



GEOHYDROLOGY

GEOTECHNICAL

ENVIRONMENTAL

SOCIAL DEVELOPMENT



Draft EIA Report

14/12/16/3/3/2/2296

**PROPOSED RENEWABLE ENERGY GENERATION PROJECT ON
PORTION 2 OF THE FARM ROOIDRAAI 85 IQ, JB MARKS LOCAL
MUNICIPALITY, DR KENNETH KAUNDA DISTRICT
MUNICIPALITY, NORTH-WEST PROVINCE
Short name: MOPANE SOLAR PV 5**

June 2023

Commissioned by: Voltalia South Africa (Pty) Ltd
Document version 1.0 – Draft
Compiled by: A von Well



Proudly Supporting
TOUCHING AFRICA

Prepared by



**PROPOSED RENEWABLE ENERGY GENERATION PROJECT ON
PORTION 2 OF THE FARM ROOIDRAAI 85 IQ, JB MARKS LOCAL
MUNICIPALITY, DR KENNETH KAUNDA DISTRICT MUNICIPALITY,
NORTH-WEST PROVINCE**

Short name: MOPANE SOLAR PV 5

June 2023

PROJECT APPLICANT

Company name: **Voltaia South Africa (Proprietary) Limited**
Contact Person: Mr. Armandt Joubert
Physical Address: 30th Floor, The Box (Atterbury House), 9 Riebeek Street, Cape Town,
8001
Postal Address: 30th Floor, The Box (Atterbury House), 9 Riebeek Street, Cape Town,
8001
Telephone Number: 071 872 7799
E-mail: ajoubert@voltaia.com

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Company Name: AGES Limpopo (Pty) Ltd (Reg: 2006/020831/07)
Contact Persons: Mr. Anton von Well
Physical Address: 120 Marshall Street, Polokwane, 0699, South Africa
Postal Address: P.O. Box 2526, Polokwane, 0700, South Africa
Telephone Number: +27 (82) 872 5258 / +27 0(15) 291 1577
E-mail: avonwell@ages-group.com



A. von Well
Senior Environmental Assessment Practitioner
Registered EAP (EAPASA Ref. 2019/934)

*LIMPOPO PROVINCE: 120 Marshall Street Polokwane 0699, P.O Box 2526 Polokwane 0700
Tel: +27-15-291 1577 Fax: +27 (0) 15 291 1577 www.ages-group.com*

Although AGES Limpopo (Pty) Ltd exercises due care and diligence in rendering services and preparing documents, AGES Limpopo (Pty) Ltd accepts no liability, and the client, by receiving this document, indemnifies AGES Limpopo (Pty) Ltd and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by AGES Limpopo (Pty) Ltd and by the use of the information contained in this document.

This document contains confidential and proprietary information of AGES Limpopo (Pty) Ltd and is protected by copyright in favour of AGES Limpopo (Pty) Ltd and may not be reproduced or used without the written consent of AGES Limpopo (Pty) Ltd, which has been obtained beforehand. This document is prepared exclusively for ***Volitalia South Africa (Pty) Ltd*** and is subject to all confidentiality, copyright and trade secrets, rules, intellectual property law and practices of South Africa.

REPORT DISTRIBUTION LIST

Name	Institution
Mr. Armandt Joubert	Voltalia South Africa (Pty) Ltd
	National Department of Forestry, Fisheries and the Environment (DFFE)
	Department of Water and Sanitation (DWS)
	Department of Agriculture, Land Reform and Rural Development (DALRRD)
	North-West Department of Economic Development, Environment, Conservation and Tourism (DEDECT)
Municipal Manager	Dr Kenneth Kaunda District Municipality
Municipal Manager	JB Marks Local Municipality
	South African Heritage Resources Agency (SAHRA)
	Eskom Land & Rights
	Registered Interested and Affected Parties (I&AP's)

DOCUMENT HISTORY

Report No	Date	Version	Status
14/12/16/3/3/2/2296	June 2023	1.0	Draft

RESOLUTION OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND INVITATION TO COMMENT

Volitalia South Africa (Pty) Ltd has appointed AGES Limpopo (Pty) Ltd as the Environmental Assessment Practitioner (EAP) to undertake the Scoping & Environmental Impact Assessment (EIA) for the Mopane Solar PV 5 Facility. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations, as amended in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

This Draft EIA Report represents the findings of the EIA process and contains the following chapters:

- **Section 1** – Objective of the EIA Process
- **Section 2** – Details of the Environmental Assessment Practitioner (EAP)
- **Section 3** – Location of Activity
- **Section 4** – Plan of the Proposed Activity
- **Section 5** – Scope of the Proposed Activity
- **Section 6** – Legal and Policy Requirements
- **Section 7** – Need/Desirability of the Project
- **Section 8** – Motivation for Preferred Development Footprint in the Preferred Site
- **Section 9** – Consideration of Alternatives
- **Section 10** – Description of the proposed process to identify and rank environmental impacts that the activity, associated structures and infrastructure will impose on the preferred location through the life of the activity
- **Section 11** – Summary and findings and recommendations of specialist reports and how findings have been included in the assessment report
- **Section 12** – Environmental Impact Statement
- **Section 13** – Final Proposed Alternatives Responding to Impact Management Measures, Avoidance and Mitigation Measures Identified in Assessment
- **Section 14** – Aspects which were conditional to the findings of the assessment by the EAP or Specialists which are to be included as conditions of Authorisation
- **Section 15** – Assumptions uncertainties and gaps in knowledge
- **Section 16** – Reasoned opinion for authorisation of activity and conditions in respect of that authorisation
- **Section 17** – Period of Environmental Authorisation and Date of Conclusion of Activity
- **Section 18** – Undertaking Under Oath or Affirmation by the EAP
- **Section 19** - Bibliography

EXECUTIVE SUMMARY

Voltaia South Africa (Pty) Ltd is proposing the development of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure located approximately 7km north-west of Welverdiend along the border between Gauteng and the North-West Province. The proposed development area is located on Portion 2 of the farm Rooidraai 85 IQ, located within JB Marks Local Municipality, Dr Kenneth Kaunda District. **North-West Province.**

The proposed development area is approximately 182 ha and the Photovoltaic (PV) Power Plant, and its connection infrastructure consists of the installation of the following equipment:

- Photovoltaic modules (mono-crystalline, poly-crystalline, mono -or bi-facial modules)
- Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations
- Internal cabling and string boxes
- Medium voltage stations, hosting DC/AC inverters and LV/MV power transformers
- Medium voltage receiving station(s)
- Workshops & warehouses
- One on-site high-voltage substation with high-voltage power transformers, stepping up voltage, and one high-voltage busbar with metering and protection devices (switching station)
- Battery Energy Storage System (BESS) will be located next to the onsite substation.
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Patented Sewage system

Evaluation of the Mopane Solar PV 5 Facility

The chapters of the Draft EIA Report together with the specialist studies contained in the attached Annexures provide a detailed assessment of possible impacts that the proposed Mopane Solar PV 5 facility may have on the environment. This chapter contains the environmental assessment of the solar PV facility by providing a summary of the results and conclusions of the assessment of the project site and development footprint. In so doing, it draws on the information gathered as part of the EIA process, knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the proposed development. This is done to describe the preferred location as identified as a result of the outcomes of specialist assessments conducted.

No environmental fatal flaws or unacceptable impacts were identified by the environmental specialists, provided that recommended mitigation measures are implemented during construction and operational phases. The mitigation measures include, amongst others, the avoidance of sensitive areas in the development footprint. Based on this avoidance, the preferred alternative was identified.

The potential environmental impacts associated with the Mopane Solar PV 5 facility identified and assessed through the EIA Scoping process include, amongst others:

- Impacts on Ecology;
- Impacts on Aquatic Ecology;
- Impacts on Avifauna;
- Visual Impacts;
- Socio-economic Impacts;
- Impacts on Land Use, Soil and Agricultural Potential;
- Impacts on Heritage Resources.

Impacts on Terrestrial Ecology

A Terrestrial Biodiversity Impact Assessment was conducted to describe the ecology present on site, to assess its ecological sensitivity and to indicate the most suitable areas for the proposed development, in order to identify the preferred development site locality. After the site visit the following was concluded:

- Most of the natural grassland and woodland have a Medium Sensitivity and development can be supported provided certain mitigation measures are implemented. Where clearance of the vegetation would cause protected plants or other fauna to be removed, permits should be obtained from relevant authorities.
- The exotic bushclumps have a low sensitivity and unlimited development can be supported in this area.

After the assessment, it was concluded that a detailed terrestrial biodiversity, plant species theme and animal species theme assessment should be conducted, which was conducted during November 2022 to identify specific fauna habitats, and to compare these habitats with habitat preferences of different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid. The seasonal survey was considered as sufficient due to adequate early rains that fell in the area during October and Early November 2022.

An important aspect relating to the proposed development site should be to protect and manage the biodiversity (structure and species composition) of the vegetation types which are represented on the proposed development site. Mitigation measures and monitoring must be implemented should the development be approved.

Impacts on Aquatic Ecology

Since the site survey confirmed that no natural freshwater ecosystems are located within the study or investigation area, and the proposed PV plant poses no significant quantum of risk to any freshwater ecosystems in the area, the study area has been assessed to have a low aquatic biodiversity sensitivity. Accordingly, an Aquatic Biodiversity Compliance Statement has been compiled.

Due to the closest freshwater ecosystem being at a distance of greater than 500 m from the study area, no Zones of Regulation will apply to the study area and proposed PV plant, nor would the property be subject to a Water Use Authorisation in terms of Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998). The proposed PV Power Plant poses no significant quantum of risk to existing freshwater ecosystems in the area and therefore no risk assessment is required in accordance with GN509 of 2016.

Impacts on Avifauna

An Avifaunal Assessment was conducted in order to determine whether the proposed development would have negative impacts on avifauna.

The field survey area covered the entire farm of 800 ha. The assessment included a thorough desktop study which encompassed a wider geographical range than the field survey. The field survey was conducted on 28-30 October 2022.

The desktop analysis recorded 316 species from more than 500 full protocol cards registered during SABAP2 in 12 pentads surrounding the proposed Mopane Solar PV 5 facility. The data revealed that, on average, independent of the month, one can observe ± 202 species. Of these, 164 were confirmed during the point survey count, another 19 species were recorded during incidental recordings within the study period, and a further 70 are likely to occur.

The species richness analysis for the proposed Mopane Solar PV 5 facility would hold ± 186 species based on the species accumulation curve. The species accumulation curve suggested adequate sampling for the proposed area was reached and therefore did not require further sampling. Sampling was conducted at the beginning of the wet season when migrator species had returned. Only two species recorded during the field survey were not recorded here previously, suggesting that the number of species within the area has been saturated and could make accurate conclusions from the desktop analysis.

Grassland Species confirmed include Spike-heeled Lark, Cloud Cisticola, Capped Wheatear, *etc.* The field survey observed endemic/near-endemic species, such as Cape Sparrow, Fiscal Flycatcher, Sabota Lark, *etc.* Twenty threatened or near-threatened species were recorded in the greater region during a desktop survey, and two confirmed during a field survey. Mopane Solar PV 5 development and connecting infrastructure may pose a significant threat regarding habitat loss, collisions, and electrocution.

Assessment of impacts identified by Birdlife SA as significant for PV developments has revealed that most of the impacts fall in the low to moderate-risk category. As most threats to birds and other wildlife posed by PV facilities are poorly understood, the Mopane Solar Parks, if approved, have the potential to provide an ideal platform for monitoring the impact of Solar Parks on the avifaunal communities in grasslands close to wetlands and a river system. Birds in these systems usually stick to them but can occasionally fly between systems, which increases the risk of a negative interaction with the Solar Park. The Solar Park might have a negligible effect on the overall bird community, as more than 38% of the landscape has already undergone some anthropogenic disturbance. The proposed development allows institutions to conduct valuable and relevant research into threats posed to avifauna by PV facilities and how to avoid these threats, especially high-priority species.

The proposed Mopane Solar PV 5 development will generate several environmental impacts on avifauna. Based on the present desktop study, the author's opinion is that the negative avifaunal impacts associated with the proposed Mopane Solar PV 5 can largely be mitigated and that the project may go ahead.

Visual Impacts

Impact on the visual environment during the construction phase is assessed to have a low intensity over a localized area and would occur over the short-term resulting in a low consequence. Probability of the unmitigated impact is moderate resulting in a predicted significance of impact to be LOW. The implementation of mitigation measures would not significantly reduce the anticipated impact, which would remain LOW.

The visual impacts associated with the Mopane Solar PV 5 facility and associated connection infrastructure, are of a nature, scale and duration that will require some mitigation to maintain the impacts at LOW during operational phase. The Project is deemed acceptable from a visual perspective, given a predicted low impact. Impacts associated with construction, operation and decommissioning phases can be mitigated to acceptable levels provided recommended measures are effectively implemented and managed in the long term.

Socio-economic Impacts

Community Services is the largest economic sector, contributing 33% to local gross value added. Sustained growth in this sector is challenged by high public debt levels. Economic growth in this municipality is lower than the national growth rate. Municipal planning documents emphasize the need for higher levels of economic growth and job creation.

The NDP supports the procurement of 20 GW of renewable energy by 2030, which was raised to 24 GW by the updated IRP. This leaves some way to go from the 6.5 GW that is currently procured under REIPPPP. The Provincial Strategic Plan echoes support for and related targets for renewable energy that are contained in the NDP. The first two priority focus areas in the Provincial Strategic Plan include renewable energy development with specific reference to solar PV projects. The Provincial SDF confirms this. It is also confirmed in the IDP of JB Marks Local Municipality. By Dec 2021, North-West Province had 5 renewable energy projects that generate 275 MW with solar PV technology. These projects are in operation, but none of them are in JB Marks Local Municipality. They had an investment value of almost R6.3bn and have created more than 7,400 job years of employment. In addition, three (3) solar PV development proposals were given preferred bidder status in December 2022 under bid window 6.

The assessment is that the socio-economic impact of the proposed Mopane Solar PV 5 project will be positive. Mitigation measures are recommended against institutional, safety and crime risks, particularly during construction. Mitigation measures recommended by specialists should also be implemented.

Impacts on Land Use, Soil and Agricultural Potential

An Agricultural Potential Impact Assessment on soils potential was conducted. A thorough investigation of the soil types of the proposed development site is necessary for an accurate classification of the soils. The main aim of the study was to identify soil types on site and evaluate their specific characteristics to determine the agricultural potential of the soils. The assessment of agricultural potential and land capability of the study area was based on a combination of desktop studies and a site visit for soil sampling, characterization, and also validation of generated information.

The proposed development site shows some variation in terms of soil characteristics and soil types identified during the survey. Classification of soils was based on land type description and Binomial System for South Africa, which classifies soils into forms and families based on diagnostic horizon of the soil profile. Exposed soil profile characteristics created by road cuttings in the field were used to describe local soil forms. Soils were classified into broad classes according to a dominant soil form and family as follows:

- Deep, red apedal soils of the Hutton soil form.
- Shallow, red apedal soils of Hutton/Glenrosa soil form with scattered Mispa soils.

Geological formations and vegetation patterns showed a strong correlation to major soil units mapped in the study area.

Provided that the proposed development and layout plans is consistent with the agro-ecosystem sensitivity map and take all the mitigation measures into consideration, the planned development can be supported.

Impacts on Heritage Resources (archaeology and palaeontology)

Topography of the study area is undulating with no major topographic features (such as pans or shelters) that would have been focal points for human activity in antiquity. Chert outcrops mean that readily available raw material for lithic manufacture resulted in a background scatter of expediently knapped Stone Age artefacts to be present in the area.

During the survey no Earlier Stone Age material was noted and although few diagnostic pieces were recorded in the low-density open-air scatters, the lithics suggest human occupation of the wider area from the MSA onwards.

The project area consists of expansive open fields with dense grass cover that are divided into large grazing camps, mainly used for cattle and horses. These camps are fenced off with low-wire fences and have small gravel roads along the outer edges. Gravel roads resulted in cleared areas in dense grass cover often exposing isolated Stone Age lithics.

The palaeontological sensitivity of the study area is very high, and an independent study was conducted for this aspect (Bamford 2023). The proposed site lies on potentially fossiliferous Malmani Subgroup (Transvaal Supergroup) that could preserve trace fossils such as stromatolites or micro-bialites in dolomites.

A site visit and walk through in December 2022 (summer) by the palaeontologist confirmed that weathered dolomites and cherts were fairly common in the area for solar collectors and substations. NO FOSSILS, such as stromatolites, were seen in dolomite outcrops but a Fossil Chance Find Protocol must be added to the EMPr.

Based on this information it is recommended that no further palaeontological impact assessment is required unless fossils are found by the contractor, developer, environmental officer or other designated responsible person once excavations have commenced.

The impact on heritage resources is low, and the project can commence provided that the recommendations in this report are adhered to, based on the South African Heritage Resource Authority (SAHRA) 's approval.

Noise Impact

A screening report assessed the potential noise impact due to the proposed development of Mopane Solar PV 5 facility. Generally, noises associated with a PV facility relates to:

- Construction activities, though such noises are generally of a short duration and normally only associated with the day-time period (reducing the probability of a noise impact occurring); and
- Operational activities, associated with the limited maintenance activities, a hum from the invertors and transformers in the substations, as well as fan noises from the climate control system of the BESS. Noises from the BESS may take place at night and could be audible up to 500m from a BESS at night.

Considering the distance of potential noise sources from (Noise Sensitive Receptors), the temporary nature of construction noise impacts as well as the low magnitude of operational noises, the development of the Mopane Solar PV 5 facility is unlikely to influence ambient sound levels. No further Scoping or other acoustical studies would be required for the proposed development of the Mopane Solar PV 5 facility, and it is recommended that the project be authorised (in terms of acoustics).

Recommendations

Ecological Impacts

- On site biodiversity should be protected and managed.
- Vegetation removal should be kept to a minimum during the construction phase of the development and only vegetation on footprint areas may be removed.
- Mitigation measures and monitoring must be implemented should the development be approved.

Aquatic Ecological Impacts

The proposed PV plant poses no significant quantum of risk to any freshwater ecosystems in the area, the study area has been assessed to have a low aquatic biodiversity sensitivity. Due to the closest freshwater ecosystem being at a distance greater than 500 m from the study area, no Zones of Regulation will apply to the study area and proposed PV plant.

Avifauna Impacts

The assessment of impacts identified by Birdlife SA as significant for PV developments has revealed that most of these impacts fall within the low to moderate-risk category. As most threats to birds and other wildlife posed by PV facilities are poorly understood, the Mopane Solar Parks, if endorsed, have the potential to provide a platform for monitoring impacts of Solar Parks on avifaunal communities in grasslands near wetlands and rivers.

The proposed Mopane Solar PV 5 development will generate several environmental impacts on avifauna. Based on the present the author's opinion is that the negative avifaunal impacts associated with the proposed Mopane Solar PV 5 can largely be mitigated and that the project may be approved from an avifaunal perspective.

- Mitigation measures proposed by the avifauna specialist must be adhered to and implemented.
- The proposed project must be made available for studies and monitoring order to better understand threats to birds and other wildlife posed by PV facilities which are currently poorly understood. This project has the potential to provide an ideal platform for monitoring the impact of Solar Parks on the avifaunal communities in grasslands close to wetlands and a river system.

Visual Impacts

Mopane Solar PV facility 5 and associated connection infrastructure, are of a nature, scale and duration that will require some mitigation to maintain impacts at MODERATE during the operational phase.

The impacts associated with the construction, operation and decommissioning phases can be somewhat mitigated to acceptable levels, but the recommended measures must be effectively implemented and managed in the long term.

Socio-economic Impacts

The socio-economic impact assessment concluded that the socio-economic impact of the proposed Mopane Solar PV 5 project will be positive.

- Mitigation measures are recommended against institutional, safety and crime risks, particularly during construction.
- Mitigation measures recommended by other specialists must be implemented.

Impacts on Land Use, Soil and Agricultural Potential

- The proposed development and layout plans must be consistent with the agro-ecosystem sensitivity map.
- All the mitigation measures indicated in the agricultural potential report must be taken into consideration.

Archaeological and palaeontological Impacts

- Regular monitoring of the development footprint by the ECO to implement Chance Find Procedure for heritage and palaeontology resources in case heritage resources are uncovered during the course of construction;
- Any changes to the layout is subject to a heritage walkdown prior to development.
- Recommendations in the archaeological impact report must be adhered to.
- Approval must be obtained from SA Heritage Resource Authority (SAHRA).
- Fossil Chance Find Protocol must be added to the EMPr.
- No further palaeontological impact assessment is required unless fossils are found once excavations have commenced.

Noise Impact

Considering the distance of potential noise sources from (Noise Sensitive Receptors), the temporary nature of construction noise impacts as well as the low magnitude of operational noises, the development of the Mopane Solar PV 5 facility is unlikely to influence ambient sound levels at the NSR in the vicinity of the project site.

- It is the opinion of the author that no further Scoping or other acoustical studies would be required for the proposed development of the Mopane Solar PV 5 facility, and it is recommended that the project be authorised (in terms of acoustics).

Table of Contents

1	OBJECTIVE OF THE EIA PROCESS.....	1
2	DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP).....	2
3	LOCATION OF ACTIVITY.....	2
3.1	SURVEYOR GENERAL 21 DIGIT CODES OF DEVELOPMENT AREAS.....	2
3.2	PHYSICAL ADDRESS AND FARM NAME.....	2
4	PLAN OF THE PROPOSED ACTIVITY.....	4
5	SCOPE OF THE PROPOSED ACTIVITY.....	6
5.1	LISTED ACTIVITIES TRIGGERED IN TERMS OF NEMA.....	6
5.2	DESCRIPTION OF ASSOCIATED STRUCTURES AND INFRASTRUCTURE RELATED TO THE DEVELOPMENT.....	7
5.3	LAYOUT OF INFRASTRUCTURE AND STRUCTURES ON SITE.....	7
5.4	TECHNICAL DETAILS OF THE PROPOSED FACILITY.....	9
5.5	PRIMARY COMPONENTS.....	11
5.5.1	<i>PROJECT FUNCTIONING.....</i>	<i>11</i>
5.5.2	<i>BATTERY ENERGY STORAGE SYSTEM (BESS).....</i>	<i>13</i>
5.5.3	<i>ACCESS ROAD AND INTERNAL ROADS.....</i>	<i>14</i>
5.5.4	<i>TRAFFIC IMPACT OF THE PROPOSED DEVELOPMENT.....</i>	<i>15</i>
5.5.4.1	Traffic Impact – Construction Phase.....	15
5.5.4.2	Traffic Impact – Operation Phase.....	16
5.5.5	<i>LIGHTING SYSTEM.....</i>	<i>16</i>
5.5.6	<i>STORMWATER COLLECTION SYSTEM.....</i>	<i>16</i>
5.5.7	<i>Water requirements.....</i>	<i>17</i>
5.5.8	<i>SEWERAGE.....</i>	<i>19</i>
5.5.9	<i>REFUSE REMOVAL.....</i>	<i>20</i>
5.6	TEMPORARY CONSTRUCTION CAMP.....	20
5.6.1	<i>Phase I.....</i>	<i>21</i>
5.6.2	<i>Phase II.....</i>	<i>21</i>
5.6.3	<i>Phase III.....</i>	<i>21</i>
5.6.4	<i>Phase IV.....</i>	<i>22</i>
5.6.5	<i>Earthworks.....</i>	<i>22</i>
6	LEGAL AND POLICY REQUIREMENTS.....	24
6.1	REGULATORY AUTHORITIES.....	24
6.1.1	<i>NATIONAL AUTHORITIES.....</i>	<i>24</i>
6.1.2	<i>PROVINCIAL AUTHORITIES.....</i>	<i>25</i>
6.1.3	<i>LOCAL AUTHORITIES.....</i>	<i>25</i>
6.2	LEGISLATION, REGULATIONS AND GUIDELINES.....	26
7	NEED/DESIRABILITY OF THE PROJECT.....	32
7.1	FUTURE NEED AND DESIRABILITY.....	33
8	MOTIVATION FOR PREFERRED DEVELOPMENT FOOTPRINT IN THE PREFERRED SITE.....	34
8.1	THE CHOICE OF THE NORTH-WEST PROVINCE AND SITE LOCATION.....	34
9	CONSIDERATION OF ALTERNATIVES.....	35
9.1	DETAILS OF ALTERNATIVES CONSIDERED.....	35
9.1.1	<i>PROJECT ALTERNATIVES AND LAYOUT.....</i>	<i>35</i>
9.1.2	<i>SITE ALTERNATIVES.....</i>	<i>36</i>

9.1.3	ACTIVITY ALTERNATIVES.....	37
9.1.4	TECHNOLOGY ALTERNATIVES.....	37
9.1.5	NO-GO ALTERNATIVE	39
9.2	DETAILS OF PUBLIC PARTICIPATION PROCESS UNDERTAKEN.....	40
9.3	SUMMARY OF ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES	42
9.4	ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROPOSED PV SOLAR PARK.....	44
9.4.1	PROPERTY DESCRIPTION AND CURRENT LAND USE.....	44
9.4.2	ENVIRONMENTAL FEATURES.....	44
9.4.3	WIND AND SOLAR DEVELOPMENTS WITH ENVIRONMENTAL AUTHORISATION OR APPLICATIONS UNDER CONSIDERATION WITHIN 30 KM OF THE PROPOSED AREA.....	46
9.4.4	CLIMATE	46
9.4.5	TOPOGRAPHY AND DRAINAGE.....	46
9.4.6	SOILS AND GEOLOGY.....	47
9.4.7	Regional Geological Setting.....	48
9.4.7.1	Stratigraphy.....	48
9.4.7.2	Structural geology.....	48
9.4.7.3	Status w.r.t. dolomite land.....	49
9.4.7.4	Undermining	49
9.4.8	ECOLOGY (FAUNA & FLORA)	49
9.4.8.1	Vegetation Types.....	49
9.4.8.2	Red Data Species	52
9.4.8.3	Protected Species (North-West Nature Conservation Ordinance)	53
9.4.8.4	Protected Trees Species (NFA).....	53
9.4.8.5	Alien Invasive Species	53
9.4.8.6	Conclusions	53
9.4.8.7	Fauna.....	55
9.4.8.8	Summary and results of the Terrestrial Biodiversity Impact Assessment	58
9.4.9	Aquatic Ecology	60
9.4.10	AVIFAUNA	60
9.4.11	VISUAL	62
9.4.12	SOCIO-ECONOMIC ENVIRONMENT	63
9.4.13	AGRICULTURAL POTENTIAL.....	64
9.4.13.1	Deep, red apedal soils of the Hutton soil form.....	64
9.4.13.2	Shallowish, red apedal soils of the Hutton / Glenrosa soil form.....	65
9.4.13.3	Impacts on the agricultural capability.....	65
9.4.14	CULTURAL AND HERITAGE RESOURCES.....	67
9.4.15	PALAEONTOLOGICAL RESOURCES.....	68
9.4.16	TRAFFIC IMPACT ASSESSMENT.....	69
9.4.17	RADIO FREQUENCY INTERFERENCE	70
9.4.18	Noise Impacts.....	71
9.4.19	AVIATION IMPACT ASSESSMENT.....	72
9.4.20	STORMWATER MANAGEMENT PLAN.....	73
9.5	IMPACTS AND RISKS IDENTIFIED	76
9.5.1	DEGREE TO WHICH THE IMPACTS CAN BE REVERSED	80
9.5.2	DEGREE TO WHICH IMPACTS MAY CAUSE IRREPLACEBLE LOSS OF RESOURCES	80
9.5.3	DEGREE TO WHICH IMPACTS CAN BE AVOIDED, MANAGED OR MITIGATED.....	80
9.6	HIGH LEVEL RISK ASSESSMENT FOR BESS TECHNOLOGY.....	80
9.7	METHODOLOGY USED FOR THE ASSESSMENT OF SIGNIFICANCE OF IMPACTS	86
9.8	ASSESSMENT CRITERIA	88
9.9	POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY	90
9.10	POSSIBLE MITIGATION MEASURES AND RESIDUAL RISK.....	90
9.11	CONCLUDING STATEMENT INDICATING PREFERRED ALTERNATIVE AND ACTIVITY LOCATION.....	90

10	DESCRIPTION OF THE PROPOSED PROCESS TO IDENTIFY AND RANK ENVIRONMENTAL IMPACTS THAT THE ACTIVITY, ASSOCIATED STRUCTURES AND INFRASTRUCTURE WILL IMPOSE ON THE PREFERRED LOCATION THROUGH THE LIFE OF THE ACTIVITY	91
10.1	DESCRIPTION OF ENVIRONMENTAL ISSUES AND RISKS IDENTIFIED DURING THE EIA PROCESS	91
10.2	ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS AND RISKS	92
10.2.1	<i>DEGREE TO WHICH IMPACT CAN CAUSE IRREPLACEABLE LOSS OF RESOURCE</i>	<i>92</i>
10.2.2	<i>DEGREE TO WHICH IMPACT CAN BE MITIGATED</i>	<i>92</i>
10.3	IMPACTS & MITIGATION MEASURES OF CONSTRUCTION PHASE	92
10.3.1	<i>ATMOSPHERIC POLLUTION AND NOISE</i>	<i>93</i>
10.3.2	<i>LAND AND SOILS</i>	<i>97</i>
10.3.3	<i>GROUNDWATER AND SURFACE WATER POLLUTION</i>	<i>104</i>
10.3.4	<i>WATER USE / WATER QUANTITY</i>	<i>110</i>
10.3.5	<i>ARCHAEOLOGICAL, CULTURAL AND SOCIAL FEATURES</i>	<i>113</i>
10.3.6	<i>IMPACT OF THE DEVELOPMENT ON ECOLOGY (FAUNA & FLORA) OF THE AREA</i>	<i>117</i>
10.3.7	<i>VISUAL IMPACTS</i>	<i>126</i>
10.3.8	<i>SAFETY, HEALTH, SECURITY AND FIRE HAZARDS</i>	<i>128</i>
10.3.9	<i>TRAFFIC AND ROAD SAFETY</i>	<i>132</i>
10.3.10	<i>SOCIO-ECONOMIC IMPACT</i>	<i>134</i>
11	ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS	138
11.1	CUMULATIVE IMPACTS ON THE ECOLOGY (FAUNA & FLORA)	140
11.2	CUMULATIVE IMPACTS ON AQUATIC ECOLOGY	141
11.3	CUMULATIVE IMPACTS ON AVIFAUNA	142
11.4	CUMULATIVE IMPACTS ON LAND USE, SOIL AND AGRICULTURAL POTENTIAL	143
11.5	CUMULATIVE IMPACTS ON HERITAGE (INCLUDING ARCHAEOLOGY, PALAEOLOGY AND CULTURAL LANDSCAPE)	144
11.6	CUMULATIVE VISUAL IMPACTS	144
11.7	CUMULATIVE SOCIO-ECONOMIC IMPACTS	146
11.8	CUMULATIVE TRAFFIC IMPACTS	147
11.9	CONCLUSION REGARDING CUMULATIVE IMPACTS	148
12	SUMMARY AND FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS AND HOW FINDINGS HAVE BEEN INCLUDED IN THE ASSESSMENT REPORT	150
13	ENVIRONMENTAL IMPACT STATEMENT	156
13.1	SUMMARY KEY FINDINGS OF THE EIA	156
14	FINAL PROPOSED ALTERNATIVES RESPONDING TO IMPACT MANAGEMENT MEASURES, AVOIDANCE AND MITIGATION MEASURES IDENTIFIED IN ASSESSMENT	156
15	ASPECTS WHICH WERE CONDITIONAL TO THE FINDINGS OF THE ASSESSMENT BY THE EAP OR SPECIALISTS WHICH ARE TO BE INCLUDED AS CONDITIONS OF AUTHORISATION	156
16	ASSUMPTIONS UNCERTAINTIES AND GAPS IN KNOWLEDGE	157
17	REASONED OPINION FOR AUTHORISATION OF ACTIVITY AND CONDITIONS IN RESPECT OF THAT AUTHORISATION	157
18	PERIOD OF ENVIRONMENTAL AUTHORISATION AND DATE OF CONCLUSION OF ACTIVITY	158
19	UNDERTAKING UNDER OATH OR AFFIRMATION BY THE EAP	159
20	BIBLIOGRAPHY	160

List of Figures

FIGURE 1. REGIONAL LOCALITY MAP	4
FIGURE 2. TOPOGRAPHICAL MAP	5
FIGURE 3. PROPOSED DRAFT LAYOUT PLAN OF THE MOPANE SOLAR PV 5.....	10
FIGURE 4. FRONT VIEWS OF THE PV ARRAYS MOUNTED ON HORIZONTAL 1-AXIS TRACKER.....	12
FIGURE 5. BATTERY ENERGY STORAGE SYSTEM (BESS)	14
FIGURE 6. SOIL FORM MAP.....	48
FIGURE 7. VEGETATION UNIT MAP OF THE PROPOSED DEVELOPMENT AREA (FROM BIODIVERSITY REPORT).....	51
FIGURE 8. SENSITIVITY MAP	54
FIGURE 10. INDICATION OF THE COMBINED VISUAL EFFECT OF ALL PHASES OF THE PROJECT	145

List of Tables

TABLE 1. LISTED ACTIVITIES I.T.O. EIA REGULATIONS 2014 TRIGGERED BY THE PROPOSED DEVELOPMENT.....	6
TABLE 2. TECHNICAL DETAILS OF THE PROPOSED FACILITY	9
TABLE 3. CONSTRUCTION TIMEFRAME: AVERAGE DAILY TRIPS OF MEDIUM AND HEAVY VEHICLES (*).....	15
TABLE 4. WATER CONSUMPTION DURING THE CONSTRUCTION PHASE OF THE PROJECT	18
TABLE 5. WATER CONSUMPTION DURING THE OPERATIONAL PHASE OF THE PROJECT.....	19
TABLE 6. REVIEW OF RELEVANT LEGISLATION	26
TABLE 7. SITE LOCATION AND PROPERTY DETAILS	44
TABLE 8. ENVIRONMENTAL SCREENING TOOL TABLE	44
TABLE 9. LAND TYPES, GEOLOGY, AND DOMINANT SOIL TYPES OF THE PROPOSED DEVELOPMENT SITE	47
TABLE 10. DECLARED WEEDS AND INVADER PLANTS OF THE STUDY AREA.	53
TABLE 11. RED DATA LIST OF POTENTIAL FAUNA FOR THE STUDY AREA	56
TABLE 12. MOPANE SOLAR PV 5 EIA PROJECT HERITAGE SITES LOCATIONS	67
TABLE 13. IMPACT ASSESSMENT CRITERIA	88
TABLE 14. SUMMARY OF THE CUMULATIVE IMPACT SIGNIFICANCE FOR THE MOPANE SOLAR PV 5 FACILITY WITHIN THE PROJECT SITE	149

LIST OF ANNEXURES

Annexure A – Site Sensitivity Verification Report

Annexure B – Layout and technical drawings of the PV Power Plant

Annexure C – General Photos of the project site

Annexure D – Comments & Responses Report

Annexure E – Terrestrial Biodiversity Impact Assessment

Annexure F – Avifaunal Assessment

Annexure G – Aquatic Assessment and statement

Annexure H – Archaeological Impact Assessment

Annexure I – Palaeontological Impact Assessment

Annexure J – Preliminary Geotechnical Investigation

Annexure K – Visual Impact Assessment

Annexure L – Agro-Ecosystem Specialist Report

Annexure M – Traffic Impact Assessment Report

Annexure N – Civil Aviation Impact Assessment

Annexure O – Radio Frequency Interference (RFI) Assessment

Annexure P – Socio-Economic Assessment

Annexure Q – Noise Compliance Statement

Annexure R – Fire Management Plan

Annexure S1 – Environmental Management Programme (EMPr)

Annexure S2 – EMPr – Generic – Powerline

Annexure S3 – EMPr – Generic - Substation

Annexure T – Screening Report

Annexure U – Curriculum Vitae (EAP)

ABBREVIATIONS AND ACRONYMS

AGES	Africa Geo-Environmental and Engineering Services (Pty) Ltd
BID	Background Information Document
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CSP	Concentrating Solar Power
DALRRD	Department of Agriculture, Land Reform and Rural Development
DFFE	National Department of Forestry, Fisheries and the Environment
DMR	Department of Mineral Resources
DME	Department of Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environment Impact Assessment Report
EMPr	Environmental Management Programme
ESS	Environmental Scoping Study
GHG	Green House Gases
GIS	Geographic Information Systems
GN	Government Notice
GWh	Giga Watt hour
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IPP	Independent Power Producer
kV	kilovolt
MW	Mega Watt
MWp	Mega Watt peak
NEMA	National Environmental Management Act - Act no. 107 of 1998
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act - Act no. 25 of 1999
NWA	National Water Act - Act no. 36 of 1998
PoS	Plan of Study
Property / Project site	Portion 2 of the Farm Rooidraai 85 IQ (JB Marks Local Municipality, DR Kenneth Kaunda District Municipality, North-West Province)
PV	Photovoltaic
RFP	Request for Qualification and Proposals for New Generation Capacity under the IPP Procurement Programme
REIPPPP	Renewable Energy IPP Procurement Programme
RMIPPPP	Risk Mitigation IPP Procurement Programme
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
UPS	Uninterruptible Power Supply
Voltalia South Africa	Voltalia South Africa (Pty) Ltd (Applicant)

1 OBJECTIVE OF THE EIA PROCESS

According to Regulation No R 326 of 7 April 2017, of the EIA Regulations, 2014, as amended, the objective of the EIA process is to, through a process of consultation:

- a. Identify the policies and legislation relevant to the study and how the study complies with the policies and legislation.
- b. Motivate the need and desirability of the proposed activity including the need and desirability of the activity in the context of the preferred location.
- c. Identify the location of the development footprint within the preferred site, based on an impact assessment and risk ranking process which includes cumulative impacts and a ranking process of all the identified alternatives focussing on the geographical, physical, biological, social, economic and cultural aspects of the environment.
- d. Determine the
 - a. Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform preferred alternatives; and
 - b. Degree to which these impacts
 - i. Can be reversed;
 - ii. May cause irreplaceable loss of resources, and
 - iii. can be avoided, managed or mitigated.
- e. Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment.
- f. Identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity.
- g. Identify suitable measures to avoid, manage or mitigate identified impacts.
- h. Identify risks that need to be managed and monitored.

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Name of EAP: AGES – Anton von Well

Contact details of EAP:

Physical Address: 120 Marshall Street,
Polokwane, 0699

Telephone number: 015 291 1577

Fax number: 015 291 1577

Expertise of EAP: The EAP is registered as an Environmental Assessment Practitioner at EAPASA and has 23 years of experience with management and conducting of EIA's. Curriculum Vitae of EAP is included in Annexure U.

3 LOCATION OF ACTIVITY

3.1 SURVEYOR GENERAL 21 DIGIT CODES OF DEVELOPMENT AREAS

Site location - Surveyor-general 21-digit site code:

T	0	I	Q	0	0	0	0	0	0	0	0	0	8	5	0	0	0	0	2
1	2		3			4					5								

3.2 PHYSICAL ADDRESS AND FARM NAME

VOLTALIA SOUTH AFRICA (PTY) LTD is proposing the establishment of a **renewable energy generation facility (Photovoltaic Power Plant)** with associated infrastructure and structures on:

- **Portion 2 of the Farm ROOIDRAAI 85 IQ**

located within the **JB Marks Local Municipality, DR Kenneth Kaunda District Municipality, North-West Province.**

The renewable energy generation facility will be a **Photovoltaic (PV) Power Plant** with a **maximum generation capacity up to 120 MW** at the point of connection (**Export Capacity**).

The name of the facility will be **MOPANE SOLAR PV 4.**

The **footprint (fenced area)** of the proposed development is approximately **182 ha in extent.**

The corner co-ordinates of the proposed Mopane Solar PV 5 include the following:

S 26° 22' 33.3" E 27° 09' 01.1"

S 26° 22' 41.6" E 27° 09' 06.6"

S 26° 23' 11.3" E 27° 09' 08.7"

S 26° 22' 56.3" E 27° 10' 07.4"

S 26° 22' 21.6" E 27° 10' 07.0"

Access to Mopane Solar PV 5 will be from both the D859 (Preferred) and R501 (alternative).

In order to develop the facility, Voltalia South Africa (Pty) Ltd must undertake an Environmental Impact Assessment (EIA) process and acquire environmental authorisation from the *National Department of Forestry, Fisheries and the Environment (DFFE)*, in consultation with the *North West Department of Economic Development, Environment, Conservation and Tourism (DEDECT)*, in terms of the EIA Regulations, 2014 published on 4 December 2014, as amended under section 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

Voltalia South Africa (Pty) Ltd is the applicant for the Mopane Solar PV 5 (the proposed project) which will be connected to the Eskom **Carmel Substation (MTS)** which is located approximately 16,4 km south-east of the project site.

The powerline (for the Eskom grid connection) from the proposed PV Solar Park to the substation **does not form part** of this application. But the 132kV on-site powerline to the collector substation is included in this application.

With the aim of identifying and assessing all potential environmental impacts related to the development as well as suggesting possible mitigation measures and alternatives, AGES has appointed specialist sub-consultants to compile detailed reports and to study the activities necessary for the assessment of the specific impacts related to their field of expertise.

AGES and the other specialist consultants are in a position of independency from Voltalia South Africa (Pty) Ltd and not subsidiaries or affiliated to the latter. AGES and the specialist consultants have no secondary interest connected with the development of this project or of other projects which may originate from the authorization of the project.

The characteristics, technology and extent of Mopane Solar PV 5 is defined and evaluated in the EIA Report and its annexures.

4 PLAN OF THE PROPOSED ACTIVITY



Figure 1. Regional Locality Map



Figure 2. Topographical Map

5 SCOPE OF THE PROPOSED ACTIVITY

5.1 LISTED ACTIVITIES TRIGGERED IN TERMS OF NEMA

The listed activities in terms of sections 24 and 24D of NEMA, included in **Listing Notices 1, 2 & 3 of the EIA Regulations, 2014, as amended**, identified for the proposed development, are detailed in table below.

Table 1. Listed Activities i.t.o. EIA Regulations 2014 triggered by the proposed development.

<p>GN R.327 Item 11 (i) The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.</p>	<p>A 132 kV powerline will of 2,8 km will be constructed from the onsite substation to the collector substation which is also located on Portion 12 of the farm Blaauwbank 125 IQ.</p>
<p>GN R.327, Item 24 (ii) The development of - (ii) a road with a reserve wider than 13,5m, or where no reserve exists where the road is wider than 8m.</p>	<p>Access to Mopane Solar PV 5 will be from D859 and R501. During construction, the access road will be wider than 8 m to allow the transportation of abnormal goods (e.g. power transformers, turbines).</p>
<p>GN R.327, Item 28 Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.</p>	<p>The construction of the Mopane Solar PV 5 facility will require clearance of indigenous, where the total area to be transformed (footprint of the plant) will be up to 182 ha.</p>
<p>GN R.325 Item 1 The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs within an urban area.</p>	<p>The Mopane Solar PV 5 facility consisting of the construction, operation and maintenance of a Photovoltaic (PV) Power Plant with a maximum generation capacity up to 120 MW. The proposed substation will be located on Portion 2 of the farm Rooidraai 85 IQ.</p>
<p>GN R.325 Item 15 The clearance of an area of 20 ha or more of indigenous vegetation</p>	<p>The construction of the Mopane Solar PV 5 facility will require clearance of indigenous, where the total area to be transformed (footprint of the plant) will be up to 182 ha. The required footprint should be cleared from the existing vegetation.</p>
<p>GN R.324 Item 12(h)iv The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p>	<p>The construction of the Mopane Solar PV 5 facility will require clearance of indigenous, where the total area to be transformed (footprint of the plant) will be up to 182 ha in a critical biodiversity area in North-West province.</p>

There are layout and site plans included in Annexure B, which are based on results of the Environmental Screening Tool as well as inputs and recommendations from specialists. It was subject to a public participation process and thus far, no comments were received which led to a change in the site layout plans from the Scoping Report to the Draft EIA Report. However, the Draft EIA Report will be made available for comments and the site layout plans will be finalized thereafter in the Final EIA Report. All information acquired was analysed in order to determine the proposed development layout and site plans. Such approach ensures a holistic view of future requirements of the site and that resources are utilised to their full availability in terms of social and environmental sustainability.

5.2 DESCRIPTION OF ASSOCIATED STRUCTURES AND INFRASTRUCTURE RELATED TO THE DEVELOPMENT

The project envisages the establishment of a solar power plant with a maximum generation capacity at the delivery point (Maximum Export Capacity) of up to 120MW.

The construction timeframe is estimated to be 15 months.

The preferred technical solutions entail:

- **mono/polycrystalline PV modules, mono or bi-facial.**
- **fixed mounting systems or horizontal 1-axis trackers.**

The energy generated by the Mopane Solar PV 5 will reduce the quantity of pollutants and greenhouse gases emitted into the atmosphere. The reduced amount of CO₂ will be the emissions that would have been generated by a thermal power plant using fossil fuels for producing the same quantity of energy that produced by the Mopane Solar PV 5.

The detailed description of the characteristic and functioning of the PV plant and its connection is given in the following paragraphs.

5.3 LAYOUT OF INFRASTRUCTURE AND STRUCTURES ON SITE

The layout of the proposed development is the result of a comparative study of various layout alternatives and had been defined in consideration of the results of some specialist studies conducted during this EIA phase.

The PV plant is designed and conceived in order to minimize visual and noise impacts, as well as to operate safely and assuring a high level of reliability, with low water consumption and the need only for easy and quick maintenance and repair for approximately 30 years.

The footprint (fenced area) of the Mopane Solar PV 5 will be up to 182 ha.

The main drives of the proposed layout are:

- to maximize the energy production and the reliability of the PV plant, by choosing proven solar technologies; mono or bi-facial mono/polycrystalline solar modules mounted on single-axis horizontal trackers (SAT) or on fixed mounting systems.
- to avoid and/or restrict encroachment on Critical Biodiversity Areas (CBAs).

The proposed layout plan (attached as Annexure B and also shown in Figure 3 below) was drawn using PV modules mounted on trackers. In the case of PV modules mounted on fixed mounting systems, the layout plans will not change, except for the orientation of the PV arrays: East-West instead of North-South.

The required footprint - corresponding on the fenced area - will be up to 182 ha, and the maximum height of the structures (PV modules and support frames) will be approximately 4.5m above the ground level.

Herewith the co-ordinates and size of the proposed development:

Solar Field

S 26° 22' 33.3" E 27° 09' 01.1"

S 26° 22' 41.6" E 27° 09' 06.6"

S 26° 23' 11.3" E 27° 09' 08.7"

S 26° 22' 56.3" E 27° 10' 07.4"

S 26° 22' 21.6" E 27° 10' 07.0"

182 ha

Substation

S 26° 22' 35.6" E 27° 10' 02.6"

S 26° 22' 38.5" E 27° 10' 02.7"

S 26° 22' 38.5" E 27° 10' 06.7"

S 26° 22' 35.6" E 27° 10' 06.8"

1 ha

Battery Energy Storage System (BESS)

S 26° 22' 38.7" E 27° 10' 03.6"

S 26° 22' 40.6" E 27° 10' 03.6"

S 26° 22' 40.6" E 27° 10' 06.7"

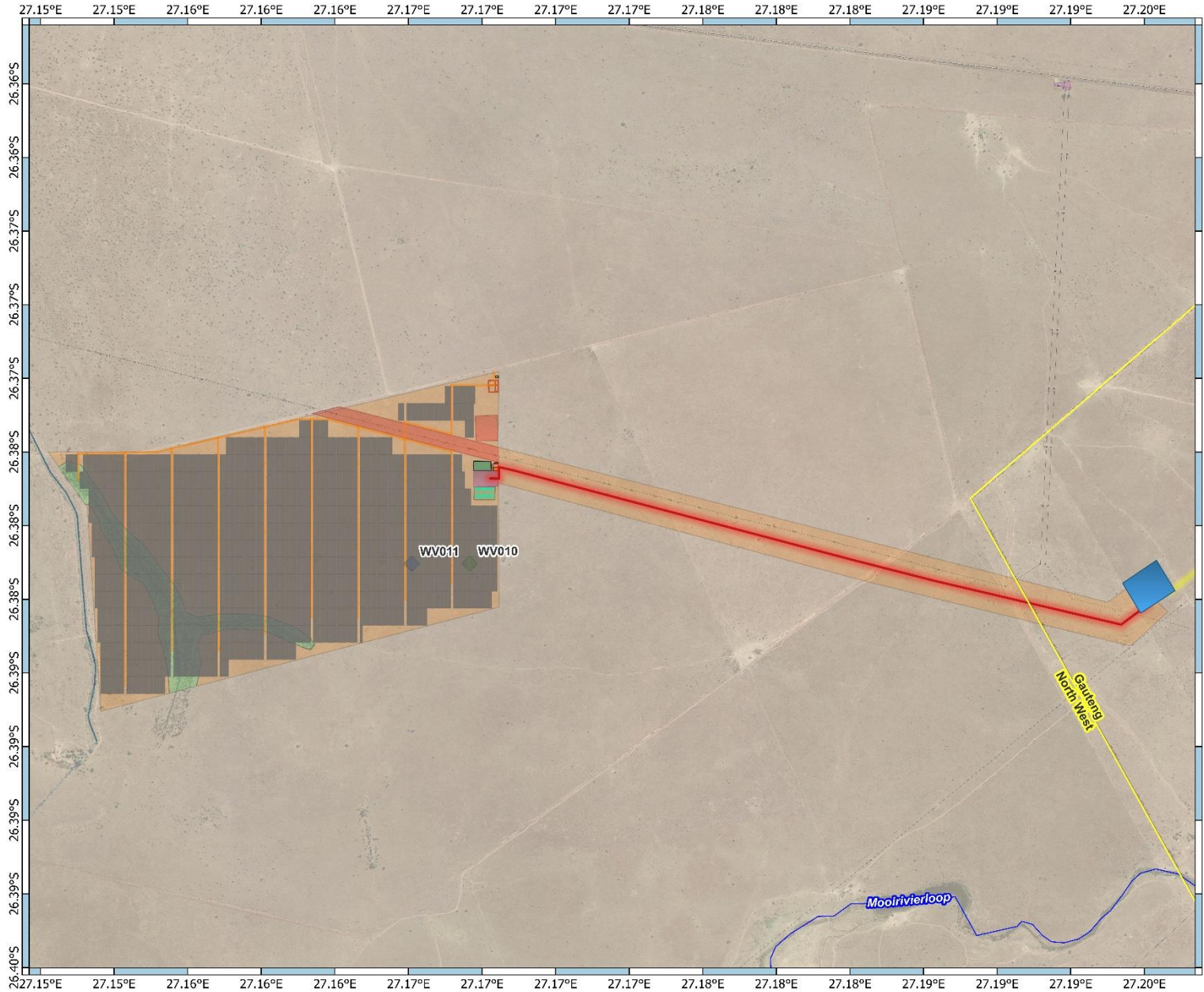
S 26° 22' 38.6" E 27° 10' 06.7"

0.5 ha

5.4 TECHNICAL DETAILS OF THE PROPOSED FACILITY

Table 2. Technical Details of the proposed facility

Infrastructure	Footprint and Dimensions
Development area	Approx. 182 ha. The PV structures will occupy the majority of the area, with supporting infrastructure such as internal roads, auxiliary buildings (1ha) and an onsite substation (1ha) occupying the remaining extent.
Capacity	Minimum of 120MWac.
Number of Panels	± 189 544
Structures	Single axis tracking will be used. Structures will be approximately 3.5m in height, while centralised inverter stations will be approximately 3m in height, or alternatively string inverters will be mounted approximately 0.3m above ground.
Operations and Maintenance (O&M) building footprint:	Located in close proximity to the collector substation. Septic tanks with portable toilets. Typical areas include: Operations building – 20m x 10m = 200m ² Workshop – 15m x 10m = 150m ² Stores - 15m x 10m = 150m ²
Construction camp laydown	Typical area 100m x 50m = 5000m ² . Sewage: Septic tanks and portable toilets.
Temporary laydown or staging area:	Typical area 220m x 100m = 22000m ² .
Internal Roads:	Width of internal road – Between 5m and 6m. Length of internal road TBC.
Cables:	The medium voltage collector system will comprise of cables up to and include 33kV that run underground, except where a technical assessment suggest that overhead lines are required, in the facility connecting the panel and inverters to the onsite substation.
Battery energy storage system (BESS):	A Battery Energy Storage System (BESS) will be located next to the onsite substation. The storage capacity and type of technology would be determined at a later stage during the development phase, but will most likely comprise an array of containers, outdoor cabinets and/or storage tanks.
Eskom substation and powerline	A 132kV powerline will be constructed on-site for the connection of the on-site substation to the collector substation and is included in this EA application. But for the Eskom grid connection it is proposed that the solar PV facility will connect to the Carmel MTS, through a powerline up to 275kV from the collector substation. The powerline will be approximately 16.4km in length and this is applied for in a separate EA application.



Site Layout over Sensitivity Map

Mopane Solar PV 5

Gauteng- & North West Province

Site Specific Data

- Collector Substation
- PV 3 - Internal Powerlines

Mopane SP PV 5

- PV Panels
- Roads
- Restricted Area
- Phase 5
- Construction Laydown Area
- Guard House
- O&M Control Room
- On site Substation
- Permanent Laydown Area
- Septic Tank
- Substation Control Room
- Water Treatment Plant

Battery Infrastructure

- Battery area
- Battery Container
- Power Conversion System

Sensitivity Mopane 5

- Low Sensitivity - Degraded / Modified Land
- Medium Sensitivity - Indigenous grassland / woodland with widespread status

Heritage Sites

- ◆ Medium Significance
- ◆ Low Significance

Hydrology

- Secondary Rivers

AGES Limpopo (Pty) Ltd
120 Marshall Street
Polokwane, 0699
+27 15 291 1577

Map Composed by:
D. van der Walt
Projection: WGS 84
2023-06-08

Figure 3. Proposed Draft Layout Plan of the Mopane Solar PV 5

5.5 PRIMARY COMPONENTS

The proposed development (the Photovoltaic (PV) Power Plant and its connection infrastructure) consists of the installation of the following equipment:

- Photovoltaic modules (mono-crystalline, poly-crystalline, mono or bi-facial modules)
- Mounting systems for the PV arrays (single-axis horizontal trackers or fixed structures) and related foundations
- Internal cabling and string boxes
- Medium voltage stations, hosting DC/AC inverters and LV/MV power transformers
- Medium voltage receiving station(s)
- Workshops & warehouses
- One on-site high-voltage substation with high-voltage power transformers, stepping up voltage, and one high-voltage busbar with metering and protection devices.
- On-site 132kV powerline to collector substation, approximately 2.8 km long. (For the grid connection a 275kV power line, approximately 16,4 km long, will connect the collector substation to the Eskom Carmel Substation. However, this is a separate application.)
- Battery Energy Storage System (BESS).
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities

The powerline to ensure an Eskom connection will consist of monopole structures up to 18m in height, positioned 200m between each pole, with a 30m servitude to accommodate sufficient space for the powerline.

5.5.1 PROJECT FUNCTIONING

Solar energy facilities using PV technology convert sun energy to generate electricity through a process called Photovoltaic Effect, which consists of the generation of electrons by photons of sunlight in order to create electrical energy.

The preferred technical solutions are:

- Mono / bi-facial mono / polycrystalline modules, mounted on:
- fixed mounting systems or mounted on horizontal 1-axis trackers, which represent the best performing options in terms of reliability and costs/efficiency.

The final choice of the type of solar modules (mono-crystalline or polycrystalline, mono or bi-facial) and mounting system (fixed or tracker) can be taken at the time of the commission date, on the basis of the availability of PV modules and mounting systems, of the worldwide market and of the cost-efficiency curve.

The required footprint - corresponding to the fenced area - will not exceed 182 ha, and the maximum height of structures (PV modules and support frames) will be approximately 4.5 m above ground level. PV modules will be assembled on zinc-coated steel or aluminium frames, to form PV arrays. The metal frames that sustain PV arrays are set to the ground by fixed support poles.



Figure 4. Front views of the PV arrays mounted on horizontal 1-axis tracker

String Boxes monitor the currents in photovoltaic modules and can promptly diagnose faults. String boxes are also designed with a circuit breaker in order to disconnect the photovoltaic sub-fields from the inverters. The PV sub-fields are thought to be linked to central inverters, located in medium voltage stations. Each station comprises prefabricate buildings designed to host DC/AC inverters and a medium voltage power transformer. The DC/AC inverters are deemed to convert direct current (DC) into alternate current (AC) at low voltage; subsequently the AC will pass through a medium-voltage transformer in order to increase the voltage up to 132 kV.

The energy delivered from the medium voltage stations will be collected into one (or more) medium voltage receiving station(s), parallel connecting all the PV fields of the PV generator. From the medium voltage receiving station, the energy will be delivered to two high-voltage power transformers (250 MVA, plus one as spare), which will step up the electric energy from the medium voltage level (132 kV) to the required connecting voltage. The power transformers will be connected to an on-site 132 kV busbar (the so called "switching station"), to be equipped with protection and metering devices.

The new on-site substation will be equipped with circuit breakers upstream and downstream, to disconnect the PV power plant and/or the power line in case of failure or grid problems. **Mopane Solar PV 5** will connect to the 275kV busbar of the **Eskom Carmel Main Transmission Substation (MTS)** via a new 275kV power line $\pm 16,4$ km long. This will be achieved via a connection of a 132kV powerline from the on-site substation to the collector substation from where the 275kV powerline will run.

5.5.2 BATTERY ENERGY STORAGE SYSTEM (BESS)

A Battery Energy Storage System (BESS) with an output capacity up to 120 MWac and a storage system will be installed next to the on-site step-up substation and switching station, within the footprint and fenced area of the Mopane Solar PV 5.

The lithium-ion batteries will store energy at times of low energy demand and release the energy to the grid at times of peak demand. The battery energy storage system can also provide other grid services (if required by Eskom) aimed to improve grid stability and power quality, by turning on and off in fractions of a second, such as "Fast Frequency Response" (FFR).

The Battery Storage Facility will have a footprint of up to 0.5 hectare and will comprise of the following equipment:

- Containers, on a concrete platform, will house the batteries, management system and auxiliaries.
- Transformer stations.
- Additional area is required for the container for cooling units.
- Internal access roads up to 8.0 m wide between rows of containers. Where required, internal access roads will be constructed.
- BESS will be connected:
 - to the PV plant by means of DC/DC inverters, and
 - to the bus-bay of the on-site step-up substation by means of kiosk transformers, medium-voltage overhead lines and/or underground cables;
- Temporary infrastructure including a site camp and a laydown area.

The batteries to be installed in the containers will be of the Lithium-ion type and the battery cells will be pre-assembled at the supplier factory prior to delivery to the site. NO electrolytes will be transported to and handled on site. The Battery System shall be able to store electrical energy and charge and discharge electrical energy when connected to a Power Conversion Unit (PCU), which performs the current conversion from LV DC to MV AC (and vice versa). The battery is commonly connected at AC MV level to the Renewable Power Plant for HV conversion and grid interconnection.

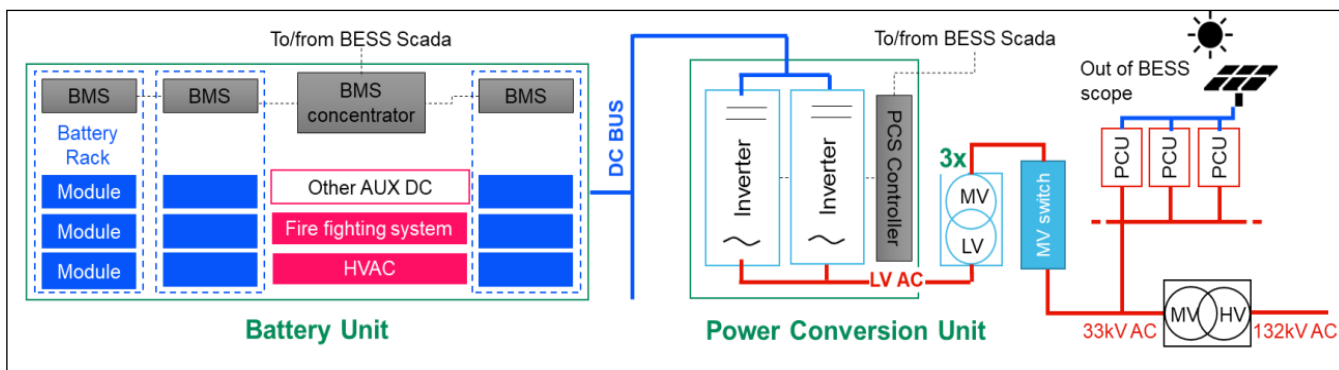


Figure 5. Battery Energy Storage System (BESS)

Battery Storage in combination to solar power plants is capable to provide multiple services to the plant and to the power transmission network adding flexibility to the system. Possible applications include amongst others: renewable generation time shifting, unbalancing reduction, curtailment avoidance, frequency regulation, voltage support, spinning reserve.

5.5.3 ACCESS ROAD AND INTERNAL ROADS

Access to the Mopane Solar PV 5 will be from the district road D859, which runs along the Eastern corner of the project site.

Internal roads will consist of gravel roads designed in accordance with engineering standards. The roads will have a width of 4.0 m allowing for the slow-moving heavy vehicles. However, during construction phase, access roads will be wider than 8 m to allow the transportation of abnormal goods (e.g. power transformers, etc.).

During operation, access roads will be up to 4 m wide and once the solar farm is in operation, the internal roads will mainly be used for maintenance and inspections.

The vertical alignment of the roads will not present significant challenges due to the flatness of the terrain. The entire development will be contained inside a fenced area and the roads are not intended for public use.

5.5.4 TRAFFIC IMPACT OF THE PROPOSED DEVELOPMENT

5.5.4.1 Traffic Impact – Construction Phase

Siyazi (Pty) Ltd was appointed to conduct a Traffic Impact Assessment in order to assess the possible impacts the proposed development might have on traffic in the area. The Traffic Impact Assessment report is included in Annexure M of this Draft EIA Report.

Approximately 100 people are expected to be employed during the construction period (15 months), although this number can increase to 150 during peak periods.

Overall traffic to and from the work site will amount to approximately 3 800 medium / heavy vehicle trips over the whole construction period. As indicated in the table below, the average number of medium and heavy trucks to and from the site will be 11.5 trucks per working day.

Medium and heavy trucks will access / leave the site only during the working days (Monday to Friday), during daytime. The provision of a fuelling area on the work site could reduce the load of heavy vehicles on public roads. The installation of one steel fuel tank (capacity of <30 000 litres) is recommended.

Table 3. Construction timeframe: Average daily trips of medium and heavy vehicles (*)

Transportation of:	months	1	2	3	4	5	6	7	8
Fencing and tools	trips/month	32	32	0	0	0	0	0	0
Clearance of the site (vegetation transportation)	trips/month	56	32	0	0	0	0	0	0
Piles / frames for mounting systems	trips/month	0	0	80	80	80	80	80	0
Sands & gravel for on-site concrete production	trips/month	0	120	192	192	192	208	208	216
PV modules	trips/month	0	0	0	0	0	0	0	0
MV stations	trips/month	0	0	0	0	0	48	48	48
HV substation components	trips/month	0	0	32	32	32	0	0	0
Cables	trips/month	0	0	0	0	0	0	0	64
Average trips per month	trips/month	64	280	304	304	304	336	336	328
Average trips per working day (*)	trips/day	2.9	12.7	13.8	13.8	13.8	15.3	15.3	14.9

Transportation of:	months	9	10	11	12	13	14	15	TOTAL
Fencing and tools	trips/month	0	0	0	0	0	0	0	64
Clearance of the site (vegetation transportation)	trips/month	0	0	0	0	0	0	0	88
Piles / frames for mounting systems	trips/month	0	0	0	0	0	0	0	400
Sands & gravel for on-site concrete production	trips/month	208	192	128	0	0	0	0	1 856
PV modules	trips/month	0	64	128	272	264	136	0	864
MV stations	trips/month	48	48	0	0	0	0	0	240
HV substation components	trips/month	0	0	0	0	0	0	0	96
Cables	trips/month	64	0	0	0	0	0	0	128
Average trips per month	trips/month	320	304	256	272	264	136	0	3 808
Average trips per working day (*)	trips/day	14.5	13.8	11.6	12.4	12.0	6.2	0.0	11.54

5.5.4.2 Traffic Impact – Operation Phase

The traffic impact during the operation phase will be insignificant, considering that about 60/70 people will work on the PV facility, in the following manner:

- during the daytime approximately 14 people;
- during the night-time 6 people.

A Traffic Impact Assessment report is included in Annexure M.

5.5.5 LIGHTING SYSTEM

The lighting system will consist of the following equipment:

- Floodlight-towers: maximum 10 m high, with directional lamps (LED type), 120 W, installed around the HV substation. Normal lighting: 15 lux; up to 40 lux in case of emergency.
- Street lighting along internal roads, for the stretch from the access point up to the HV substation inside the property: 1 streetlamp, maximum 5.5 meters high, every 20 meters, having a LED lamp of 120 W.
- 2x120 W spotlights (LED type) mounted on the top of medium-voltage stations.

The lighting of the MV stations and of the on-site HV substation will be on only in case of intrusion/emergency or necessity to reach the MV stations / HV substation during the night.

During the night, the video-surveillance system will use infra-red (or micro-wave) video-cameras, which do not need a lighting system (which could reduce the functioning).

5.5.6 STORMWATER COLLECTION SYSTEM

Given the low rainfall, flat topography and low flow speed of run-off, no formal stormwater structures are required as the proposed gravel roads will be developed at ground level so as not to disturb the natural flow of stormwater. Run-off will not be concentrated, and existing drainage patterns will be left unchanged.

Aspects of importance in the management plan are:

- Hydrological characteristics including flood volumes, possible flood line challenges and general flow patterns expected on site. (Topography and climatological drivers).
- Water quality due to site activities.
- Mitigating the hydrologic impact of the solar farm development.

The purpose of the Stormwater Management Plan (SWMP) must be to:

- provide guidance to align all phases of development and the eventual operation to the relevant Acts of Law.
- provide for rational thinking in concept development and design.
- Minimise risk of on-site and/or downstream damage due to hydrological impact and includes exposure to runoff associated with normal rain, and during flood events.
- To minimise the risk to on site and / or downstream contamination through storm water due to waste on site.
- It needs to consider the impact of rain on the site, the impact of water entering the site from higher ground and the impact of water leaving the site.

The SWMP Report will not be a design report; guidance is given in it for compliance by the eventual design-implementation- and operational teams.

The **technical parameters** to be detailed in the stormwater management plan are:

- Geographical orientation
- Topography of the site
- Surface conditions on site
- Climatic conditions in the area
- Hydrological setting of the area

5.5.7 WATER REQUIREMENTS

Water requirements during the construction phase

The construction phase will last approximately 12 months.

A) Construction of internal gravel roads

- Water is necessary for the construction of internal gravel roads, in order to get the gravel compacted to optimum moisture content (OMC).

B) Workers

- Approximately 100 people are estimated to be employed during the construction period but can increase to 150 during peak periods. This number can be higher if the construction period is shortened significantly, and more labour is required.
- Each worker needs 50 liters / 8 working hours for sanitary use.
- Water consumption will be:
 - 100 people x 50 l/person x 264 working days = 1 320 m³ over 12 months.

C) Concrete production

- Concrete is necessary for basements of medium-voltage stations, high-voltage substation, control building, warehouse and workshop, basement of BESS and foundations of mounting systems. Volume of concrete produced will be ±15000m³
- 200 litres of water are needed for 1 cubic meter of concrete.
- Water consumption will be: 15 000 m³ x 200 liters / m³ = **3 000 m³**

D) Vehicle cleaning

As mitigation measure, the cleaning of vehicles like excavators, mechanical diggers and pile rammers will be done once or twice per month only and not during working days, to limit water requirements during construction activities. In order not to waste a large amount of water, high pressure cleaners will be used. Overall, the water requirement for cleaning activity is very low. Overall and average water consumption during construction is detailed in the following table.

Table 4. Water consumption during the construction phase of the project

WATER REQUIREMENT DURING THE CONSTRUCTION PHASE OF THE PROJECT		
DESCRIPTION	UNIT	TOTAL
Timeframe of the construction activities	<i>months</i>	12
Timeframe of the construction activities - calendar days	<i>days</i>	360
Overall water consumption for internal roads	<i>m³</i>	6,850
Overall water consumption for sanitary use	<i>m³</i>	1,650
Overall water consumption for concrete production	<i>m³</i>	3,000
OVERALL WATER CONSUMPTION	<i>m³</i>	11,500
Daily water consumption (average over 450 calendar days)	<i>m³/day</i>	32.0

Storage tanks will be sized in order to provide a reserve of water approximately **200m³**.

Water requirements during the operational phase

During operation, water is only required for the operational team on site (sanitary use), as well as for the cleaning of the solar panels. Further water consumption may be only for routine washing of vehicles and other similar uses.

A) Water for sanitary use

Approximately 35/40 people will be employed during operation, which will have a lifetime of ± 25-30 years. Mopane Solar PV 5 will operate 7 days/week and personnel will operate in shifts. A surveillance team will be present during daytime, night-time and weekends. The average number of people working on site will be of 14 people daytime and 6 people at night. Average daily water consumption for sanitary use is estimated to be 150 l/day/person for 20 people (14 people daytime and 6 people at night). Daily water consumption will be ±3000 l/day.

B) Water consumption to clean the PV modules

The cleaning activities of the solar panels will take place twice per year. It is assumed that up to 1.0 litre per m² of PV panel surface will be needed. The amount of water for cleaning is up to 850 m³ per cleaning cycle and 1 700 m³/year. PV modules cleaning activity can last less than 1 month. If the cleaning activity lasts ± 2 weeks (12 working days), the daily water consumption will be approximately **71,000 liters/day, over 12 days.**

Conclusion

The daily water requirement will be approximately **3,000 l/day** over 12 months for sanitary use (i.e. **90,000 l/month** and **1,095 m³/year**). Water consumption will increase to **74,000 l/day** during the cleaning of solar modules (71,000 l/day for cleaning activity and 3,000 for sanitary use), which will last less than a month and will occur twice a year during dry periods. PV modules are conceived as self-cleaning with the rain. It is proposed that **90,000 l** of water will be stored in **storage tanks** for fire, emergency and washing of panels twice a year. Overall and average water consumption during operation is detailed in a table below.

Table 5. Water consumption during the operational phase of the project

WATER REQUIREMENT DURING THE OPERATIONAL PHASE		
DESCRIPTION	UNIT	TOTAL
Average daily water consumption for sanitary use	<i>l/day</i>	3,000
Average daily water consumption during cleaning activity (*)	<i>l/day</i>	74,000
Average monthly water consumption for sanitary use (over 30 days)	<i>l/month</i>	90,000
Annual water consumption for sanitary use	<i>m³/year</i>	1,095
Annual water consumption for PV modules cleaning activities (twice/year)	<i>m³/year</i>	1,700
ANNUAL WATER CONSUMPTION DURING OPERATION	<i>m³/year</i>	2,795
DAILY WATER CONSUMPTION DURING OPERATION (average over 365 day)	<i>m³/day</i>	7.66

(*) over 12 working days, twice per year

C) Water provision during construction and operation

Water needs for the construction phase (11,500 m³ over approximately 15 months) and the operational phase (2795 m³/year) may be obtained from the Local Municipality and/or from on-site boreholes. The Local Municipality will be consulted in this respect.

5.5.8 SEWERAGE

Considering that the proposed development will not include formal residential properties there is no need to connect to the municipal sewer reticulation system. Sewer reticulation will be handled by a suitable patented and commercially available wastewater treatment system, which will be a closed system.

The sewer system will consist of an installation to serve the offices of the control building. The system will be installed in line with the requirements of the manufacturer. Typical systems consist of a conservancy tank (built underground on site), and patented digester. Most systems require electricity to power pumps and fans used in aeration process, although some systems use wind power and could require chlorine tablets available commercially.

Effluent from the wastewater treatment system will be suitable for re-use as water for the flushing of toilets, or for fire-fighting purposes. This could reduce the overall water requirement of the development substantially. An application for a Water Use License for all water uses triggered according to Section 21 of the National Water Act, 1998 (Act No. 36 of 1998), will be submitted to the Department of Water and Sanitation.

5.5.9 REFUSE REMOVAL

During construction, solid waste will mainly consist of vegetation material as a result of the clearance of vegetation. Other type of solid waste will include, amongst others, wood from packaging, boxboards, expanded polystyrene and household waste. Vegetation material from clearing activity can be recycled to be re-used as organic fertilizer. Other solid wastes will be recycled as much as possible. Non-recyclable waste will be delivered to the closest legal landfill site. The proposed development site is relatively close to Welverdiend and household waste can be taken to the municipal landfill site, regularly. During the operational phase (± 30 years), solid waste will mainly consist of household waste from the operational team. Other type of solid waste will come from the maintenance activity in case of failure of some components.

At the end of the project lifetime, the PV plant will be decommissioned. Silicon of PV modules and cables (copper and/or aluminium) will be recycled, as well as aluminium (zinc-coated steel) frames and piles of mounting systems. There will be an agreement with the Local Municipality for the PV plant's refuse at the nearby municipal refuse site. No refuse will be buried or incinerated on site. Measures to manage waste is included in the EMP.

5.6 TEMPORARY CONSTRUCTION CAMP

A construction camp (± 2 ha) will be located in the planned development area, close to the on-site substation. The construction site area will be gradually reduced at the completion of the last PV fields, and at the end of the works the construction area will be converted into the last PV arrays. The optimal location of a construction site is important during the planning phase to minimize impacts on the surrounding environment.

The site's location is dictated by the nature of the works to be undertaken, specialist studies, site restrictions, town planning intended uses and access. Area identified for the construction site must meet the following requirements:

- sufficient size;
- proximity to existing roads;
- availability of water and energy;
- low environmental and landscape value;
- sufficient distance from residential areas; and
- proximity to the worksite.

To ensure environmental compatibility, the following factors have been considered:

- restrictions on land use (landscape, archaeological, natural, hydrological, etc.);
- terrain morphology;
- presence of high environmental value areas (*e.g.* wetlands); and
- sand & stone supply.

The establishment of the construction site will be divided into four phases. Steps included here do not follow a time sequence but considered overlapping and simultaneous events.

5.6.1 PHASE I

The area will be fenced to prevent intrusion of animals and to protect against materials theft within the site. A video surveillance system will be provided.

5.6.2 PHASE II

During the fencing operation as described in Phase I, trees with a conservation value, will be removed and placed temporarily in a safe location for future planting at the end of work. This procedure is required for environmental mitigation. The other tree species will be cut down and transferred to facilities for wood processing.

5.6.3 PHASE III

At completion of the works defined in Phases I and II, the following step will be the site clearing and the construction of internal roads. The internal road network should ensure a two-way traffic of heavy goods vehicles to minimize trips. The road system is planned for a width of 8 meters for access roads and 4 meters for internal roads. Roads will be of dry and compacted materials. The facility will require constant access control, a weigh-house for heavy trucks, removable structures for the storage of yard tools and temporary storage areas. During Phase III, the installation of MV/LV transformers connected to the Eskom grid is also planned, as well as the laying of underground electrical cables.

5.6.4 PHASE IV

Temporary storage areas of materials and workshops will be constructed and used for:

- temporary storage of photovoltaic modules;
- temporary storage for frames and piles of the mounting systems of the PV arrays;
- storage and processing of building material for construction (sand, gravel, concrete batching and mixing plant, steel, etc.);
- drinking water storage for human consumption;
- worker care facilities and site management buildings,
- prefabricated housing modules for workers who may require accommodation inside the site (only key personnel will be allowed to stay overnight);
- technical cabins and management offices;
- medical care unit in a prefabricated module, in order to allow immediate first aid and minor surgical emergency;
- recreation area and canteen (prefabricated modules);
- parking lots for employees (located close to the staff housing), for visiting staff (located close to the offices area), and for trucks and work vehicles during inactivity;
- workshop and storage facilities on the site for contractors;
- electrical network for living units, offices and service structures;
- water supply for living units through polyethylene pipes connected to storage;
- wastewater treatment system. The treated water will be used to moisten dusty areas and reduce dust pollution during windy conditions;
- temporary chemical toilets; and
- solid waste collection point.

5.6.5 EARTHWORKS

Clearing activity is required to remove shrubs and trees from the planned footprint (± 182 ha). Due to the flatness of the development area, limited earthworks are envisaged for the installation of PV module mounting systems. Mounting systems will consist of metallic frames to be assembled on-site, supported by pre-bored cast-in-situ concrete piles.

Earthworks will be required during the construction of internal roads and access road. The vertical alignment of the roads will not present any significant challenges due to the flatness of the terrain so that no deep cuts or fills will be required.

Given the low rainfall, flat topography and low flow speed of run-off - no formal storm water structures are required as the proposed gravel roads will be developed at ground level, so as not to disturb the natural flow of storm water. This means that run-off will not be concentrated, and the existing drainage patterns will be left undisturbed.

Only the foundation plate for the small high-voltage substation may require earthworks in excess of 500 mm cut or fill (the footprint will be up to 10 000 m²). Topsoil stripping will result in temporary spoils heaps which must be spread over the site upon completion of the project.

The concrete necessary for the basements of the medium-voltage stations, the high-voltage substation, the control building and the warehouse will be provided from commercial sources in the vicinity of the development. Gravel needed for construction of internal roads will be obtained from commercial sources in Welverdiend area and communities.

.

6 LEGAL AND POLICY REQUIREMENTS

The legislative and regulatory framework of reference for the solar power plant project includes statutory and non-statutory instruments by which National, Provincial and Local authorities exercise control throughout the development of the same project.

The development and the environmental assessment process of a solar power plant project involve various authorities dealing with the different issues related to the project (economic, social, cultural, biophysical etc.).

6.1 REGULATORY AUTHORITIES

6.1.1 NATIONAL AUTHORITIES

At national level, the main regulatory authorities and agencies are:

- *Department of Mineral Resources and Energy (DMRE)*: the Department is competent and responsible for all policies related to energy, including renewable energy. Solar energy is contemplated and disciplined under the White Paper for Renewable Energy and the Department constantly conducts research activities in this respect;
- *National Department of Forestry, Fisheries and the Environment, (DFFE)*: the Department is competent and responsible for all environmental policies and is the controlling authority under the terms of NEMA and EIA Regulations. The DFFE is also the competent authority for the proposed project, and is entrusted with granting the relevant environmental authorisation;
- *National Energy Regulator of South Africa (NERSA)*: the Regulator is competent and responsible for regulating all aspects dealing with the electricity sector and, in particular, issues the licence for independent power producers;
- *South African Heritage Resources Agency (SAHRA)*: The Agency is responsible for the protection and survey, in association with provincial authorities of listed or proclaimed sites, such as urban conservation areas, nature reserves and proclaimed scenic routes under the terms of the National Heritages Resources Act (Act no. 25 of 1999).
- *South African National Roads Agency Limited (SANRAL)*: the Agency is responsible for all National road routes.

6.1.2 PROVINCIAL AUTHORITIES

At provincial level, the main regulatory authority is the *North-West Department of Economic Development, Environment, Conservation and Tourism (DEDECT)*; this Department is responsible for environmental policies and is the Provincial authority in terms of NEMA and the EIA Regulations and is also the commenting authority for the proposed project.

6.1.3 LOCAL AUTHORITIES

At a local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the North-West Province, Municipalities and District Municipalities are involved in various aspects of planning and the environment related to solar energy facilities development. The Local Municipality is the *JB Marks Local Municipality* which is part of the *Dr Kenneth Kaunda District Municipality*.

Under the terms of the Municipal System Act (Act no. 32 of 2000), all municipalities are deemed to go through an Integrated Development Planning (IDP) process to devise a five-year strategic development plan for the area of reference.

The identification of priority areas for conservation and their positioning within a planning framework of core, buffer, and transition areas is the subject of bioregional planning. Priority areas are individuated and defined with reference to visual and scenic resources and their identification and protection is granted through visual guidelines drafted for the area included in bioregional plans.

Local authorities also provide specific by-laws and policies to protect visual and aesthetic resources with reference to urban edge lines, scenic drives, special areas, signage, communication masts etc. Finally, there are also various non-statutory bodies and environmental groups, who are involved in the definition of various aspects of planning and the protection of the environment, which may influence in the development of the proposed project.

6.2 LEGISLATION, REGULATIONS AND GUIDELINES

A review of relevant legislation involved in the proposed development is in table 5 below.

Table 6. Review of relevant legislation

National Legislation	Sections applicable to the proposed project	Compliance with legislation
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	<ul style="list-style-type: none"> • Prohibition of the spreading of weeds (S5) • Classification of categories of weeds & invader plants and restrictions in terms of where these species may occur (Regulation 15 of GN R0148) • Requirement and methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R0148) 	<ul style="list-style-type: none"> • Classification of alien invasive plants in the EIA Report. • Management measures in the EMPr. • Alien Invasive Management Plan included in Annexure 1 of EMPr.
National Water Act, 1998 (Act No. 36 of 1998)	<ul style="list-style-type: none"> • Entrustment of the National Government to the protection of water resources (S3) • Entitlement to use water (S4) - Schedule 1 provides the purposes which entitle a person to use water (reasonable domestic use, domestic gardening, animal watering, fire-fighting and recreational use) • Duty of Care to prevent and remedy the effects of water pollution (S19) • Procedures to be followed in the event of an emergency incident which may impact on water resources (S20) 	<ul style="list-style-type: none"> • Need for the application of a Water Use License (WUL) in terms of the Act,. • Several Impact Management Actions listed in the EMPr pertaining to the prevention of water pollution including procedures to follow in the event of an emergency incident.

<p>National Forests Act, 1998 (Act No. 84 of 1998)</p>	<ul style="list-style-type: none"> Protected trees 	<ul style="list-style-type: none"> NFA must always be considered in case a permit application needs to be submitted for the removal of protected trees in terms of Act. Possibility of protected trees on site is discussed in section 9.4.8.4 of the EIA Report.
<p>National Environmental Management Act, 1998 (Act no. 107 of 1998)</p>	<ul style="list-style-type: none"> EIA Regulations 2014 (GN R. 326, 327, 325, 324 of 07 April 2017), as Amended Requirement for potential impact on the environment of listed activities to be considered, investigated, assessed and reported on to the competent authority (S24 - Environmental Authorisations) Duty of Care (S28): requirement that all reasonable measures are taken in order to prevent pollution or degradation from occurring, continuing and recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the environment 	<ul style="list-style-type: none"> Section 24 (2) of the Act indicates: The Minister, or an MEC with the concurrence of the Minister, may identify— (a) activities which may not commence without environmental authorisation from the competent authority; An application for environmental authorisation was submitted to the competent authority and the application process commenced. Duty of care principle applied throughout the EMPr as included in the EIA Report.
<p>National Heritage Resources Act, 1999 (Act no. 25 of 1999)</p>	<ul style="list-style-type: none"> Provision for the protection of all archaeological objects, paleontological sites and material and meteorites entrusted to the provincial heritage resources authority (S35) 	<ul style="list-style-type: none"> Heritage and Archaeological impact assessment was conducted and discussed in detail in the EIA Report in Section 9.4.14. Impacts identified and discussed in Section 11.5 of the EIA report.

	<ul style="list-style-type: none"> • Provision for the conservation and care of cemeteries and graves by SAHRA, where this is not responsibility of any other authority (S36) • List of activities which require notification from the developer to the responsible heritage resources authority, with details regarding location, nature, extent of the proposed development (S38) 	<ul style="list-style-type: none"> • Assessment report included in Annexure H of the EIA report. • Specific impact management actions listed in the EMPr of the EIA report.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	<ul style="list-style-type: none"> • Provision for the MEC for Environmental Affairs/Minister to publish a list of threatened ecosystems and in need of protection (S52) • Government notices: GN R150 (Commencement of Threatened and Protected Species Regulations, 2007); GN R151 (Lists of critically endangered, vulnerable & protected species) and GN R152 (Threatened Protected Species Regulations) 	<ul style="list-style-type: none"> • Biodiversity according to the NEM:BA was specifically assessed in the EIA report. • No threatened ecosystems were identified in site. • No threatened, vulnerable, critically endangered or protected species were identified on the site.
National Environmental Management: Air Quality Act, 2004 (Act no. 39 of 2004)	<ul style="list-style-type: none"> • Provision for measures in respect of dust control (S32) • Provision for measures to control noise (S34) 	<ul style="list-style-type: none"> • No activities on site will require any permits and/or licenses in respect of dust control or noise management. • Atmospheric pollution (dust) and noise is discussed in Section 10.2.1 of the EIA report. • Mitigation measures are included in the EMPr in order to mitigate for any impacts as a result of increased dust during the construction phase as well as measures to control noise during the construction phase.
National Environmental Management: Waste Management Act, 2008 (Act no. 59 of 2008)	<ul style="list-style-type: none"> • Waste management measures • Regulations and schedules • Listed activities which require a waste licence 	<ul style="list-style-type: none"> • No listed activities, require a waste license and are triggered as a result of the proposed facility.

		<ul style="list-style-type: none"> Waste management is discussed throughout the EIA report and refers to refuse, wastewater (sewage) and other waste, especially during the construction phase. A high number of impact mitigation measures are included in the EMPr in order to mitigate for any impacts as a result of increased occurrence of waste, on site.
Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)	<ul style="list-style-type: none"> Health and safety of all involved before and after construction must be protected. 	<ul style="list-style-type: none"> No licenses or permits are required in terms of the Act but must be considered, during the construction phase. A number of impact mitigation measures are included in the EMPr in order to ensure compliance with the Act.

Policies and White Papers	Sections applicable to the proposed project	Compliance
Integrated Resource Plan (IRP1) Integrated Resources Plan 2010-2030 (IRP 2010).	<ul style="list-style-type: none"> The first Integrated Resource Plan was published in 2009. DoE decided to undertake a detailed process to compile South Africa’s 20-year electricity plan, Integrated Resources Plan 2010-2030 (IRP 2010). The IRP1. IRP 2010 and IRP 2019 outline the Government’s vision, policy and strategy in matter of the use of energy resources and the current status of energy policies in South Africa. In the IRP 2019, published in October 2019, provision has been made to procure an additional 6 000 MW of solar PV and 14 400 MW of wind between 2022 and 2030. 	<ul style="list-style-type: none"> This application for a renewable energy project is a direct result of the publication of the IRP and specifically the IRP which was published in 2019.
Renewable Energy IPP Procurement Programme (REIPPPP)	<ul style="list-style-type: none"> The IPP Procurement Programme, issued on 3rd August 2011 by the DoE, envisages the commissioning of 3 725 MW of renewable projects (1 450 MW with Solar PV technology) capable of beginning commercial operation before the end of 2020. A number of BID Windows have been published and the next submissions will be in terms of BID Window 7. 	<ul style="list-style-type: none"> This application for a renewable energy project is a direct result of the REIPPPP for renewable energy projects.

Regulations, Tools and Protocols	Sections applicable to the proposed project	Compliance
<p>EIA Regulations, 2014 as amended 7 April 2017: Government Notice R326, R324, R325 and R327.</p>	<ul style="list-style-type: none"> • The EIA Regulations of 2014 was published on 4 December 2014 in Government Notice No. 982. • The EIA Regulations of 2014 was amended, and amendments were published on 7 April 2017 in Government Notice No. 326. • Amendments to the EIA Regulations, Listing Notices 1, 2 and 3, published on 11 June 2021 in Government Notice No. 517. 	<ul style="list-style-type: none"> • From December 2014, these Regulations were used for applications for environmental authorisation for activities triggered in listing notices included in these regulations. • From April 2017 these Regulations were applied when applying for environmental authorisation for activities triggered in listing notices included in these regulations. • For new applications, amended listing notices were checked for new activities triggered.
<p>Procedures for assessment and minimum criteria for reporting on identified environmental themes in terms of NEMA, when applying for environmental authorisation, published on 20 March 2020 in Government Notice No. 320</p>	<ul style="list-style-type: none"> • Environmental Themes for: <ul style="list-style-type: none"> ○ Agriculture ○ Avifauna ○ Biodiversity ○ Noise ○ Defence ○ Civil Aviation 	<ul style="list-style-type: none"> • The following themes were applied in the EIAR: <ul style="list-style-type: none"> ○ Agriculture ○ Avifauna ○ Biodiversity ○ Noise ○ Defence ○ Civil Aviation
<p>Procedures for assessment and minimum criteria for reporting on identified environmental themes in terms of NEMA, when applying for environmental authorisation, published on 30 October 2020 in Government Notice No. 1150</p>	<ul style="list-style-type: none"> • Environmental Themes for: <ul style="list-style-type: none"> ○ Terrestrial Animal Species ○ Terrestrial Plant Species 	<ul style="list-style-type: none"> • The following themes were applied in the report: <ul style="list-style-type: none"> ○ Terrestrial Animal Species ○ Terrestrial Plant Species
<p>Notice of requirement to submit a report generated by the National Web Based Environmental Screening Tool i.t.o. NEMA and EIA Regulations, 2014, as amended, published on 5 July 2019 in Government Notice No. 960.</p>	<ul style="list-style-type: none"> • The EIA is based on results from The Environmental Screening Tool. 	<ul style="list-style-type: none"> • The results of the Environmental Screening Tool were used to appoint the applicable specialists

Other Documents	Sections applicable to the proposed project	Compliance
<p>Identification procedures to be followed when applying for or deciding on an EA application for the development of electricity transmission and distribution infrastructure when occurring in renewable energy development zones, published on 26 February 2021 in Government Notice No. 145.</p>	<ul style="list-style-type: none"> • Application form was submitted according to the REDZs and Strategic Transmission Corridors, March 2017. • The map including the Expanded Eastern and Western Corridors were also consulted. 	<ul style="list-style-type: none"> • The Scoping and EIA process was followed as the proposed development site does not fall within the REDZs. • The proposed development site, also doesn't fall within the Expanded Eastern and Western Corridors.
<p>Department of Environmental Affairs, 2015. Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa. CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B. Stellenbosch</p>	<ul style="list-style-type: none"> • General background information • In the Strategic Environmental Assessment (SEA) as included in this document, the Limpopo Province was not assessed in a number of sections. The Limpopo Province was not considered a Focus Area. 	<ul style="list-style-type: none"> • Used as additional background information in EIA Report.

7 NEED/DESIRABILITY OF THE PROJECT

South Africa currently relies principally on fossil fuels (coal and oil) for the generation of electricity. At the present date, Eskom generates approximately 90% of the electricity used in South Africa. On the other hand, South Africa has a largely unexploited potential in renewable energy resources such as solar, wind, biomass and hydro to produce electricity as opposed to other energy types (liquid fuel or coal).

South Africa's electricity supply still heavily relies upon coal power plants, whereas the current number of renewable energy power plants is still limited. In the last few years, the demand for electricity in South Africa has been growing at a rate approximately 3% per annum.

These factors, if coupled with the rapid advancement in community development, have determined the growing consciousness of the significance of environmental impacts, climate change and the need for sustainable development. The use of renewable energy technologies is a sustainable way in which to meet future energy requirements.

The Renewable Energy IPP Procurement Programme (REIPPPP), issued on 3rd of August 2011, by the Department of Energy (DoE) envisaged the commissioning of 3725 MW of renewable projects (1450 MW with solar photovoltaic technology) capable of beginning commercial operation before the end of 2017. This goal has not been fully fulfilled.

On 2014, the Department of Energy announced the intention to procure an additional **3 600 MW** of renewable energy projects by **2020** (DOE Media Statement of 12 December 2014).

In the **IRP 2019**, issued by the Department of Energy (now **Department of Mineral Resources and Energy (DMRE)**) under Notice No. 1360 dated 18 October 2019 in *Government Gazette* 42784, pursuant to the Electricity Regulation Act, provision has been made to procure an additional **6 000 MW** of solar PV and 14 400 MW of wind between **2022** and **2030**.

The purpose of the proposed Solar Photovoltaic Plant is to add new capacity for the generation of renewable electric energy to the national electricity supply in compliance with the Renewable Energy IPP Procurement Programme (REIPPPP) and in order to meet the growth of the North-West Province.

The use of solar radiation for power generation is considered a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions. The generation of renewable energy will contribute to the growth of South Africa's electricity market, which has been primarily dominated up to this date by coal-based power generation. With specific reference to photovoltaic energy, and the proposed project, it is important to consider that South Africa has one of the highest levels of solar radiation in the world.

The proposed solar park will assist the Eskom grid to meet the high energy demand related to activities conducted in the Welverdiend areas. Furthermore, being a renewable energy project, which does not generate greenhouse gases, it will assist to compensate the greenhouse gas emissions arising from these mining and industrial activities.

The purpose of the proposed **Mopane Solar PV 5** is to add new capacity for the generation of electrical energy to the national electricity supply, in compliance with the Minister of Energy's Determinations.

The use of solar radiation for power generation is considered as a non-consumptive use and a renewable natural resource which does not produce greenhouse gas emissions. The generation of renewable energy will contribute to the growth of South Africa's electricity market, which has been primarily dominated up to this date by coal-based power generation. With specific reference to photovoltaic energy, and the proposed project, it is important to consider that South Africa has one of the highest levels of solar radiation in the world.

The reasons for the location of the project in the selected area can be synthesized as follows:

- low requirement for municipal services;
- compliance with national and provincial energy policies and strategies;
- no impact on people health and wellbeing;
- no waste and noise;
- no impact on air quality;
- compatibility with the ecosystem and the surrounding landscape;
- likelihood of social and economic development of marginalized, rural communities; and
- attraction of environmentally aware (green) tourists to the area.

7.1 FUTURE NEED AND DESIRABILITY

In 20-30 years' time certain of the infrastructure of the solar facility will probably be not be functioning with the same effectivity as when newly constructed. The energy requirements of the country will certainly not become less, but instead will become more dependent on renewable sources like solar and wind energy. It will be the same in this case. Mopane Solar PV 5 will most probably never decommission completely as the country and area around it will be dependent on its energy generation. It will rather upgrade then or constantly go through a process of upgrading of technology so that the facility stays abreast of technology and energy needs and requirements in the area. Applications and studies to support upgrades to the solar facility will be done in future when required.

8 MOTIVATION FOR PREFERRED DEVELOPMENT FOOTPRINT IN THE PREFERRED SITE

8.1 THE CHOICE OF THE NORTH-WEST PROVINCE AND SITE LOCATION

The Mopane Solar PV 5 will be located near the city of Welverdiend, in the North-West Province. During the previous Rounds of the REIPP Procurement Programme, very few projects were selected by the Department of Energy (now Department of Mineral Resources and Energy) in the North-West Province. Therefore, the macro-area where the project is planned never received the benefits - in terms of socio-economic development and local content, arising from the previous Rounds of the REIPP Procurement Programme.

The North-West Province has been identified by Voltalia South Africa as an ideal area for establishing a solar PV plant on the basis of several important considerations:

- there are few green projects currently operating in the North-West Province and it is clear that the "green energy quota" can be achieved mainly by means of solar projects, considering the high solar resources and the availability of lands with low ecological and agricultural value;
- available Eskom grid capacity;
- other infrastructure nearby to develop a renewable energy project.

In addition to these favourable conditions in terms of desirability of renewable solar energy projects in the North-West Province, the site of the Mopane Solar PV 5 has been chosen on the basis of several elements:

- the chosen site is suitable for the installation of a PV power plant due to its appropriate morphologically (flat terrain) and regarding favourable radiation conditions;
- the available radiation allows a high rate of electric energy production, as a combination of latitude-longitude and climatic conditions;
- the low to medium ecological sensitivity of the proposed project site (old fields, degraded / modified land) and
- available Eskom grid connectivity.

9 CONSIDERATION OF ALTERNATIVES

9.1 DETAILS OF ALTERNATIVES CONSIDERED

The EIA Regulations, 2014, as amended, Section 28(1)(c) and NEMA, Section 24(4), require investigation and consideration of feasible and reasonable alternatives for any proposed development as part of the EIA process. Therefore, a number of possible alternatives for accomplishing the same objectives must be identified and investigated. In particular:

- the property on which, or location where, it is proposed to undertake the activity;
- the location within the current identified site;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;
- the operational aspects of the activity (schedule, process);
- the sustainability of other alternatives, and
- the option of not implementing the activity (No Go Alternative).

9.1.1 PROJECT ALTERNATIVES AND LAYOUT

The layout of the proposed development is the result of a comparative study of various layout alternatives and had been defined whilst considering the results of all specialist studies conducted during the scoping phase. The PV plant is designed to minimize visual and noise impacts, to operate safely and assuring a high level of reliability, with low water consumption and the need for easy and quick maintenance and repair for approximately 30 years.

The footprint (fenced area) of the Mopane Solar PV 5 will be up to 182 ha.

The main drives of the proposed layout are:

- to maximize the energy production and the reliability of the PV plant, by choosing proven solar technologies; mono or bi-facial mono/polycrystalline solar modules mounted on single-axis horizontal trackers (SAT) or on fixed mounting systems.
- to develop the PV power plant in the southern section of the farm, avoiding high potential agricultural land and natural areas.
- to avoid the Critical Biodiversity Areas (CBAs).

The proposed layout plan (Annexure B and below) was drawn using PV modules mounted on trackers. In case of PV modules mounted on fixed mounting systems, the layout plans will not change, except for the orientation of PV arrays: East-West instead of North-South. The site layout plan included in Annexure B is more detailed.

The required footprint - corresponding on the fenced area - will be up to 182 ha, and the maximum height of the structures (PV modules and support frames) will be approximately 4.5 m above the ground level.

The location of the planned footprint was assessed and included in this Environmental Impact Assessment Report. No comments were received as a result of the Public Participation Process. However, all specialists' inputs were evaluated in order to confirm that the site layout as is, is acceptable from results from the specialists' reports. No amendments were made to the site layout plan as it was found to be in line with the findings of the specialists.

9.1.2 SITE ALTERNATIVES

The following selection criteria were applied in order to identify the preferred site alternative:

- Connection availability and proximity
- Land availability
- Sufficient land surface area (± 182 ha)
- Current land use
- Environmental impact (biodiversity)
- Agricultural potential
- Solar radiance
- Socio-economic issues (land cost and local community unemployment)
- Occurrence of Heritage resources

When the listed criteria were applied the following conclusions were made:

- Connection availability and proximity.

There is currently connection availability via the **Eskom Carmel Main Transmission Substation (MTS)**, which is nearby in close proximity to the proposed development site.

- Land availability

The landowner agreed to making some land available to for the development of Mopane 5 PV Solar Park. The landowner was prescriptive in land available for the proposed development. The drainage line occurring to the south of the proposed development site had to be avoided and the site had to be a certain distance from his homestead.

- Sufficient land surface area (± 182 ha)

As a result of the abovementioned prescriptions, by the landowner, it was found that the land parcels made available, were large enough to be sufficient for the intended purpose.

- Current land use

The proposed development land is used for livestock farming at present. Natural vegetation of the site varies from intact to exotic bushclumps. The development site is strategically situated in an area, which will not impact on other agricultural activities.

- Environmental impact (biodiversity)

Degraded grassland identified on the proposed development site, associated with the exotic tree bushclumps has a low sensitivity. Natural grassland has a Medium Sensitivity and development can be supported in the area provided certain mitigation measures are implemented.

- **Agricultural potential**

Many old, cultivated fields confirm that crop cultivation over the longer term is not financially viable under the current climatic conditions. Livestock and/or small game grazing is viable due to a slightly higher nutrient and organic content of topsoil in grass and woodland areas. The landowner will be able to continue with farming with livestock.

- **Solar radiance**

The solar irradiation was found to be sufficient for the development of a PV Solar Park. This is according to the Global Horizontal Irradiation map published by SolarGis. The long-term average of yearly sums of global horizontal irradiation is 2000 to 2100 kW/m².

- **Socio-economic issues (land cost and local community unemployment)**

It is confirmed in the socio-economic impact assessment report, that sustained growth in this sector is challenged by high public debt levels. Economic growth in the local municipality is lower than the national growth rate. Municipal planning documents emphasize the need for higher levels of economic growth and job creation. This site is ideal for a contribution to economic growth and job creation in the local municipal area.

- **Occurrence of Heritage resources**

No ESA material were noted on site and heritage observations within the study area is limited to low density MSA scatters with few diagnostic artefacts and no formal tools. These tools are out of context and scattered too sparsely to be significant. The palaeontological sensitivity of the area is classified as very high, but on a palaeontological site visit found no fossils present within the proposed project area. No adverse impact to heritage resources is expected by the project and no graves were found and the landowner has no knowledge of any graves on site.

9.1.3 ACTIVITY ALTERNATIVES

Activity alternatives were not considered. The North-West Province is currently an area which is available for renewable energy projects. While the country is in a crisis with the generation of electrical energy, the selection of an activity such as the generation of electricity from renewable sources like solar in this case is the correct way to go to relieve the crisis and to mitigate global warming caused by the burning of fossil fuels for generation of electricity. Further activity alternatives were not investigated as the landowner is only in accordance with the proposed activity and did not give permission for any other activity to be considered.

9.1.4 TECHNOLOGY ALTERNATIVES

PV Plant and Solar Thermal Power Plant

The alternative to PV for producing energy from the sun is a thermal solution. There are different forms of technology and these technologies can be with or without thermal storage and they can use diathermic oils or, more sophisticated ones can use water and/or molten salts.

The final choice is the PV option because these kinds of project result in:

- lower construction costs;
- lower operating and maintenance costs (O&M);
- it is a simpler, quicker and more experienced technology; and
- lower environmental impact, considering that, a PV plant requires low volume of water.

Wind Power Plant

Another alternative to PV for producing energy from the sun is electrical energy from wind. A wind energy facility has a significant visual impact especially where it is located in a relative flat topographical area. Most important, the project site is not windy enough to be considered suitable for a wind farm. The PV option is thus still a better choice than wind energy based on the same reasons given above.

Alternatives for the Mounting System of the PV Modules

Preferred technical solutions for the proposed solar park entail PV modules mounted on fixed mounting systems or horizontal single-axis trackers.

A tracking solution is the best performing in terms of efficiency, because its energy production is approximately 20% more if compared with fixed systems. This type of technology is characterized by higher technical complexity and higher installing and maintenance costs, if compared with a fixed mounting solution. The selected tracking system is the horizontal single-axis tracker (SAT), which doesn't differ from a fixed system, except for the presence of tracking devices and orientation of rows of PV arrays (north - south instead of west – east direction).

The technology of mounting systems is under continuous evolution. A final decision about the mounting system technology will be taken only at the commissioning date. The selection of fixed mounting system or horizontal single-axis trackers will not affect the layout of the PV power plant or imply any additional visual or environmental impacts that will necessitate specific or different mitigation measures. The development will not exceed the current planned footprint (182 ha) and height of structures (PV modules and support frames) will be maximum 4.5 m above ground level. Both fixed and horizontal single-axis tracking solutions grant reversibility of the development in respect of the terrain's morphology, geology and hydrogeology. At the end of the PV plant's lifetime, the site can easily be returned to its status prior to the establishment of the PV plant.

BESS Technology alternatives and the Risk/Benefit of using Lithium-Ion Batteries

Batteries store electrical energy in chemical form. Electrochemical technologies include:

- a) batteries with solid electrolyte, as Lithium-ion battery;
- b) batteries with liquid electrolyte, as Na-S battery, Lead-Acid (PbA) battery, nickel - cadmium (Ni-Cd) battery or other types of liquid metal battery

The preferred technology for the Battery Energy Storage System (BESS) is **Lithium-ion battery cells**, which will be pre-assembled and installed in containers prior to delivery to site. Lithium-ion cells technology offers the highest energy density (compared to other cell technologies), does not suffer from memory effect and is low maintenance. Typical lithium-ion cells used for BESS hold a solid rechargeable electrolyte (energy accumulator), and don't hold liquid or gas. *The main benefit of solid ceramic electrolytes is that there is no risk of leaks, which is a serious safety issue for batteries with liquid electrolytes.* A BESS does not emit any gas to the atmosphere during construction and/or normal operation. Containers of batteries are equipped with a firefighting system designed to effectively detect smoke and high temperatures and automatically activate extinguishers to prevent fire. The external metallic surface of the cells is designed to resist fire. **The preferred technology is therefore Lithium-ion battery cells with solid rechargeable electrolyte.** Batteries with liquid electrolytes are not preferred for the risk of leakage and consequent potential impacts on environment.

9.1.5 NO-GO ALTERNATIVE

The no-go alternative is the option of not establishing a Photovoltaic Power Plant on the site, or any of its alternatives. The environment will remain in its current state (status quo). This will not create any new employment opportunities, and therefore the anticipated economic benefits of the project will accrue to the study area (see the paragraph 6.4 *Socio-Economic Environment*). Should this alternative be selected the socio-economic and environmental benefits related to the use of renewable energy resources will not be realised with prejudice to development in the area. The benefits related to the establishment of a renewable energy facility are analysed in the REFIT Regulatory Guideline published by NERSA (March 2009):

- *Enhanced and increased energy security:*
- *Resource economy and saving:*
- *Support of new technologies and new industrial sectors:*
- *Exploitation and capitalization of South Africa's renewable resources:*
- *Employment creation and career opportunities:*
- *Pollution reduction:*
- *Contrast to Global warming and climate mitigation:*
- *Protection of natural foundations of life for future generations:*
- *Acceptability to society and community:*
- *Commitment to and respect of international agreements:*

9.2 DETAILS OF PUBLIC PARTICIPATION PROCESS UNDERTAKEN

All relevant I&AP's have been identified and involved in the public participation process from the beginning of the project as per sections 54, 55, 56 and 57 of the EIA regulations 2014, as amended. The public participation process offers the opportunity to become actively involved through constant sharing of information. The main purposes of the public participation process are to ensure that:

- all relevant information in respect of the application is made available to I&APs for their evaluation and review;
- reasonable opportunity is given to I&AP's to comment and to submit queries related to the proposed project;
- comments and queries by the I&APs to the Draft Scoping and to the EIA Reports are submitted and evaluated in a reasonable timeframe and in predetermined terms.

The notifications to the I&APs of the property owners adjacent to Portion 2 of the farm Rooidraai 85 IQ were completed.

The public was informed of the proposed development and the database of Interested and Affected parties was populated.

In Annexure D (Comments & Responses Report), there is a list of all components of the public participation process. The public was informed of the project by means of:

- Site notices put up at the proposed development site at two (2) areas on the fences at the proposed development area on 09 November 2022.
- Background Information Documents (BIDs) were emailed to most of the Authorities involved on 15 & 16 November 2022.
- A Notice / Advertisement was published in the Carletonville Herald of 10 November 2022 and the Noordwester of 11 November 2022, which is distributed in the general area.
- Emails of the BID were sent to other most of the relevant Authorities possible interested and affected parties/stakeholders (other I&APs).
- **The first part and initial Public Participation Process was run from 16 November 2022 until 09 January 2023.**
- BIDs were sent to:
 - JB Marks Local Municipality
 - Local Municipality Ward Councillor
 - Dr Kenneth Kaunda District Municipality
 - Department of Water & Sanitation
 - North-West Department of Economic Development, Environment, Conservation & Tourism (DEDECT)
 - Eskom

- Department of Minerals and Energy
 - DMR (Department of Mineral Resources).
 - Department of Science & Technology
 - South African Astronomical Observatory (SAAO) and Southern African Large Telescope (SALT)
 - South African Radio Astronomy Observatory (SARAO) and Square Kilometre Array (SKA)
 - Council for Scientific and Industrial Research (CSIR)
 - SANRAL
 - Department of Agriculture, Forestry & Fisheries: Provincial
 - South African Civil Aviation Authority - SACAA
 - DFFE: Directorate: Climate Change & Air Quality, Biodiversity & Conservation, Protected Areas Systems Management
 - Transnet
 - SAHRA
 - Endangered Wildlife Trust (EWT)
 - Bird Life SA
- An I&AP Register was opened which will be maintained and updated as required.
 - Registrations of I&APs'
 - Few people registered as I&APs, but no comments were received during the initial public participation process from adjacent landowners and/or interested and/or affected parties. Please refer to Section 9.3 of this report.
 - The Draft Scoping Report (in electronic format) was made available for a 30-day commenting period for comments from 27 January 2023 until 27 February 2023.

The Final Scoping Report and the Plan of Study for EIA was submitted to the DFFE for review and approval on 10 March 2023. It was accepted by the competent authority on 19 April 2023.

The Draft EIA Report will now be submitted to the competent authority for review and will be available for a 30-day commenting period.

9.3 SUMMARY OF ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Organ of state & IAPs	Date	Comments and/recommendations	Response from EAP
09 November 2022 Site Notice			
10 November 2022 Carletonville Herald & 11 November 2022 Noordwester Newspaper			
BID forwarded via email 15 and 16 November 2022			
Andrew Salomon - SAHRA	16/11/2022 3	Sent response to upload reports to SAHRIS	16/11/2023 AGES responded that heritage specialist would submit documents
Central Point - Department of Water and Sanitation	16/11/2022 2	Acknowledged BID notification	
Raymond Takuba - Juwi Renewable Energies	16/11/2022 2	Registered as I&AP	16/11/2022 AGES acknowledged
Kim Pontac - Legacy Environmental Consulting	25/11/2022 2	Registered as I&AP	25/11/2022 AGES acknowledged
Winnie Lekabe - ATNS	01/12/2022 2	Requested information	01/12/2022 Correspondence from Aviation specialist Tobie du Toit
Itani Mashamba – Merafong City Local Municipality	01/12/2022 2	Registered as I&AP	01/12/2022 AGES acknowledged
Theo Kotze - Developlan Town Planners	02/12/2022 2	Registered as I&AP	05/12/2022 AGES acknowledged
Barnie Pretorius - Adjacent Landowner	13/12/2022 2	Registered as I&AP	14/12/2022 AGES acknowledged
Lizell Stoh - CAA	01/02/2023 3	Responded that Air Traffic and Navigation Services (ATNS) will evaluate applications	01/02/2023 AGES acknowledged
Application and Draft Scoping Report submitted to DFFE 27 January 2023			
Draft Scoping Report circulated for comments via email (link or PDF) 01 February to 03 March 2023			
John Geeringh - Eskom	03/02/2023 3	Requested kmz files	03/02/2023 AGES sent kmz files

Organ of state & IAPs	Date	Comments and/recommendations	Response from EAP
Ria Barkhuizen - SANRAL	07/02/2023	Acknowledge DSR will send comments	
Ria Barkhuizen - SANRAL	20/02/2023	Sent comments, they have NO objection	
Amy Hill - Atlantic Energy	24/02/2023	Registered as I&AP and requested link	02/03/2023 AGES sent links, links downloaded
Lydia Kutu - Integrated Environmental Authorisations DFFE	27/02/2023	Sent comments on DSR	
Mr Seoka Lekota - Biodiversity Conservation DFFE	02/03/2023	Sent comments on DSR	

9.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROPOSED PV SOLAR PARK

The receiving environment has been described using a combination of specialist inputs, on-site observations, a review of existing literature and utilizing Geographic Information Systems (GIS) planning tools.

9.4.1 PROPERTY DESCRIPTION AND CURRENT LAND USE

The proposed development will be on Portion 2 of the farm Rooidraai 85 IQ located in the JB Marks Local Municipality, DR Kenneth Kaunda District Municipality, North-West Province. Access to the Mopane Solar PV 5 will be from both the D859 (Preferred) and R501 (alternative).

Table 7. Site location and Property details

<i>Site location and Property details</i>	
Farm	Rooidraai 85 IQ
Portion	2
LPI code	T0IQ00000000008500002
Overall Extent	800.6533 hectares
Landowner	Gerbet Trust
Diagram deed number	DB82/905
Title deed number	T71062/2002
Registration date	2002/06/14
Current land use	Grazing, cattle farming

9.4.2 ENVIRONMENTAL FEATURES

Environmental Screening Report – Annexure T.

Table 8. Environmental Screening Tool Table

Theme	Very high	High	Medium	Low	Specialist studies conducted	Motivation for no Specialist Studies
Agriculture		X			X	
Animal species			X		X	
Aquatic biodiversity	X				X	
Archaeological and Cultural Heritage				X	X	
Avian		X			X	
Civil Aviation				X	X	
Defence				X	X	
Landscape					X	
Paleontology	X				X	
Plant Species			X		X	
RFI				X	X	
Terrestrial Biodiversity	X				X	

The following environmental sensitivities are identified for the project area:

- **Agriculture Theme**

Sensitivity - High land capability.

Major land use of the study area as classified by the Environmental Potential Atlas of South Africa (2000) is vacant land and dissected plains and is currently used for grazing and classified as partially arable. Investigation of soil types of the development site is necessary for a more accurate classification of the agricultural potential (Annexure L).

- **Animal species Theme**

Sensitivity - Medium.

A sensitivity analyses was conducted to identify the most suitable site for the development. Results and mitigation measures included in Terrestrial Biodiversity Impact Assessment (Annexure E).

- **Aquatic Biodiversity Theme**

Sensitivity - Very high

The project area is not located within any Strategic Water Source Area. There are no wetland features located within the proposed development area. Drainage lines were demarcated with buffer areas indicated. See both Terrestrial Biodiversity Impact Assessment (Annexure E) and Wetland Riparian and Aquatic Statement in Annexure G.

- **Avian Species Theme**

Sensitivity - High

The avifaunal assessment conducted (Annexure F) concluded that no significant bird flight paths, migratory routes or roosting sites were identified but the modified farmland habitats do attract nomadic species for transitory feeding and breeding purposes. No particularly sensitive avian habitats occur on the project site. The project area is not located within an Important Birding Area (IBA) according to Birdlife SA IBA programme.

- **Civil Aviation Theme**

Sensitivity - Low

A Civil Aviation impact assessment was done and the report is included in Annexure N of this draft EIA Report. An application for approval will be submitted to the Civil Aviation Authority and ATNS.

- **Defence Theme**

Sensitivity - Low

Combined Defence and Radio Frequency Assessment was done and this report is included in this draft EIA Report attached in Annexure O.

- **Paleontological Theme**

Sensitivity - High

The palaeontologist concluded that it is extremely unlikely that fossils will be exposed as a result of the proposed development. If fossils are uncovered in the course of the development, the developer should immediately call a qualified palaeontologist to assess the situation and, if necessary, undertake excavation of the fossils (Annexure I).

- **Plant Species Theme**

Sensitivity - Medium

The botanist concluded that the development can be supported provided that the mitigation measures and sensitivity map are implemented (Terrestrial Biodiversity Impact Assessment - Annexure E).

- **RFI Theme**

Sensitivity - Low

Combined Defence and Radio Frequency Assessment was done, and the report is attached in Annexure O.

- **Terrestrial Biodiversity Theme (Annexure E)**

Sensitivity - Very High because it falls within CBA 2 and due to the presence of indigenous grassland.

The degraded grassland associated with the old fields has a low sensitivity. The natural grassland has a Medium Sensitivity and development can be supported in the area provided certain mitigation measures are implemented (see Annexure E).

9.4.3 WIND AND SOLAR DEVELOPMENTS WITH ENVIRONMENTAL AUTHORISATION OR APPLICATIONS UNDER CONSIDERATION WITHIN 30 KM OF THE PROPOSED AREA

According to the DFFE database, no wind and solar projects were proposed within 30 km from the project site or applied for an Environmental Authorisation.

9.4.4 CLIMATE

The climate for the region can be described as warm-temperate. In terrestrial environments, limitations related to water availability are always important to plants and plant communities. The study area is situated within the summer and autumn rainfall region with very dry winters and frequent frost that occurs during the colder winter months. The mean annual temperature for the area is 16.1°C, and the mean annual frost days is 37 days. Mean Annual Potential Evaporation is 2407mm, with Mean Annual Soil Moisture Stress of 78%.

9.4.5 TOPOGRAPHY AND DRAINAGE

The study area lies completely within the Upper Vaal Water Management Area (WMA) and entirely within the Highveld ecoregion (Kleynhans *et al.*, 2005).

The topography is characterised by slightly undulating plains. The topography of the site can be described as generally favourable, when considering that most of the area consists of slopes of less than 1:5. The site is located at an altitude of 1460 meters above mean sea level (AMSL).

Most properties situated within a 500m radius are being used for livestock grazing and crop cultivation. The proposed development land is used for livestock farming at present. The natural vegetation of the site varies from intact to planted pastures.

The site is located within the C23G quaternary catchment and is situated in the Upper Vaal Water Management Area. Drainage occurs as sheet-wash into the drainage channels and wetlands on site that eventually drains into the major river namely the Mooi River and Mooiriviersloop River that occurs to the west and south of the site respectively.

The land-use of the proposed development site is livestock, and the surrounding areas for crop cultivation and grazing. The major land use of the study area as classified by the Environmental Potential Atlas of South Africa (2000) is **vacant land**.

9.4.6 SOILS AND GEOLOGY

Geology is directly related to soil types and plant communities that may occur in a specific area (Van Rooyen & Theron, 1996). A land type unit is a unique combination of soil pattern, terrain and macroclimate, the classification of which is used to determine the potential agricultural value of soils in an area. The land type unit represented within the study area include the Fa14 land type (Land Type Survey Staff, 1987) (ENPAT, 2001). The land type, geology and associated soil types is presented in Table 5 below as classified by the Environmental Potential Atlas, South Africa (ENPAT, 2000).

Table 9. Land types, geology, and dominant soil types of the proposed development site

Landtype	Soils	Geology
Fa14	Glenrosa and/or Mispah forms (other soils may occur), lime rare or absent in the entire landscape	Dolomite and chert of the Chuniespoort Group; chert gravels are abundant on middle and footslopes including valley bottoms.

Soils associated with the site vary between slightly deeper, loamy red apedal soils, to shallow rocky soils.

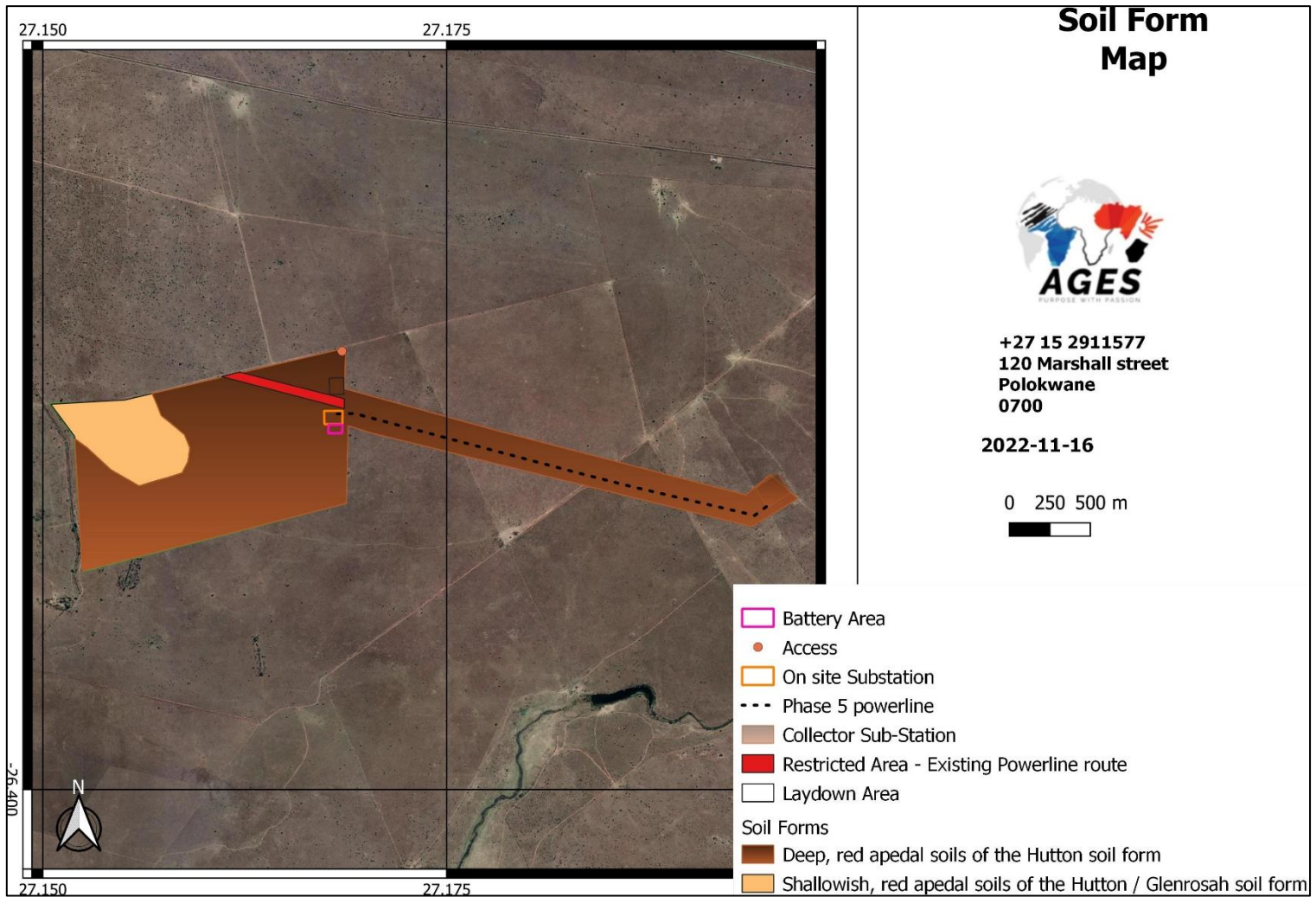


Figure 6. Soil Form Map

9.4.7 REGIONAL GEOLOGICAL SETTING

A Preliminary geotechnical investigation was done, and the report is attached as Annexure J.

9.4.7.1 Stratigraphy

Published geological map indicates the site to be wholly underlain by dolomite and chert of the Malmani Subgroup that forms part of the Chuniespoort Group and Transvaal Supergroup. Individual formations have not yet been mapped in the area. Alluvial deposits, in places diamondiferous, occur along the flood plain of the Mooi River and Mooirivierloop Stream.

9.4.7.2 Structural geology

Weakly defined east-west & north-south trending linear structures, inferred to represent dyke intrusions and/or faults, cut through the area. It is expected that the surrounding strata could have undergone a degree of vertical and/or lateral displacement and/or alteration that could have led to the formation of localized zones of weakness along which the presence of voids is common.

9.4.7.3 Status w.r.t. dolomite land

The whole study area classifies as dolomite land. Several instances of relatively small to medium-sized surface instability have been reported in the area, with the Carletonville area to the southeast especially notorious for large to very large sinkholes.

9.4.7.4 Undermining

The available geological information does NOT provide any indication of underground mining activities in the area. However, diamond-bearing gravels does occur at surface in the area.

9.4.8 ECOLOGY (FAUNA & FLORA)

A Terrestrial Biodiversity Impact Assessment (Annexure E) was conducted by AGES to describe the ecology (fauna and flora) present in the site, to assess its ecological sensitivity and to indicate the most suitable areas for the proposed development. A pre-screening site visit was conducted to determine if the assessment was accurate and if the studies recommended should be conducted. After the site visit the following was concluded:

- The site has a HIGH Sensitivity from a terrestrial biodiversity perspective due to the presence of indigenous grassland.
- The site has a Medium Sensitivity from an Animal Species Theme Perspective due to the presence of natural fauna habitats.
- The site has a Medium Sensitivity from a Plant Species Theme Perspective due to the presence of indigenous grassland.

After the assessment, it was concluded that a detailed terrestrial biodiversity, plant species theme and animal species theme assessment should be conducted. A survey was conducted during November 2022 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid. This report is included in Annexure E of this Draft EIAr.

9.4.8.1 Vegetation Types

The most recent classification of the area by Mucina & Rutherford (2006) shows that the site is classified as Carletonville Dolomite Grassland.

Carletonville Dolomite Grasslands (Gh15) are predominantly found in the North-West Province, in the regions around Potchefstroom, Ventersdorp and Carletonville. Vegetation and Landscape Features Carletonville Dolomite Grasslands occur on slightly undulating plains which are typically intersected by rocky chert ridges. They are species rich and according to Mucina and Rutherford (2006), dominated by many plant species.

The proposed development site occurs on a slightly undulating landscape. It is important to survey the area to have a better understanding of the ecosystem and the potential impact of the development on the natural environment. This was identified as a key factor, and subsequently the footprint areas were completely surveyed.

The site forms part of a larger farm used for livestock farming. The vegetation units on the site vary according to soil characteristics, topography, and land-use. Vegetation units were identified on the footprint development sites and can be divided into 2 distinct vegetation units according to soil types and topography.

The vegetation communities identified on the proposed development site are classified as physiographic physiognomic units, where physiognomic refers to the outer appearance of the vegetation, and physiographic refers to the position of the plant communities in the landscape. The physiographic-physiognomic units will be referred to as vegetation units in the following sections. These vegetation units are divided in terms of the land-use, plant species composition, topographical and soil differences that had the most definitive influence on the vegetation units. Each unit is described in terms of its characteristics and detailed descriptions of vegetation units are included in the following section. A species list for the site is included in Appendix B of the specialist report, while a plant species list for the quarter degree grid square (QDS) is included in Appendix A also of the specialist report. Photographs of each unit is included in the next section of the specialist report to illustrate the grass layer, woody structure, and substrate (soil, geology etc.).

The following vegetation units were identified during the survey.

1. *Schizachyrium – Trachypogon – Seriphium* rocky grassland
2. Open grassland with *Searsia pyroides* clumps
3. *Searsia pyroides* open woodland

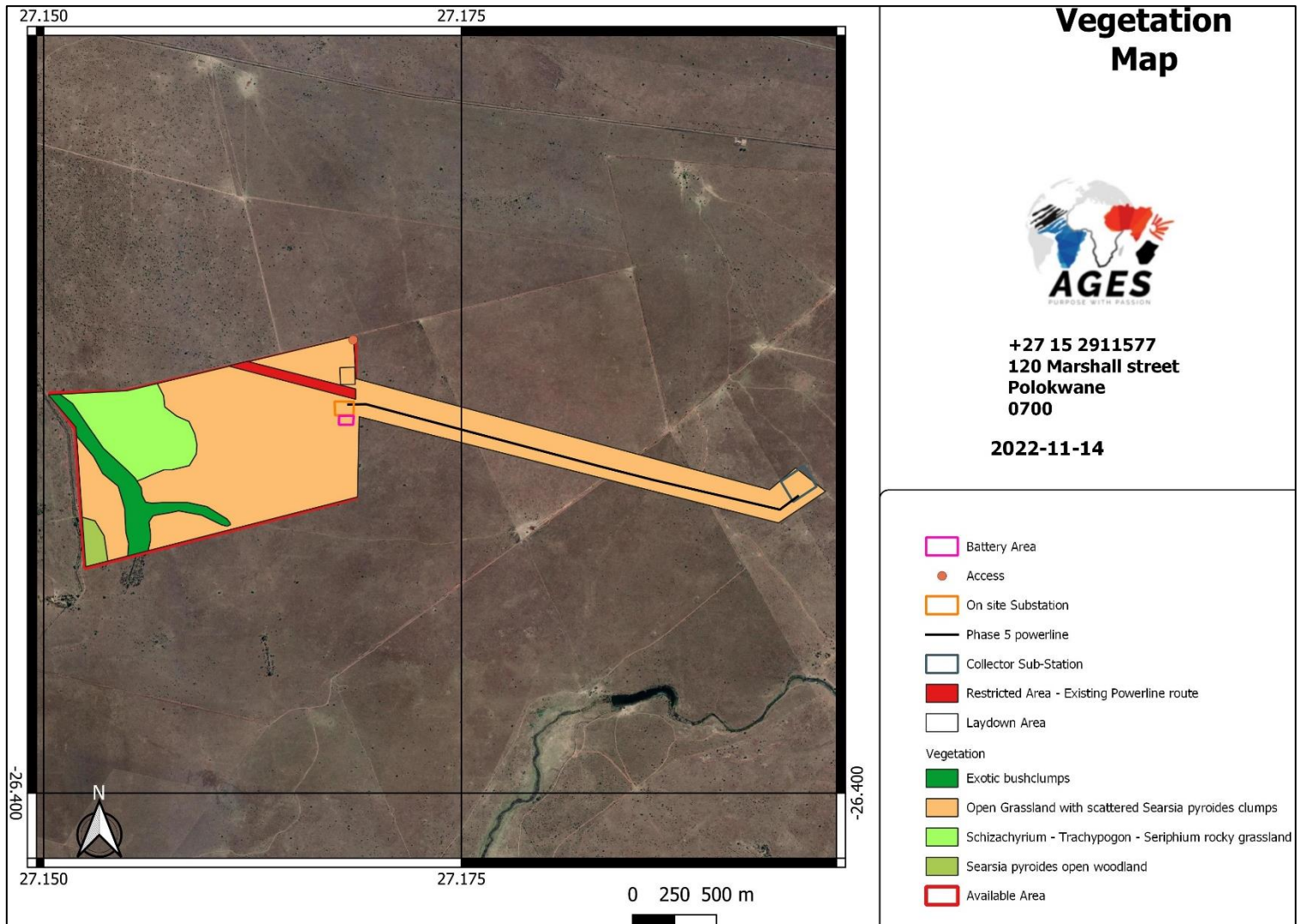


Figure 7. Vegetation Unit Map of the proposed development area (From Biodiversity Report)

- *Schizachyrium – Trachypogon – Seriphium* rocky grassland

This vegetation unit comprises an isolated section of the project area on undulating terrain. The soil is shallow and red soils of the Glenrosa and Hutton soil forms derived from quartzite. There are little to no trees present with the grasses having the highest cover. The grass layer is dominated by species such as *Schizachyrium sanguineum*, *Trachypogon spicatus*, *Tristachya leucothrix*, and *Elionorus*, while the dwarf shrub *Seriphium plumosum* is also prominent indicating that the area was probably overgrazed in the past.

The following specific recommendations for the vegetation unit regarding the proposed development should be adhered to:

- The vegetation unit is classified as having a medium sensitivity due to the due to the widespread status of this vegetation unit within the larger project area.
- The eradication of protected plant species *Boophane distycha* would need a permit from local authorities in the Free State.
- The development of the solar development is considered suitable in this area.

- Open grassland with *Searsia pyroides* clumps

A large section of the proposed development footprint forms medium tall grassland with scattered bushclumps of the woody species *Searsia pyroides* on red-apedal soils of the Hutton soil form. The grass layer is well developed and dominated by species such as *Elionorus muticus*, *Hyparrhenia hirta* and *Schizachyrium sanguineum*.

The following specific recommendations for the vegetation unit should be adhered to:

- The vegetation unit is classified as having a Medium sensitivity due its widespread occurrence in the Grassland Biome.
- The eradication of protected plant species *Boophane* would need a permit from local authorities in the North-West.
- The development of the solar development is considered suitable in this area.

- *Searsia pyroides* open woodland

This vegetation unit occurs on red apedal soils in the south-western section of the site and represent secondary old fields. The woody layer forms an open woodland mostly dominated by species such as *Searsia pyroides*, *Grewia flava*, *Diospyros lycioides* and *Vachellia karroo*, while the grass layer is dominated by species such as *Elionorus muticus*, *Aristida congesta* and *Schizachyrium sanguineum*.

The following specific recommendations for the vegetation unit regarding the proposed development should be adhered to:

- The vegetation unit is classified as having a Medium sensitivity due its widespread occurrence in the Grassland Biome.
- The development of the solar development is considered suitable in this area.

- Exotic bushclumps

The exotic bushclumps represent homogenous stands of *Eucalyptus camaldulensis* red apedal soils of the Hutton soil form. Exotic weeds and pioneer grasses often colonize the areas beneath the exotic bushclumps. No detailed survey was considered for this area due to the completely modified state of the vegetation.

9.4.8.2 Red Data Species

Only the red data species *Boophane distycha* was observed during the surveys. The species can be relocated from its current conditions if needed through a rescue and relocation programme should the development activities impact on populations. Ecological monitoring must be implemented during the construction phase and specific sensitive habitats (riparian) needs to be avoided to ensure that any potential red data species potentially missed during the field surveys are preserved and not potentially impacted on.

9.4.8.3 Protected Species (North-West Nature Conservation Ordinance)

Plant species are also protected in the North-West Province according to the North-West Nature Conservation Ordinance. According to this ordinance, no person may pick, import, export, transport, possess, cultivate, or trade in a specimen of a specially protected or protected plant species. The Appendices to the ordinance provide an extensive list of species that are protected, comprising a significant component of the flora expected to occur on site. Communication with Provincial authorities indicates that a permit is required for all these species if they are expected to be affected by the proposed project.

After a detailed survey was conducted during November 2022, the listed species *Boophane disticha* confirmed for the site. No eradication should be allowed without a permit.

9.4.8.4 Protected Trees Species (NFA)

The National Forest Act, 1998 (Act No. 84 of 1998) provides a list of tree species considered important in a South African perspective because of scarcity, high utilization, common value, etc. In terms of the National Forest Act of 1998, these tree species may not be cut, disturbed, damaged, destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased, or sold – except under license granted by a delegated authority. Obtaining relevant permits are required prior to any impact on these individuals. Taking cognizance of the data obtained from the field surveys, **no protected tree species** occur in the area.

9.4.8.5 Alien Invasive Species

The following alien invasive and exotic plant species were recorded on site during the surveys as stipulated in the Alien and Invasive Species Regulations (GNR 599 of 2014).

Table 10. Declared weeds and invader plants of the study area.

Species	Category
<i>Argemone ochroleuca</i>	1b
<i>Datura stramonium</i>	1b
<i>Eucalyptus camaldulensis</i>	1b
<i>Verbena brasiliensis</i>	1b
<i>Xanthium strumarium</i>	1b

According to the amended regulations (No. R280) of March 2001 of the Conservation of Agricultural Resources Act 1983 (Act no. 43 of 1983), it is the legal duty of the land user/landowner to control invasive alien plants occurring on the land under their control.

9.4.8.6 Conclusions

An important aspect relating to the proposed development site should be to protect and manage the biodiversity (structure and species composition) of the vegetation types which surround the project area.

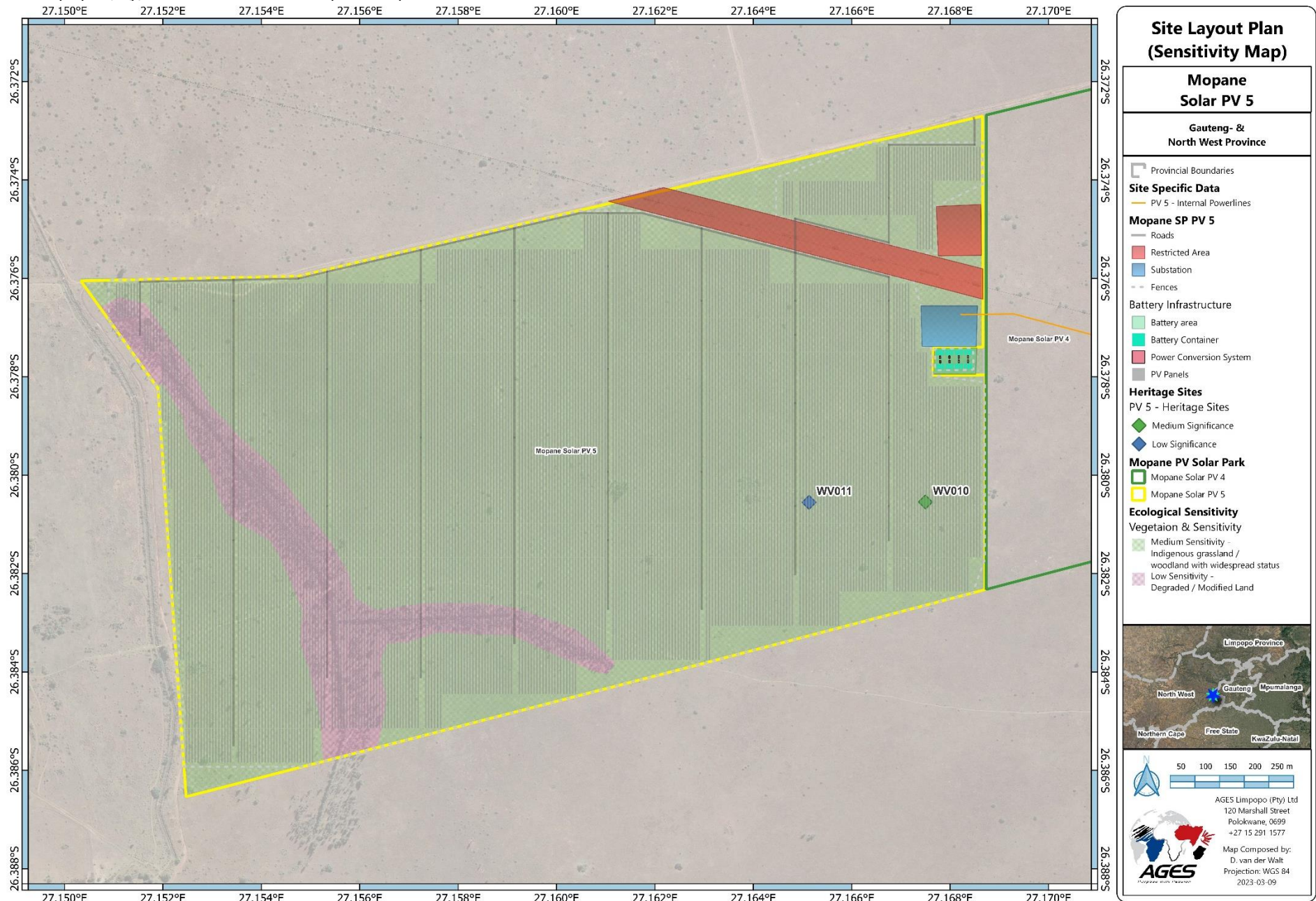


Figure 8. Sensitivity Map

9.4.8.7 Fauna

A survey was conducted during November 2022 to identify specific fauna habitats, and to compare these habitats with habitat preferences of the different fauna groups (birds, mammals, reptiles, amphibians) occurring in the quarter degree grid. During the site visits mammals, birds, reptiles, and amphibians were identified by visual sightings through random transect walks. In addition, mammals were also recognized as present by means of spoor, droppings, burrows or roosting sites.

Mammals

Much of the large and medium-sized mammal fauna that previously occurred on the project site is now locally extinct or occurs in small, fragmented populations in reserves. Most of the habitat types on the respective study sites are fragmented. Therefore, the expected mammalian richness on these areas is considered low, although slightly higher richness values are expected from the more intact grassland, woodland and wetland habitats.

The Highveld Ecoregion contains a high number of mammals, but only the orange mouse (*Mus orangiae*) is restricted to the ecoregion, and the rough-haired golden mole (*Chrysoxalax villosa*) is near-endemic. The ecoregion supports populations of large mammal species, some of which are rare in southern Africa (Stuart and Stuart 1995). Among these are brown hyena (*Hyaena brunnea*), African civet (*Civettictis civetta*), leopard (*Panthera pardus*), pangolin (*Manis temminckii*), honey badger (*Mellivora capensis*), striped weasel (*Poecilogale albinucha*), aardwolf (*Proteles cristatus*), oribi (*Ourebia ourebi*), and mountain zebra (*Equus zebra hartmannae*).

Predators that still roam freely in the area include larger predators such as brown hyena, while smaller predators such as caracal, serval and honey badger are common throughout the larger area. Antelope species such as duiker and steenbok will roam freely through the area and are not restricted by game fences. Smaller mammal species such as honey badgers and serval can become habituated to anthropogenic influences, while other species such as brown hyena will rather move away from the construction activities and will seldom use the area.

Connectivity 1 of the project site to the remainder of the larger area is Moderate due to other surrounding areas representing natural grassland and wetlands. Of significance is the role of wetlands and indigenous grasslands as a zoogeographical dispersal corridor in the larger area.

Most mammal species are highly mobile and will move away during construction of the solar development. The most important corridors that need to be preserved for free-roaming mammal species in the area include the wetlands and indigenous grasslands.

¹ **Connectivity (habitat connectivity)** - Allowing for the conservation or maintenance of continuous or connected habitats, so as to preserve movements and exchanges associated with the habitat.

Herpetofauna

Twenty-nine amphibians occur within the eco-region but none are endemic (Passmore and Carruthers 1995). Breeding habitat of frogs and toads can be found mostly in the permanent wet zone of the wetlands and dams in the larger area. Amphibian species potentially occurring in the larger area include Common River Frog, Natal Sand Frog, Gutteral Toad, Raucous Toad and Bubbling Kassina. These species are non-threatened and widespread, and as such the development will not have any impact on amphibian conservation within the region.

Relatively few reptile species occur in the Highveld Ecoregion, due to its cool climate. The ecoregion supports some of Africa's most characteristic reptile species, including Nile crocodile, African rock-python, water monitor and veld monitor. There are two endemic reptiles: giant girdled lizard, and *Agama distanti* (Branch 1998). Several additional reptile species are near-endemic, including Drakensberg rock gecko, giant spinytail lizard, and Breyer's whiptail.

In the presence of dead termitaria, the small geckos listed are probably found on the site. A few terrestrial lizards (Yellow-throated Plated Lizard, Variegated Skink), typical for Highveld Grassveld, are expected to be present. A variety of smaller snake species characteristic for Highveld Grassveld will be present (Common Wolf Snake, Brown House Snake), although some might be dependent on by the presence of dead termitaria. The only venomous snakes, which has been reported as being present and common, is as expected, the Rinkhals, Mozambique spitting cobra, snouted cobra and the Puffadder for this QDS. All the reptile species are common and widespread, and as such the development will not have any impact on reptile conservation within the region. The sungazer lizard occurs in some of the grassland areas, while the southern spiny agama and the striped harlequin snake may occur in small numbers in suitable habitat.

According to the existing databases and field survey the following number of fauna species included in the IUCN red data lists can potentially be found in the study area:

Table 11. Red data list of potential fauna for the study area

English Name	Conservation Status	Probability of occurrence on site
BIRDS (SABAP 2 LIST SPECIES)		
Pallid Harrier	Near Threatened	Moderate
Greater Flamingo	Near Threatened	Low (wetlands)
Grass Owl	Vulnerable	Moderate
Secretarybird	Vulnerable	Moderate
Cape Vulture	Endangered	Moderate
Macoa Duck	Near Threatened	Low (wetlands)
MAMMALS		
Serval	Near Threatened (2016)	Moderate
African Clawless Otter	Near Threatened (2016)	Low (wetlands)

The **cumulative negative impacts** of the proposed development will have a medium to low impact on the fauna of the area.

Recommendations and mitigating measures still need to be implemented to ensure the survival of these species, other fauna habitats and feeding grounds as stipulated below:

- The development would not have a significant impact on the above-mentioned red data fauna since adequate and natural habitat/vegetation would be available on the peripheral grassland habitats surrounding the development site. The most probable habitat to find any of the red data species in the study area would be in the more natural areas of the grassland and wetlands where little or no disturbances from humans or livestock occur at a regular interval. Fauna will therefore rather move away from the area and utilize adjacent, more natural areas. Importance to preserve wetland habitat to the south of the development footprint must be considered a high priority.
- The removal of vegetation should be confined to footprints of the proposed development site. This will be on small sections in relation to the total available surrounding habitat for fauna. The development will not influence the natural feeding and movement patterns of the existing fauna in the area.
- If one considers the habitat descriptions of the red data species, most of them are not directly threatened by habitat loss. The impact of development on the red data species would therefore be less than predicted.
- The protection of different habitat types in the area will be important to ensure the survival of the different animals due to each species' individual needs and requirements. Sufficient natural corridor sections should be protected around the proposed development footprints to allow fauna to move freely between the different vegetation units on the property. The drainage channels and sections of natural vegetation will be preserved as corridors in the area and mitigation measures should be implemented to ensure that the habitats are protected.
- Taller (>3m) indigenous trees in this area provide resting/perching sites for larger birds like birds of prey, arboreal reptiles and mammals that might occur/pass through the area and should preferably be preserved. The larger trees should be protected as far as possible and be incorporated into the proposed development. The removal of large dead trees is not advised as these trees also provide smaller habitats for the mentioned bat species as well as rodents. The grass layer on the other hand also provides a valuable food source (insects, reptiles, small mammals that occur in/on the grass layer) for fauna.
- A monitoring programme needs to be implemented by a specialist if any rare species are confirmed on the property.

9.4.8.8 Summary and results of the Terrestrial Biodiversity Impact Assessment

Detailed ecological (fauna habitat & flora) surveys were conducted during November 2022 to verify the ecological sensitivity and ecological components of the site at ground level. The timing of the season was considered as adequate due to sufficient rains received in the area during the winter months and early spring. The survey was considered successful.

Most sensitive sections: It is evident from the distribution of biodiversity, presence of threatened species and sites of scientific interest, that the proposed development has the potential for negative impact on the flora and faunal of the study area. This is particularly true of the sensitive vegetation associated with the riverine and wetland ecosystems and the larger project area, although none such habitats occurred on site.

Most sensitive habitats: Many threatened species are grassland specialists, linked to these habitats either for breeding, feeding or shelter. Major impacts on wetland areas to the south of the site should be avoided wherever possible during construction. Where unavoidable impacts will occur on grassland and wetland zones, strict mitigation measures and legislation should be implemented (DAFF licence for eradication of protected trees, IWUL application etc.).

Monitoring of threatened species: Many endemic and protected species have been recorded in region. The EMPr for the development should highlight the conservation status of these species and note that steps must be undertaken in conjunction with conservation authorities to protect or translocate any populations encountered during project actions. Ecological monitoring is recommended for the construction phase of the development considering the presence of potential red data fauna on areas surrounding the site. The importance of rehabilitation and implementation of mitigation processes to prevent negative impacts on the environment during and after the construction phase of the solar development should be considered a high priority. The proposed site for the development varies from being in a slightly degraded to pristine state.

A sensitivity analyses was conducted to identify the most suitable site for the development. From this investigation and ecological surveys, the following main observations was made:

- Most of the proposed development footprints represent CBA2 areas although most of these areas should rather be classified as ESA1 or ESA2 areas. The management objective for this area is to maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern.
- Officially protected areas, either Provincially or Nationally that occur close to a project site could have consequences as far as impacts on these areas are concerned. For the proposed development and associated infrastructure no protected areas occur in proximity, with the closest being the Abe Bailey Provincial Nature Reserve that occurs to the east of the project area.

- The National Protected Areas Expansion Strategy (NPAES) are areas designated for future incorporation into existing protected areas (both National and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. No NPAES occur within the project area, although the Vaal Grasslands NPAES occur to the east and south of the project area.

Only the red data species *Boophane distycha* was observed during the surveys. The species can be relocated from its current conditions if needed through a rescue and relocation programme should the development activities impact on populations.

Ecological monitoring must be implemented during the construction phase and specific sensitive habitats (riparian) needs to be avoided to ensure that any potential red data species potentially missed during the field surveys are preserved and not potentially impacted on.

Some potential rare fauna may also occur in the area, and specific mitigation measures need to be implemented to ensure that the impact of the development on the species' habitat will be low. Specific mitigation relating to red data fauna includes the following:

- Disturbances in close vicinity of the development (periphery) should be limited to the smallest possible area to protect species habitat.
- Corridors are important to allow fauna to move freely between the areas of disturbance.

Several ecological potential impacts were identified and assessed. A few of these were assessed as having potentially medium or high significance, including the following:

- Destruction or disturbance to sensitive ecosystems leading to reduction in the overall extent of a particular habitat;
- Increased soil erosion;
- Impairment of the movement and/or migration of animal species resulting in genetic and/or ecological impacts;
- Destruction/permanent loss rare, endangered, endemic and/or protected species;
- Establishment and spread of declared weeds and alien invader plants;
- Soil and water pollution through spillages;
- Establishment and spread of declared weeds and alien invader plants;
- Impacts of human activities on fauna and flora of the area during construction;
- Air pollution through dusts and fumes from construction vehicles (construction phase).

Mitigation measures are provided that would reduce these impacts from a higher to a lower significance. A monitoring plan is recommended for the construction phase of the development should the proposed application be approved.

The proposed development should allow corridors of indigenous grassland and wetlands on areas outside the development footprint to be preserved. Where sensitive areas of natural vegetation cannot be avoided, mitigation measures are recommended to minimise and/or offset impacts. Negative impacts can be minimised by strict enforcement and compliance with an EMP which considers the recommendations for managing impacts detailed above.

According to the Ecological Specialist, provided that the proposed development and layout plans is consistent with the sensitivity map and take all the mitigation measures into consideration stipulated in this report, the planned development can be supported.

9.4.9 AQUATIC ECOLOGY

Scientific Aquatic Services (SAS) (Pty) Ltd was appointed to undertake a freshwater assessment to verify the presence of freshwater ecosystems within the area demarcated for a proposed Photovoltaic (PV) Power Plant with associated infrastructure. The Aquatic Biodiversity Statement is attached as Annexure G of this report.

On site, it was confirmed that soil in the study area did not display any characteristics of redoximorphism such as mottling (indicators of a fluctuating water table associated with wetland conditions).

No sign of wetness was found at the site where the depression wetland was suggested by the NFEPA (2011) and National Wetland Map (NBA 2018) databases, and it is therefore confirmed that this site is not a wetland. No other natural freshwater ecosystems were found in the study area. Although there were depressional areas in the topography of the landscape, none of these areas were found to possess vegetative wet responses.

Based on site verification undertaken by Scientific Aquatic Services and findings thereof presented in an attached report, it was confirmed that no natural freshwater ecosystems occur in the study/investigation area. Due to the closest freshwater ecosystem being greater than 500 m distant from the study area, no Zones of Regulation will apply to the study area and proposed development, nor would the development be subject to a Water Use Authorisation in terms of Section 21(c) and (i) of the National Water Act, 1998 (Act No 36 of 1998). The proposed PV Power Plant poses no significant quantum of risk to existing freshwater ecosystems in the area and no risk assessment is required in accordance with GN509 of 2016.

9.4.10 AVIFAUNA

An Avifaunal Assessment (Annexure F) was conducted by Ryno Kemp (Pr.Sci.Nat.) in order to determine whether the proposed development would have negative impact on avifauna. The field survey area covered the entire farm of 800 ha and included a thorough desktop study which encompassed a wider geographical range than the field survey. The field survey was conducted on 28-30 October 2022.

The desktop analysis recorded 316 species from more than 500 full protocol cards registered during SABAP2 in the 12 pentads surrounding the proposed Mopane Solar Park and connection lines. The data also reveal that, on average independent of the month, one can observe 202 ± 21 species. Of these, 164 were confirmed during the point survey count, another 19 species were recorded during incidental recordings within the study period, and a further 70 are likely to occur. Species richness analysis in Estimate S confirmed that the proposed Mopane Solar Park and Connection power line would hold $\sim 186 \pm 8$ species based on the species accumulation curve.

The species accumulation curve suggested adequate sampling for the proposed area was reached and therefore did not require further sampling. Sampling was conducted at the beginning of the wet season when migrator species had returned.

Only two species recorded during the field survey have not been recorded previously, suggesting that the number of species within the area has been saturated and accurate conclusions could be made from the desktop analysis. It would not make sense to repeat the survey during the winter months as suggested in the Best Practice Guidelines Birds & Solar Energy (Jenkins et al. 2017). Species confirmed include grassland species (Spike-heeled Lark, Cloud Cisticola, Capped Wheatear, etc.). Field survey observed endemic or near-endemic species in South Africa, including Cape Sparrow, Fiscal Flycatcher, Sabota Lark, etc. Twenty threatened or near-threatened species were recorded in the greater region during a desktop survey, and only two were confirmed during a field survey. Mopane Solar Park and power line pose a significant threat regarding habitat loss, collisions and electrocution with infrastructure.

The assessment of impacts identified by Birdlife SA as significant for PV developments has revealed that most of these impacts fall within the low to moderate-risk category. As most threats to birds and other wildlife posed by PV facilities are poorly understood, the Mopane Solar Parks, if endorsed, have the potential to provide an ideal platform for monitoring the impact of Solar Parks on the avifaunal communities in grasslands close to wetlands and a river system. Birds within these systems usually stick to them but can occasionally fly between systems, which increases the risk of a negative interaction with the Solar Park.

The Solar Parks might have a negligible effect on the overall bird community, as more than 38% of the landscape has already undergone some anthropogenic disturbance, and even the proposed area is used for grazing livestock. The proposed development allows institutions to conduct valuable and relevant research into threats posed to avifauna by PV facilities and how to avoid these threats, especially to high-priority species. The biggest concern is the threat of internal power lines to threatened species and large terrestrial birds such as vultures, korhaans and herons. Designs of internal power lines must be endorsed by the Eskom-EWT strategic Partnership on birds and Energy, considering the mitigation guidelines recommended by Birdlife SA (Jenkins *et al.* 2017).

Bird diverters or spirals must be added to transmission lines to reduce collision risk. All parts of infrastructure must be nest proofed and fitted with anti-perched devices on areas that can lead to electrocution. Any exposed parts must be covered (insulated) to reduce electrocution risk. Power lines must be checked quarterly to repair any failed mitigations. Careful consideration needs to be taken as the proposed development can slightly impact the ecological process of the bird community.

If the wetland and river system can be avoided as far as possible with the mitigations applied, the impact might reduce in some cases. However, the competent authority must consider all prescribed mitigation measures and recommendations when reviewing the application. The proposed Mopane Solar PV 5 development will generate environmental impacts on avifauna. Based on the present desktop study, the author's opinion is that negative avifaunal impacts associated with Mopane Solar PV 5 can largely be mitigated.

9.4.11 VISUAL

A Visual Impact Assessment (Annexure K) was conducted by Graham Young Landscape Architects, to determine visual impact of proposed development. It was found that the study area's scenic quality is rated low to high within the context of the sub-region, and the project site is in a moderate rated landscape type. Sensitive viewing areas and landscape types were identified and mapped, indicating potential sensitivity to the Project, mainly for residences of farmsteads to the immediate west and south of the site. Impacts on views are the highest when viewers are sensitive to change in the landscape, and the view is focused on and dominated by change. The Project's visual impact will cause changes in the landscape that are noticeable to people viewing the landscape from a public road north of the site. Farmsteads to the west and south of the site will not see the proposed development.

The impact on the visual environment during the construction phase is assessed to have a low intensity over a localized area (but extend beyond the site boundary to at least 3,0km) and would occur over the short-term (less than five years) resulting in a low consequence. The probability of the unmitigated impact is moderate resulting in a predicted significance of impact is LOW. The implementation of mitigation measures would not significantly reduce the anticipated impact, which would remain LOW.

Impact on the visual environment during operational phase is assessed to have a moderate intensity and would occur over the long-term (anticipated to be thirty years) resulting in a moderate consequence. Probability of unmitigated impact is moderate resulting in a predicted significance of impact, which is LOW. Significance of a moderate impact is that it could have an influence on the decision, and impact will not be avoided unless mitigated. Mitigation measures can slightly reduce visual impact, but it would remain a LOW impact.

9.4.12 SOCIO-ECONOMIC ENVIRONMENT

A report on the socio-economic considerations related to the proposed project was compiled and is attached in this Report in Annexure P. The following issues can be anticipated:

- The socio-economic impact of the proposed Mopane Solar PV 5 project is considered positive, and the application is supported, provided that all the mitigation measures proposed by specialist consultants are implemented.
- The project is consistent with development policies at the national, provincial and local government levels, although the institutional readiness for a project of this nature will have to be carefully managed at the municipal level.
- The project area is on farmland, with low potential for agriculture or any other land use. The 2017 Gross Domestic Product (GDP) of the local municipality is estimated at more than R22bn (nominal prices), which was a contribution of 8% to the provincial economy. Community Services, which is mostly the various tiers of government, is the largest economic sector, contributing 33% to local gross value added. Sustained growth in this sector is challenged by high public debt levels.
- Economic growth in this municipality is lower than the national growth rate. Municipal planning documents emphasize the need for higher levels of economic growth and job creation.
- The National Development Plan supports the procurement of at least another 20 GW of renewable energy by 2030, which has been raised to 24 GW by the updated IRP. This leaves some way to go from the 6.5 GW that is currently procured under REIPPPP. A key driver of the global shift is government policy support and renewable energy prices dropping below R0.50/kWh under competitive processes.
- The Provincial Strategic Plan echoes the support for and related targets for renewable energy that are contained in the National Development Plan. The first two priority focus areas in the Provincial Strategic Plan include renewable energy development with specific reference to solar photovoltaic projects. The Provincial Spatial Development Framework confirms this position. It is also confirmed in the integrated development plan of the JB Marks Local Municipality.
- By Dec 2021, North West Province had 5 renewable energy projects that generate 275 MW with solar PV technology. These projects are in operation, but none of them are in the local municipal area. They had an investment value of almost R6.3bn and have created more than 7,400 job years of employment. In addition, three solar PV development proposals were given preferred bidder status in December 2022 under bid window 6.
- The assessment is that the socio-economic impact of the proposed Mopane Solar PV 5 project will be positive. Mitigation measures are recommended against institutional, safety and crime risks, particularly during construction. Mitigation measures recommended by other specialists should also be implemented.

9.4.13 AGRICULTURAL POTENTIAL

An Agricultural Potential Impact Assessment on soils potential was conducted and is included in this Report in Annexure L. A thorough investigation of the soil types of the proposed development site is necessary for an accurate classification of the soils. The main aim of the study is to identify the soil types on site and evaluate their specific characteristics to determine the agricultural potential of the soils.

The assessment of agricultural potential and land capability of the study area was based on a combination of desktop studies to amass general information and then through site visit for status quo assessment, soil sampling and characterization, and also the validation of generated information from desktop studies.

The proposed development site shows some variations in terms of soil characteristics and soil types identified during the survey. The classification of soils on the farm was based on land type description and the Binomial System for South Africa, which classifies soils into forms and families based on the diagnostic horizon of the soil profile. Exposed soil profile characteristics created by road cuttings in the field were also used in describing the local soil form. Soil identification and classification of the dominant soil type were done.

Soils were classified into broad classes according to dominant soil form and family as follows:

- Deep, red apedal soils of the Hutton soil form.
- Shallowish, red apedal soils of Hutton/Glenrosah soil form with scattered Mispah soils.

The geological formations and vegetation patterns showed a strong correlation to the major soil units mapped in the study area.

9.4.13.1 Deep, red apedal soils of the Hutton soil form

Description: Hutton soils are identified based on an apedal (structureless) "red" B-horizon. These soils are the main agricultural soil found in South Africa, due to deep, well-drained nature of the soil. Hutton soils on site are restricted to north-eastern and north-western plateaus of the site and is deep but has a low clay content. Relatively high magnesium and iron content of parent rocks from which the soils are derived, impart strong red colours noted.

Landscape: Slightly undulating landscape.

Depth: 600-1200mmmm

Texture: Medium coarse sandy loam to sandy clay loam

Average Clay Content: 10-20%

Agricultural Potential: Moderate potential soils– soils deep and loamy that has a good water holding capacity and the clay content of the soils is sufficient. Under the climatic conditions these soils would not sustain arable crop production. The most viable option for crop production on the soil form is under irrigation considering the variable rainfall and moisture availability due to higher day temperatures.

Irrigation is not common practice in the area and for any irrigation to be undertaken, it will require the installation of surface water impoundments as storage during dry months. Limited water availability, high evaporation rates and high water demands by crops would render crop cultivation not sustainable in the area. Many old, cultivated fields confirm that crop cultivation over the long term is not a financially viable option under prevailing climatic conditions.

Land capability: Livestock and/or game grazing are viable due to the slightly higher nutrient and organic content of the topsoil in grassland and woodland areas that support a mixture of palatable and unpalatable species.

9.4.13.2 Shallowish, red apedal soils of the Hutton / Glenrosa soil form

Binominal Classification S.A.: Hutton/Glenrosa with scattered representations of Mispah soil form.

Description: The shallow Hutton or Glenrosa soil forms are the second most dominant of the plain areas of the project site and has a medium depth. The soil in this area has a sandy-loam to loamy structure forms a mosaic of Hutton and Glenrosa soils. Hutton soils are identified based on the presence of an apedal (structureless) "red" B-horizon.

Landscape: Slightly undulating plains (grassland)

Depth: 100-400mm

Texture: Sandyloam to sandyclayloam

Average Clay Content: 10-20%

Agricultural Potential: Moderate to low potential soils, due to the shallow nature of the soils.

Land capability: Livestock and/or game grazing are viable due to the slightly higher nutrient and organic content of the topsoil in grassland and woodland areas that support a mixture of palatable and unpalatable species.

9.4.13.3 Impacts on the agricultural capability

The impacts associated with the proposed development on the agro-ecosystem capability will depend on the specific area where the development will take place. The following list of impacts is anticipated with the proposed developments on the soils and land capability in the area during the construction phase:

- Disturbance of soils (Soil compaction, erosion and crusting);
- Soil contamination due to leaching of soluble chemical pollutants;
- Loss of current and potential agricultural land.

Provided that the development and layout plans is consistent with agro-ecosystem sensitivity map and take all mitigation measures into consideration the development can be supported.

Land capability: Livestock/game grazing are viable due to slightly higher nutrient and organic content of topsoil in wooded areas that support a mixture of palatable and unpalatable species.

Arable Land (Crop Production)

The proposed development site is composed of sandy clay loam to sandy-loam soils. The soil has a clay content varying between 10% (sandy loam soils) and 25% (sandy loam clay soils). The soils are further predominantly red-apedal soils with a loamy texture. The soil depth is however lower than the prescribed 900mm for high potential soils in the North West Province and not under irrigation. The farm is expected to receive an annual total rainfall of about 590 mm which is relatively low and highly variable. The farm is in an area which is marginal to dry for rain-fed arable crop production. Economically viable farming is restrictive to irrigated cropping due to the high risk that could be associated with dry-land farming. At present no irrigation or centre pivots occur on the property. Furthermore, higher day temperatures and evaporation rates in summer months may hamper soil moisture storage for crop use.

Grazing Land (Livestock Production)

The current vegetation at the proposed site of development consists mainly of areas of with mixed quality grazing (highly palatable and unpalatable grasses) throughout most parts of the site and these areas can support limited grazing by livestock and game species. The nature of the vegetation and size of the properties make the area marginal for extensive livestock production. Using planted pasture to supplement livestock production is an option considering the water availability for extensive irrigation.

Considering that re-growth of grass will take place under the panels as the mounting systems are at least 1m above ground level, the grazing value of the land will still be available to small livestock such as game, goats and sheep. At the end of the lifetime of the solar plant, structures will be removed, and natural vegetation will re-establish naturally. The grazing value of the land can therefore be increased by using planted pasture underneath the solar panel mounts. The nature of the vegetation at the farm is therefore marginal for extensive livestock production. Using planted pasture to supplement livestock production is however possible but this could be constrained by high demand for irrigation water due to the shallow and often sandy nature of the soil and relatively higher day temperatures in summer.

Impacts on the agricultural capability

The impacts associated with the proposed development on the agro-ecosystem capability will depend on the specific area where the development will take place. If the activities take place along the slightly undulating terrain the impacts will be lower with only marginal erosion risks that can be managed through proper mitigation measures. Mitigation of overall impacts on soils (compaction, erosion) will be easier on flatter areas. The following list of impacts is anticipated with the proposed developments on soils and land capability during the construction phase:

- Disturbance of soils (Soil compaction, erosion and crusting);
- Soil contamination due to leaching of soluble chemical pollutants;
- Loss of current and potential agricultural land.

Mitigation measures are provided that would reduce these impacts from a higher to a lower significance. Furthermore, the proposed layout plan of the PV plant should be consistent with the agro-ecosystem maps and recommendations stipulated in this report, and the impact on the sensitive soil forms on site should be kept to a minimum. According to the soil specialist who conducted the Agricultural Potential Impact Assessment, provided that the proposed development and layout plans is consistent with the agro-ecosystem sensitivity map and take all the mitigation measures into consideration stipulated in this report, the planned development can be supported.

9.4.14 CULTURAL AND HERITAGE RESOURCES

An Archaeological Impact Assessment (Annexure H) was conducted by Beyond Heritage to ascertain whether there are any remains of significance in the area that will be affected by the proposed development. Isolated and low density MSA artefacts are found across the wider landscape. These artefacts are mainly made from locally occurring chert and Cryptocrystalline silica (CCS) and is considered to form part of the background scatter (Orton 2016) of the area.

Isolated Stone Age scatters are out of context and scattered too sparsely to be of significance. Any additional effects to subsurface heritage resources can be successfully mitigated by implementing a chance find procedure. Mitigation measures as recommended in this report should be implemented during all phases of the project. Impacts of the project on heritage resources is expected to be low during all phases of the development.

The proposed project will have a low cumulative impact as no significant heritage resources will be adversely affected. Although surface sites can be avoided or mitigated, there is a chance that completely buried sites would still be impacted on, but this cannot be quantified. During the survey, a number of heritage receptors were noted, and recommendations were made in terms of heritage resources management, which is shown in the following table:

Table 12. Mopane Solar PV 5 EIA project heritage sites locations

Site Code	Coordinate S E	Short Description	Significance/Field Rating	Mitigation Action
WV010	S26° 22' 49.9619" E27° 10' 02.9964"	The site consists of a medium density (5m ²) Stone Age debitage and flakes scatter. The cultural material covers approximately a 40x50m area but is most dense at the centre of the site. There are no formal tools only debitage left on the site all of which consists of a black coloured chert suggesting that this was most likely a production site utilizing the raw material from the site.	Medium Significance GP B	Stone Age site at WV010 must be retained <i>in-situ</i> with a minimum buffer of 40 meters. If this is not possible, the site will require Phase 2 mitigation (surface sampling and potentially test excavations) with the required permit prior to construction. Regular monitoring of the development footprint by the ECO to implement the Chance Find Procedure for heritage and palaeontology resources in case heritage resources are uncovered during the course of construction. Any changes to the layout should be subjected to a heritage walkdown prior to development.
WV011	S26° 22' 49.9945" E27° 09' 54.4789"	The site consists of a low-density Middle Stone Age Stone tool scatter located at a low-lying rock outcrop	Low Significance GP C	

The possibility of the occurrence of subsurface finds cannot be excluded. If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped, and a qualified archaeologist must be contacted for an assessment of the find and therefore chance find procedures should be put in place as part of the EMPr.

9.4.15 PALAEOLOGICAL RESOURCES

A Palaeontological Impact Assessment (Annexure I) was conducted by Prof Marion Bamford. The project lies in the south western part of the Transvaal Basin where the lower rocks of the Transvaal Supergroup are exposed, in particular the dolomites of the Malmani Subgroup (Chuniespoort Group, Transvaal Supergroup; ca 2585-2480 Ma).

Based on the fossil record and confirmed by a site visit and walk through there are NO FOSSILS in exposures of dolomite in the project footprint. There were mostly cherts but some dolomites occur in the proposed solar collector area. The western and central part has only a few cherts and mainly is covered with soils. No stromatolites were found on the farm. It would appear that stromatolites, oolitic and algal dolomite are generally absent from this region. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary.

There is a very small chance that trace fossils may occur in below the ground surface in the dolomites of the Malmani Subgroup so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found once excavations and drilling have commenced, then they should be rescued, and a palaeontologist called to assess and collect a representative sample. There is an extremely small chance of fossils being impacted on by this project.

Recommendations of the Palaeontological Specialist

Based on the fossil record but confirmed by the site visit and walk through there are NO FOSSILS in exposures of dolomite in the project footprint. There were mostly cherts but some dolomites occur in the proposed solar collector area. The western and central part has only a few cherts and mainly is covered with soils. No stromatolites were found on the farm although stromatolites have been recorded from some exposures of the Malmani Subgroup. This is reflected in the lack of a formation being assigned to the area, because the type of fossils would enable the recognition of the Formations within this group. It would appear that stromatolites, oolitic and algal dolomite are generally absent from this region. It is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary.

There is a very small chance that trace fossils may occur in below the ground surface in the dolomites of the Malmani Subgroup so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer or other responsible person once excavations and drilling have commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample.

9.4.16 TRAFFIC IMPACT ASSESSMENT

A Traffic Impact Assessment Report was obtained as conducted by Siyazi Limpopo Consulting Services (Pty) Ltd. The purpose of the study was to assess the implications of the vehicular traffic that could potentially be generated due to the proposed development in terms of:

- a. The traffic impact that the change in land use would have on the road and transport-related infrastructure.
- b. Whether it is possible to accommodate the proposed development within acceptable norms from a traffic-engineering point of view.
- c. The mitigating measures required to accommodate the proposed development within acceptable traffic-engineering norms.

Findings of the Traffic Impact Assessment include the following:

1. The road network-related impact from a road capacity perspective due to Mopane Solar PV 5 of the Proposed Development would have a low significance due to a low volume of vehicles along Road D859 as determined by the relevant 12-hour manual traffic counts and that no road capacity-related mitigating measures would be required.
2. The road network-related impact from a road safety perspective in terms of intersection spacing would have a low significance due to no existing intersections within the vicinity of Mopane Solar PV 5 of the Proposed Development, and therefore no mitigating measures would be required.
3. The road network-related impact from a road safety perspective in terms of intersection sight distances due to Mopane Solar PV 5 of the Proposed Development access intersection (Point B) would have a low significance due to the required intersection sight distances being sufficient at the proposed access intersection and no mitigating measures would be required.
4. The road network-related impact from a road safety perspective in terms of the speed limit along Road D859 would have a low significance on Mopane Solar PV 5 of the Proposed Development and no road safety-related mitigating measures in terms of the speed limit would be required.
5. The road network-related impact from a road safety perspective in terms of the need for dedicated right-turn and left-turn lanes at the intersection of Roads D331 and D859 as part of Mopane Solar PV 5 of the Proposed Development would have a medium-high significance due to a potential increase in collisions (rear-end which could lead to fatalities), specifically vehicles waiting within the main traffic flow lane of Road D331 (north approach) to turn right into Road D859 if a dedicated right-turn lane is not provided. With the provision of the above-mentioned, the impact from a road safety perspective in terms of the need for dedicated turning lanes would have a low significance.

6. The road network-related impact from a road safety perspective in terms of pedestrian movements with the proposed access intersection (Point B) due to Mopane Solar PV 5 of the Proposed Development would have a low significance as no pedestrian activity is expected along Road D859 due to the rural locality of Mopane Solar PV 5 of the Proposed Development and limited public transport availability, and that no road safety-related mitigating measures in terms of pedestrian movement would be required.
7. The road network-related impact from a road safety perspective in terms of loading and off-loading of workers, specifically during the construction phase, as part of Mopane Solar PV 5 of the Proposed Development would have a medium-high significance if a dedicated loading and off-loading area is not provided on site as part of Mopane Solar PV 5 of the Proposed Development and workers are loaded and off-loaded within the road reserve of Road D859. With the provision of a dedicated loading and off-loading area on site as part of Mopane Solar PV 5 of the Proposed Development and ensuring that contractors make use of the dedicated area, the impact from a road safety perspective in terms of loading and off-loading workers would have a low significance.

Recommendations include the following:

- a. It would be required to repair the roadway at the intersection of Roads D859 and D331 as it is in a very poor condition. A pavement design engineer needs to be appointed to assess intersection from a pavement design point of view and implement improvements.
- b. Provide reflective road studs as part of the intersection to improve visibility of the intersection geometry when it is dark.
- c. Provide relevant road traffic signs and road markings.
- d. Provide 60 metres dedicated right-turn lane on the northern approach of Road D331.
- e. Provide 60 metres dedicated left-turn lane on the eastern approach of Road D859.

9.4.17 RADIO FREQUENCY INTERFERENCE

This Site Sensitivity Verification was undertaken by Mr. PF Smuts, an ECSA registered Engineer with more than 30 years of experience in the field of Radar, microwave and RF technology.

Electromagnetic interference (EMI), also called radio-frequency interference (RFI) when in the radio frequency spectrum, is a disturbance generated by an external source that affects an electrical circuit by electromagnetic induction, electrostatic coupling, or conduction.

Radio frequency interference, **RFI**, is any undesirable electrical energy with content within the frequency range dedicated to radio frequency transmission. **Radiated emissions** are unintentional energy that escapes the equipment in the form of electric, magnetic, or electromagnetic fields. **Conducted emissions** are unintentional energy carried out of equipment on equipment's power cables or attached signal cables. The conducted emissions can also be carried into equipment from an external source.

For the proposed renewable energy generation facilities (PV Power Plants) with associated infrastructure and structures to be in a position to interfere with any electronic and telecommunication systems associated with a commercial business, airports, telescopes or military installations, it must be located suitably close enough (or within an area considered as an affected area) to installations or have a conductive path into such an installation via cable, power lines and other carrier devices or technology.

Mopane Solar PV 5 area is located close to the R501 road and other local roads as well as railway lines that are suitable for any landward movement. There are no military training areas and bases in close vicinity and is not foreseen to have any impact on military landwards activities.

There are no runways visible in this area as well as the close surrounding area. It is not foreseen that a military airport will be constructed in this area. No corridors or buffer areas, other than the power line corridor, are identified or required within or close to the project footprint.

After evaluation and consideration of all activities identified, it is still considered to be classified as low sensitivity to RFI.

For the proposed development there should be no unacceptable impact on existing and potential, future installations if all equipment to be used acceptable EMI/RFI levels that have been subjected to ICASA requirements and power lines and sub-stations are installed according to ESKOM best practices and standards. No Cumulative RFI effects are expected at any of the adjacent sites and whether there are one or five PV solar sites the outcome will be the same.

9.4.18 NOISE IMPACTS

Enviro-Acoustic Research cc was commissioned to compile a Noise Compliance Statement as part of the Environmental Authorisation for proposed development of the 120MW Mopane Solar PV 5 facility west of Werverdiend, North-west Province. The statement is attached in Annexure Q. Because the online screening tool does not identify noise as an environmental theme require further investigation for a PV facility, the requirements of SANS 10328:2008 to assess whether noise is a potential issue of concern.

Considering the information gained on numerous different projects in typical rural areas as well as the developmental character, ambient sound levels will be low and typical of a rural noise district. SANS 10103:2008 recommend rating levels of:

- 45 dBA for the daytime period; and
- 35 dBA for the night-time period.

These rating levels were considered in the screening report as the potential noise limits.

The screening report assessed the potential noise impact due to the proposed development of the Mopane Solar PV 5 facility. Generally, noises associated with a PV facility relates to:

- Construction activities, though such noises are generally of a short duration and normally only associated with the day-time period (reducing probability of a noise impact occurring); and
- Operational activities, associated with the limited maintenance activities, a hum from the invertors and transformers in the substations, as well as fan noises from the climate control system of the BESS. Noises from the BESS may take place at night and could be audible up to 500m from a BESS at night.

Considering the distance of potential noise sources, the temporary nature of construction noise impacts and the low magnitude of operational noises, the development of the Mopane Solar PV 5 facility is unlikely to influence ambient sound levels in the vicinity of the project site.

It is the opinion of the specialist that no further Scoping or other acoustical studies would be required for the proposed development of the Mopane Solar PV 5 facility, and it is recommended that the project be authorised (in terms of acoustics).

9.4.19 AVIATION IMPACT ASSESSMENT

The development of solar developments throughout South Africa means that new renewable energy plants and overhead transmission lines are sometimes developed near existing civil and military airbases. The aviation assessment is done to determine if a proposed renewable energy generation project will interfere with the Obstacle Limitation Surfaces of airports in the vicinity of the project. Although a "low" sensitivity has been identified, an Aviation Consultant undertook a safeguarding assessment for the proposed new solar park and new transmission line in the North West Province in the vicinity of Carletonville Airport (FACR). The Aviation Assessment is attached in Annexure N. FACR is the ICAO (International Civil Aviation Organization) code for the Carletonville Airport. There are no Military installations and also no promulgated Danger, Restricted and Prohibited areas according to the SACAA list in the vicinity of the Mopane Solar PV 5.

It was decided to assess the development using the methodology of assessment of the Obstacle Limited Surfaces and the Approach/Departure Surfaces of Carletonville Airport. This was done in accordance with the ICAO and SACAA safeguarding rules and regulations. According to the SACAA, Carletonville Airport is not a certified airport under Instrument Flight Rules. The possibility exist that the Carletonville Airport could become an Instrument Flight Rules airport in the future, therefore both the Obstacle Limited Surfaces as well as the Approach/Departure Surfaces were assessed. Evidence from the assessment and technical drawings show clearly that Mopane Solar PV 5 Project will not interfere with the Obstacle Limit Surfaces and the Approach/Departure Surfaces of Carletonville Airport (FACR).

9.4.20 STORMWATER MANAGEMENT PLAN

The purpose of Storm Water Management Plan Report is to assess the hydrology and identify elements of storm water management in support of the work of other specialists on the EIA team and draw an outline plan to support the detail design of storm water systems to protect the site and infrastructure during the construction and operational phases.

Topography

The larger area consists of slightly undulating plains (>80% with a slope <5%) and straight slopes, with a low-medium drainage density of 0-2 km/km² and low-medium stream frequency of 0-6 streams/km². There is a northeast-to-southwest natural drainage line traversing the larger area.

Erosion

- Based on the slope gradient and soil erodibility index, the water erosion susceptibility is relatively high *i.e.* Class 5 for the broader area. However, the areas near the natural drainage lines could even be higher. The general predicted soil loss is low to moderate and due to the shallowness of the soil, it has a low potential for regeneration if badly eroded. The sediment delivery potential is low to medium.
- The susceptibility to water erosion is Class 2 or land with low to moderate susceptibility to water erosion; generally, gently to moderately sloping. Soils have low to moderate erodibility potential.
- The prevalence of the relatively sandy loam soil and the annual rainfall of about 550 mm resulted in low plant biomass production and low soil organic material, rendering the land susceptible to wind erosion. The wind erodibility index is Class 4a. In this Class, sandy loams are strongly dominant, which makes them somewhat susceptible to wind erosion.

Hydrological Characteristics

The area drains predominantly towards the Mooi River towards the west. The Mooi River Loop flows from east to west south of the site into the Mooi River towards the south-south-west of the site. Both the Mooi River and the Mooi River Loop flow by, quite a distance from the site. Flood lines on these two rivers do not affect the development site.

Further analysis indicates that the runoff predominantly discharges into the veld through surface sheet flow from where it concentrates into a weakly defined natural drainage system. This was confirmed during a site inspection where limited drainage structures could be identified visually. In a separate assessment that was conducted, the presence of underlying dolomite on the development site was confirmed. It is considered a realistic possibility that lower-than-anticipated run-off occurs, due to an increased infiltration rate on the dolomite structures. The site is drained naturally with minimal impact from agricultural activities, farm service roads and fences.

HYDROLOGICAL CONSIDERATIONS

Four aspects of flow require consideration:

1. Drainage through the defined drainage channel from higher ground in the catchment area:
 - Although there is a catchment area of substantial size upstream of the site, there is no identifiable drainage line to consider in terms of 1:100-year floods.
 - No formal flood-line provisions apply.
2. Surface flow and channels with limited impact reaching the site from higher ground:
 - Flood water from the higher catchment area towards the north will impact on this site and must be managed.
3. Surface flow generated on site:
 - During direct rainfall on-site, sheet flow will occur, leading to the smallest of flow channels interlinking with larger channels, until they flow into drainage lines of a magnitude that needs to be managed.
4. Flow speed of down flowing water:
 - A definite relationship exists between the flow speed of water and erosion. In general terms, the capacity of water to transport solid particles (thus to erode) is exponential to the flow- speed. A slight increase in flow speed thus gives rise to a proportionally bigger erosion risk.
 - The flow speed of surface flood water is of importance because of:
 - the potential damage to the development.
 - the potential downstream impact due to altering the natural flow regime.
 - The flow speed of flood water is a function of:
 - Climate, and specifically precipitation and its intensity.
 - Slope of the flow path of water: Through the correct design of discharge channels on site, the flow speed of water can be manipulated. A longer flow path with a more gradual slope may decelerate down flow. Care must be taken not to slow down the water to the point that suspended solids may in turn be deposited in the channels. This will cause blockages that will require additional maintenance to clean and to dispose of the material.
 - Vegetation on site: Vegetation forms a physical obstacle that dissipates energy from flowing water and has a slowing effect. It is advisable that vegetation be preserved.

Construction Phase Storm Water Management

- It's recommended that access and service roads, as well as storm water systems are constructed at commencement of the construction phase to ensure that suitable storm water management measures are in place at the least additional cost.
- These permanent routes must also be used for construction purposes. In order to preserve the natural state of the surface and vegetation as far as practically possible, off-road driving should be restricted to the absolute essential.
- Space for lay-down areas for construction material and for construction facilities is restricted on-site. It is not possible to give clear directions in terms of its positioning. The following should however be considered:
 - High-resolution site survey data must be used to design storm water ditches to direct surface flood water past any stockpiles.
 - Site clearing should be limited to the essential.
 - Construction waste, including possible broken and damaged panels must be collected and stored safely for disposal in accordance with the relevant waste regulations, protocols, and product specifications. Care must be taken not to leave any waste on site that can lead to future contamination of the site or the downstream area.
- Training with regards to storm water management of construction personnel must be undertaken as part of their induction.

Operational Phase Storm Water Management

- Training with regards to storm water management of site personnel must be undertaken as part of their induction. Refreshment training must be undertaken periodically.
- Regular conditional inspections of all storm water infrastructure are required. Inspection data must be recorded and accumulated for tracking purposes. Regular reporting should be a scheduled management task.
- Any item found to be out of order, for instance, accumulation of settled sand in a trench, or erosion, must be addressed and corrected without delay to keep the storm water system in a good and fully functional condition. A record must be kept of all repairs.
- Specific attention must be given to inspection during and after any rain and/or flood event to curb any damage that may occur.
- If any structures had to be erected in a flood line area, the Water Use Licences will contain various conditions about monitoring, maintenance, repair, and reporting that must be complied with. It is essential to make this a key responsibility of the relevant manager.

Way Forward

Storm water flows into the project area from higher up, down to the lowest point and out of the site.

During the layout planning and design care should be taken to lead the water systematically down to the lowest point.

No clear "high impact" drainage line could be identified on-site or from the contour plan. Consideration should be given to "cut off" storm water flows from higher land at the point of entry into the site, leading it out and disposing of it in open veld. Evidence of flooding is less than what should be expected under normal conditions. The concern arises about the presence of dolomite on the site. Known dolomitic areas exist in the vicinity of the site. Dolomite leads to increased infiltration of storm water, and thus to reduced down flow, which is to the advantage of the development. The risk of the formation of sinkholes must be considered during planning, design, implementation and operation.

Further specialist investigation pertaining to the presence and expected impact of dolomite is recommended.

9.5 IMPACTS AND RISKS IDENTIFIED

The environmental impacts of the construction, operation, maintenance and management of the proposed project were identified and the . significance of the impacts was assessed. Each impact was assessed and rated. The assessment of the data, whereas possible was based on broadly accepted scientific principles and techniques. As previously described, construction activities for the establishment of the proposed PV power plant include:

- land clearing activities necessary for preparation of the site and access routes;
- excavation and filling activities;
- transportation of various materials;
- construction of the storage structures;
- installation of the PV modules and construction of associated structures and infrastructure; and
- construction of the on-site high-voltage substation.

EXTENT

The extent of most of the construction activities is localized and impacts will only occur at the development site. Some activities will extend to adjacent landowners as access roads will be used which will lead to an increase in the traffic in the area. mitigations measures are included in this EIA report.

DURATION

The impact of construction activities will only be for the duration of the construction phase, after which it will cease completely. (Construction period planned to last between a minimum of 6 months and a maximum 15 months).

PROBABILITY

The probability of impacts occurring during the construction is phase very high as there will be impacts on the vegetation as most will be removed to make way for the proposed development. The evaluation of environmental impacts as a result of the proposed development is discussed in this EIA report. Environmental impacts associated with the operational phase of a solar energy facility include visual and other impacts.

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

The identification of impacts is based on:

- legal and administrative requirements;
- the nature of the proposed activity;
- the nature of the receiving environment;
- specialist studies and
- issues raised during the public participation process.

Potential impacts include:

- Impacts on soils & agricultural potential;
- Impacts on ground water;
- Impacts on the road system and traffic;
- Impacts on air quality and potential emissions;
- Geological, soil and erosion impacts;
- Impacts on avifauna;
- Impacts on vegetation;
- Impacts on heritage resources;
- Noise impacts;
- Impacts on tourism;
- Social impacts; and
- Visual impacts.

Potential impacts identified include:

- **Impacts on soils & agricultural potential:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: Low
 - Significance: Low
- **Impacts on ground water:**
 - Extent: Surrounding and adjacent land
 - Duration: Life of the project (approx. 30 years)
 - Probability: Medium
 - Significance: Low
- **Impacts on the road system and traffic:**
 - Extent: Surrounding and adjacent land
 - Duration: Life of the project (approx. 30 years)
 - Probability: Low
 - Significance: Low
- **Impacts on air quality and potential emissions:**
 - Extent: Regional
 - Duration: Life of the project (approx. 30 years)
 - Probability: Very Low
 - Significance: Very Low
- **Geological, soil and erosion impacts:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: Low
 - Significance: Low
- **Impacts on avifauna:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: Low
 - Significance: Low
- **Impacts on vegetation:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: High
 - Significance: Medium

- **Impacts on heritage resources:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: Low
 - Significance: Low
- **Noise impacts:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: Low
 - Significance: Very Low
- **Impacts on tourism:**
 - Extent: Regional
 - Duration: Life of the project (approx. 30 years)
 - Probability: Unknown
 - Significance: Unknown
- **Social impacts:**
 - Extent: Regional & Locally
 - Duration: Life of the project (approx. 30 years)
 - Probability: High
 - Significance: High - Positive
- **Visual impacts:**
 - Extent: Locally at the proposed site
 - Duration: Life of the project (approx. 30 years)
 - Probability: Definite
 - Significance: Medium

The significance of the potential impacts was determined as all the specialist studies have been obtained.

9.5.1 DEGREE TO WHICH THE IMPACTS CAN BE REVERSED

- The visual impact is resident for a long time (25-30 years). It can be reversed during decommissioning and rehabilitation of the area.
- Biodiversity impacts can be reversed at the decommissioning stage of the development. Plants can be replanted, and animals will return to the project area.
- Impacts on soil (erosion) can be reversed by careful handling of stormwater on site.
- Impacts on water quality and quantity can be reversed at the decommissioning stage.
- Agricultural resources will again become available after decommissioning of the facility.
- Impacts on heritage resources could be permanent without mitigation.
- The potential impacts on river systems, drainage channels and wetlands will be minimal. Impacts on these resources can be reversed successfully.
- Socio-economic impacts can be reversed at the decommissioning phase, though this will have a nett negative effect on the area.

9.5.2 DEGREE TO WHICH IMPACTS MAY CAUSE IRREPLACEABLE LOSS OF RESOURCES

The only impact which can cause an irreplaceable loss of resources is an impact on the heritage resources where heritage sources are destroyed. This should not happen as the heritage resources are well surveyed and protected from development impacts.

9.5.3 DEGREE TO WHICH IMPACTS CAN BE AVOIDED, MANAGED OR MITIGATED

It is not possible to completely avoid the impacts of the development on the environment. By following the mitigation and management measures detailed in the impact section in this report, most of the impacts and the effects it can have on the environment can be successfully lowered to a lower degree of significance to the environment. This can be done to a point where the impacts are acceptable and where the benefits of the development are greater than the detriment to the environment.

9.6 HIGH LEVEL RISK ASSESSMENT FOR BESS TECHNOLOGY

Batteries store electrical energy in chemical form. The range of electrochemical technologies include:

- a) batteries with solid electrolyte, as Lithium-ion battery;
- b) batteries with liquid electrolyte, as Na-S battery, Lead-Acid (PbA) battery, nickel - cadmium (Ni-Cd) battery or other types of liquid metal battery

A Li-ion battery cell is a sealed article, with a typical voltage of 3.6V DC per cell and it is an article with no intended release of its substances.

The preferred technology for the Battery Energy Storage System (“BESS”) is **Lithium-ion battery cells**, which will be pre-assembled at the supplier factory and installed in the containers prior to delivery to the site. Lithium-ion cells technology offers the highest energy density (compared to the other cell technologies), does not suffer from memory effect and is low maintenance. Typical lithium-ion cells used for BESS hold a solid rechargeable electrolyte (the energy accumulator), therefore they don’t hold any liquid or gas. The main benefit of solid ceramic electrolytes is that there is no risk of leaks, which is a serious safety issue for batteries with liquid electrolytes.

A BESS does not emit any gas to the atmosphere during construction and/or normal operation. The containers of the batteries are equipped with a firefighting system conceived to effectively detect smoke and high temperatures and automatically activate the extinguishers to prevent fire. Furthermore, the external metallic surface of the cells is conceived to resist to fire.

The preferred technology is therefore Lithium-ion battery cells with solid rechargeable electrolyte.

Under normal conditions of use, the battery does not release its content as it is sealed. In case of accidental release of the batteries components, please refer to the emergency response guidance below)

In case of large electrical serial assembly, modules and full battery may offer high Voltage hazard (> 36 Volts).

The presence of the High Voltage warning sign requires dedicated intervention equipment:



The primary focus is on the fire hazards associated with Li-ion batteries and potential for a condition known as “thermal runaway”. Thermal runaway results from **internal shorts** inside a battery cell which occur due to a variety of reasons and **can ultimately lead to the battery catching fire**.

The following measures will reduce the fire risk to an acceptable level:

- The Battery Management System should include an approved device to preclude, detect, and control thermal runaway.
- The BESS should incorporate appropriately certified inverters/inverter systems and must comply with all safety standards which address risk assessment and controls.
- The BESS must be located well away from critical buildings or equipment and located in a non-combustible enclosure. Sufficient clearance should be maintained around the installation to provide for fire service access.
- Clear signage should be visible to include warnings of a possible fire hazard.

- An approved, monitored, automatic smoke detection system must be installed at the BESS. A fire suppression system must be designed and installed at the BESS.
- Regular inspections must be undertaken to ensure battery systems do not overheat.
- Portable fire extinguishers must be provided at the BESS.
- Installations should have emergency power disconnects to ensure manual, remote, and local disconnect is possible adjacent to the BESS.
- BESS must have an online condition monitoring system. System should be fitted with temperature monitoring incorporating a high temperature alarm for battery room and container. Temperatures should be monitored at a constantly attended location.

Additional general recommendations to prevent and manage potential contamination of water resources in the BESS area:

- Compilation and adherence to a procedure for the safe handling of battery cells;
- Lithium-ion batteries must have battery management systems (containment, automatic alarms and shut-off systems) to monitor and protect cells from overcharging or damaging conditions, such as temperature extremes;
- Compilation of an Emergency Response Plan for implementation in the event of a spill of electrolyte from the batteries;
- Provision of spill kits on-site for clean-up of spills and leaks;
- Immediate clean-up of spills and disposal of contaminated absorbents and materials or soil at a licensed hazardous waste disposal facility;
- Recording and reporting of all significant electrolyte spills so that appropriate clean-up measures can be implemented. A copy of these records must be made available to authorities on request throughout the project lifecycle;
- Frequent and appropriate disposal of any hazardous waste to prevent pollution of soil and groundwater;
- On-site battery maintenance should only be undertaken on impermeable surfaces with secondary containment measures. Any resulting hazardous substances must be disposed of appropriately; and
- Provision of emergency and safety signage on-site, and demarcation of areas which may pose a safety risk (hazardous substances). Emergency numbers for local police, fire department, Eskom and Local Municipality must be placed in clearly visible areas.
- Dispose of waste batteries in accordance with national legislation. When collected waste batteries must undergo recycling to comply with national regulations. Batteries should not be disposed of into the environment.

Safe handling advice

- When handling the batteries (cells), use personal protective equipment (non-conductive gloves), specifically to avoid short-circuits between the battery poles.

Technical measures/precautions

- Follow the instructions reported in the user's manual prepared by the manufacturer.
- Do not short (+) or (-) battery terminals with conductors, do not allow battery terminals to contact each other.
- Do not use unadapted charging systems.
- Do not reverse the polarity,
- Do not mix different types of batteries or mix new and old ones together e.g. in a power pack,
- Do not open the battery system or modules,
- Do not use the unit without its electronic management system,
- Do not submit to static electricity risks to avoid damages to the protecting electronic circuit,
- Do not submit to excessive mechanical stress,
- Do not expose the battery to water or humidity (avoid water condensation),
- Do not expose to heat, or throw into fire. Such unsuitable use can cause leakage or evacuate through a safety valve gaseous electrolyte fume that may cause fire,
- Immediately disconnect the batteries and isolate in a safe place if, during operation, they emit an unusual smell, develop heat, change shape/geometry, or behave abnormally. Contact the manufacturer if any of these problems are observed.

Storage

- Keep in a dry, cool and well-ventilated place, check recommended storage temperature specified in the user's manual as per the manufacturer, (e.g. 35°C),
- Keep away from heat sources (max 60°C) and sources of ignition. Protect from direct exposure to sunlight.
- Keep away from water and condensation.
- Store in closed container and packaging, in such a way to prevent short circuits and damages during storage or transportation. Packaging qualified for transport is generally suitable for storage.
- In case of risk of thermal runaway during storage or transport, it is necessary to use strong outer packaging as recommended by the UN Special Provision 376 in order to restrict the potential ejection of cells constituents and battery parts during fire.
- In case of mixed storage of goods and articles, organize separate storage area for lithium-ion batteries. *E.g.* by maintaining a distance of 2.5 meters between the Lithium-ion batteries storage area and other goods.
- Store in limited quantities and in isolated area under external surveillance, unless specifically designed storage building (detectors and/or sprinklers protection systems).
- Infra-Red cameras may be used to detect any excessive temperature raise in stored quantities, *e.g.* > 85°C

The potential hazard offered by damaged lithium batteries *in absence of fire* is mainly the release of an electrolyte containing a corrosive salt. Measures should also be taken to protect operators from inhalation of volatile organic substances. Reaction of the electrolyte with water/humidity may generate hydrofluoric acid and irritate the eyes, nose, throat and skin.

Personal precautions

- Use personal protective equipment.
- Avoid contact with skin and eyes.
- Ventilate the area.
- Position yourself in the wind direction.

Environmental precautions

- Eliminate all possible sources of heat or ignition.
- Prevent further leakage or spillage if safe (use absorbent cloth or other inert absorbent non-conductive mineral such as sand, sodium bicarbonate, alumina or vermiculite).
- Dry clothes can also be used as a absorbent material in absence of fire.
- Do not allow material to contaminate ground water system.

The information below refers to exposure to the substances contained in the battery.

Call for emergency services. Consider and decide about the adapted intervention plan (ACTIVE/PASSIVE Response, proximity or distance response).

In active response, (with Fire)

- Large flow of water can be used to **reduce the temperature of the batteries** and stop the fire reactions inside the batteries. Specific care should be taken for large and compact batteries, where cooling may require more time.
- Foam and specialized products can be used to reduce access of oxygen to the fire and stop flames but are generally less efficient than cooling down the batteries. Be aware of the risk of re-ignition until the batteries have been cooled down below 100°C.

In passive response, control extension of fire to neighbours materials and buildings

- Use abundant flow of water to cool down cells or batteries adjacent to the ones that have caught fire (maintain low temperature) whatever the type of batteries at the origin of the fire.
- The first responders need to be informed that in case of fire there is a risk of ejection of projectiles from the battery.

Suitable extinguishing media

- Water (see below)
- Specialized products, liquid foam, carbon dioxide (CO₂), sand, vermiculite.

Warning/risk for the use of water

- If water is used on active batteries, caution should be taken to avoid the electrical hazard that may be present (in case of high voltage battery, > 36 Volts).
- The decision to use large amount of water is depending on the local circumstances (water retentions systems, environment risks.).
- In case of fire including large Lithium metal or Lithium metal polymer batteries, the use of water may increase the energy /heat release.
- In such case, stop the use of water and allow the energetic fire of the battery for 15 minutes.
- Protect or cool with water the surroundings to avoid propagation of the fire.

Treatment of Wastewater

- Confine the effluent or the contaminated material and collect it further as hazardous waste (water) for appropriate treatment.
- Pick up and transfer to properly labelled containers.
- Dispose of in accordance with local waste management legislation and emissions regulations.

9.7 METHODOLOGY USED FOR THE ASSESSMENT OF SIGNIFICANCE OF IMPACTS

To assess the impacts on the environment, the process will be divided into two main phases namely the Construction phase and the Operational phase. The activities, products and services present in these two phases will be studied to identify and predict all possible impacts. In any process of identifying and recognising impacts, one must recognise that the determination of impact significance is inherently an anthropocentric concept. Duinker and Beanlands, (1986) in DEAT 2002. Thompson (1988), (1990) in DEAT 2002 stated that the significance of an impact is an expression of the cost or value of an impact to society.

However, the tendency is always towards a system of quantifying the significance of the impacts so that it is a true representation of the existing situation on site. This will be done by using where possible, legal and scientific standards which are applicable.

The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to some extent to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The consequence matrix uses parameters like severity, duration and extent of impact as well as compliance to standards. Values of 1-5 are assigned to the parameters that are added and averaged to determine overall consequence. The same process is followed with the likelihood that consists of two parameters namely frequency and probability. The overall consequence and the overall likelihood are then multiplied to give values ranging from 1 to 25. These values as shown in the following table are then used to rank the significance.

It must be said however that in the end, a subjective judging of an impact can still be done, but the reasons for doing so must be qualified.

Significance ratings (Plomp 2004)

Significance	Low -	Low-Medium -	Medium -	Medium-High -	High -
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25
Significance	Low +	Low-Medium +	Medium +	Medium-High +	High +
Overall Consequence X Overall Likelihood	1-4.9	5-9.9	10-14.9	15-19.9	20-25

Description of the parameters used in the matrixes

Severity:

Low	Low cost/high potential to mitigate. Impacts easily reversible, non-harmful insignificant change/deterioration or disturbance to natural environments.
Low-medium	Low cost to mitigate Small/ potentially harmful Moderate change/deterioration or disturbance to natural environment.
Medium	Substantial cost to mitigate. Potential to mitigate and potential to reverse impact. Harmful Significant change/deterioration or disturbance to natural environment
Medium-high	High cost to mitigate. Possible to mitigate Great/Very Harmful Very significant change/deterioration or disturbance to natural environment.
High	Prohibitive cost to mitigate. Little or no mechanism to mitigate. Irreversible. Extremely Harmful Disastrous change/deterioration or disturbance to natural environment.

Duration:

Low	Up to one month
Low-medium	One month to three months
Medium	Three months to one year
Medium-high	One to ten years
High	Beyond ten years

Extent:

Low	Within footprint area
Low-medium	Whole of site
Medium	Adjacent properties
Medium-high	Communities around site area
High	Ditsobotla Municipality area

Frequency:

Low	Once/more a year or once/more during operation
Low-medium	Once/more in 6 months
Medium	Once/more a month
Medium-high	Once/more a week
High	Daily

Probability:

Low	Almost never/almost impossible
Low-medium	Very seldom/highly unlikely
Medium	Infrequent/unlikely/seldom
Medium-high	Often/Regularly/Likely/Possible
High	Daily/Highly likely/definitely

Compliance:

Low	Best Practise
Low-medium	Compliance
Medium	Non-compliance/conformance to policies etc. - internal
Medium-high	Non-compliance/conformance to legislation etc. - external
High	Directive, prosecution of closure or potential for non-renewal of licences or rights

9.8 ASSESSMENT CRITERIA

The terms of reference for the EIA study will include criteria for the description and assessment of environmental impacts. These criteria are drawn from the *Integrated Environmental Management Guidelines Series, Guideline 5: Assessment of Alternatives and Impacts*, published by the DFFE in terms of the Environmental Impact Assessment. These criteria include:

Table 13. Impact Assessment Criteria

<p>Nature of impact This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. The description should include what is being affected, and how.</p>		
<p>Extent The physical and spatial size of the impact.</p>	<p>Site</p>	<p>The impact could affect the whole, or a measurable portion of the above-mentioned properties.</p>
	<p>Local</p>	<p>The impacted area extends only as far as the activity, e.g. a footprint.</p>
	<p>Regional</p>	<p>The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.</p>
<p>Duration The lifetime of the impact; this is measured in the context of the lifetime of the proposed base.</p>	<p>Short term (2)</p>	<p>The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the phases.</p>
	<p>Medium term</p>	<p>The impact will last up to the end of the phases, where after it will be entirely negated.</p>
	<p>Long term</p>	<p>The impact 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.</p>
	<p>Permanent</p>	<p>The only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.</p>
<p>Intensity</p>	<p>Low</p>	<p>The impact alters the affected environment in such a way that the natural processes or functions are not affected.</p>
	<p>Medium</p>	<p>The affected environment is altered, but function and process continue, albeit in a modified way.</p>

	High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Probability This describes likelihood of impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time.	Improbable	The possibility of the impact occurring is very low, due either to the circumstances, design or experience.
	Probable	There is a possibility that the impact will occur to the extent that provisions must be made therefore.
	Highly probable	It is most likely that the impacts will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity.
	Definite	The impact will take place regardless of any prevention plans, and there can only be relied on mitigation actions or contingency plans to contain the effect.
Determination of 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.	No significance	The impact is not substantial and does not require any mitigation action.
	Low	The impact is of little importance but may require limited mitigation.
	Medium	The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
	High	The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

9.9 POSITIVE AND NEGATIVE IMPACTS THAT THE PROPOSED ACTIVITY AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY

- The positive impact that the development will have on the environment and community is a Socio-economic impact. It will create *temporary jobs* during the construction phase.
- The PV Solar Park will help to reduce the pressure on the Eskom grid in the country with far less negative impacts on the natural resources of the area than in the case of power generation using other sources like coal, gas, water and nuclear energy.
- During the operational phase the PV Solar Park might have a negative impact on the *visual environment*) in the area of the PV Facility.

9.10 POSSIBLE MITIGATION MEASURES AND RESIDUAL RISK

- To mitigate the visual impact, screening of the facility can be done with vegetation.
- Panels must be washed with methods that can save on water use. Employees living/sleeping at the site must be educated on the saving of water.
- Water used for domestic purposes (sanitation) must be treated before release to comply with standards for effluent release.
- The storm water must be managed so that erosion is not caused on the site.
- Domestic waste must be removed from the site on a regular basis not to impact on the soils or water bodies in the area.

9.11 CONCLUDING STATEMENT INDICATING PREFERRED ALTERNATIVE AND ACTIVITY LOCATION

The preferred alternative was selected based on the fact that it will have the smallest impact on the environment having been located on the least sensitive area, avoiding potentially sensitive heritage sites and will be in line with Eskom requirements.

The negative impacts including the *cumulative* impacts can be effectively mitigated and managed to reduce the negative effect the impacts would have on the environment, so that the development with the positive effect of the socio-economic impact and the positive impact of renewable energy generation will have a positive effect on the environment that would offset the negative effects of the development.

10 DESCRIPTION OF THE PROPOSED PROCESS TO IDENTIFY AND RANK ENVIRONMENTAL IMPACTS THAT THE ACTIVITY, ASSOCIATED STRUCTURES AND INFRASTRUCTURE WILL IMPOSE ON THE PREFERRED LOCATION THROUGH THE LIFE OF THE ACITIVITY

An environmental impact is defined as a change in the environment: physical/chemical, biological, cultural and/or socio-economic. Any impact can be related to certain aspects of human activities in this environment and this impact can be either positive or negative. It could also affect the environment directly or indirectly and the effect of it can be cumulative.

10.1 DESCRIPTION OF ENVIRONMENTAL ISSUES AND RISKS IDENTIFIED DURING THE EIA PROCESS

The potential aspects to assess during the EIA process may include:

- Soils & agricultural potential;
- Avifauna aspects;
- Vegetation aspects;
- Heritage resources aspects;
- Socio-economic aspects; and
- Visual aspects.

The **decommissioning activities** of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

The identification of impacts will be based on:

- legal and administrative requirements;
- the nature of the proposed activity;
- the nature of the receiving environment;
- specialist studies; and
- issues raised during the public participation process.

Potential impacts may include:

- Impacts on soils & agricultural potential;
- Impacts on avifauna;
- Impacts on vegetation;
- Impacts on heritage resources;
- Social impacts; and
- Visual impacts.

10.2 ASSESSMENT OF POTENTIALLY SIGNIFICANT IMPACTS AND RISKS

Impacts with a rating of Medium-High or High are impacts which are regarded as potentially significant, rated without any mitigation measures. In this impact assessment, there were NO impacts which were regarded as potentially significant impacts:

- i. NO impacts will result in a significant loss of a natural resource (soils)
- ii. Local communities WILL benefit in various ways, including job opportunities, skills development and other projects.
- iii. NO impacts could result in loss of life or injuries.
- iv. All impacts are reversible.
- v. Successful mitigation is possible.

10.2.1 DEGREE TO WHICH IMPACT CAN CAUSE IRREPLACEABLE LOSS OF RESOURCE

- i. If this impact is not mitigated, it can lead to an irreplaceable loss of a resource.
- ii. The impact will not lead to an irreplaceable loss of resources.
- iii. This impact will not lead to an irreplaceable loss of any resources.
- iv. The impact could lead to loss of life.

10.2.2 DEGREE TO WHICH IMPACT CAN BE MITIGATED

- i. Successful mitigation is possible.
- ii. Mitigation is possible.
- iii. This impact will not lead to an irreplaceable loss of any resources.
- iv. The impact can be mitigated successfully.

10.3 IMPACTS & MITIGATION MEASURES OF CONSTRUCTION PHASE

All the possible impacts that can be predicted in both the construction and operational (limited) phase of the PV Solar Park are addressed. Specific mitigation measures are proposed, and the significance of these impacts is described with and without the mitigation measures. Furthermore, considering that all or part of the construction infrastructure may be owned and/or operated by Eskom, the mitigation measures described in the following paragraphs and in particular in the attached Environmental Management Programme (EMPr) can be the responsibility of Eskom or of the developer.

10.3.1 ATMOSPHERIC POLLUTION AND NOISE

Listed Activity:

Listing Notice 1, Activity 24 (ii) - The development of a road with a reserve wider than 13,5m or where no reserve exists where the road is wider than 8m.

Listing Notice 2, Activity 15 - The clearance of an area of 20 hectares or more of indigenous vegetation.

Construction Phase

During this phase there will be a concentration of earthmoving equipment and construction vehicles that will level the area, clear vegetation for construction purposes and in the process, create dust and exhaust smoke that will impact on air quality. There will be more noise created by vehicles during this phase. Burning of waste and fires at construction sites may create smoke.

Construction Phase Impacts

Impact: Atmospheric Pollution		
Activity: Earthworks and Vegetation Clearance		
Specific Impact: <u>Air Pollution – Dust</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low-Medium – 2
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium-High – 4	Medium – 3
Probability	Medium-High – 4	Medium – 3
Significance	Medium – 12	Low-Medium – 6
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • The clearing of the site should be done in phases as construction progresses. • Construction areas must be dampened/treated to prevent excessive dust formation. This would lower the cumulative impact of dust formation. • Cleared vegetation must be stock-piled and removed regularly and distributed amongst local community members (if possible). Cleared vegetation may not be burned on site. 		

Impact: Noise		
Activity: Vehicle Movement		
Specific Impact: <u>Noise Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low-Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium – 3	Low – 1
Probability	Medium-High – 4	Medium – 3
Significance	Low-Medium – 9.3	Low – 3.3
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Vehicles must be well serviced to prevent excessive smoke and noise. • Speed of construction vehicles must be kept low (20-30km/h) to reduce the generation of dust and noise. • Construction may only take place during the hours between sunrise and sunset on weekdays and Saturdays. • Contractors must comply with Provincial noise regulations. • Construction machinery must be fitted with noise mufflers and be maintained properly. This would lower the cumulative impact of noise during this phase 		

Impact: Atmospheric Pollution		
Activity: Burning of cleared vegetation, veld fires and cooking fires		
Specific Impact: <u>Air pollution</u> (excessive smoke)		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium – 3	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 5.3	Low – 1.6
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		

- Solid waste generated by the construction teams may not be burned on site or the surrounding areas but be regularly removed to the municipal waste disposal site.
- The cleared vegetation must be stock-piled and should be removed at regular intervals and be distributed amongst the local community members. The cleared vegetation may not be burned on site.
- Cooking at construction site may not be done on open fires. Gas stoves can be used.

Operational Phase

There will be very low traffic volumes and people in the area and there should be no smoke or burning of waste, which can cause air pollution. The only impact that may occur is the noise from the BESS, once established.

Impact: Atmospheric Noise		
Activity: Battery Energy Storage System		
Specific Impact: <u>Noise Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low-Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – 1	Low – 1
Frequency	Low-Medium – 2	Low – 1
Probability	Medium – 3	Low – 1
Significance	Low-Medium – 7.5	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Noises from the BESS may take place at night and could be audible up to 500m from a BESS at night. • BESS should be established as far away as possible from residential dwellings. 		

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Atmospheric Pollution		
Activity: Earthworks and Vegetation Clearance		
Specific Impact: <u>Air Pollution – Dust</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low-Medium – 2
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium-High – 4	Medium – 3
Probability	Medium-High – 4	Medium – 3
Significance	Medium – 12	Low-Medium – 6
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • The clearing of the site should be done in phases as construction progresses. • Construction areas must be dampened/treated to prevent excessive dust formation. This would lower the cumulative impact of dust formation. • Cleared vegetation must be stock-piled and removed regularly and distributed amongst local community members (if possible). Cleared vegetation may not be burned on site. 		

Impact: Noise		
Activity: Vehicle Movement		
Specific Impact: <u>Noise Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low-Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium – 3	Low – 1
Probability	Medium-High – 4	Medium – 3
Significance	Low-Medium – 9.3	Low – 3.3
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

<p>Mitigation:</p> <ul style="list-style-type: none"> • Vehicles must be well serviced to prevent excessive smoke and noise. • Speed of construction vehicles must be kept low (20-30km/h) to reduce the generation of dust and noise. • Construction may only take place during the hours between sunrise and sunset on weekdays and Saturdays. • Contractors must comply with Provincial noise regulations. • Construction machinery must be fitted with noise mufflers and be maintained properly. This would lower the cumulative impact of noise during this phase

Impact: Atmospheric Pollution		
Activity: Burning of cleared vegetation, veld fires and cooking fires		
Specific Impact: Air pollution (excessive smoke)		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium – 3	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 5.3	Low – 1.6
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
<p>Mitigation:</p> <ul style="list-style-type: none"> • Solid waste generated by the construction teams may not be burned on site or the surrounding areas but be regularly removed to the municipal waste disposal site. • The cleared vegetation must be stock-piled and should be removed at regular intervals and be distributed amongst the local community members. The cleared vegetation may not be burned on site. • Cooking at construction site may not be done on open fires. Gas stoves can be used. 		

10.3.2 LAND AND SOILS

Listed Activity:

Listing Notice 1, Activity 24 (ii) - The development of a road with a reserve wider than 13,5m or where no reserve exists where the road is wider than 8m.

Listing Notice 2, Activity 15 - The clearance of an area of 20 hectares or more of indigenous vegetation.

Construction Phase

During construction, the vehicles have the potential to spill diesel and lubricants that can pollute the soil and the same applies to the storage of solid waste before it can be disposed of which can also become a nuisance.

Cumulative impact of possible soil erosion is increased with the development actions.

Construction Phase Impacts

Impact: Land and Soils		
Activity: Spilling of oil/diesel by construction machinery		
Specific Impact: <u>Contamination of soil</u>		
	Without Mitigation	With Mitigation
Severity	Medium-High – 4	Low – 1
Duration	Medium – 3	Low – Medium – 2
Extent	Medium – 3	Low – Medium – 2
Frequency	Medium – 3	Low – Medium – 2
Probability	Medium – 3	Low – Medium – 2
Significance	Medium – 10.5	Low – 4.5
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Construction vehicles must be well maintained and serviced to minimise leaks and spills. • Spill trays must be used during refuelling of vehicles on site. • Any spills must be treated and removed by a qualified agent. • Temporary diesel storage must not exceed 30 000 l at construction camp. Diesel tanks and harmful chemicals and oils must be within bunded area and water from bunding must be channelled through oil separator. 		

Impact: Land and Soils		
Activity: Spilling of chemicals/sewage and solid waste		
Specific Impact: <u>Contamination of soil</u>		
	Without Mitigation	With Mitigation
Severity	Medium-High – 4	Low – 1
Duration	Medium – 3	Low – Medium – 2
Extent	Medium – 3	Low – Medium – 2
Frequency	Medium – 3	Low – Medium – 2
Probability	Medium – 3	Low – Medium – 2
Significance	Medium – 10.5	Low – 4.5

Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Chemical/temporary sanitation facilities at construction site must be regularly serviced to ensure no spills or leaks to surface and/or groundwater. • Chemical toilets (if used) must be placed on level ground. • The mixing of cement and paints must be done at designated areas on a protective plastic lining to contain any spillages into surface and groundwater resources. • Solid waste must be kept in containers and disposed of regularly at the closest municipal dumping site. 		

Impact: Land and Soils		
Activity: Stormwater over roads and cleared areas		
Specific Impact: <u>Erosion</u>		
	Without Mitigation	With Mitigation
Severity	Medium-High – 4	Low – 1
Duration	Medium – 3	Low – Medium – 2
Extent	Medium – 3	Low – Medium – 2
Frequency	Medium – 3	Low – Medium – 2
Probability	Medium – 3	Low – Medium – 2
Significance	Medium – 10.5	Low – 4.5
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Slopes produced by removing soil must be kept to a minimum to reduce the chances of erosion damage to the area. • Soil should be handled when dry, to reduce compaction risk. • During construction, sensitive soils with high risk of compaction (e.g. clayey soils) must be avoided by construction vehicles and equipment, wherever possible, in order to reduce potential impacts. • Institute a storm water management plan including temporary and permanent erosion control plans. • Minimise bare areas-revegetate as soon as possible to prevent soil erosion and mitigate the cumulative effect of erosion. 		

Impact: Land and Soils		
Activity: Using land for solar facility		
Specific Impact: <u>Sterilising of Agricultural Land</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – 1
Frequency	Medium – 3	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 5.3	Low – 1.6
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Clearance of vegetation should be restricted to the footprint area and access road. • Construction activities should be restricted to the proposed development footprint. • The clearing of the site should be done in phases as the construction progresses. 		

Operational Phase

Solid waste can be a nuisance and has the potential to pollute soil if not managed. Wastewater from activities can pollute soil. Stormwater management to limit/avoid soil erosion.

Operational Phase Impacts

Impact: Land and Soils		
Activity: Solid Waste Disposal		
Specific Impact: <u>Soil Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	YES
Mitigation:	
<ul style="list-style-type: none"> Solid waste must be kept in closed containers and disposed of regularly at closest municipal dumping site. 	

Impact: Land and Soils		
Activity: Storm water from paved areas and solar panels		
Specific Impact: <u>Erosion</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – Medium – 2	Low – Medium – 2
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6.5	Low – 3
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> The surface drainage system should be monitored after storms and storm water damage should be repaired. The maintenance of the roads must be kept up to standard to prevent and reduce the incident of erosion next to the roads. 		

Impact: Land and Soils		
Activity: Use of fertilizers, insecticides and herbicides		
Specific Impact: <u>Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.5	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

Mitigation:

- The use of eco-friendly products e.g., organic compost, herbicides and insecticides should be promoted and should only be used according to the specifications.

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Land and Soils		
Activity: Spilling of oil/diesel by machines or tanks		
Specific Impact: <u>Contaminate soil</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Construction vehicles must be well maintained and serviced to minimise leaks and spills. • Spill trays must be used during refuelling of vehicles on site. • Any spills must be treated and removed by a qualified agent. • Temporary diesel storage must not exceed 30 000 litres at construction camp. Diesel tanks and harmful chemicals and oils must be in bunded area and water from bunding must be channelled through oil/water separator. 		

Impact: Land and Soils		
Activity: Sewage		
Specific Impact: <u>Contamination of soil</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Temporary sanitation facilities at construction site must be regularly serviced to ensure no spills or leaks to surface and/or groundwater. • Chemical toilets (if used) must be placed on level ground. 		

Impact: Land and Soils		
Activity: Building Rubble Disposal		
Specific Impact: <u>Soil Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Building rubble must be kept in closed containers and disposed of regularly at the closest municipal dumping / refuse site. 		

10.3.3 GROUNDWATER AND SURFACE WATER POLLUTION

Listed Activity:

Listing Notice 1, Activity 12(xii)(c) – Development of infrastructure or structures with physical footprint of 100m² or more; within 32m of a watercourse, measured from edge of watercourse.

Construction Phase

- Lack of sanitation facilities could result in ground water pollution and health risks.
- Construction vehicles will be refuelled at the construction camp.
- Spillage of fuel and lubricants from construction vehicles could occur. Storm water contamination by solid waste could lead to groundwater and surface water pollution.
- Soil cover and vegetation is removed, and storm water can cause erosion. Road construction may increase possible erosion, because of increased storm water run-off.

Construction Phase Impacts

Impact: Groundwater and Surface Water Pollution		
Activity: Spillage of fuel (fuel tanks) and lubricants from construction vehicles		
Specific Impact: <u>Groundwater Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Medium -High – 4	Low-Medium – 2
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low-Medium – 2
Frequency	Medium – 3	Low-Medium – 2
Probability	Medium – 3	Low Medium – 1
Significance	Medium – 10.5	Low – 4.12
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Drip pans should be used during re-fuelling and servicing of construction vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products. • Oil traps must be installed in vehicle wash bay to prevent pollution and must be serviced on a regularly. • Any spills must be treated and removed by a qualified agent. • Diesel storage must not exceed 30 000l. Diesel tanks and other harmful chemicals and oils must be in bunded area. Any water from bunding must flow through oil/water skimmer. • Vehicle maintenance yard and construction storage area should have bund walls and lined with impermeable material to prevent ground and surface water pollution. • Chemical/temporary sanitation facilities at construction site must be regularly serviced to ensure no spills or leaks to surface and/or groundwater. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Clearing of vegetation		
Specific Impact: <u>Erosion & Siltation of Streams</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low-Medium – 2
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low-Medium – 2
Frequency	Medium – 3	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 6.5	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Clearance of vegetation and construction activities must be restricted to the footprint area and access road. • Cleared areas should be rehabilitated by reintroducing a grass layer to limit soil erosion. • Berms to limit water flow over cleared areas, to limit erosion. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Solid waste disposal water resources		
Specific Impact: <u>Pollution of freshwater resources</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> • Solid waste must be kept in adequate waste bins. Construction waste and various waste products must be removed regularly to the closest municipal landfill site. 		

Operational Phase

- Pollution by sanitation system leakages, solid waste and erosion may lead to water pollution. Storm water run-off over open areas can cause erosion.
- Storm water flowing over polluted areas could lead to water pollution.
- Fertilizers, pesticides and herbicides used at the project during operation can create pollution if not handled and applied correctly.
- Cumulative impacts could be a concentration of water runoff during rain events when panels are in a relatively flat position.

Operational Phase Impacts

Impact: Groundwater and Surface Water Pollution		
Activity: Spillage of fuel and lubricants from vehicles		
Specific Impact: <u>Groundwater Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low-Medium – 2
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low -Medium – 2	Low – 1
Significance	Low-Medium – 6.5	Low – 3
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Vehicles must be well serviced to prevent any leakages. • Vehicles may not be serviced on site. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Solid waste disposal-freshwater resources		
Specific Impact: <u>Groundwater Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6	Low – 2.75

Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Solid waste must be kept in adequate closed waste bins and removed on a weekly basis to the closest municipal landfill site. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Solid waste disposal-freshwater resources		
Specific Impact: <u>Groundwater Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Solid waste must be kept in adequate waste bins and removed on a weekly basis to municipal landfill site. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Use of fertilizers, insecticides and herbicides		
Specific Impact: <u>Surface water pollution</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> The use of eco-friendly products e.g. Organic Compost, herbicides and insecticides should be promoted. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Stormwater runoff		
Specific Impact: Surface Water Pollution		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Storm water run-off from the site must be managed in such a way that erosion of the area is not caused by water accumulated on the site. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Cooling water for fire/thermal runaway at BESS		
Specific Impact: Pollution of Surface and Groundwater		
	Without Mitigation	With Mitigation
Severity	Medium – High – 4	Medium – 3
Duration	Low – 1	Low – 1
Extent	Medium – 3	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 6	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

Mitigation:

- Water used for extinguishing a fire or thermal runaway at BESS must be contained and disposed of or treated at a Hazardous waste facility.

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Groundwater and Surface Water Pollution		
Activity: Spillage of fuel and lubricants from construction vehicles and fuel tanks		
Specific Impact: <u>Groundwater Pollution</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low-Medium – 2
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low -Medium – 2	Low – 1
Significance	Low-Medium – 6.5	Low – 3
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Drip pans should be used during re-fuelling and servicing of construction vehicles. Used parts like filters should be contained and disposed of at a site licensed for dumping of these waste products. • Oil traps must be installed in the vehicle wash bay to prevent pollution. Oil traps must be serviced on a regular basis by an approved service agent. • Any spills must be treated and removed by a qualified agent. 		

Impact: Groundwater and Surface Water Pollution		
Activity: Building rubble disposal water resources		
Specific Impact: <u>Pollution of freshwater resources</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low-Medium – 2
Duration	Medium – 5	Medium – 5
Extent	Low – 1	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low -Medium – 2	Low – 1
Significance	Low-Medium – 6.5	Low – 3
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Building rubble must be kept in adequate waste bins. Construction waste and various waste products must be removed regularly to the closest municipal landfill site. 		

10.3.4 WATER USE / WATER QUANTITY

Listed Activity:

Listing Notice 2, Activity 1 - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more.

Listing Notice 2, Activity 15 - The clearance of an area of 20 ha or more indigenous vegetation.

Construction Phase

During this phase, water consumption will be the highest because it will be utilized for gravel roads and building construction.

Construction Phase Impacts

Impact: Water Use		
Activity: Construction Process		
Specific Impact: <u>Water Consumption</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low -Medium – 2
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low -Medium – 2
Frequency	Medium – High – 4	Low – Medium – 2

Probability	Medium – 3	Low – 1
Significance	Medium – 11.37	Low – 4.12
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> Water should be used sparingly, and it should be ensured that no water is wasted. Water use in construction must be managed in such a way that there is no wastage of water as a resource. Washing of construction vehicles should be limited to once or twice a month and must be done with high-pressure sprayers to reduce water consumption. 		

Impact: Water Use		
Activity: Dampening of cleared areas to prevent dust pollution		
Specific Impact: <u>Water Consumption</u>		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low -Medium – 2
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low -Medium – 2
Frequency	Medium – High – 4	Low – Medium – 2
Probability	Medium – 3	Low – 1
Significance	Medium – 11.37	Low – 4.12
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> Roads must be treated with chemicals to lower water use for dust suppression. 		

Operational Phase

Water use will be limited except for short periods when the PV modules are cleaned. The water needed for the operational phase will be provided from boreholes on site.

Operational Phase Impacts

Impact: Water Use		
Activity: Water use & cleaning of panels		
Specific Impact: <u>Water Consumption</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Cleaning of panels should be done only when necessary to limit the impact on water resources. • Care must be taken not to waste any water. In the offices, half-flush systems in the toilets as well as water aerators in all taps must be installed to reduce water consumption. • Workers must be educated on the value of water and how to use it sparingly. 		

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Water Use		
Activity: Decommissioning Process		
Specific Impact: <u>Water Consumption</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative

Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> Water should be used sparingly, and it should be ensured that no water is wasted. Water use in construction must be managed in such a way that there is no wastage of water as a resource. Washing of construction vehicles should be limited and must be done with high-pressure sprayers to reduce water consumption. 		

Impact: Water Use		
Activity: Dampening of cleared areas to prevent dust pollution		
Specific Impact: <u>Water Consumption</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 5.5	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> Roads must be treated with chemicals to lower water use for dust suppression. 		

10.3.5 ARCHAEOLOGICAL, CULTURAL AND SOCIAL FEATURES

Listed Activity:

Listing Notice 1, Activity 11 (i) - The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.

Listing Notice 2, Activity 15 - The clearance of an area of 20 hectares or more of indigenous vegetation.

Construction Phase

The clearing of the site may have a negative impact on the archaeological features. Care must be taken in excavations and moving of soil to observe any other archaeological, previously undetected, features of importance, which must be left and reported to the archaeologist.

Construction Phase Impacts

Impact: Loss of Archaeological, Cultural and Social Features		
Activity: Earth moving and soil clearance		
Specific Impact: Destroy Archaeological Evidence and Heritage		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Regular monitoring of the development footprint by the ECO to implement the Chance Find Procedure for heritage resources in case heritage resources are uncovered during construction. Any changes to the layout should be subjected to a heritage walkdown prior to development. ECO must contact archaeologist on standby in case of finds who will liaise with SAHRA on nature of find and suitable actions, must be taken, e.g. immediate site inspection or application for collection permit. Care must be taken during the construction process that anything of archaeological value that is unearthed must be recorded. The archaeologist or SAHRA must be notified if anything of importance is discovered. 		

Impact: Loss of Archaeological, Cultural and Social Features		
Activity: Earth moving and soil clearance		
Specific Impact: Impact of Palaeontological Resources		
	Without Mitigation	With Mitigation
Severity	Low – 1	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Medium – 3
Frequency	Low – 1	Low – 1
Probability	Low – 1	Low – 1

Significance	Low – 2.75	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> It is not feasible for a specialist monitor to be continuously present at the earth works and therefore, personnel must be involved in mitigation by watching for fossils. Follow the steps outlined in the Chance Find Protocol in the Paleontological report if any fossilised remains are found. The ECO must contact the palaeontologist contracted to be on standby in the case of finds. The latter will liaise with SAHRA on the nature of the find and suitable consequent actions, must be taken, such as an immediate site inspection and/or application for a palaeontological collection permit. 		

Operational Phase

The operational phase will not have any negative impact on the archaeological features of the site if the recommendations of the Heritage Impact Assessment and Palaeontological assessment are strictly adhered to.

Operational Phase Impacts

Impact: Loss of Archaeological, Cultural and Social Features		
Activity: Operational Activities of Development		
Specific Impact: <u>Destroy Archaeological Evidence and Heritage</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> The heritage sites identified and indicated on the site lay out plan must be cordoned off and be preserved. There must be no development in these areas and there should be no access to this site, either. 		

- The ECO must contact the archaeologist contracted to be on standby in the case of finds. The latter will liaise with SAHRA on the nature of the find and suitable consequent actions, must be taken, such as an immediate site inspection and/or application for an archaeological collection permit.
- Care must be taken during the construction process that anything else of archaeological value that is unearthed must be recorded. Please refer to the Archaeological Impact Assessment (Annexure H). The archaeologist or SAHRA must be notified whenever anything of importance is discovered.

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Loss of Archaeological, Cultural and Social Features		
Activity: Earth moving		
Specific Impact: Destroy Archaeological Evidence and Heritage		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • The ECO must contact the archaeologist contracted to be on standby in the case of finds. The latter will liaise with SAHRA on the nature of the find and suitable consequent actions, must be taken, such as an immediate site inspection and/or application for an archaeological collection permit. • Care must be taken during the decommissioning phase that anything else of archaeological value that is unearthed must be recorded. The archaeologist or SAHRA must be notified whenever anything of importance is discovered. 		

Impact: Loss of Archaeological, Cultural and Social Features		
Activity: Earth moving		
Specific Impact: <u>Impact of Palaeontological Resources</u>		
	Without Mitigation	With Mitigation
Severity	Low – 1	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Medium – 3
Frequency	Low – 1	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 2.75	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> It is not feasible for a specialist monitor to be continuously present at the earth works and therefore, personnel must be involved in mitigation by watching for fossils. Follow the steps outlined in the Chance Find Protocol in the Paleontological report if any fossilised remains are found. The ECO must contact the palaeontologist contracted to be on standby in the case of finds. The latter will liaise with SAHRA on the nature of the find and suitable consequent actions, must be taken, such as an immediate site inspection and/or application for a palaeontological collection permit. 		

10.3.6 IMPACT OF THE DEVELOPMENT ON ECOLOGY (FAUNA & FLORA) OF THE AREA

Listed Activity:

Listing Notice 1, Activity 12 (xii) (c) - The development of infrastructure or structures with a physical footprint of 100m² or more; within 32m of a watercourse, measured from the edge of a watercourse.

Listing Notice 1, Activity 24 (ii) - The development of a road with a reserve wider than 13,5m or where no reserve exists where the road is wider than 8m.

Listing Notice 2, Activity 1 - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more.

Listing Notice 2, Activity 15 - The clearance of an area of 20 hectares or more of indigenous vegetation.

Planning and Construction Phase

The removal of natural vegetation and destruction of habitat will have a negative effect on the biodiversity and is part of a cumulative effect together with other renewable energy development projects in the area. It is though partly on agricultural lands areas which has a LOW -MODERATE agricultural potential. The specific mitigation measures included in the Ecological and Avifauna Impact Assessment (Annexures E, F & G) should be adhered to.

Construction Phase Impacts

Impact: Ecology (Fauna and Flora)		
Activity: Earthworks and vegetation clearance at construction site		
Specific Impact: <u>Loss of indigenous plant species & disturbance to sensitive habitats</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
<p>Mitigation:</p> <ul style="list-style-type: none"> • Clearance of vegetation should be restricted to footprint area and access roads. • Construction activities should be restricted to the proposed development footprint. -Do not use more agricultural cropland areas than planned for. • No unnecessary clearance of vegetation must be allowed. Where possible, natural vegetation must be retained to limit this impact. • Cleared areas should be rehabilitated by reintroducing a vegetation layer as soon as possible to limit the occurrence of erosion. 		

Impact: Ecology (Fauna and Flora)		
Activity: Vegetation clearance and movement of people on site at development area		
Specific Impacts: Spreading of exotic and/or invasive plant species		
	Without Mitigation	With Mitigation
Severity	Medium – 3	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – High – 4	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 7	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Clearance of vegetation should be restricted to footprint area and access roads. • Construction activities should be restricted to the proposed development footprint. • No unnecessary clearance of vegetation must be allowed. Where possible, natural vegetation must be retained to limit this impact. • Cleared areas should be rehabilitated by reintroducing a vegetation layer as soon as possible to limit the occurrence of erosion. 		

Impact: Ecology (Fauna and Flora)		
Activity: Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion		
Specific Impacts: <u>Soil erosion</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

<p>Mitigation:</p> <ul style="list-style-type: none"> • Cleared areas should be rehabilitated by reintroducing a vegetation layer as soon as possible to limit the occurrence of erosion. • The stockpiled topsoil and construction material should be managed in such a way that the material is not transported by wind or rain. This can be done by restricting the height of the stockpiles, sandbagging and avoiding steep slopes. • No unnecessary clearance of vegetation must be allowed. Where possible, natural vegetation must be retained to limit this impact. • Clearance of vegetation should be restricted to footprint area and access roads.

Impact: Ecology (Fauna and Flora)		
Activity: Soil Sterilisation – Land not available for agriculture		
Specific Impacts: <u>Less land available for agricultural development</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Medium – 3	Low -Medium – 2
Frequency	Low – Medium – 2	Low – 1
Probability	Medium – 3	Low -Medium – 2
Significance	Low-Medium – 8.75	Low – 4.5
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
<p>Mitigation:</p> <ul style="list-style-type: none"> • Clearance of vegetation should be restricted to footprint area and access roads. • Construction activities should be restricted to the proposed development footprint. -Do not use more agricultural grazing areas than planned for. • No unnecessary clearance of vegetation must be allowed. Where possible, natural vegetation must be retained to limit this impact. • Cleared areas should be rehabilitated by reintroducing a vegetation layer as soon as possible to limit the occurrence of erosion. • The herbaceous layer should be revived after clearance of the vegetation and actively managed through slashing during the entire lifetime of the project. Small animals like sheep could also graze beneath the panels. 		

Impact: Ecology (Fauna and Flora)		
Activity: Control of animals on site		
Specific Impacts: <u>Disturbance to and loss of indigenous fauna to the area</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
<p>Mitigation:</p> <ul style="list-style-type: none"> • Construction must preferably take place after the bird breeding season. • Speed limit of 30 km/h must be enforced on the roads. • Bird nests found in the construction phase must be reported to the ECO. • Herbicides used to control invasive plant species must be chosen in consultation with an ecologist. Some agents are detrimental to surrounding fauna and flora. • Poisons for control of problem animals must be avoided. The wrong use thereof can have disastrous consequences for raptors occurring in the area. Use of poisons for control of vermin should only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for all applications. • Speed limit of 30km/h on site to avoid collisions with night birds and twilight active birds. • Only power lines structures that are considered safe for birds should be erected to avoid the electrocution of birds (particularly large raptors) perching or attempting to perch. • Where possible the installation of artificial bird space perches or platforms at a safe distance from energised components. • All probable and high-risk perching surfaces should be fitted with bird guards and perch guards as deterrents. • Overhead transmission cables should be marked with bird diverters to make the lines as visible as possible to collision-susceptible species. • No animals may be killed, captured or hunted on site by construction workers. Do not feed any wild animals on site. • Where trenches pose a risk to animal safety, they should be adequately cordoned off to prevent animals falling in and trapped and/or injured. This can be prevented by constant excavating and backfilling of trenches during construction process. 		

Impact: Ecology (Fauna and Flora)		
Activity: The occurrence of veldt fires		
Specific Impacts: The loss of indigenous fauna and flora		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • No Fires should be allowed within construction camp and extra care should be taken to prevent veldt fires. • Firebreaks should comply with the National Veldt and Forest Fire Act, 1998. • The cleared vegetation may not be burned on site. The cleared vegetation should be stockpiled and distributed to the local communities. 		

Operational Phase

Operation of the development can have a negative impact on biodiversity if not managed correctly. Exotic invasive plant species can have negative impacts on indigenous vegetation.

Operational Phase Impacts

Impact: Ecology (Fauna and Flora)		
Activity: Rehabilitation of cleared areas		
Specific Impact: Spreading of exotic invasive plants & Loss of habitat and indigenous flora		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	YES
Mitigation: <ul style="list-style-type: none"> The herbaceous layer should be revived after clearance of the vegetation and actively managed through slashing during the entire lifetime of the project to limit open soils which is prone to erosion. An ecologist must be consulted on the use of herbicides/eco-friendly products to control exotic tree and shrub species. The use of eco-friendly products e.g. Organic Compost and/or Effective Microorganisms (EM), which reduces the frequency of application of conventional fertilizers, herbicides and insecticides, should be promoted. 	

Impact: Ecology (Fauna and Flora)		
Activity: The occurrence of veldt fires		
Specific Impact: <u>The loss of indigenous fauna and flora</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to Prepare and maintain firebreaks). 		

Impact: Ecology (Fauna and Flora)		
Activity: The control of pests and vermin		
Specific Impact: Killing and poisoning of fauna feeding on poisoned vermin / pest		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Herbicides used to control invasive plant species must be chosen in consultation with an ecologist. Some agents are detrimental to surrounding fauna and flora. • Poisons for control of problem animals must be avoided. The wrong use thereof can have disastrous consequences for raptors occurring in the area. Use of poisons for control of vermin should only be used after approval from an ecologist. • Limit pesticide use to non-persistent, immobile pesticides and apply in accordance with label and application permit directions and stipulations for all applications. 		

Impact: Ecology (Fauna and Flora)		
Activity: Birds colliding with power line and panels		
Specific Impact: Electrocutation of birds		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	High – 5	High – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

Mitigation:

- Report all incidences of collisions of birds with panels.
- Panels should be tilted towards the vertical when not in use.
- All probable and high-risk perching surfaces should be fitted with bird guards and perch guards as deterrents.
- Where possible the installation of artificial bird space perches or platforms at a safe distance from energised components.
- Overhead transmission cables should be marked with bird diverters to make the lines as visible as possible to collision-susceptible species.

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Ecology (Fauna and Flora)		
Activity: Earthworks and Removal of Infrastructure		
Specific Impact: <u>Loss of indigenous plant species & disturbance to sensitive habitats</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • The removal of infrastructure on site should be done in phases as the decommissioning progresses. • The building rubble must be stock-piled and should be removed at regular intervals. • The disturbed areas must be revegetated immediately after the infrastructure has been removed from site to prevent soil erosion and limit invasive plants to germinate on disturbed areas. 		

10.3.7 VISUAL IMPACTS

Listed Activity:

Listing Notice 1, Activity 11 (i) - The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.

Listing Notice 2, Activity 1 - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more.

Construction Phase

The natural aesthetic character of the site will change. However, the local communities will be informed of the development stages and impacts on them during the construction phase.

Construction Phase Impacts

Impact: Visual Disturbance		
Activity: Buildings & Panels		
Specific Impact: <u>Visual</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – Medium – 2
Frequency	Low – Medium – 2	Low – 1
Probability	Medium – 3	Low – Medium – 2
Significance	Low-Medium – 7.5	Low – 3.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Only the footprint and a small “construction buffer zone” around proposed components are exposed and natural occurring vegetation, should be retained. • Revegetate bare areas with vegetation occurring naturally in the area. • Ensuring that cut to fill areas (if any) are revegetated with indigenous species that relate to the original vegetation types, as soon as possible after the establishment of terraces/roads/parking areas. • Structures should be painted to mimic the hues of existing vegetation, specifically warehouses, workshops and control buildings associated with substation. • Construction camp areas should either be screened or positioned in areas where they would be less visible from human settlements and main roads. 		

Impact: Visual Disturbance		
Activity: Lights		
Specific Impact: <u>Visual</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Medium – 3	Low – Medium – 2
Frequency	Low – Medium – 2	Low – 1
Probability	Medium – High – 4	Low – Medium – 2
Significance	Low-Medium – 9	Low – 3.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Install light fixtures that provide precisely directed illumination to reduce light “spillage” beyond immediate surrounds of project site and aimed away from public roads and areas around the site. Minimise lighting to security lighting. • Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site. • Minimise number of light fixtures to the bare minimum and connecting these lights to motion sensors in order to limit light pollution. 		

Operational Phase

Buildings and the solar modules have a visual impact to surrounding properties and to the sensitive viewers around the project site and lights at night can be a nuisance.

Impact: Visual Disturbance		
Activity: Lights		
Specific Impact: <u>Visual</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Medium – 3	Low – Medium – 2
Frequency	Low – Medium – 2	Low – 1
Probability	Low – Medium – 2	Low – 1
Significance	Low-Medium – 7	Low – 3
Status (Positive or Negative)	Negative	Negative

Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Avoid high pole top security lighting along the periphery of the site and use only lights that are activated on illegal entry to the site. • Minimise number of light fixtures to the bare minimum and connecting these lights to motion sensors in order to limit light pollution. 		

10.3.8 SAFETY, HEALTH, SECURITY AND FIRE HAZARDS

Listed Activity:

Listing Notice 1, Activity 11 (i) - The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.

Listing Notice 2, Activity 1 - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more.

Construction Phase

Construction activities such as excavating of foundations and trenches, movement of construction vehicles, the use of equipment and the congregation of workers and staff on site increases the risk of injury. The activities of construction personnel on site may contribute to an increase in the level of crime in the area and may also contribute to an increased fire risk.

Construction Phase Impacts

Impact: Safety, Health, Security and Fire Hazards		
Activity: Construction activities – excavation of foundations, trenches etc.		
Specific Impact: Loss or injury to human life		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

Mitigation:

- The Contractor shall conform to the Occupational Health and Safety Act, 1993 (Act 85 of 1993) and regulations applicable. The Act requires the designation of a Health and Safety representative when more than 20 employees are employed.
- Open trenches or excavations must be marked with danger tape or safety netting and must be filled and compacted as soon as possible.
- Personal protective equipment must be issued to personnel working at the BESS to protect them against, shock, inhalation of vapours and contact with chemical substances especially when there is a fire hazard.

Impact: Safety, Health, Security and Fire Hazards

Activity: Security

Specific Impact: Crime

	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	

Mitigation:

- Mitigation measures is required in the form of equipment design and on-site security. To ensure the panels and equipment are well protected.
- Number of construction workers to stay on site should be limited to the minimum.
- Proper access control (I.D. cards) should be enforced to ensure that no authorised persons enter the site.
- A security fence should be constructed along the boundary of the development.

Impact: Safety, Health, Security and Fire Hazards		
Activity: Fire Hazards		
Specific Impact: <u>Loss of human life and construction equipment etc.</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • No solid waste or vegetation may be burnt on the premises or surrounding areas. • Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to prepare and maintain firebreaks). • Fire extinguishers and fire-fighting equipment must be available. 		

Operational Phase

Fires and criminal activities pose a significant risk during the operation of the development.

Operational Phase Impacts

Impact: Safety, Health, Security and Fire Hazards		
Activity: Security		
Specific Impact: <u>Crime</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – 1	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 3.25	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	YES
Mitigation: <ul style="list-style-type: none"> Mitigation measures is required in the form of equipment design and on-site security. To ensure the panels and equipment are well protected. Number of construction workers to stay on site should be limited to the minimum. Proper access control (I.D. cards) should be enforced to ensure that no authorised persons enter the site. A security fence should be constructed along the boundary of the development. 	

Impact: Safety, Health, Security and Fire Hazards		
Activity: Fire Hazards		
Specific Impact: <u>Loss of human life and construction equipment etc.</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – 1	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 3.25	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> No solid waste or vegetation may be burnt on the premises or surrounding areas. Firebreaks should comply with the National Veldt and Forest Fire Act, 1998 (Chapter 4: Duty to prepare and maintain firebreaks). Fire extinguishers and fire-fighting equipment must be available especially to be able to combat fires at the BESS. 		

10.3.9 TRAFFIC AND ROAD SAFETY

Listed Activity:

Listing Notice 1, Activity 11 (i) - The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.

Listing Notice 1, Activity 24 (ii) - The development of a road with a reserve wider than 13,5m or where no reserve exists where the road is wider than 8m.

Construction Phase

Trip generation during the construction phase will be much higher than during operational phase. It is assumed that construction will take 15 months. If 10% of the trips occur in the peak hour approximately 4 trucks will arrive and leave in the peak hour. Private vehicles will also be used by construction supervision and admin staff to access the site as well as the construction workers who will arrive via bus or taxi.

Construction Phase Impacts

Impact: Traffic and Road Safety		
Activity: Construction Activities – Increase in Traffic		
Specific Impact: <u>High volume of vehicle trips with specific reference to heavy vehicles could contribute to a higher rate of deterioration of road surfaces</u>		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Intersection sight distances for access intersection need to be complied with. This should be determined as part of the detail design phase. • Monitor vehicle volumes along Road D859. Once volumes become high with high vehicle speeds, gaps in traffic flow could become problematic for vehicles to enter traffic flow from proposed development. • The sensitivity of the intersection of Roads D859 and D331 is regarded as high due to the intersection being in a very poor condition and the lack of a dedicated right-turn lane on the northern approach of Road D331. 		

Impact: Traffic and Road Safety		
Activity: Road Safety Issues - Public Transport		
Specific Impact: Loading and off-loading of visitors and workers by public transport/ arranged shuttle transport could lead to the unsafe manoeuvres by vehicles at intersections it could lead to fatal vehicle accidents.		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 3	Medium – 3
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low – 4.12	Low – 2.25
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> • Provide a dedicated loading and off-loading area on site and ensure that contractors make use of it and not stop within Road D859, road reserve at the proposed access intersection to load and off-load workers. 		

Operational Phase

During operational phase, the facility will be managed by staff supported by admin and maintenance personnel. These are low traffic volumes (<20vph) that will have an insignificant impact on the road network surrounding the proposed development. Dedicated turn lanes will improve road safety at the intersection.

Operational Phase Impacts

Impact: Traffic and Road Safety		
Activity: Operational Activities – Increase in Traffic		
Specific Impact: High volume of vehicle trips with specific reference to heavy vehicles could contribute to a higher rate of deterioration of road surfaces		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative

Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Intersection sight distances for access intersection need to be complied with. This should be determined as part of the detail design phase. • Monitor vehicle volumes along Road D859. Once volumes become high with high vehicle speeds, gaps in traffic flow could become problematic for vehicles to enter traffic flow from proposed development. • Sensitivity of intersection of Roads D859 and D331 is regarded as high due to intersection being in a very poor condition and the lack of a dedicated right-turn lane on the northern approach of Road D331. 		
Impact: Traffic and Road Safety		
Activity: Road Safety Issues - Public Transport		
Specific Impact: Loading and off-loading of visitors and workers by public transport could lead to the unsafe manoeuvres by vehicles at intersections it could lead to fatal vehicle accidents.		
	Without Mitigation	With Mitigation
Severity	Low – Medium – 2	Low – 1
Duration	Medium – 5	Medium – 5
Extent	Low – Medium – 2	Low – 1
Frequency	Low – Medium – 2	Low – 1
Probability	Low – 1	Low – 1
Significance	Low-Medium – 4.875	Low – 2.75
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation: <ul style="list-style-type: none"> • Provide a dedicated loading and off-loading area on site and ensure that contractors make use of it and not stop within Road D859, road reserve at the proposed access intersection to load and off-load workers. 		

10.3.10 SOCIO-ECONOMIC IMPACT

Listed Activity:

Listing Notice 2, Activity 1 - The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 MW or more.

Construction phase

The construction and operation phases of the development will have a positive impact on the socio-economic environment of beneficiary communities through employment opportunities and training and skills development.

Construction Phase Impacts

Impact: Job Creation		
Activity: Job creation		
Specific Impact: <u>Job creation</u>		
	Without Mitigation	With Mitigation
Severity	High – 5	High – 5
Duration	Medium – 3	Medium – 3
Extent	Medium – High – 4	Medium – High – 4
Frequency	Medium – High – 4	Medium – High – 4
Probability	High – 5	High – 5
Significance	Medium – High – 18+	Medium – High – 18+
Status (Positive or Negative)	POSITIVE	POSITIVE
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Jobs must be created for unemployed local people and skills must be transferred to them. Where viable, the work must be executed in a labour-intensive manner to create as many jobs as possible. 		

Operational phase

A number of permanent jobs will be created for local people during this phase. The local communities were identified for the purpose of entering into a partnership for the project, as required by the rules of the REIPP Procurement programme.

Operational Phase Impacts

Impact: Job Creation		
Activity: Job creation		
Specific Impact: <u>Job creation</u>		
	Without Mitigation	With Mitigation
Severity	High – 5	High – 5
Duration	Medium – 5	Medium – 5
Extent	Medium – High – 4	Medium – High – 4
Frequency	Medium – High – 4	Medium – High – 4
Probability	High – 5	High – 5
Significance	High – 20.25 +	High – 20.25+
Status (Positive or Negative)	POSITIVE	POSITIVE
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Jobs must be created for unemployed local people and skills must be transferred to them. Where viable, the work must be executed in a labour-intensive manner to create as many jobs as possible. 		

Impact: Job Creation		
Activity: Solar energy value chain		
Specific Impact: <u>Boost local business for solar components</u>		
	Without Mitigation	With Mitigation
Severity	High – 5	High – 5
Duration	Medium – 5	Medium – 5
Extent	Medium – High – 4	Medium – High – 4
Frequency	Medium – High – 4	Medium – High – 4
Probability	High – 5	High – 5
Significance	High – 20.25 +	High – 20.25+
Status (Positive or Negative)	POSITIVE	POSITIVE
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	YES
Mitigation:	
<ul style="list-style-type: none"> Boost local business for solar components. 	

Decommissioning Phase

The decommissioning activities of the PV plant mainly include the removal of the project infrastructure and the restoring of the site *status quo ante*.

Decommissioning Phase Impacts

Impact: Job Creation		
Activity: Job creation		
Specific Impact: Job creation		
	Without Mitigation	With Mitigation
Severity	High – 5	High – 5
Duration	Medium – 3	Medium – 3
Extent	Medium – High – 4	Medium – High – 4
Frequency	Medium – High – 4	Medium – High – 4
Probability	High – 5	High – 5
Significance	Medium – High – 18+	Medium – High – 18+
Status (Positive or Negative)	POSITIVE	POSITIVE
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	YES	
Mitigation:		
<ul style="list-style-type: none"> Jobs must be created for unemployed local people and skills must be transferred to them. Where viable, the work must be executed in a labour-intensive manner to create as many jobs as possible. 		

11 ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

Cumulative impacts are assessed within the context of the extent of the proposed development within a 30 km radius in relation to general habitat loss and disturbance resulting from other anthropogenic activities in the area. The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline.

Cumulative impacts were assessed in relation to other renewable energy developments in the proximity from the proposed Mopane Solar PV 5. Mitigation measures are proposed, in order to mitigate the impacts that may result from the establishment of the Mopane Solar PV 5 to an acceptable level.

The general approach to this study has been guided by the principles of Integrated Environmental Management (IEM). In accordance with the IEM Guidelines issued by the previously called DEA, an open approach, which encourages accountable decision-making, was adopted.

The principles of the IEM require:

- informed decision-making.
- accountability for information on which decisions are made;
- a broad interpretation of the term "environment";
- an open participatory approach in the planning of proposals.
- consultation with I&APs;
- due consideration of alternatives;
- an attempt to mitigate negative impacts and enhance positive impacts of proposals;
- an attempt to ensure social costs of developments are outweighed by social benefits;
- democratic regard for individual rights and obligations;
- compliance with these principles during all stages of the planning, implementation and decommissioning of proposals; and
- the opportunity for public and specialist input in the decision-making process.

The combined, incremental effects of human activity, referred to as cumulative impacts, may pose a serious threat to the environment. While they may be insignificant by themselves, cumulative impacts accumulate over time, from one or more sources, and can result in the degradation of important resources.

Method and process used for assessment of cumulative impacts at Mopane Solar PV 4:

Step 1: Initiate the process by identifying possible cumulative impacts of the proposed project on the surrounding environment at the project location. The possible cumulative impacts can be selected based on information related to current or anticipated future conditions, the occurrence of protected species or habitats, and the presence or anticipated presence of other human activities that would (adversely) affect the same environment. Once the possible cumulative impacts have been selected, they should be subject to each of the following five steps.

Identified possible cumulative impacts:

- Visual impact
- Loss of Agricultural Resources
- Loss of Biodiversity
- Increase in Traffic Impact
- Increased positive Socio-economic Impact

Step 2: Identify other past, present, and reasonably foreseeable future actions within the space and time boundaries that have been, are, or could contribute to cumulative effects in the area. Based on this knowledge, identify appropriate spatial and temporal study boundaries.

- Visual impact
- Loss of Agricultural Resources
- Loss of Biodiversity
- Increase in Traffic Impact
- Increased positive Socio-economic Impact

Step 3: For the identified cumulative impacts, assemble appropriate information and describe and assess the historical to current conditions of the area. The historical information should coincide with the selected past temporal boundary (or historical reference point). Further, and depending upon the availability of information, any identified trends in the conditions of the area should be identified.

Step 4: Numerous types of tools could be used to establish either descriptive or quantitative connections. Predictions related to future cumulative impacts, resulting from multiple actions may be problematic due to the absence of detailed information; however, identification of changes in the environment and their indicators can be useful. Finally, emphasis should be given to the anticipated cumulative impacts.

Step 5: Assess the significance of the cumulative effects. Such significance determinations should begin with the incremental effects (the direct and indirect effects) of the proposed development on the directly surrounding areas. The concept of environmental sustainability (including social and economic sustainability) could be considered both in relation to incremental effects and cumulative effects.

Step 6: For negative incremental impacts from the proposed project and for which the cumulative effects are significant, develop appropriate action-specific mitigation measures for such impacts. Further, if significant cumulative effects are anticipated consideration should be given to multi-stakeholder collaboration to develop joint cumulative effects management measures, either locally or regionally, or both. Finally, multi-stakeholder collaboration in follow-up activities can be both cost-efficient and an aid in local and regional planning.

Environmental Assessment Framework and Cumulative Effects Assessment (A tool to be used as referred to in Step 4):

1. Scoping.
2. Analysis.
3. Mitigation.
4. Significance.
5. Follow-up.

According to the DFFE database, no wind and solar projects were proposed within 30 km from the project site or has applied for an Environmental Authorisation.

The Mopane Solar Park project consists of five PV solar parks, and should all five solar parks be constructed, then proposed possible impacts will have a cumulative impact on the environment.

As there is uncertainty if all five proposed solar parks will be authorised or be developed, it is also difficult to quantitatively assess the potential cumulative impacts. The possible cumulative impacts will be discussed in this section of the EIAR.

11.1 CUMULATIVE IMPACTS ON THE ECOLOGY (FAUNA & FLORA)

This section describes the cumulative potential impacts of the project on the ecology (Fauna & Flora). Cumulative impacts are assessed in context of the proposed development area, other developments in the area, as well as general habitat loss and transformation resulting from other activities in the area.

Any impact can be related to certain aspects of human activities in this environment and this impact can be either positive or negative. It could also affect the environment directly or indirectly and the effect of it can be cumulative. There are three major categories of impacts on biodiversity namely:

- Impacts on habitat resulting in loss, degradation and / or fragmentation.
- Direct impacts on fauna and flora and species, for example plants and animals that are endemic / threatened / special to a habitat will not be able to survive if that habitat is destroyed or altered by the development.
- Impact on natural environmental processes and ecosystem functioning. This can lead to an accumulated effect on both habitat and species.

This biodiversity assessment focused on the description of ecosystem- and species-related biodiversity. It can be expected that if ecosystem diversity is managed effectively, species and genetic diversity should also be protected. Emphasis was therefore placed on the ecosystem diversity (landscape/habitat types) within the proposed development area, with reference to biota observed and expected to utilise these landscapes or habitat types.

Impact: Direct Habitat Destruction		
The development of the proposed Mopane Solar PV 5 facility will contribute to cumulative habitat loss within the Werverdiend area and Critical Biodiversity Area.		
	Overall impact of the proposed development considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Very Low	Low
Duration	Low-Medium	Medium
Magnitude	Low	Low
Probability	Medium	Medium
Significance	Low-Medium	Medium
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: <ul style="list-style-type: none"> • The removal of indigenous plants should be kept to a minimum necessary. • Peripheral impacts around the development footprint sites on the surrounding vegetation of the area should be avoided and a monitoring programme should be implemented to ensure the impacts are kept to a minimum. • During construction, sensitive habitats must be avoided by construction vehicles and equipment, wherever possible. • All development activities should be restricted to specific recommended areas. 		

11.2 CUMULATIVE IMPACTS ON AQUATIC ECOLOGY

A background study of relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA] 2011 database; The National Wetland Map 5 (2018), the North-West Biodiversity Spatial Plan (2015) and the Gauteng Province C-Plan (2011)) was undertaken to aid in defining presence of any freshwater ecosystems prior to the site survey of the study area as well as the associated 500 m investigation area.

No impacts to the freshwater environment or freshwater features in the area surrounding the study area are envisioned and the risk profile to the freshwater environment is considered low to negligible. Should the PV power plant, as proposed, remain within the demarcated footprint (study area) as provided by the proponent, the PV power plant construction and operation will not result in an impact (new or cumulative) on any freshwater features in the vicinity of the study area. The proposed PV plant in its current form is associated with a low risk to the freshwater environment.

The cumulative impact on the freshwater environment or freshwater features in the area surrounding the study area will thus be not significant.

11.3 CUMULATIVE IMPACTS ON AVIFAUNA

This section describes the potential cumulative impacts of the project on the local and regional avifauna community.

Localised cumulative impacts include those from operations that are close enough to potentially cause additive effects on the local environment or any sensitive receivers (such as nearby large road networks, other solar PV facilities, and power infrastructure, agricultural loss). Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves.

The total area within the 30 km buffer around the project area amounts to 30,000 ha, but when considering the transformation (11539 ha) that has taken place within this radius, 18461 ha of intact habitat remains according to the 2018 National Biodiversity Assessment. Therefore, the area within 30 km of the project has experienced approximately 38.5% loss of natural habitat. Considering this context, the project footprint for Mopane Solar PV 1 is 185 ha, Mopane Solar PV 2 is 197ha, Mopane Solar PV 3 is 246 ha, Mopane Solar PV 4 181 ha and Mopane Solar PV 5 is 182 ha in the 30 km region measuring a maximum of 17472 ha, which includes the project area (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 41.8% (the sum of all related developments as a percentage of the total remaining habitat). Approximately, 38.5 % of the habitat has already been lost, and as discussed above the proposed solar developments will result in a cumulative loss of approximately 41.8 % from only similar developments. This means that the careful spatial management and planning of the entire region must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

Impact: Avifauna		
The development of the proposed Mopane Solar PV 5 facility will contribute to cumulative impact on the avifauna within the Welverdiend area.		
	Overall impact of the proposed development considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Very Low	Low
Duration	Low-Medium	Medium
Magnitude	Low	Low
Probability	Medium	Medium
Significance	Medium	Medium
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
<p>Mitigation:</p> <ul style="list-style-type: none"> • Bird nests found during the construction phase must be reported to the ECO. • Report all incidences of collisions of birds with panels. • Panels should be tilted towards the vertical when not in use. • All probable and high-risk perching surfaces should be fitted with bird guards and perch guards as deterrents. • Where possible the installation of artificial bird space perches or platforms at a safe distance from energised components. • Only power lines structures that are considered safe for birds should be erected to avoid the electrocution of birds (particularly large raptors) perching or attempting to perch. • Overhead transmission cables should be marked with bird diverters to make the lines as visible as possible to collision-susceptible species. 		

11.4 CUMULATIVE IMPACTS ON LAND USE, SOIL AND AGRICULTURAL POTENTIAL

Considering that re-growth of grass will take place under the panels as the mounting systems are at least 1m above ground level, the grazing value of the land will still be available to small livestock such as game, goats and sheep. At the end of the lifetime of the solar plant, structures will be removed, and natural vegetation will re-establish naturally. The grazing value of the land can therefore be increased by using planted pasture underneath the solar panel mounts. The nature of the vegetation at the farm is therefore marginal for extensive livestock production. Using planted pasture to supplement livestock production is however possible but this could be constrained by high demand for irrigation water due to the shallow and often sandy nature of the soil and relatively higher day temperatures in summer.

The impacts associated with the proposed development on the agro-ecosystem capability will depend on specific area where development will take place. The following list of impacts is anticipated with the proposed developments on soils and land capability during construction:

- Disturbance of soils (Soil compaction, erosion and crusting).
- Soil contamination due to leaching of soluble chemical pollutants.
- Loss of current and potential agricultural land.

Mitigation measures are provided that would reduce these impacts from a higher to a lower significance. Furthermore, the proposed layout plan of the solar development should be consistent with the agro-ecosystem maps and recommendations stipulated in this report, and the impact on the sensitive soil forms on site should be kept to a minimum.

11.5 CUMULATIVE IMPACTS ON HERITAGE (INCLUDING ARCHAEOLOGY, PALAEOLOGY AND CULTURAL LANDSCAPE)

The proposed project will have a low cumulative impact as no significant heritage resources will be adversely affected.

11.6 CUMULATIVE VISUAL IMPACTS

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect how the landscape is experienced, and cumulative effects may be positive or negative. Where they comprise a range of benefits, they may form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility of a range of developments and the combined effects of individual components of the proposed development (all five phases of the project) occurring in different locations or over a period of time. The separate effects of such individual developments may not be significant, but they may adversely impact visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, vegetative cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions.

The cumulative impact of the Project is potentially MODERATE when the five phases of the Mopane Project are considered along with the 275kV connector powerline. Figure 10 indicates the cumulative visibility of all phases of the Project.

The intervisibility and the Project along with the other solar PV projects (solar projects are proposed to the immediate north of Mopane Solar PV 4 and Mopane Solar PV 5 and to the south east of the project sites north and south of Carmel substation and immediately west of Carletonville north and south of the R501), would over time, result in the nature and character of the sub-region being impacted in a manner beyond the anticipated moderate cumulative negative impact of the proposed Project alone. The combined effect of approved, pending and proposed solar power developments would cause a change the nature, sense of study and character of the sub-region’s landscape’s baseline.

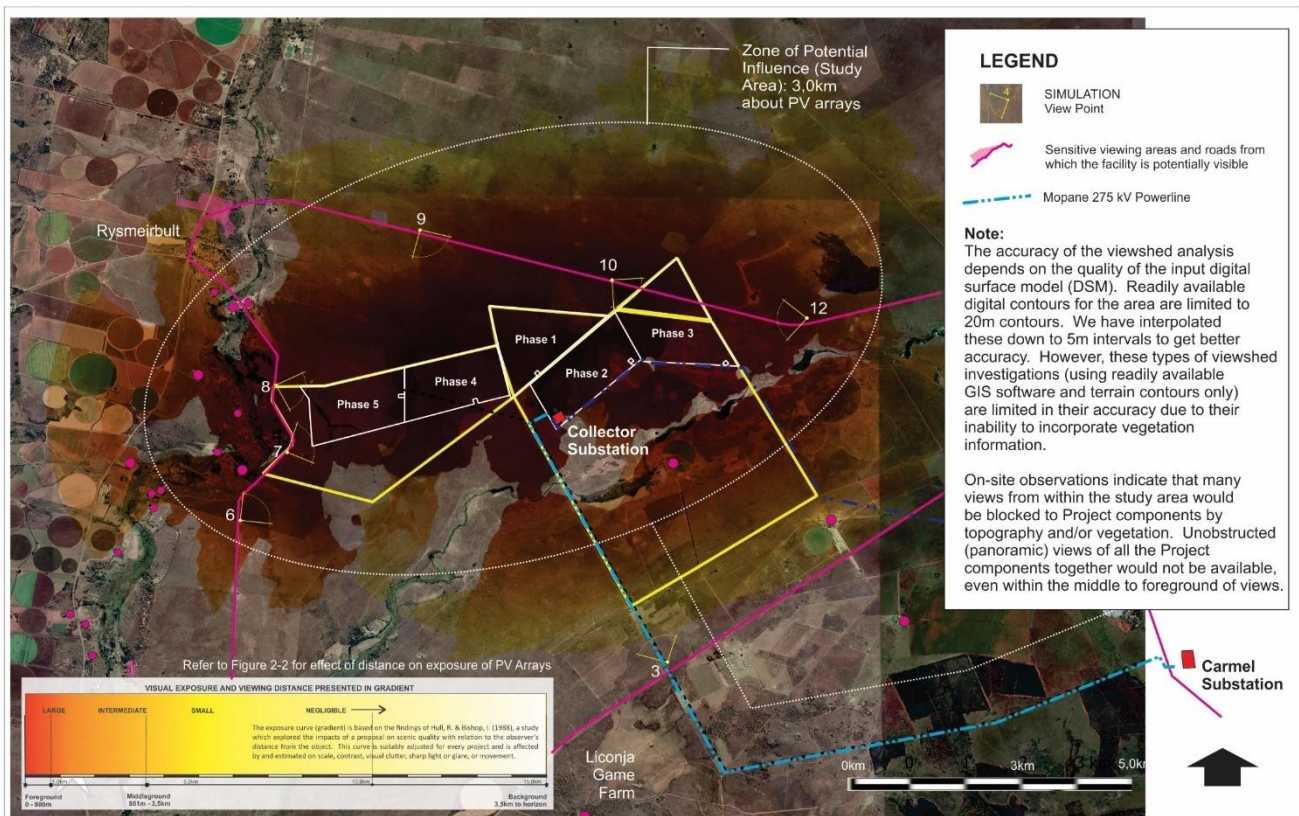


Figure 9. Indication of the combined visual effect of all phases of the project

The significance of the cumulative impact of these projects on the visual environment during their operational phases is assessed to have a moderate intensity and over the long-term with an unmitigated sub-regional impact extending beyond the site (to at least 3,0km beyond the site boundaries) and is assessed to be MODERATE. I.e. it could influence the decision to not proceed with the projects or require EIRIA modification(s) of the various projects’ design/locations (where relevant).

Impact: Visual		
The development of the proposed Mopane Solar PV 5 facility will contribute to cumulative impact on the visual within the Welverdiend area.		
	Overall impact of the proposed development considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Low	Medium
Duration	Low-Medium	Medium
Magnitude	Medium	Medium
Probability	Low-Medium	Medium
Significance	Medium	Medium
Status (Positive or Negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> • Only the footprint and a small "construction buffer zone" around proposed components are exposed and natural occurring vegetation, should be retained. • Revegetate bare areas with vegetation occurring naturally in the area. • Ensuring that cut to fill areas (if any) are revegetated with indigenous species that relate to the original vegetation types, as soon as possible after the establishment of terraces/roads/parking areas. • Structures should be painted to mimic the hues of existing vegetation, specifically warehouses, workshops and control buildings associated with substation. 		

11.7 CUMULATIVE SOCIO-ECONOMIC IMPACTS

The socio-economic impact of the proposed Mopane Solar PV 5 project is considered positive, and the application is supported, provided that all the mitigation measures proposed by specialist consultants are implemented.

Impact: Socio-economic		
The establishment of a number of renewable energy facilities in the Welverdiend area will create employment, skills development and training opportunities.		
	Overall impact of the proposed development considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Medium-High	High
Duration	High	High
Magnitude	High	High
Probability	High	High
Significance	High	High
Status (Positive or Negative)	Positive	Positive
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> Jobs must be created for unemployed local people and skills must be transferred to them. Where viable, the work must be executed in a labour-intensive manner to create as many jobs as possible. 		

11.8 CUMULATIVE TRAFFIC IMPACTS

The following recommendations are made from a traffic engineering perspective as part of Mopane Solar PV 5 of the Proposed Development and all phases of the Proposed Development Cumulatively, and is relevant to the construction and operational phases:

- As part of the construction phase for Phase 1 of the Proposed Development and All Phases of the Proposed Development, a dedicated loading and off-loading area on site should be established where workers can safely be loaded and off-loaded by public transport or arranged transport.
- As part of the detailed design phase and town planning process, further investigation is recommended to determine the possibility of locating the access from and to Road D859 for Phase 1 of the Proposed Development at a location where only one road authority would be involved. The last-mentioned recommendation would simplify the process and requirements for access approval.
- As part of the detailed design phase and town planning process, further investigation is recommended for on-site traffic-related matters which include vehicle circulation and parking layouts.

- d. Collaboration with Transnet and further investigations would be required with regards to the proposed access road/existing railway line at-grade crossing to determine the activity of the existing railway line, and the requirements from a safety perspective.
- e. It is recommended that the speed limit be reduced to 80km/h at the proposed access intersection proposing to provide access to and from Road D859 to the Proposed Development. Further investigation as part of the detail design phase is recommended to determine whether alternative access points would be viable.
- f. It is recommended that a road servitude as required over the relevant properties be registered to ensure accessibility to all phases in the future.

11.9 CONCLUSION REGARDING CUMULATIVE IMPACTS

Cumulative impacts are expected to occur with the development of the Mopane Solar PV 5 facility throughout all phases of the project life cycle and within all areas of study considered as part of this EIA report. The main aim for the assessment of cumulative impacts considering the Mopane Solar PV 5 facility is to test and determine whether the development will be acceptable within the landscape proposed for the development, and whether the loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The following conclusions can be drawn regarding the cumulative impacts associated with the project:

- There will be no unacceptable loss or impact on ecological aspects (vegetation types, species and ecological processes) due to the development of the Mopane Solar PV 5 Facility and other renewable energy facilities within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no significant loss of sensitive and significant aquatic features, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to avifauna with the development of the Mopane Solar PV 5 facility and other renewable energy projects within the surrounding area, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no unacceptable loss of land capability due to the development of the Mopane Solar PV 5 facility and other renewable energy projects within the surrounding areas, provided recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.

- Change to the sense of place and character of the area is expected with the development of renewable energy facilities. However, the change is not considered to be a fatal flaw.
- There will be no unacceptable loss of heritage resources associated with the development of the Mopane Solar PV 5 facility and other developments within the surrounding areas. The cumulative impact is therefore acceptable.
- No unacceptable socio-economic impacts are expected to occur. The cumulative impact is therefore acceptable.
- No unacceptable impacts to the traffic network are expected to occur with the development of the Mopane Solar PV 5 facility and other renewable energy projects within the surrounding areas. The cumulative impact is therefore acceptable.

Positive cumulative impacts are expected to occur from a socio-economic perspective. These impacts will range from a medium to high significance depending on the impact being considered.

All cumulative impacts associated with the Mopane Solar PV 5 facility will be of low to medium significance, with impacts of a high significance associated with bats cumulative impacts. A summary of the cumulative impacts is included in Table 14.

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low-Medium	Medium
Avifauna	Medium	Medium
Land use, soil and agricultural potential	Low	Low-Medium
Visual	Medium	Medium
Socio-Economic	High	High
Traffic		

Table 14. Summary of the cumulative impact significance for the Mopane Solar PV 5 facility within the project site

12 SUMMARY AND FINDINGS AND RECOMMENDATIONS OF SPECIALIST REPORTS AND HOW FINDINGS HAVE BEEN INCLUDED IN THE ASSESSMENT REPORT

The main issues identified as a result of the specialist studies include the following:

- Visual impacts
- Soil erosion (Wind and water)
- Impact on biodiversity (bird collisions)
- Agricultural land availability
- Archaeological sites
- Paleontological finds
- Impacts on traffic safety

SPECIALIST	FINDINGS	RECOMMENDATIONS
<p>Landscape Architect: Visual Impacts</p>	<p>The existing visual condition of the landscape that may be affected by the proposed Mopane Solar PV 5 facility has been described. Sensitive viewing areas and landscape types have been identified and mapped, indicating potential sensitivity to the project, mainly for residences of farmsteads to the immediate west and south of the site.</p> <p>The Project's visual impact will cause changes in the landscape that are noticeable to people viewing the landscape from the public road immediately north of the site. Farmsteads to the west and south of the site will not see the proposed development.</p> <p>Impact on the visual environment during <u>construction phase</u> is assessed to have a low intensity over a localized area and would occur over the short-term resulting in a low consequence. Probability of the unmitigated impact is <i>low</i> resulting in a predicted LOW significance.</p>	<ol style="list-style-type: none"> 1. With the preparation of the land, the minimum amount of existing vegetation and topsoil should be removed. 2. Construction site, waste areas, storage areas and ablution facilities, should either be screened or positioned in areas where they would be less visible from the public road north of the project site. 3. Construction activities should be limited to between 08:00 and 17:00 or in conjunction with the ECO. 4. Adopt responsible construction practices that strictly contain the construction/establishment activities to demarcated areas. 5. Building or waste material discarded should be undertaken at an authorised location, which should not be within any sensitive areas. 6. Existing vegetation should be retained where possible. 7. All cut and fill slopes (if any) and areas affected by construction work should be progressively top soiled and re-vegetated as soon as possible. 8. Disturbed soil must be exposed for the minimum time possible once cleared to avoid prolonged exposure to wind and water erosion and to minimise dust generation.

SPECIALIST	FINDINGS	RECOMMENDATIONS
	<p>Mitigation measures would not significantly reduce the anticipated impact and would remain LOW.</p> <p>Impact on the visual environment during <u>operational phase</u> is assessed to have a moderate intensity and would occur over the long-term resulting in a low consequence. Probability of the unmitigated impact is <i>low</i> resulting in a predicted LOW significance.</p> <p>Mitigation measures can slightly reduce the visual impact, but it would remain a LOW impact.</p> <p>The nature of the visibility of the project and limited number of people that could be affected, suggests that glint and glare is not a significant issue.</p> <p><i>Visual impacts associated with construction, operation and decommissioning phases can be somewhat mitigated to acceptable levels provided the recommended measures are effectively implemented and managed in the long-term.</i></p>	<ol style="list-style-type: none"> 9. Lighting should be kept to a minimum. 10. Lighting should be carefully directed and only used where necessary. 11. Paint all structures (structural support for the arrays) with colours that reflect and compliment the colours of the surrounding landscape.
<p>Soil Specialist: Soil Potential assessment</p>	<p>The land in general has a low capability for crop cultivation, except under extensive irrigation on large pockets of land and deeper soil forms and can mostly be utilized as grazing for wildlife. The construction of the proposed solar development will result in a partial loss of the land capability as it currently is.</p>	<ol style="list-style-type: none"> 1. Unnecessary soil compaction must be avoided. 2. Minimize the area of land disturbance. 3. Erosion and dust control measures to be implemented. 4. Stormwater management plan to be implemented. 5. Exposed, bare soil must be minimized. 6. Topsoil to be conserved and maintained where possible. 7. Store chemicals on impervious area. 8. Soil pollution to be avoided and prevented. 9. Treat spillages according to correct procedures. 10. Stockpile topsoil separately from subsoil. 11. Restrict development to specific areas.

SPECIALIST	FINDINGS	RECOMMENDATIONS
Archaeologist: Archaeology and graves	During the survey no Earlier Stone Age material was noted and although few diagnostic pieces were recorded in a low-density open-air scatter the lithics suggest human occupation of the wider area from the MSA onwards.	<ol style="list-style-type: none"> 1. Regular monitoring of the development footprint by the ECO to implement the Chance Find Procedure for heritage and palaeontology resources (outlined in Section 10.2) in case heritage resources are uncovered during the course of construction. 2. After the conclusion of the field survey the layout was slightly changed resulting in a small area not being physically surveyed. This area is seen as of low heritage sensitivity based on the extensive survey of the surrounding area but should be subjected to a heritage walkdown prior to development. 3. Similarly any further changes to the layout should be assessed by a heritage specialist.
Paleontological specialist	The palaeontologist confirmed that weathered dolomites and cherts were fairly common in the area for the proposed solar collectors and substation. NO FOSSILS, such as stromatolites, were seen in the dolomite outcrops. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr.	<ol style="list-style-type: none"> 1. It's extremely unlikely that the proposed development will have any effect on palaeontological heritage. However, if fossils are exposed in possible Quaternary alluvial deposits, which are not indicated on the geological map, it will create a unique opportunity to explore the area for fossils. 2. It is thus recommended that, in the unlikely event that fossils are exposed as a result of the PV development, a qualified palaeontologist must be contacted to assess the exposure for fossils before further activities takes place so that the necessary rescue operations are implemented following the attached Chance Find Protocol (CFP). 3. Depending on the nature of fossils discovered this could entail excavation and removal to a registered palaeontological museum collection.
Avifauna specialist: Impact on biodiversity (bird collisions)	Findings of the relevant impact assessment concluded that the proposed Mopane Solar PV 5 development would have a low to medium impact on the bird communities and will cause a slight impact on the ecological process of the overall bird community. The biggest concern is the threat the power lines within this area hold to threatened species such as vultures korhaans and herons present at the site. Therefore,	<ol style="list-style-type: none"> 1. Put bird diverters on power lines. 2. Put bird guards and perch guards as deterrents on infrastructure. 3. The installation of artificial bird space perches or platforms at a safe distance from energised components 4. Use bird-friendly powerline designs. 5. Keep activities inside development area. 6. Strict environmental control measures to be implemented.

SPECIALIST	FINDINGS	RECOMMENDATIONS
	<p>careful considerations need to be taken in terms of the proposed power line.</p>	<ol style="list-style-type: none"> 7. Bird nests found must be reported. 8. Limit vehicle speeds on site. 9. Keep lighting to the minimum at night. 10. Report collisions with panels. 11. Train ECO and workforce well.
<p>Ecological specialist</p>	<p>The proposed development activities will modify the vegetation and faunal habitats of the development site to a certain extent varying according to the habitats on the site, although in general the vegetation on site where the development footprint is planned are classified as pristine to slightly degraded.</p> <ul style="list-style-type: none"> • The North-West Biodiversity Conservation Plan indicates that most of the proposed development footprint falls into a CBA2 area, although most of these areas should rather be classified as ESA1 or ESA2 areas. The management objective for this area is to maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern. • The project area is not located within or close to any IBA • Development area does not fall in any area as identified in the Protected Areas Network and National Protected Areas Expansion strategy (NPAES). • The indigenous grassland vegetation units on the proposed development site is not considered a Critical Habitat in line with IFC Performance Standard PS6. 	<ol style="list-style-type: none"> 1. A permit must be obtained from authorities before any protected plants are eradicated. These plants should form part of a rescue and relocation programme should the development activities impact on populations. 2. Natural vegetation removal should be kept to a minimum during any future construction activities and only vegetation in the footprint areas should be removed. The unnecessary impact on the surrounding vegetation types should be avoided as far as possible. Considering the footprint area to form part of an area that is degraded, the impact on the vegetation of the larger area would be low. 3. A detailed species rescue, relocation and re-introduction plan should be developed and implemented by a qualified person before any excavations or disturbance commences. 4. Mitigation measures and monitoring should be implemented should the development be approved. 5. Where trenches pose a safety risk, they should be adequately cordoned off to prevent animals falling in and getting trapped and/or injured. 6. No animals may be poached during the construction of the solar park. 7. Do not feed any wild animals on site. 8. Waste bins and foodstuffs should be made scavenger proof. 9. Roads in the area should be designed without pavements to allow for the movement of small mammals. 10. Monitoring of the environmental aspects should be done over the longer term to ensure that impacts are limited to a minimum during the construction and operational phases.

SPECIALIST	FINDINGS	RECOMMENDATIONS
<p>Stormwater management plan</p>	<p>A stormwater management plan is to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated stormwater or increased soil erosion. The plan must include the implementing of appropriate design measures that will allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of stormwater run-off.</p>	<p>CONSTRUCTION</p> <ol style="list-style-type: none"> 1. It is recommended that access and service roads, as well as stormwater systems are constructed at the commencement of the construction phase to ensure that suitable stormwater management measures are in place at the least additional cost. 2. Permanent routes must be used for construction purposes. In order to preserve the natural state of the surface and vegetation as far as practically possible, off-road driving should be restricted to the absolute essential. 3. Temporary or permanent soil stockpiles should be placed in such a way to minimize the impact on surface flow. 4. Site clearing should be limited to the essential. 5. Construction waste, including possible broken and damaged panels must be collected and stored safely for disposal in accordance with the relevant waste regulations, protocols, and product specifications. Care must be taken not to leave any waste on site that can lead to future contamination of the site or the downstream area. 6. Training with regards to stormwater management of construction personnel must be undertaken as part of their induction. <p>OPERATION</p> <ol style="list-style-type: none"> 1. Training regarding stormwater management of site personnel must be undertaken as part of induction. Training must be undertaken periodically. 2. Regular inspections of all stormwater infrastructure are required. 3. Any item that may be found to be out of order, for instance accumulation of settled sand in a trench, or erosion, must be addressed and corrected without delay to keep the stormwater system in a good and fully functional condition. 4. Specific attention must be given to inspection during and after any rain and/or flood event to kerb any damage that may occur. 5. If any structures have to be erected in the 1:100-year flood line zones, Water Use Licencing is compulsory (i.t.o. section 21(c)) of the National Water Act.

SPECIALIST	FINDINGS	RECOMMENDATIONS
Traffic Impact Study	Road surface of the intersection of Roads D859 and D331 is currently in very poor condition with an excess of potholes. Should the roadway deteriorate more and not be repaired, access to Phase 5 of the Proposed Development will become problematic via this intersection.	<ol style="list-style-type: none"> 1. The access point from and to the proposed development must preferably be at a location where only one road authority would be involved as this would simplify the process and requirements for access approval. 2. Road should be repaired by the contractor. 3. As part of the construction phase, a dedicated loading and off-loading area on site should be established where workers can safely be loaded and off-loaded by public transport or arranged transport. 4. From a road safety perspective, dust suppression on the proposed access road (should be conducted when required to avoid road visibility issues caused by dust from vehicles making use of the road, which could lead to vehicle accidents.
Aviation Specialist	There are no Military installations and also no promulgated Danger, Restricted and Prohibited areas according to the South African Civil Aviation Authority (SACAA) listed in the vicinity of the Mopane Solar PV 5.	It will not be necessary to investigate the Obstacle Identification Surfaces of the runway at Carletonville Airport.
RFI & Defence Specialist	<p>All activities identified, is considered to be classified as low sensitivity to RFI.</p> <p>There should be no unacceptable impact on existing and potential, future installations if all equipment to be used permanently or temporarily has acceptable EMI/RFI levels that have been subjected to ICASA requirements and power lines and sub-stations are installed according to ESKOM best practices and standards adopted.</p>	Irrigation installations and other communication equipment could potentially be affected by solar facility equipment. However, in this case, the equipment together with the solar facility control, monitor and security facility will be able to co-exist if they adhere to all ICASA radiation and interference equipment regulations.
Noise Impact Study	Considering the distance of potential noise sources from Noise Sensitive Receptors (NSR), the temporary nature of construction noise impacts as well as the low magnitude of operational noises, the development of the Mopane Solar PV 5 facility is unlikely to influence ambient sound levels at the NSR in the vicinity of the project site.	No further Scoping or other acoustical studies would be required for the proposed development of the Mopane Solar PV 5 facility, and it is recommended that the project be authorized (in terms of acoustics).

13 ENVIRONMENTAL IMPACT STATEMENT

13.1 SUMMARY KEY FINDINGS OF THE EIA

It can be concluded that there will be environmental impacts including cumulative impacts as a result of the proposed development of the Mopane Solar PV 5 facility. However, all the impacts can be mitigated to an extent which would make the development possible. Most of the impacts can be avoided and potential impacted areas such as the heritage site will be demarcated as no-go areas, therefore limiting the possible negative environmental impacts to an acceptable level.

14 FINAL PROPOSED ALTERNATIVES RESPONDING TO IMPACT MANAGEMENT MEASURES, AVOIDANCE AND MITIGATION MEASURES IDENTIFIED IN ASSESSMENT

The preferred alternative was identified after all possible negative impacts were mapped and demarcated as no-go zones.

In order to minimize negative environmental impacts, there are areas that are not available for future developments of any kind. In order to mitigate for most of the negative impacts, avoidance seemed to be the best option in terms of the main issues, including:

- Visual impacts
- Bird collisions - limit occurrences
- Impacts on soils
- Impacts on biodiversity
- Degradation of archaeological sites/paleontology.
- Impacts on Traffic

15 ASPECTS WHICH WERE CONDITIONAL TO THE FINDINGS OF THE ASSESSMENT BY THE EAP OR SPECIALISTS WHICH ARE TO BE INCLUDED AS CONDITIONS OF AUTHORISATION

- Archaeological discoveries:
 - If anything of archaeological/paleontological significance is found, the archaeologist as well as SAHRA must be notified immediately.
 - Strict monitoring should be done during the construction phase.
- Eskom-approved; bird friendly devices must be attached to the powerlines to avoid bird collisions.
- Protected plants on site – permit applications and avoidance

An ecologist should be appointed to assist with permit applications as well as assistance on site before construction commences during ground truthing.

- Inform staff of the need to watch for potential fossil occurrences.
- Inform staff of the procedures to be followed in the event of fossil occurrences.
- Monitor for presence of fossils, especially fossil bones
- Obtain permit from SAHRA for collection of fossil finds.
- Traffic Impact:
 - Transport for workers should be by means of arranged or contracted transport. A dedicated public transport loading and off-loading area should be provided on site where workers and visitors can be loaded and off-loaded within a safe and dedicated area.
 - With the provision of the required sight distances at the final proposed access intersection position which would be determined (mitigated) as part of the detail design phase, the impact from a road safety perspective in terms of intersection sight distances would have a low significance.
 - With the provision of a dedicated loading and off-loading area on site as part of the Proposed Development and ensuring that contractors make use of the dedicated area, the impact from a road safety perspective in terms of loading and off-loading workers would have a low significance.

16 ASSUMPTIONS UNCERTAINTIES AND GAPS IN KNOWLEDGE

Uncertainties could be limited by implementing a thorough ground-truthing process before construction commences.

It is assumed that the developer will always act responsibly towards the environment during the development and will comply with the conditions of the environmental authorization at all times.

17 REASONED OPINION FOR AUTHORISATION OF ACTIVITY AND CONDITIONS IN RESPECT OF THAT AUTHORISATION

It is the opinion of the EAP that the environmental impacts associated with the proposed development were identified and that the mitigation measures proposed to mitigate the negative impacts will decrease the environmental negative impacts to acceptable levels.

The EAP respectfully request comments from the competent authority to issue environmental authorisation for the proposed Mopane Solar PV 4, based on the findings included in this Final Impact Assessment Report.

Conditions to be included in the environmental authorisation

- Appoint an environmental control officer on site during construction of the development to monitor the development for compliance with the conditions of the environmental authorization.
- Permits are needed if any protected plants will be affected by the development and consequently have to be removed from the construction area.
- Invader plants must be controlled through removal and destroying the plants.
- Only vegetation inside the development footprint may be removed for construction.
- Preconstruction walk-through of the approved development footprint must be undertaken to ensure that sensitive habitats and species are avoided where possible.
- Permits from relevant authorities must be obtained for the removal or disturbance of any TOPs, Red Data listed or nationally protected species.
- Rehabilitation Plan that guides planting and seeding with indigenous perennial shrubs and succulents from the local area must be developed to avoid erosion and alien invasion.
- Sensitive habitats in close proximity to the development footprint must be avoided or demarcated as No-Go area (i.e. SWSA)
- Suitable bird repelling structures and bird diverters must be considered to avoid collision of birds with the PV facility.
- Pre and Post construction monitoring must be conducted under the guidance of an avifaunal specialist to assess collision rates.
- The development must stay clear of the identified heritage features found on the proposed site.
- Should any previously undetected surface of subsurface paleontological or archaeological material be exposed during development activities, all activities should be suspended, and the archaeological specialist should be notified immediately.

18 PERIOD OF ENVIRONMENTAL AUTHORISATION AND DATE OF CONCLUSION OF ACTIVITY

The period for which the EA is required is for 10 Years from date of Environmental Authorisation.

The date on which the activity will be concluded is in 10 years from date of Environmental Authorisation. Post construction monitoring must be done for at least 2 Years after finalisation of construction.

19 UNDERTAKING UNDER OATH OR AFFIRMATION BY THE EAP

I, Anton von Well, appointed EAP for the proposed Mopane Solar PV 5 application for Environmental Authorisation, hereby confirm:

- Correctness of the information provided in this report.
- All comments and inputs and responses from stakeholders and I&APs are included here.
- All inputs and recommendations from the specialist reports where relevant, are included.
- Any information provided by the EAP to interested and affected parties and responses by the EAP to comments or inputs made by Interested and affected parties do form part of this Final report.



Signed

Date...13/06/2023.....

20 BIBLIOGRAPHY

DEAT, 1998. *Guideline Document on the EIA Regulations implementation of sections 21, 22 and 26 of the Environment Act*, Government Printer, Pretoria.

DEAT, 1999. *Environmental Management Framework for the Northern Province*. University of Pretoria, Pretoria.

DEAT, 2002. *Impact Significance, Integrated Environmental Management, Information Series 5, Department of Environmental Affairs and Tourism*, Pretoria

DUINKER, P.N. and BEANLANDS, G.E. 1986. The significance of environmental impacts: and exploration of the concept, *Journal of Environmental Management*, 10(1), 1-10 in DEAT, (2002).

MIDGLEY, D.C. PITMAN, W.V. AND MIDDLETON, B.J.1994. First Edition *Surface water resources of South Africa 1990, Volume VI, Drainage regions U,V,W,X, Eastern Escarpment*. WRC Report No 298/6.2/94, Pretoria.

PLOMP, H. 2004. *A process for assessing and evaluating environmental management risk and significance in a gold mining company*. Conference Papers-Annual National Conference of the International Association for Impact Assessment: South African Affiliate.

THOMPSON, M.A., 1988. *The determination of Impact Significance in Environmental Impact Assessment*, Unpublished Master of Science Thesis, University of Manchester, UK.

THOMPSON, M.A., 1990. Determining Impact significance in EIA: a review of 24 methodologies, *Journal of Environmental Management*, 30, 235-250.