PROPOSED NAOS SOLAR PV PROJECT TWO ON PORTION 2 OF THE FARM WATERFORD IN FREE STATE PROVINCE

Prepared for: SOLA Group
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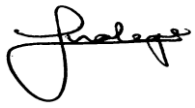
Primary author	Mokgatla Molepo (MSc. Zoology) Pr. Nat. Sci. (009509) Ecologist (Zoology) & Avifaunal Specialist 
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SPECIALIST INFORMATION AND LEGAL REQUIREMENTS

National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations 2014 (as amended) Requirements for Specialist Reports (Appendix 6):

The details of -	
○ the specialist who prepared the report; and	Page 11
○ the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 11
A declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 13
An indication of the scope of, and the purpose for which, the report was prepared;	Page 9
○ An indication of the quality and age of base data used for the specialist report;	Page 26
○ A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Page 37
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Page 35
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Page 35
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Page 17
An identification of any areas to be avoided, including buffers;	Page 20
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Page 20
A description of any assumptions made and any uncertainties or gaps in knowledge;	Page 9
A description of the findings and potential implications of such findings on the impact of the proposed activity, or activities;	Page 43
Any mitigation measures for inclusion in the EMPr;	Page 44
Any conditions for inclusion in the environmental authorisation;	Page 44
Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Page 44
A reasoned opinion-	
○ whether the proposed activity, activities or portions thereof should be authorised;	Page 44
○ regarding the acceptability of the proposed activity or activities; and	Page 44
○ if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Page 44

A description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
Any other information requested by the competent authority.	Not applicable
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not applicable

EXECUTIVE SUMMARY

Project background

The proposed Naos Solar PV Project Two is planned to be developed on Portion 2 of the Farm Waterford No. 573, approximately 24 km north of the town of Viljoenskroon. The farm is located in Ward No. 22 of the Moqhaka Local Municipality, in the Fezile Dabi District Municipality, Free State province. The local municipality coordinates are 27º12' 55.69" South and 26°58' 51.56" East. The proposed site is accessible via the existing R59, R501 and S643 roads. The proposed Naos Solar PV Project Two development footprint will cover up to 400 Ha which was assessed as part of the Basic Assessment (BA) process.

The key components of the proposed projects are the following:

- PV Panel Array - To produce up to 200MW generation capacity, each proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility.
- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion (Lithium Iron Phosphate / Sodium Sulphur) or Vanadium Redox technology and will have a capacity of up to 4.5GWh. The extent of the system will be ~4.59ha.
- Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 33kV to 132kV. The normal components and dimensions of a distribution-rated electrical substation will be required. A collector substation with a capacity of 132kV will also be required. There are currently two alternative locations for the collector substations.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on the sites for each project:
    - Operations & Maintenance Building / Office (~2504m²);
    - Switch gear and relay room (~800m²);
    - Staff lockers and changing room (~200m²);
    - Security control (~60m²);
    - Permanent Laydown Area (~6.88ha); and
    - Temporary batching plant
- Roads –
- Access will be obtained via the existing R59, R501 and S643 roads. An internal site road network will also be required to provide access to each respective solar field and associated infrastructure. Internal roads will be up to 16km in length and 12m in width, whereas the main access road will be up to 27.5km in length.

- Fencing - For health, safety and security reasons, the facilities will be required to be fenced off from the surrounding farms.

No no-go areas are applicable to the project site from an avifaunal perspective. Should the proposed activity not proceed, due to other specialist studies, the site will remain unchanged and will continue to be used for agricultural purposes.

No other possible sites were identified on the affected property(ies) for the developments. This site is referred to as the preferred site. Some limited sensitive features occur on the site. The size of the site makes provision for the exclusion of any sensitive environmental features that may arise through the Basic Assessment process to enable the appropriate placement of the infrastructure within the development footprint.

Avifaunal community

The overall avifaunal species occurring at the proposed development site are dominantly represented by chats, swifts, pipits, kites, martins, wagtails, lapwings, herons and cisticolas. One bird species of priority, the Lanner Falcon was encountered during the transect surveys. The Lanner Falcon was encountered three times, where it was seen once on the Grassland ecosystem and twice approximately 70 m nesting on trees. The observed aquatic species are represented in Appendix D.

Impacts and mitigations for Naos Solar PV

Loss of priority avian species from important habitats

Rated Negative medium impact (environmental significance = 42) but can be reduced to Negative low impact (environmental significance = 16) with effective implementation and ongoing monitoring of required mitigations as specified;

Loss of resident avifauna through increased disturbance

Rated Negative medium impact (environmental significance = 36) but can be reduced to Negative low impact (environmental significance = 16) with effective implementation and ongoing monitoring of required mitigations as specified;

Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats

Rated Negative medium impact (environmental significance = 45) but can be reduced to Negative low impact (environmental significance = 20) with effective implementation and ongoing monitoring of required mitigations as specified;

Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity

Rated Negative medium impact (environmental significance = 36) but can be reduced to Negative low impact (environmental significance = 18) with effective implementation and ongoing monitoring of required mitigations as specified;

Cumulative impacts of the above.

The cumulative and residual impacts should be prioritised. With the effective implementation and ongoing monitoring of required mitigations as specified, all potential impacts for the 200 MW Naos Solar PV Project Two will remain on Negative low impact environmental significance.

Impact statement

Despite some residual and cumulative impacts, there is no objection for the proposed 200 MW Naos Solar PV Project Two from an avifaunal perspective. It should be noted that a separate avifaunal impact study for the 132kV grid connection was undertaken. The overall impact of the project on avifauna can be effectively mitigated, should the controls prescribed in this report be adequately followed, with sufficient monitoring of mitigation effectiveness.

CONTENTS

TERMS OF REFERENCE

MORA Ecological Services (Pty) LTD was requested by SOLA Group to conduct a specialist avifaunal assessment towards their pursuit of obtaining the requisite environmental authorisations for the proposed 200 MW Naos Solar PV Project Two development. The critical objective of this specialist avifaunal assessment is to determine the bird species community and the potential impacts the proposed development may have on avifauna species. The following tasks were undertaken by MORA Ecological Services (Pty) Ltd to achieve the assessment objective:

- Site visits to identify the avian habitats associated with the proposed development;
- Field data collection to define the current avifauna community within the development site and the identification of Red Data and/or endemic species which could potentially be affected by the proposed development and associated infrastructure;
- Integration of the site data collected (species counts) and the Southern African Bird Atlas Project 2 avian atlases to develop a comprehensive avifaunal database likely to be present within the development footprint;
- Identify potential negative impacts on the avifaunal diversity and species composition at the site of the proposed development and assess the significance of these impacts;
- To provide recommendations and mitigation measures for the potential impacts in order to avert or lower their significance on the avifaunal diversity and species composition.

The site details provided were that the EIA footprint is up to 400 Ha on Portion 2 of the Farm Waterford No. 573. The survey was conducted throughout all identified habitats using various methods i.e. walked transects, vehicle drive transects, powerline inspection and the fixed point survey.

ASSUMPTIONS, LIMITATIONS, UNCERTAINTIES AND GAP ANALYSIS

- The findings, results, observations, conclusions and recommendations provided in this report are based on the author's best scientific and professional knowledge as well as available information regarding the potential impacts on terrestrial environment.
- It was assumed that a two season survey with a total of five days of fieldwork is sufficient for assessing available habitats for birds of conservation concern.
- MORA Ecological Services (Pty) LTD relied on Environamics, as the EAP, to supply correct information on the site locality and extent, as well as project details which were assumed to be correct.
- It was assumed that the information contained in existing databases, reports and publications is correct.
- MORA reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

- The impacts of solar developments on avifauna are not completely understood in South Africa and are hampered by good monitoring data to evaluate the effectiveness of proposed mitigations.

SPECIALIST DETAILS, CURRICULUM VITAE AND DECLARTION

The surveys and assessment were undertaken by Mokgatla Jerry Molepo, a competent avifaunal specialist and Director of MORA Ecological Services (Pty) Ltd.

Curriculum vitae

EDUCATION:

- MSc Zoology, Nelson Mandela University (Percy FitzPatrick Institute of African Ornithology Centre of Excellence)

Research Project Topic: Foraging behaviour and thermal physiology in Cape Sugarbirds: sex-specific responses to temperature.

- BSc Honours in Zoology, University of Limpopo

Research Project Topic: Morphometrics and plumage variation in the South African Fiscal flycatcher *Sigelus silens* Shaw 1809.

- BSc Botany & Zoology, University of Venda
- Grade 12, Marobathota High School

CERTIFICATES:

- SASS5 Aquatic Biomonitoring, GroundTruth
- Hydropedology and Wetland Functioning, Terra Soil Science & Water Business Academy
- Section 21 (c) & (i) Water Use Authorisation Training, Department of Water and Sanitation
- Basic Project Management, Hudisa Business School

PROFESSIONAL MEMBERSHIP:

- South African Council for Natural Scientific Professions (SACNASP) – Professionally registered as Professional Natural Scientist. **Registration number:** 009509
- British Ecological Society (BES). **Membership number**: 1010709
- Zoological Society of Southern Africa (ZSSA). **Membership number**: 691

WORK EXPERIENCE:

- MORA Ecological Services (Pty) Ltd: April 2018 – Current, I am an Environmental Specialist, and my duties include; (i) Conducting Biodiversity, Aquatic Impact Assessments, Rehabilitation (ii) Compilation of specialist reports.
- Arcus Consulting: May - November 2017, I was a subcontracted avifaunal surveyor for the proposed Highlands Wind Energy Farm, Somerset East, Eastern Cape.
- Centre for African Conservation Ecology (ACE), Nelson Mandela University: 2015 - 2016, I was a field guide/ environmental educator. Responsibilities: taking school learners on trial walks inside the Nelson Mandela University Nature Reserve.
- South African National Biodiversity Institute (SANBI): May – December 2014, I was a Zoological Systematics Technician. Responsibilities: (i) Insect identification and curation, and (ii) compiling

the animal checklist of South Africa, (iii) Sourcing wildlife crime reports on endangered animals and plants for Barcode of Wildlife Project, (iv) Monitoring the bird population in the Botanical Garden.

- Department of Zoology, University of Venda: 2009 – 2013, I was a Research Assistant under Dr. T.C Munyai who was conducting a long-term research project which monitored the effects of climate change on biota and processes influencing ecosystem functioning and species diversity patterns.
- Percy FitzPatrick Institute of African Ornithology: March – April 2014, I was a Research Assistant under Dr. Rita Covas' Sociable Weaver Research Project. This is a long-term study which looks at the reproductive success of Sociable weavers at Benfontein Nature Reserve in Kimberley.

Key experience in specialist projects

Year	Project	Location:	Role(s)
2022	Avifaunal Impact Assessment for the proposed 132kV for Musina-Makhado Special Economic Zone North Site	Musina, Limpopo	Avifaunal Specialist/Ornithologist
2022	Avifaunal Impact Assessment for the proposed Khauta PV Solar including 44kV and 132kV Powerline	Welkom, Free State	Avifaunal Specialist/Ornithologist
2022	Avifaunal Impact Assessment for the proposed NAOS PV Solar including 132kV Powerline	Free State	Avifaunal Specialist/Ornithologist
2022	Preconstruction Avifaunal Assessment for the proposed Lichtenburg PV Solar including 132kV Powerline	Lichtenburg, North West	Avifaunal Specialist/Ornithologist
2022	Preconstruction Botanical Assessment for the proposed Lichtenburg PV Solar including 132kV Powerline	Lichtenburg, North West	Ecologist
2022	Biodiversity Assessment, Land Capability and Veld Condition Assessment for PPC Cement SA Slurry	Slurry, North West	Ecologist
2021	Avifaunal Impact Assessment for the proposed Upington-Aries 2x 400kV	Upington, Northern Cape	Avifaunal Specialist/Ornithologist
2021	Habitat Assessment Post Rehabilitation for PPC Cement SA Dwaalboom Factory	Dwaalboom, Limpopo	Ecologist
2021	Habitat Assessment Post Rehabilitation for Gibson Bay Wind Energy Farm	Humansdorp, Eastern Cape	Ecologist
2021	Wetland Rehabilitation for the sewer pipeline construction in Daveyton	Ekurhuleni East College Campus, Daveyton, Gauteng	Wetland Ecologist
2021	12 Months Wetland Rehabilitation Supervision for Ekangala Ext F Waterborne Sanitation Project	City of Tshwane Metropolitan Municipality, Ekangala, Gauteng	Aquatic Ecologist

DECLARATION BY THE SPECIALIST

I, Mokgatla Jerry Molepo declare that:

• I act as the independent specialist in this application;

• I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

• I declare that there are no circumstances that may compromise my objectivity in performing such work;

• I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

• I will comply with the Act, Regulations and all other applicable legislation;

• I have no, and will not engage in, conflicting interests in the undertaking of the activity;

• I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

• all the particulars furnished by me in this form are true and correct; and

• I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

MORA Ecological Services (Pty) Ltd

Name of Company

29/08/2022

Date

INTRODUCTION

Proposed Development

MORA Ecological Services (Pty) Ltd was appointed by SOLA Group to conduct an avifaunal specialist assessment and Environamics (hereafter referred to as the EAP) to undertake a Basic Assessment process for the proposed 200 MW Naos Solar PV Project Two that is planned to be developed on Portion 2 of the Farm Waterford No. 573, approximately 24 km north of the town of Viljoenskroon. The farm is located in Ward No. 22 of the Moqhaka Local Municipality, in the Fezile Dabi District Municipality, Free State province. The local municipality coordinates are 27°12' 55.69" South and 26°58' 51.56" East. The proposed site is accessible via the existing R59, R501 and S643 roads. The proposed 200 MW Naos Solar PV Project One development footprint will cover up to 400 Ha which was assessed as part of Basic Assessment (BA) process.

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infrastructure. Access roads will be up to 12m in width. The main access road providing direct access to the project will be up to 8m wide and 6km long.

- Fencing - For health, safety and security reasons, the facilities will be required to be fenced off from the surrounding farms.

SITE DESCRIPTION

Figure 1 shows the exact extent of the proposed geographic area for the 200 MW Naos Solar PV development. The site boundary in on Portion 2 of the Farm Waterford No. 573, approximately 24 km north of the town of Viljoenskroon. Viljoenskroon is a farming town in the Northern Free State region of the Free State province, popularly known for maize and cattle farming.

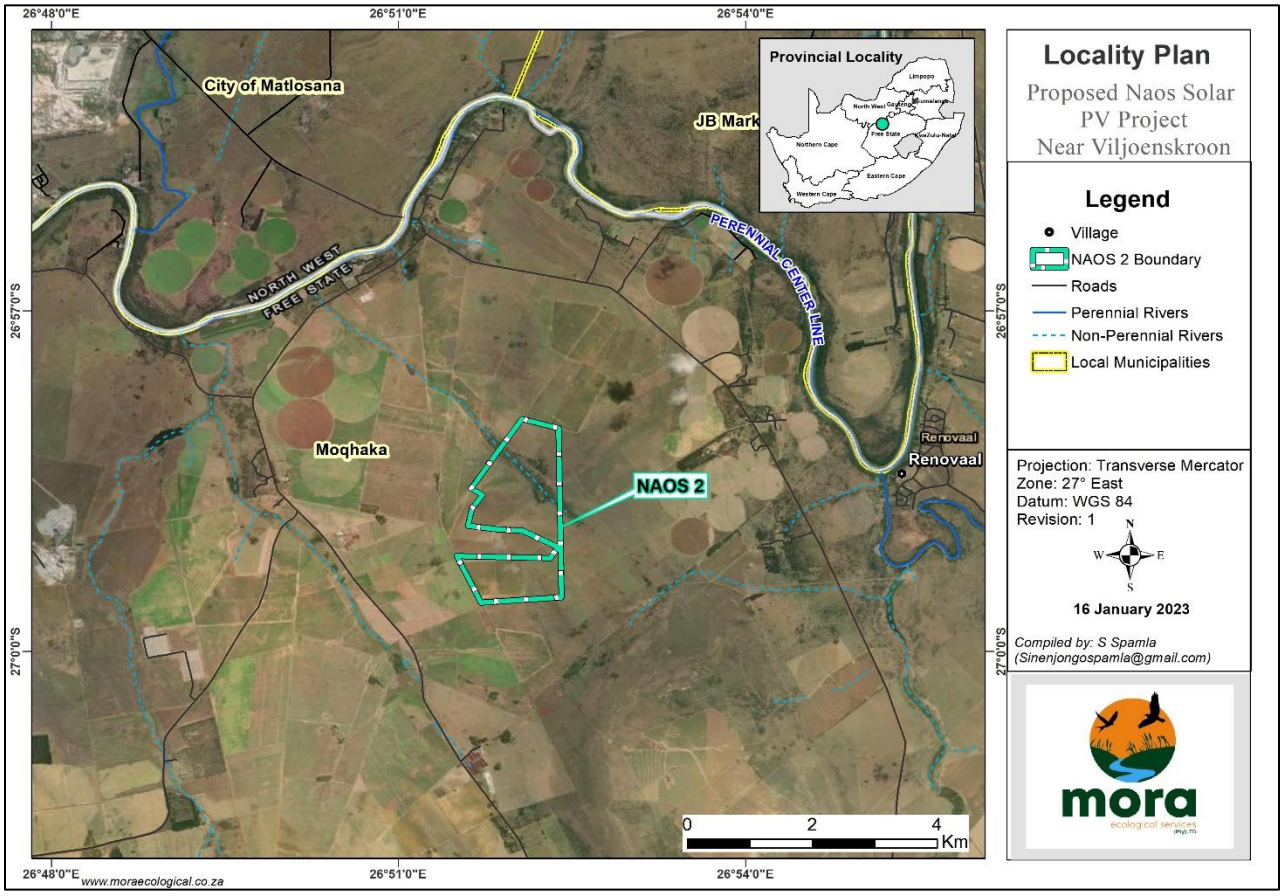

Figure 1. Locality map of the proposed development area.

Vegetation

The geographic region of the proposed Naos Solar PV Project Two development falls within the Grassland biome (Figure 2). The broad ecology of the Fezile Dabi District Municipality is represented by grassland ecosystems with seven vegetation types. The original vegetation is classified as Vaal-Vet Sandy Grassland, forming part of the Dry Highveld Grassland Broad Vegetation Unit. The Dry Highveld Grassland Bioregion has a total area of 117 753 km^2 and approximately 32 717 km^2 (31.51%) of it is already transformed (Carbutt

et al., 2011). Mucina and Rutherford (2006) noted the bioregion to be dominated by semi-arid sweetveld that is drought-adapted and shows a significant amount of reproduction from seed. Plants in the Dry Highveld Grassland persist vegetatively from year to year and new plants establish after droughts from dormant seeds. Hence, most of the geographic area has been transformed for agricultural activities.

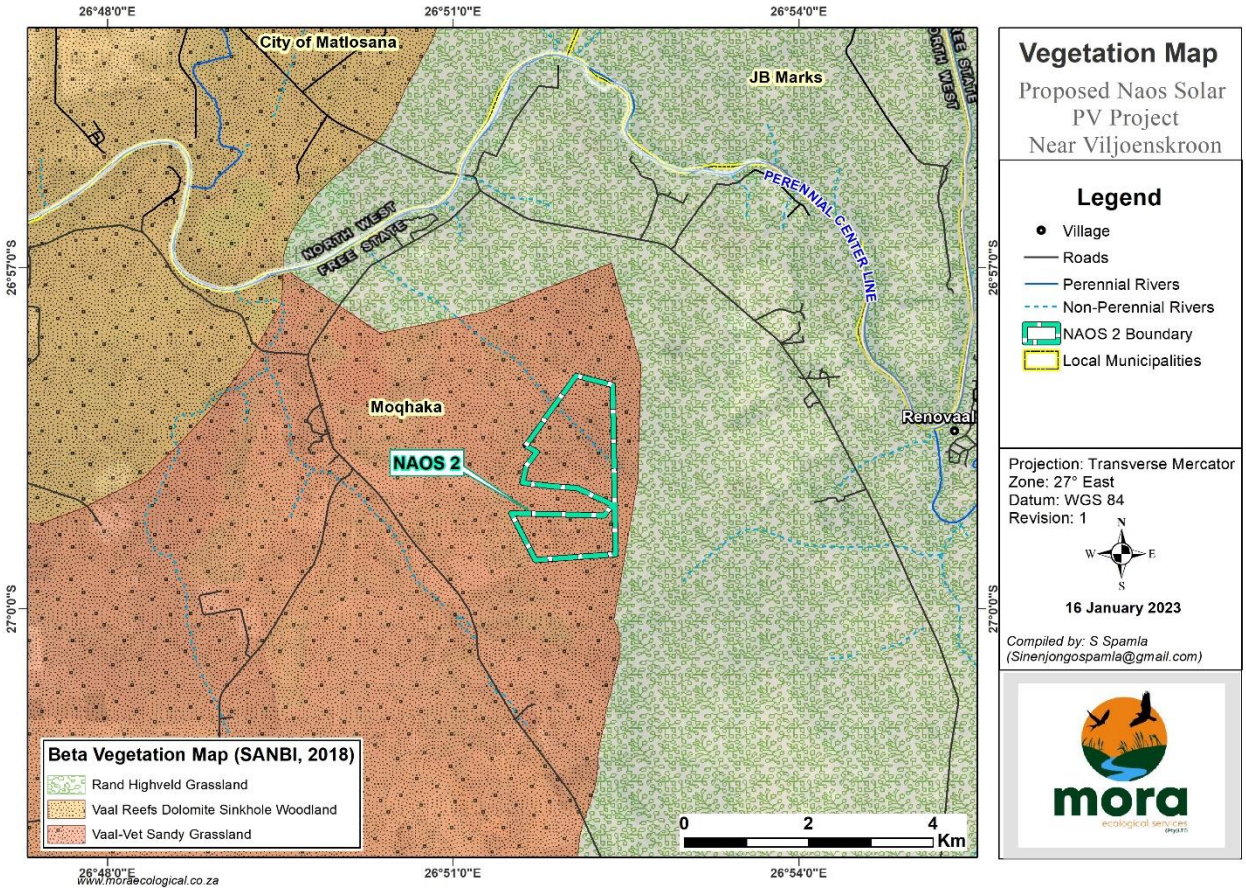

Figure 2. Vegetation map relative to the proposed development area.

Geology

The Vaal River forms the northern boundary of the project area, flowing from east to west. The geology of the region is made up of dolomite, stromatolitic, interbedded chert, minor carbonaceous shale, limestone and quartzite o the Malmani Subgroup. The topography of the region is classified as plains and pans and no hills or outcrops are known to exist in the vicinity of the project area as shown in the photograph (Figure 3) below.

Figure 3. Photograph of the assessment area taken during field surveys.

Climate

The proposed development area is characterized by cold and frosty winters, with low and highly variable summer rainfalls. Rainfall is strongly seasonal, resulting to a low mean annual precipitation ranging between 400 to 500 mm. The highly variable summer rainfalls are evident on the drier parts of the region, i.e. towards the eastern region of the Dry Highveld Grassland. The area is therefore a semi-arid ecosystem.

Land-use

A majority of the Moqhaka Local Municipality is leased by local farmers and is used for agriculture (i.e. grazing and crop production). The area is particularly important for growing maize and is a rangeland for sheep and cattle. A smaller percentage of the area is notably important for gold mining activities, which all together improve the socio-economic state of the Moqhaka Local Municipality.

Significance of avifauna population at Farm Waterford No. 573

The DFFE screening tool was consulted using the feasibility region shown in Figure 4 which covers the proposed 200 MW Naos Solar PV development area. The DFFE screening tool outputs (Figure 5) provided an avifaunal risk ranking for the site as having Low Environmental Sensitivity. It is important to delineate sensitive avian habitats within the project site in order to ensure the development does not have a long-term negative impact on these habitats. Important avian habitats play an integral role in their persistence within a landscape providing nesting, foraging and reproductive benefits.

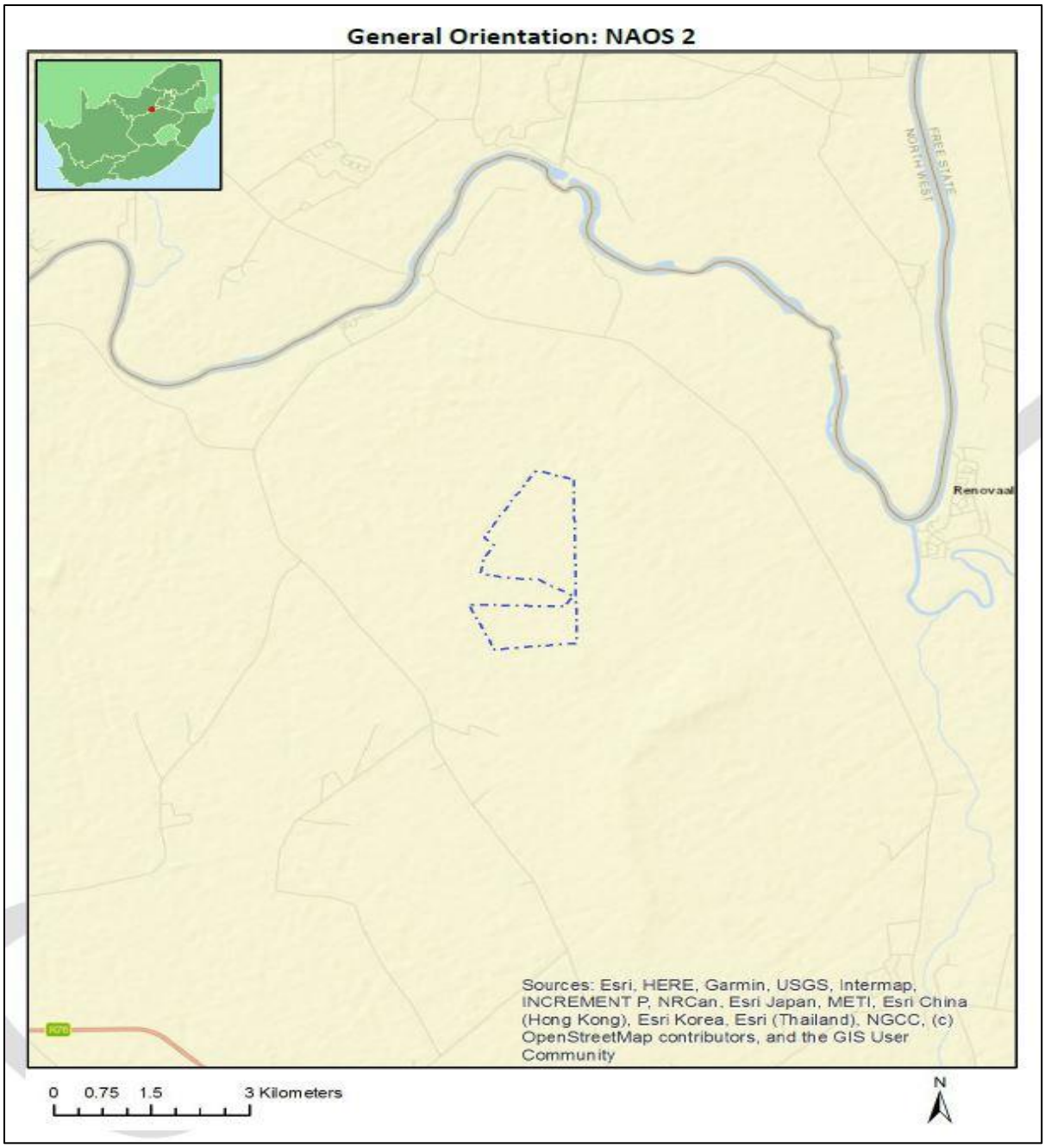

Figure 4. Feasibility area assessed to determine area sensitivity.

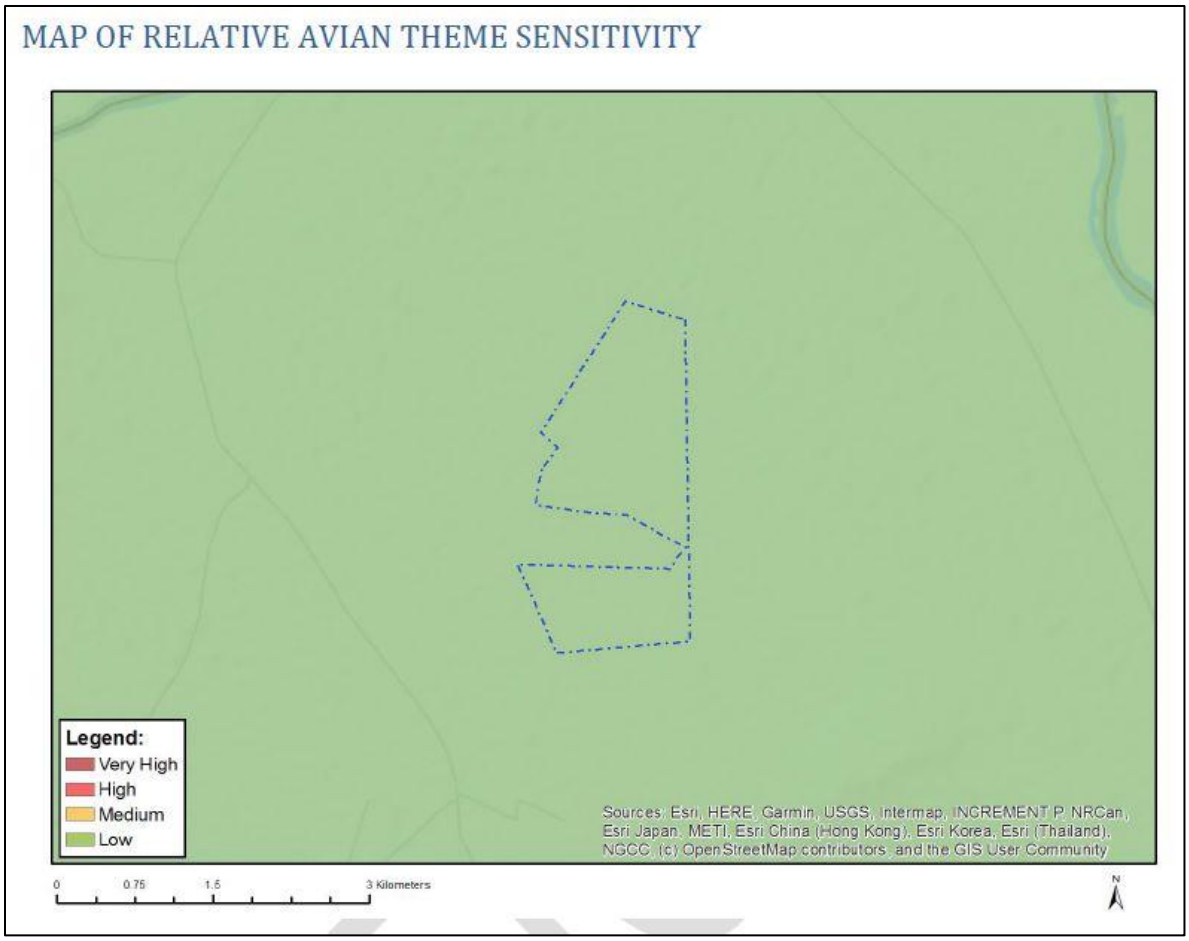

Figure 5. DFFE screening tool outputs of avifaunal sensitivity for the proposed 200 MW Naos Two Solar PV development site.

All the ecological features of the study area were considered, and sensitive areas were assessed. Based on the area sensitivity conducted during the specialist assessment, less than 30 ha of land provide an important habitat for medium to large, bodied birds. This includes the waterbodies within the site. Overall, the site was observed to be of low to moderate avifaunal sensitivity. Figure 6 shows important habitats in relation to the project layout. It is recommended that the sensitive habitats shown in Figure 6 are used as a guide for sensitive areas during the construction and operational phase.

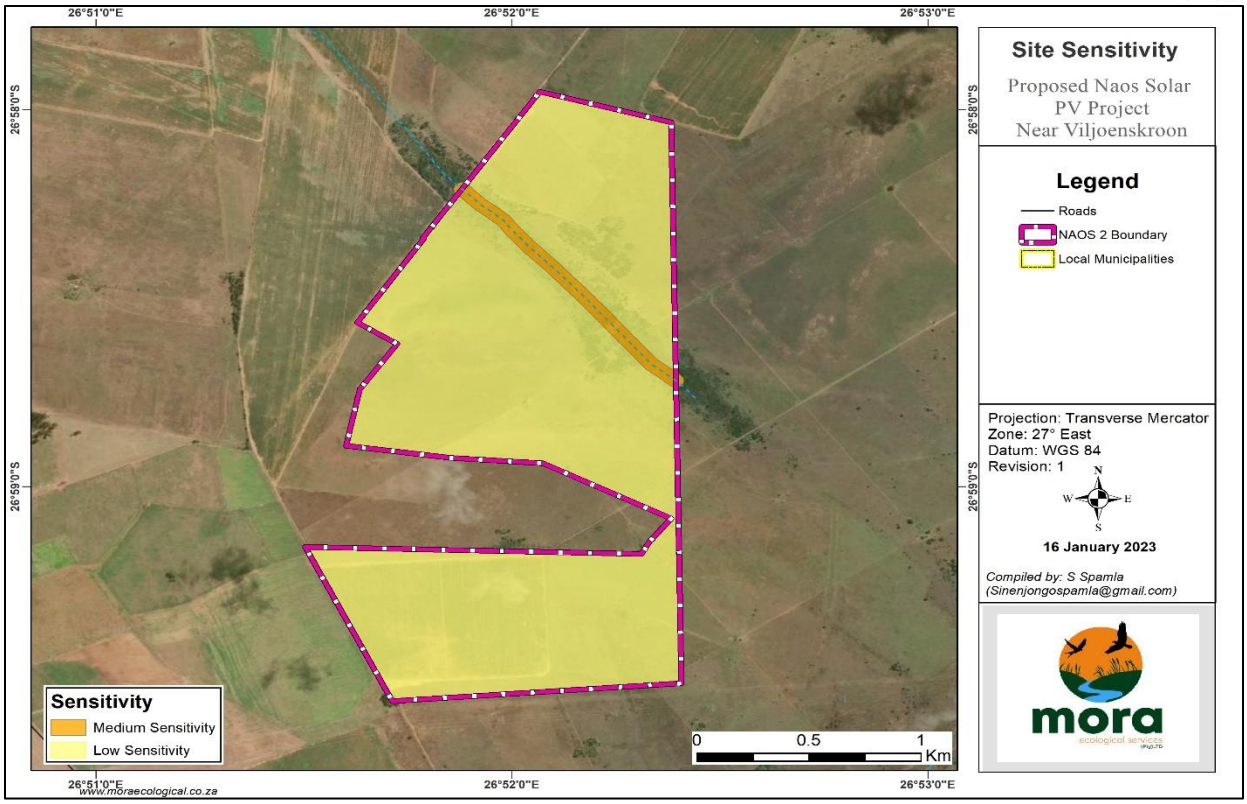

Figure 6. Important habitat in relation to the Naos Solar PV project layout.

LEGAL FRAMEWORK RELATING TO AVIFAUNA AND PROPOSED DEVELOPMENT

International law and conventions

The importance of sustainable development and the protection of environmental resources have globally become a driving factor in the construction of new legislation governing industrial practices and their impact on the environment. South Africa has signed and ratified a number of global treaties, protocols and conventions, agreeing to implement the policies, which endorse sustainable development and promote a positive environmental legacy for future generations. A considerable international convention to which South Africa is in agreement with in signatory is namely the Convention on Biological Diversity (CBD). The CBD is notably the key international convention for sustainable development. The CBD has three main objectives which lead and encourage a sustainable future. These are:

- The conservation of biological diversity;
- The sustainable use of its components; and
- The fair and equitable sharing of the benefits from the use of genetic resources.

Although the convention does not include specific recommendations or guidelines pertaining to birds and solar infrastructure interactions and impacts, it does make provisions for sustaining and restoring biodiversity. The convention covers all possible domains that are directly or indirectly related to biodiversity and its role in development, ranging from science, politics and education to agriculture, business and culture.

South African Constitution

The foundation of South Africans Environmental law is set in the Constitution of the Republic of South Africa (1996), specifically “Chapter 2- The Bill of Rights: section 24”. This has allowed for the rapid development of environmentally based legislations which guard, enforce and guide all parties to maintain the human rights granted in the Constitution. These rights include:

- The right to an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management Act (NEMA)

The National Environmental Management Act (NEMA), Act 107 of 1998 is the fundamental environmental legislation which aims to strengthen the rights granted in the South African Constitution. The NEMA Act is the foundation of environmental law in South Africa and has set the framework for additional legislation to build on. The Act establishes principles for decision-making on environmental matters, as well as providing motive for institutions which promote cooperative governance, and which can coordinate environmental action plans. Section 2(4) specifies that sustainable development requires the consideration of all relevant

factors. In the regard to biodiversity and South Africa's ecological integrity, development should not result in the disturbance of ecosystems and loss of biological diversity, if not possible, these effects must be minimised and remedied. A low-risk, cautious approach should always be applied, considering limits of current knowledge concerning consequences and actions. Always anticipate possible negative impacts on the environment and people's environmental rights, identified impacts should be prevented and where they cannot be altogether prevented, are minimised and mitigated. Outlined NEMA principles with regard to biodiversity are to:

- Prevent pollution and ecological degradation
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management of Biodiversity Act (NEMBA)

The National Environmental Management of Biodiversity Act (NEMBA) Act 10 of 2004 was designed to provide a management and conservation outline for biological diversity, as drafted under the NEMA. NEMBA focuses on the management and conservation of biodiversity, with its relevant components, which includes the use of indigenous biological resources in a sustainable manner, the fair and equitable sharing of benefits arising from bio-prospecting, cooperative governance in biodiversity management and conservation within the structures of NEMA. The Act, in protecting biodiversity, deals with the protection of threatened ecosystems and species, the control of alien invasive species, genetically modified organisms and regulates bio-prospecting. As with NEMA, NEMBA incorporates and gives effect to international agreements relating to biodiversity. The Act gives the Minister of Environmental Affairs, Forestry and Fisheries the power to categorise any process or activity in a listed ecosystem, as a threatening process, thereafter, be regarded as an activity contemplated in Section 24(2) (b) of NEMA which states that: Specified activities may not be commenced without prior authorisation from the Minister or MEC and specify such activities. NEMBA is the most prominent statute containing provisions directly aimed at the conservation of birds with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). The NEMBA Regulations on Threatened or Protected Species (TOPS, 2007) lists all of the species (including avian) that are threatened with extinction and therefore, nationally protected under an approach to sustainable use and development. Periodically, Red Data books are published, and the data used to update these lists of protected species.

Norms, Guidelines and Standards

BirdLife South Africa compiled the Best Practice Guidelines on Birds and Solar Energy to guide the assessment and monitoring of the impact of solar generating facilities on birds in South Africa. This guideline has been followed as far as possible in the compilation of this report.

REGIONAL SOLAR ENERGY DEVELOPMENT

The regional geographic area of existing or proposed solar energy developments were also considered in this specialist study. The geographic spread of PV solar projects is considered to understand the cumulative impacts experienced by the avifauna population in the specified regional geographic boundary. Additionally, this will inform the nature of impacts that solar energy development will have on the natural environment during the construction phase.

Information on similar projects occurring within the 30 km radius of the proposed development was provided by Environamics as the project EAP. Table 1 shows a summary of related facilities, that may have a cumulative impact, in a 30 km radius of the solar energy facility. The geographic area for the mentioned projects are located within the Free State Province. Figure 8 shows the Geographic area of evaluation with utility-scale renewable energy generation sites and power lines for the 200 MW Naos Solar PV Project Two. It is unclear whether other projects not related to renewable energy is or has been constructed in this area, and whether other projects are proposed. In general, development activity in the area is focused on agriculture and mining. It is quite possible that future solar farm development may take place within the general area.

Table 1. A summary of related facilities, that may have a cumulative impact, in a 30 km radius of the solar energy facility.

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Paleso SPP[1]	11km	150MW	14/12/16/3/3/1/2365	Basic Assessment	Approved
Siyanda SPP	10km	150MW	14/12/16/3/3/1/2369	Basic Assessment	Approved
Thakadu SPP	4km	150MW	14/1216/3/3/1/2476	Basic Assessment	Approved
Ngwedi SPP	9km	150MW	14/12/16/3/3/1/2535	Basic Assessment	In process
Nyarhi SPP	3km	150MW	14/12/16/3/3/1/2533	Basic Assessment	In process
Kabi Vaalkop PV 3	13km	75 MW	12/12/20/2513/3	Scoping and EIA	Approved

[1] Environamics was the EAP responsible for the Basic Assessments for the Paleso, Siyanda, Ngwedi, Nyarhi and Thakadu Solar Power Plants.

Site name	Distance from study area	Proposed generating capacity	DEFF reference	EIA process	Project status
Kabi Vaalkop PV 2	12km	75 MW	12/12/20/2513/2	Scoping and EIA	Approved
Kabi Vaalkop PV[2]	11km	75 MW	12/12/20/2513/4	Scoping and EIA	Approved
Kabi Vaalkop PV 1	11km	75 MW	12/12/20/2513/1	Scoping and EIA	Approved
Buffels Solar PV 1	8km	100MW	14/12/16/3/3/2/777	Scoping and EIA	Approved
Buffels Solar PV 2	8km	100 MW	14/12/16/3/3/2/778	Amendment	Approved
Rietvlei solar	16 km	-	14/12/16/3/3/2/450	Scoping and EIA	Withdrawn/Lapsed
Genesis Orkney Solar (Pty) Ltd	24 km	100MW	14/12/16/3/3/2/954	Scoping and EIA	Approved
Afropulse 538 Pty Ltd	7 km	50MW	12/12/20/2280	BAR	Withdrawn/Lapsed
Mulilo Renewable Project Developments (Pty) Ltd (Cluster Development): Vlakfontein Solar PV1 (Pty) Ltd Biesiefontein Solar PV1 (Pty) Ltd Kleinfontein Solar PV1 (Pty) Ltd Zaaiplaats Solar PV1 (Pty) Ltd Hormah Solar PV1 (Pty) Ltd Ratpan Solar PV1 (Pty) Ltd Ratpan Solar PV2 (Pty) Ltd	2.78	75 – 100MW	Projects only in commencement phase with no Applications for EA submitted as yet	BAR	In process (commencement Phase)

[2] The application was only for transmission infrastructure (i.e. substation and power lines) and not a PV solar power plant.

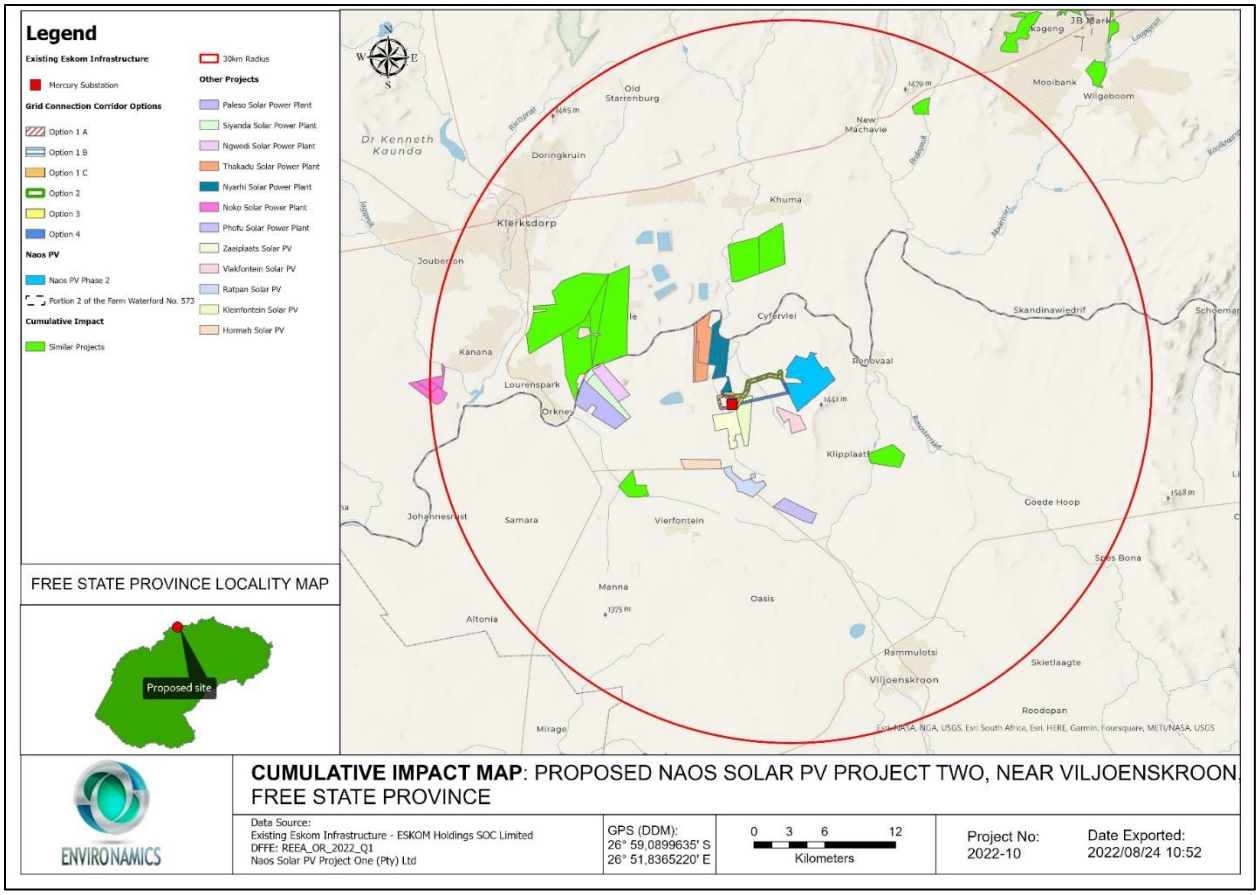

Figure 7. Geographic area of evaluation with utility-scale renewable energy generation sites and power lines for the 200 MW Naos Solar PV Project Two.

BASELINE DESCRIPTION OF THE AVIFAUNAL COMMUNITY

SABAP2 data

The Second South African Bird Atlas Project 2 (SABAP2), a continuous initiative of the Animal Demography Unit of the University of Cape Town, was consulted for data collected for the pentads in which the site is situated. SABAP2 is the second bird atlas project that was initiated in July 2007. SABAP2 was designed to run indefinitely with the aim to create a valuable long-term dataset for southern Africa. The objective of the SABAP2 project is to accurately provide specified information on bird distributions, taken over a period of years. The site of the proposed development for the 200MW Naos Solar PV Project Two is located in pentad 2655_2650 (Figure 9). The pentad occupies approximately 7,700 Ha, whereas the total EIA footprint is up to 400 Ha. The pentad covers greater avian diversity and comprises priority habitats (waterbodies), which will substantially increase the species counts. These species counts should not be expected for the development site.

Figure 8. Location and extent of SABAP2 2655_2650 pentad relative to the 200 MW Naos Solar PV Project Two development site.

According to the SABAP2 species list in Table 2, it is estimated that a total of 211 birds species occur in the broader area of the proposed area for development. Of the 211 bird species 14 bird species were observed during the transect surveys. An additional total of 9 bird species were recorded during fixed point avifaunal surveys at the wetland habitat (Appendix B, Figure 12). Of the Grassland species, one species, the Pied Crow, was not previously recorded on site according to the SABAP2 species list for pentad

2655_2650 (Figure 9). Also, one waterbird species, the Hamerkop, is a newly observed bird species that was not previously recorded during the second bird atlas project. This may be attributed to the seasonal movement patterns of birds. Although there are many long-distance migrant species that will only be recorded during early to mid-summer and also some regional migrants and nomadic species that are more likely to occur in winter, these surveys were undertaken in both summer and winter seasons.

Table 2. List of avifaunal species encountered on site during structured surveys or recorded during SABAP2 assessments for the wider pentads.

No.	Species	Observed during assessments
1	Acacia Pied Barbet	No
2	African Black Duck	No
3	African Darter	No
4	African Fish Eagle	No
5	African Hoopoe	No
6	African Jacana	No
7	African Palm Swift	No
8	African Paradise Flycatcher	No
9	African Pied Wagtail	No
10	African Pipit	Yes
11	African Red-eyed Bulbul	No
12	African Reed Warbler	No
13	African Sacred Ibis	No
14	African Snipe	No
15	African Spoonbill	No
16	African Stonechat	No
17	African Swamphen	No
18	African Wattled Lapwing	No
19	Amur Falcon	No
20	Ant-eating Chat	No
21	Ashy Tit	No
22	Banded Martin	No
23	Barn Swallow	No
24	Bar-throated Apalis	No
25	Black Crake	No
26	Black-chested Prinia	No
27	Black-collared Barbet	No
28	Black-crowned Night Heron	No
29	Black-headed Heron	No
30	Blacksmith Lapwing	Yes

No.	Species	Observed during assessments
31	Black-throated Canary	No
32	Black-winged Kite	Yes
33	Black-winged Stilt	No
34	Blue Waxbill	No
35	Blue-billed Teal	No
36	Bokmakierie	No
37	Bokmakierie	No
38	Brown-backed Honeybird	No
39	Brown-crowned Tchagra	No
40	Brown-hooded Kingfisher	No
41	Brown-throated Martin	Yes
42	Brubru	No
43	Brubru	No
44	Buffy Pipit	No
45	Burchell's Coucal	No
46	Cape Longclaw	Yes
47	Cape Robin-Chat	No
48	Cape Shoveler	No
49	Cape Sparrow	No
50	Cape Starling	No
51	Cape Turtle Dove	Yes
52	Cape Wagtail	Yes
53	Cape White-eye	No
54	Capped Wheatear	No
55	Cardinal Woodpecker	No
56	Caspian Tern	No
57	Chestnut-backed Sparrow-Lark	No
58	Chestnut-vented Warbler	No
59	Chinspot Batis	No
60	Cinnamon-breasted Bunting	No
61	Cloud Cisticola	No
62	Common Buzzard	No
63	Common Moorhen	No
64	Common Myna	No
65	Common Ostrich	No
66	Common Sandpiper	No
67	Common Scimitarbill	No
68	Common Waxbill	No
69	Crested Barbet	No

No.	Species	Observed during assessments
70	Crowned Lapwing	Yes
71	Desert Cisticola	No
72	Diederik Cuckoo	No
73	Domestic Goose	No
74	Dusky Indigobird	No
75	Eastern Clapper Lark	No
76	Eastern Long-billed Lark	No
77	Egyptian Goose	Yes
78	European Bee-eater	No
79	Familiar Chat	No
80	Fiscal Flycatcher	No
81	Fulvous Whistling Duck	No
82	Gabar Goshawk	No
83	Giant Kingfisher	No
84	Glossy Ibis	No
85	Golden-tailed Woodpecker	No
86	Goliath Heron	No
87	Great Egret	No
88	Great Reed Warbler	No
89	Greater Honeyguide	No
90	Greater Kestrel	No
91	Greater Striped Swallow	No
92	Green Wood Hoopoe	No
93	Green-winged Pytilia	No
94	Grey Heron	Yes
95	Grey-headed Gull	No
96	Hadada Ibis	No
97	Helmeted Guineafowl	No
98	Horus Swift	No
99	House Sparrow	No
100	Indian Peafowl	No
101	Intermediate Egret	No
102	Jameson's Firefinch	No
103	Kalahari Scrub Robin	No
104	Karoo Thrush	No
105	Kittlitz's Plover	No
106	Lanner Falcon	Yes
107	Lesser Grey Shrike	No
108	Lesser Kestrel	No

No.	Species	Observed during assessments
109	Lesser Swamp Warbler	No
110	Levaillant's Cisticola	No
111	Little Bee-eater	No
112	Little Egret	No
113	Little Grebe	Yes
114	Little Rush Warbler	No
115	Little Stint	No
116	Little Swift	No
117	Long-billed Crombec	No
118	Long-tailed Paradise Whydah	No
119	Long-tailed Widowbird	No
120	Malachite Kingfisher	No
121	Malachite Sunbird	No
122	Marsh Owl	Yes
123	Marsh Sandpiper	No
124	Marsh Warbler	No
125	Namaqua Dove	No
126	Natal Spurfowl	No
127	Neddicky	No
128	Neddicky	No
129	Northern Black Korhaan	Yes
130	Orange River Francolin	No
131	Orange River White-eye	No
132	Orange-breasted Waxbill	No
133	Pied Kingfisher	No
134	Pied Starling	No
135	Pink-billed Lark	No
136	Pin-tailed Whydah	No
137	Pririt Batis	No
138	Purple Heron	No
139	Purple Indigobird	No
140	African Quailfinch	No
141	African Quailfinch	No
142	Rattling Cisticola	No
143	Red-backed Shrike	No
144	Red-billed Firefinch	No
145	Red-billed Quelea	No
146	Red-billed Teal	No
147	Red-capped Lark	No

No.	Species	Observed during assessments
148	Red-chested Cuckoo	No
149	Red-chested Flufftail	No
150	Red-collared Widowbird	No
151	Red-eyed Dove	No
152	Red-faced Mousebird	No
153	Red-headed Finch	No
154	Red-knobbed Coot	No
155	Red-throated Wryneck	No
156	Reed Cormorant	No
157	Rock Dove	No
158	Rock Kestrel	No
159	Rock Martin	Yes
160	Ruff	No
161	Ruff	No
162	Rufous-naped Lark	No
163	Sabota Lark	No
164	Scaly-feathered Weaver	Yes
165	Sedge Warbler	No
166	Shaft-tailed Whydah	No
167	South African Cliff Swallow	No
168	South African Shelduck	Yes
169	Southern Fiscal	No
170	Southern Grey-headed Sparrow	No
171	Southern Masked Weaver	No
172	Southern Red Bishop	No
173	Southern Yellow-billed Hornbill	No
174	Speckled Mousebird	No
175	Speckled Pigeon	Yes
176	Spike-heeled Lark	No
177	Spotted Eagle-Owl	No
178	Spotted Flycatcher	No
179	Spotted Thick-knee	No
180	Spur-winged Goose	No
181	Squacco Heron	No
182	Striated Heron	No
183	Swainson's Spurfowl	No
184	Tawny-flanked Prinia	No
185	Thick-billed Weaver	No
186	Three-banded Plover	No

No.	Species	Observed during assessments
187	Village Indigobird	No
188	Village Weaver	No
189	Violet-eared Waxbill	No
190	Wattled Starling	No
191	Western Cattle Egret	No
192	Whiskered Tern	No
193	White Stork	No
194	White-backed Mousebird	No
195	White-bellied Sunbird	No
196	White-breasted Cormorant	Yes
197	White-browed Sparrow-Weaver	No
198	White-faced Whistling Duck	No
199	White-fronted Bee-eater	No
200	White-rumped Swift	No
201	White-throated Swallow	No
202	White-winged Tern	No
203	White-winged Widowbird	No
204	Willow Warbler	No
205	Wing-snapping Cisticola	No
206	Wood Sandpiper	No
207	Yellow Canary	No
208	Yellow-billed Duck	Yes
209	Yellow-crowned Bishop	No
210	Yellow-fronted Canary	No
211	Zitting Cisticola	Yes

General species description

The overall avifaunal species occurring at the proposed development site are dominantly represented by chats, swifts, pipits, kites, martins, wagtails, lapwings, herons and cisticolas. One bird species of priority, the Lanner Falcon was encountered during the transect surveys. The Lanner Falcon was encountered three times, where it was seen once in the Grassland ecosystem and twice approximately 70 m perching on trees. The observed aquatic species are represented in Appendix D.

Species of conservation importance

Nine (9) categories are used by the International Union for Conservation of Nature (IUCN) in distinguishing the conservation status of species across all taxa (IUCN, 2001). Figure 10 is a diagram showing the

structure of the 9 categories and Table 3 gives a summary of the 9 categories which were all considered for this study. The categories are important for classifying species at high risk of global extinction to further inform specialist recommendations. The assessment of Red Data status follows Taylor (2015) and the ESKOM Red Data Book of Birds of South Africa, Lesotho and Swaziland.

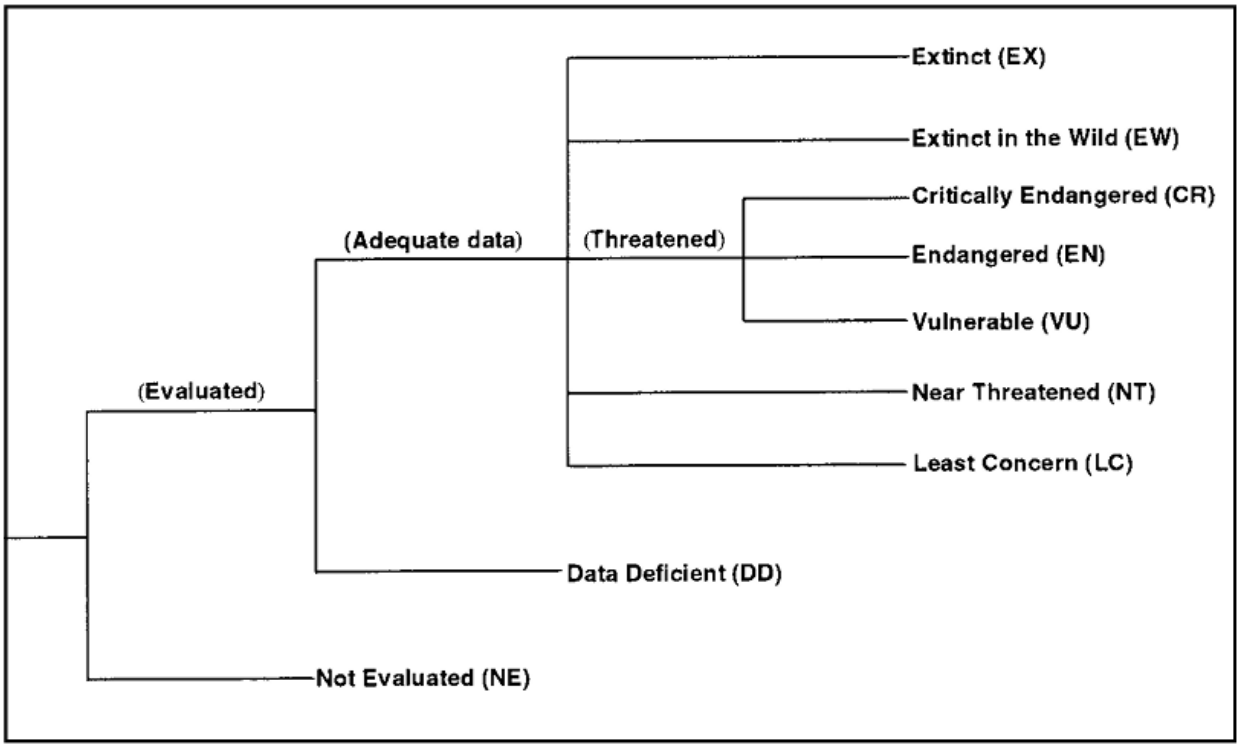

Figure 10. A representation of the relationships between the 9 categories (IUCN, 2001).

Table 3. IUCN red-list conservation criteria

Extinct	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild	A taxon is extinct in the wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), and throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Critically Endangered	A taxon is critically endangered when the best available evidence indicates that it meets any of the criteria for critically endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered	A taxon is endangered when the best available evidence indicates that it meets any of the criteria for endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable	A taxon is vulnerable when the best available evidence indicates that it meets any of the criteria for vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened	A taxon is near threatened when it has been evaluated against the criteria but does not qualify for critically endangered, endangered or vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern	A taxon is least concern when it has been evaluated against the criteria and does not qualify for critically endangered, endangered, vulnerable or near threatened. Widespread and abundant taxa are included in this category.
Data Deficient	A taxon is data deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.
Not Evaluated	A taxon is not evaluated when it is has not yet been evaluated against the criteria.

Of the 23 listed avifaunal species encountered on site during structured surveys or recorded during SABAP2 assessments for the wider pentads, only one species is classified as Red Data Species which is the Lanner Falcon.

Endemic species

South Africa has a rich diversity of nationally and regionally endemic species that are found nowhere else on earth and, therefore, warrant consideration for assessment of sensitivity to potential developments. The endemic Northern Black Korhaan (*Afrotis afraoides*) was encountered during the transect surveys. The Northern Black Korkhaan was heard 100 m north patch calling on the Grassland ecosystem and incidentally observed 3 times 150 m south patch calling on the Grassland habitat. A photographic representation of the Northern Black Korkhaan observed on site is shown in Appendix C.

METHODS

Methodology

Prior to conducting field assessments, a comprehensive literature review of available published and unpublished literature pertaining to bird interactions with solar plants, substations and power lines was undertaken. The aim of the desktop study was to summarise various issues involved specifically for the proposed 200 MW Naos Solar PV Project Two near Viljoenskroon, Free State Province and associated infrastructure. Additionally, a list of previously recorded birds was obtained from Southern African Bird Atlas Project 2 (SABAP 2), and Google Earth was also used to determine potential habitats for birds. The field survey was thereafter conducted for assessing the impact of the proposed development on the extant avifaunal population. All habitat types were covered during the assessments, and all attempts were made to ensure a representative spread of sampling localities and survey effort that reflected overall habitat composition.

Resident avifaunal population assessment

In determining the *in situ* local avifauna and avian habitats present on the proposed development area, site visits were undertaken from the 17th to 19th of March 2022, 03rd to 05th June 2022 and 19th to 21st June 2022. The surveys were conducted by two competent fieldworkers, and the survey time was from 06h00 am until 18h00 pm. Birds were observed using 8 x 42 Bushnell binoculars and photographic were taken where possible.

Data collection methods included the following:

- Vehicle drive surveys: Vehicle surveys were predominantly done along the farm dirt roads and twin tracks as well as the service road of the existing power line infrastructure
- Walked-transects: Walking a fixed-length transect within a given time and recording all bird species seen or heard within a specified transect width.
- For large tree-nesting birds, tall Eucalyptus trees were walked through in order to check for raptor nests.
- Lastly, waterbodies were inspected for waterfowl and other species that frequent waterbodies.

All data was recorded on BasicAirData GPS logger and Birdlasser. Figure 11 shows the survey tracks used to sample the area to achieve the objectives of the assessment.

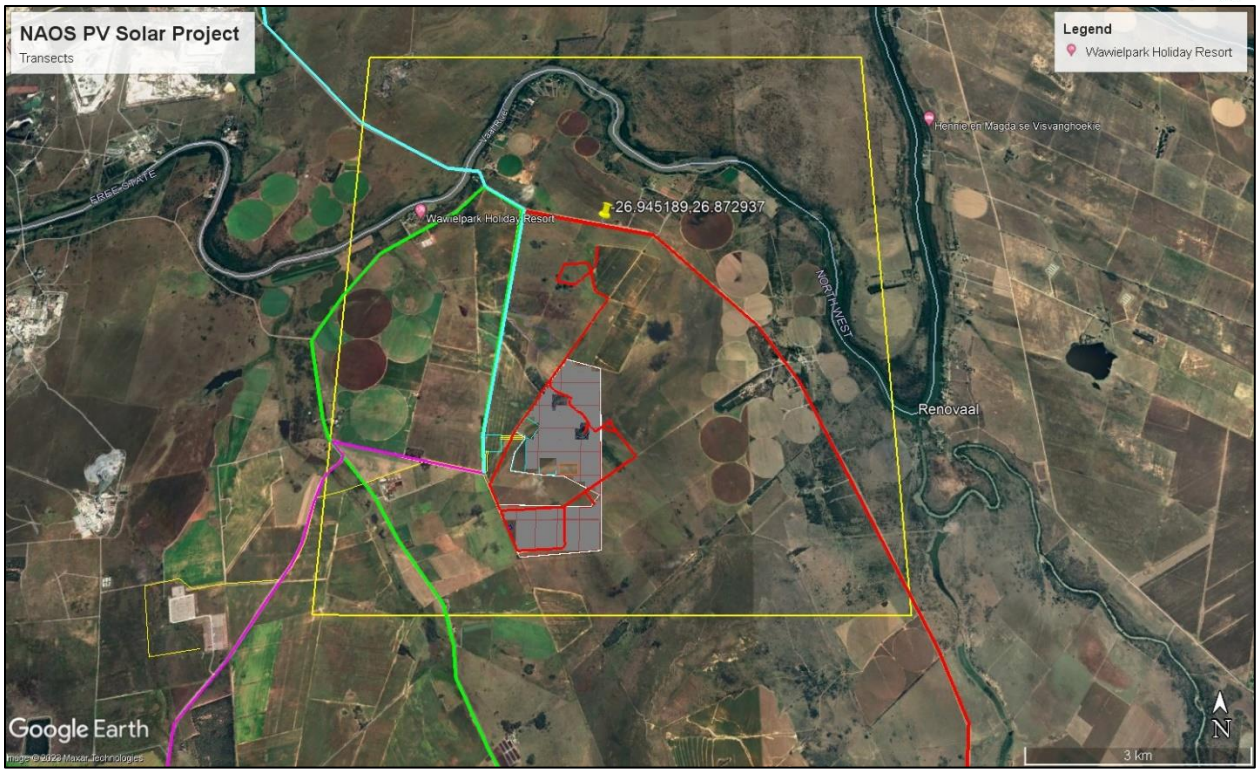

Figure 9. Locations of avifaunal survey transects in relation to the 200 MW Naos Solar PV Project Two. Site boundary (yellow line). Survey tracks (red lines).

The coverage of the study site was deemed adequate for the current scope of work (Figure 9). The crops were omitted during this survey, this was to avoid any impacts on the production. However, should the developer use these cultivated lands for the project, it will have no additional impacts on the avifauna . The transects were widely spaced due to the flat topography of the area.

RESULTS OF AVIFAUNAL POPULATION ASSESSMENT

From the survey, a total of 23 bird species were observed within the proposed site i.e. waterbirds (Appendix E) and birds encountered during transect surveys. Out of the 23 observed species, one (1) species was classified as Red Data which is the Lanner Falcon. Previous records from SABAP 2 also revealed that there is only one Red Data (Lanner Falcon, *Falco biarmicus*) species is present within the area. A total of 3 individuals of the Lanner Falcon were encountered during the surveys. The primary threat to the Lanner Falcon is the loss or transformation of habitat within the Grassland Biome. Secondary threats, amongst many other, include collisions with powerlines and poisoning by agrochemicals (Taylor, 2015). Additionally, there were medium to large sized species that are threatened by habitat loss and are may be prone to collision. These species are listed in Table 2, and some photographically shown in Appendix C. During the survey, certain habitats were thoroughly surveyed as they were potential habitats of inhabiting target

species These habitats included grassland areas, artificial dams within the site and tall trees. Although the area is located less than a kilometre from the Vaal River, one would expect a high diversity of bird species within the site. However, the diversity was low within and around the project area. This could be due to the habitat transformation.

Table 4.Collision prone species

Scientific name	Common name	Preferred habitat	Threats
Afrotis afraoides	Northern Black Korhaan	Grassland & Savanna	Collisions, Disturbance, Habitat loss
Asio capensis	Marsh Owl	Moist Grassland	Disturbance, Habitat loss
Scopus umbretta	Hamerkop	Waterbody margins	Disturbance, Habitat loss
Falco biarmicus	Lanner Falcon	Widespread	Collisions, Disturbance, Electrocution, Habitat loss

Species richness, species evenness, and species abundance

The overall species richness of the site is considered low (3,2295) as indicated in Table 5. Species evenness reflected that the site was highly even as a value of 0 indicates complete unevenness and a value of 1 indicates complete evenness. A diversity index score of below 1.5 is considered poor, between 1.5 and 2.5 is moderate, between 2.5 and 3.5 is high, and greater than 3.5 is extreme. The site can be concluded to have a moderately low diversity.

Table 5. Avifaunal species richness, evenness and diversity recorded during transect surveys on the Waterford Farm

Total Species	Total No. of Individuals	Margalef's richness	Evenness	Shannon D	Simpson D
S	N	d	J'	H'(loge)	1-Lambda'
14	56	3,2295	0,85541	2,254	0,877532

IMPACT ASSESSMENT RATINGS

The methodology for assessing the impact ratings was supplied by Environamics as the EAP for the proposed 200 MW Naos Solar PV Project Two Development. The methodology is included as Appendix A: Method of Environmental Assessment at the end of this report. The rating rankings for assessing impacts significance are as shown in Table 6 below. The findings of the impact assessment ratings are shown in the tables below. Table 7 is the impacts matrix used for scoring environmental significance and Table 8 is

a summary of impacts ratings for the proposed 240 MW Naos Solar PV Two development using Appendix A.

Table 6. Impact rating scoring used for the avifaunal impact assessment at the proposed Naos Solar PV Project Two development site.

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

An impacts assessment of all potential pre-construction, construction, operational and maintenance phase impacts associated with the activities pertaining to the proposed infrastructure developments are provided in Table 7.

Table 7. Avifaunal impact ratings for the PV array and associated infrastructure at the proposed Naos Solar PV Project Two development site.

Construction Phase	Preferred Alternative	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of priority avian species from important habitats	Minimise the construction footprint and preserve indigenous vegetation wherever possible. . Rehabilitate where possible, all areas that will no longer be used for construction purposes with indigenous flora

Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	1
Total SP:	42	16
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of resident avifauna through increased disturbance	Minimise the construction footprint and preserve indigenous vegetation wherever possible. Rehabilitate where possible, all areas that will no longer be used for construction purposes with indigenous flora.
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	2	1
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	36	16
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Long-term or permanent degradation and modification of the receiving environment resulting in the loss of important avian habitats	Use designated roads to access the site. Minimise the construction footprint and preserve indigenous vegetation wherever possible. Rehabilitate where possible, all areas that will no longer be used for construction purposes with indigenous flora.
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	45	20
Significance rating:	Negative medium impact	Negative low impact
Operation Phase	**Preferred Alternative**	
	Before Mitigation	**After Mitigation**
POTENTIAL IMPACTS ASPECTS		

POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Long-term or permanent degradation and modification of the receiving environment resulting in the loss of important avian habitats	Monitor and rehabilitate any degraded areas resulting from operational activities. Use indigenous species for revegetating cleared areas that are no longer required for development activities.
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	45	20
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of resident avifauna through increased disturbance	Monitor and rehabilitate any degraded areas resulting from operational activities. Use indigenous species for revegetating cleared areas that are no longer required for development activities.
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	2	1
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	36	16
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity	Ensure bird flight diverters and fence markers are placed correctly to prevent collisions. Conduct quarterly fatality monitoring assessments
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	3	2
Probability:	3	2
Total SP:	36	18
Significance rating:	Negative medium impact	Negative low impact
Decommissioning Phase	**Preferred Alternative**	

	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Long-term or permanent degradation and modification of the receiving environment resulting in the loss of important avian habitats	Compile a rehabilitation plan that will be implemented following the decommissioning phase, as required by legislation and regulation
Magnitude:	3	2
Duration:	3	2
Geographical Extent:	1	1
Loss of Resources:	3	2
Reversibility:	3	2
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	45	20
Significance rating:	Negative medium impact	Negative low impact
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Displacement of resident avifauna through increased disturbance	Compile a rehabilitation plan that will be implemented following the decommissioning phase , as required by legislation and regulation
Magnitude:	3	2
Duration:	2	1
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	2	1
Cumulative Effect:	2	1
Probability:	3	2
Total SP:	36	16
Significance rating:	Negative medium impact	Negative low impact

Table 8. Summary of avifaunal impact ratings for the proposed Naos Solar PV Project Two development.

	Average impact rating	Significance class	Average mitigated impact	Significance class
Avifaunal impacts of the PV array and associated infrastructure	40.64	Negative medium impact	18.00	Negative low impact

MITIGATION REQUIREMENTS

Loss of priority avian species from important habitats

The area has been identified as 'Low Avian Sensitivity' by DFFE's screening tool. This low avian sensitivity was also confirmed during the field surveys. One priority species, the Lanner Falcon, was recorded on the site and has also been confirmed for the wider SABAP2 pentads in wetland habitats. The construction footprint must be minimised and indigenous vegetation must be reserved as much as possible. Constructing during breeding seasons (summer) must be avoided and construction must run for a shortest possible timeframe. Pollution must be controlled.

Loss of resident avifauna through increased disturbance

The resident avifaunal community has a moderately low diversity and only one individual of the endemic Northern Black Korhaan was recorded on site which is of Least Concern (IUCN 3.1), and one Red Data species which is the Lanner Falcon (Near Threatened). A rehabilitation plan that will be implemented following the decommissioning phase should be in place.

Long-term or permanent degradation and modification of the receiving environment resulting to the loss of important avian habitats

Designated roads must be used to access the proposed development site. The construction footprint must be minimised and indigenous vegetation should be reserved as much as possible. construction should run for a shortest possible timeframe. Pollution should be controlled and the area should preferably be rehabilitated using indigenous vegetation.

Collisions with PV panels and electrocution risks leading to injury or loss of avian life which decreases avifauna species diversity

To avoid the impacts associated with PV panel collisions, anti-collision markers should be placed along the boundary fence of the PV panels. To avoid electrocutions, it is recommended that the developer use bird friendly monopole with a perch. Implementing these mitigations should reduce the significance by 50% and results in acceptable Low (L) impact ratings.

In summary, the majority of the mitigations listed in Table 7 above for the 240 MW Naos Solar PV development involve minimising impact footprints during construction, limiting site access beyond direct disturbance zones, reducing noise pollution, and using designated roads as much as possible. Implementing these mitigations reduces the significance by 44% which results in acceptable Negative low impact ratings.

NO-GO AREAS, BUFFERS AND ALTERNATIVES

No no-go areas are applicable to the project site from an avifaunal perspective. Should the proposed activity not proceed, due to other specialist studies, the site will remain unchanged and will continue to be used for agricultural purposes.

No other possible sites were identified on the affected property(ies) for the development. This site is referred to as the preferred site. Some limited sensitive features occur on the site such as the two dams. In terms of Collector Substations (CS), only CS 1 is preferred due to its distance away from the non-perennial watercourse. These dams have been excluded according to the layout from the developer.

The size of the site makes provision for the exclusion of any sensitive environmental features that may arise through the Basic Assessment process to enable the appropriate placement of the infrastructure within the development footprint.

CONCLUSION AND RECOMMENDATIONS

The proposed 300 MW Naos Solar PV Two is situated in an area are low avian sensitivity. Assessments for the present waterbodies were conducted where only species of Least Concern were encountered. As a result, from a avifaunal perspective, there is no objection to the development of the proposed Naos Solar PV Two development and associated infrastructure, provided to the recommended mitigation measures are strictly followed. The overall impacts (including cumulative) for the project is considered to be low and will not cause detrimental impacts to the avifauna species located within the development area and surrounds.

Specific conditions recommended for the Environmental Authorisation from an avifaunal perspective.

1. Implement mitigation controls during the construction phase as specified in the mitigation requirements. Monitor and report on their effectiveness.
2. Implement mitigation controls during the operational phase as specified in the mitigation. Monitor and report on their effectiveness.
3. Monitoring of implementation of mitigation controls, along with reporting, should be undertaken at least quarterly throughout the construction phase, and bi-annually during the operational phase. Monitoring, at the minimum, should consist of a quarterly monitoring of the Solar PV area for evidence of PV collisions. This monitoring can be conducted by the Site Environmental Officer (SEO) with the help of the specialist when necessary.
4. As much of the natural habitat should be preserved as possible during construction and operation to lessen the operational impacts and to reduce the irreversibility of impacts.

5. Effective restoration of the natural habitats that were intact before the development should be implemented and reported on after decommissioning.

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APPENDICES

Appendix A: Method of Environmental Assessment

1.1 METHOD OF ENVIRONMENTAL ASSESSMENT

The environmental assessment aims to identify the various possible environmental impacts that could results from the proposed activity. Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed.

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e., site, local, national or global whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 6.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.1.1 Impact Rating System

Impact assessment must take account of the nature, scale and duration of impacts on the environment whether such impacts are positive or negative. Each impact is also assessed according to the project phases:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, the following criteria is used:

Table 9. The rating system

NATURE		
Include a brief description of the impact of the environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.

2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.
PROBABILITY		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ MAGNITUDE		
Describes the severity of an impact.		

1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.

4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the 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 similar or diverse activities as a result of the project activity in question.		
1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity. The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.

74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.

Appendix B: Photographs of sampled habitat types

Figure 12. Wetland habitat where fixed point avifaunal surveys were conducted to confirm avian sensitivity.

Figure 13. Grassland habitat where walked and vehicle drive transects were conducted.

Appendix C: Species composition of encountered avifaunal community during assessments and photographs of selected bird species from the site

Species	Latitude	Longitude	Count
African Pipit	-26.992122	26.876714	3
Black-winged Kite	-26.975469	26.871188	2
Brown-throated Martin	-26.992193	26.875944	10
Cape Longclaw	-26.987847	26.872654	1
Crowned Lapwing	-26.990321	26.875571	2
Lanner Falcon	-26.992511	26.873957	3
Marsh Owl	-26.945195	26.873358	1
Northern Black Korhaan	-26.990319	26.875599	6
Pied Crow	-26.992493	26.873401	2
Ring-necked Dove	-26.991122	26.868319	1
Rock Martin	-26.988897	26.873987	1
Scaly-feathered Weaver	-26.988397	26.871414	15
Speckled Pigeon	-26.990285	26.875528	3
Zitting Cisticola	-26.992753	26.868824	6

Marsh Owl

Northern Black Korhaan

Appendix D: List of water birds encountered during the focal point surveys

Species	Count	Conservation status
Blacksmith Lapwing	2	*Least Concern*. A healthy and stable population exists.
Cape Wagtail	1	*Least Concern*. A healthy and stable population exists.
Egyptian Goose	4	*Least Concern*. A healthy and stable population exists.
Grey Heron	1	*Least Concern*. A healthy and stable population exists.
Hamerkop	1	*Least Concern*. A healthy and stable population exists.
Little Grebe	2	*Least Concern*. A healthy and stable population exists.
South African Shelduck	2	*Least Concern*. A healthy and stable population exists.
White-breasted Cormorant	1	*Least Concern*. A healthy and stable population exists.
Yellow-billed Duck	3	*Least Concern*. A healthy and stable population exists.

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