33	0	33	20	40
Egret, Little			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Egret, Western Cattle			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Eremomela, Karoo		*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Eremomela, Yellow-bellied			33	20	0	0	100	0	0	0	0	86	0	0	67	80	60
Falcon, Amur			33	20	0	25	0	0	0	0	0	0	0	0	33	20	0
Falcon, Lanner	VU		0	10	0	0	100	0	0	0	0	0	0	0	0	20	0
Finch, Red-headed			33	10	50	0	0	0	0	0	0	0	0	0	0	20	20
Firefinch, Red-billed			0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Fiscal, Common			100	90	100	75	100	100	0	0	0	100	100	100	67	100	80
Flamingo, Greater	NT		0	30	0	25	0	0	0	0	0	14	0	100	0	20	0
Flycatcher, Chat			100	10	50	25	100	0	67	0	0	86	0	100	100	100	80
Flycatcher, Fairy		*	0	0	0	0	0	0	67	0	0	57	67	0	33	20	0
Flycatcher, Fiscal		*	0	20	50	0	0	0	33	0	0	57	100	100	33	40	40
Flycatcher, Spotted			0	20	50	0	0	0	0	0	0	0	0	0	0	0	0

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Francolin, Grey-winged		*	0	0	0	0	0	0	33	0	0	86	67	0	0	0	0
Goose, Egyptian			33	80	50	75	100	0	0	100	0	86	0	100	67	100	80
Goose, Spur-winged			0	40	50	50	100	0	0	0	0	43	0	100	0	20	40
Goshawk, Gabar			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Goshawk, Pale Chanting			100	60	50	75	0	100	100	100	100	100	67	100	67	100	80
Grebe, Little			0	10	0	50	0	0	0	0	0	0	0	100	0	0	0
Greenshank, Common			0	30	0	0	0	0	0	0	0	14	0	100	0	0	40
Guineafowl, Helmeted			0	70	100	25	100	0	0	0	0	86	100	0	100	100	60
Gull, Grey-headed			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Hamerkop			0	10	0	25	0	0	0	0	0	0	0	100	0	40	20
Hawk, African Harrier-			0	10	0	0	0	0	0	0	0	0	0	0	0	20	0
Heron, Black-headed			33	30	0	0	0	0	0	0	0	0	0	0	33	20	60
Heron, Grey			0	40	0	25	0	0	0	0	0	0	0	100	33	0	40
Honeyguide, Greater			0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
Honeyguide, Lesser			0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
Hoopoe, African			0	40	50	0	0	0	33	0	0	71	0	0	0	20	20
Ibis, African Sacred			0	80	100	50	0	0	0	100	0	0	0	100	0	0	40
Ibis, Glossy			0	60	0	0	0	0	0	0	0	0	0	0	0	0	0
Ibis, Hadeda			67	90	100	50	100	0	0	100	0	71	67	0	67	100	100
Kestrel, Greater			33	0	50	50	0	0	0	0	0	14	0	100	0	20	60
Kestrel, Lesser			100	50	100	100	100	100	67	100	0	14	0	100	33	40	0
Kestrel, Rock			0	20	0	25	100	0	33	0	0	57	33	0	0	20	0
Kingfisher, Malachite			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Kite, Black-shouldered			0	20	0	0	0	0	0	0	0	0	0	0	0	0	0
Kite, Yellow-billed			0	0	0	0	0	0	0	0	0	0	0	100	0	0	20
Korhaan, Blue		*	33	20	50	0	0	0	0	0	0	0	0	0	67	0	0
Korhaan, Karoo	NT		67	0	0	25	0	0	0	0	0	57	67	0	67	80	80
Korhaan, Northern Black			100	90	100	100	100	0	100	100	0	71	100	100	100	100	100
Lapwing, Blacksmith			0	70	100	50	0	0	33	100	0	71	0	100	67	80	100
Lapwing, Crowned			0	20	50	0	0	0	0	0	0	14	0	0	100	60	20
Lark, Black-eared Sparrow-		*	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
Lark, Eastern Clapper			100	60	100	100	100	0	67	100	0	100	100	0	100	80	100
Lark, Eastern Long-billed		*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lark, Grey-backed Sparrow			67	10	50	25	100	0	33	100	0	14	0	0	0	20	60
Lark, Karoo		*	0	10	0	0	0	0	33	0	0	14	0	100	0	20	0
Lark, Karoo Long-billed			67	0	0	50	100	0	67	100	0	100	100	0	67	60	80
Lark, Large-billed		*	100	20	100	50	0	100	33	0	0	100	67	0	67	60	80
Lark, Melodious		*	0	0	0	0	0	0	0	0	0	14	33	0	0	20	0
Lark, Red-capped			0	0	0	0	0	0	0	0	0	29	0	0	67	20	20
Lark, Sabota			67	40	50	75	100	100	0	100	0	71	100	0	67	40	40
Lark, Spike-heeled			67	50	100	75	100	100	67	100	100	86	100	0	67	100	100
Martin, Brown-throated			67	20	0	25	0	0	0	0	0	14	0	0	0	20	20
Martin, Rock			0	50	50	50	0	0	33	100	0	86	100	0	100	100	80
Moorhen, Common			0	50	0	0	0	0	0	0	0	0	0	100	0	0	0
Mousebird, Red-faced			0	40	50	0	0	0	0	0	0	57	67	0	33	40	20
Mousebird, Speckled			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Mousebird, White-backed			33	90	50	50	0	0	33	100	0	100	100	0	0	80	80
Neddicky			0	0	0	0	0	0	0	0	0	29	33	0	0	0	0
Nightjar, European			0	0	0	0	0	0	0	0	0	0	0	0	33	0	0
Nightjar, Rufous-cheeked			0	0	0	0	0	0	0	0	0	14	33	0	0	0	0
Ostrich, Common			0	20	0	25	0	0	0	0	0	0	0	0	0	0	0
Owl, Spotted Eagle-			0	10	0	0	0	0	0	0	0	71	67	0	33	20	40
Penduline-tit, Cape			33	0	0	0	0	0	0	0	0	29	0	0	0	40	0
Pigeon, Speckled			67	60	100	75	100	100	33	0	0	100	67	0	100	80	80
Pipit, African			67	70	50	75	100	100	67	100	100	29	100	0	67	80	80
Pipit, African Rock	NT	*	0	0	0	0	0	0	67	0	0	86	100	0	33	40	40
Pipit, Long-billed (Nicholson's)			0	10	0	0	0	0	33	0	0	86	67	0	67	0	0
Pipit, Plain-backed			0	0	0	0	0	0	0	0	0	0	0	0	0	20	0
Plover, Kittlitz's			0	10	50	25	0	0	0	0	0	14	0	0	0	0	20
Plover, Three-banded			33	70	50	25	100	0	0	0	0	71	0	100	100	20	60
Prinia, Black-chested			67	10	0	25	0	0	0	0	0	29	33	0	33	20	20
Prinia, Karoo		*	33	20	50	50	100	0	67	0	0	57	67	0	0	40	40
Quail, Common			0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
Quail-finch, African			0	0	0	0	0	0	0	0	0	0	0	0	33	0	0
Quelea, Red-billed			33	30	50	0	0	0	0	0	0	14	0	0	33	40	60
Raven, White-necked			0	10	0	0	0	0	33	0	0	57	67	0	0	20	0
Robin, Kalahari Scrub			0	0	0	0	0	0	0	0	0	0	0	0	0	40	0
Robin, Karoo Scrub			67	60	50	75	100	100	100	100	0	86	100	100	67	100	100
Robin-chat, Cape			0	60	50	75	0	100	33	100	0	86	100	100	0	40	80

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Ruff			0	30	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandgrouse, Namaqua			0	10	0	0	0	0	33	0	0	29	33	0	33	60	40
Sandpiper, Common			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandpiper, Curlew			0	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandpiper, Wood			0	10	0	0	0	0	0	0	0	0	0	0	0	0	20
Secretarybird	VU		0	10	0	0	0	0	0	0	0	43	0	0	33	20	0
Shelduck, South African			67	50	0	75	0	0	67	0	0	71	0	100	67	60	40
Shoveler, Cape			0	10	0	0	0	0	0	0	0	0	0	0	0	0	20
Sparrow, Cape			100	100	100	100	100	100	67	100	100	86	100	0	100	100	100
Sparrow, House			67	60	50	50	0	0	0	0	0	100	0	0	67	60	80
Sparrow, Southern Grey-headed			67	0	50	25	0	0	33	100	0	57	0	0	0	40	0
Sparrowhawk, Rufous-breasted			0	0	0	0	0	0	0	0	0	0	33	0	0	0	0
Sparrow-weaver, White-browed			67	10	0	0	0	0	0	0	0	0	0	0	0	60	0
Spoonbill, African			0	0	0	25	0	0	0	0	0	0	0	100	0	0	0
Starling, Cape Glossy			0	10	50	25	0	0	0	0	0	71	33	0	33	60	20
Starling, Common			0	50	0	0	0	0	0	0	0	0	0	0	0	0	0
Starling, Pale-winged			0	30	0	0	0	0	67	100	0	86	100	0	67	20	20
Starling, Pied		*	33	50	100	100	0	0	67	100	0	86	33	0	33	100	80
Starling, Red-winged			0	0	0	25	0	0	0	0	0	14	0	0	0	0	0
Starling, Wattled			0	10	0	0	0	0	0	0	0	14	0	0	33	20	0
Stilt, Black-winged			0	70	0	25	0	0	33	0	0	29	0	100	0	0	0
Stint, Little			0	20	0	0	0	0	0	0	0	0	0	0	0	0	0
Stonechat, African			67	50	50	0	0	0	0	0	100	0	0	0	0	60	40

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Stork, Black	VU		0	20	0	50	0	0	0	0	0	0	0	0	0	20	0
Stork, White	(Bonn)		33	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Sunbird, Dusky			0	10	0	50	0	0	33	0	0	14	100	0	33	20	40
Sunbird, Malachite			0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
Sunbird, Southern Double-collared		*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Swallow, Barn			100	50	100	75	100	100	67	100	100	29	33	100	67	60	60
Swallow, Greater Striped			100	30	100	100	100	100	67	100	100	57	67	100	33	80	60
Swallow, South African Cliff		*	67	50	50	75	100	0	33	0	0	0	0	0	0	0	0
Swallow, White-throated			67	20	50	25	100	0	0	100	0	14	0	100	0	20	20
Swift, African Black			33	0	0	0	0	0	0	0	0	0	0	0	33	0	0
Swift, Alpine			0	0	0	0	0	0	33	0	0	14	67	0	0	0	20
Swift, Common			33	10	0	25	0	0	0	0	0	29	33	0	67	20	20
Swift, Little			33	70	50	50	0	100	33	100	0	71	33	0	67	60	60
Swift, White-rumped			67	40	100	50	0	0	33	0	100	14	33	0	67	40	60
Teal, Cape			0	30	0	0	0	0	0	0	0	43	0	0	0	0	0
Teal, Red-billed			0	20	0	50	0	0	0	0	0	14	0	0	0	0	0
Thick-knee, Spotted			0	20	0	0	0	0	33	0	0	71	33	0	0	60	60
Thrush, Karoo		*	33	80	50	25	0	0	33	100	0	100	67	0	0	40	60
Thrush, Short-toed Rock			0	0	0	0	0	0	33	0	0	43	33	0	0	0	0
Tit, Grey		*	0	0	50	0	0	0	33	0	0	57	67	0	33	0	0
Tit-Babbler, Chestnut-vented			0	0	0	25	0	0	67	100	0	71	100	0	0	40	40
Tit-Babbler, Layard's		*	0	0	0	0	0	0	67	0	0	86	100	0	67	60	40
Wagtail, Cape			33	70	50	50	100	100	67	100	0	71	100	100	67	100	60

Species	Red Data	Endemic or Near-endemic	Pentads														
			3030_2400	3035_2400	3040_2400	3030_2405	3035_2405	3040_2405	3030_2410	3035_2410	3040_2410	3030_2415	3035_2415	3040_2415	3030_2420	3035_2420	3040_2420
			Reporting Rate (%)														
Warbler, African Reed			0	40	50	25	0	0	0	100	0	0	0	0	0	0	0
Warbler, Cinnamon-breasted		*	0	0	0	0	0	0	0	0	0	14	0	0	0	0	0
Warbler, Lesser Swamp			0	30	0	0	0	0	0	0	0	0	0	0	0	0	0
Warbler, Namaqua		*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Warbler, Rufous-eared			100	80	100	100	100	100	67	100	100	86	100	100	100	80	100
Waxbill, Common			0	30	0	0	0	0	0	0	0	0	0	0	0	60	60
Weaver, Cape		*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weaver, Southern Masked			100	100	50	100	100	100	67	100	100	100	100	100	67	80	100
Wheatear, Capped			0	40	100	0	100	100	33	0	100	0	0	100	67	40	60
Wheatear, Mountain			0	0	50	25	0	0	67	100	100	100	100	0	67	80	40
White-eye, Cape		*	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0
White-eye, Orange River			0	30	50	0	0	0	33	0	0	86	100	0	0	0	0
Whydah, Pin-tailed			0	20	0	25	0	0	0	100	0	14	0	0	33	60	0

APPENDIX IV: POTENTIAL MAMMAL SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Bathyergidae	*Cryptomys hottentotus*	African Mole Rat	GBIF	LC
Bovidae	*Redunca fulvorufula*	Southern Mountain Reedbuck	GBIF	EN
	Syncerus caffer	African Buffalo	GBIF	LC
	Pelea capreolus	Grey Rhebok	GBIF	NT
	Oryx gazella	Gemsbok	MammalMAP	LC
	Raphicerus campestris	Steenbok	MammalMAP	LC
	Antidorcas marsupialis	Springbok	GBIF	LC
	Tragelaphus strepsiceros	Greater Kudu	GBIF	LC
	Sylvicapra grimmia	Common Duiker	GBIF	LC
	Alcelaphus buselaphus	Bubal Hartebeest	GBIF	LC
	Damaliscus pygargus	Bontebok	GBIF	LC
	Connochaetes gnou	Black Wildebeest	GBIF	LC
Canidae	*Otocyon megalotis*	Bat-eared Fox	MammalMAP	LC
	Vulpes chama	Cape Fox	GBIF	LC
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	GBIF	LC
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	GBIF	NT
Felidae	*Felis nigripes*	Black-footed Cat	MammalMAP, GBIF	VU
	Leptailurus serval	Serval	GBIF	LC
	Felis catus	Domestic Cat	MammalMAP	INT
Gliridae	*Graphiurus ocularis*	Spectacled Dormouse	GBIF	NT
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	MammalMAP, GBIF	LC
	Suricata suricatta	Meerkat	GBIF	LC
	Atilax paludinosus	Marsh Mongoose	GBIF	LC
Hyaenidae	*Proteles cristata*	Aardwolf	MammalMAP	LC
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	MammalMAP	LC
Leporidae	*Bunolagus monticularis*	Riverine Rabbit	GBIF	CR
	Lepus saxatilis	Scrub Hare	MammalMAP, GBIF	LC
	Lepus capensis	Cape Hare	GBIF	LC
	Pronolagus saundersiae	Hewitt's Red Rock Hare	GBIF	LC
Macroscelididae	*Elephantulus edwardii*	Cape Elephant Shrew	GBIF	LC
	Elephantulus myurus	Eastern Rock Elephant Shrew	GBIF	LC
	Macroscelides proboscideus	Round-Eared Elephant Shrew	GBIF	LC
	Elephantulus rupestris	Western Rock Elephant Shrew	GBIF	LC
Muridae	*Otomys auratus*	Vlei Rat	GBIF	NT
	Otomys sloggetti	Sloggett's Vlei Rat	GBIF	LC
	Aethomys ineptus	Tete Veld Aethomys	GBIF	LC
	Otomys karoensis	Robert's Vlei Rat	GBIF	LC
	Desmodillus auricularis	Cape Short Eared Gerbil	GBIF	LC
	Micaelamys granti	Grant's Micaelamys	GBIF	LC
	Gerbilliscus brantsii	Highveld Gerbil	GBIF	LC
	Parotomys littledalei	Littledale's Whistling Rat	GBIF	NT
	Rattus rattus	Black Rat	GBIF	INT
	Gerbilliscus leucogaster	Bushveld Gerbil	GBIF	LC
	Otomys unisulcatus	Bush Vlei Rat	GBIF	LC
Mustelidae	*Hydrictis maculicollis*	Spotted Necked Otter	GBIF	NT
	Aonyx capensis	Cape Clawless Otter	GBIF	NT
	Ictonyx striatus	Striped Polecat	MammalMAP, GBIF	LC
	Poecilogale albinucha	African Striped Weasel	GBIF	NT
Nesomyidae	*Mystromys albicaudatus*	White Tailed Rat	GBIF	VU

Family	Scientific Name	Common Name	Data Source	Status
	Saccostomus campestris	Pouched Mouse	GBIF	LC
Nycteridae	*Nycteris thebaica*	Egyptian Slit Faced Bat	GBIF	LC
Orycteropodidae	*Orycteropus afer*	Aardvark	Site-walkthrough*	LC
Pedetidae	*Pedetes capensis*	Springhare	GBIF	LC
Pteropodidae	*Eidolon helvum*	Straw Coloured Fruit Bat	GBIF	LC
	Rousettus aegyptiacus	Egyptian Fruit Bat	GBIF	LC
Rhinolophidae	*Rhinolophus darlingi*	Darling's Horseshoe Bat	GBIF	LC
Sciuridae	*Xerus inauris*	South African Ground Squirrel	GBIF, MammalMAP	LC
Soricidae	*Suncus varilla*	Lesser Dwarf Shrew	GBIF	LC
Suidae	*Phacochoerus africanus*	Common Warthog	GBIF, MammalMAP	LC
Vespertilionidae	*Neoromicia zuluensis*	Zulu Serotine	GBIF	LC
	Eptesicus hottentotus	Long-tailed Serotine	GBIF	LC

APPENDIX V: POTENTIAL AMPHIBIAN SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Brevicepitidae	*Breviceps adspersus*	Bushveld Rain Frog	FrogMAP, GBIF	LC
Bufonidae	*Poyntonophrynus vertebralis*	Southern Pygmy Toad	FrogMAP	LC
	Vandijkophrynus gariepensis	Karoo Toad	FrogMAP, GBIF	LC
	Amietophrynus gutturalis	Marbled Toad	GBIF	LC
	Amietophrynus rangeri	Raucous Toad	GBIF	LC
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	FrogMAP, GBIF	LC
Pipidae	*Xenopus laevis*	African Clawed Frog	GBIF	LC
Pyxicephalidae	*Amietia fuscigula*	Cape River Frog	FrogMAP	LC
	Cacosternum boettgeri	Common Caco	FrogMAP, GBIF	LC
	Pyxicephalus adspersus	Giant Bull Frog	FrogMAP	NT
	Tomopterna tandyi	Tandy's Sand Frog	FrogMAP, GBIF	LC
	Strongylopus grayii	Gray's Grass Frog	GBIF	LC
	Tomopterna cryptotis	Striped Pyxie	GBIF	LC

APPENDIX VI: POTENTIAL REPTILE SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Agamidae	*Agama aculeata aculeata*	Common Ground Agama	ReptileMAP	LC
	Agama atra	Southern Rock Agama	GBIF	LC
Cordylidae	*Karusasaurus polyzonus*	Karoo Girdled Lizard	ReptileMAP, GBIF	LC
Elapidae	*Aspidelaps lubricus*	Cape Coral Snake	GBIF	LC
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Thick-toed Gecko	GBIF	LC
	Pachydactylus mariquensis	Common Banded Gecko	GBIF	LC
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	ReptileMAP, GBIF	LC
	Nucras holubi	Holub's Sandveld Lizard	GBIF	LC
Lamprophiidae	*Lycophidion capense capense*	Cape Wolf Snake	ReptileMAP	LC

	Psammophylax rhombeatus	Rhombic Skaapsteker	GBIF	LC
	Psammophis trinasalis	Fork-marked Sand Snake	GBIF	LC
	Lamprophis aurora	Aurora House Snake	GBIF	LC
	Duberria lutrix	Common Slug-Eater	GBIF	LC
Pelomedusidae	*Pelomedusa subrufa*	Marsh Terrapin	GBIF	LC
Scincidae	*Trachylepis sulcata*	Western Rock Skink	Observed	LC
	Acontias gracilicauda	Thin-tailed Legless Skink	GBIF	LC
Testudinidae	*Homopus boulengeri*	Karoo Padloper	GBIF	NT (EN*)
	Psammobates tentorius	Tent Tortoise	GBIF	LC
	Homopus areolatus	Parrot-Beaked Tortoise	GBIF	LC
	Stigmochelys pardalis	Leopard Tortoise	GBIF, ReptileMAP	LC
	Homopus femoralis	Greater Padloper	GBIF	LC
	Psammobates oculiferus	Serrated Tortoise	GBIF	NE
Varanidae	*Varanus albigularis albigularis*	Rock Monitor	ReptileMAP, GBIF	LC

APPENDIX VII: POTENTIAL INVERTEBRATE SPECIES ON THE PROJECT SITE

Family	Scientific Name	Common Name	Data Source	Status
Aeshnidae	*Anax imperator*	Blue Emperor	OdonataMAP	LC
	Zosteraeschna minuscula	Friendly Hawker	GBIF	LC
	Pinheyschna subpupillata	Stream Hawker	GBIF	LC
Apidae	*Amegilla atrocincta*		GBIF	NE
Araneidae	*Argiope australis*	Common Garden Orbweb Spinner	GBIF	NE
	Cyrtophora citricola	Tropical Tent-web Spider	GBIF	NE
Buthidae	*Parabuthus granulatus*	Granulated Thick-tailed Scorpion	GBIF	NE
	Uroplectes carinatus		GBIF	NE
Carabidae	*Anthia thoracica*	Gewone Oogpister	GBIF	NE
Coenagrionidae	*Pseudagrion newtoni*	Harlequin Sprite	GBIF	VU
	Africallagma glaucum	Swamp Bluet	OdonataMAP	LC
	Africallagma sapphirinum	Sapphire Bluet	GBIF	LC
	Pseudagrion caffrum	Springwater Sprite	GBIF	LC
	Pseudagrion vaalense	Vaal Sprite	GBIF	LC
	Pseudagrion citricola	Yellow-Faced Sprite	GBIF	LC
Crambidae	*Loxostege frustalis*		LepiMAP, GBIF	NE
Ctenizidae	*Stasimopus unispinosus*		GBIF	NE
Cyrtaucheniidae	*Ancylotrypa pusilla*		GBIF	NE
Daesiidae	*Biton schreineri*		GBIF	NE
Eupterotidae	*Rhabdosia vaninia*		LepiMAP	NE
Gnaphosidae	*Drassodes tesselatus*		GBIF	NE
	Theuma schreineri		GBIF	NE
	Zelotes fuligineus		GBIF	NE
	Zelotes invidus		GBIF	NE
Gomphidae	*Notogomphus praetorius*	Yellowjack Longlegs	GBIF	LC
	Ceratogomphus pictus	Common Thorntail	GBIF	LC
Hesperiidae	*Spialia sataspes*	Boland sandman	LepiMAP	LC
	Spialia agylla	Grassveld Sandman	GBIF	LC
	Metisella malgacha	Grassveld Sylph	GBIF	LC
	Kedestes lepenula	Chequered Ranger	GBIF	LC
	Kedestes barberae	Freckled Ranger	GBIF	LC
	Gomalia elma	Green-marbled Skipper	GBIF	LC

Family	Scientific Name	Common Name	Data Source	Status
	Eretis umbra	Small Marbled Elf	GBIF	LC
	Spialia spio	Mountain Sandman	GBIF	LC
	Spialia nanus	Dwarf Sandman	GBIF	LC
	Spialia mafa	Mafa Sandman	GBIF	LC
	Spialia diomus	Common Sandman	GBIF	LC
	Spialia asterodia	Star Sandman	GBIF	LC
Idiopidae	*Galeosoma schreineri*		GBIF	NE
	Gorgyrella schreineri		GBIF	NE
Libellulidae	*Crocothemis erythraea*	Broad Scarlet	OdonataMAP	LC
	Sympetrum fonscolombii	Red-veined Darter or Nomad	OdonataMAP	LC
	Trithemis arteriosa	Red-veined Dropwing	OdonataMAP	LC
	Acisoma panorpoides	Grizzled Pintail	GBIF	LC
Liocranidae	*Rhaebоctesis transvaalensis*		GBIF	NE
Lycaenidae	*Argyraspodes argyraspis*	Warrior silver-spotted copper	LepiMAP, GBIF	LC
	Chrysoritis chrysaor	Burnished opal	LepiMAP, GBIF	LC
	Tylopaedia sardonyx	King Copper	GBIF	LC
	Trimenia macmasteri	McMaster's Silver-spotted Copper	GBIF	LC
	Trimenia argyroplaga	Large Silver-spotted Copper	GBIF	LC
	Thestor protumnus	Boland Skolly	GBIF	LC
	Thestor basutus	Basuto Skolly	GBIF	LC
	Oraidium barberae	Dwarf Blue	GBIF	LC
	Lycaena clarki	Eastern Sorrel Copper	GBIF	LC
	Leptotes brevidentatus	Short-toothed Zebra Blue	GBIF	LC
	Lepidochrysops patricia		GBIF	LC
	Lepidochrysops ortygia	Koppie Blue	GBIF	LC
	Lepidochrysops letsea	Free State Blue	GBIF	LC
	Iolaus bowkeri		GBIF	LC
	Harpendyreus tsomo	Tsomo Mountain Blue	GBIF	LC
	Harpendyreus notoba	Salvia Mountain Blue	GBIF	LC
	Eicochrysops messapus	Cupreos Blue	GBIF	LC
	Deudorix antalus	Brown Playboy	GBIF	LC
	Crudaria leroma	Silver-spotted Grey	GBIF	LC
	Chrysoritis turneri	Turner's Opal	GBIF	LC
	Chrysoritis chrysantas	Karoo Copper	GBIF	LC
	Brephidium metophis	Tinktinkie Blue	GBIF	LC
	Azanus moriqua	Black-Bordered Babul Blue	GBIF	LC
	Anthene contrastata		GBIF	LC
	Anthene butleri	Pale Hairtail	GBIF	LC
	Aloeides vansoni	Van Son's Copper	GBIF	LC
	Aloeides pierus	Dull Copper	GBIF	LC
	Aloeides pallida	Giant Copper	GBIF	LC
	Aloeides molomo	Molomo Copper	GBIF	LC
	Aloeides macmasteri	McMaster's Copper	GBIF	LC
	Aloeides gowani	Gowan's Copper	GBIF	LC
	Aloeides damarensis	Damara Copper	GBIF	LC
	Aloeides aranda	Aranda Copper	GBIF	LC
	Actizera lucida	Rayed Blue	GBIF	LC
	Azanus jesous	Topaz-Spotted Blue	GBIF	LC
	Zizula hylax	Tiny Grass Blue	GBIF	LC
	Azanus ubaldus	The Bright Babul Blue	GBIF	LC
	Anthene amarah	The Black-Striped Hairtail	GBIF	LC

Family	Scientific Name	Common Name	Data Source	Status
	Lampides boeticus	Pea Blue	GBIF	LC
	Leptotes pirithous	Lang's Short-Tailed Blue	GBIF	LC
	Chilades trochylus	Grass Jewel	GBIF	LC
	Zizeeria knysna	Dark Grass Blue	GBIF	LC
Lycosidae	*Evippomma squamulatum*		GBIF	NE
	Geolycosa subvittata		GBIF	NE
	Lycosa schreineri		GBIF	NE
	Pardosa schreineri		GBIF	NE
Meloidae	*Hycleus transvaalicus*		GBIF	NE
Nymphalidae	*Junonia hierta cebrene*	Yellow pansy	LepiMAP, GBIF	LC
	Stygionympha robertsoni	Robertson's hillside brown	LepiMAP, GBIF	LC
	Stygionympha irrorata	Karoo Hillside Brown	GBIF	LC
	Acraea stenobea	Suffused Acraea	GBIF	LC
	Acraea neobule	Wandering Donkey Acraea	GBIF	LC
	Vanessa cardui	Painted Lady	GBIF	LC
	Hypolimnas misippus	Common Diadem	GBIF	LC
	Danaus chrysippus	African Monarch	GBIF	LC
	Junonia oenone	Dark Blue Pansy	GBIF	LC
	Ypthima asterope	African Ringlet	GBIF	LC
Papilionidae	*Papilio demodocus*	Citrus Swallowtail	GBIF	LC
Pieridae	*Pontia helice helice*	Common meadow white	LepiMAP, GBIF	LC
	Pinacopteryx eriphia	Zebra White	GBIF	LC
	Colotis agoye	Speckled Sulphur Tip	GBIF	LC
	Colotis euippe	Smoky Orange Tip	GBIF	LC
	Eurema brigitta	No-Brand Grass Yellow	GBIF	LC
	Colotis evenina	Common Orange Tip	GBIF	LC
	Belenois aurota	Brown-Veined Caper White	GBIF	LC
	Colotis eris	Banded Gold Tip	GBIF	LC
	Catopsilia florella	African Emigrant	GBIF	LC
	Colias electo	African Clouded Yellow	GBIF	LC
Pyrgomorphidae	*Phymateus morbillosus*	Common Milkweed Locust	GBIF	NE
Scorpionidae	*Opistophthalmus austerus*		GBIF, ScorpionMAP	NE
	Opistophthalmus pictus		GBIF	NE
Segestriidae	*Ariadna karrooica*		GBIF	NE
	Ariadna scabripes		GBIF	NE
Solpugidae	*Solpuga chelicornis*		GBIF	NE
	Zeria venator		GBIF	NE
	Solpuga villosa		GBIF	NE
Sphingidae	*Hippotion rosae*		GBIF	NE
	Agrius convolvuli	Convolvulus Hawk	GBIF	NE
	Acherontia atropos	Death's Head Moth	GBIF	NE
	Daphnis nerii	Oleander Hawkmoth	GBIF	NE
	Hippotion celerio	Silver-Striped Hawk-Moth	GBIF	NE
	Hyles livornica	Striped Hawk-Moth	GBIF	NE
	Afroclanis calcareus		GBIF	NE
	Basiothia charis		GBIF	NE
	Basiothia schenki	Brown Striped Hawkmoth	GBIF	NE
	Batocnema africanus		GBIF	NE
	Rufoclanis numosae	Wavy Polyptychus	GBIF	NE
	Sphingonaepiopsis ansorgei		GBIF	NE

Family	Scientific Name	Common Name	Data Source	Status
	Sphingonaepiopsis nana		GBIF	NE
	Temnora murina		GBIF	NE
	Temnora namaqua		GBIF	NE
	Temnora pseudopylas		GBIF	NE
	Temnora pylades		GBIF	NE
	Temnora pylas		GBIF	NE
	Theretra cajus		GBIF	NE
	Theretra capensis		GBIF	NE
	Theretra orpheus		GBIF	NE
	Hippotion roseipennis		GBIF	NE
	Hoplistopus butti		GBIF	NE
	Hoplistopus penricei		GBIF	NE
	Lophostethus dumolinii	Arrow Sphinx	GBIF	NE
	Macropoliana natalensis		GBIF	NE
	Microsphinx pumilum		GBIF	NE
	Odontosida magnificum		GBIF	NE
	Odontosida pusillus		GBIF	NE
	Phylloxiphia punctum		GBIF	NE
	Polyptychus grayii		GBIF	NE
	Praedora leucophaea		GBIF	NE
	Pseudoclanis molitor		GBIF	NE
	Pseudoclanis postica	Mulberry Hawkmoth	GBIF	NE
	Rhodafra opheltes		GBIF	NE
Synlestidae	*Chlorolestes fasciatus*	Mountain Malachite	GBIF	LC
Theraphosidae	*Harpactira namaquensis*	Bronze Baboon Spider	SpiderMAP	NE
Theridiidae	*Latrodectus karrooensis*	Karroo Button Spider	GBIF	NE

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Cape Town
8001

23 February 2021

RE: AVIFAUNAL PEER REVIEW OF THE BASIC ASSESSMENT - TERRESTRIAL ANIMAL SPECIES SPECIALIST ASSESSMENT REPORT (AVIFAUNAL COMPONENT) FOR THE MULILO TOTAL HYDRA STORAGE PROJECT: GRID INTERCONNECTION.

To whom it may concern,

1. Background

WildSkies Ecological Services (Pty) Ltd was appointed by Arcus (during February 2021) to conduct a peer review of the study entitled: "TERRESTRIAL ANIMAL SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED MULILO TOTAL HYDRA STORAGE GRID CONNECTION NEAR DE AAR, NORTHERN CAPE PROVINCE" (Arcus – February 2021).

In conducting this peer review we have considered the following documents supplied to us by Arcus:

- The specialist terrestrial animal species specialist assessment report (Arcus – February 2021).

2. Findings

Confirmation of independence

This is a thorough, well written piece of work based on thorough field assessment. I see no reason to question the independence of the avifaunal specialist who compiled the report.

Acceptability of the terms of reference of the specialist studies

I cannot identify any gaps or omissions in the terms of reference utilised for the study.

The suitability of the different assessment methodology used for data gathering and analysis

Overall the methods used and level of effort of study are suitable in my view.

Evaluate the validity of the findings (review data evidence)

Overall the findings are sound, and based on the data collected on site and from various available secondary data sources.

Discuss the suitability of the mitigation measures and recommendations

The mitigation measures are appropriate for a project of this nature in my view.

Identify any short comings and mitigation measures to address the mitigation measures

I have not identified any short comings requiring action.

Evaluate the appropriateness of the reference literature and data

The literature and data consulted is thorough and mostly up to date. I judge it to be appropriate for this purpose.

Indicate whether a site inspection was carried out as part of the peer review

No site inspection was carried out as part of the peer review. A brief once off site inspection would carry very little value in this instance and there are no specific issues that could have benefited from an on-site examination by the peer reviewer. I am also familiar with most of the study area from other work in the area.

Indicate whether the article is well written and easy to understand

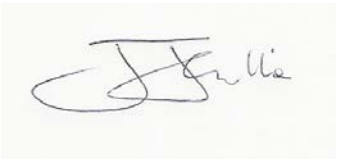
The avifaunal impact assessment study is well written in my view and follows a logical sequence throughout. It is easy as a reader to follow the sequence from background, to baseline data, to impact assessment, to management and mitigation.

3. Conclusions

I conclude that this site has been thoroughly and adequately studied. We believe that the findings are reasonable and based on sound data.

Please don’t hesitate to contact us if you have any further questions.

Kind regards



Jon Smallie

APPENDIX 1. CV OF PEER REVIEWER

JONATHAN JAMES SMALLIE
WildSkies Ecological Services (2011/131435/07)
Curriculum Vitae

BACKGROUND

Date of birth:	20 October 1975
Qualifications:	BSC – Agriculture (Hons) (completed 1998) University of Natal – Pietermaritzburg MSC – Environmental Science (completed 2011) University of Witwaterstrand
Occupation:	Specialist avifaunal consultant
Profession registration:	South African Council for Natural Scientific Professions

CONTACT DETAILS

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Email: jon@wildskies.co.za
Postal: 36 Utrecht Avenue, Bonnie Doon, East London, 5210
ID #: 7510205119085

PROFESSIONAL EXPERIENCE

Strategic Assessments:

East Cape Biodiversity Strategy & Action Plan – avifauna.

Renewable energy:

Post construction bird monitoring for wind energy facilities:

Dassieklip (Caledon) –initiated in April 2014 (2yrs); Dorper Wind Farm (Molteno) – initiated in July 2014 (2yrs); Jeffreys Bay Wind Farm – initiated in August 2014 (4yrs); Kouga Wind Farm – started Feb 2015 (2yrs); Cookhouse West Wind Farm – started March 2015 (1yr); Grassridge Wind Farm – initiated in April 2015 (2yrs); Chaba Wind Farm – initiated December 2015 (1yr); Amakhala Emoyeni 01 Wind Farm initiated August 2016 (2yrs); Gibson Bay Wind Farm – initiated March 2017 (2yrs); Nojoli Wind Farm initiated March 2017 (2yrs); Sere Wind Farm (2yrs).

Pre-construction bird monitoring & EIA for wind energy facilities:

Golden Valley 1; Middleton; Dorper; Qumbu; Ncora; Nqamakhwe; Ndakana; Thomas River; Peddie; Mossel Bay; Hluhluwe; Richards Bay; Garob; Outeniqua; Castle; Wolf; Inyanda-Roodeplaat; Dassiesridge; Great Kei; Bayview; Grahamstown; Bakenskop; Umsobomvu; Stormberg; Zingesele; Oasis; Gunstfontein; Naumanii; Golden Valley Phase 2; Ngxwabangu; Hlobo; Woodstock; Scarlet Ibis; Albany; Golden Valley 1 2nd monitoring; Umtathi Emoyeni; Pensulo Zambia; Unika 1 Zambia; Impofu; Nuweveld; Kleinsee wind energy facilities.

Screening studies for wind energy facilities:

Tarkastad Wind Farm; Quanti Wind Farm; Ruitjies Wind Farm; Stutterheim Wind Farm; Molteno Wind Farm; Noupoort Wind Farm.

Avifaunal walk through for wind energy facilities:
Garob Wind Farm; Golden Valley 1 wind farm; Nxuba Wind Farm.

Pre-construction bird monitoring and EIA for Solar energy facilities:
Bonnievale Solar Energy Facility; Dealesville Solar Energy Facility; Rooipunt Solar Energy Facility; De Aar Solar Energy Facility; Noupoort Solar Energy Facility, Aggeneys Solar Energy Facility; Eskom Concentrated Solar Power Plant; Bronkhorstspruit Solar Photovoltaic Plant; De Aar Solar Energy Facility; Paulputs Solar Energy Facility; Kenhardt Solar Energy Facility; Wheatlands Solar Energy Facility; Nampower CSP project;

Other Electricity Generation:
Port of Nqura Power Barge EIA; Tugela Hydro-Electric Scheme; Mmamabula West Coal Power Station (Botswana).

Electricity transmission & distribution:
Overhead transmission power lines (>132 000 kilovolts):
Oranjemund Gromis 220kv; Perseus Gamma 765kv; Aries Kronos 765kv; Aries Helios 765kv; Perseus Kronos 765kv; Helios Juno 765kv; Borutho Nzelele 400kv; Foskor Merensky 275kv; Kimberley Strengthening; Mercury Perseus 400kV; Eros Neptune Grassridge 400kV; Kudu Juno 400kV; Garona Aries 400kV; Perseus Hydra 765Kv; Tabor Witkop 275kV; Tabor Spencer 400kV; Moropule Orapa 220kV (Botswana); Coega Electrification; Majuba Venus 765kV; Gamma Grassridge 765kV; Gourikwa Proteus 400KV; Koeberg Strengthening 400kV; Ariadne Eros 400kV; Hydra Gamma 765kV; Zizabona transmission – Botswana; Maphutha Witkop 400kv; Makala B 400kv; Aggeneis Paulputs 400kv; Northern Alignment 765kv; Kappa Omega 765kv; Isundu 400kv and Substation; Senakangwedi B Integration; Oranjemund Gromis;

Overhead distribution power lines (<132 000 kilovolts):
Kanoneiland 22KV; Hydra Gamma 765kV; Komani Manzana 132kV; Rockdale Middelburg 132kV; Irenedale 132 kV; Zandfontein 132kV; Venulu Makonde 132 kV; Spencer Makonde 132 kV; Dalkeith Jackal Creek 132Kv; Glen Austin 88kV; Bulgerivier 132kV; Ottawa Tongaat 132kV; Disselfontein 132kV; Voorspoed Mine 132kV; Wonderfontein 132kV; Kabokweni Hlau Hlau 132kV; Hazyview Kiepersol 132kV; Mayfern Delta 132kV; VAAL Vresap 88kV; Arthursview Modderkuil 88kV; Orapa, AK6, Lethakane substations and 66kV lines (Botswana); Dagbreek Hermon 66kV; Uitkoms Majuba 88kV; Pilanesberg Spitskop 132kV; Qumbu PG Bison 132kV; Louis Trichardt Venetia 132kV; Rockdale Middelburg Ferrochrome 132kV; New Continental Cement 132KV; Hillside 88kV; Marathon Delta 132kV; Malelane Boulder 132kV; Nondela Strengthening 132kV; Spitskop Northern Plats 132kV; West Acres Mataffin 132kV; Westgate Tarlton Kromdraai 132kV; Sappi Elliot Ugie 132kV; Melkhout Thyspunt 132kV; St Francis Bay 66kv; Etna Ennerdale 88kv; Kroonstad 66kv; Firham Platrand; Paradise Fondwe 132kv; Kraal Mafube 132kv; Loeriesfontein 132kv; Albany Mimosa 66kv; Zimanga 132kv; Grootpan Brakfontein; Mandini Mangethe; Valkfontein Substation; Sishen Saldanha; Corinth Mzongwana 132kv; Franklin Vlei 22kv; Simmerpan Strengthening; Ilanga Lethemba 132kv; Cuprum Burchell Mooidraai 132; Oliphantskop Grassridge 132;

Risk Assessments on existing power lines:
Hydra-Droerivier 1,2 & 3 400kV; Hydra-Poseidon 1,2 400kV; Butterworth Ncora 66kV; Nieu-Bethesda 22kV; Maclear 22kV (Joelshoek Valley Project); Wodehouse 22kV (Dordrecht district); Burgersdorp Aliwal North Jamestown 22kV; Cradock 22kV; Colesberg area 22kV; Loxton self build 11kV; Kanoneiland 22kV; Stutterheim Municipality 22kV; Majuba-Venus 400kV; Chivelston-Mersey 400kV; Marathon-Prairie 275kV; Delphi-Neptune 400kV; Ingagane – Bloukrans 275kV; Ingagane – Danskraal 275kV; Danskraal – Bloukrans 275kV

Avifaunal "walk through" (EMP's):

Kappa Omega 765kv; Rockdale Marble Hall 400kv; Beta Delphi 400kV; Mercury Perseus 765kV; Perseus 765kV Substation; Beta Turn 765kV in lines; Spencer Tabor 400kV line; Kabokweni Hlau Hlau 132kV; Mayfern Delta 132Kv; Eros Mtata 400kV; Cennergi Grid connect 132kV; Melkhout Thyspunt 132kv; Imvubu Theta 400kv; Outeniqua Oudshoorn 132kv; Clocolan Ficksburg 88kv.

Strategic Environmental Assessments for Master Electrification Plans:

Northern Johannesburg area; Southern KZN and Northern Eastern Cape; Northern Pretoria; Western Cape Peninsula

Other electrical infrastructure work

Investigation into rotating Bird Flapper saga – Aberdeen 22Kv; Special investigation into faulting on Ariadne-Eros 132kV; Special investigation into Bald Ibis faulting on Tutuka Pegasus 275kV; Special investigation into bird related faulting on 22kV Geluk Hendrina line; Special investigation into bird related faulting on Camden Chivelston 400kV line

Water sector:

Umkhomazi Dam and associated tunnel and pipelines; Rosedale Waste Water Treatment Works; Lanseria Outfall Sewer; Lanseria Wastewater Treatment Works;

Wildlife airport hazards:

Kigali International Airport – Rwanda; Port Elizabeth Airport – specialist study as part of the EIA for the proposed Madiba Bay Leisure Park; Manzini International Airport (Swaziland); Polokwane International Airport; Mafekeng International Airport; Lanseria Airport

Other sectors:

Lizzard Point Golf Estate – Vaaldam; Lever Creek Estates housing development; East Cape Biodiversity Strategy and Action Plan 2017; Cathedral Peak Road diversion; Dube Tradeport; East London Transnet Ports Authority Biodiversity Management Plan; Leazonia Feedlot; Carisbrooke Quarry; Senekal Sugar Development; Frankfort Paper Mill;

Employment positions held to date:

- August 1999 to May 2004: Eastern Cape field officer for the South African Crane Working Group of the Endangered Wildlife Trust
- May 2004 to November 2007: National Field officer for Eskom-EWT Strategic Partnership and Airports Company SA – EWT Strategic Partnership (both programmes of Endangered Wildlife Trust)
- November 2007 to August 2011: Programme Manager – Wildlife & Energy Programme – Endangered Wildlife Trust
- **August 2011 to present: Independent avifaunal specialist – Director at WildSkies Ecological Sevices (Pty) Ltd**

Relevant achievements:

- Recipient of BirdLife South Africa's Giant Eagle Owl in 2011 for outstanding contribution to bird conservation in SA
- Founded and chaired for first two years – the Birds and Wind Energy Specialist Group (BAWESG) of the Endangered Wildlife Trust & BirdLife South Africa.

Conferences attended & presented at:

- August 2019. Conference of Wind Energy and Wildlife, Stirlign, Scotland.
- November 2018. Raptor Research Foundation. Skukuza, Soith Africa.
- October 2017. Conference of Wind Energy and Wildlife, Estoril Portugal
- May 2011. Conference of Wind Energy and Wildlife, Trondheim, Norway.
- March 2011. Chair and facilitator at Endangered Wildlife Trust – Wildlife & Energy Programme – "2011 Wildlife & Energy Symposium", Howick, SA
- September 2010 – Raptor Research Foundation conference, Fort Collins, Colorado. Presented on the use of camera traps to investigate Cape Vulture roosting behaviour on transmission lines
- May 2010 - Wind Power Africa 2010. Presented on wind energy and birds
- October 2008. Session chair at Pan-African Ornithological Conference, Cape Town, South Africa
- March 27 – 30 2006: International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. Presented a paper entitled "Assessing the power line network in the Kwa-Zulu Natal Province of South Africa from a vulture interaction perspective".
- June 2005: IASTED Conference at Benalmadena, Spain – presented a paper entitled "Impact of bird streamers on quality of supply on transmission lines: a case study"
- May 2005: International Bird Strike Committee 27th meeting – Athens, Greece. Presented a paper entitled Bird Strike Data analysis at SA airports 1999 to 2004.
- 2003: Presented a talk on "Birds & Power lines" at the 2003 AGM of the Amalgamated Municipal Electrical Unions – in Stutterheim - Eastern Cape
- September 2000: 5th World Conference on Birds of Prey in Seville, Spain.

Papers & publications:

- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Guidelines on how to avoid or mitigate impacts of electricity power grids on migratory birds in the African-Eurasian Region. CMS Technical Series Number XX. Bonn, Germany.
- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Review of the conflict between migratory birds and electricity power grids in the African-Eurasian region. CMS Technical Series Number XX, Bonn, Germany.
- Jenkins, A.R., van Rooyen, C.S, Smallie, J.J, Harrison, J.A., Diamond, M.D., Smit-Robinson, H.A & Ralston, S. 2014. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa
- Jenkins, A.R., Shaw, J.M., Smallie, J.J., Gibbons, B., Visagie, R. & Ryan, P.G. 2011. Estimating the impacts of power line collisions on Ludwig's Bustards Neotis ludwigii. Bird Conservation International.
- Jordan, M., & Smallie, J. 2010. A briefing document on best practice for pre-construction assessment of the impacts of onshore wind farms on birds. Endangered Wildlife Trust , Unpublished report
- Smallie, J., & Virani, M.Z. 2010. A preliminary assessment of the potential risks from electrical infrastructure to large birds in Kenya. Scopus 30: p32-39
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. A preliminary survey of avian mortality on power lines in the Overberg, South Africa. Ostrich 2010. 81 (2) p109-113
- Jenkins, A.R., Smallie, J.J., & Diamond, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International 2010. 20: 263-278.
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. Modelling power line collision risk for the Blue Crane *Anthropoides paradiseus* in South Africa. Ibis 2010 (152) p590-599.
- Jenkins, A.R., Allan, D.G., & Smallie, J.J. 2009. Does electrification of the Lesotho Highlands pose a threat to that countries unique montane raptor fauna? Dubious evidence from surveys of three existing power lines. Gabar 20 (2).
- Smallie, J.J., Diamond, M., & Jenkins, A.R. 2008. Lighting up the African continent – what does this mean for our birds? Pp 38-43. In Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H.,

& Muchai. (eds). Proceedings of the 12th Pan-african Ornithological Congress. 2008. Cape Town. Animal Demography Unit. ISBN (978-0-7992-2361-3)
- Van Rooyen, C., & Smallie, J.J. 2006. The Eskom –EWT Strategic Partnership in South Africa: a brief summary. Nature & Faunae Vol 21: Issue 2, p25
- Smallie, J. & Froneman, A. 2005. Bird Strike data analysis at South African Airports 1999 to 2004. Proceedings of the 27th Conference of the International Bird Strike Committee, Athens Greece.
- Smallie, J. & Van Rooyen, C. 2005. Impact of bird streamers on quality of supply on transmission lines: a case study. Proceedings of the Fifth IASTED International Conference on Power and Energy Systems, Benalmadena, Spain.
- Smallie, J. & Van Rooyen, C. 2003. Risk assessment of bird interaction on the Hydra-Droërivier 1 and 2 400kV. Unpublished report to Eskom Transmission Group. Endangered Wildlife Trust. Johannesburg. South Africa
- Van Rooyen, C. Jenkins, A. De Goede, J. & Smallie J. 2003. Environmentally acceptable ways to minimise the incidence of power outages associated with large raptor nests on Eskom pylons in the Karoo: Lessons learnt to date. Project number 9RE-00005 / R1127 Technology Services International. Johannesburg. South Africa
- Smallie, J. J. & O'connor, T. G. (2000) Elephant utilization of *Colophospermum mopane*: possible benefits of hedging. African Journal of Ecology 38 (4), 352-359.

Courses & training:

- Successfully completed a 5 day course in High Voltage Regulations (modules 1 to 10) conducted by Eskom – Southern Region
- Successfully completed training on, and obtained authorization for, live line installation of Bird Flappers

TERRESTRIAL ANIMAL SPECIES SITE SENSITIVITY VERIFICATION REPORT FOR THE PROPOSED MULILO TOTAL HYDRA STORAGE PROJECT: GRID INTERCONNECTION NEAR DE AAR, NORTHERN CAPE PROVINCE

For

Mulilo Total Hydra Storage (Pty) Ltd

February 2021

Prepared By:

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1 INTRODUCTION

The applicable legislation relevant to this assessment is provided in more detail in Appendix I, however the Government Gazette, No. 43855 (Published in Government Notice No. 1150) of 30 October, 2020: "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species" is of particular relevance to the production of this report. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations.

The assessment and minimum reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the National Web Based Screening Tool[1] ('Screening Tool').

A desk-top study and a site visit was conducted to determine the suitability of the site sensitivity determination of the Screening Tool.

2 METHODS

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 fauna 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 Areas of southern Africa (IBA) project[7] as well as several available assessments for neighbouring projects. Road mortality records were obtained from the Endangered Wildlife Trust (EWT) Wildlife and Roads Project[8].

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 which may require increased attention during the site visit.

Due to ongoing updates of the Screening Tool, the output was regenerated prior to the compilation of this report (accessed 10 February 2021) to determine if any additions to the databases queried had relevance to the proposed development.

2.2 Site Visit

A site walk-through was conducted during the survey of the site between 10 February 2020 and 14 February 2020. The conditions of the site visit were ideal for the assessment as the area receives summer rainfall and a significant amount of rainfall had fallen during the season, allowing for a thorough assessment of features such as temporary wetlands, vleis,

[1] https://screening.environment.gov.za/screeningtool/

[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.

[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.

[8] https://www.ewt.org.za/resources/resources-biodiversity-data/ accessed 04 March 2020.

drainage lines, seeps and water-filled depressions to be conducted. Plant species such as grasses and herbs were flourishing during the site visit increasing the abundance of insects and animals such as granivorous and insectivorous birds.

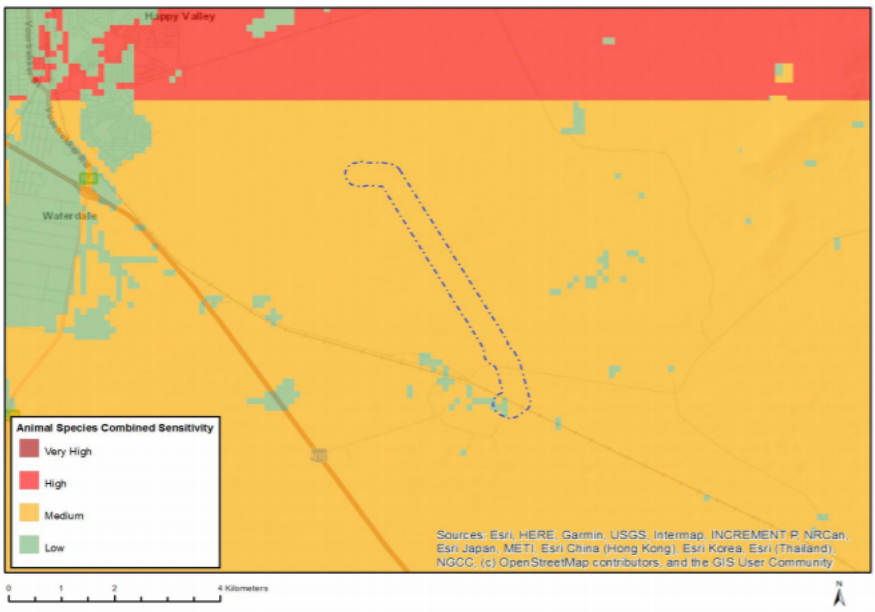
3 RESULTS

3.1 Desktop Study

3.1.1 Screening Tool

The Screening Tool identified the project site to be of **Medium Sensitivity** in the Animal Species Theme (Figure 1), due to the potential presence of the Endangered bird, Ludwig's Bustard *(Neotis ludwigii).*

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		x	

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Medium	Aves-Neotis ludwigii

Figure 1: Results of the National Web-based Screening Tool.

3.1.2 Database Search

3.1.2.1 Bird Species

The proposed grid connection corridor falls within the large Platberg-Karoo Conservancy (SA037, Figure 2). The conservancy covers the entire districts of De Aar, Philipstown and Hanover in the south-eastern portion of the Northern Cape Province.

Power lines in the district have been identified as a high threat to large terrestrial birds such as cranes and bustards, which collide with them, and to raptors, which have been electrocuted while perching on them. Power lines can, however, also be beneficial to large raptors which breed on them in areas where large trees are uncommon.

Some areas around the project site are known to be important breeding and 'lekking' grounds for the Endangered Ludwig's Bustard *(Neotis ludwigii)*. 'Lekking' is a mating system where males congregate in an area to display to females, Ludwig's Bustards exhibit an 'exploded' or 'dispersed' lekking system in which the displaying males are more widely spread over an area than typical of more conventional lekking arenas observed in other species[9]. While the project site is not directly within these areas, the species could potentially be impacted upon while traversing the project site to and from these areas.

3.1.2.2 Mammal Species

There were 61 mammal species listed in databases that could occur in the study area, 12 of which are listed as threatened or near threatened. Based on the habitats present in the grid connection corridor and surrounding areas, it is considered likely that some of these species could potentially occur on site.

3.1.2.3 Amphibian Species

There are 13 amphibian species that have a geographical distribution that includes the project site. The Giant Bullfrog *(Pyxicephalus adspersus)* is listed by NEMBA as a *Protected Species*. This species was located in the broader area surrounding the project site and could potentially occur in the grid connection corridor near temporarily inundated depressions.

3.1.2.4 Reptiles Species

There are 23 reptile species recorded in databases or observed from in or around the area project site that could occur in the area. The Karoo Padloper *(Chersobius [Homopus] boulengeri*) is listed as Near Threatened in the Regional Red List, however a more recent assessment lists the species as Endangered as most localities where populations previously occurred no longer harbour viable populations and that the species is no longer being found by farmers. The Karoo Padloper is associated with dolerite ridges and rocky-outcrops in dwarf shrubland containing succulent and grassy elements. Such habitat is present on the project site and it could potentially occur in the area, albeit with a low probability.

3.1.2.5 Invertebrate Species

There are 159 invertebrate species recorded from various databases that could occur on the project site. While this list cannot be considered to be complete, a single species with a distribution range that potentially overlaps the project site is listed by the IUCN as *Vulnerable*, namely the Harlequin Sprite *(Pseudagrion newtoni).* This damselfly is currently

[9] Allan DG: Ludwig's Bustard. In Roberts Birds of Southern Africa. 7th edition. Edited by: Hockey PAR, Dean WJR, Ryan PG. Trustees of the John Voelcker Bird Book Fund, Cape Town; 2005:293–294.

known from only a single location in Mpumalanga, the probability for this species to occur on site is low.

3.1.3 GIS and Satellite Imagery

The project site was mapped using publically available satellite imagery and GIS to determine the relative importance of the site in relation to the IBA (Figure 2).

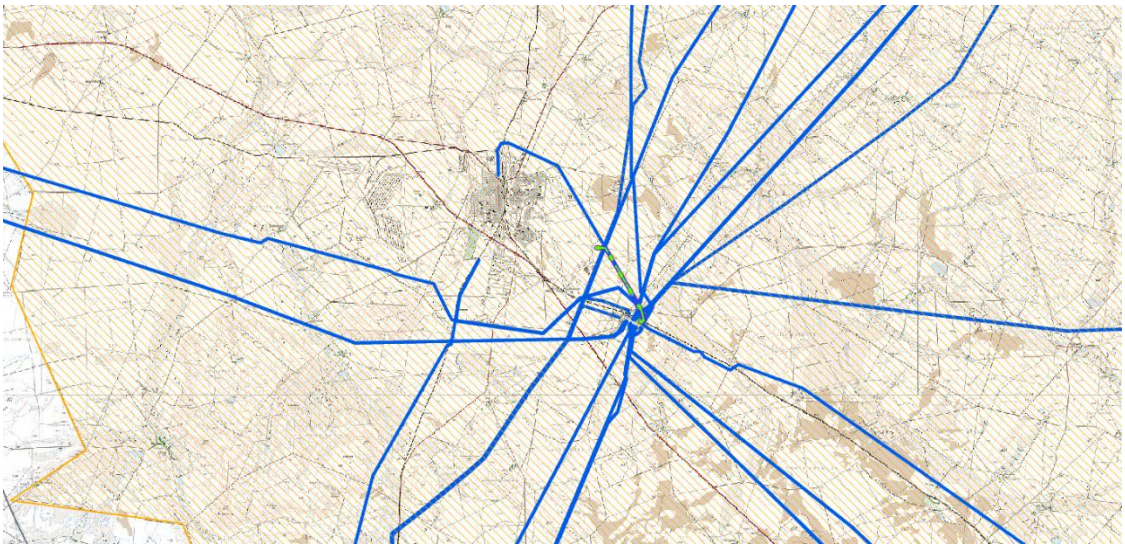


Figure 2: Grid connection corridor (green) in relation to existing electricity transmission infrastructure (blue) converging on the Hydra Main Transmission Substation near De Aar, with a small portion of the large IBA covering a large portion of the region indicated with orange hatching.

3.2 Site Visit

The conditions during the site visit were excellent for the field assessment as the area had received a good amount of rainfall allowing for a thorough assessment of potentially important animal habitats such as temporary wetlands, vleis, drainage lines, seeps and water-filled depressions to be conducted.

The site visit confirmed the indication from satellite imagery and GIS mapping that multiple existing power lines exist in the immediate vicinity of the project site, converging on the nearby Eskom Hydra Main Transmission Substation (Figure 3). The site visit also confirmed that the proposed route of the grid connection power line to be assessed runs adjacent to an existing power line.

No Ludwig's Bustard were observed on the project site, however this species was observed and confirmed to be present in the broader surrounding area.

Figure 3: Multiple electricity transmission lines exist converging on the Hydra Main Transmission Substation.

4 CONCLUSION

The results from the desktop study, GIS and satellite mapping and site visit indicate that the classification of the site to be of Medium Terrestrial Animal Species sensitivity by the Screening Tool may be overly simplistic and that a Terrestrial Animal Species Specialist Assessment should be conducted to produce a finer-scale terrestrial animal sensitivity map. This is due to the available habitats available in the proposed development footprint, the position of the proposed grid corridor adjacent to existing electricity transmission infrastructure, the proximity of the proposed project site to the town of De Aar and the relative size of the proposed site in the context of the broader area, which comprises large areas of mostly untransformed and contiguous habitat. Furthermore the confirmed presence of Ludwig's Bustard in the surrounding area, and the relative importance of the broader area as a breeding area for this species makes it likely that the species may either be present on the project site occasionally or traverse the project site while commuting to or from lekking areas in the broader area. Therefore a Terrestrial Animal Species Specialist Assessment is applicable.