TERRESTRIAL BIODIVERSITY AND AVIFAUNAL ASSESSMENT:

PROPOSED HEUNINGSPRUIT 50MW PV SOLAR FACILITY, FREE STATE

February 2023

DOCUMENT CONTROL

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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 3
○ the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 7
A declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 10
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 18
○ A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Page 17
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Page 17
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Page 17
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 30
An identification of any areas to be avoided, including buffers;	Page 45
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 45
A description of any assumptions made and any uncertainties or gaps in knowledge;	Page 11
A description of the findings and potential implications of such findings on the impact of the proposed activity, or activities;	Page 41
Any mitigation measures for inclusion in the EMPr;	Page 45
Any conditions for inclusion in the environmental authorisation;	Page 45
Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Page 45
A reasoned opinion-	
○ whether the proposed activity, activities or portions thereof should be authorised;	Page 45
○ regarding the acceptability of the proposed activity or activities; and	Page 45
○ 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 45

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

CONTENTS

SPECIALIST DETAILS, CURRICULUM VITAE AND DECLARTION

The surveys and site assessments were undertaken by suitably qualified field specialists of MORA Ecological Services (Pty) Ltd. The report was drafted by Mokgatla Jerry Molepo, a competent Environmental 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;

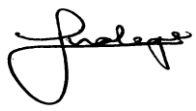
• I will comply with the Act, Regulations and all other applicable legislation;

• 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

24/02/2023

Date

INTRODUCTION & BACKGROUND

Contrarians Capital Holdings, hereafter referred to as the “applicant”, is proposing the development of a new Heuningspruit 50MW Photovoltaic (PV) Solar Facility, near Koppies, within Ngwathe Local Municipality, in the Free State Province. The proposed PV Site is located in farm Voorspoed 1508 and Verdun No 1511.

MORA Ecological Services (Pty) Ltd was requested by the CR Renewables as the appointed Environmental Assessment Practitioners, hereafter referred to as the “EAP” to conduct a terrestrial biodiversity and avifaunal impact assessment towards their pursuit of obtaining solar PV development rights by means of transforming land. Specialist studies are essential for obtaining the requisite environmental authorisations for the proposed project.

TERMS OF REFERENCE

Considering the requirements of national legislation and of the proposed project, the purpose of this report is to make provision of substantial information in advising the outcome of the application with respect to the ecological viability of the proposed project. The objectives of this report are, therefore, to:

- Describe the baseline receiving environment;
- Identify and describe terrestrial plants and animal species sensitivities within the area and the manner in which these sensitive receptors may be impacted upon;
- Identify priority ecological, hydrological, botanical and faunal features within the proposed areas;
- Record the presence and diversity of plant species of conservation significance (TOPS, Red data, Protected, etc.)
- Mapping sensitive areas within the proposed development area;
- Running the screening tool to identify any critical issues pertaining to biodiversity
- Evaluate the extent of site-related impacts;
- Conduct a risk assessment for the proposed project; and
- Provide the prescription of mitigation measures and recommendations for identified risks.

ASSUMPTIONS, LIMITATIONS, UNCERTAINITIES AND GAP ANALYSIS

The following limitations should be noted for the assessment:

- 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 of solar developments on the terrestrial environment;

- It is assumed that the information contained in existing databases, reports and publications is correct;
- The assessment of impacts was based on the current state of the primary receiving environment;
- Only a single season survey was conducted for the respective studies;
- Night surveys were not performed due to safety and budgetary reasons;
- Despite these limitations, a comprehensive desktop study was conducted, in conjunction with the detailed results from the surveys, and as such there is a high level of confidence in the information provided;
- 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.

PROJECT AREA

The proposed development is located 14 km north to north-east of Ventersburg and about 25 km south of Kroonstad and is bisected by the N1 highway. The project boundary falls on the Ngwathe Local Municipality (Category B). The Ngwathe Local Municipality is an administrative area in the Fezile Dabi District of the Free State in South Africa. Geographically, it is situated in the northern part of the Fezile Dabi District and is approximately 7055 Square kilometres. Within Ngwathe, the proposed project area is located in the Heuningspruit region of the Free State. Heuningspruit is located 3,042 km south of the equator. Precisely, the project boundary is 27°26'39.80"S latitude and 27°25'2.03"E longitude. The development footprint is approximately 261 Hectares.

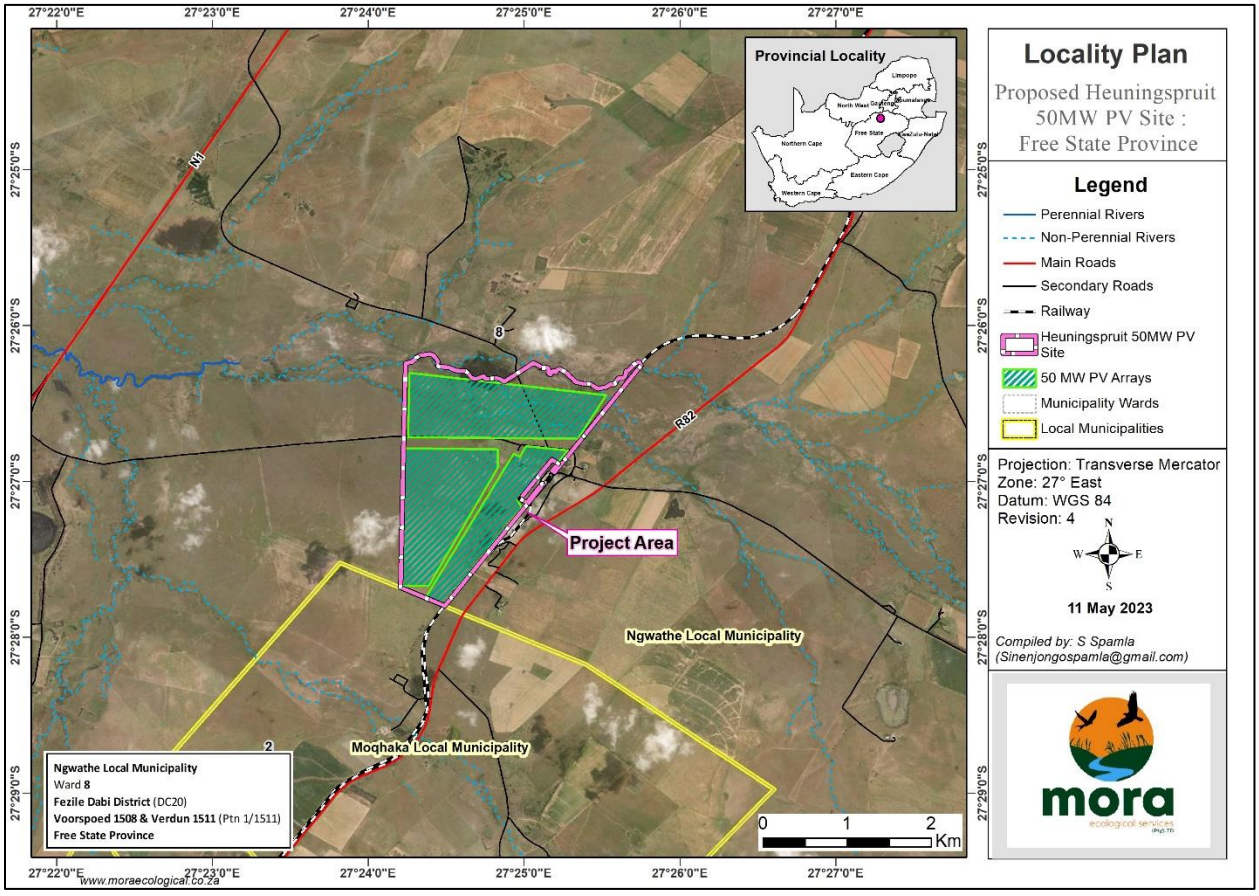


Figure 1: Project area location map relative to South Africa as provided by the EAP.

KEY LEGISLATIVE REQUIREMENTS

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.

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 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.

Additionally, NEMBA regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

- To prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
- To manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular;
- To eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats;

According to Section 65 of the Act, "Restricted activities involving alien species":

- A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7.

Restricted activities include the following:

- Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
- Having in possession or exercising physical control over any specimen of a listed invasive species.
- Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.
- Conveying, moving, or otherwise translocating any specimen of a listed invasive species.
- Selling or otherwise trading in, buying, receiving, giving, donating, or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
- Spreading or allowing the spread of any specimen of a listed invasive species.
- Releasing any specimen of a listed invasive species.

Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of the amendments to the regulations under this Act, landowners are legally responsible for the control of invasive alien plants on their properties. The schedules provide a list of declared weeds and invaders, which have been divided into three categories, as follows:

- Category 1 plants are prohibited and must be controlled.
- Category 2 plants (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- Category 3 plants (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading there of, except within the flood line of watercourses and wetlands.

METHODS

Methodology

Prior to conducting field assessments, a comprehensive literature review of available published and unpublished literature pertaining to the current use of the land and the potential environmental sensitivity of the site was conducted. The site visit was conducted in February 2023 to undertake necessary in-field procedures in assessing the overall terrestrial biodiversity composition within the study area. The survey was conducted by two competent fieldworkers of MORA Ecological Services (Pty) Ltd, i.e., a senior ecologist (Pr. Sci. Nat.) and an assistant (Junior Specialist, Cand. Sci. Nat). Surveys were conducted on the development footprint area (**Error! Reference source not found.**) and the survey time daily was from 06h00 am until 18h00 pm. Figure 2 below is a photographic representation of the development footprint area. Additional images of the receiving environment are shown in Appendix B.

Figure 2: Development footprint.

Terrestrial assessment

Geographic Information Systems (GIS) Mapping

Existing data layers were incorporated into a GIS software to establish how the proposed project might interact with any ecologically important entities. The guideline provides a spatial overview of threatened ecosystems and guidance on mitigating biodiversity impacts from the different phases of the proposed activity.

Botanical assessment

Vegetation units, flora species composition, plant sensitivity and habitat types

The main objective of the flora assessment was an ecological assessment of habitat types as well as the identification of any Red Data species within the area footprint. The fieldwork methodology included the following techniques;

- A visual inspection of the study area was done before surveys were conducted.
- During the process different, homogenous vegetation units were identified and subsequently surveyed on foot and by vehicle in order to determine the floristic composition of each unit.
- A plotless sampling method was used to record data.
- Species identification was done following reputable checklists and field guides.
- Identification of floral red-data species.
- Where necessary, plant material was collected and/or photographs taken of specimens for identification purposes.

The desktop study entailed the use of the Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006).

Faunal assessment (Mammals, Avifauna, Reptiles and Amphibians)

The faunal assessment was done mainly on a desktop level, supported by on-site observations. No faunal trapping or any other quantitative field species data capturing was, however, conducted due to time and budgetary constraints. A cross reference with available habitats of the study area was also conducted in order to establish the faunal potential. In assessing species occurrence, their approximate distribution and habitat requirements were firstly considered. Therefore, only animal groups for which distribution data are available have been considered in this assessment.

The desktop study entailed the use of the Animal Demographic Units (ADU) Virtual Museum tool. The ADU is a research unit of the University of Cape Town in the Biological Sciences Department. The ADU was initiated with the mission to understand animal populations, especially population dynamics, and therefore provide inputs to their conservation. The ADU Virtual Museum is designed to allow Citizen Science inputs

for effectively achieving mass participation projects, long-term ecological monitoring, innovative statistical modelling and population-level interpretation of results. Currently, it has achieved approximately 16 million dated and georeferenced records of fauna species.

The ADU was used to identify presence of the following animal groups:

- Mammals
- Reptiles
- Amphibians

For the avifauna species, 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 on 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 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 pentads cover a greater avian diversity and comprises priority habitats including waterbodies. The inclusion of aquatic habitats in the pentads will substantially increase the species counts.

Impacts assessment

The methodology for assessing the impact ratings is included as Appendix A: Method of Environmental Assessment at the end of this report. Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the project area, specifically the proposed prospecting footprint. Impacts were assessed in terms of the construction, operational, decommissioning, rehabilitation and closure phases. The operational phase refers to that phase of the project where the prospecting is being conducted and once complete, the decommissioning phase will begin.

It should be noted that the impacts described are not exhaustive, and more impacts may be identified at a later stage as more project specific information becomes available. Mitigation measures were only applied to impacts deemed relevant based on the impact analysis. The rating rankings for assessing impacts significance are shown in Table 1.

Table 1: Impact rating scoring used.

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.

The aim of conducting a risk assessment is to identify the impacts that the current activity, as well as that of the operational phase of which the proposed project will have on the receiving terrestrial environment. If avoidance is not possible, recommendations and practical mitigation measures are mandatory. Only Low Risk Activities located within the regulated area of the receiving environment will qualify for the proposed project. Considering the proposed project, buffer zones were suggested that mitigation techniques will be advised to ensure that threats are kept to a minimum.

RECEIVING ENVIRONMENT

Critical Biodiversity Areas and Ecological Support Areas

Figure 3 below is a spatial representation of the biodiversity sector plan of the Free State Province, relative to the proposed development footprint. Critical Biodiversity Areas (CBAs) are terrestrial and aquatic features in the landscape that are critical for conserving biodiversity and maintaining ecosystem functioning. Whereas, Ecological Support Areas (ESAs) are supporting areas which are intended for safeguarding and/or preventing the degradation of CBAs. Figure 3 shows a large proportion of the proposed development area being categorized as ESA2, and smaller parts being ESA1. This, therefore, gives an indication that the receiving environment is of great biodiversity significance. Construction activities should be limited to the lesser sensitive regions of the receiving environment.

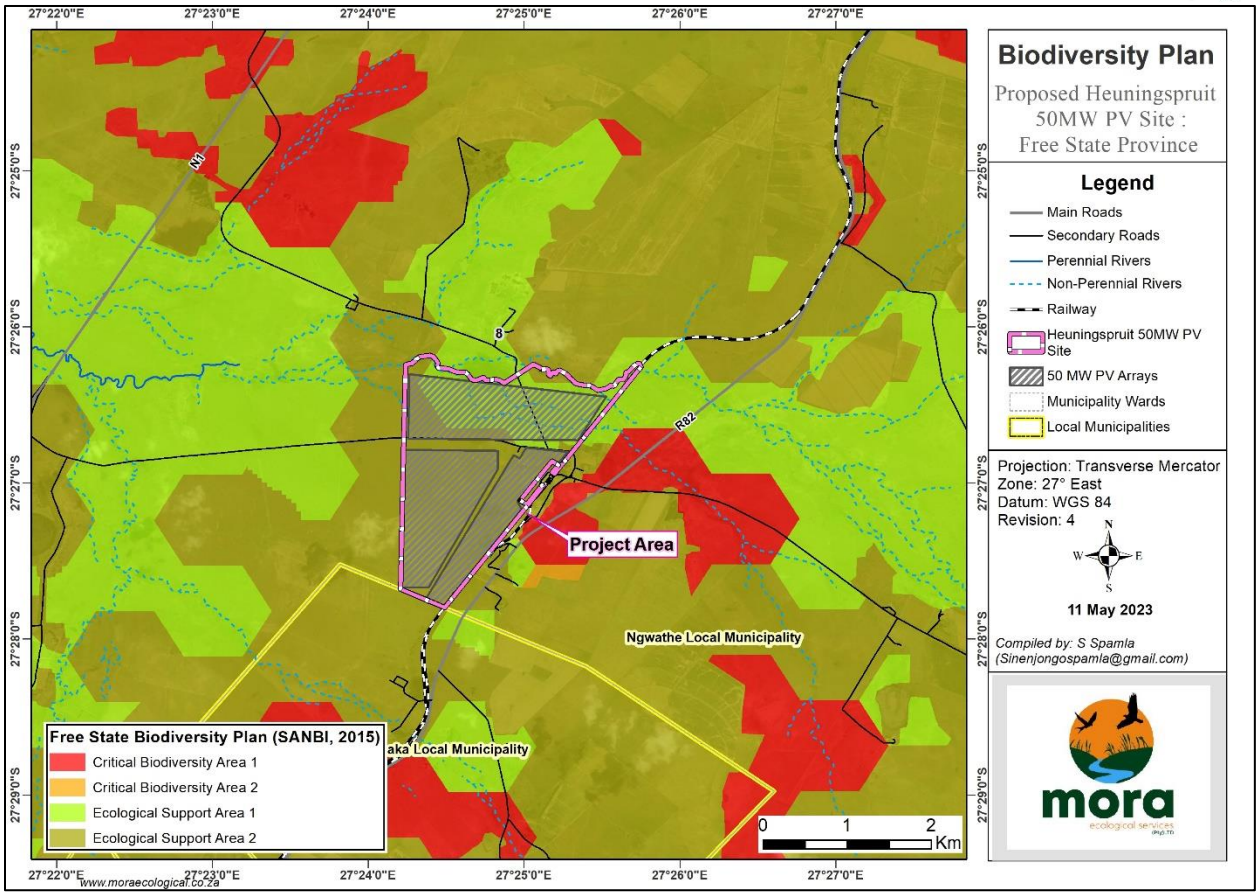


Figure 3: FSBS Terrestrial CBAs of the receiving environment.

Vegetation

The geographic region of the proposed Solar PV development falls on the Grassland biome (Figure 4). The Grassland biome is the second largest and comprises 27.9% of Southern Africa and spans across six provinces. The broad ecological unit of the Fezile Dabi District Municipality is represented by grassland ecosystems with seven vegetation types. The broad vegetation unit is classified as the Dry Highveld Grassland. The Dry Highveld Grassland Bioregion has a total area of 117 753 km^2 and approximately 32 717 km^2 (31.51%) of it has already been transformed.

Within the Dry Highveld Grassland, the proposed Solar PV development area falls under the Central Free State Grassland (Gh 6) as shown in Figure 4 below.

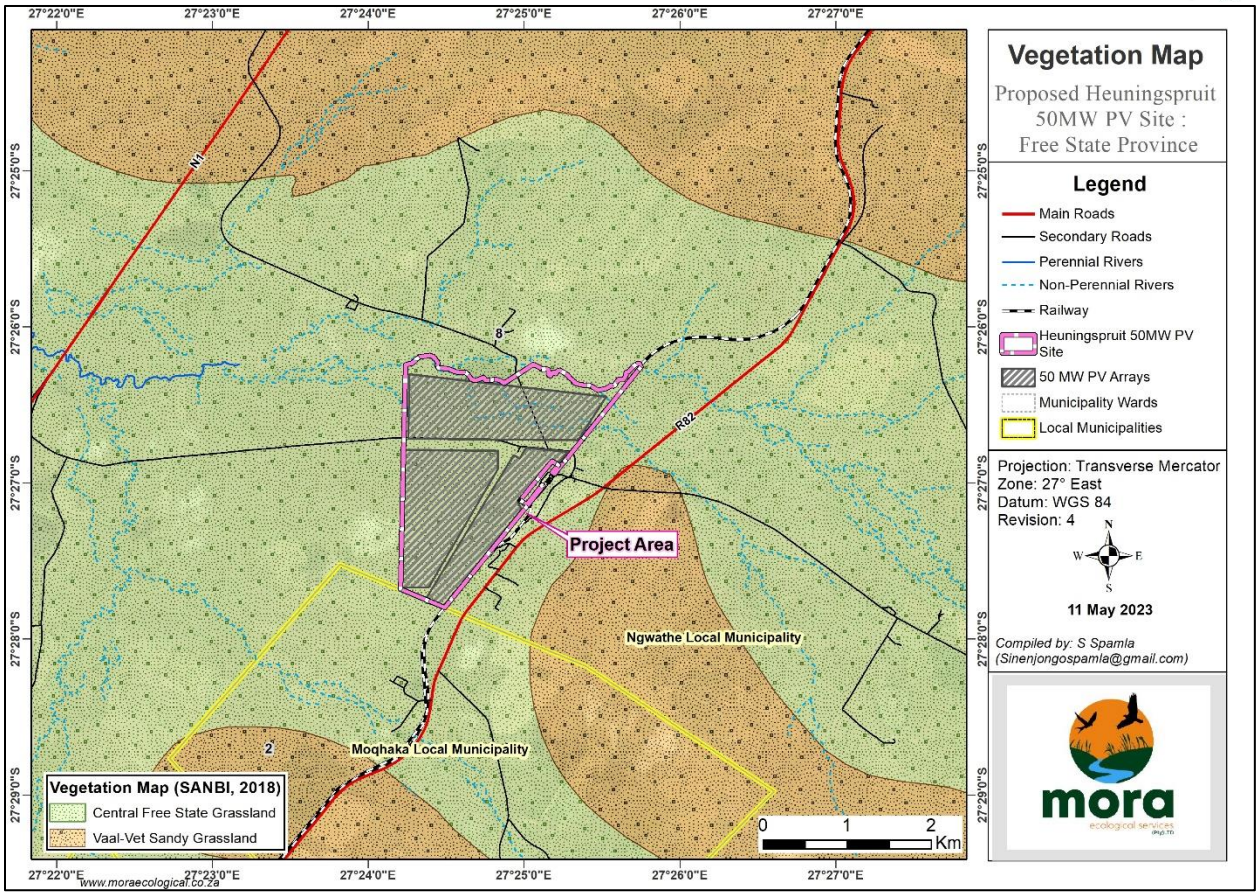


Figure 4: Vegetation map.

Climate

The climate of the area is noted to be generally temperate, with summer rain and dry winters. The area is a semi-arid ecosystem. The rainfall varies with a mean annual of 560 mm. The area is noted to have very cold winters, usually with frost. 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.

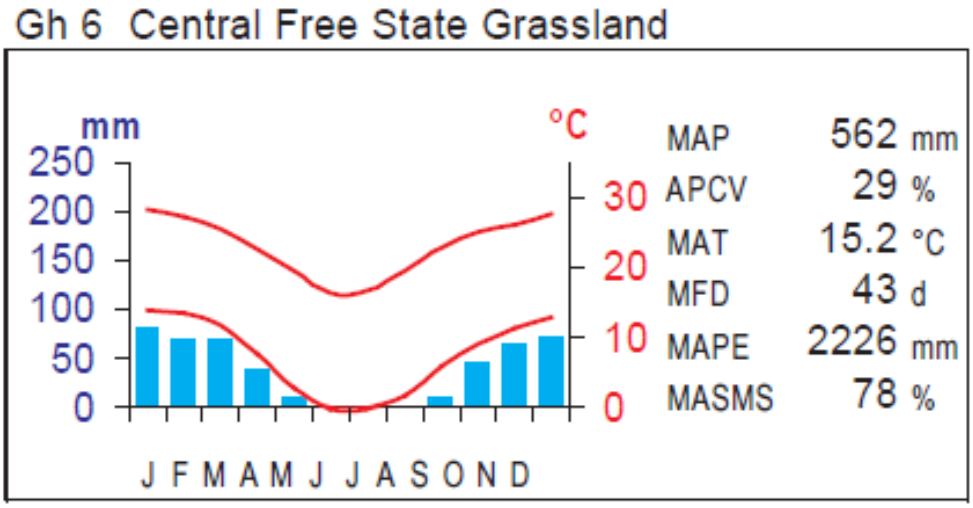


Figure 5: Climate diagram.

Hydrology

Hydrology consists of all water related features. This includes rivers, dams, canals, pans, wetlands, springs, surface water and ground water features. The main hydrological features within the study area have been mapped (Figure 6). The main hydrological features of the study area were dams, wetlands and non-perennial rivers. A 32 m rivers buffer area was applied at desktop level for all aquatic habitats to define the sensitivity of the proposed development area. The protection of the aquatic ecosystem structure and function is an important goal of environmental water resource management. During the pre-construction and construction phases, it is the responsibility of the applicant to ensure that the waterbodies are not transformed or impacted upon as they are important and sensitive habitats.

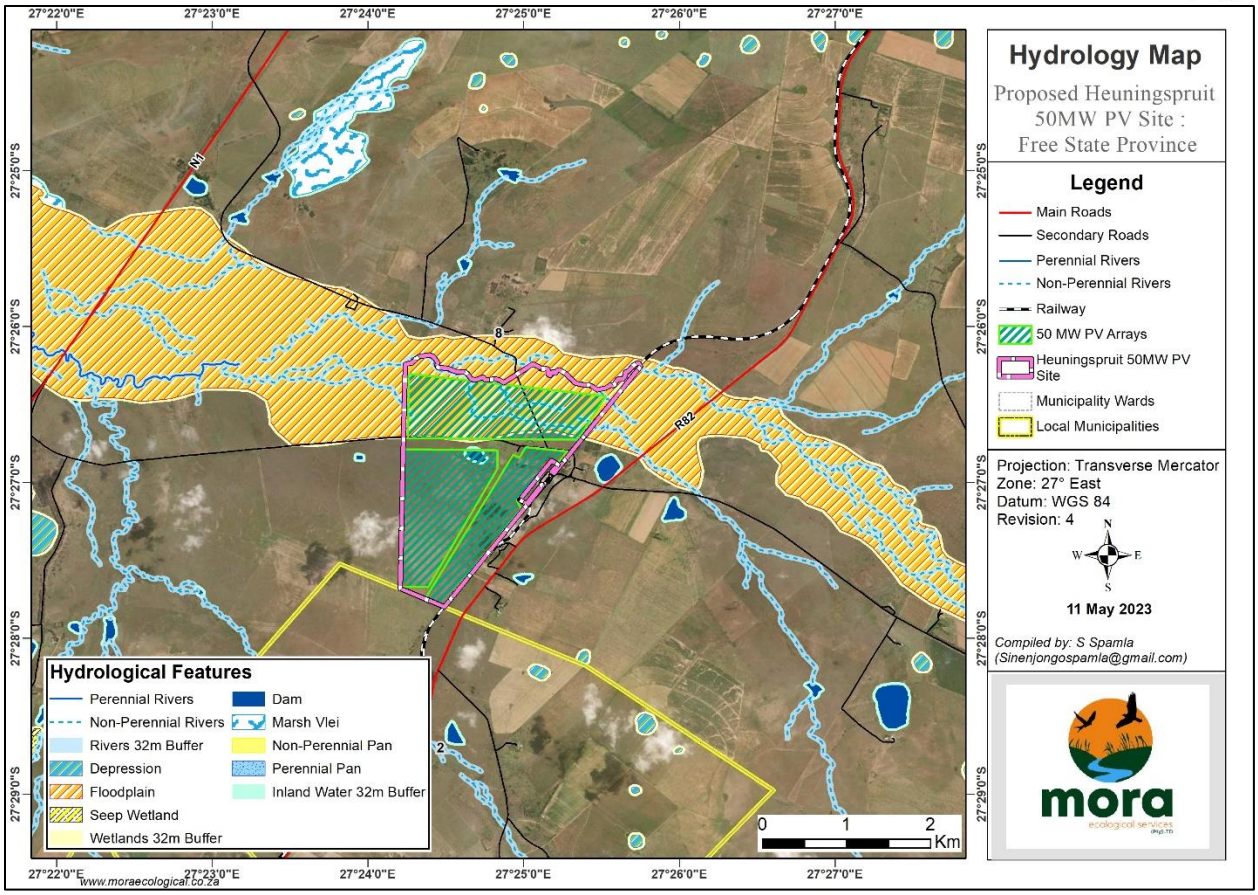


Figure 6: Representation of aquatic features within the study area.

DESKTOP ASSESSMENT

Flora assessment

Mucina and Rutherfold (2006) were consulted at desktop level to understand the habitat types and flora species composition, especially quantifying the presence of Red Data or species of conservation importance with the proposed prospecting area. Important taxa species in each bioregion are as follows: Evidently, flora species data from Mucina and Rutherford (2006) indicate a higher diversity. Important taxa occurring in the Central Free State Grassland are as follows:

Small Trees:

Acacia karroo, Celtis africana, Cussonia paniculata, Pittosporum viridiflorum, Rhus lancea, Scolopia zeyheri, Ziziphus mucronata.

Tall Shrubs:

Buddleja saligna (d), Euclea crispa subsp. ovata (d), Gymnosporia polyacantha (d), Olea europaea subsp. africana (d), Rhus burchellii (d), R. erosa (d), Diospyros lycioides subsp. lycioides, Grewia occidentalis, Gymnosporia buxifolia, Tarchonanthus camphoratus.

Low Shrubs:

Helichrysum dregeanum (d), Pentzia globosa (d), Anthospermum rigidum subsp. pumilum, Asparagus cooperi, A. laricinus, Berkheya annectens, Chrysocoma ciliata, Clutia pulchella, Euryops empetrifolius, Felicia filifolia subsp. filifolia, F. muricata, Nenax microphylla, Osyris lanceolata, Rosenia humilis, Selago saxatilis, Solanum tomentosum var. coccineum.

Graminoids:

Aristida adscensionis (d), A. congesta (d), A. diffusa (d), Cymbopogon pospischilii (d), Cynodon dactylon (d), C. incompletus (d), Eragrostis chloromelas (d), E. lehmanniana (d), E. micrantha (d), E. obtusa (d), E. trichophora (d), Eustachys paspaloides (d), Heteropogon contortus (d), Panicum stapfianum (d), Setaria lindenbergiana (d), S. sphacelata (d), Sporobolus fimbriatus (d), Themeda triandra (d), Tragus koelerioides (d), Digitaria argyrograpta, Elionurus muticus, Enneapogon scoparius, Eragrostis plana, E. superba, Tragus berteronianus, T. racemosus, Triraphis andropogonoides.

Herbs:

Berkheya onopordifolia var. onopordifolia, Hermannia coccocarpa, Indigofera alternans, Mohria caffrorum, Pupalia lappacea, Salvia repens.

Geophytic Herbs:

Oxalis corniculata, O. depressa.

Succulent Herb:

Crassula lanceolata.

Alien invasive plants

Invasive alien species have been identified as the second greatest driver of habitat destruction by outcompeting native biodiversity. Biological invasions have deleterious impact on water quality, microclimate, soil nutrients, agricultural economies, and fire regime, listing them amongst the most prominent influencers of ecological change. Within the jurisdiction of the prosed project area, previously observed invasive alien plants at high infestations are flowering plants in the cactus family Cactaceae.

Fauna assessment

Based on historical data of the Animal Demographic Units (ADU) Virtual Museum, the following fauna species occur on site:

Table 1: List of mammal, reptile and amphibian species from ADU Virtual Museum records using the 2727AD Quarter Degree Square.

Reptiles

Pseudaspis cana
Hemachatus haemachatus
Panaspis wahlbergii
Dasypeltis scabra
Duberria lutrix lutrix
Trachylepis punctatissima

Amphibians

Cacosternum boettgeri

Image source: https://nextgenherpetologist.co.za/2017/10/08/boettgers-caco-cacosternum-boettgeri/

Mammals

Damaliscus pygargus phillipsi

Image source: https://www.animal.photos/mamm4/antel-bles.htm

Aepyceros melampus

Image source: https://www.shadowsofafrica.com/impala-aepyceros-melampus
Antidorcas marsupialis


Image source : https://eleducation.org/resources/springbok

NB: None of the Mammalia, Reptile or Amphibian species are Red Data or of conservation concern.

According to the SABAP2 species list in pentad 2725_2720, the estimated total of 102 birds species occur in the broader area of the proposed project. Table 2 is the list of avifauna species occurring in the broader pentads areas and might possibly be affected by the proposed Solar PV development.

Table 2: List of avifaunal species recorded during SABAP2 assessments for the wider pentads.

No.	Avifauna Species
1	Acacia Pied Barbet
2	African Pipit
3	African Red-eyed Bulbul
4	African Spoonbill
5	African Stonechat
6	Ant-eating Chat
7	Barn Swallow
8	Black-chested Prinia
9	Black-headed Heron
10	Blacksmith Lapwing
11	Black-throated Canary
12	Black-winged Kite
13	Black-winged Stilt
14	Blue Korhaan
15	Blue Waxbill
16	Bokmakierie
17	Brown-hooded Kingfisher
18	Brown-throated Martin
19	Buffy Pipit
20	Cape Longclaw
21	Cape Robin-Chat
22	Cape Shoveler
23	Cape Sparrow
24	Cape Starling
25	Cape Turtle Dove
26	Cape White-eye
27	Cardinal Woodpecker
28	Chestnut-vented Warbler
29	Cloud Cisticola
30	Common Buzzard
31	Common Moorhen
32	Common Ostrich
33	Crested Barbet
34	Crowned Lapwing
35	Diederik Cuckoo
36	Double-banded Courser
37	Eastern Clapper Lark

No.	Avifauna Species
38	Egyptian Goose
39	Familiar Chat
40	Fiscal Flycatcher
41	Glossy Ibis
42	Great Egret
43	Greater Flamingo
44	Greater Kestrel
45	Greater Striped Swallow
46	Green-winged Pytilia
47	Grey Heron
48	Hadada Ibis
49	Hamerkop
50	Helmeted Guineafowl
51	House Sparrow
52	Intermediate Egret
53	Kalahari Scrub Robin
54	Laughing Dove
55	Little Grebe
56	Little Swift
57	Long-tailed Widowbird
58	Marsh Owl
59	Mountain Wheatear
60	Namaqua Dove
61	Natal Spurfowl
62	Nicholson's Pipit
63	Northern Black Korhaan
64	Orange River Francolin
65	Orange River White-eye
66	Orange-breasted Waxbill
67	Pied Avocet
68	Red-billed Quelea
69	Red-billed Teal
70	Red-capped Lark
71	Red-eyed Dove
72	Red-faced Mousebird
73	Red-headed Finch
74	Red-knobbed Coot
75	Reed Cormorant

No.	Avifauna Species
76	Ruff
77	Rufous-naped Lark
78	Secretarybird
79	South African Cliff Swallow
80	South African Shelduck
81	Southern Fiscal
82	Southern Masked Weaver
83	Southern Red Bishop
84	Speckled Mousebird
85	Spike-heeled Lark
86	Spotted Thick-knee
87	Spur-winged Goose
88	Swainson's Spurfowl
89	Three-banded Plover
90	Village Indigobird
91	Western Cattle Egret
92	Whiskered Tern
93	White-backed Mousebird
94	White-browed Sparrow-Weaver
95	White-rumped Swift
96	White-throated Swallow
97	White-winged Tern
98	Wood Sandpiper
99	Yellow Canary
100	Yellow-billed Duck
101	Yellow-crowned Bishop
102	Zitting Cisticola

Table 3: List of avifaunal species recorded during February 2023 survey.

Scientific name	Common name
Rhinopomastus cyanomelas	Common Scimitarbill
Anthus cinnamomeus	African Pipit
Microcarbo africanus	Reed Cormorant
Trachyphonus vaillantii	Crested Barbet

Polemaetus bellicosus	Martial Eagle
Buteo buteo	Common Buzzard
Columba guinea	Speckled Pigeon
Passer melanurus	Cape Sparrow
Crithagra flaviventris	Yellow Canary
Spilopelia senegalensis	Laughing Dove
Streptopelia capicola	Cape Turtle Dove
Cisticola aridulus	Desert Cisticola
Macronyx capensis	Cape Longclaw
Melaenornis silens	Fiscal Flycatcher
Numida meleagris	Helmeted Guineafowl
Curruca subcoerulea	Chestnut-vented Tit-Babbler
Plocepasser mahali	White-browed Sparrow-Weaver
Tadorna cana	South African Shelduck
Ortygospiza atricollis	African Quail-Finch
Quelea quelea	Red-billed Quelea
Afrotis afraoides	Northern Black Korhaan
Vanellus coronatus	Crowned Lapwing
Prinia flavicans	Black-chested Prinia
Euplectes orix	Southern Red Bishop
Vidua macroura	Pin-tailed Whydah
Euplectes progne	Long-tailed Widowbird
Euplectes capensis	Yellow Bishop

Ardea cinerea	Grey Heron
Plegadis falcinellus	Glossy Ibis
Ardea melanocephala	Black-headed Heron
Bostrychia hagedash	Hadeda
Motacilla capensis	Cape Wagtail
Tricholaema leucomelas	Acacia Pied Barbet
Mirafra africana	Rufous-naped Lark
Pternistis swainsonii	Swainson's Spurfowl
Batis pririt	Pririt Batis
Plectropterus gambensis	Spur-winged Goose
Merops apiaster	European Bee-eater
Ploceus velatus	Southern Masked Weaver
Ploceus capensis	Cape Weaver
Crithagra atrogularis	Black-throated Canary
Hirundo rustica	Barn Swallow
Petrochelidon spilodera	South African Cliff Swallow
Apus affinis	Little Swift
Cecropis cucullata	Greater Striped Swallow
Polyboroides typus	African Harrier-Hawk
Lanius collaris	Southern Fiscal
Oena capensis	Namaqua Dove
Pycnonotus nigricans	African Red-eyed Bulbul
Riparia paludicola	Brown-throated Martin

Myrmecocichla formicivora	Ant-eating Chat
Melaniparus afer	Grey Tit
Elanus caeruleus	Black-winged Kite
Cisticola tinniens	Levaillant's Cisticola
Lamprotornis nitens	Cape Glossy Starling
Falco amurensis	Amur Falcon
Estrilda astrild	Common Waxbill
Micronisus gabar	Gabar Goshawk
Threskiornis aethiopicus	African Sacred Ibis
Dendrocygna viduata	White-faced Whistling Duck
Anthoscopus minutus	Cape Penduline Tit

HABITAT SENSITIVITY

The DFFE screening tool was consulted using the feasibility region shown in **Error! Reference source not found.** which covers the geographical extent of the proposed project area. Based on the selected classification, and the environmental sensitivities of the proposed development footprint, Table 4 is a summary of the development site environmental sensitivities. The terrestrial biodiversity and animal themes were classified as having Very High Environmental Sensitivity. The Plant species category is of Medium Sensitivity. To explain the sensitivity rankings, Table 5 gives a detailed description of the site sensitivity ratings used in the screening tool.

Table 4: Summary of DFFE screening tool outputs

Theme	Very High Sensitivity	High Sensitivity	Medium Sensitivity	Low Sensitivity
Animal Species			**X**	
Plant Species				**X**
Terrestrial Biodiversity	**X**			
Avian Species				**X**

Table 5: Site sensitivity ratings to species data in the screening tool

Sensitivity Rating	Description of Sensitivity Rating
Very high	Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km^2 is considered critical habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under the CR, EN, or VU criteria of the IUCN or species listed as Critically/Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a critical habitat, all remaining suitable habitat has been manually mapped at a fine scale.
High	Recent occurrence records for all threatened (CR, EN, VU) and/or Rare endemic species are included in the high sensitivity level. Spatial polygons of suitable habitat have been produced for each species by intersecting recently collected occurrence records (those collected since the year 2002) that have a spatial confidence level of less than 250 m with segments of remaining natural habitat. For birds, species distribution models (SDMs) and SABAP2 data (http://sabap2.birdmap.africa/) were combined to delineate the 'high' sensitivity areas
Medium	Medium Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level. Two types of spatial models have been included. The first is a simple rule-based habitat suitability model where habitat attributes such as vegetation type and altitude are selected for all areas where a species has been recorded to occur. The second is a species distribution model which uses species occurrence records combined with multiple environmental variables to quantify and predict areas of suitable habitat. The models provide a probability-based distribution indicating a continuous range of habitat suitability across areas that have not been previously surveyed. A probability threshold of 75% for suitable habitat has been used to convert the modelled probability surface and reduce it into a single spatial area which defines areas that fall within the medium sensitivity level.
Low	Low Areas where no species of conservation concern (SCC) are known or expected to occur.

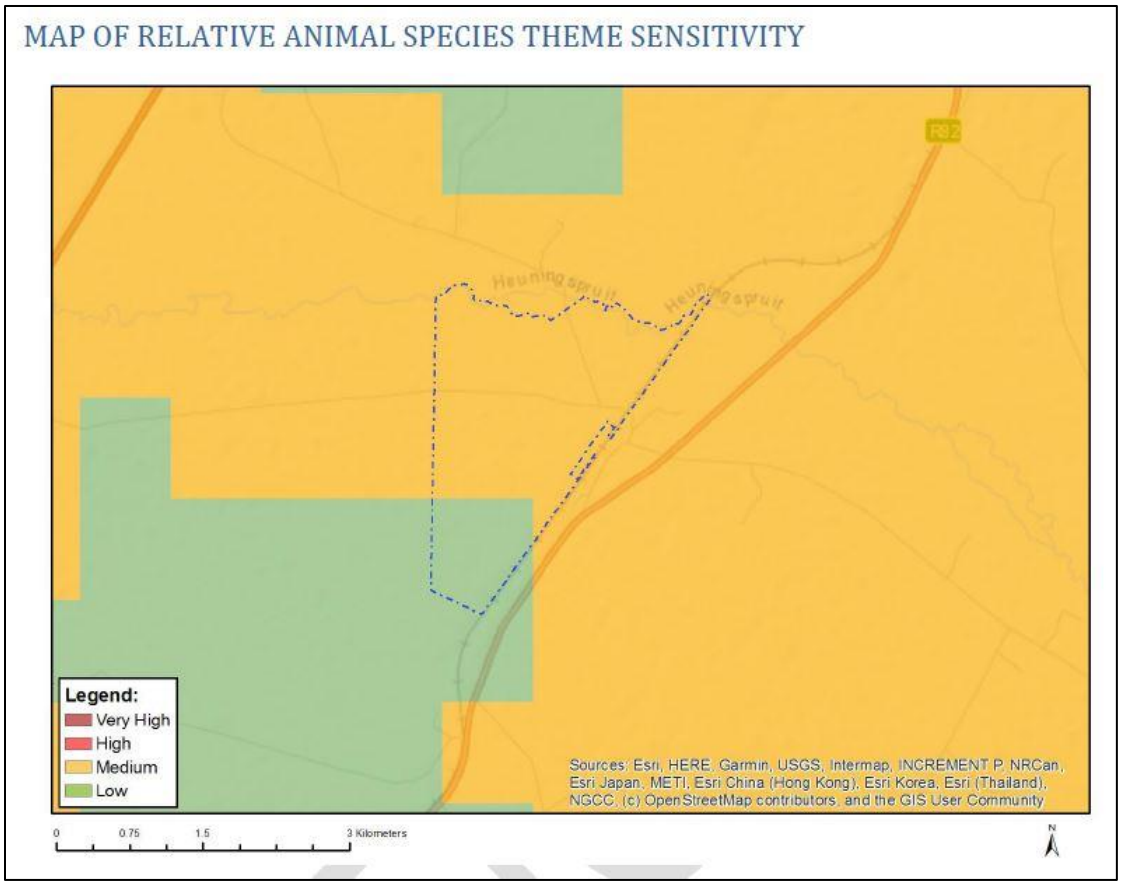


Figure 7: Animal species sensitivity

Group-Species	Sensitivity
Mammalia-*Hydrictis maculicollis*	Medium

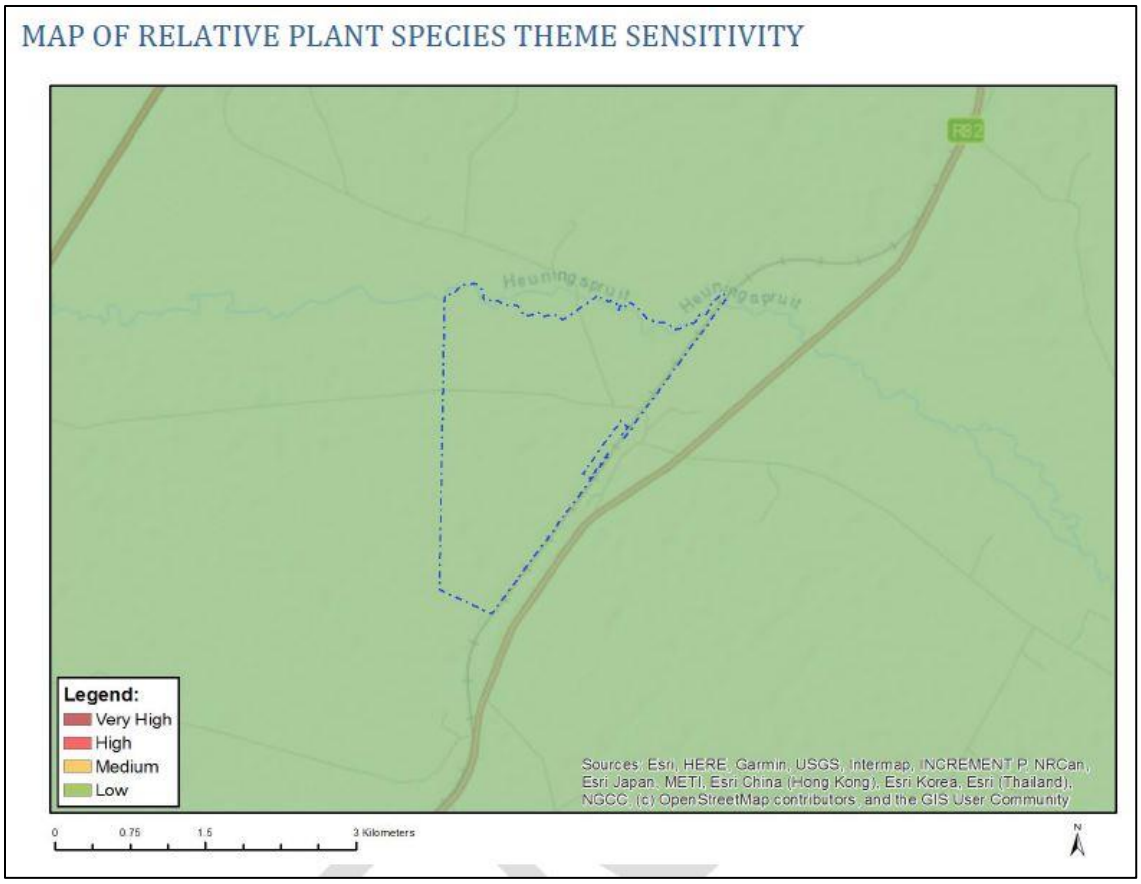


Figure 8: Plant species sensitivity

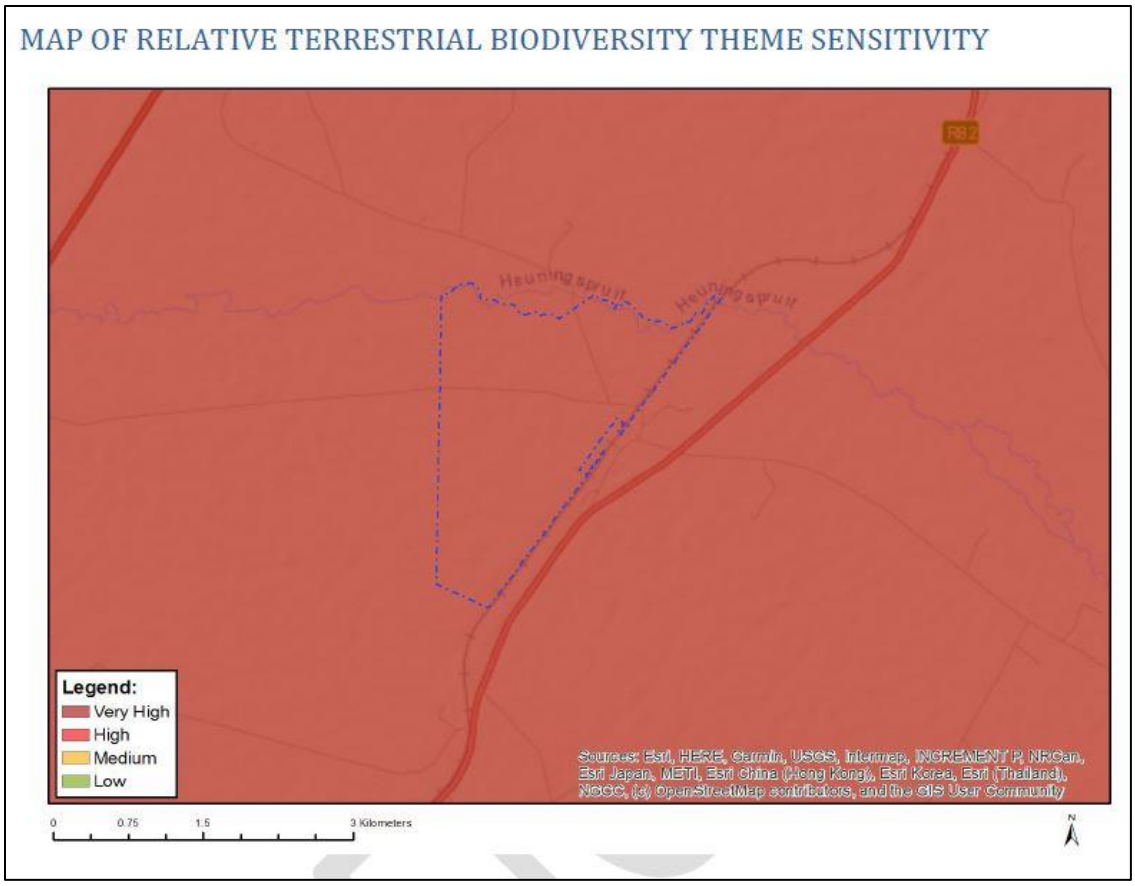


Figure 9: Terrestrial biodiversity sensitivity

Sensitivity	Feature(s)
Very High	Ecological support area 1
Very High	Ecological support area 2
Very High	FEPA Subcatchment

FIELD SURVEYS

Terrestrial assessment

Two broad vegetation units were identified during surveys. Both based on floristic differences of different topographical positions and natural habitat types.

- Vegetation Unit 1: Natural grassland with trees in the background
- Vegetation Unit 2: Natural pan filled with water
- Vegetation Unit 3: Transformed area

Figure 10: Vegetation unit 1 (grassland) in proposed development area.

Figure 11: Vegetation Unit 2 (Natural vegetation) in proposed development area.

Figure 12. Vegetation Unit 3 (transformed area) in proposed development area.

Invasive Alien Plants

Category 1/1b under CARA and NEMBA invasive alien plant species were recorded on site. Below are photographic examples of invasive alien plants observed during surveys. The observed species are highly competitive species that grow and reproduce quickly. Additionally, these plant species, for example *Opuntia microdasys*, have highly effective seed dispersal methods and a few enemies. Therefore, it should be well ensured that invasive alien plants are controlled prior to reaching the construction phase of the development. This will assist in reducing the propagation of these problematic species across the footprint area.

Figure 13: *Opuntia microdasys* observed on site in high densities.


Figure 14: *Opuntia ficus-indica* observed on site in moderately low densities.

A combination of mechanical and chemical control methods with be required. Chemical controls should be implemented before the end of the summer season.

Fauna assessment

No fauna species were visually observed on site during the time of the assessments.

IMPACT ASSESSMENT RATINGS & REQUIRED MITIGATIONS

Given that only a small portion within the development footprint will occupy the proposed 50 MW PV arrays area, the impacts assessment ratings will be mostly Negative medium impact to Negative low impact from a specialist perspective. However, considering the aforementioned conservation status of the footprint bioregion and the recommended mitigations are not implemented, the project will drastically have an overall Negative high impact which should be avoided by the applicant.

Construction Phase	Preferred Alternative (Alternative 1)	
	Before Mitigation	After Mitigation
POTENTIAL IMPACTS ASPECTS		
POTENTIAL ENVIRONMENTAL IMPACT / NATURE OF IMPACT:	Loss of priority flora and fauna species from important habitats	Minimise the development footprint and reserve indigenous vegetation wherever possible. Avoid undertaking project activities during the breeding season (summer). The project should be in shortest timeframe and control pollution.
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 flora and fauna through increased disturbance	Minimise the development footprint and reserve indigenous vegetation wherever possible. Avoid undertaking project activities during the breeding season (summer). The project should be in shortest timeframe and control pollution.
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 to the loss of important habitats	Use designated roads to access the site. Minimise the project footprint and reserve indigenous vegetation wherever possible. Avoid undertaking project activities during the breeding season (summer). The project should be in shortest timeframe and control noise pollution. Rehabilitate area 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 (Alternative 1)**	
	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 to the loss of important habitats for species	Minimise the development footprint and reserve indigenous vegetation wherever possible. Avoid undertaking project activities during the breeding season (summer). The project should be in shortest timeframe and control pollution
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 flora and fauna through increased disturbance	Minimise the development footprint and reserve indigenous vegetation wherever possible. Avoid undertaking project activities during the breeding season (summer). The project should be in shortest timeframe and control pollution
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
Decommissioning Phase	**Preferred Alternative (Alternative 1)**	
	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 to the loss of important habitats	Have a biodiversity protocol and rehabilitation plan that will be implemented following the decommissioning phase
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 fauna species through increased disturbance	Have a biodiversity protocol and rehabilitation plan that will be implemented following the decommissioning phase
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
Post Decommissioning Phase	**Preferred Alternative (Alternative 1)**	
	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 to the loss of important habitats for all animal and vegetation groups	Minimise project footprint and habitat transformation, limit ongoing human activity to the minimum required for ongoing operation, control noise to minimum, rehabilitate with native vegetation and retain indigenous vegetation throughout as far as possible, limit roadways and vehicle speeds; rehabilitate thoroughly post-decommissioning with locally native species
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:	Cumulative displacement of resident fauna species	Minimise development footprint and habitat transformation, limit ongoing human activity to the minimum required for ongoing operation, control noise pollution, rehabilitate with indigenous flora and reserve indigenous vegetation throughout as far as possible, limit roadways and vehicle speeds
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 to the loss of important habitats for flora and fauna species	Minimise project footprint and habitat transformation, rehabilitate with indigenous flora and reserve indigenous vegetation throughout as far as possible
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:	Spreading of invasive alien plants from margins. The altered environment will also favour species that are better adapted to disturbed/transformed areas.	Invasive plant material should be disposed by incineration, or alternatively, composting to break down seeds. If seedbank persists, invasive alien plant management and eradication measures should be implemented.
Magnitude:	4	3
Duration:	3	3
Geographical Extent:	1	1
Loss of Resources:	2	2
Reversibility:	3	2
Probability:	4	3
Total SP:	52	33
Significance rating:	Negative high impact	Negative medium impact

NO-GO AREAS, BUFFERS AND ALTERNATIVES

No no-go areas or buffers are applicable for this study.

IMPACT STATEMENT

From the survey conducted, there are no evident fatal flaws that would prevent this development from being authorised, nor being conducted in a sustainable manner. It is therefore the opinion of the specialist that the proposed development be considered, provided that all mitigations and recommendations are strictly followed.

CONCLUSION AND RECOMMENDATIONS

Overall, the impacts associated with this proposed solar facility are considered Low-Medium.
The recommendations are listed below:

Important recommendations for the conservation of the current vegetation structure

- The proponent must be committed to a conservation approach of practice and the actual footprint of disturbance must be kept to a minimum.
- As much of the natural environment must be conserved, there should be minimal vegetation clearing.
- Relocation of important species, identification and demarcation of specimens and sub habitats not to be disturbed will have to be done beforehand by a specialist.
- Important species (flora) that will be threatened by the development must be relocated to safer habitats by suitable specialists.
- Preventative erosion control measures to be put in place.
- Conduct alien invasive species monitoring on an annual basis.

Important recommendations for conservation of fauna species

- The proponent must be committed to a conservation approach of practice and the actual footprint of disturbance must be kept to a minimum.
- Relocation of important species, identification and demarcation of specimens and sub habitats not to be disturbed will have to be done beforehand by a specialist.
- Important species (fauna) that will be threatened by the development must be relocated to safer habitats by suitable specialists.
- Preventative erosion control measures to be put in place.

Specific conditions recommended for the EA from a biodiversity 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 development area;
4. As much of the natural habitat as possible should be preserved 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.

REFERENCES

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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 the Table below.

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:

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: Photographic representation of receiving environment

REPORT COMPILED BY:

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