May 2023

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

CARINA ENERGY (PTY) LTD (BUFFALO 1 SOLAR PARK) RENEWABLE ENERGY GENERATION PROJECTS ON FARM BUFFELSJAGT 744-LQ WITH OVERHEAD POWERLINES TO THE ESKOM MEDUPI SUBSTATION, WITHIN THE LEPHALALE LOCAL MUNICIPALITY, WATERBERG DISTRICT MUNICIPALITY.

DEFF REF:14/12/16/3/3/2/2241

A SYSTEMS APPROACH
APPLIED TO YOUR REQUIREMENTS

Prepared for:
Carina Energy (Pty) Ltd

QUALITY AND REVISION RECORD

QUALITY APPROVAL

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This report has been prepared in accordance with Exigent Quality Management System.

DISTRIBUTION

DISTRIBUTION LIST
Registered and Potential Registered and Affected Parties.
Department of Forestry, Fisheries and the Environment.
Stakeholders

REFERENCE

When used as a reference this report should be cited as: Exigent (2023) EIA Report for the Carina Energy (Pty) Ltd (**Buffalo 1 Solar Park**) Renewable Energy Generation Project on Farm **Buffelsjagt 744-LQ** with Overhead Powerline to the Eskom Medupi Substation, within the Lephalale Local Municipality, Waterberg District Municipality.

DISCLAIMER

Even though every care is taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time and budget. Discussions are to some extent made on reasonable and informed assumptions built on bona fide information sources, as well as deductive reasoning. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage during the impact assessment phase. The author does not accept responsibility for conclusions made in good faith based on own databases or on the information provided. Although the author exercised due care and diligence in rendering services and preparing documents, he accepts no liability, and the client, by receiving this document, indemnifies the author against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, directly or indirectly by the authors and by the use of this document. This report should therefore be viewed and acted upon with these limitations in mind.

PURPOSE OF THE REPORT AND INVITATION TO COMMENT

Carina Energy (Pty) Ltd appointed Exigent as the independent environmental consultant (EAP) to undertake the Scoping and Environmental Impact Assessment (S&EIA) process for the Buffalo 1 Solar Park project. The EIA process is being undertaken in accordance with the requirements of the 2014 EIA Regulations, as amended, promulgated in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA).

This EIA Report consists of twelve chapters, as follows:

- **Chapter 1** provides background to the Buffalo 1 Solar Park project and the EIA process.
- **Chapter 2** provide an overview of the EIA methodology that was followed during this EIA.
- **Chapter 3** provides the site selection information.
- **Chapter 4** describes solar as a power generation option and provides insight to technologies for solar energy.
- **Chapter 5** outlines the strategic regulatory and legal context for energy planning in South Africa, and specifically for the proposed facility.
- **Chapter 6** describes the need and desirability of the Buffalo 1 Solar Park project within the project site.
- **Chapter 7** describes the project alternatives.
- **Chapter 8** describes the existing biophysical and socio-economic environment affected by the proposed facility.
- **Chapter 9** provides a description and assessment of the potential impacts as well as potential cumulative impacts associated with the proposed Buffalo 1 Solar Park project and associated infrastructure.
- **Chapter 10** provides the recommendations for the various specialists relating to the Buffalo 1 Solar Park project.
- **Chapter 11** presents the management and mitigations recommendations based on the findings of the EIA for the (project).
- **Chapter 12** provides references used in the compilation of the Draft EIR

EXECUTIVE SUMMARY

Carina Energy (Pty) Ltd is proposing the development, construction and operation of a renewable energy generation facility (Photovoltaic Power Plant) and associated infrastructure, and structures on **Farm Buffelsjagt 744-LQ**, located within the Lephalale Local Municipality, Waterberg District Municipality, Limpopo Province.

The project envisages the establishment of a **solar photovoltaic (PV) power plant** with a maximum generation capacity at the delivery point (Maximum Export Capacity) of up to **240 MW**, within a development area (PV plant footprint) up to **500 ha**. The proposed **Buffalo 1 Solar Park** will deliver the electrical energy to the Eskom Medupi substation through a new power line of approximately 10 to 13 km in length. Two 132 kV feeder bays will be commissioned and equipped at the Eskom Medupi substation.

The Draft Environmental Impact Assessment undertaken in line with the requirements of the National Environmental Management Act Environmental Impact Assessment Regulations of 2014 (GNR 326), as amended. The proposed development requires environmental authorisation in terms of the National Environmental Management Act Regulations 326. The information contained in this Draft Environmental Impact Assessment Report provides a comprehensive description of the need and desirability of the proposed solar park development, specifically relating to sustainability in the economic, social and environmental spheres.

An important part of any Environmental Impact Assessment is public participation. Stakeholder engagement was initiated from the outset of the project to ensure that all stakeholders were adequately and effectively consulted. The Draft Environmental Impact Assessment Report will be made available for public and stakeholder review for a period of 30 days. All comments received and issues raised will be documented and addressed and responded to in the Final Environmental Impact Assessment Report.

Table 0-1 General site information for the proposed facility

Province	Limpopo		
District Municipality	Waterberg District		
Local Municipality	Lephalale Local		
Ward Number (s)	3		
Nearest Town (s)	Lephalale		
Affected Properties:		**Parent Farm Number**	**Farm Portion**
PV Array		Buffelsjagt 744 LQ	Portion 0
Transmission Corridor	Alternative Corridor 1	Verguld Helm 321 LQ	Portion 0
	Alternative Corridor 1	Kromdraai 690 LQ	Portion 0
	Alternative Corridor 1	Kuipersbult 511 LQ	Remaining extent
	Alternative Corridor 1	Kuipersbult 511 LQ	Portion 1
	Alternative Corridor 2	Hooikraal 315 LQ	Portion 0
	Alternative Corridor 2	Vaalpensloop 313 LQ	Remaining extent
	Alternative Corridor 2	Vaalpensloop 313 LQ	Portion 1

	Alternative Corridor 2	Hieromtrent 460 LQ	Portion 0
	Alternative Corridor 2	Turfvlakte 463 LQ	Portion 0
	Eskom Medupi substation	Naauw Ontkomen 509 LQ	Portion 0

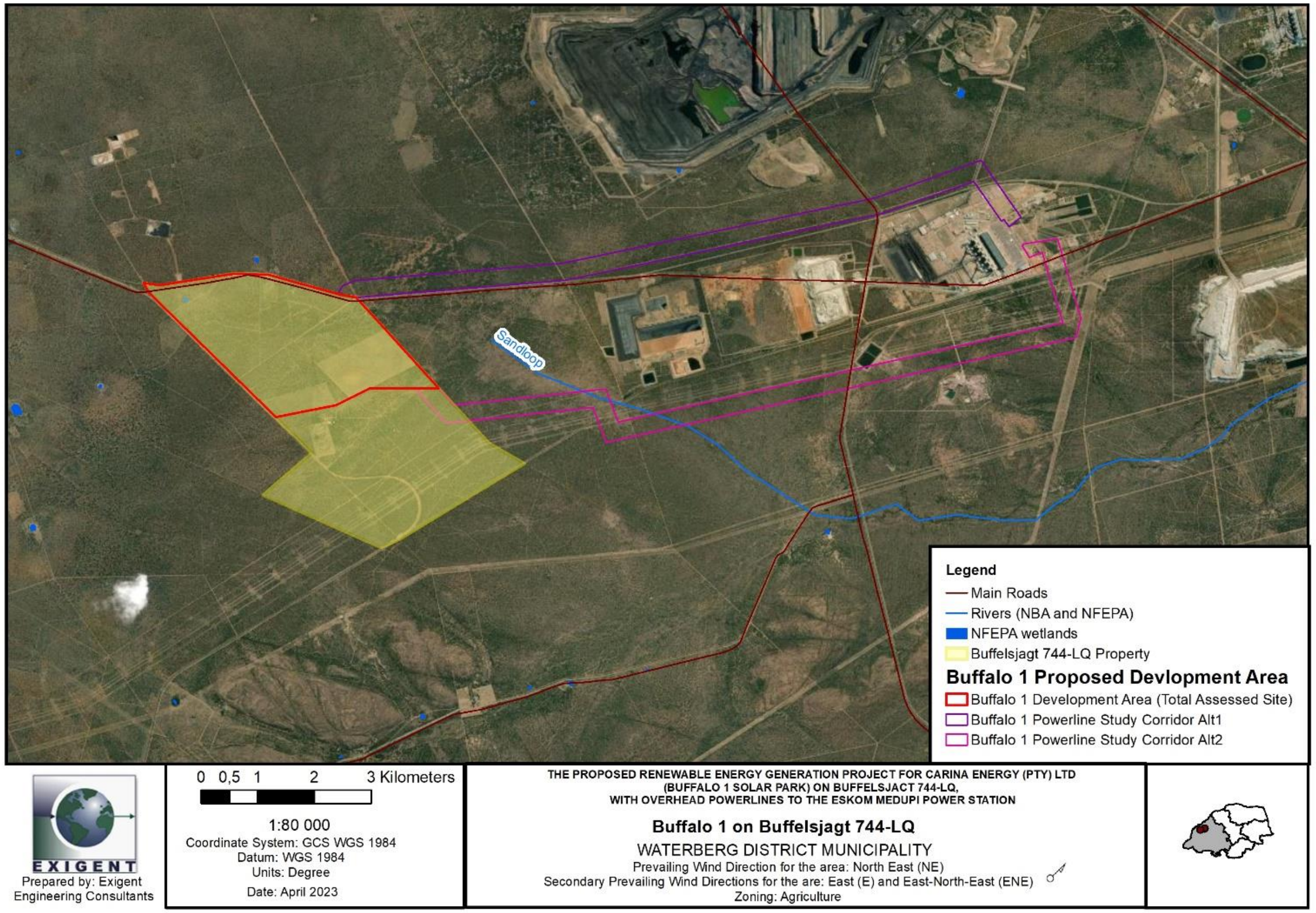

Figure 0-1 Location of the proposed Facility

The full extent of the project site (1366.6 ha) has been considered within the EIA process with the aim of determining the suitability from an environmental- and social perspective and identifying areas that should be avoided in development planning. Within this identified project site, a development area and a development footprint have been defined for assessment. The project site is larger than the area required for the development footprint of a Buffalo 1 Solar Park Facility and therefore provides the opportunity for the optimal placement of infrastructure, ensuring avoidance of major identified environmental sensitivities or constraints identified through this EIA process.

The Buffalo 1 Solar Park Facility is proposed in response to the identified objectives of national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Buffalo 1 Solar Park Facility under the DMRE's REIPPP Programme or possibly a similar private procurement process with the aim of evacuating the generated power into the national grid. The Buffalo 1 Solar Park Facility falls within the Central Transmission Corridor that has been identified by the Government (**Figure 0-2**). The proposed facility will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) published by the DMRE, with the Buffalo 1 Solar Park Facility set to inject up to 240MW of electricity into the national grid. Similarly, the location of the new renewable electricity generation facility in the Limpopo Province is important in the context of the Just Energy Transition (JET). The Buffalo 1 Solar Park Facility will provide valuable jobs and socio-economic benefits that are required in an area where coal fired generation will be phased out over the next 30 years in South Africa[1]. This project will be vitally important if the JET is to be successfully implemented and is a transition for everyone.

[1] Staff Writer, 6 July 2022, South Africa approves $8.5 billion plan to move away from coal, Businesstech, Website address: https://businesstech.co.za/news/energy/603460/south-africa-approves-8-5-billion-plan-to-move-away-from-coal/

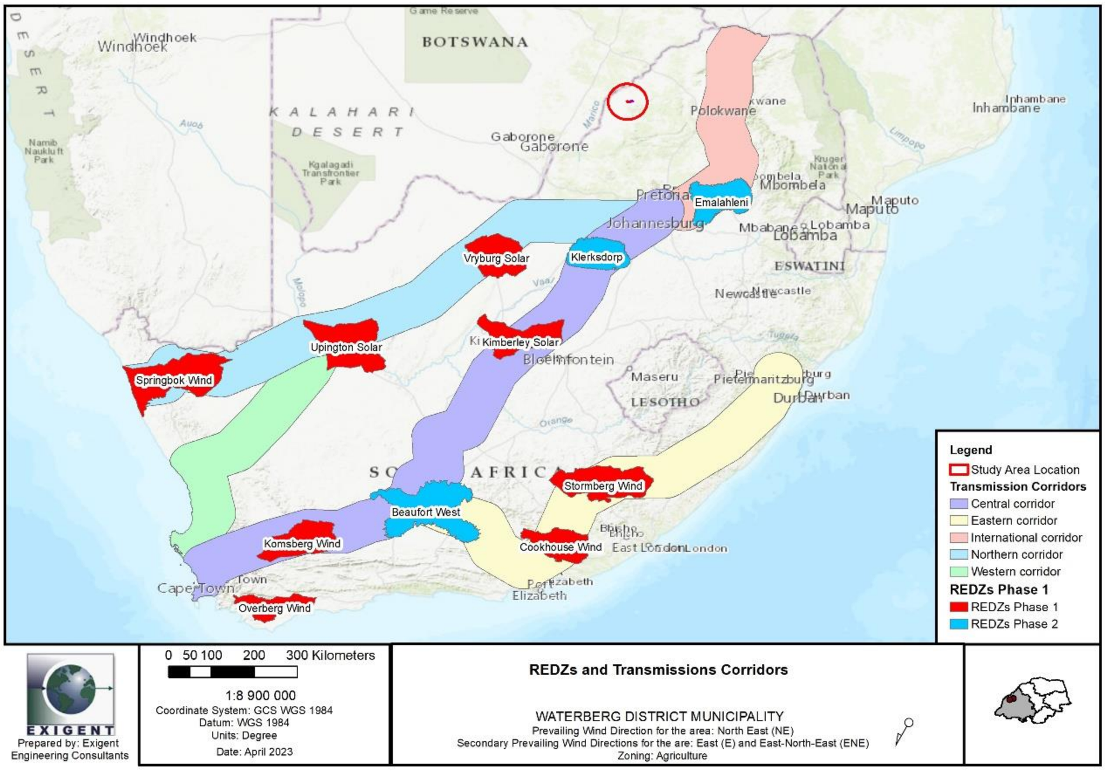

Figure 0-2: The Central Transmission Corridors

Infrastructure associated with the Buffalo 1 Solar Park Facility will include the following:

- 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 33kV/132kV step-up substation** with high-voltage power transformers, stepping up the voltage from 33kV (or 22k) to 132kV, and one 132kV busbar with metering and protection devices (switching station)
- one **132 kV power line, approximately 10 to 13 km long** (depending on the selected powerline corridor, alternative 1 or 2), connecting the on-site 132kV switching station to the 132 kV busbar of the Eskom Medupi Substation
- Should the connection solution proposed by Eskom be at 400kV (**Connection Alternative 1 @ 400kV**):
    - one **132kV/400kV step-up substation** with high-voltage power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), to be built in proximity of the Eskom Medupi Substation

- One **400 kV power line** connecting the on-site 400kV switching station to the 400 kV busbar of the Eskom Medupi Substation

- An **extension of the 132kV and/or 400kV busbar of the Eskom Medupi substation** may be required
- **Battery Energy Storage System (BESS),** with a Maximum Export Capacity up to 240 MW and a 6-hour storage capacity up to 1440 MWh, with a footprint up to 20 ha within the proposed PV plant footprint / fenced area
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Access point from Road D1675 from Lephalale to Steenbokpan
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Sewage system

During the construction phase, the site may be provided with additional:
- Water access point, water supply pipelines, water treatment facilities
- Pre-fabricated buildings
- Workshops & warehouses

to be removed at the end of construction.

The connection may also entail interventions on the Eskom grid, according to Eskom's connection requirements/solution.

The proposed Buffalo 1 Solar Park Facility development requires a development footprint of approximately **500 ha** and is located within the broader area of approximately 1366.6 ha. Therefore, as part of the alternatives that will be assessed within the EIA process, the final setting of the PV facility will be appropriately sited within the broader area such that any identified environmental sensitivities can be avoided.

ENVIRONMENTAL PERMITTING REQUIREMENTS
The Buffalo 1 Solar Park Facility and its associated infrastructure trigger the need for the following environmental permit:

- **An Environmental Authorisation** (EA) from the National Department of Forestry, Fisheries, and the Environment (DFFE), in consultation with the Limpopo Department of Economic Development Environment and Tourism (LEDET), in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Environmental Impact Assessment (EIA) Regulations (GNR 326), 2014, as amended.

Exigent has been appointed by the Applicant as the Independent Environmental Assessment Practitioner (EAP) in accordance with NEMA and Regulations 21 to 24 of the 2014 EIA Regulations (GNR 326), as amended to undertake the required S&EIA in support of the application for Environmental Authorisation (EA) and the public participation process (PPP) for the project, in order to identify and assess all potential environmental impacts associated with the proposed Buffalo 1 Solar Park and recommend appropriate mitigation measures in an Environmental Management Programme (EMPr).

An EIA is an effective planning and decision-making tool that is used by the project developer as it allows for the identification and management of potential environmental impacts associated with a specific project and activity. It provides the opportunity for the developer to be fore warned of potential environmental issues, sensitive areas and allows for the resolution of issues reported on in the Scoping and EIA Reports as well as a dialogue with Interested and Affected Parties (I&APs). Comprehensive, independent environmental specialist studies are required in accordance with the EIA Regulations to provide the competent authority with sufficient information in order to make an informed decision on the proposed project.

The listed activities associated with the proposed development, as stipulation under the Environmental Impact Assessment (EIA) Regulations of 2014 (GN R.983, GN R.984 and GN R.985), as amended are listed in Table 5-1 under Section 5 of this Draft EIA Report. The purpose of these regulations is to avoid negative impacts on the environment or where they cannot be avoided, ensure mitigation and management of the impacts to acceptable levels, while optimising positive environmental impacts.

The EIA process being undertaken for the proposed Buffalo 1 Solar Park Facility comprises two phases – i.e., (1) Scoping and (2) Impact Assessment - and involves the identification and assessment of environmental impacts through specialist studies, as well as public participation. The process followed in these two phases is as follows:

- The **Scoping Phase** includes the identification and description of potential impacts associated with the proposed project through a desktop study and consultation with I&APs and key stakeholders. This phase considers the broader project area in order to identify and delineate any environmental fatal flaws, no-go or sensitive areas, as well as project alternatives in order to determine which should be assessed in more detail in the EIA Phase. Following the public review period of the Scoping Report, this phase culminates in the submission of a final Scoping Report (this report) and Plan of Study for the EIA Phase to the competent authority for acceptance and approval to continue with the EIA Phase of the process.

- **The EIA Phase** involves a detailed assessment of potentially significant positive and negative impacts (direct, indirect, and cumulative) identified in the Scoping Phase. This phase considers a proposed development footprint and includes detailed specialist investigations (including field surveys), consideration of feasible alternatives and public consultation. Recommendations of practical and achievable mitigation and management measures are included in an Environmental Management Programme (EMPr) considering all phases of the project. Following the public review period of the EIA

Report and EMPr, this phase culminates in the submission of a Final EIA Report and EMPr to the competent authority for review and decision-making.

PUBLIC PARTICIPATION

A general PPP has been followed during the Scoping Phase and EIR Phase of the EIA for the proposed project. The aim and purpose of the PPP is to:

- Ensure all relevant Key stakeholders and I&APs have been identified and invited to engage in the scoping phase;
- Raise awareness, educate and increase understanding of stakeholders about the proposed project, the affected environment and the environmental process being undertaken;
- Create a platform for Key stakeholders and I&APs to freely communicate, issues or concerns and suggestions for enhancing potential benefits and/or to prevent or mitigate impacts;
- Accurately document all opinions, concerns and queries raised regarding the project; and,
- Ensure the issues and concerns of the stakeholders and I&APs related to the project are addressed in an adequate manner.

The Scoping & EIR process has been announced through a Background Information Document (BID) and the Draft Scoping Report (DSR), and advertisements that was published in the Platinum Bushvelder newspaper on 12 August 2022, and 19 August 2022. Site notices were also placed along the corners of the proposed development as well as within and around key community areas. Please see Figure 0-3.

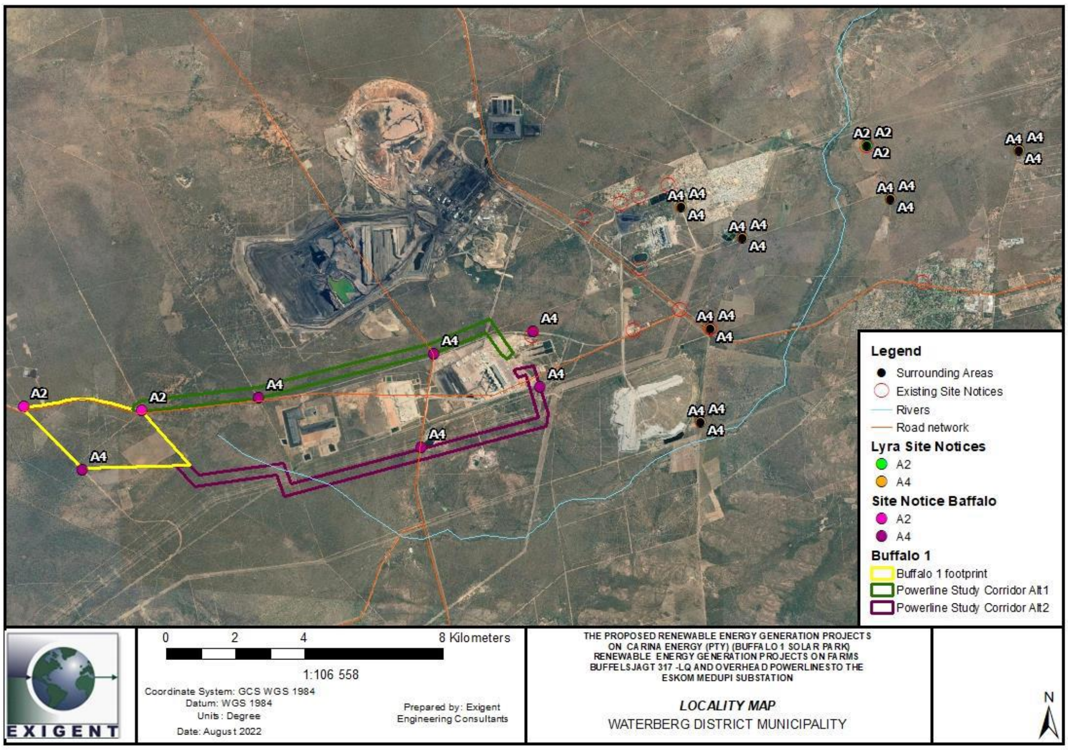

Figure 0-3 Map of area where site notices were placed.

This Draft Scoping Report was made available for comments for 30 calendar days from 19 August 2022 until the 20 September 2022. Written comments on this Draft Scoping Report were submitted to Exigent' Social Facilitation Specialist on or before 20 September 2022.

All registered I&APs have been and will be informed of the availability of the documentation for comment (as referred to above) when it is made available.

EVALUATION OF THE PROPOSED PROJECT

The potential environmental impacts identified, which are typically associated with solar energy projects, are associated with the construction and operational phases of the proposed project. The following potential environmental impacts has been assessed during the Environmental Impact Assessment phase of the (Scoping & EIR) process:

- An **Avifaunal Impact Assessment** has been conducted by a specialist to provide final recommendations on suitable aquatic avifaunal species and habitat buffer zones.
- A **Terrestrial Ecological Assessment and Aquatic Ecological Assessment** have been conducted to assess potential impacts on the ecology and biodiversity including the fauna, flora, aquatic and terrestrial biodiversity within the proposed development footprint.
- A **Soil and Agricultural Potential Assessment** has been conducted by a specialist to assess the potential of soil erosion and the loss of agricultural potential as well as other potential impacts in this specialist field.
- A **Heritage (including Archaeological & Paleontological) Impact Assessment** has been conducted by an Archaeologist to assess whether the construction of proposed project would have any impacts on significant artefacts.
- The **Visual Impact Assessment** of the PV facility has been assessed.
- A **Socio-Economic Impact Assessment** has been conducted to assess the potential impacts on the surrounding areas.
- A **Geotechnical Assessment** was done to assess the geotechnical requirements for the construction activities related to the project.

The outcome of this Draft EIR has not identified any fatal flaws associated with the proposed development of the Buffalo 1 Solar Park Facility. Subject to the outcome of the Public Participation Process, it is Exigent' reasoned opinion that the project should proceed.

Specialists' recommendations noted a number of significant and sensitive features/habitats throughout the original assessment area and the surrounding 500 m 'zone of influence'. Based on these findings and the subsequent initial recommendations of the Site Verification Report, the original proposed development area was significantly reduced in size and the design layouts of the Photovoltaic (PV) grid were revised by the applicant to adhere to the recommendations of the various specialists. The proposed development area is adequately kept away from any of the identified significant and sensitive features/habitats and species. The proposed development area discussed in this draft Environmental Impact Report (DEIR) report therefore constitutes this final acceptably reduced and revised area.

The EIA Report, together with the specialist studies contained within **Appendices F** provide a detailed assessment of the potential impacts on the farm properties that may result from the development of the proposed project. Please note that <u>no environmental fatal flaws</u> or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint. Subject to the outcome of the Public Participation Process, it is Exigent' reasoned opinion that the project should proceed.

BRIEF DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

Vegetation - *The development site lies within the Savanna biome which is the largest biome in Southern Africa. The Savanna Biome is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). and grazing also keep the grassy layer dominant.*

The most recent classification of the area is Sweet Bushveld vegetation type. The Limpopo Sweet Bushveld vegetation type has a least threatened conservation status, with 19% transformed and 1% statutorily conserved. This vegetation type in its pristine state is characterized by short open woodland, in disturbed areas thickets of Senegalia erubescens, Senegalia mellifera and Dichrostachys cinerea. The Limpopo Sweet Bushveld vegetation is classified as a Least threatened ecosystem.

Heritage - *The topography of the study area is flat with a few natural pans but no other focal points like rock outcrops or hills that would have attracted human occupation in antiquity. Multiple modern structures are scattered across the project area which were previously used for hunting camps and the project area is considered to be of low heritage significance.*

Plant, Animal and Terrestrial Biodiversity - *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.*
No individuals of the endemic or biogeographically important plants listed by Mucina & Rutherford for the relevant vegetation types were observed during the survey because of the habitat not being suitable, while the degraded state of the vegetation for the remainder of the area makes the probability of findings these species improbable, even though it might have been previously found in the larger area. Habitat degradation is one of the main reasons for plant species becoming extinct in a particular area.
Three major fauna habitats were observed in the area namely:

- *Mixed woodland.*
- *Old fields.*
- *Riparian habitats / open water habitats*

Palaeontology - *The study area is indicated as of moderate palaeontological significance on the SAHRA Paleontological map (Paleontological Specialist Report). Based on the field work and site visit* *that it is extremely unlikely that any fossils would be preserved in the overlying soils and sands of the Quaternary.*

Groundwater - *Drainage occurs as sub surface flow on the bedrock contact below the aeolian sand horizon from where it percolates through the fractured rock mass to the fractured rock aquifer located within the Karoo Sedimentary succession. As a result drainage lines are poorly developed, and streams are mostly ephemeral.*

Watercourses - *The study area falls within the Mokolo River Catchment, which drains into the Limpopo River to the north. The Mokolo River catchment covers an area of 8 387 km2. The catchment stretches from the Waterberg Mountains though the upper reaches of the Sand River and includes the Mokolo Dam and a few small tributaries that join the main Mokolo River up to its confluence with the Limpopo River. The site is located within the A42J and A41E quaternary catchment and is situated in the Limpopo Water Management Area. Drainage occurs as sheet-wash into the drainage channels on site that eventually drains into the major river namely the Mokolo River that occurs to the east of the project area.*

During the EIA phase, these areas were assessed, and the development footprint has been selected with the aim to avoid these.

Agricultural Potential - *Agricultural potential range from Medium-Low to Moderate on the site and the land capability is predominantly livestock grazing.*

Geotechnical information - *The study area is underlain by aeolian sand and sediments of the Karoo Supergroup. The Karoo supergroup is represented by the Eendragtpan, Grootegeluk and Swartrant Formations. Underlying the quaternary sediments south of the Eensaamheid fault, is underlain by sediments of the Magalakwena formation of the Waterberg Group.*

Avifauna: *The SEI of the proposed PAOI was found to be medium, highly likely due to the overall disturbance in the area, such as the mine, power station, roads and fences, existing power line infrastructure and human settlements, influence the. SCC behaviour results in the low abundance of SCC observed in the area and therefore the overall avifauna sensitivity is medium sensitivity.*

IMPACT EVALUATION OF THE BUFFALO 1 SOLAR PARK FACILITY

The EIA Report, together with the specialist studies contained within **Appendices F** provide a detailed assessment of the potential impacts on the farm property that may result from the development of the proposed project. Please note that no environmental fatal flaws or unacceptable impacts were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint.

The potential environmental impacts that were identified during the scoping phase and subsequent consultation with the Competent Authority (CA) associated with the proposed project and which were assessed through the EIA process include the following:

- Impacts on soils and agricultural potential.
- Impacts on aquatic ecology.
- Impacts on avifaunal ecology.
- Impacts on the terrestrial ecology (flora and fauna).
- Impacts on the economy.
- Impacts on the heritage resources, including archaeology, palaeontology and the cultural landscape.
- Positive and negative social impacts.
- Visual impacts on the area imposed by the components of the facility.

Specialists' recommendations noted a number of significant and sensitive features/habitats throughout the original assessment area and the surrounding 500 m 'zone of influence'. Based on these findings and the subsequent initial recommendations of the Site Verification Report, the original proposed development area was significantly reduced in size and the design layouts of the Photovoltaic (PV) grid were revised by the applicant to adhere to the recommendations of the various specialists. The proposed development area is adequately kept away from any of the identified significant and sensitive features/habitats and species. The proposed development area discussed in this draft Environmental Impact Report (DEIR) report therefore constitutes this final acceptably reduced and revised area.

Impacts on soils and agricultural potential

The agricultural specialist[2] noted that the project area should be considered as being moderate value grazing land with limited potential for arable agriculture considering the climatic conditions. The final land use will be agricultural grazing. The project area consists of moderate potential grazing land with Classes IV, V and VI. All of these land capability classes (except Class V) is suitable for the development of the renewable energy developments.

Based on Part 1 of the Regulation of Conservation of Agricultural Resources Act 43 of 1983, the proposed area can be classified as having soil potential that vary from Medium to Low. The proposed solar development will cause a loss of grazing and agricultural value of the land to a certain extent, although site specific mitigation will ensure that the land can still be utilized for grazing during and after the lifespan of the development and that the grazing value of the land will still be available to small livestock such as game, goats and sheep. Surrounding areas is used for livestock and game grazing, although other land-uses include residential developments, industrial land-uses and mining. The development will not impede on any of the neighbouring land-uses.

Impacts on aquatic ecology

One wetland type was identified namely endorheic depressions (natural and man-made). The floodplain river (Sandloop River) and its tributaries can be classified as 'River channels', although these drainage channels are not wetlands in the 'true' sense of the word but should rather be described as water courses as stipulated in the National Water Act.

[2] Henning, B.J. 2023. An agricultural agro-ecosystem specialist report for the proposed renewable energy generation project to be known as Buffalo 1 Solar Park on Farm Buffelsjagt 744 LQ with overhead powerlines to the Eskom Medupi Substation, within the Lephalale Local Municipality, Waterberg District Municipality.

The results of the Present Ecological Status assessment indicates that the riparian zones is 'Moderately Modified' and the Ecological Importance Status is 'Moderate'.

Impacts relating to the proposed development on the watercourses / riparian zones are as follows:

- Impact on the characteristics of the watercourse i.e., flow regime, habitat, biota, water quality and geomorphology due to construction within floodline zone.
- Soil compaction and increased risk of sediment transport and erosion
- Soil and water pollution
- Spread and establishment of alien invasive species in wetlands.

The proposed development will have a potential direct or indirect impact on the instream and riparian habitat. Mitigation (including rehabilitation) of the impacts should rather focus on the management of stormwater, erosion prevention and connection with the larger system. Indirect impacts could occur because of construction activities (dust, spillages etc.).

Impacts on the avifauna

During the construction phase vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise pollution. Increased human presence can lead to poaching and the increase in vehicle traffic and heavy machinery will potentially lead to roadkill.

The principal impacts of the operational phase are electrocution, collisions, fencing, chemical pollution due to chemical cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the "lake effect" [3](Lovich & Ennen, 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. This "lake-effect" hypothesis has not been substantiated or refuted to date [4](Visser et al, 2019). It can however be said that the combination of powerlines, fencing and large infrastructure will influence avifauna species. Visser et al (2019) performed a study at a utility-scale PV SEF in the Northern Cape and found that most of the species affected by the facility were passerine species. This is due to collisions with solar panels from underneath. During a predator attack while foraging under the panels, individuals may alight and then collide with the panel. Larger species were said to be more influenced by the facilities when they were found foraging close by and were disturbed by predators which resulted in collisions with infrastructure.

The avifauna Project Area of Influence (PAOI) for the proposed site is adjacent to the eastern boundary of Tierkop Private Game Reserve. The proposed site does not overlap with any:

- Important Bird Areas (IBAs)
- Coordinated Avifaunal Roadcount Routes (CARRs)
- Coordinated Waterbird Counts

[3] Lovich, J.E. & Ennen, J.R. 2011. Wildlife conservation and solar energy development in the desert southwest, United States. BioScience 61:982-992.

[4] Visser, Elke & Perold, V. & Ralston-Paton, S. & Cardenal, A. C. & Ryan, P.G., (2019). Assessing the impacts of a utility-scale photovoltaic solar energy facility on birds in the Northern Cape, South Africa. Renewable Energy, Elsevier, vol. 133(C), pages 1285-1294.

- Strategic Water Source Areas
- National Protected Area Expansion Strategy (NPAES)

The SEI of the proposed PAOI was found to be medium, highly likely due to the overall disturbance in the area, such as the mine, power station, roads and fences, existing power line infrastructure and human settlements, influence the. SCC behaviour results in the low abundance of SCC observed in the area and therefore the overall avifauna sensitivity is medium sensitivity. However, the sensitivity can be assumed to be Impacts were identified as being High to Medium in the Construction Phase, most of which could be reduced to Medium to Low, and even Absent with the application of mitigation measures. Impacts in the operational phase are expected to be Medium and can be reduced to Medium to Low with mitigation measures. Decommissioning phase impacts are expected to be Medium and can be reduced to Low with mitigation measures.

Impacts on the terrestrial ecology (flora and fauna)
The Terrestrial specialist noted that the project area is not located close to any Listed Threatened Ecosystem. The project area is near the listed NFEPA river, named Sandloop River, although this river will not be impacted on by the development footprint. The project area is not located within any SWSA.

The site falls within a CBA2, although the woodland areas of this section of the bushveld should be classified as ESA1 or ESA2 due to encroachment of the woody layer, although the woodland areas still support habitat of protected tree species. A small pan occurs in the north-western section of property and the proposed powerlines cross two drainage channels.

Although the screening tool lists Tierkop Private Nature Reserve as part of the adjacent property, this reserve was not flagged in the Limpopo Conservation Plan or the South African National Biodiversity Institute (SANBI) database on formally protected areas.

The D'Nyala Nature Reserve (forming part of the Limpopo Central Bushveld NPAES) occurs approximately 10km to the east of the project area. This area is large and mostly intact, and these areas are required to meet biodiversity targets, and suitable for protection. The development of the solar power plant will not impede on any of the NPAES.

Impacts on the Socio-Economy
The Lephalale municipal area is sparsely populated with approximately 120,000 residents in 2022. There are no human settlements within 16km of the proposed site. Estimated GDP was R14.4 billion at current prices for 2021, with the dominant sectors being electricity generation and coal mining. The number of unemployed people in 2021 were estimated at 10,330 according to the strict definition.

The socio-economic impact of the proposed Buffalo 1 Solar Project is positive, and the application is supported, provided that all the mitigation measures proposed by specialist consultants are implemented. There is no need to relocate communities. Employment and procurement needs, at least at the first level, can be provided by the local economy. Cumulative socio-economic impacts will be positive and will increase with additional solar projects. The local area under consideration can accommodate more than one solar project.

Impacts on the heritage resources,

The topography of the study area is flat with a few natural pans but no other focal points like rock outcrops or hills that would have attracted human occupation in antiquity. Multiple modern structures are scattered across the project area which were previously used for hunting camps and the project area is considered to be of low heritage significance. This was confirmed during the survey whereby no heritage resources were identified within the Project area.

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.

Impact on palaeontology

The proposed site lies on the potentially fossiliferous Swartrand Formation (Equivalent of the Pietermaritzburg Formation, Ecca Group, Karoo Supergroup) that could preserve trace fossils and fossil plants of the Glossopteris flora. Most of the site is on Quaternary sands that have a lower sensitivity and might have fragmented transported fossils. The site visit and walk through on 11th March 2023 by palaeontologists confirmed that there were no fossils in the project footprint. Nonetheless, a Fossil Chance Find Protocol should 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 for foundations and infrastructure have commenced.

The impact will only be during the construction phase and pre-mitigation will be low risk and post-mitigation will be low risk. There will be no cumulative impact or risk and there are no no-go areas. As far as the palaeontology is concerned, the project should be authorised.

Visual impacts on the area imposed by the components of the facility

The study area's landscape has, been transformed by mining and power generating and distribution infrastructure. The Project site is located in close proximity to the Eskom Medupi Power Station. Northeast of the site is the Grootgeluk Coal mine, and a number of Eskom distribution powerlines criss-cross the area.

Impacts on views are the highest when viewers are sensitive to change in the landscape, and the view is focused on and dominated by the change. During the initial public participation process, no visual issues were raised by the public indicating a low sensitivity towards the development. The Project's visual impact will cause moderate 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.

Assessment of Cumulative Impacts

Overall, because of the restricted nature of solar plants and few or no emissions and pollutants into air when operational, soil and water cumulative impacts to the environment are limited. An assessment on the cumulative impacts were done by the various specialists and their results are noted in section 9.6 of this report.

Conclusions on Cumulative Impacts

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 proposed project and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to avifauna with the development of the proposed project and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- Cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area.
- Positive impacts are expected to be Medium-High during the operational phase when the cumulative benefit of electricity generation capacity will occur.
- There will be no unacceptable loss of heritage resources associated with the development. There will also be no unacceptable impacts to the cultural landscape as a result of the development of the SPV facility.
- There will be no unacceptable loss of heritage resources pr paleontological resources associated with the development of the solar park.
- The significance of the cumulative impact of these projects on the visual environment during their operational phases is assessed to have a low intensity and over the long-term with an unmitigated sub-regional impact extending beyond the site and is assessed to be low risk. The cumulative impact with effective management measures is LOW.
- With regards to the cumulative impacts relating to social and economic impacts it was noted that the proposed development will be positive and will increase with additional solar projects. The local area under consideration can accommodate more than one solar project.
- The overall cumulative impacts from an avifauna perspective indicated that the impacts are Medium for the project in isolation and in consideration with Buffalo 2, Lyra 1 and Lyra 2 PV facility proposed in the area.

ASSESSMENT OF THE ALTERNATIVES

In accordance with the requirements of Appendix 3 of the 2014 EIA Regulations (GNR 326), reasonable and feasible alternatives, including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered. The energy generation alternatives were assessed and considered within the development of the IRP and the need for the development of renewable energy projects has been defined.

The preferred project site was identified through an investigation of prospective sites and properties in the area within the Limpopo Province. The investigation involved the consideration of specific characteristics that play a role in the opportunities and limitations for the development of a Solar Energy Facility. The key drivers in siting the project were determined by:

- Access to the National Electricity Grid;
- Solar resource;
- Land availability;
- Geographical and topographical considerations; and,
- Access to the project site.

The overall aim of the facility layout (i.e., development footprint) is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operation, and maintenance costs, and social and environmental impacts.

Assessment of the type of renewable energy
The Applicant is a renewable energy project developer and therefore only considered renewable energy activities in accordance with the need for such development within the IRP (refer to Chapters 6 for more detail). The development of a wind energy facility was also considered, but Class 3 winds (which are the standard requirement for the wind turbine to produce energy) with a speed of at least 23km/h is required to optimise wind turbine electricity generation. The windiest month (with the highest average wind speed) is November (8 km/h) in Lephalale. The calmest month (with the lowest average wind speed) is June (4 km/h). These average wind speeds were too low to function a wind farm optimally and therefore wind generation was not further investigated as an alternative activity in this EIA Report. With the focus on solar energy, the assessment for alternatives were focussed on the alternative technologies to be implemented in the project.

Assessment of the No-go Alternative
The 'do-nothing' alternative is the option of not constructing and operating the proposed project. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with a Solar Energy Facility. There will be no energy for the national grid, no job creation and the site will remain as is. The 'do-nothing' alternative will therefore likely result in minimising the cumulative impact on land, although it is expected that pressure to develop the site for renewable energy purposes will be actively pursued due to the same factors which make the site a viable option for renewable energy development. The 'do-nothing' alternative has been assessed as part of the EIA Phase (refer to Chapters 7 and 10 of this EIA Report). The 'do-nothing' alternative will do little to influence the renewable energy targets set by government. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

Assessment of the Facility Layout
A number of ecologically / conservation significant and sensitive aquatic features/habitats and species, as well potential heritage sites were identified throughout the original assessment area and the surrounding 500 m 'zone of influence'. Based on these findings and the subsequent initial

recommendations of the Site Verification Report and subsequent specialist assessments, the original proposed development area was significantly reduced in size and the design layouts of the Photovoltaic (PV) grid were revised by the applicant and the procedure is illustrated in Figure 0-4**.** This was done to ensure that the proposed development area is adequately kept away from any of the identified ecologically/conservation significant and sensitive aquatic features/habitats and -species. The proposed development area discussed in this report, therefore constitutes this final acceptably reduced and revised area.

As noted above, the indicative facility layout/development footprint assessed within this EIA Report (Figure 0-4) was designed by the project developer in order to respond to and avoid the sensitive environmental and social features located within the project site, which were identified by the specialists during the Scoping Phase of the EIA process. This approach ensured the application of the mitigation hierarchy (i.e., avoid, minimise, mitigate, and offset) to the proposed project, which ultimately ensures that the development is appropriate from an environmental perspective and is suitable for development within the project site.

Based on the findings as documented in this EIA report, it was concluded that this layout avoids areas of sensitivity and therefore no further optimisation is recommended. As such, the impact of this proposed Facility Layout is considered to be acceptable, and the layout is recommended for approval. Final micro-siting must however be undertaken prior to construction considering all mitigation measures recommended within this EIA Report and associated specialist studies.

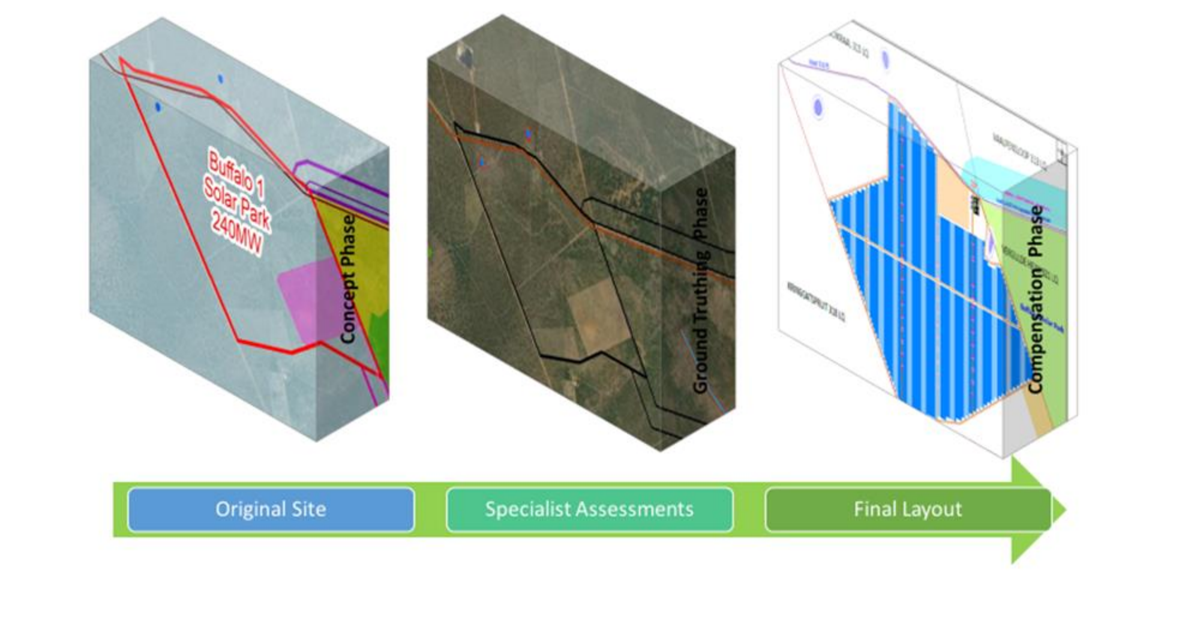

Figure 0-4 Environmental Screening and Assessment Process that informs the Final Layout

ENVIRONMENTAL COSTS VERSUS BENEFITS

This project forms part of the promulgated IRP 2010-2030 plan that identified electricity generation technology (specifically renewable energy – solar PV) to meet the expected demand growth up to 2030. This project aims to produce and distribute renewable energy generated electricity.

COSTS

Environmental costs (including those to the natural-, economic- and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the EIA Report and the EMPr are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

- Loss of land for agriculture – The amount of agricultural land loss is well within the allowable development limits prescribed by the agricultural protocol. These limits reflect the national need to conserve valuable agricultural land and therefore to steer, particularly renewable energy developments, onto land with lower agricultural production potential. The proposed development offers positive impact on agriculture by way of improved financial security for farming operations, as well as security benefits against stock theft and other crime.
- Impacts on surrounding freshwater resources – the impacts on freshwater resources have been minimised through the avoidance of the sensitive features by the project infrastructure. The internal access roads and MV Cabling will utilise the existing main access road to the north and all other infrastructure will remain within low-sensitive green developable area.
- Loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the solar farm – The cost of loss of biodiversity has been minimised/avoided through avoiding placement of project components and infrastructure within the ecological features considered to be of very high sensitivity (No-Go areas).
- Impacts on avifauna – loss of bird's species due to habitat loss, electrocution and collision. The impact has been minimised through the avoidance of areas of very high sensitivity (No-Go areas) and is considered to be acceptable with implementation of management action.
- Impact to the cultural landscape - The Park is proposed within a landscape area with an overriding agricultural character. Whilst the proposed project will create a new large scale industrial node within the agricultural landscape, this is not entirely out of character with the broader region. However, it will be a significant local character change.
- Impact on heritage and palaeontological resources - According to Bamford (2023), `no fossil remains of any kind were recorded within the project area. Heritage resources were recorded in the north-eastern corner of the proposed footprint development area and a 30m buffer has been recommended.
- Impact on the local economy – The economic impacts created by a capital injection (CAPEX) are once-off impacts that will only occur for the duration of construction. Thus, economic impacts associated with the construction phase are not sustainable economic impacts. Operational economic impacts, unlike capital expenditure economic impacts are sustainable and thus are calculated as an annual impact based on operational expenditure (OPEX) for a given year.
- Impact on the visual surroundings – The worst-case scenario (i.e. primarily the impact on users of the public roads within foreground views, is assessed below. Visual impact on all other areas within the study area would be less that the assessed worst-case scenario. The cause of visual impact during the construction phase are the activities associated with the clearing of bush (the

most disruptive activity as the change from the existing/baseline landscape is high) and the erection of the PV structures, associated infrastructure and the powerlines.

BENEFITS:

It is anticipated that with the implementation of the recommended mitigation measures from all the specialists and overall project implementation, the proposed project will provide the following benefits:

- The most notable advantage of solar energy is that it is a renewable energy, which is why it is considered inexhaustible and are considered a reliable long-term investment and a hedge against rising energy costs.
- Solar panels can use both direct and indirect sunlight. So even if it’s cloudy, panels can still produce electricity. With the installation of the BESS at the proposed project it is anticipated that the facility will bank excess solar production from sunny days to offset the times where the panels may not be producing. Through this option more consistent power supply is guaranteed.
- One of the biggest environmental advantages of solar energy (as current best electricity generation solution) entail the curbing and reducing the impacts on climate change. Solar is a renewable energy source with a fraction of the emissions of natural gas or coal (life-cycle carbon emissions are 95% lower than coal). In fact, the small number of emissions required to manufacture a solar panel are offset within its first two years of production.
- The water requirement for a solar farm is negligible compared to the levels of water used by coal-based technologies. Water is normally required during the construction phase and then periodically during the operation phase whereby the panels must be cleaned from time to time.
- The project provides an opportunity for a new land use on the affected agricultural properties which would result in additional financial benefits to the directly affected landowners through compensation. It is important to note that the construction and operation of a solar facility can occur in concurrent with crop production.
- In terms of the location this project will contribute towards the National, Provincial and Local goals for the development of renewable energy as outlined in the respective Integrated Development Plans (IDPs) and IPP plan.
- The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy, in line with national policy regarding energy generation.
- The project will result in important economic benefits at the local and regional scale through job creation, income, and other associated downstream economic development, supporting the Just Energy Transition in the region. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.
- It is anticipated that the proposed project will contribute to achieving goals for implementation of renewable energy and sustaining a ‘green’ economy within South Africa. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas, the benefits of the project are expected to partially offset the localised environmental costs of the solar farm, provided that the mitigation measures, as recommended by the specialists are adhered to.

OVERALL CONCLUSION (IMPACT STATEMENT)

The preferred activity entails the development of a renewable energy facility on site using solar as the preferred technology, due to the availability of a strong solar resource, available grid capacity, benign topography, and good access. A technically viable development footprint was amended by the developer to exclude environmental sensitivities identified in the scoping study and assessed as part of the EIA process. The assessment of the development footprint within the project site was undertaken by independent specialists and their findings have informed the results of this EIA Report.

In terms of the relevant policies and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial, and national level.

The independent specialist findings from the EIA studies undertaken have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the project site subject to implementation of the recommended mitigation measures. The developer has amended the project development footprint in response to the identified sensitive environmental features and areas present within the project site. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e., tier 1 of the mitigation hierarchy). The layout for the PV facility and associated infrastructure assessed within this EIA Report is located outside of the sensitive areas and features regarded to be No-Go for development and is therefore considered to be acceptable for implementation.

The impacts that are expected to remain after the avoidance of the sensitive areas by the facility layout have been reduced to acceptable levels through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy. Therefore, impacts can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

The benefits of the proposed project is expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure on the project site within lower sensitive areas through the avoidance of features and areas considered to be sensitive/No-Go for development, the benefits of the project are expected to partially offset the localised environmental costs of the solar facility.

Based on the above it can be concluded that the development of the proposed project will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

OVERALL RECOMMENDATION

Considering the findings of the assessments (Figure 0-5), the independent specialist studies, the impacts identified by all, the revised development footprint, the avoidance of the sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the proposed project is acceptable within the landscape and can reasonably be authorised subject to implementation of the refined optimised facility layout and the mitigation and enhancement measures recommended by the specialists.

The following key conditions would be required to be included within an authorisation issued for the Buffalo 1 Solar Park Facility:

- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within Appendices F are to be implemented;
- The EMPr (for the facility and onsite substation) as contained within Appendix H of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Following the final design of the proposed project, a final layout must be submitted to DFFE for review and approval prior to commencing with construction. Micro-siting must take all recommended mitigation measures into consideration. No development is permitted within the identified No-Go areas as detailed in Figure 0-5.
- It is recommended that an Environmental Site Officer (ESO) must form part of the on-site team to ensure that the EMPr is implemented and enforced, and an Environmental Control Officer (ECO) must be appointed to oversee the implementation activities and monitor compliance for the duration of the construction phase.
- A preconstruction walk-through of the final development footprint for protected species that would be affected and that can be translocated must be undertaken. The survey must also cover sensitive habitats and species that are required to be avoided. Permits from the relevant authorities, will be required to relocate and/or disturb listed species.
- Where practical, prevent birds from nesting in substation infrastructure through exclusion covers or spikes if required (this will need to be determined on a case-by-case basis).
- All other relevant environmental permits must be obtained prior to the construction of the facility.
- A validity period of a minimum of 10 years of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

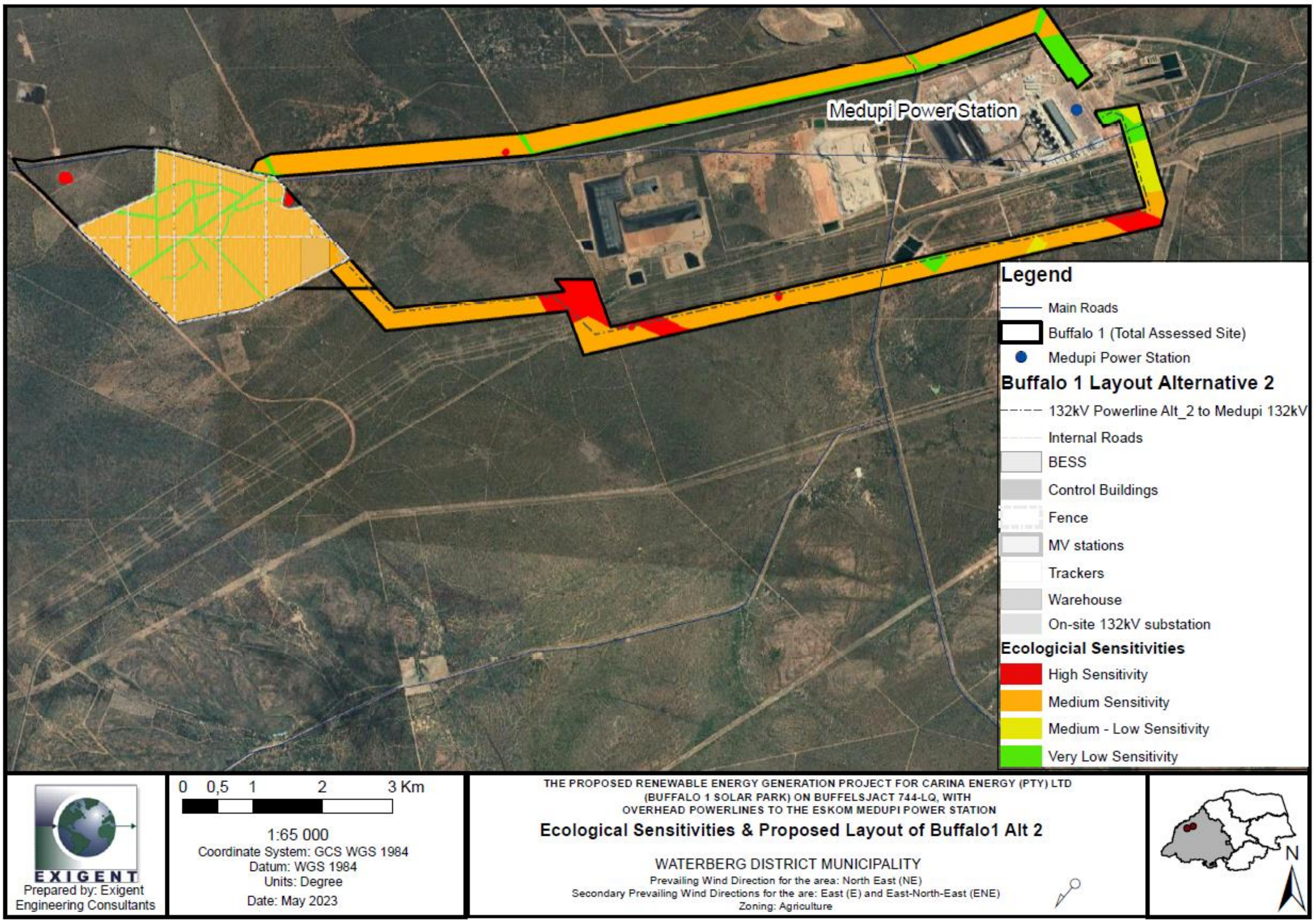

Figure 0-5 Overall Site Sensitivities for the Buffalo 1 Solar Park Facility based on the Specialist Assessments

REPORT DETAILS

TITLE	DRAFT EIR REPORT FOR BUFFALO 1 SOLAR PARK
Purpose of this report:	This Draft EIR Report is available to all registered and potential Interested and Affected Parties (I&APs). This Draft EIR Report forms part of a series of reports and information sources that are being provided during the Scoping and Environmental Impact Reporting (Scoping & EIR) process for the proposed Buffalo 1 Solar Park. This report forms part of the Scoping & EIR process. Registered I&APs will be given an opportunity to comment on the following reports as part of the Scoping & EIR process: • Draft Scoping Report; • Draft Environmental Impact Assessment Report; and

TITLE	DRAFT EIR REPORT FOR BUFFALO 1 SOLAR PARK
	• Draft Environmental Management Programme. In accordance with the EIA Regulations, 2014 (as amended), the objectives of the EIA process are to, through a consultative process: (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context; (b) describe 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 and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment; (d) determine the-- (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and (ii) degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources, and (cc) 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; and (h)identify residual risks that need to be managed and monitored. The Draft EIR Report will be available to all stakeholders for a thirty (30) day review and comment period from **18 May 2023 – 19 June 2023**. An application has been submitted to the DFFE.
Prepared for:	Carina Energy (Pty) Ltd
Published by:	18 May 2023
Author:	Amanda Masikane
DFFE Case Officer & Ref. No:	Matlhodi Mogorosi Ref. No.: 2022-10-0026 (pre-application reference)

TITLE	DRAFT EIR REPORT FOR BUFFALO 1 SOLAR PARK
	DFFE Ref. No.: 14/12/16/3/3/2/2241 LEDET Ref No: 12/1/9/CR-W232
Date:	18 May 2023

CONTENT OF ENVIRONMENTAL IMPACT REPORT

The table below lists the minimal contents of an EIA Report in terms of Appendix 3 of the Environmental Impact Assessment Regulations of 2014 (Government Notice No. 982, as amended).

Table 0-1 General Requirements of a EIA Report as set out in Appendix 3.

REQUIREMENT	DETAILS
(a) details of - (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Appendix A
(b) the location of the activity, including – (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	Section 3
(c) a plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is (i) a linear activity, a description, and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 3
(d) a description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and;	The listed and specified activities triggered are detailed in Table 5-1
(i) a description of the associated structures and infrastructure related to the development;	The description of the proposed activity is detailed in section 4 of this report.
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development	The legislative and policy context is included in section 5 of this report.

REQUIREMENT	DETAILS
complies with and responds to the legislation and policy context;	
(f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;	The need and desirability of the project are included in section 6 of this report.
(g) a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;	Section 10.2 and 10.3
(h) a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including: - (i) details of the development footprint alternatives considered;	The details of all alternatives considered are included in section 7.
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	The details of the public participation to be undertaken are detailed in section 2.5 as well as the details of the public participation for the remainder of the environmental impact and reporting process are detailed in Appendix D of this report.
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Issues and responses are included in Public Participation Report as Appendix D.
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage, and cultural aspects;	Detailed site description and attributes are included in section 8 of this report.
(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which these impacts – (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed, or mitigated;	A description of potential impacts identified by the EAP as well as participating specialists is included in section 9 of this report.

REQUIREMENT	DETAILS
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	The methodology used for the determination and ranking of significance is included in section 9.3 of this report. Please also refer to the specific methodologies in the specialist reports attached in Appendixes G
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage, and cultural aspects;	This EIR report identifies the potential positive and negative impacts associated with the proposed project. These are included in section 9 of this report.
(viii) the possible mitigation measures that could be applied and the level of residual risk;	The site-specific mitigation measures from the specialist studies and EAP will be identified and incorporated in the draft Environmental Impact Report. This is included in section 9. and 10.2 of the report.
(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and;	Details regarding the criteria for the selection of the preferred site layout and technologies is included in section 7 of this report. Alternatives have been discussed in section 7 of this report.
(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Please note that the proposed site (refer to section 7) and location (refer to section 7) and layout (i.e. the proposed development footprint) have been informed and developed based on the constraints and sensitivities identified through specialist site sensitivity verification assessments, undertaken during 2022, by various specialists that have been commissioned to outline the possible site sensitivities within the greater study area (i.e. identification of sensitive areas, No-Go areas and buffers for sensitive areas).
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including – (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Details of the process undertaken to identify, assess and rank the impacts of the proposed activity and associated structures and infrastructure is included in section 9.
(ii) an assessment of the significance of each issue and risk and an indication of the extent	Details of the significance of each issue and risk and an indication of the extent to which the issue and risk

REQUIREMENT	DETAILS
to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	could be avoided is included in section 9.
(j) an assessment of each identified potentially significant impact and risk, including— (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk can be reversed; (vii) the degree to which the impact and risk can be mitigated;	The assessment of each identified potentially significant impact and risk is included in section 9 and cumulative impacts are address in section 9.5.
(k) where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;	The signed EAP declaration is appended to the EIA as Appendix A and a summary of the findings is included in the executive summary and section 10 of the report.
(l) an environmental impact statement which contains— (i) a summary of the key findings of the environmental impact assessment: (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity	A summary of the findings and related maps are included in the executive summary and section 10 of the report.

REQUIREMENT	DETAILS
and identified alternatives;	
(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	The recommendations and mitigation measures from specialists have been incorporated into the Draft EMPr and is attached as Appendix H to this report.
(n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	The final proposed alternatives are included in section 10 of the report.
(o) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	Aspects which are conditional to the findings of the assessment either by the EAP or specialist are included as conditions of authorisation in section 10.
(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Assumptions, uncertainties and gaps in knowledge is mentioned in section 1.5, 1.6 and 1.7 of the report.
(q) a reasoned opinion as to whether the proposed activity should or should not be authorised and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	The reasoned opinion as to whether the proposed activity should or should not be authorised is contained in section 10.
(r) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;	The proposed activity includes operational aspects.
(s) an undertaking under oath or affirmation by the EAP in relation to – (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any	The signed EAP declaration of independence is appended to the EIA as Appendix A.

REQUIREMENT	DETAILS
responses by the EAP to comments or inputs made by interested or affected parties;	
(t) where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Deleted by GN 517 of 11 June 2021.
(u) any specific information that may be required by the competent authority; and	This will be addressed throughout the EIA process.
(v) any other matters required in terms of section 24(4)(a) and (b) of the Act.	This will be addressed throughout the EIA process.
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	This is discussed in section 5.2.

ACRONYMS AND ABREVIATIONS

BID	Background Information Document
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CRR	Comments and Response Report
DM	District Municipality
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water Affairs and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ESAs	Ecological Support Areas
EXIGENT	Exigent Engineering Consultants
GN	Government Notice
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IWULA	Integrated Water Use License Application
LED	Local Economic Development

LEMA	Limpopo Environmental Management Act
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
NBA	National Biodiversity Authority
NBF	National Biodiversity Framework
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NEMAQA	National Environmental Management: Air Quality Act
NEMWA	National Environmental Management: Waste Act
NFEPA	National Freshwater Ecosystem Priority Areas
NGOs	Non-Government Organizations
NHRA	National Heritage Resources Act
NWA	National Water Act, Act 36 of 1998
PPP	Public Participation Process
SAHRA	South African Heritage Resource Agency
SANBI	South African National Botanical Institute
TOR	Terms of References

GLOSSARY OF TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the ‘do nothing’ alternative.

Anthropogenic: Change induced by human intervention.

Applicant: means a person who has submitted an application for an environmental authorisation to the competent authority and has paid the prescribed fee.

Arable potential: Land with soil, slope and climate components where the production of cultivated crops is economical and practical.

Archaeological resources: This includes:

- material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years including artifacts, human and hominid remains and artificial features and structures;
- rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10 m of such representation;
- wrecks, being any vessel or aircraft, or any part thereof which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the republic as defined in the Maritimes Zones Act, and any cargo, debris or artifacts found or associated therewith, which is older than 60 years or which South African Heritage Recourses Act (SAHRA) considers to be worthy of conservation;
- features, structures and artifacts associated with military history which are older than 75 years and the site on which they are found.

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Commissioning: Commissioning commences once construction is completed.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cultural significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative Impact: In relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Development area: The development area is that identified area (located within the project site) where the Buffalo 1 Solar Park is planned to be located.

Development footprint: The development footprint is the defined area (located within the development area) where the PV array and other associated infrastructure for the project is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

'Do-nothing' alternative: The 'do-nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do-nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Ecology: The study of the interrelationships between organisms and their environments.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: All physical, chemical and biological factors and conditions that influence an object.

Environmental Impact Assessment: In relation to an application, to which Scoping and Environmental Impact Assessment must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of the application.

Environmental Impact Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project.

Ephemeral: When referring to a stream or drainage line, it refers to the flow characteristics by which only periodic surface flows typically occur. Similarly when referring to a pan or depression, this would be characterised by only periods of time when surface water occurs within it, usually associated with the rainy season.

Heritage resources: This means any place or object of cultural significance. See also archaeological resources above.

Hydromorphic / hydric soil: Soil that, in its undrained condition, is saturated or flooded long enough during the growing season to develop anaerobic conditions favouring growth and regeneration of hydrophytic vegetation. These soils are found in and associated with wetlands.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Kilovolt (kV): a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

Local relief: The difference between the highest and lowest points in a landscape. For this study, it is based on 1:50 000 scale.

Loop-in-loop out: a closed electric or magnetic circuit through which a signal can circulate, as in a feedback control system.

Macro-geomorphological: Related to / on the scale of geomorphic provinces. A geomorphic province is a spatial entity with common geomorphic attributes.

Method statement: A written submission to the ECO and the site manager (or engineer) by the Engineering Procurement Contractor (EPC) Contractor in collaboration with his/her EO.

Mitigation hierarchy: The mitigation hierarchy is regarded as a guideline framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities.

No-Go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Parabolic trough: Is a type of solar thermal energy collector. It is constructed as a long parabolic mirror (usually coated silver or polished aluminium) with a Dewar tube running its length at the focal point.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances).

Photovoltaic effect: Electricity can be generated using photovoltaic panels (semiconductors) which are comprised of individual photovoltaic cells that absorb solar energy to produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Proponent: means a person intending to submit an application for environmental authorisation and is referred to as an applicant once such application for environmental authorisation has been submitted.

Red Data species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

Scoping Report: A report that aim to identify the relevant policies, legislation, the need and desirability, proposed alternatives and associated preliminary risks and potential key issues associated with the proposed development. It forms part of the first phase of an Environmental Impact Assessment process.

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Soil compaction: Soil becoming dense by blows, vehicle passage or other types of loading. Wet soils compact easier than moist or dry soils.

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1 INTRODUCTION

1.1 Introduction and background

Carina Energy (Pty) Ltd (Reg. no. 2022/367044/07) is proposing the development, construction and operation of a renewable energy generation facility (Photovoltaic Power Plant) and associated infrastructure, and structure on **Farm Buffelsjagt 744-LQ** located within the Lephalale Local Municipality, Waterberg District Municipality, Limpopo Province

The project is planned as part of a larger cluster of renewable energy projects (to be known as the Buffalo and Lyra Cluster), which include Buffalo 1 Solar Park, Buffalo 2 Solar Park, Lyra 1 Solar Park and Lyra 2 Solar Park. Each renewable energy facility will be constructed as a separate stand-alone project and therefore, separate Scoping and Environmental Impact Assessment (S & EIA) processes will be undertaken for each of the four renewable energy facilities.

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 **240 MW**. The proposed Buffalo 1 Solar Park will deliver the electrical energy to the Medupi Power station through a new power line of approximately 10 to 13 km in length. Two 132 kV feeder bays will be commissioned and equipped at the Eskom Medupi substations.

It is the developer's intention to bid the 240MW **Buffalo 1 Solar Park** under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme or a similar tender, with the aim of evacuating the generated power into the national grid. The **Buffalo 1 Solar Park** is thus in response to the identified objectives of National and Provincial Government and Local and District Municipalities to develop renewable energy facilities for power generation purposes. The location of the project in the Limpopo Province is important in the context of the Just Energy Transition (JET) programme. It is expected that the **Buffalo 1 Solar Park** will provide valuable jobs and socio-economic benefits not only in the immediate surroundings but also to the wider community, contributing to stabilise the electricity supply in the country. This is in line with the objectives of the Integrated Resource Plan (IRP), with the project set to inject up to 240MW electricity into the national grid.

From a regional perspective, the identified area within the Limpopo Province is considered favourable for the development of a commercial Solar PV Energy Facility by virtue of prevailing solar climatic conditions, the extent of the affected properties, the availability of a direct grid connection (i.e., a point of connection of the national grid via the Eskom Medupi substation) and the availability of land on which the development can take place.

The competent authority (CA) responsible for considering this proposal is the National Department of Forestry, Fisheries and Environment (DFFE). The application is undertaken in terms of EIA Regulations published in terms of Government Notice No. R. 362 of 7 April 2017 under Section 24(5), and 44 of the

National Environmental Management Act (NEMA) (Act No. 107 of 1998), as amended, the intent to carry out the Environmental Impact Assessment Process (in terms of Listing Notice 1 – GN R324, Listing Notice 2 – GN R325 and Listing Notice 3 – GN R327) for various listed activities.

1.2 Requirements for an environmental impact assessment process

In terms of GNR 779 of 01 July 2016, the DFFE has been determined as the Competent Authority for all projects which relate to the IRP for Electricity 2010 – 2030, and any updates thereto. Through the decision-making process, the DFFE will be supported by the Limpopo Economic Development, Environment and Tourism (LEDET) as the commenting authority.

Section 24 of South Africa's National Environmental Management Act (Act No. 107 of 1998) (NEMA) pertains to Environmental Authorisations (EA), and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the Competent Authority (CA). The 2014 Environmental Impact Assessment (EIA) Regulations, as amended (GNR 326), published under the NEMA, prescribe the process to be followed when applying for Environmental Authorisation (EA), while the Listing Notices (Listing Notice 1 (GNR 327), as amended, Listing Notice 2 (GNR 325), as amended, and Listing Notice 3 (GNR 324)), as amended contain those activities which may not commence without an EA from the CA.

As the development of the solar project has the potential to impact on the environment, an EA is required from the National DFFE subject to the completion of a full S&EIA process, as prescribed in Regulations 21 and 24 of the 2014 EIA Regulations (GNR 326), as amended. The requirement for EA subject to the completion of a full S&EIA process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 1 (GNR 325), as amended, namely:

"The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20MW or more."

1.3 Project overview

A larger technically feasible project site, with an extent of ~1366ha has been identified by the applicant as a technically suitable area for the development of the proposed project. A development area of 500 ha has been identified within the project site by the proponent for the development based on the outcome of the specialist assessments within the Scoping and EIA phases of the process as well as technical considerations. The project site (**Figure** 1-1) comprises numerous properties as listed in **Table** 1-1 below.

Table 1-1 Detailed description of the proposed project

Province	Limpopo
District Municipality	Lephalale District Municipality
Local Municipality	Waterberg Local Municipality
Ward Number	Ward 3
Nearest Town	Lephalale
Affected Properties	Farm Buffelsjagt 744 LQ
Current zoning	Agriculture

Site Coordinates	23° 43' 15" S; and 27° 27' 20" E		
Corner Coordinates of the assessed area		**Latitude**	**Longitude**
	Corner 1	23°42'35.05"S	27°25'47.07"E
	Corner 2	23°43'51.39"S	27°27'2.71"E
	Corner 3	23°43'34.75"S	27°27'56.66"E
	Corner 4	23°43'34.85"S	27°28'35.70"E
	Corner 5	23°42'43.09"S	27°27'48.52"E

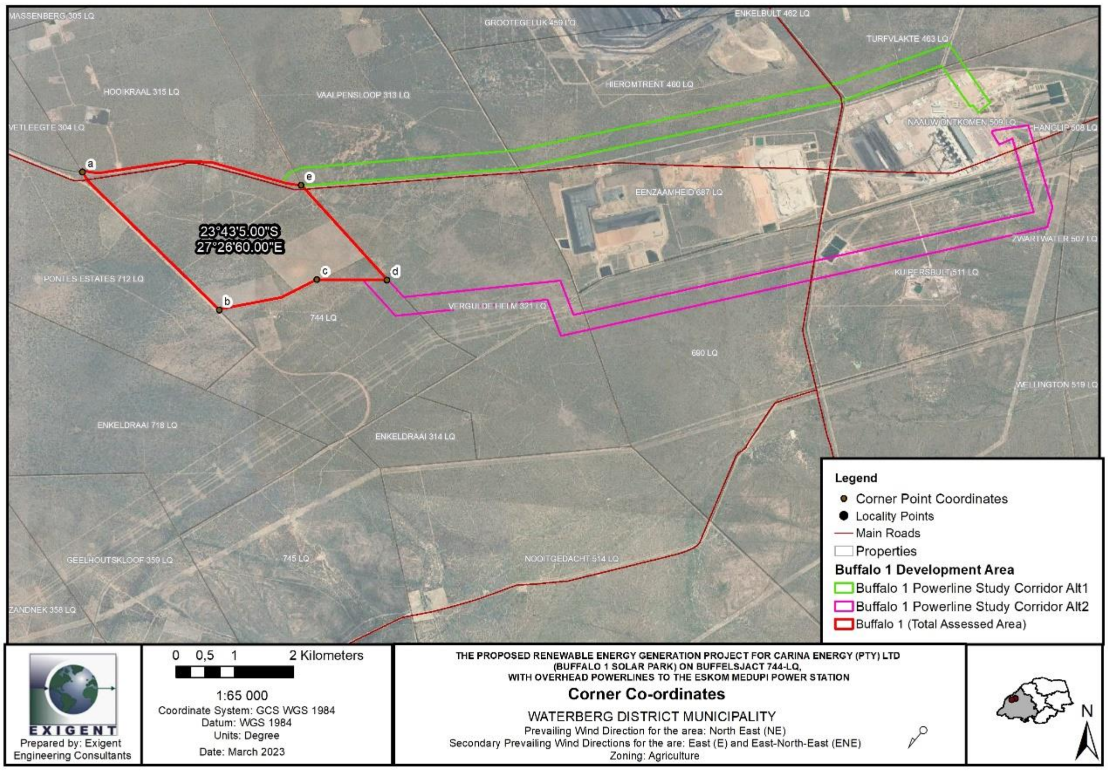

Figure 1-1: Location of the Buffalo 1 Solar Park

During the Scoping Phase and EIA Phase, the full extent and environmental sensitivities of the project site was considered by the specialist assessments. The aim was to determine the suitability of the site from an environmental and social perspective and identifying sensitive areas that should be avoided in the development planning. Based on the specialist assessments undertaken during the Scoping Phase and EIA Phase, areas of environmental sensitivity were identified within the project site.

In order to avoid these areas of potential sensitivity and to ensure that potential detrimental environmental impacts are minimised as far as possible, the developer identified a suitable development footprint of around 500 ha in extent within the project site where the PV modules and other associated infrastructure for the proposed project is planned to be constructed. Since the project site assessed during the Scoping Phase is larger than the area required for the development footprint, it provides the opportunity for the optimal placement of the infrastructure through ensuring avoidance of major identified environmental sensitivities.

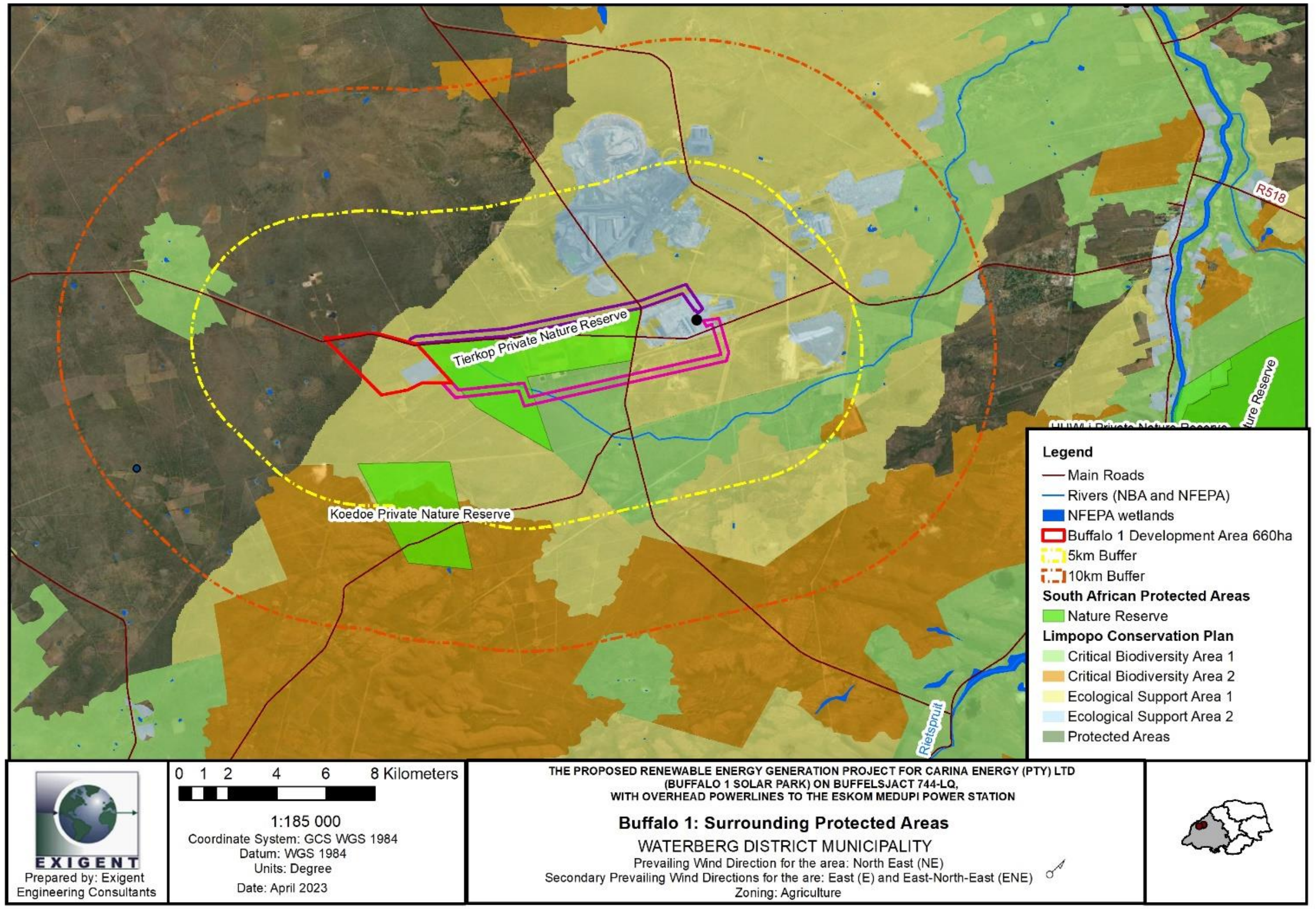

Figure 1-2 Locality map of proposed development

1.4 Details of environmental assessment practitioner

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326), as amended, the applicant has appointed Exigent as the independent Environmental Consultant responsible for managing the Application for EA and supporting S & EIA process; inclusive of comprehensive, independent specialist studies. Exigent was established in 1998 providing multidisciplinary engineering and environmental services. The Exigent Environmental Business Unit provides sustainable answers within an environmental developmental framework. Our foundations are built upon ecological principles with wide ranging expertise in environmental management and assessment processes. The qualifications and experience of the primary assessors and report compilers are listed in **Table** 1-2.

Table 1-2 Environmental Assessment Practitioner details

EAP	QUALIFICATION	EXPERIENCE
Jacolette Adam	MSc, LLM (Environmental Law)	23 years of professional experience in the environmental sector and has been a certified Professional Natural Scientist since 2002 (400088/02) and a registered Environmental Assessment Practitioner (EAPASA). She has successfully completed numerous environmental assessments throughout South Africa for a wide range of clients.
Michelle Boshoff	MSc	Michelle is a certified Professional Natural Scientist (119286), and registered with Environmental Assessment Practitioner of South Africa (EAPASA) (2020/714), International Impact Assessment Association of South Africa (IAIAsa) (5602). She has over 21 years of professional experience in the environmental management sector where she has performed leading roles in government departments, the mining sector and consultancies. Michelle has extensive knowledge and experience in environmental management projects in South Africa and the wider southern African region.
Amanda Masikane	BSc Honours	Amanda completed her Bachelor of Science majoring in Environmental Sciences and Earth Science at the University of KwaZulu-Natal in 2014 and completed her Honours in Environmental Sciences in 2015. Her experience include report writing, environmental impact assessments, water monitoring, GIS data analysis, collation of environmental data and environmental compliance auditing.

In order to adequately identify and assess potential environmental impacts associated with the proposed project, the following specialist sub-consultants have provided input into this EIA Report (**Table 1-3**):

Table 1-3: List of specialists involved in the EIA phase

Specialist	Company	Area of Expertise
Dr. Barend Henning	AGES	Agriculture
Dr. Barend Henning	AGES	Aquatic
Stephen van Staden	SAS Environmental Group of Companies	SASS
Andrew Husted	The Biodiversity Company	Avifauna
Dr. Barend Henning	AGES	Terrestrial

Specialist	Company	Area of Expertise
Glen Steyn	Glen Steyn & Associates	Socio -Economic
Carel de Beer	Geotechnical Specialists	Geotechnical
Jaco Van der Walt	Beyond Heritage	Heritage
Prof. Marion Bamford	Marion Bamford	Paleontological
Graham Young	Graham Young Landscape Architect	Visual
George Hatting	GMH Consulting Engineers	Engineering Services

1.5 Assumptions and limitations

- All information provided by the applicant, engineering team, specialists and I&APs to the Environmental team was correct and valid at the time that it was provided;
- The information provided by the applicant, engineering team and specialists are accurate and unbiased;
- The need and desirability were based on strategic national, provincial and local plans and policies which reflect the interests of both statutory and public viewpoints;
- The EIA process is a project-level framework and is limited to assessing the environmental impacts associated with the project phases of the activity being applied for within the development footprint only;
- Strategic level decision making is achieved through co-operative governance with sustainable development principles underpinning all decision-making;
- The public will receive a fair and recurring opportunity to participate in the EIA process, through the provision of Public Participation timeframes stipulated in the Regulations;
- It is not always possible to involve all I&APs individually. However, every effort has been made to involve as many interested parties as possible; and,
- The scope of this investigation is limited to assessing the environmental impacts associated with the construction, operation and decommissioning of a PV plant.
- Strategic level investigations undertaken by the applicant prior to the commencement of the EIA process, determined that the development site represents a potentially suitable and technically acceptable location for solar development.
- The proposed project development footprint as provided by the applicant is correct and will not be significantly deviated from.
- The development footprint (the area that will be affected during the operation phase) will include the footprint for the Solar Energy Facility and associated infrastructure (i.e., internal access roads, and grid connection infrastructure).
- Conclusions of the specialist studies undertaken, and this overall impact assessment assume that any potential impacts on the environment associated with the proposed development will be avoided, mitigated, or offset in accordance with the relevant recommendations made.
- This report and its investigations are project specific (i.e. solar), and consequently the environmental team did not evaluate any other power generation alternatives.
- With regards to water uses, the proposed development may require Water Use Authorisation in accordance with the following sections of the NWA (Act No. 36 of 1998, as amended): Section 21(a) – Taking water from a water resource, Section 21(c) – Impeding or diverting the flow of water in a watercourse, Section 21(i) – Altering the bed, banks, course, or characteristics of a watercourse, and either Section 21(g) – Disposing of waste in manner that may detrimentally

impact a water resource, or Section 21(e) – Engaging in a controlled activity. The Water Use Application will be submitted to the DWS via the Electronic Water Use Licence Application and Authorisation System (e-WULAAS) for the affected areas within the development area.
- The developer acknowledges that the DEIR does not include an impact assessment associated with water abstraction from the proposed development site or related infrastructure. Should the developer be appointed as a preferred bidder in the REIPPP process, further investigations in terms of water provision will be made and an application for a Water Use Authorisation for the above-mentioned identified water uses will be made by the applicant. The process of applying for a WUL or General Authorisation (GA) registration will only be completed once a positive EA has been received. This is in line with the requirements of the DWS.

1.6 Gaps in knowledge

The EIA process is being undertaken prior to the availing of certain information which would be derived from the project design and feasibility studies. As such, technical aspects included herein derive from a range of sources including pre-feasibility engineering and through personal communication with the design team. Given that the EIA process is one of several investigations being done, milestones and key outputs for each of these may not always be available for interrogation into the EIA process. As such, the DFFE and other commenting and decision-making Authorities are required to generate their decision based on the information available to the study at the time, whilst measures can be adopted to manage any changes as conditions within decisions are made.

Exigent is an independent environmental consulting firm and as such, all processes and attributes of the EIA are addressed in a fair and unbiased fashion. It is believed that through the running of a transparent and participatory process, risk associated with assumptions, uncertainties and gaps in knowledge can be, and were, minimised.

1.7 Uncertainties

Given that an EIA involves prediction, uncertainty forms an integral part of the process. Two types of uncertainty are associated with the EIA process, namely process-related and prediction related. The FAO[5] cites types of uncertainty as discussed by De Jongh in Wathern. These are summarised as follow:

- **Uncertainty of prediction** is critical at the data collection phase as final certainty will only be resolved on implementation of the activity being applied for;
- **Uncertainty of values** depicts the approach assumed during the EIA process, while final certainty will be determined at the time decisions are made. Enhanced communications and widespread co-ordinations can lower uncertainty; and,
- **Uncertainty of related decisions**, relates to the decision-making aspect of the EIA process, which shall be appeased once monitoring of the project phase is undertaken.

[5] Dougherty, T.C. and Hall, A.W., 1995. Environmental impact assessment of irrigation and drainage projects (Vol. 53). Food & Agriculture Organisation.

The FAO 1995 further stresses the significance of widespread consultation towards minimising the risk of omitting significant impacts. The use of quantitative impact significance rating formulas can further limit the occurrence and scale of uncertainty.

2 THE EIA PHASE METHODOLOGY

An EIA process is a planning and decision-making tool. It identifies potential negative and positive impacts of a proposed project and recommends ways to enhance the positive impacts and mitigate the negative impacts. The EIA will address the impacts associated with the project and provide an assessment of the project in terms of the biophysical, social and economic environments to assist the environmental authority in making decisions regarding authorization of the proposed project. The process is largely comprised of the Environmental Scoping Phase and the EIA phase.

The main aim of an Environmental Impact Assessment (EIA) is to obtain background environmental data, to assess potential impacts associated with a proposed project against the background data, assess the risks, propose mitigation measures so that decision makers can make an informed decision on the environmental effects of the proposed project on people and the environment, and to minimise the adverse effects of a project, within engineering and other constraints (i.e. following the mitigation hierarchy).

The main purpose of the EIA process is to identify issues surrounding the proposed project. Issues were identified through:

- Desktop assessment of the proposed area;
- Physical site inspections of the proposed area;
- Review of available literature;
- Professional judgment;
- Identifying impacts;
- Prediction and evaluation of economic, environmental and social impacts; and,
- A comprehensive Public Participation Process (PPP).

In terms of the EIA Regulations of December 2014, as amended published in terms of the NEMA (Act No. 107 of 1998), as amended, the construction and operation of the 240 MW Buffalo 1 Solar Park Facility is a listed activity requiring EA. The application for EA is required to be supported by a full S&EIA process based on the contracted capacity of the facility being 240 MW and Activity 1 of Listing Notice 2 (GNR 325) being triggered.

An EIA process refers to the process undertaken in accordance with the requirements of the 2014 EIA Regulations (GNR 326), as amended, which involves the identification and assessment of direct, indirect, and cumulative environmental impacts associated with a proposed project or activity. The EIA process comprises two main phases: i.e., (1) Scoping- and (2) EIA Phase and is illustrated in **Figure 2-1**. Public participation forms an important component of the process and is undertaken throughout both phases.

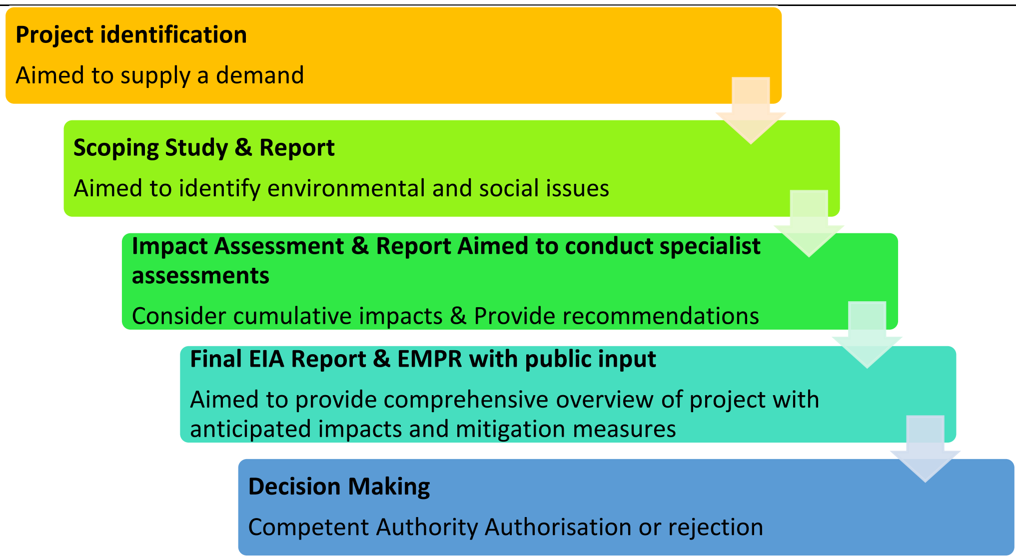

Figure 2-1: Illustration of the main phases in an Environmental Impact Assessment (EIA) Process

This EIA phase of the S&EIA process aimed at assessing potential issues associated with the proposed project identified through the Scoping Phase. This was achieved through an assessment of the proposed project involving detailed specialist studies, as well as a consultation process with the I&APs, including the decision-making authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant organs of state departments, ward councilors and other key stakeholders. The S&EIA process is illustrated in **Figure 2-2.**

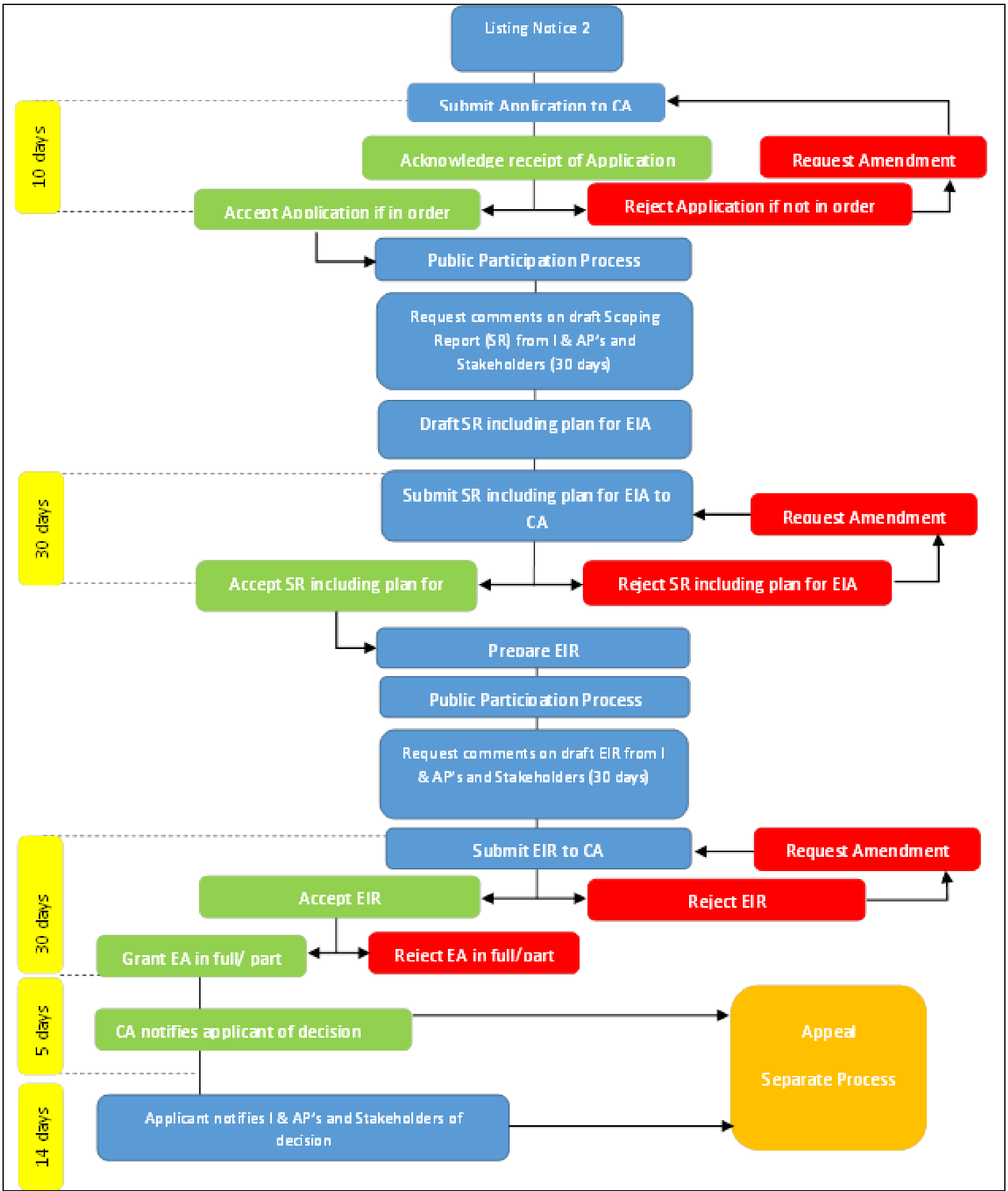

Figure 2-2: Scoping and Environmental Assessment Process

2.1 Competent authority

The Competent Authority in respect of this application will be DFFE, specifically because the listed activities applied for includes an Energy Generation Facility, which is a national competency. The LEDET will be notified as a key stakeholder in a commenting capacity on the S&EIR process.

In terms of GNR 779 of 01 July 2016, the DFFE has been determined as the Competent Authority for all projects which relate to the IRP for Electricity 2010 – 2030, and any updates thereto. Through the decision-making process, the DFFE will be supported by LEDET as the commenting authority.

2.2 Application form

An application for EA was completed by Exigent and was submitted to the DFFE on 08 December 2022 along with the DSR. The Final Scoping Report was accepted by the DFFE on 22 March 2023.

2.3 Consultation with authorities and key stakeholders

During the Scoping- and the EIA phase a number of I&APs, stakeholders and other regulating authorities were identified and have been requested to comment on the Draft EIA Report in terms of Regulation 41 of the EIA Regulations of 2014, as amended.

2.4 Identification of potential environmental impacts

Potential positive and negative direct and indirect environmental impacts associated with the proposed development were identified within the Scoping- and EIA phases and have been evaluated through desktop studies and site inspections and a site sensitivity verification assessment.

2.5 Public Participation Process (PPP)

The EIA Regulations, 2014 (GNR 326), as amended specify that a PPP must be conducted as an integral part of the EIA process. This chapter outlines the PPP that has been followed in terms of Regulations 39 to 44 during the Scoping- and EIA phase for the proposed project.

The primary objectives of the Public Participation Process (PPP) include:

- Meaningful and timeous participation of I&APs;
- Identification of issues and concerns of key stakeholders and I&AP with regards to the proposed development, i.e., focus on important issues;
- Promotion of transparency and an understanding of the proposed project and its potential environmental (social and biophysical) impacts;
- Accountability for information used for decision-making;
- To serve as a structure for liaison and communication with I&APs.
- Ensure all relevant key stakeholders and &APs have been identified and invited to engage in the Scoping/EIA phase;
- Raise awareness, educate and increase understanding of stakeholders about the proposed project, the affected environment and the environmental process being undertaken;
- Create a platform for key stakeholders and I&APs to freely communicate any issues or concerns and suggestions for enhancing potential benefits and/or to prevent or mitigate impacts;
- Accurately document all opinions, concerns and queries raised regarding the project;
- Ensure the issues and concerns of the stakeholders and I&APs related to the project are addressed in an adequate manner;
- A variety of mechanisms are provided to I&APs to correspond and submit their comments i.e., fax, post, email, telephone, text message (SMS and WhatsApp);

- An adequate review period is provided for I&APs to comment on the findings of the S&EIA Reports; and,
- The information presented during the PPP is presented in such a manner, i.e., local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.

Regulation 40(2) of the EIA Regulations, 2014, as amended requires that PPP, contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application unless access to that information is protected by law and must include consultation with—

(a) the competent authority;

(b) every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation;

(c) all organs of state which have jurisdiction in respect of the activity to which the application relates; and,

(d) all potential, or, where relevant, registered interested and affected parties.

The sharing of information forms the basis of the PPP and offers the opportunity for I&APs to become actively involved in the EIA Process from the outset. The PPP is designed to provide sufficient and accessible information to I&APs in an objective manner and affords I&APs opportunities to provide input into and receive information regarding the EIA process in the following ways:

During the **Scoping Phase**:

- Provide an opportunity to submit comments regarding the project;
- Assist in identifying reasonable and feasible alternatives, where required;
- Contribute relevant local information and knowledge to the environmental assessment;
- Allow registered I&APs to verify that their comments have been recorded, considered, and addressed, where applicable, in the environmental investigations;
- Foster trust and co-operation;
- Generate a sense of joint responsibility and ownership of the environment;
- Comment on the findings of the Scoping Phase results; and,
- Identify issues of concern and suggestions for enhanced benefits.

During the **EIA Phase**:

- Contribute relevant local information and knowledge to the environmental assessment;
- Verify that issues have been considered in the environmental investigations as far as possible as identified within the Scoping Phase;
- Comment on the findings of the environmental assessments; and,
- Attend a Focus Group Meeting (if applicable) to be conducted for the project.

During the **decision-making phase**:

- To advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

2.5.1 Public participation process during EIA

A comprehensive PPP has been conducted in terms of Regulation 982 of NEMA EIA Regulations of 2014, as amended. The PPP was undertaken in a manner that ensures that all I&APs were adequately informed of the proposed development and to ensure that everyone had the opportunity to raise their concerns and/or comments.

2.5.2 Process followed

Subsequent to the approval of the Scoping Report, an EIA Report must be compiled and made available for I&AP comment for a 30-day period. Comments on the EIA Report has to be incorporated into a Final EIA Report that will be submitted to DFFE for a decision. The decision will be communicated to all registered I&APs within 14 days after Environmental Authorisation has been granted. I&APs will be afforded an opportunity to submit any appeals on the decision.

The proposed project was brought to the attention of the public by the following means:

- Fixing of a notice board at:
  - a place conspicuous to and accessible by the public on the proposed development site; and,
  - another public place.
- Witten notice by the following means:
  - a BID was given to the landowner and adjacent landowners;
  - a BID and soft copy of the report was provided to any organ of state having jurisdiction in respect of any aspect of the proposed development;
  - a soft copy of the report were submitted to DFFE; and,
  - Placing an advert in one local and national newspaper.

2.5.3 Identification of interested and affected parties

I&APs have been identified primarily through responses received from the site notices and adverts placed for the project. Notifications were also sent to key stakeholders informing them of the application process and indicating how they could become involved in the project. The contact details of all identified I&APs were captured in an electronic database. This database has been updated on an on-going basis throughout the EIA process.

2.5.4 Issues and response report

Issues and concerns raised in the PPP have been compiled into an Issues and Responses Trail. This will be incorporated and submitted with the Final EIR.

2.5.5 Advertising

In compliance with the EIA Regulations GN R982 (2014), as amended, notification of the commencement of the EIA process for the project was advertised in English on the newspaper namely, Platinum Bushveld Local Newspaper on the 12th August 2022 in the legal section and the erratum was advertised on the 19th August 2022. I&APs were requested to register their interest in the project and become involved in the EIA process. The primary aim of these advertisements was to ensure that the widest group of I&APs possible is informed and invited to provide input, questions and comments on the project. In addition to advertisements, two A1 and A4 size site notices were placed at the most accessible areas by the community notifying them of the EIA process for the project. Details of the public participation can be obtained in the Public Participation Report in Appendix D.

2.5.6 Consultation with authorities and organs of state

In order to comply with this requirement, the proposal is to provide all relevant parties with access to digital copies of the DSR, FSR, DEIAR, DEMPr and all specialist studies and plans. Such digital copies have been/will be provided to the Competent Authority, Organs of State and State Departments via digital platforms (email, website and direct download link). Where authorities such as DFFE and SAHRA, have online submission portals, these portals have been utilised for the submission of such reports. Where such authorities, state departments or organs of state do not have access to digital platforms, copies of the documentation will be provided to such parties upon request.

The following authorities and organs of state have been identified and consulted for this project:

- DFFE
- LEDET
- Lephalale District Municipality
- Waterberg Local Municipality
- DMRE
- Eskom (Limpopo– Regional Office)
- DALRRD
- National Department of Agriculture (DoA):
- Provincial Roads Authority
- SANRAL
- SAHRA
- DWS
- South African Radio Astronomy Observatory (SARAO)
- SKA South Africa (Project Office)
- Speakers Office (Ward Councillor – Ward No. 3).
- Civil Aviation Authority (CAA)
- Air Traffic and Navigation Services (ATNS)

2.5.7 Consultation with potential I&APS:

The first step in the PPP entails the identification of key I&APs and Stakeholders, including:

- Local and provincial government.
- Affected and neighbouring landowners; and
- Environmental Organisations.

Identification of I&APs takes place through existing databases, door to door interaction, responses to newspaper advertisements, networking and a proactive process to identify key I&APs within the study area. All I&AP information (including contact details), together with dates and details of consultations and a record of all issues raised will be recorded within a comprehensive database of affected landowners (and occupiers where relevant). This database is updated on an on-going basis throughout the project process and will act as a record of the communication/involvement process. This database was prepared by Exigent and will be utilised to record I&APs and stakeholder responses. The database was continually updated throughout the process. Landowners and key stakeholders were given the opportunity to comment during the public registration period on the proposed solar park development.

The most affected parties include the landowners where the proposed project is planned. The landowner for Farm Buffelsjagt 744-LQ is Hennie Hills Familie Trust (Title Deeds attached in Appendix B).

The compilation of the stakeholder database entailed the development and maintenance of an electronic database for the duration of the project where stakeholders and affected parties can register (**Appendix D)**. The process began with an initial scan of national, provincial and local authorities and service providers such as ESKOM and Transnet to identify potential stakeholders. The identification and registration of stakeholders will be an on-going activity during the Scoping and EIA phases of the project.

All Interested & Affected Parties (I&APs) that were identified or registered as part of the process have been directly informed of the EIA process and review documents via registered post, telephone calls and emails. They have been provided with access to digital copies of the SR via the following:

- The digital copy of the documentation that was available to download on the Exigent website (exigent.co.za) and direct download link;
- Attachments to e-mails; and,
- Hard copies of the documentation were provided via postal or courier services where they did not have access to the digital platforms provided.

2.5.8 General requirements

Section 39 - 41 of the EIA Regulations 2014, as amended details the PPP that must take place as part of an EIA process. The table (Table 2-1) below lists these requirements along with the proposed actions to comply with both Section 41 as well as Section 9.1 and Annexure 2 of EIA Regulations.

Table 2-1: General PPP requirements in terms of Regulation 41 of the EIA Regulations

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
Regulation 39(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in	A landowner consent for the development has been obtained in terms of this requirement and no deviation or additional actions in terms this regulation is required.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. (2) Subregulation (1) does not apply in respect of-. (a) linear activities;	
Regulation 41.(2) The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by -	
(a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of - (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and, (ii) any alternative site;	Site notices have will be placed at the boundary of the property and the main access point to the property. No deviation or additional actions in terms of the Regulations are required in this regard.
(b) giving written notice, in any of the manners provided for in section 47D of the Act, to -	
(i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;	The landowner has been requested to assist with identification and notification of all tenants and occupiers on the properties. No deviation or additional actions in terms of regulation are required in this regard.
(ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;	Owners of adjacent properties for the non-linear components will be notified of this environmental process and will be provided with access to digital copies of the documentation via the website and direct download link. Landowners will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms. Such owners will be requested to inform the occupiers of the land of this environmental process and the process to obtain copies of the relevant reports.
(iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;	The ward councillor will be notified of this environmental process and will be provided with access to the digital copies of the documentation. The ward councillor will be informed that copies of the documentation can be provided via postal or courier

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
	services should they not have access to the digital platforms.
iv) the municipality which has jurisdiction in the area;	Relevant departments of the Local Municipality as well as the District Municipality will be provided with access to the digital copies of the documentation. Municipal officials will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms.
(v) any organ of state having jurisdiction in respect of any aspect of the activity; and	All organs of state that have jurisdiction in respect of the activity will be notified of this environmental process and will be provided with access to the digital copies of the documentation. Organs of State will be informed that copies of the documentation can be provided via postal or courier services should they not have access to the digital platforms.
(vi) any other party as required by the competent authority;	DFFE and LEDET will be given an opportunity to comment on the DSR, DEIAR and Draft EMPr. DFFE and LEDET will be given an opportunity to comment on the DSR, DEIAR and Draft EMPr. Should the Departments identify any additional I&APs/parties that need to provide comment, copies of the documentation and opportunity to comment will be provided to such parties.
(c) placing an advertisement in - (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;	An advert calling for registration and notifying potential I&APs of the availability of the DSR were published in the Platinum Bushvelder newspaper on 12 and 19 August 2022. There is currently no official Gazette that has been published specifically for the purpose of providing public notice of applications.
(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and	Adverts has been placed in the Platinum Bushvelder, a provincial newspaper, as the potential impacts are not expected to extend beyond the borders of the municipal area.
(e) using reasonable alternative methods, as agreed	Notifications will include provision for alternative

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
to by the Competent Authority, in those instances where a person is desirous of but unable to participate in the process due to - i. illiteracy; ii. disability; or, iii. any other disadvantage.	engagement in the event of illiteracy, disability or any other disadvantage. In such instances, Exigent will engage with such individuals in such a manner as agreed on with the competent authority.
3) A notice, notice board or advertisement referred to in sub-regulation (2) must - a. give details of the Application or proposed application which is subjected to Public Participation; and b. state - i. whether Basic Assessment or S&EIR procedures are being applied to the Application; ii. the nature and location of the activity to which the application relates; iii. where further information on the Application or proposed application can be obtained; and iv. the manner in which and the person to whom representations in respect of the application or proposed application may be made.	All notice boards will be placed in terms of this requirement and no deviation or additional actions in terms of regulation.
(4) A notice board referred to in sub-regulation (2) must- a. be of a size at least 60cm by 42cm; and, b. display the required information in lettering and in a format as may be determined by the Competent Authority.	All notice boards have complied with this requirement.
(5) Where Public Participation is conducted in terms of this Regulation for an Application or proposed Application, sub-regulation (2)(a), (b), (c) and (d) need not be complied with again during the additional Public Participation Process contemplated in regulations 19(1)(b) or 23(1)(b) or the Public Participation Process contemplated in Regulation 21(2)(d), on condition that -	This will be complied with if final reports are produced during the EIA process.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
a. such process has been preceded by a Public Participation Process which included compliance with sub-regulation (2)(a), (b), (c) and (d); and, b. written notice is given to Registered Interested and Affected Parties regarding where the - i. revised Environmental Impact Assessment or, EMPr or Closure Plan, as contemplated in Regulation 19(1)(b); ii. revised Environmental Impact Report or EMPr as contemplated in Regulation 23(1)(b);or iii. Environmental Impact Report and EMPr as contemplated in Regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.	
6) When complying with this Regulation, the person conducting the Public Participation Process must ensure that - information containing all relevant facts in respect of the Application or proposed Application is made available to potential Interested and Affected Parties; and, a. participation by potential or Registered Interested and Affected Parties is facilitated in such a manner that all potential or Registered Interested and Affected Parties are provided with a reasonable opportunity to comment on the Application or proposed Application. (7) Where an EA is required in terms of these Regulations and an Authorisation, Permit or Licence is required in terms of a specific environmental management Act, the Public Participation Process	An EA and WULA is required in terms of the NEMA and NWA. All reports will be submitted to relevant authorities and I&APs, that will be informed of such combination of processes that will be subject to public participation.

PUBLIC PARTICIPATION PROCESS REGULATED REQUIREMENT	PROPOSED ACTIONS
contemplated in this Chapter may be combined with any Public Participation Processes prescribed in terms of a specific environmental management Act, on condition that all relevant Authorities agree to such combination of processes.	

2.5.9 Site notices

The NEMA EIA Regulations of 2017 require that a site notice be fixed at a place conspicuous to the public at the boundary of the site where the activity to which the application relates is to be undertaken, and on any alternative sites. The purpose of the site notice is to notify neighbours of the project and to provide details for registration as a stakeholder. Four site notices were placed on Buffalo 1 Solar Park. Refer to Appendix D2.4 for a copy of the site notice placed and Appendix E for the photographs of the site notices.

2.5.10 Advertisements

In accordance with the EIA Regulations, the commencement of the EIA Process for the project was advertised in the local newspaper. An English advert was placed in the Platinum Bushvelder Local Newspaper on 12 August 2022 in the legal section on Page 06 (Appendix D2.1). In order to ensure that the widest group of I&APs were informed regarding the proposed project, site notices was placed at 4 strategic points on the outer boundaries of the site. Copies of the newspaper advertisements and photos of the site notices placed on site are attached in Appendix D2

2.5.11 Notification of stakeholders and I&APS

The NEMA EIA Regulations of 2017 require an inclusive, transparent process of engagement. Any and all persons who may be affected by and/or have an interest in a proposed project are entitled to be informed and submit comments.

Procedures for informing stakeholders about a project and engaging their participation have become standard practice. The stakeholder consultation process was undertaken in English.

Stakeholders and I&APs were directly informed of the proposed project via the distribution of the BID and I&AP Comment Form and were requested to submit their comments to the Social Facilitation Specialist. Proof of the notification can be obtained in the Public Participation Report.

2.5.12 Background Information Document (BID)

A BID was compiled and distributed to I&APs and relevant stakeholders providing information regarding the proposed development and well as the environmental authorisation process. The aim of the BID is to provide a brief outline of the proposed project, provide I&APs and stakeholders with a map of the study area, provide preliminary details regarding the EIA, and to explain how I&APs can become involved in the project.

Notice was given to owners and occupiers of land adjacent to the site where the activity is to be undertaken via various methods;

- Municipal Ward Councillor in which the site and alternate site is situated;
- Municipality who has jurisdiction of the area;
- Any organ of state having jurisdiction in respect of any respect of the activity; and
- Any other party as required by the CA.

The purpose of the BID was to provide written background information to parties interested in and/or affected by the proposed development, to afford them the opportunity to register and become involved in the EIA process and to provide information of the EIA process to be followed.

The BID's were distributed to I&AP's through email notification. The Lephalale Local Municipality, Waterberg District Municipality as well as relevant stakeholders such as ESKOM, and DWS received the BID through e-mail. A copy of the BID is included in Appendix D2.

2.5.13 Notification to competent authorities

The Competent Authority and a number of Organs of State were directly informed on the proposed project via a direct link to the DSR and were requested to submit comments to the Social Facilitation Specialist / Environmental Assessment Practitioner. The same process will be followed for the DEIR.

Hard copies will be posted to the pre-identified key stakeholders and electronic copies will be distributed to all registered I&APs.

A 30-calendar day period will be allowed for this review process. All I&APs and Stakeholders registered on the project database will be notified of the availability of this report by letter, facsimile or e-mail. Copies of the final report will be submitted to the DFFE. The DFFE will request all state departments that administer a law relating to a listed activity to comment on the final Scoping and EIA Reports within 30 calendar days from date of submission.

2.5.14 Notification of availability of draft EIA report

All registered I&APs have been notified of the availability of the DEIAR for review and comment. This DEIAR was available for a 30-day review and comment period extending from **18 May 2023 – 19 June 2023.**

2.5.15 Availability of draft EAIR

The draft EAIR report is available for a 30-day comment period extending from **18 May 2023- 19 June 2023**. Comments received during the DEIAR phase will be sent to the CA during the Final EIA.

- Exigent's Website: www.exigent.co.za; and,

- Direct download link or attachment.

All notifications (including the site notice and advert) have made provisions for potential I&APs to contact Exigent, should they not have access to the digital platforms provided. In such instances, Exigent had arranged other suitable mechanisms for I&APs to be able to access the relevant information.

2.5.16 Comments and responses on draft EIAR

All comments and/or issues raised by I&APs on the DSR was considered, responded to and included in the DEIAR. The DEIAR will be submitted to the Competent Authority on **19 May 2023**. Following publication of the adverts, placing of the site notices and circulation of the BID, I&AP's were registered on the I&AP list and comments were recorded on the Comments and Responses Report (CRR) (Appendix D4).

2.5.17 Acceptance of the scoping report and DEIAR

The Scoping Report was made available to I&APs for 30 calendar days to review it and to respond and provide comments. Following the period of public review, the final Scoping Report has been updated, and the Final Scoping Report has been submitted to DFFE. DFFE has considered the Final Scoping Report.

The Final Scoping Report (FSR) and received by the Department on 06 February 2023, was approved by the Competent Authority on **22 March 2023**. Based on the approved Scoping Report the DEIAR will be sent to DFFE for comment on 11 July 2023.

2.5.18 Recording of comments

Comments raised by I&APs to date have been included into a Comments and Responses (C&R) Report, which is included in Appendix D4 of this EIA Report. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised.

Table 2-2 Summary of comments per subject, received from I&AP's and stakeholders for the proposed Buffalo 1 Solar Park project

Date	Institution	Contact name	Issues raised	Response
05 December 2022	Groothoek Coal Mining Company (Pty) Ltd	Vivienne Solomons	As discussed in our communication with you on 1 December 2022, we have only now become aware of the proposed establishment of renewable energy generation facilities – Buffalo 1 & 2 Solar Parks as well as Lyra 1 & 2 Solar Parks with associated infrastructure, located within the Lephalale Local Municipality in the Waterberg District Municipality, Limpopo Province. We hereby register Groothoek Coal Mining Company (Pty) Ltd (GCMC) as an Interested and Affected Party (I&AP) in the proposed Solar Parks project. GCMC is the holder of a Mining Right in respect of the Farms Eendracht and Groothoek in the Lephalale Local Municipality. Kindly also provide us with a copy of the Background Information Document (BID). Our contact details are as follows: Richard Montjoie I Geologist E-mail: [redacted]	The BID was sent to the I & AP and they were added into the I &AP list, 05 December 2022.

2.6 Plan of study

In terms of the EIA Regulations 2014, as amended a PoSEIA, was prepared and submitted as part of the Scoping Report.

2.7 Draft Scoping Report

All public comments on the DSR have been captured in an IRR, and these were considered and included in the DSR. The DSR has been submitted to the DFFE, I&APs and other authorities. All registered I&APs have been notified of the availability of the DSR in order for them to note how their comments and issues were addressed. The DSR were submitted to the DFFE within 44 calendar days from submitting the Application for EA and DSR for consideration and approval to proceed with the EIA phase of the proposed project.

2.8 Specialist studies

The objective of the Scoping Phase were to identify what information is required to adequately assess the environmental impacts of the project. Thus, this phase was designed to focus subsequent data collection and investigations on issues of concern and importance. A number of specialist studies were identified to obtain adequate information to conduct the assessment on the proposed development. The Terms of Reference for the specialist studies are included in Appendix F.

The following specialist studies will be included in the EIA study:

- Terrestrial Assessment;
- Wetland Functionality (SASS) Assessment;
- Avifaunal Assessment;
- Heritage Assessment
- Palaeontological Assessment;
- Aquatic Biodiversity Assessment;
- Agricultural Potential Assessment;
- Geotechnical Assessment;
- Socio-economic Assessment;
- Visual Impact Assessment; and
- Engineering Services Report.

2.9 Draft EIA Report

The EIA process is required in order to get approval for the project from a competent authority. The EIA Report aim to assess the significant effects of the proposed project or development proposal on the environment. Furthermore, the report intends to provide sufficient information towards Regulators and I&APs to think about the likely effects on the environment at the earliest possible time and aim to avoid, reduce or offset those effects.

2.10 Alternatives

A requirement of the EIA process is to identify and evaluate feasible alternatives to the project. This could include alternative locations, activities and sources. The alternatives of the project are discussed in detail in Section 7 of the report.

3 PROJECT LOCATION AND PROPERTY DESCRIPTION

Buffalo 1 Solar Park: on Farm Buffelsjagt 744 LQ (the Project Site)(**Figure** 3-1), with Overhead Powerline up to the Eskom Medupi Substation, potentially crossing, Farm Turfvlakte 463 LQ, Farm Hieromtrent 460 LQ, Remaining Extent of the Farm Vaalpensloop 313 LQ, Portion 1 of the Farm Vaalpensloop 313 LQ, Farm Vergulde Helm 321 LQ, Remaining Extent of the Farm Kuipersbult 511 LQ, Portion 1 of the Farm Kuipersbult 511 LQ, Farm Kromdraai 690 LQ, Farm Hooikraal 315 LQ and Farm Naauw Ontkomen 509 LQ, located In the Lephalale Local Municipality, Waterberg District Municipality, Limpopo Province. The site is located within the Quaternary Degree Grid Cell (QDGC) 2327CB.

Figure 3-1. Photos of the study area

The chosen site is suitable for the installation of a photovoltaic (PV) power plant. It is appropriate morphologically (flat terrain) and regarding the favourable radiation conditions. The available radiation allows a high rate of electric energy production. The proposed development will have footprint up to **500 ha** (**Figure** 3-2 & **Table** 3-1).

Table 3-1 the extent and centre point coordinates of the proposed development site.

PORTION		GEOGRAPHICAL COORDINATES		EXTENT (HA)
		LATITUDE	LONGITUDE	
FARM BUFFELSJAGT 744-LQ	BUFFALO 1 SOLAR PARK	23° 43' 15" S	27° 27' 20" E	500

The 21-digit surveyor general code of the cadastral land parcels are:

T	0	L	Q	0	0	0	0	0	0	0	0	0	7	4	4	0	0	0	0	0

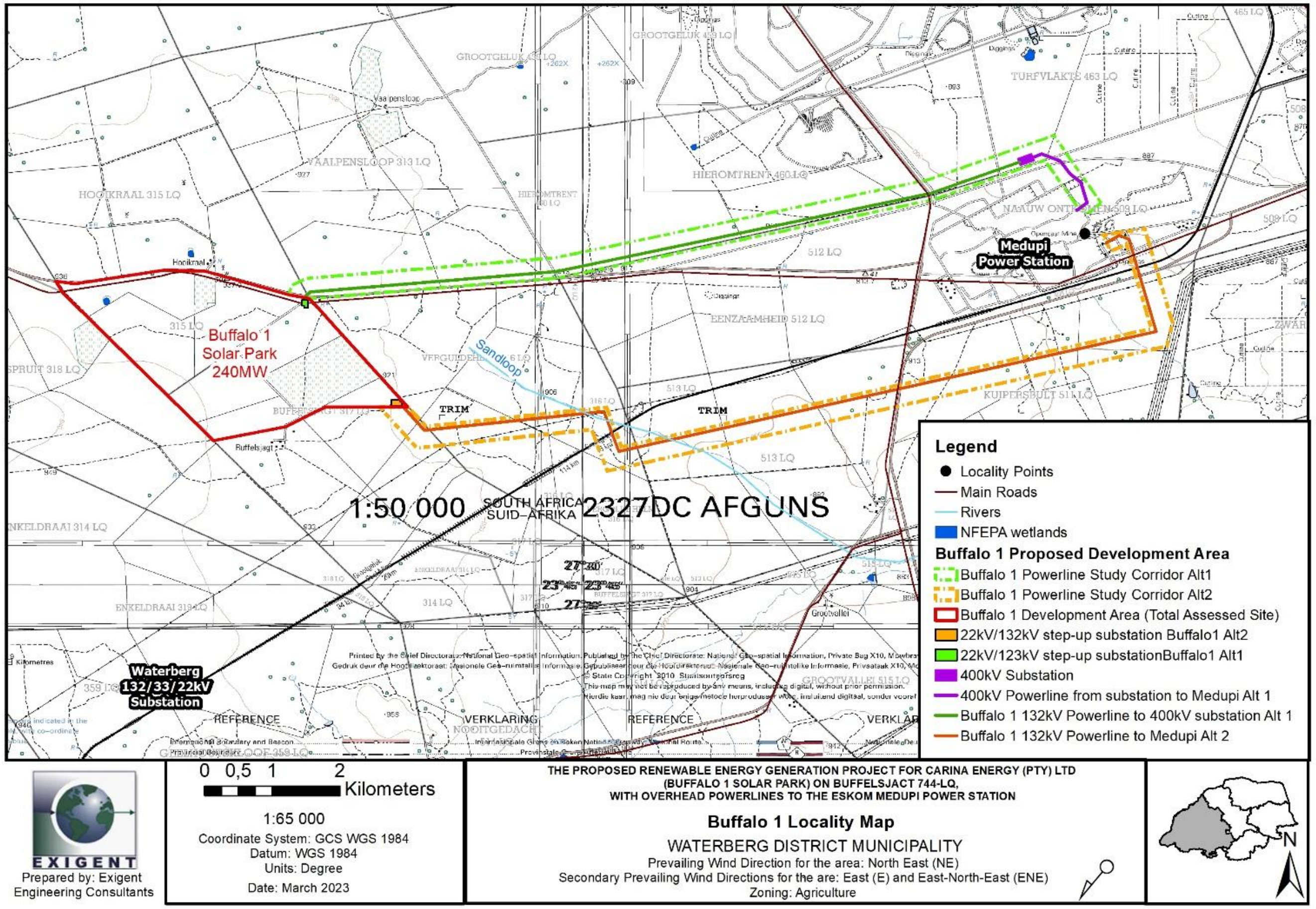

Figure 3-2 Locality map of proposed development

3.1 Historical land use

Historically the site was used for agricultural practises. Based on the available Google Earth imagery, there has been limited changes in the land use of the study site itself, since 1985.

3.2 Land use

Farm Buffelsjagt 744-LQ (1366.6 ha) is used as an agricultural unit mostly for grazing purposes and the land use status is "Agriculture". The new rights as approved by the Lephalale Municipality would however permit the use of the existing farm portion for a Renewable Energy Generation Project (PV Solar Plant).

The proposed solar park development will not permanently affect the agricultural or grazing value of the site as the re-growth of grass will take place under the panels as the mounting systems are at least 1m above ground level. The renewable energy facility is expected to have a lifespan of approximately 30 to 40 years and the power plant infrastructure would be decommissioned once it has reached the end of its economic life: all structures will be removed, and the land will return to agricultural land. This will enable natural re-growth of indigenous vegetation and fauna re-population as well as the continued use of the area for agricultural and grazing purposes.

The property is currently managed as a game farm and some powerlines transvers through the site (Figure 3-3).

Figure 3-3: Photo's of the Buffalo 1 site.

3.3 Surrounding areas

The Buffalo 1 Solar Park is located in close proximity to the ESKOM Medupi Substation **Figure** 3-4.

The Buffalo 1 Solar Park property is located west of the Medupi Substation in an area that is already affected by various electrical overhead power lines. On the northeast of the site there is Grootegeluk Coal mine. The surrounding land uses and zonings are indicated in **Figure** 3-4 and **Figure** 3-5 below:

Table 3-2 Surrounding Land Use and Zoning

Direction	Land Use	Zoning
North	Vacant land	Agriculture
South	Vacant land	Agriculture
East	ESKOM Sub-station Power plant	Agriculture
West	Vacant	Agriculture

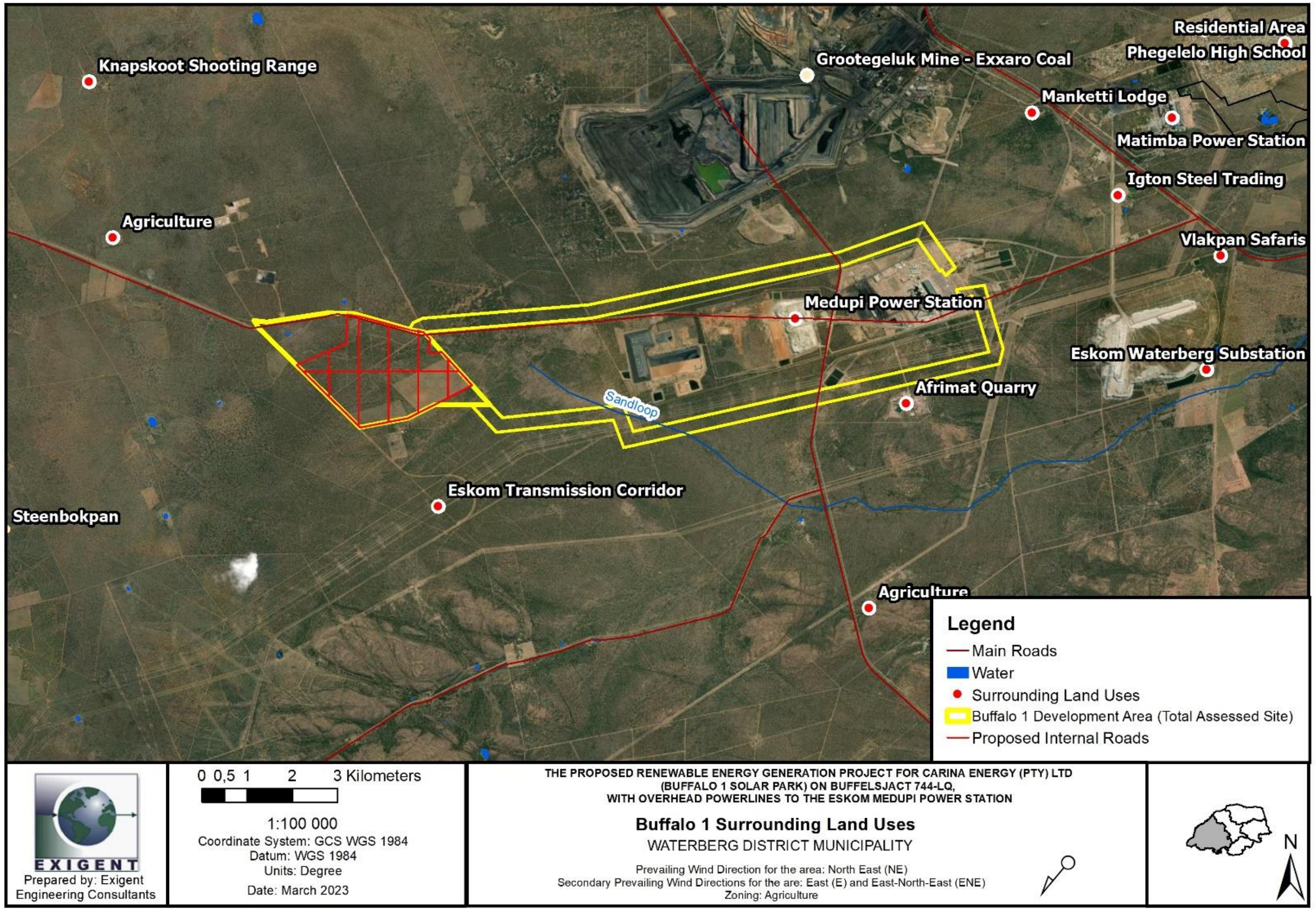

Figure 3-4. Surrounding Land use map.

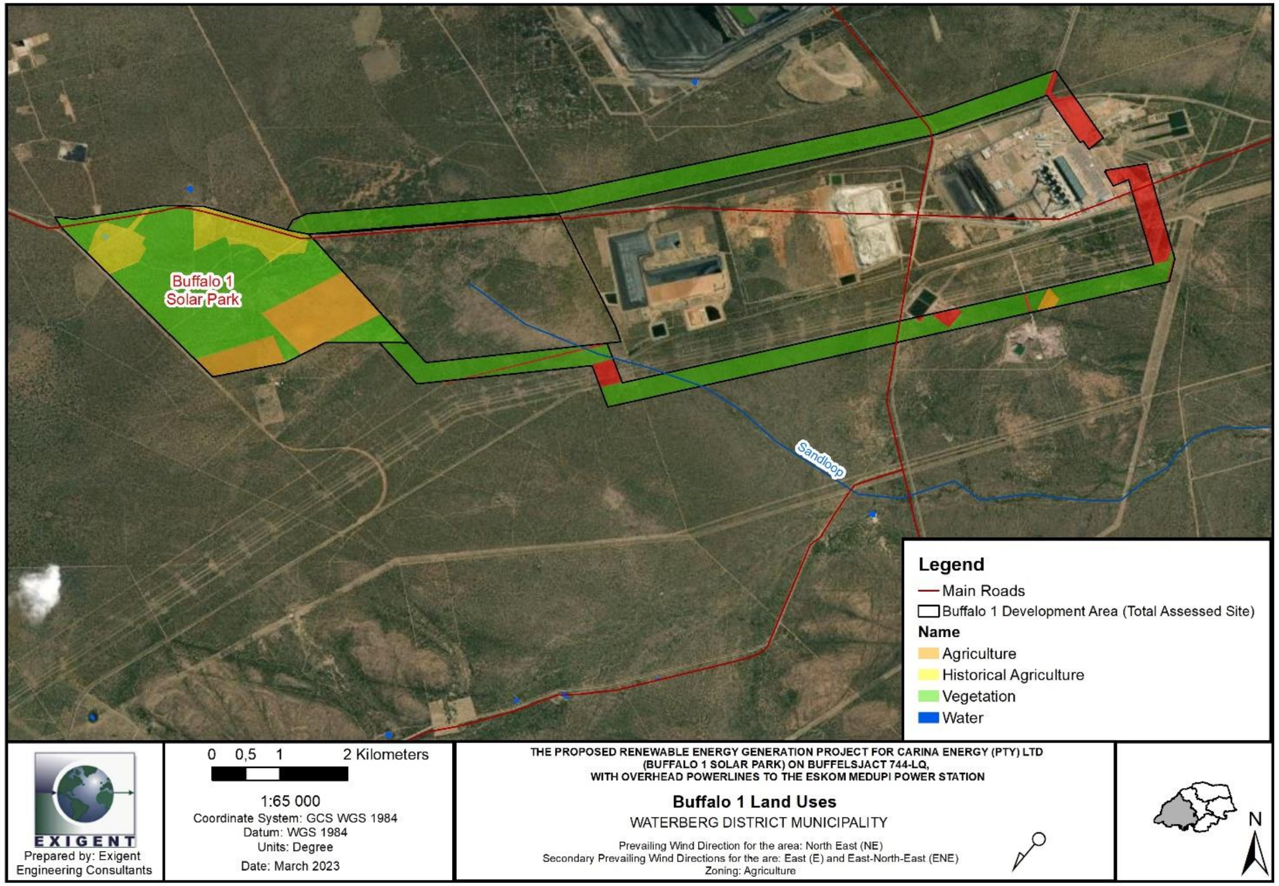

Figure 3-5.Current Land use map.

3.4 Approved solar parks in the area

As per the site Screening report extracted from the DFFE website, it was indicated that numerous projects were previously approved within close proximity to the proposed development area. Table 3-3 lists the previous Solar PV applications within proximity to the proposed development that has been approved. Figure 3-6 indicates the location of the approved Solar PV farms in relation to the proposed development.

Table 3-3. Previous applications within proximity to the proposed development.

Map reference nr	EIA reference nr	Application Title	Distance from proposed development area
Approved as indicated in the Screening Tool document (Buffalo 1 Solar Park)			
1	12/12/20/2306	Exxaro Photovoltaic Plant	13.6 km
2	12/12/20/2152	Delta Solar Park (EA lapsed)	3.7 km
	14/12/16/3/3/2/700		
3	14/12/16/3/3/2/444	Vangpan Solar Park	10.5 km
4	14/12/16/3/3/2/300	Lephalale Solar Park	

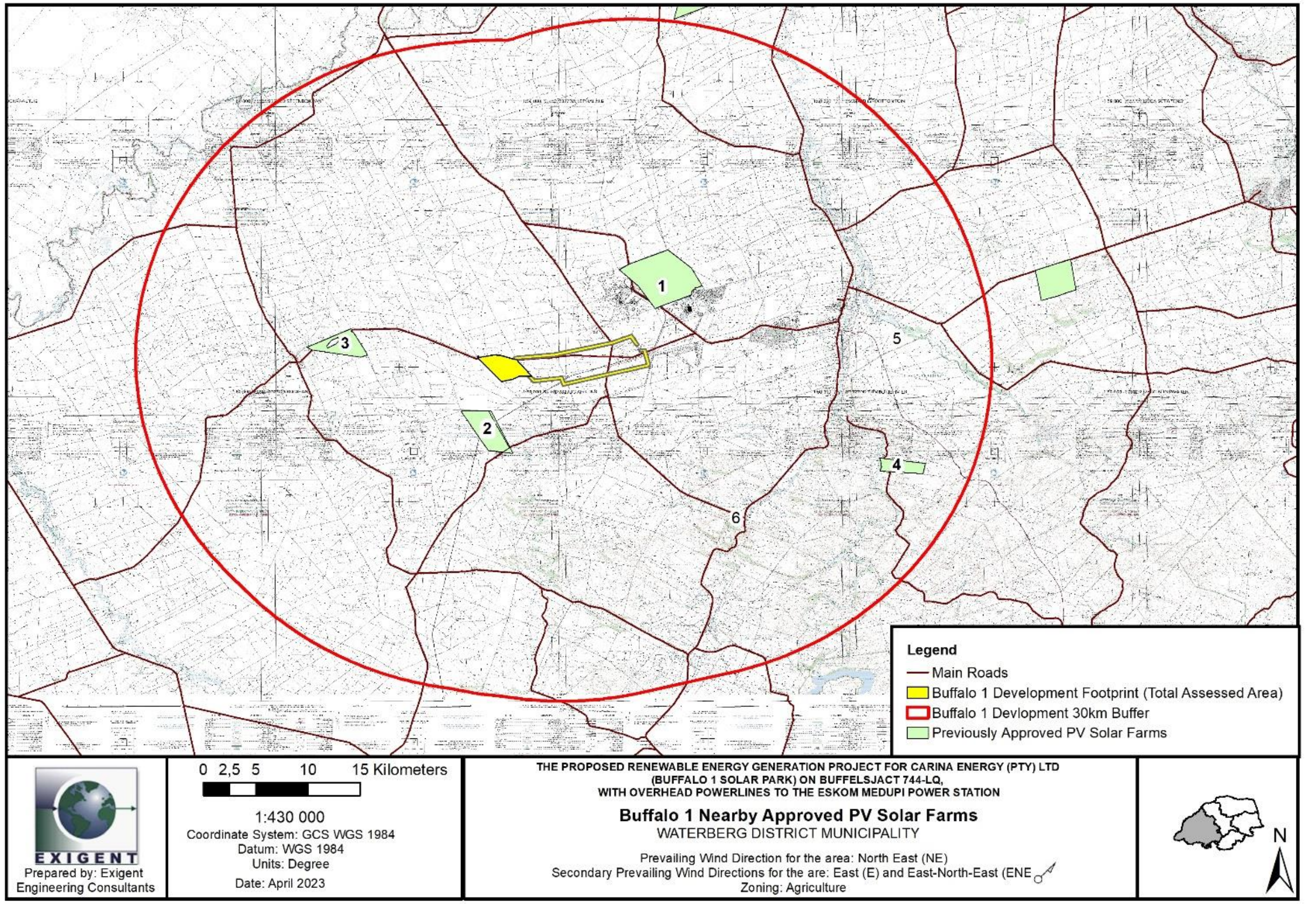

Figure 3-6. Approved Solar PV farms within a 30 km radius of the proposed development.

4 PROJECT & ACTIVITY DESCRIPTION

This section of the EIA Report summarises the project proposal and provides a detailed description of all project components and activities throughout the construction, operation, and decommissioning phases of the project. Please refer to the location map as appended to Appendix C1. Detailed plans and layouts have been included in Appendix C2 in the draft EIAR for consideration and recommendations. Table 4-1 summarise the details of the planned infrastructure and more detail in the later sections of this chapter.

4.1 Technical data spreadsheet

Table 4-1: Project Technical data spreadsheet

Component	Descriptions/dimensions
Output capacity of the PVPP	Maximum Export Capacity (@ the point of connection): up to **240 MW** Installed capacity - DC side (PV modules): up to 375.0 MWp Installed capacity - AC side (inverters): up to 300.0 MW
Height of PV panels	Up to 4.5 m
Area of the PV Array	Total area of the PV Array: 174.71 ha (considering 625,000 PV modules of 2.795 m^2 each)
Number of inverters required	Each Medium voltage station will be equipped with DC/AC inverters that convert Direct Current (DC) into Alternate Current (AC) at a low voltage (typically 600 V). There will be 100 medium voltage stations of 3.0 MW throughout the proposed development. PV technology is in constant and rapid evolution, this means that the final choice of the type (e.g. central inverters or string inverters) and model of inverter can be taken at the time of the commission date, on the basis of the availability of inverters of the worldwide market and of the cost-efficiency curve. In any case, the total installed capacity of the inverters (AC side) will be up to 300 MWac.
Area occupied by inverter/transformer stations/substations	There will be 100 medium voltage stations throughout the proposed development. Each will have an area of approximately 30 m^2. Therefore, the combined area of the medium voltage stations will be 3000 m^2.
Control rooms	The substation will be equipped with 2 control rooms. The control rooms will have a length of 30 m and a width of 11 m. Therefore, each of the control room will have an area of 330 m^2.
Workshops/Warehouses	Three warehouses / workshops will be constructed within close proximity to the on-site substation and switching station. The three warehouses will have an area of approximately 300 m^2 each: 900 m^2 in total.
Capacity of on-site substations	The **on-site 22kV/132kV step-up substation and 132kV switching station** will host two 300 MVA 22kV/132kV transformers (one as spare). **Should the connection solution proposed by Eskom be at 400kV, additional infrastructure is required - outside the project footprint:** one 132kV/400kV step-up substation with high-voltage power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), **to be built in proximity of the Eskom Medupi Substation (Connection Alternative 1 @ 400kV).** The 132kV/400kV step-up substation will host two 300 MVA 132kV/400kV transformers.

Component	Descriptions/dimensions
Area occupied by both permanent and construction laydown areas	Project footprint / fenced area is up to approximately **500 ha**. Surface area (within the project footprint) will be covered by PV modules, internal roads, MV stations, HV substation and switching station, control buildings, warehouses and Battery Energy Storage System (BESS). The construction camp (temporary) will be up to 20 ha in extent and will correspond to the area used for BESS.
Areas occupied by buildings	Medium-voltage stations occupy a footprint up to 3,000 m^2. On-site substation and switching station occupy a footprint of approx. 11,250 m^2. This area includes the control buildings. Workshop & Warehouse occupy a footprint of approx. 300 m^2 each. In total, 3 warehouses are foreseen. Therefore, the total area occupied by buildings (MV stations, HV substation, Workshop & Warehouse) amounts to approx. 15,150 m^2 (1.5 ha). The Battery Energy Storage Systems (BESS) will be located in the area where the camp site will be for the purpose of the construction phase. This area will be approximately 20 ha in size. **Should the connection solution proposed by Eskom be at 400kV, additional infrastructure is required - outside the project footprint:** one 132kV/400kV step-up substation and switching station, **to be built in proximity of the Eskom Medupi Substation,** with a footprint of approx. 22,500 m^2. **(Connection Alternative 1 @ 400kV).**
Length of internal roads	Approximately 40,000 m
Width of internal roads	Up to 8.0 m, with a road reserve up to 13.5 m
Access roads	The project footprint / development area will have direct access from the **District Road Road D1675 towards Steenbokpan.**
Proximity to the grid connections	**<u>Connection Alternative 2 @ 132kV:</u>** One 132 kV power line (double circuit), approximately **13.1 km long**, connecting the on-site 132kV switching station to the 132 kV busbar of the **Eskom Medupi Substation (Connection Alternative 2).** **<u>Connection Alternative 1 @ 400kV</u>, should the connection solution proposed by Eskom be at 400kV:** • one 132 kV power line (double circuit), approximately **10.0 km long**, connecting the on-site 132kV switching station to the 132 kV busbar of the 132kV/400kV step-up substation and 400kV switching station to be built in proximity of the **Eskom Medupi Substation (Connection Alternative 1 @ 400kV).** • one 132kV/400kV step-up substation with 2x300MVA 132kV/400kV power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), to be built in proximity of the Eskom Medupi Main Transmission Substation (MTS) **(Connection Alternative 1 @ 400kV).** One 400 kV power line, approximately **1.3 km long**, connecting the on-site 400kV switching station to the 400 kV busbar of the Eskom Medupi Substation **(Connection Alternative 1 @400kV).**
Height of fencing	3.0 m
Type of fencing	Wire mesh fencing with video-surveillance system.
Height of overhead powerlines	132kV: up to 25 m above the ground level 400 kV (if required): up to 45 m above the ground level
Length and width of servitude of 132kV powerlines	**<u>Connection Alternative 2 @ 132kV:</u>** One 132 kV power line (double circuit), approximately **13.1 km long**, connecting the on-site 132kV switching station to the 132 kV busbar of the **Eskom Medupi Substation (Connection Alternative 2 @ 132kV).**

Component	Descriptions/dimensions
	<u>Connection Alternative 1 @ 400kV</u>, should the connection solution proposed by Eskom be at 400kV: • one 132 kV power line (double circuit), approximately **10.0 km long**, connecting the on-site 132kV switching station to the 132 kV busbar of the 132kV/400kV step-up substation and 400kV switching station to be built in proximity of the **Eskom Medupi Substation (Connection Alternative 1 @ 400kV).** Servitude width for a 132kV powerline: **36 m** (18 m from each side of the center line).
Length and width of servitude of 400kV powerlines	**<u>Connection Alternative 1 @ 400kV (not preferred)</u>, should the connection solution proposed by Eskom be at 400kV:** One 400 kV power line, approximately **1.3 km long**, connecting the on-site 400kV switching station to the 400 kV busbar of the **Eskom Medupi Substation (Connection Alternative 1 @ 400kV).** Servitude width for a 400kV powerline: **55 m** (27.5 m from each side of the center line).
On-site substation and switching station	One on-site 22kV/132kV step-up substation and 132kV switching station is required, having a footprint of 11,250 m^2.
400kV Substation dimensions	**Should the connection solution proposed by Eskom be at 400kV, additional infrastructure is required - outside the project footprint:** one 132kV/400kV step-up substation and switching station, **to be built in proximity of the Eskom Medupi Substation,** with a footprint of approx. 22,500 m^2 **(Connection Alternative 1 @ 400kV).**
Battery Energy Storage Facility	BESS with a Maximum Export Capacity up to 240 MW and a 6-hour storage capacity up to 1440 MWh, with a footprint up to 20 ha within the proposed PV plant footprint / fenced area.

4.2 Energy generation and avoided co_2 production

This project envisages the establishment of a solar photovoltaic power plant with a maximum generation capacity at the delivery point (Maximum Export Capacity) of **up to 240 MW.**

The construction timeframe is estimated to be approximately 24 months.

The preferred technical solutions envisage:

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

The estimated annual energy production is calculated in approximately:

- **2050 kWh/kWp/year** (load factor = 0.234), in the case of PV modules mounted on fixed mounting systems; or
- **2400 kWh/kWp/year** (load factor = 0.274) in the case of bi-facial PV modules mounted on trackers.

Therefore, the Solar Parks will generate:

- **768.7 GWh per year** in the case of PV modules mounted on fixed mounting systems; or
- **900.0 GWh per year** in the case of PV modules mounted on trackers.

The Global Horizontal Irradiation of the site is 2070 kWh/m^2/year (source: https://solargis.info/imaps/).

The energy generated by the Solar Park will reduce the quantity of pollutants and greenhouse gases emitted into the atmosphere. The reduced amount of CO_2 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 it is produced by the Solar Park.

The quantity of the avoided CO_2 is calculated as follows: the energy produced by each Solar Park (up to 768.7 GWh/y or 900.0 GWh/y) is multiplied by the Eskom's average emission factor which is 1.015 t CO^2/MWh (source: Energy Research Centre, University of Cape Town. (2009 Carbon accounting for South Africa).

This means that, in the case of a Solar Park, the avoided CO_2 emissions are approximately 757,389 tons of CO_2 per year in the case of PV modules mounted on fixed mounting systems, or 886,700 tons of CO_2 per year in the case of PV modules mounted on trackers.

Considering that 1 kg of coal generates approximately 3.7 kWh (supposing a caloric value of 8000 kcal/kg and a coal plant efficiency of 40%), the coal saved by the Buffalo 1 Solar Park will be approximately 207,770 tons of coal / year in the case of PV modules mounted on fixed mounting systems, or 243,243 tons of coal / year in the case of PV modules mounted on trackers.

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

4.3 Primary components and infrastructure

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 33kV/132kV step-up substation** with high-voltage power transformers, stepping up the voltage from 33kV (or 22k) to 132kV, and one 132kV busbar with metering and protection devices (switching station)
- one **132 kV power line, approximately 10 to 13 km long** (depending on the selected powerline corridor, alternative 1 or 2), connecting the on-site 132kV switching station to the 132 kV busbar of the Eskom Medupi Substation
- Should the connection solution proposed by Eskom be at 400kV (**Connection Alternative 1 @ 400kV**):

- one **132kV/400kV step-up substation** with high-voltage power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), to be built in proximity of the Eskom Medupi Substation
- One **400 kV power line** connecting the on-site 400kV switching station to the 400 kV busbar of the Eskom Medupi Substation

- An **extension of the 132kV and/or 400kV busbar of the Eskom Medupi substation** may be required
- **Battery Energy Storage System (BESS),** with a Maximum Export Capacity up to 240 MW and a 6-hour storage capacity up to 1440 MWh, with a footprint up to 20 ha within the proposed PV plant footprint / fenced area
- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system
- Access point from Road D1675 from Lephalale to Steenbokpan
- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Sewage system

During the construction phase, the site may be provided with additional:

- Water access point, water supply pipelines, water treatment facilities
- Pre-fabricated buildings
- Workshops & warehouses

to be removed at the end of construction.

4.3.1 Photovoltaic (PV) Array

Solar energy facilities using PV technology convert sun energy to generate electricity through a process known as the 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 at present represent the best performing options in terms of reliability and costs/efficiency.

The PV technology is in constant and rapid evolution, this means that 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 on the fenced area - will not exceed 500 ha, and the maximum height of the structures (PV modules and support frames) will be approximately 4.5 m above the ground level. Therefore. the impacts and mitigation measures will not change.

It is planned that the SPV modules to be connected in series and parallel to form an array of modules, thus increasing total available power output to the needed voltage and current for a particular application. A PV module will be composed of interconnected solar cells that are encapsulated between a glass cover and weatherproof backing. The modules will be typically framed in aluminium frames suitable for mounting.

The PV modules will be mounted on high-rise or elevated structures that are either fixed, at a defined angle, or mounted to a single or double axis tracker to optimise electricity yield. The technology alternatives for the PV modules at this stage are under consideration.

It is recommended that the solar panels are placed such that runoff can pass between each module, minimizing the concentration of runoff and allowing vegetation growth between and beneath the arrays.

4.3.2 Mounting structures

PV modules will be assembled on zinced steel or aluminium frames, to form PV arrays. The metal frames that sustain PV arrays are set to the ground by fixed support poles.

A. <u>In the case of PV modules mounted on fixed mounting systems</u>

Each mounting frame will host several PV modules along two or more parallel rows consisting of PV modules placed side by side, with the position of the PV arrays northwards and at an optimized tilt. The rows are mounted one on top of the other, with an overall mounting structure height up to 4.5 meters above ground level. Please see Plate 4-1 and Plate 4-2

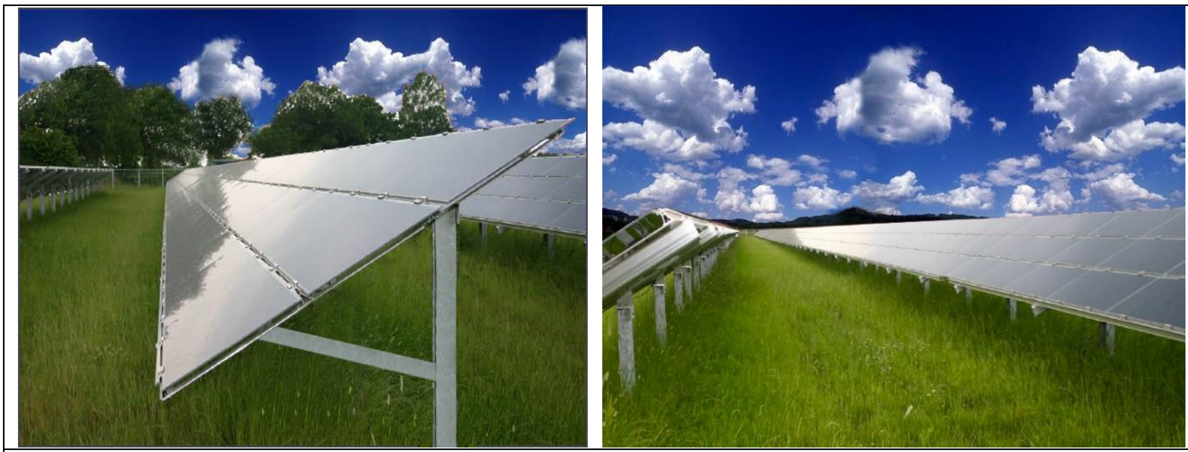

Plate 4-1: Lateral views of PV arrays mounted on fixed mounting systems

Plate 4-2: **Frontal view of PV arrays mounted on fixed mounting systems**

B. <u>In the case of PV modules mounted on trackers:</u>

Each PV array is composed of several PV modules disposed along one or more parallel rows consisting of PV modules placed side by side. Each tracker is composed by several PV arrays North-South oriented and linked by a horizontal axis, driven by a motor. The horizontal axis allows the rotation of the PV arrays toward the West and East direction, in order to follow the daily sun path. The maximum mounting structure height will be up to 4.5 meters above ground level. Please see Plate 4-3 and Plate 4-4

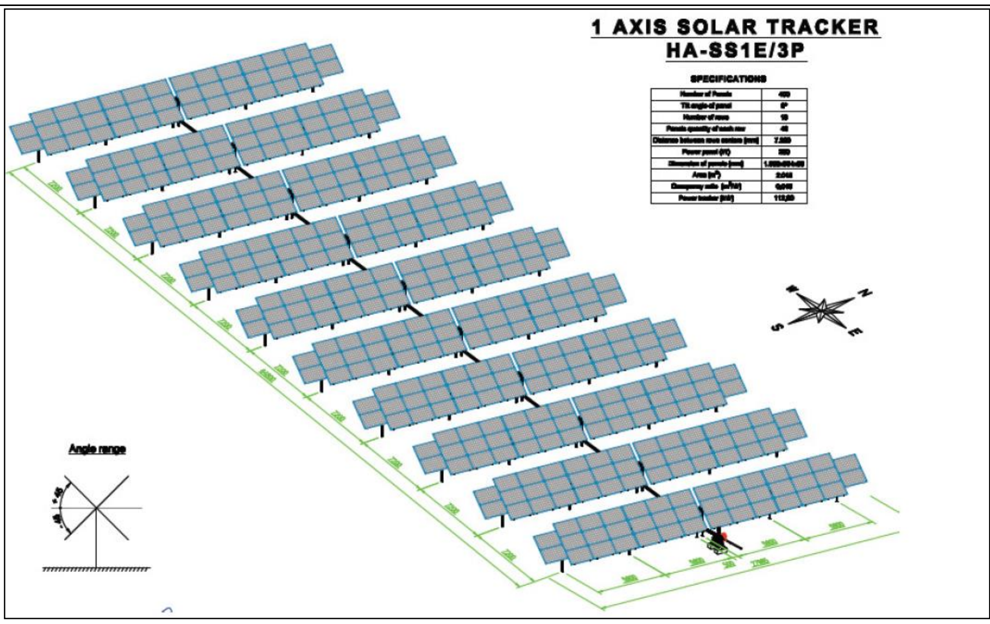

Plate 4-3: **Simulation views of the PV arrays mounted on 1-axis horizontal tracker**

Plate 4-4: Frontal views of the PV arrays mounted on horizontal 1-axis tracker

C. In both cases (where both alternatives are used)

PV modules are series-connected outlining PV strings made of several modules, so that the PV string voltage fits into the voltage range of the inverters. PV strings are set up in order to be connected to DC-connection boxes. Each String Box allows the parallel connection of several PV strings (also called "PV sub-field").

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 (typically 600 V); subsequently the AC will pass through a medium-voltage transformer in order to increase the voltage up to 33 kV (or 22 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 one step-up transformer of 300 MVA (plus one as spare), which will step up the electric energy from the medium voltage level (22 kV or 33 kV) to 132 kV. 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 33kV/132kV substation and 132kV switching station will need to be equipped with circuit breakers upstream and downstream, in order to disconnect the PV power plant and/or the power line in case of failure or grid problems.

4.3.3 Buffalo 1 132kV Powerline

One **132 kV power line, approximately 10 to 13 km long** (depending on the selected powerline corridor and connection solution, alternative 1 or 2), will connect the on-site 132kV switching station to:

- the 132 kV busbar of the Eskom Medupi Substation (Connection Alternative 2 @ 132kV); or
- to the new "Buffalo" 132kV/400kV substation and 400kV switching station (Connection Alternative 1 @ 400kV), proposed next to the Eskom Medupi substation, on Farm Turfvlakte 463 LQ.

More detail on the connection alternatives is discussed in section 7.2.6 of this report.

The new **"Buffalo 1" 132kV Powerline** (double circuit) will consist of a series of steel or aluminium monopole structures to be installed approximately 200 – 260 m apart, with supporting electrical cables. The proposed structures will be between 18 m and 25 m high and the basement of each pole will have a footprint of approximately 0.6 m2.

The construction phase of the powerline will last approximately 9 months and will involve a team of 10 to 15 people. Monopole structures installation will not require the establishment of a permanent construction site, but will be done step-by-step, to only affect small stretches of corridor and for a short time.

An access road (dirty road), approximately 4.0 m wide, may be constructed within the power line servitude, for construction and maintenance activities. In correspondence of the turning points, the road reserve will be up to 14 m in order to allow the transportation of abnormal loads (steel monopoles).

Site preparation will consist of the clearing of the powerline servitude and vegetation removal will be done only within the servitude, for the minimum width required by the installation activities and by the Eskom security rules. Vegetation should not interfere with the high-voltage cables.

The proposed 132 kV powerline (double circuit) may be built by Carina Energy (Pty) Ltd and/or Eskom but will be owned and operated by Eskom Distribution. This will depend on the Eskom grid code in relation to the IPP's (Independent Power Producers) and on a Connection Agreement to be finalized prior to or simultaneously with the conclusion of the PPA (Power Purchase Agreement) in respect of the options of retaining ownership of the connection works once completed.

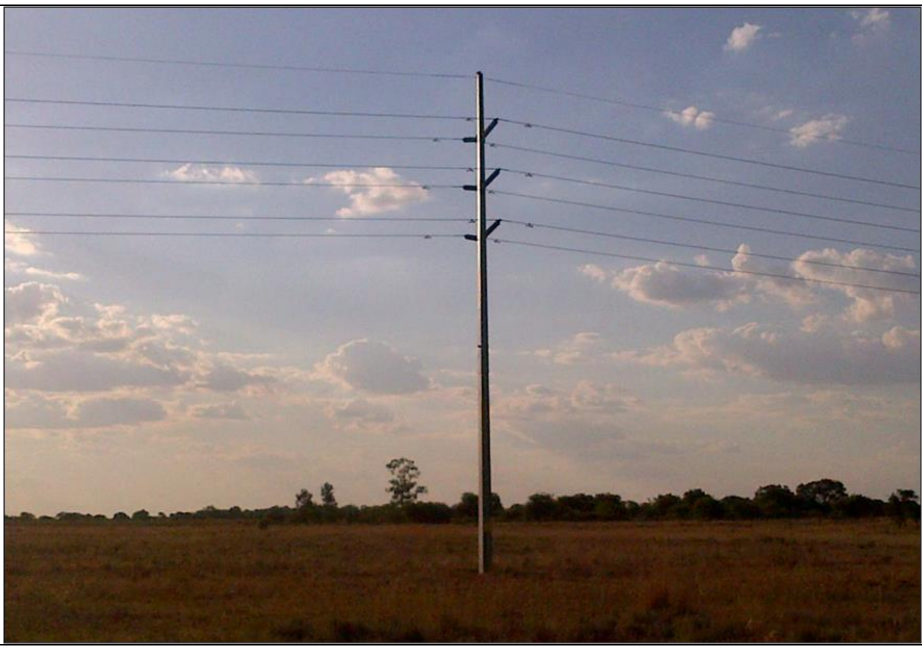

Figure 4-1: Steel monopole structure for a 132 kV powerline (double circuit)

Please see below the list of properties potentially crossed by the new Buffalo 1 132kV Powerline, within the proposed Powerline Corridors 1 and 2:

Powerline Corridors 1 and 2:

- Farm Buffelsjagt 744 LQ (Alternative Corridors 1 and 2 – project site)
- Farm Vergulde Helm 321 LQ (Alternative Corridor 1)
- Farm Kromdraai 690 LQ (Alternative Corridor 1)
- Remaining Extent of Farm Kuipersbult 511 LQ (Alternative Corridor 1)
- Portion 1 of Farm Kuipersbult 511 LQ (Alternative Corridor 1)
- Farm Hooikraal 315 LQ (Alternative Corridor 2)
- Remaining Extent of Farm Vaalpensloop 313 LQ (Alternative Corridor 2)
- Portion 1 of Farm Vaalpensloop 313 LQ (Alternative Corridor 2)
- Farm Hieromtrent 460 LQ (Alternative Corridor 2)
- Farm Turfvlakte 463 LQ (Alternative Corridor 2)
- Farm Naauw Ontkomen 509 LQ (Alternative Corridors 1 and 2 – Eskom Medupi substation)

4.3.4 Buffalo 400kV Substation and Buffalo 400kV Powerline

Should the connection solution proposed by Eskom be at 400kV (**Connection Alternative 1 @ 400kV**), the proposed project will require the construction and operation of:

- one **132kV/400kV step-up substation** with high-voltage power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), to be built in proximity of the Eskom Medupi Substation, on Farm Turfvlakte 463 LQ.
- One **400 kV power line, 1.3 km long,** connecting the on-site 400kV switching station to the 400 kV busbar of the Eskom Medupi Substation.

The **“Buffalo” 132kV/400kV substation and 400kV switching station** **<u>will be shared by the Buffalo 1 and 2 Solar Parks</u>**, but the applicant in terms of the environmental process is **Carina Energy (Pty) Ltd.** Once built, this shared 400kV connection infrastructure will be owned and operated by Eskom.

The connection may entail the extension of the 132kV and/or 400V busbar of the Eskom Medupi substation for the establishment of new 132kV or 400kV bus-bays.

4.3.5 Battery Energy Storage System

The need for a BESS is required due to the fact that electricity is only produced by the solar field while the sun is shining, while the peak demand may not necessarily occur during daylight hours. Therefore, the storage of electricity in BESS and supply thereof during peak demand will mean that the facility is more efficient, reliable and electricity supply is more consistent. Currently, battery technology alternatives being considered are either solid state batteries or redox flow batteries.

A **BESS** (with a footprint of up to **20 ha**) with an output capacity up to **240 MW** and a storage capacity up to **1440 MWh (6-hour storage)** will be installed next to the on-site step-up substation and switching station, within the footprint and fenced area of the Solar Park.

Lithium-ion batteries will store energy at times of low energy demand and release the energy to the grid at times of pick 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).

Each Battery Storage Facility (one per project) will have a footprint of **up to 20 hectares** and will comprise of the following equipment:

- Up to 288 containers (each up to 40 m^2), each with a storage capacity of up to 5 MWh and on a concrete platform. These will house the batteries, management system and auxiliaries.
- Up to 120 transformer stations (up to 35 m^2 each).
- Up to an additional 10 m^2 per container for cooling units.
- Internal access roads up to 8.0 m wide between rows of containers.
- BESS will be connected:
    - to the PV plant by means of DC/DC inverters, and
    - to the 22 kV (or 33 kV) 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 (Plate 4-5) 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.

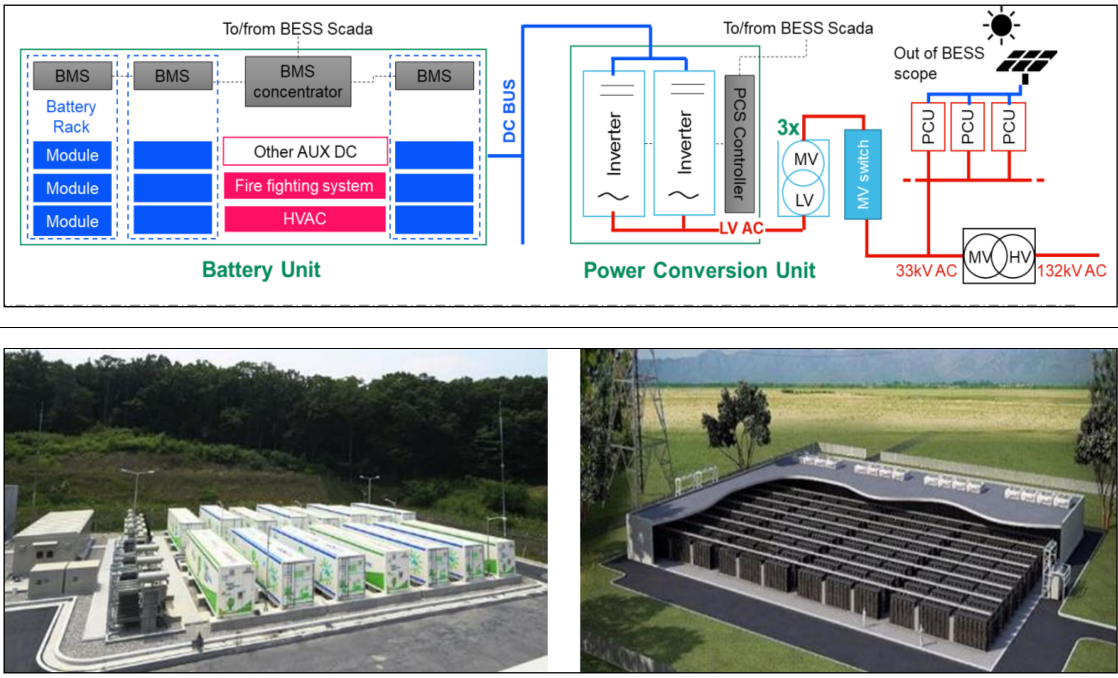

Plate 4-5: Battery Energy Storage Systems (BESS)

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.

4.3.6 Auxiliary buildings

The proposed buildings and facilities needed to service the proposed SPV Facility are a control room, a general office, access control and security building, ablution facilities and kitchen area, a small workshop and a store. The total area occupied is approximately 1.5 ha.

And also the following:

- Electrical system and UPS (Uninterruptible Power Supply) devices
- Lighting system
- Grounding system

4.3.7 External and internal access roads

The project footprint / development area will have direct access from the **District Road Road D1675 towards Steenbokpan**.

The internal road layout is dependent on the PV module layout, however, it is anticipated that a network of gravel internal access roads (each with a width of up to 8 m) will be required to access the PV modules for cleaning and maintenance that may be required during operational phase.

During operation, access and internal roads will be up to 8 m wide with a road reserve up to 13.5 m. During the construction phase, the access road and some of the internal roads will have a road reserve wider than 13.5 m (up to 16.0 m) to allow the transportation of abnormal goods (e.g. power transformers, etc.).
Internal roads will consist of gravel roads designed in accordance with engineering standards. The roads will have a width up to 8.0 meters allowing for the slow-moving heavy vehicles. 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.

4.3.8 Lighting system

The lighting system will consist of the following equipment (per project):

- Floodlight-towers: maximum 10 meters high, with directional lamps (LED type) of 120 W, installed around the HV loop-in loop-out 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).

4.3.9 Fencing of the site

It is planned that the site will be cordoned off and fenced with wire mesh fencing with video-surveillance system. during both the construction and operational phases. This is likely to entail the establishment of an electrified fence (up to 3m) which will remain in situ for the lifetime of the project (i.e. for the operational phase). For the construction phase, the construction area and construction site camp may also be cordoned off with temporary fencing.

4.3.10 Water storage and conservation

It is proposed that 90,000 litres of water will be stored in storage tanks for fire, emergency and washing of panels twice a year.

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 liters per m^2 of PV panel surface will be needed. Therefore, the amount of water for cleaning is up to 1,750 m^3 per cleaning cycle and **3,500 m^3 per year**.

PV modules cleaning activity can last less than 1 month. If the cleaning activity lasts approximately 4 weeks (24 working days), the daily water consumption will be approximately 72,917 liters/day, over 24 days.

The water consumption will increase up to 76,667 liters/day during the cleaning of the solar modules (72,917 liters/day for cleaning activity and 3,750 for sanitary use), which will last less than a month and will occur twice per year during the dry period.

4.3.11 Water for sanitation

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

The sewer system will consist of an installation to serve the offices of the control buildings. 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 a patented digester. Most systems require electricity to power the pumps and fans used in aeration process, although some systems use wind power (whirlybird). The system could require chlorine tablets available commercially. The effluent from the wastewater treatment system will be suitable for irrigation of lawns, or re-use in the dwellings as water for the flushing of toilets, or for fire-fighting purposes. This could reduce the overall water requirement of the development substantially.

The volume to be treated by the system will be maximum 3,750 litres/day. In this respect, a Water Use License Application will be submitted.

Approximately 40 people will be employed during the operation phase of the PV power plant, which will have a lifetime of 30 to 40 years.

Each Solar Park will be in operation 7 days per week; therefore, personnel will operate in shifts. The surveillance team will be present during daytime, night-time and weekends. The average number of people working on site will be of 17 people daytime and 8 people at night.

The average daily water consumption for sanitary use is estimated to be 150 litres/day/person for 25 people (17 people daytime and 8 people at night). The daily water consumption will be approximately 3750 litres/day (**1,370 m^3 per year**).

4.3.12 Temporary construction camp

The construction camp (approximately 20 ha) will be located within the planned development area, close to the new on-site substation, at the planned location of the BESS. Consequently, the construction site area will be gradually reduced at the completion of the BESS. The optimal location of the construction site is important during the planning phase in order to minimize impacts on the surrounding environment. The site's location has been dictated by the nature of the works to be undertaken, specialist studies, site restrictions, town planning intended uses and access.

The area identified for the construction site had to 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.

In addition, 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 distinct phases. The steps individuated hereinafter do not follow a time sequence, but it should be considered as overlapping and simultaneous events.

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.

Phase II

During the fencing operation as described in Phase I, the most valuable trees, if any, 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 low value tree species will be cut and transferred to facilities for wood processing.

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 the internal roads. The internal road network should ensure a two-way traffic of heavy goods vehicles in order to minimize trips. The road system is planned for a width of 8 meters. 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.

Phase IV

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

- temporary storage of photovoltaic modules (covered with compacted dry material to avoid direct contact with the ground);
- 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 (it is foreseen that only key personnel should be allowed to stay overnight);
- technical cabins and management offices;
- medical care unit in a prefabricated module, 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;
- Lilliput or similar sewer treatment system. The treated water will be used to moisten dusty areas and reduce dust gathering due to windy actions;
- solid waste collection area.

Earthworks will be required during the construction of internal roads. 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. Considering a road pavement thickness of 300 mm and an overall road surface of approx. 180,000 m^2, the amount of cut or fill is estimated to be approx. 54,000 m^3.

Further items of earthworks would be required where temporary storage areas will be prepared for the storage of the photovoltaic modules and other equipment during construction of the solar park. Small earthworks will be required for the installation of the PV modules and of the medium-voltage stations. None of these activities should require earthworks in excess of 500 mm cut or fill.

Only the foundation plate for the high-voltage substation may require earthworks in excess of 500 mm cut or fill. The footprint will be of approximately 11,250 m^2 for the on-site 22kV/132kV substation and 132kV switching station, and of approximately 22,500 m^2 for the 132kV/400kV substation and 400kV switching station to be built next to the Eskom substation.

The topsoil stripping will result in temporary spoil heaps which must be spread over the site upon completion of the project. Concrete necessary for the basements of the medium-voltage stations, the medium-voltage receiving stations, the high-voltage substation, the control building and the warehouse will be manufactured using aggregate and sand from commercial sources or will be supplied by a Ready-mix Company. Gravel necessary for the construction of internal roads may be provided from one borrow pit on site. The material from this borrow pit will only be utilized for work on this particular site only.

4.4 External services

The following external services will be required for the construction and operation of the proposed project.

4.4.1 Solid waste

During the construction phase, 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.

During the operational phase (30 to 40 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 the PV modules and cables (copper and/or aluminium conductor) will be recycled, as well as the aluminium (or zinced steel) frames and piles of the mounting systems.

No refuse will be buried or incinerated on site. Measures to manage waste has been included in the EMPr.

Carina Energy (Pty) Ltd, will enter into an agreement with the Lephalale Municipality for the disposal of refuse at the nearby municipal refuse site.

Waste removal and sanitation will be undertaken by a sub-contractor, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations positions on site.

4.4.2 Sanitation

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

The sewer system will consist of an installation to serve the offices of the control buildings. 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 a patented digester. Most systems require electricity to power the pumps and fans used in aeration process, although some systems use wind power (whirlybird). The system could require chlorine tablets available commercially. The effluent from the wastewater treatment system will be suitable for irrigation of lawns, or re-use in the dwellings as water for the flushing of toilets, or for fire-fighting purposes. This could reduce the overall water requirement of the development substantially.

The volume to be treated by the system will be maximum 3,750 litres/day. In this respect, a Water Use License Application will be submitted.

4.4.3 Water usage

The proposed development will require Water Use Authorisation in accordance with the following sections of the NWA (Act No. 36 of 1998, as amended): Section 21(a) – Taking water from a water resource, Section 21(c) – Impeding or diverting the flow of water in a watercourse, Section 21(i) – Altering the bed, banks, course, or characteristics of a watercourse, and either Section 21(g) – Disposing of waste in manner that may detrimentally impact a water resource, or Section 21(e) – Engaging in a controlled activity. The Water Use Application will be submitted to the DWS via the e-WULAAS.

An application for a Water Use Authorisation for the above-mentioned identified water uses will be made by the applicant. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received. This is in line with the requirements of the Department of Water and Sanitation.

At this stage it is anticipated that water will be required for the construction of foundations, structures, and internal roads. During operation of the SPV facility, water will also be required for activities such as dust suppression, cleaning, ablutions, and maintenance activities. Concrete production and module cleaning represent the largest water requirements during the construction and operational phases respectively. *

Water required during the construction- and operation phases will be sourced from the following potential sources (in order of priority):

- The Local Municipality (LM) - Specific arrangements will be agreed on with the Lephalale Local Municipality in a Service Level Agreement (SLA). Preliminary, water will either be trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe.
- Investigation into a third-party water supplier which may include a private services company.

As noted above, possible sources of this water are to be investigated and the relevant authorities will be approached during the planning stage, once the Applicant has been confirmed as a preferred REIPPPP bidder and the EA.

Water usage during construction

This section describes the water requirements of the during the **construction phase** (per project). The overall and average water consumption during construction is detailed in Table 4-2.

Table 4-2 Water consumption during the construction phase of the proposed development.

WATER REQUIREMENT DURING THE CONSTRUCTION PHASE OF THE PROJECT		
DESCRIPTION	**UNIT**	**VALUE**
Timeframe of the construction activities	*Months*	24
Timeframe of the construction activities - calendar days	*Days*	720
Overall water consumption for internal roads	*m^3*	9,000
Overall water consumption for sanitary use	*m^3*	3,960
Overall water consumption for concrete production	*m^3*	6,000
OVERALL WATER CONSUMPTION	***m^3***	**18,960**
Daily water consumption (average over 720 calendar days)	***m^3/day***	**26.3**

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).
- The surface of internal gravel roads will be approximately 180,000 m^2.
- 50 liters of water / m^2 of internal of roads will be required for the proposed project.
- Water consumption for internal roads will be:
  - 180,000 m^2 x 50 l/m^2 = 9,000 m^3.

B. Workers

- Approximately 150 people are expected to be employed during the construction period, although this number can increase to 300 for short spaces of time during peak periods. This number can be higher in the case the Project Company - once being selected as Preferred Bidder by the Department of Mineral Resources and Energy (DMRE) and having finalized the Connection Agreement with Eskom, where in particular it is agreed the envisaged connection timeline - evaluates to build the proposed Solar Park in a timeframe shorter than 24 months (i.e. 528 working days). For example, in the case the construction works are planned to last only 18 months (i.e. 396 working days), the average number of workers required on site during construction is 200.
- Each worker needs 50 liters / 8 working hours for sanitary use.
- Water consumption will be:
  - 150 people x 50 l/person x 528 working days = 3,960 m^3 over 24 months, or
  - 200 people x 50 l/person x 396 working days = 3,960 m^3 over 18 months.

C. Concrete production

- Concrete is necessary for the basements of the medium-voltage stations, the high-voltage substation, the control buildings, the warehouses and the basement of the BESS. The overall amount of concrete to be produced will be approximately 30,000 m^3.
- 200 litres of water are needed for 1 cubic meter of concrete.

- Water consumption will be:
    - 30,000 m^3 x 200 l/m^3 = 6,000 m^3.

D. <u>Vehicle cleaning</u>

As mitigation measure, the cleaning of vehicles like excavators, mechanical diggers and pile rammers will be done once or twice per month and not during working days, also in order to limit the water requirement during the 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.

During construction, storage tanks will be sized in order to provide a reserve of water of approximately **200 cubic meters.**

Water usage during operation

This section describes the water requirements of the during the **operational phase** (per project). 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. The overall and average water consumption during operation is detailed in Table 4-3.

Table 4-3. Water consumption during the operational phase of the proposed development.

WATER REQUIREMENT DURING THE OPERATIONAL PHASE		
DESCRIPTION	UNIT	VALUE
Average daily water consumption for sanitary use	*l/day*	3,750
Average daily water consumption during cleaning activity (over 24 working days, twice per year)	*l/day*	76,667
Average monthly water consumption for sanitary use (over 30 days)	*l/month*	112,500
Annual water consumption for sanitary use	***m³/year***	**1,370**
Annual water consumption for PV modules cleaning activities (twice/year)	***m³/year***	**3,500**
ANNUAL WATER CONSUMPTION DURING OPERATION	***m³/year***	**4,870**
DAILY WATER CONSUMPTION DURING OPERATION (average over 365 day)	***m³/day***	**13.34**

- **A) Water for sanitary use**

Approximately 40 people will be employed during the operation phase of the PV power plant, which will have a lifetime of 30 to 40 years.

The Buffalo 1 Solar Park will be in operation 7 days per week; therefore, personnel will operate in shifts. The surveillance team will be present during daytime, night-time and weekends. The average number of people working on site will be of 17 people daytime and 8 people at night.

The average daily water consumption for sanitary use is estimated to be 150 litres/day/person for 25 people (17 people daytime and 8 people at night). The daily water consumption will be approximately 3750 litres/day (**1,370 m^3 per year**).

- **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 liters per m^2 of PV panel surface will be needed. Therefore, the amount of water for cleaning is up to 1,750 m^3 per cleaning cycle and **3,500 m^3 per year**.

PV modules cleaning activity can last less than 1 month. If the cleaning activity lasts approximately 4 weeks (24 working days), the daily water consumption will be approximately 72,917 liters/day, over 24 days.

- **Conclusion**

The daily water requirement will be approximately 3,750 liters/day over 12 months for sanitary use (i.e. 112,500 l/month and 1,370 m^3/year) in each Solar Park. The water consumption will increase up to 76,667 liters/day during the cleaning of the solar modules (72,917 liters/day for cleaning activity and 3,750 for sanitary use), which will last less than a month and will occur twice per year during the dry period.

It is further proposed that 90,000 litres of water will be stored in storage tanks for fire, emergency and washing of panels twice a year.

Water needs for the construction phase (**18,960 m^3** over approximately 24 months) and the operational phase (**4,870 m^3/year**) can be obtained from the Lephalale Local Municipality and/or from on-site boreholes. The Lephalale Local Municipality will be consulted in this respect.

Storm water and drainage

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.

There is no visible erosion anywhere and the flood line of the water course crossing the Property will not be affected. The storm water system, where required, will consist of open grass lined channels and nominal concrete culverts.

Electricity

During the construction phase of the development, electricity will either be generated on site through a small solar system or through the use of generators or the existing Eskom supply on the farm will be utilised. This will depend on the Engineering, Procurement, and Construction (EPC) contractor appointed.

Hazardous substances

Hazardous and general waste will be stored separately and temporarily on site. Any waste and excess material will be removed as needed during construction and disposed of at a registered waste facility. "Dangerous goods" that are likely to be associated with the project include fuel stored during the construction phase and/or hazardous chemical substances at the substation during the operational phase.

Dangerous goods required to be stored during construction or operations (e.g. limited quantities of fuel, oil, lubricants etc.) will be stored in compliance with relevant legislation (i.e. stored on covered and bunded areas / bin, and disposed of at a registered hazardous waste site). Hazardous waste will be appropriately stored and disposed of at a registered hazardous waste site.

During the construction phase, use of the following hazardous substances is anticipated:

- Cement powder associated with the batching plant;
- Petrol/diesel for trucks/ cranes/ bulldozers/generators;
- Limited amounts of lubricants and transformer oils;
- Defunct or damaged PV modules; and
- Defunct or damaged battery units.

The proposed BESS will contain hazardous substances/toxic chemicals and/or liquid electrolyte which pose a significant environmental risk if leaked. The design of the BESS has taken into account potential leaks and equipment will be suitably bunded and/or containerised and make provision for secondary containment to accommodate any spill as a result of normal operation and maintenance.

Temporary storage and disposal of hazardous waste will be done in compliance with relevant legislation and the EMPr.

- Internal roads
- Fencing of the site and alarm and video-surveillance system
- Water access point, water supply pipelines, water treatment facilities
- Sewage system

During the construction phase, the site may be provided with additional:

- Water access point, water supply pipelines, water treatment facilities
- Pre-fabricated buildings
- Workshops & warehouses

to be removed at the end of construction.

The connection may also entail interventions on the Eskom grid, according to Eskom's connection requirements/solution.

4.5 Project phases

4.5.1 Pre-construction phase

The pre-construction phase of the proposed project includes the planning of the project, by considering the best strategic approach for layout and component design, construction and operation of the proposed development. This is done to minimize the risks during the construction phase on the environment.

Based on the environmental impacts, e.g. natural vegetation, potential graves and natural water resources, as well as engineering design considerations and existing servitudes, various alternative layout options were considered.

4.5.2 Construction phase

Construction will only be able to commence once the project receives an EA from the DFFE, preferred bidder allocation granted by DMRE or equivalent from a private buyer of the power, a generating license issued by NERSA, and a Power Purchase Agreement secured with Eskom or a buyer of the power. In addition to bidding into the REIPPPP, the developer is also considering options such as Private Power Purchase Agreements and Wheeling Agreements with Eskom to deliver the generated power to Private Offtakers.

The Buffalo 1 Solar Park will be located in Lephalale, with the grid connection powerline leading from the proposed PVPP to the existing Eskom Medupi Main Transmission Substation located towards the east of the proposed PVPP project.

The construction phase for the proposed development will be separated into two phases, namely the 1) site preparation phase, and the 2) construction and installation phase.

The construction phase of the proposed development is expected to take 24 months. It is estimated that between 150 and 200 laborers will be employed.

Site preparation phase:

The following preparations will take place:

- PV modules and all steel structures will be transported to the proposed development site.
- The main transformers, graders, drill rigs, 10 m^3 tipper truck, tractors, trailers, water tanker truck, track-loader backhoes (TLBs) and trenching machines will be delivered to site.
- Vegetation clearance will take place.
- The area will be graded and levelled according to the required specifications, using the 20-ton roller.
- Throughout the entirety of the construction phase, water spray (using the water tanker truck) will be used to control excessive dust blow off.
- Internal access roads, as indicated on the layout plans, will be established on site. These access roads will allow for easy vehicular access to each panel system within the proposed development. All roads will be gravel roads with a width of up to 8 m. (Once the proposed PVPPs are operational, the roads will mainly be used for maintenance and inspections.)

- For the purpose of the construction phase of the proposed development, water access point, water supply pipelines, water treatment facilities, pre-fabricated building, workshops and warehouses will be installed during the site preparation phase.

Construction and installation phase

- As part of the construction and installation phase, concrete transformer pads for each row of solar panels and a switch panel for connection to the power grid and control sheds will be constructed on site.
- Electrical systems development will take place in conjunction with the installation of the rest of structures on site (such as the sewer wastewater treatment works (WWTW) and all supporting infrastructure). The electrical systems installations will include electrical cabling and trenching (field trenching in and around the site where the units will be installed). These structures connect the solar units, collects the energy from them and then routes the energy to a point within the utility infrastructure system.
- A sewer reticulation system will also be installed on site. This will be done to service the offices of the control building and will be done in accordance with the specifications of the SABS. The systems will consist of an underground conservancy tank and a patented digester. These systems require electricity to power the pumps and fans used as part of the aeration process.
- During the construction phase, solid waste will mainly consist of vegetation material from the clearance of vegetation which will be recycled to be re-used as organic fertilizer. Other type of solid waste will include, amongst others, wood from packaging, boxboards, expanded polystyrene and household waste, which will be recycled as much as possible. Non-recyclable waste will be delivered to the closest permitted landfill site.
- The road layout will be designed in order to ensure ease of access to every rack or tracker structure and the horizontal geometry will be designed to enable the turning of trucks.

Water needs for the construction and operational phases will be obtained from the local municipality. The TLM will be consulted in this respect.

It is expected that once all the construction, erection, and commissioning are completed and the project is in the start-up phase, all temporary works will be removed, and any disturbed areas shall be rehabilitated and restored to the original state.

4.5.3 Operational phase

Approximately 40 people will be employed during the operation phase of each PV power plant, which will have a lifetime of 30 to 40 years. The proposed Solar Parks will be in operation 7 days per week; therefore, personnel will operate according to shifts. The surveillance team will be ensured during day-time, night-time and weekends.

For the Solar Park, the operational team will be composed by the following figures:

- 1 person as plant manager
- 3 persons for administration
- 6 people as technicians / plant operators
- 12 people for electric and generic maintenance
- 18 people as guards

The “fire team” will be composed by the people for generic maintenance, who will attend a comprehensive firefighting training program. After this training programme, the fire team will be able to drive/use/manage properly the fire extinguishers and the fire fighting vehicle, that will be available on the site.

Waste removal and sanitation will be undertaken by a sub-contractor, where possible. Waste containers, including containers for hazardous waste, will be located at easily accessible locations positions on site.

Either borehole / municipal / dam or a combination of all three will be used to provide water. Should water availability at the time of operation be limited, water will be transported to site via water tanks. Water will be used for sanitation and potable water on site as well as cleaning of the panels. Scheduled maintenance work will be carried out several times each year throughout the operational phase.

The internal site roads will be used for periodic maintenance, panel working and safety checks (including panel cleaning).

A large notice board or signage board will be located at the entrance to the site. This signage will provide essential safety information such as emergency contacts and telephone numbers. Safety signs, such as speed limits and safety information, would also be installed throughout the Project Site. These signs will be maintained throughout the operational life of the solar farm.

As an example, but not limited to, the following activities could occur in the operational phase:

- Checking and verifying of the electricity production;
- Maintaining vegetation height and alien invasive species management;
- Maintaining and monitoring a weather station;
- Routine inspection of all BESS equipment and systems;
- Periodic maintenance;
- Cleaning of PV modules; and,
- Security operations.

The traffic generated by the PV plant during operation phase once the plant is generating electricity is projected to be minimal.

4.5.4 Decommissioning phase or upgrade

After the 30-40 years of operation, the PV plant will either be decommissioned or upgraded if a new license is granted. It is anticipated that the land use will be returned to grazing and agricultural use once the site has been rehabilitated. Upgrading the PV power plant will consist of replacing old PV modules with new modules, increasing the total peak power of the plant (a process called “Repowering”) or increasing the power of the plant by adding new elements such as trackers, PV modules or transformers.

If the plant is to be decommissioned then the site should be returned to as close as possible to its original state. Other than the concrete, all of the components of a PV plant have an intrinsic value either for re-use or recycling.

The decommissioning process will consist of the following steps:

- The PV facility would be disconnected from the Eskom grid;
- The inverters and PV modules would be disconnected and disassembled;
- Concrete foundations (if used) would be removed and the structures would be dismantled;
- Wastewater storage conservancy tank would be responsibly removed and the area would be rehabilitated;
- The underground cables would be unearthed and removed and buildings would be demolished and removed;
- The fencing would be dismantled and removed;
- The roads can be retained should the landowner choose to retain them, alternatively the roads will be removed and the compaction will be reversed;
- Most of the wires, steel and PV modules are recyclable and would be recycled to a reasonable extent. The Silicon and Aluminium in PV modules can be removed and reused in the production of new modules; and,
- Any rubble and non-recyclable materials will be disposed of at a registered landfill facility.

The rehabilitation of the site would form part of the decommissioning phase. The aim would be to restore the land to its original form (or as close as possible). The rehabilitation activities would include the following:

- Removal of all structures and rubble;
- Breaking up compaction where required, loosening of the soil and the redistribution of topsoil;
- Restoration of the surface to the original contours and application of hydro seeding/seeding and/or direct planting (as required);
- Removal of all cables;
- Rehabilitation may include top soiling, raking, and/or re-seeding (whichever is appropriate); and,
- A final site walkthrough will be conducted to remove debris and/or waste generated within the site during the decommissioning process.
- Monitoring periodically to ensure rehabilitation measures successful and established.

5 LEGISLATIVE AND POLICY FRAMEWORK

Environmental decision making with regards to solar PV plants is based on numerous policy and legislative documents. These documents inform decisions on project level environmental authorisations issued by DFFE as well as comments from local and district authorities. Moreover, it is significant to note that they also inform strategic decision making reflected in the Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs). Therefore, to ensure streamlining of environmental authorisations it is imperative for the proposed activity to align with the principles and objectives of key national, provincial and local development policies and legislation.

The legislation that is relevant to this study is briefly outlined below. These environmental requirements are not intended to be definitive or exhaustive but serve to highlight key environmental legislation and responsibilities only.

5.1 Strategic electricity planning in South Africa

By the end of September 2022, the year 2022 had had more load shedding than all previous years combined. Level 6 load shedding was reimposed starting on 7 December 2022 when over 20,000MW of was taken offline due to a high number of power station breakdowns[6]. The South African government-owned national power utility and primary power generator, Eskom, and various parliamentarians attributed these rolling-blackouts to insufficient generation capacity[7]. Hence the need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by DMRE. The hierarchy of policy and planning documentation that support the development of renewable energy projects such as the proposed project is illustrated in **Figure 5-1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of the proposed project.

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role players with a key focus on supporting renewable energy projects. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As Solar PV developments are a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions), various statutory bodies are likely to be involved in the approval process of a Solar PV project and the related statutory environmental assessment process. Please refer to **Figure 5-1:**

[6] Information obtained from Wikipedia on 11 December 2022: Web address: https://en.wikipedia.org/wiki/South_African_energy_crisis#:~:text=By%20the%20end%20of%20September,number%20of%20power%20station%20breakdowns.

[7] Information obtained from article on web on 11 December 2022: What is Load Shedding Archived 9 April 2008 at the Wayback Machine: Web address: https://web.archive.org/web/20080409233818/http://www.eskom.co.za/live/content.php?Item_ID=5608

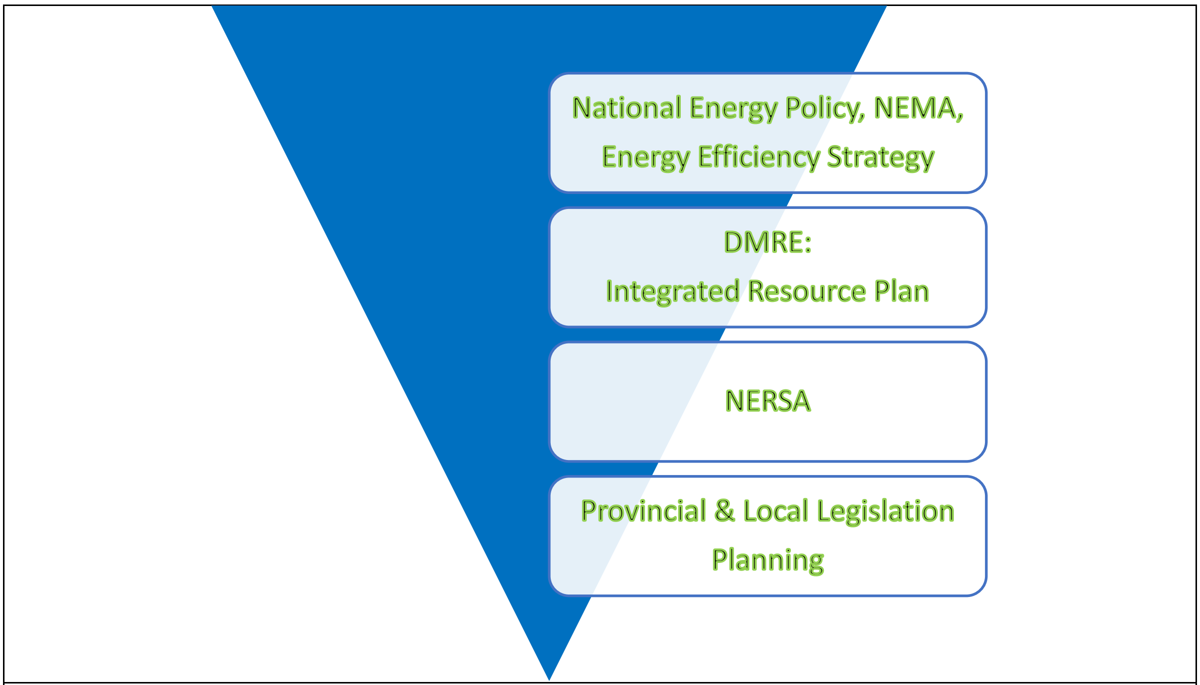

Figure 5-1: Regulatory Hierarchy of Electricity and Planning Documents

At a National Level the key regulatory agencies include the following key role players as noted in **Figure 5-2**:

DMRE	• DMRE is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity. Furthermore, the Department is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (Act No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resources that may occur within the project site and development area.
NERSA	• NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
DFFE	• DFFE is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations, 2014 (GN R326) as amended. DFFE is the Competent Authority for this project (as per GN R779 of 01 July 2016), and is charged with granting the EA for the project under consideration.
SAHRA	• SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
SANRAL	• This Agency is responsible for the regulation road maintenance of all national road routes.
DWS	• DWS responsible for effective and efficient water resource management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e., Water Use License (WUL) and General Authorisation (GA)).
DARDLR	• DARDLR is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agriculture sector.

Figure 5-2: National Level Key Regulatory Agencies

5.2 National Legislation

5.2.1 Constitution of the Republic Of South Africa Act (NO 108 of 1996)

Administering Authority: National Government

The Constitution of the Republic of South Africa (Act 108 of 1996) states that everyone has a right to a non-threatening environment and that reasonable measures are applied to protect the environment.

This includes preventing pollution and promoting conservation and environmentally sustainable development, while promoting justifiable social and economic development.

The Constitution and Bill of Rights contains a number of provisions, which are relevant to securing the protection of the environment. The Constitution of the Republic of South Africa Act places a duty on the State and citizens to protect the environment. Section 24 provides that:

"*Everyone has the right –*

(b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that

i) prevent pollution and ecological degradation.

ii) promote conservation.

iii) secure ecologically sustainable development and use of natural resources while promoting

iv) justifiable economic and social development".

5.2.2 National Environmental Management Act (NEMA), ACT 107 of 1998

Administering Authority: *DFFE*

LEDET

NEMA provides for co-operative governance by establishing principles and procedures for decision-makers on matters affecting the environment. An important function of the Act is to serve as an enabling Act for the promulgation of legislation to effectively address integrated environmental management. Some of the principles in the Act are accountability; affordability; cradle to grave management; equity; integration; open information; polluter pays; subsidiary; waste avoidance and minimisation; co-operative governance; sustainable development; and environmental protection and justice.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues and allows for the resolution of the issues reported on in the Scoping and EIA reports as well as dialogue with interested and affected parties (I&APs).

The NEMA (Act 107 of 1998) is an all-encompassing act regulating various aspects of natural resource use, integrated environmental management and pollution control. The Act provides for:

- the right to an environment that is not harmful to the health and well-being of the South African people;
- sustainable development, environmental protection, equitable distribution of natural resources; and;
- the formulation of environmental management frameworks.

NEMA Listing Notices

Environmental regulations were promulgated in terms of NEMA in 2014 to guide environmental management. These regulations include:

- GNR. 326. The Minister of Environmental Affairs, hereby make the regulations pertaining to environmental impact assessments, under sections 24(5) and 44 of the National Environmental Management Act,1998 (Act No.107 of 1998).
- GNR. 327. The purpose of this Notice is to identify activities that would require environmental authorizations prior to commencement of that activity and to identify CAs in terms of section 24(2) and 24(D) of the Act.
- GNR. 325.The purpose of this notice is to identify activities that would require an environmental authorization prior to the commencement of that activity and to identify CAs in terms of sections 24(2) and 24(D) of this Act.
- GNR. 324. The purpose of this notice is to list activities and identify CAs under sections 24(2) and 24(D) of the Act, where environmental authorisation is required prior to commencement of that activity in specific identified geographical area only.

Listed activities from these Regulations which will be triggered by the proposed project are provided in the Table 5-1.

Table 5-1. List of R327, 325 and R324, as amended activities applicable to the proposed solar park development.

RELEVANT GOVERNMENT NOTICE	ACTIVITY	LISTED ACTIVITY	APPLICABILITY TO THE PROJECT
Listing Notice 1: No. R. 327 of 2017			**BUFFALO 1 SOLAR PARK**
Listing Notice 1: No. R. 327 of 2017	11	*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;*	The Buffalo 1 Solar Park will entail the construction and operation of: an on-site 22kV/132kV step-up substation, equipped with high-voltage power transformers, stepping up the voltage from 22 kV (or 33kV) to 132kV, and one 132kV busbar with metering and protection devices (switching station); one 132 kV power line (double circuit), approximately 13.2 km long, connecting the on-site 132kV switching station to the 132 kV busbar of the Eskom Medupi Substation (Connection Alternative 2). Should the connection solution proposed by Eskom be at 400kV (Connection Alternative 1): one 132 kV power line (double circuit), approximately 10.0 km long, connecting the on-site 132kV switching station to the 132 kV busbar of the 132kV/400kV step-up substation and 400kV switching station to be built in proximity of the Eskom Medupi Substation (Connection Alternative 1). The connection may entail the extension of the 132kV busbar of the Eskom Medupi Substation for the establishment of new 132kV bus-bays.
Listing Notice 1: No. R. 327 of 2017	12	The development of – (xii) infrastructure or structures with a physical footprint of 100m^2. or more (c) within 32m of a watercourse, measured from the edge of a watercourse	The proposed Buffalo 1 132kV powerline will intercept wetlands that have been identified as per the National Freshwater Priority Areas (NFEPA) database and as per specialist study. The interception of these watercourses will exceed an area of 100 m^2.
Listing Notice 1: No. R. 327 of 2017	19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres	The proposed Buffalo 1 132kV powerline will intercept wetlands that have been identified as per the delineation of the appointed wetland specialist. The interception of these watercourses will exceed a volume of 10 m^3.
Listing Notice 1: No. R. 327 of 2017	24	The development of a road— (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres	Multiple internal roads will be constructed for the purpose of servicing the solar parks. Widths of the proposed internal roads are approximately 8 m. During construction phase, access points and some of the internal roads will have a reserve wider than 13.5 m to allow the transportation of abnormal goods (e.g. power transformers, etc.).
Listing Notice 1: No. R. 327 of	28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used	The footprint of the proposed Buffalo 1 Solar Park will have an extension of approximately 500 ha. During the construction phase, the existing vegetation within the proposed footprint will be cleared.

RELEVANT GOVERNMENT NOTICE	ACTIVITY	LISTED ACTIVITY	APPLICABILITY TO THE PROJECT
2017		for agriculture, game farming, equestrian purposes 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.	
Listing Notice 2: No. R. 325 of 2017			
Listing Notice 2: No. R. 325 of 2017	1	*The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.*	The Maximum Export Capacity of the proposed solar project will be up to 240 MW at the delivery point.
Listing Notice 2: No. R. 325 of 2017	9	Development of facilities or infrastructure for transmission and distribution of electricity with a capacity of 275 kV or more, outside urban areas or industrial complex. excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (c) within an existing transmission line servitude	Should the connection solution proposed by Eskom be at 400kV, the proposed project will require the construction and operation of: • one 132kV/400kV step-up substation with high-voltage power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), to be built in proximity of the Eskom Medupi Substation (Connection Alternative 1); • One 400 kV power line, approximately 1.3 km long, connecting the on-site 400kV switching station to the 400 kV busbar of the Eskom Medupi Substation (Connection Alternative 1). The connection may entail the extension of the 400V busbar of the Eskom Medupi Substation for the establishment of new 400kV bus-bays.
Listing Notice 2: No. R. 325 of 2017	15	The clearance of an area of 20 hectares or more of indigenous vegetation.	The proposed development will see to the clearance of approximately 600 ha of indigenous vegetation.
Listing Notice 3: No. R. 324 of 2017			
Listing Notice 3: No. 1R. 324 of 2017	4	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *e. Limpopo* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;*	In order to provide access to the various sections of the proposed development, the construction of numerous access roads will be required. It is expected that these roads will have a width up to 8 m. During construction phase, access points and some of the internal roads will have a reserve wider than 13.5 m to allow the transportation of abnormal goods (e.g. power transformers, etc.).

RELEVANT GOVERNMENT NOTICE	ACTIVITY	LISTED ACTIVITY	APPLICABILITY TO THE PROJECT
		(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas;*	
Listing Notice 3: No. R. 324 of 2017	12	*The clearance of an area of 300 square metres or more of indigenous vegetation* *e. Limpopo* *ii. Within critical biodiversity areas identified in bioregional plans;*	The proposed development will see to the clearance of approximately 500 ha of vegetation. The screening tool has identified CBA2 on Buffalo 1 Solar Park development area.
Listing Notice 3: No. R. 324 of 2017	14	*The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs—* *(a) within a watercourse;* *e. Limpopo* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.*	The proposed development will intercept wetlands that have been identified as per the National Freshwater Priority Areas (NFEPA) database. The interception of these watercourses will exceed an area of 10 m^2. The proposed Solar Park is located in a CBA 2 and adjacent to the Tierkop Private Nature Reserve and approximately 4.48 km from Koedoe Private Nature Reserve.

5.2.3 National Environmental Management: Biodiversity Act (NEMBA) (ACT NO. 10 OF 2004)

Administering Authority: DFFE

The National Environmental Management Biodiversity Act (NEMBA) provides for listing of threatened or protected ecosystems, in one of four categories: **critically endangered** (CR), **endangered** (EN), **vulnerable** (VU) or **protected**. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction and to preserve witness sites of exceptionally high conservation value. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems.

In terms of the EIA Regulations 2014, as amended a Basic Assessment is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem if more than 300 square metres are transformed.

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) addresses, amongst others:

- Biodiversity planning and monitoring;
- Protection of threatened or protected ecosystems;
- Protection of threatened or protected species; and
- The control of alien species, invasive species and genetically modified organisms.

5.2.4 National Environmental Management: Protected Areas Act (NEMPAA) (ACT NO. 57 OF 2003)

Administering Authority: DFFE

The National Environmental Management: Protected Areas (NEMPAA) intends to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. It furthermore provides for the establishment of a national register of all national, provincial and local protected areas.

The proposed project is located within 10 kilometres from nature reserves designated as protected areas in terms of NEMPAA. Buffers around protected areas are drawn at distances as defined in Listing Notice 3 of the EIA Regulations, 2014 (as amended). The activities likely to be triggered in Listing Notice 3 are applied for and included in Table 5-1– *section 5.*

5.2.5 National Environmental Management: Waste Act (NEMWA) (ACT NO. 59 OF 2008)

Administering Authority:	Hazardous Waste:	DFFE
	General Waste:	LEDET

The National Environmental Management: Waste Act (NEMWA) came into effect on 1 July 2009. Section 19 of the NEMWA provides for listed waste management activities and states in Section

19(1) that the Minister may publish a list of waste management activities that have or are likely to have a detrimental effect on the environment. Such a list was published in GN 921 of 29 November 2013, as amended identifying those waste management activities that require a Waste Management Licence in terms of the Act.

Activities are defined within Category A, Category B and Category C.
Some key definitions from this Act include:

"Disposal" – the burial, deposit, discharge, abandoning, dumping, placing or release of any waste into, or onto, any land.

"General waste" means waste that does not pose an immediate hazard or threat to health or to the environment, and includes –

- domestic waste;
- building and demolition waste;
- business waste: and
- inert waste;

"Hazardous waste" – any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

"Storage" – the accumulation of waste in a manner that does not constitute treatment or disposal of that waste.

"Waste" – any substance, whether or not that substance can be reduced, re-used, recycled and recovered –

That is surplus, unwanted, rejected, discarded, abandoned or disposed of;

Which the generator has no further use of for (he purposes of production;

That must be treated or disposed of; or

That is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector, but –

A by-product is not considered waste; and

Any portion of waste, once re-used, recycled and recovered, ceases to be waste.

No authorisation will be required in terms of activities defined within Category A and Category B. The National Norms and Standards (activities listed in Category C) must be adhered to with regards to waste management during construction and operation:

- National norms and standards for the storage of waste (GN. R 926 of 2013);
- Waste Classification and Management Regulations (GN. R 634 of 2013);

- National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN. R 635 of 2013); and
- National Norms and Standards for the Disposal of Waste to Landfill (GN. R 636 of 2013 of 2013).

5.2.6 National Environmental Management: Air Quality Act, ACT 39 of 2004

The National Environmental Management Air Quality Act (NEMAQA) was a landmark act which focused on the ambient air quality and the receptor as opposed to the previous act which defined air quality by regulating the emissions which impact air quality. As a result of the NEMAQA, standards for ambient air quality have been developed which are managed through the local municipalities or provincial municipalities.

The NEMAQA enabled the publication of the Listed Activities and Minimum Emission Requirements, which require emitters to apply for and obtain an Atmospheric Emissions License (AEL) related to installations such as combustion installations in various industries.

The NEMAQA has no sections of relevance to the proposed solar park development.

5.2.7 National Forests Act (ACT NO. 84 OF 1998)

Administering Authority: DFFE

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated*".

A terrestrial biodiversity survey has been undertaken the during the EIA phase and is discussed in more detail in section 8 of this report.

5.2.8 Fencing Act (ACT NO. 31 OF 1963)

Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.

5.2.9 Conservation Of Agricultural Resources Act (CARA) (ACT NO. 43 OF 1983)

Administering Authority: DALRRD

DoA

The mandate of the Conservation and Agricultural Resources Act (CARA) is to conserve "natural agricultural resources" (the soil, the water sources and the vegetation, excluding weeds and invader plants) through production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants.
Section 6 of the Act concerns the control measures which the following may be applicable to IPPs (subsections (2) (f), (g) and (o)):

- the regulating of the flow pattern of run-off water;
- the utilization and protection of the vegetation; and,
- the construction, maintenance, alteration or removal of soil conservation works or other structures on land.

Regulation 8 regulating the flow pattern of run-off water states that no land user shall in any manner whatsoever divert any run-off water from a water course on his farm unit to any other water course, except on authority of a written permission by the executive officer. No land user shall effect an obstruction that will disturb the natural flow pattern of run-off water on his farm unit or permit the creation of such obstruction unless the provision for the collection, passing through and flowing away of run-off water through, around or along that obstruction is sufficient to ensure that it will not be a cause for excessive soil loss due to erosion through the action of water or the deterioration of the natural agricultural resources.

The use of agricultural land for energy generation will need to be well motivated to the Department of Agriculture, since according to the Department, good productive agricultural land is in short supply in South Africa. The Department of Agriculture's Guideline Document excludes areas of high agricultural potential from being developed for wind generation energy purposes (and it is presumed that the same will apply for solar energy developments).

The EMPr, which will be included within the EIAR, will include the compulsory removal of invader plants from the study area. Regulation 2 of CARA deals with the cultivation of virgin soils. It is required that an application be submitted to the extension office of DALRRD in terms of Section 4A of the Forest Act (Act No 68 of 1972) at least three months prior to initiating the cultivation of virgin soil.

5.2.10 National Heritage Resources Act (NHRA) (ACT NO. 25 OF 1999)

Administering Authority: SAHRA
LIHRA

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (NHRA). The SAHRA and the provincial heritage resources agency in the Limpopo Province (LIHRA), is registered as a Stakeholder for this environmental process.

In terms of Section 38 of the NHRA, the Heritage Resources Agency will comment on the detailed Heritage Impact Assessment (HIA) where certain categories of development are proposed. Section 38(8) also makes provision for the assessment of heritage impacts as part of an EIA process.

The NHRA requires relevant authorities to be notified regarding this proposed development, as the following activities are relevant:

- the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
- any development or other activity which will change the character of a site exceeding 5 000 m² in extent;
- the re-zoning of a site exceeding 10 000m² in extent.

Furthermore, in terms of Section 34(1), no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the SAHRA, or the responsible resources authority.

Nor may anyone destroy, damage, alter, exhume, or remove from its original position, or otherwise disturb, any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority, without a permit issued by the SAHRA, or a provincial heritage authority, in terms of Section 36(3).

In terms of Section 35(4), no person may destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object, without a permit issued by the SAHRA, or the responsible resources authority.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed development, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GNR 668).

An Archaeological Heritage and Paleontological Impact Assessment (as required by the Screening Report) has been undertaken during the EIA phase. These assessment reports will be submitted to SAHRA and FSHRA simultaneously with this draft EIAR for input and guidance on further requirements.

5.2.11 National Water Act (NWA) (ACT NO. 36 OF 1998)

Administering Authority: DWS

The NWA (Act No. 36 of 1998) administered by the DWS aims to manage and protect the national water resources to achieve sustainable use of water for the benefit of all water users. In accordance with the provisions of the NWA (No. 36 of 1998), all water uses must be licensed with the Competent Authority (i.e., the Regional DWS or the relevant Catchment Management Agency (CMA)). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

In the event that the flow of water in the freshwater/drainage features is affected and the bed, banks or course characteristics are altered, then a water use authorisation would be required. This will need to be in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GNR 267), or a GA registered in accordance with the requirements of the Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received and the project selected as Preferred Bidder under the REIPPPP or similar programme. This is in line with the requirements of DWS.

Authorisation of these water uses will form part of a separate process to the DWS.

5.2.12 Mineral And Petroleum Resources Development Act (MPRDA) (ACT NO. 28 OF 2002)

Administering Authority: DMRE

This Act makes provisions for equitable access to and sustainable development of South Africa's mineral and petroleum resources. Section 53 (1) stipulates that Subject to subsection (2), any person who intends to use the surface of any land in any way which may be contrary to any object of this Act or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.

A Section 53 application has been submitted to DMRE for approval of the sterilisation of mineral resources in terms of the proposed change in land-use which will prevent the extraction of mineral resources during the life of the project.

5.2.13 Hazardous Substances Act (HSA) (ACT NO. 15 OF 1973)

The Hazardous Substances Act (HSA) was promulgated to provide for the control of substances which may cause injury, ill-health or death. Substances are defined as hazardous if their inherent nature is: toxic, corrosive, irritant; strongly sensitising, flammable and pressure generating (under certain circumstances) which may injure cause ill-health, or death in humans. HSA is administered by the Department of Health in consultation with other departments.

The HSA also provides for matters concerning the division of such substances or products into four groups in relation to the degree of danger, the prohibition and control of the importation, manufacture, sale, use, operation, application and disposal of such substances.

- Group 1 substances include all hazardous substances (as defined above);

- Group 2 substances include mixtures of Group 1 substances;
- Group 3 substances include substances found in certain electronic products (i.e. product with an electronic circuit); and
- Group 4 substances include all radioactive substances.

Noted with regards to the proposed BESS and storage of dangerous goods during the Project Life Cycle.

5.2.14 Astronomy Geographic Advantage Act (ACT NO. 21 OF 2007)

Administering Authority: SARAO
SKA South Africa

The purpose of the Act is to preserve the geographic advantage areas that attract investment in astronomy. The entire Northern Cape Province, excluding the Tsantsabane Municipality, has been declared an astronomy advantage area. The Northern Cape optical and radio telescope sites were declared core astronomy advantage areas. The Act allowed for the declaration of the Southern Africa Large Telescope (SALT), Meerkat and SKA as astronomy and related scientific endeavours that has to be protected.

The closest SKA station has been identified as Rem-Opt-11, at approximately 262 km from the proposed solar PV facility. Based on the distance to the nearest SKA station, the facility is considered to poses a low risk of detrimental impact on the SKA. The SKA Project Office and SARAO is registered as stakeholders in this environmental process and will be given the opportunity to provide comments and/or input during the Public Participation Process.

5.2.15 National Energy Act (ACT NO. 34 OF 2008)

Administering Authority: DMRE

The National Energy Act, 2008 (Act No. 34 of 2008) was promulgated in 2008. One of the objectives of the Act was to promote diversity of supply of energy and its sources. In this regard, the preamble makes direct reference to renewable resources, including solar and wind.

5.2.16 Municipal Systems Act (MSA) (ACT NO. 32 OF 2000)

Administering Authority: Lephalale Local Municipality
Waterberg District Municipality

The Municipal Systems Act (MSA) concerns itself with the internal systems and administration of municipalities. The Act requires that the Constitution and other national level acts (e.g. NEMA) be incorporated into strategic planning at a municipal CA responsible for administrating the MSA is dependent on the municipality in which the activity is taking place.

Development at a local level is the primary focus as the act separates the responsibility of a service authority with that of a service provider; sets out the roles of officials and councillors and provides for a range of requirements; including IDPs, performance management and tariff setting.

The Act accordingly regulates municipal service delivery and provides a comprehensive range of service delivery mechanisms through which municipalities may provide municipal services. It explains the process to be applied and the criteria to be considered in reviewing and selecting municipal service delivery mechanisms. Under the Act, every municipal council must adopt a single, inclusive and strategic plan (i.e., IDP) for the development of the municipality which amongst others:

- links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality; and,
- aligns the resources and capacity of the municipality with the implementation of the plan.

At a municipal level, these plans may call for the implementation of renewable energy projects and should be referenced in applications to motivate for relevant environmental authorisations.
IPPs will consult with the various relevant municipal authorities and development plans as applicable to the proposed project. The Lephalale Local Municipality and Waterberg District Municipality are registered as a key stakeholder in this environmental process and are referenced in the application for environmental authorisation.

5.2.17 National Infrastructure Plan

The South African Government adopted a National Infrastructure Plan in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs and strengthening the delivery of basic services.

As part of the National Infrastructure Plan, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). The Committee identified and developed 18 strategic integrated projects (SIPS). The SIPs cover social and economic infrastructure across all nine provinces (with an emphasis on lagging regions). The proposed project is aligned to at least three SIP's. The three energy SIPS are SIP 8, 9 and 10 as described below:

SIP 8: Green energy in support of the South African economy

- Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010).
- Support bio-fuel production facilities.

SIP 9: Electricity generation to support socio-economic development

- Accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.
- Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.

SIP 10: Electricity transmission and distribution for all

- Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development.

- Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity.

5.2.18 On The Energy Policy Of The Republic Of South Africa

Investment in renewable energy initiatives, such as the proposed project, is supported by the White Paper on Energy Policy for South Africa (December 1998). In this regard, the document notes:

- "Government policy is based on an understanding that renewables are energy sources in their own right, are not limited to small-scale and remote applications, and have significant medium and long-term commercial potential".
- "Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future".

The support for renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

5.2.19 White Paper on Renewable Energy

The White Paper on Renewable Energy (November 2003) (further referred to as the White Paper) supplements the White Paper on Energy Policy, which recognizes that the medium and long-term potential of renewable energy is significant. This Paper sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa.

The White Paper notes that while South Africa is well endowed with renewable energy resources that have the potential to become sustainable alternatives to fossil fuels, these have thus far remained largely untapped. As signatory to the Kyoto Protocol, Government is determined to make good the country's commitment to reducing greenhouse gas emissions (GHG). To this purpose, Government has committed itself to the development of a framework in which a national renewable energy framework can be established and operate.
Apart from the reduction of greenhouse gas emissions, the promotion of renewable energy sources is aimed at ensuring energy security through the diversification of supply (in this regard, also refer to the objectives of the National Energy Act).

The long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels.

5.2.20 Integrated Energy Plan (2016)

The Integrated Energy Plan (IEP) indicated that a diversified energy mix with a reduced reliance on a single or a few primary energy sources must be pursued. In terms of renewable energy, wind and solar are identified as the key options.

With reference to the REIPP Procurement Programme, the IEP notes:

- The REIPP Procurement Programme should be extended, and new capacity should be allocated through additional bidding windows in order ensure the ongoing deployment of renewable energy technologies.
- Experience and insights gained from the current procurement process should be used to streamline and simplify the process.

The implementation of REIPP projects in subsequent cycles of the programme should be aligned with the spatial priorities of provincial and local government structures in the regions that are selected for implementation, in line with the SDPs. This will ensure that there is long-term, sustainable infrastructure investment in the areas where REIPP projects are located. Such infrastructure includes bulk infrastructure and associated social infrastructure (e.g., education and health systems). This alignment will further assist in supporting the sustainable development objectives of provincial and local government by benefiting local communities.

5.2.21 Integrated Resource Plan

In terms of renewable energy six bidding rounds have been completed for renewable energy projects under the REIPP Procurement Programme. The most dominant technology in the Integrated Resource Plan (IRP) 2019 is renewable energy from wind and solar PV technologies, with wind being identified as the stronger of the two technologies. There is a consistent annual allocation of 1 600MW for wind technology commencing in the year 2022 up to 2030. The solar PV allocation of 1 000MW per year is incremental over the period up to 2030, with no allocation in the year 2024 (being the year the Koeberg nuclear extension is expected to be commissioned) and the years 2026 and 2027 (presumably since 2 000MW of gas is expected in the year 2027). The IRP 2019 states that although there are annual build limits, in the long run such limits will be reviewed to take into account demand and supply requirements.

5.2.22 National Development Plan

The National Development Plan (NDP) contains a plan aimed at eliminating poverty and reducing inequality by 2030 making this one of the guiding objectives of the NDP over the next 20 years. The NDP identifies 9 key challenges and associated remedial plans. Managing the transition towards a low carbon national economy is identified as one of the 9 key national challenges. Expansion and acceleration of commercial renewable energy is identified as a key intervention strategy.

5.2.23 The New Growth Path Framework

The aim of the New Economic Growth Path Framework is to enhance growth, employment creation and equity. Central to the New Growth Path is a massive investment in infrastructure as a critical driver of jobs across the economy. In this regard, the framework identifies investments in five key areas namely: energy, transport, communication, water and housing.

The New Growth Path also identifies five other priority areas as part of the programme, through a series of partnerships between the State and the private sector. The Green Economy as one of the five priority areas to create jobs, including expansions in construction and the production of technologies for solar, wind and biofuels. In this regard, clean manufacturing and environmental services are projected to create 300 000 jobs over the next decade.

5.2.24 DFFE screening tool and protocols

Administering Authority: DFFE

The DFFE Screening Tool (**Appendix I**) was generated for the proposed project and used to determine various theme sensitivities (Table 9-3**)** in terms of sections 24(5)(a) and (h) and 44 of the NEMA, within the development footprint. Based on protocols (as stipulated in Government Notices no. 43110 and no. 42946), the level (Low, Medium, High, or Very high) of these sensitivities needs to be confirmed or disputed by a site verification.

Following the site verification, a Compliance Statement or a Full Impact Assessment by a specialist was compiled based on the sensitivity level of each theme. Where the protocols were not followed i.e. a Compliance Statement or Full Impact Assessment was not done, valid and detailed reasons, based on the site verification, was outlined.

In addition to the theme sensitivities, the required specialist studies were also identified by the DFFE Screening Tool. The need for a specialist study is dependent on whether the sensitivity of the respective theme has been confirmed or disputed with a site verification. Where a specialist study has not been conducted as suggested by the DFFE Screening Tool, a motivation to exclude the study has been outlined with reference to the site verification.

5.3 Provincial Legislation

This section deals with provincially promulgated or provincially applicable legislation associated with the proposed project. The main regulatory agencies in Limpopo include the following key role players as indicated in Error! Reference source not found.

LEDET	• LEDET is the commenting authority for the EIA process for the project and is responsible for issuing of biodiversity and conservation-related permits.
Limpopo Department of Public Works, Roads & Infrastructure	• This Department provides coordination of planning, design, construction and maintenance of social and economic infrastructure.
LIHRA	• This Department identifies, conserves and manages heritage resources throughout the Limpopo Province.

Figure 5-3: Provincial regulatory agencies in Limpopo

5.3.1 Limpopo Environmental Management Act (LEMA) (ACT 7 of 2003)

The LEMA (No. 7 of 2003) deals with the conservation of wild animals, freshwater fish and the conservation and protection of flora in the Limpopo Province. Animals and plants are both listed in the schedules with different degrees of protection afforded to each.

In the province, the LEMA was passed in 2003 to combat environmental crime. Environmental crime can be classified by the following categories, any prohibited activity that harms or negatively affects or has the potential to harm or negatively affect the environment or the health, and well being of people, prohibited activities that cause pollution or ecological degradation, and prohibited activities which include the protection and conservation of the environment as a whole.[8]

[88] Limpopo Development Plan (LDP) 2015 – 2019, dated March 2015. 122p.

5.3.2 Limpopo Spatial Developent Framework

The Limpopo Development Plan (LDP) reflects steps in an ongoing journey to eliminate poverty, reduce inequality and improve the quality of life of our citizens, as visualised in the NDP. Various objectives in the LDP are listed in Table 5.3:

The LDP noted that Limpopo province is perfectly situated to develop renewable energy projects[9].

Table 5-2: Key outcomes of the Limpopo Spatial Development Framework.

LDP Outcome 4: Decent Employment through Inclusive Growth A long-term vision is provided towards dealing with the challenges of unemployment, inequality and creating a more inclusive society.
LDP Outcome 5: Skilled and Capable Workforce The LDP recognise education and training of the highest quality as a leading outcome by improved learning outcomes.
LDP Outcome 6: Competitive Economic Infrastructure Limpopo needs to invest in a network of economic infrastructure designed to support medium- and long-term economic and social objectives. This is a precondition for providing basic services such as electricity, water, sanitation, telecommunications and public transport, and it needs to be robust and extensive enough to meet industrial, commercial and household needs.
LDP Outcome 10: Environmental Protection The LDP state that “by 2030, Limpopo’s transition to an environmentally sustainable, climate-change resilient, lowcarbon economy and just society will be well underway”.

5.3.3 Limpopo Conservation Plan

The LCP maps the distribution of the Province’s known biodiversity into seven categories, ranked according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for biodiversity features. The categories are:

1. Protected Areas - already protected and managed for conservation.
2. Irreplaceable Areas - no other options available to meet conservation targets - protection crucial.
3. Significant Areas - very limited choice for meeting targets - protection needed.
4. Important and Necessary Areas with greater choice in meeting targets - protection needed;
5. Ecological and Processes Corridors - mixed natural and partially transformed areas, identified for long term connectivity.
6. Areas of Least Concern – natural areas with the least potential conflict with development; and
7. Transformed Areas - areas that do not contribute to meeting target.

The Limpopo Biodiversity Conservation Plan (**Figure 5-4**) aim to provide information to environmental regulators to be pro-active in dealing with competing land-use options considered for economic development and biodiversity conservation. The plan focus on critically important conservation areas, without neglecting the responsibility to improve the quality of life of people through sustainable development. Biodiversity Conservation Plans should be seen as the vehicle for the Biodiversity

[9] Limpopo Development Plan (LDP) 2015 – 2019, dated March 2015. 122p.

Sectors' a primary input into the various multi-sectoral planning tools such as SDF's. It should also be used as an input in development decision making, including SEAs and EIAs.

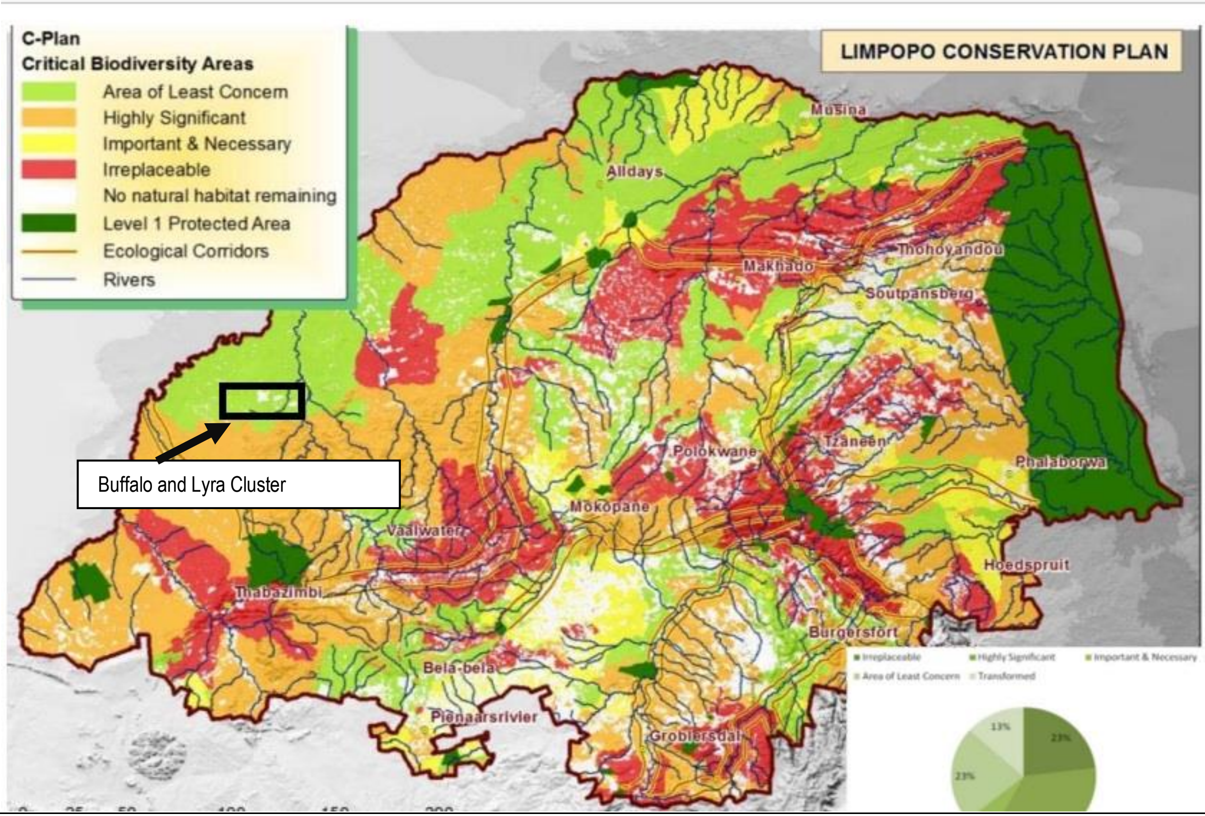

Figure 5-4: The project site in relation to the Limpopo Biodiversity Conservation Plan.

5.4 Local Authorities

5.4.1 Waterberg District Municipality

Waterberg District Municipality as a category C municipality comprises of five local municipalities which is Bela-Bela, Lephalale, Thabazimbi, Mogalakwena and Modimolle-Mookgophong. The Waterberg District is located within the southwestern part of the Limpopo Province. It is adjacent to the South African border with Botswana to the west and is bordered by the North West, Gauteng and Mpumalanga provinces to the south. Limpopo's Sekhukhune and Capricorn District Municipalities border the WDM to the east. Informed by its powers and functions, it cannot provide basic services, but it coordinates support in line with section 88(2) of the municipal system act to its local's municipalities. Within its scope of powers and functions WDM provide disaster management and firefighting services[10].

The Waterberg IDP regard renewable energy as a key component in their goal to provide bulk basic services such as electricity and transition to a low carbon economy. The IDP has made financial provision (R14 000 000 000) for renewable energy over the long term[11].

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[10] Waterberg District Municipality 2022 / 2023 Final IDP. 377p.

5.4.2 Lephalale Local Municipality

The Municipality is located in the North-western part of Waterberg District of Limpopo Province of the Republic of South Africa. It borders with four Local Municipalities (Blouberg, Modimolle-Mookgophong, Mogalakwena and Thabazimbi). Its North-Western border is also part of the International Border between South Africa and Botswana. The Lephalale Municipality is the biggest Municipality in the Limpopo Province (covering 14 000km²). The town of Lephalale is located a mere 280 km from Tshwane and a recognized gateway to Botswana and other Southern African Countries. The town Lephalale (Ellisras / Onverwacht / Marapong) is located approximately 40 km from the border of Botswana. It is situated between 23˚30' and 24˚00' south latitude 27˚30' and 28˚00' east longitude . Lephalale Municipal area's contribution of mining to GDP is significant at 59.21%. Electricity contributes 11.33% to the GDP and its contribution to the Waterberg electricity sector is at 69.65%. Other sectors that have a significant contribution to the Waterberg GDP per sector include agriculture, mining, and manufacturing. Agriculture (38.85%) is the sector that employs the largest part of the workforce and is followed by community services (15.71%)[12]. Lephalale Local Municipality has been blessed with natural resources that give it a competitive and comparative advantage in Mining, Energy, Tourism and Agriculture. The Lephalale IDP has earmarked renewable energy as a strategic goal and intervention.

5.5 Guidelines, Policies And Authoritative Reports

5.5.1 EIA Guideline for Renewable Energy Projects

The Minister of DFFE published the EIA Guideline for Renewable Energy in terms of section 24J of the NEMA on 16 October 2016.

In pursuit of promoting the country's Renewable Energy development imperatives, the Government has been actively encouraging the role of IPPs to feed into the national grid. Through its REIPPPP, the DoE has been engaging with the sector in order to strengthen the role of IPPs in renewable energy development. Launched during 2011, the IPPs Procurement Programme is designed so as to contribute towards a target of 3 725MW, and towards socio-economic and environmentally sustainable development, as well as to further stimulate the renewable industry in South Africa.

The table below (
Table 5-3) indicates the potential impacts associated with the full range of solar energy project development, together with the applicable and relevant legislation. It is stipulated that these are (under normal circumstances) the main impacts, but other impacts maybe relevant depending on project specifics.

Table 5-3 Potential environmental impacts of solar energy projects

Impact Description	Relevant Legislation
Visual Impact	NEMA

[12] Lephalale Integrated Development Plan 2020/2021. 303p.

Impact Description	Relevant Legislation
Land Use Transformation (fuel growth and production)	NEMA, NEMPAA, NHRA
Impacts on Cultural Heritage	NEMA, NHRA
Impacts on Biodiversity	NEMA, NEMBA, NEMPAA, NFA
Impacts on Water Resources	NEMA, NEMICMA, NWA, WSA
Hazardous Waste Generation	NEMA, NEMWA, HSA
Electromagnetic Interference	NEMA
Aircraft Interference	NEMA, MSA
Loss of Agricultural Land	SALA
Sterilization of Mineral Resources	MPRDA

Assuming an IPP project triggers the need for a S & EIR process under the EIA Regulations 2014, as amended, included in the assessment process is the preparation of an EMPr. Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMPr.

Potential measures for solar energy projects include but are not limited to:.

- *Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats;*
- *Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;*
- *Utilise existing roads and servitudes as much as possible to minimise project footprint;*
- *Site projects to avoid construction too near to pristine natural areas and communities;*
- *Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;*
- *Fence sites as appropriate to ensure safe restricted access;*
- *Ensure dust abatement measures are in place during- and post-construction;*
- *Develop and implement a storm water management plan;*
- *Develop and implement a waste management plan; and,*
- *Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.*

5.5.2 Best Practice Guidelines Birds & Solar ENERGY (2017)

The Best Practice Guidelines for Birds and Solar Energy[13] (2017) proposed by the Birds and Renewable Energy Specialist Group (BARESG) (convened by BirdLife South Africa and the Endangered Wildlife Trust) contain guidelines for assessing and monitoring the impact of solar generation facilities on birds in Southern Africa. The guidelines recognise the impact that solar energy may have on birds, through for example the alteration of habitat, the displacement of populations from preferred habitat, and collision and burn mortality associated with elements of solar hardware and ancillary infrastructure; and the fact that the nature and implications of these effects are poorly understood.

The guidelines are aimed at EAPs, avifaunal specialists, developers and regulators and propose a tiered assessment process, including:

(i) Preliminary avifaunal assessment – an initial assessment of the likely avifauna in the area and possible impacts, preferably informed by a brief site visit and by collation of available data; also including the design of a site-specific survey and monitoring project should this be deemed necessary.

(ii) Data collection – further accumulation and consolidation of the relevant avian data, possibly including the execution of baseline data collection work (as specified by the preliminary assessment), intended to inform the avian impact study.

(iii) Impact assessment – a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring if this was deemed a requisite at preliminary assessment.

(iv) Monitoring – repetition of baseline data collection, plus the collection of mortality data. This helps to develop a complete before and after picture of impacts, and to determine if proposed mitigation measures are implemented and are effective or require further refinement. Monitoring may only be necessary for projects with the potential for significant negative impacts on birds (i.e., large area affected and / or vulnerable species present).

In terms of the guidelines the quantity and quality of baseline data required to inform the assessment process at each site should be set in terms of the size of the site and the predicted impacts of the solar technology in question, the anticipated sensitivity of the local avifauna (for example, the diversity and relative abundance of priority species present, proximity to important flyways, wetlands or other focal sites) and the amount of existing data available for the area.

Data collection could vary from a single, short field visit (Regime 1, for e.g. at a small or medium sized site with low avifaunal sensitivity), to a series of multi-day survey periods, including the collection of various forms of data describing avian abundance, distribution and movement and spread over 12 months (Regime 3, for e.g. at a large developments located in a sensitive habitat, or which otherwise may have significant impacts on avifauna).

[13] Jenkins AR, Ralston-Paton S & Smit-Robinson HA, 2017 BirdLife South Africa. 2017. Birds & Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in Southern Africa.

Table 5-4 and **Figure** 5-4 is taken from the best practise guidelines and provides a summary of the recommended assessment regimes in relation to proposed solar energy technology, project size, and likely risk).

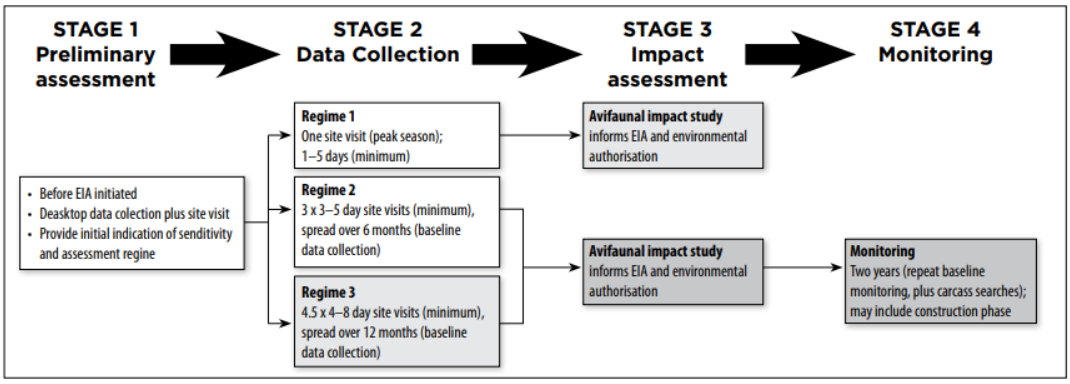

Figure 5-4: Recommended multi-tier process for assessing impacts of solar energy developments in South Africa.

Table 5-4: Recommended avian assessment regimes in relation to proposed solar energy technology project size and known impact risks.

Regime 1: One site visit (peak season); minimum 1-5 days.
Regime 2: Pre- and post-construction; minimum 2-3 x 3-5 days over 6 months (including peak season); carcass searches.
Regime 3: Pre- and post-construction; minimum 4-5 x 4-8 days over 12 months, carcass searches.

Type of technology[1]	Size[2]	Avifaunal Sensitivity[3]		
		Low	Medium	High
All except CSP power tower	Small (<30 ha)	Regime 1	Regime 1	Regime 2
	Medium (30-150 ha)	Regime 1	Regime 2	Regime 2
	Large (>150 ha)	Regime 2[4]	Regime 2	Regime 3
CSP power tower	All	Regime 3		

[1] Different technologies may carry different intrinsic levels of risk, which should be taken into account in impact significance ratings

[2] For multi-phased projects, the aggregate footprint of all the phases should be used. At 3ha per MW, Small = < 10 MW, Medium = 10-50 MW, Large = > 50MW.

[3] The avifaunal sensitivity is based on the number of priority species present, or potentially present, the regional, national or global importance of the affected area for these species (both individually and collectively), and the perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development. For example, an area would be considered to be of high avifaunal sensitivity if one or more of the following is found (or suspected to occur) within the broader impact zone: 1) avifaunal habitat (e.g. a wetlands, nesting or roost sites) of regional or national significance, 2) a population of a priority species that is of regional or national significance, and/or 3) a bird movement corridor that is of regional or national significance, and 4) a protected area and/or Important Bird and Biodiversity Area. An area would be considered to be of medium avifaunal sensitivity if it does not qualify as high avifaunal sensitivity, but one or more of the following is found (or suspected to occur) within the broader impact zone 1) avifaunal habitat (e.g. a wetland, nesting or roost sites) of local significance, 2) a locally significant population of a priority species, 3) a locally significant bird movement corridor. An area would be considered to be of low avifaunal sensitivity if it is does not meet any of the above criteria.

[4] Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

Bird distribution patterns fluctuate widely in response to environmental conditions (e.g., local rainfall patterns, nomadism, migration patterns, seasonality), meaning that a composition noted at a particular moment in time will differ during another time period at the same locality.

5.5.3 International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the proposed project:

- IFC EHS General Guidelines; and,
- IFC Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants.

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, however no Industry Sector EHS Guidelines have been developed for PV solar power to date. The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.
The General EHS Guidelines include consideration of the following:

Environmental:

- Air Emissions and Ambient Air Quality
- Energy Conservation
- Wastewater and Ambient Water Quality
- Water Conservation
- Hazardous Materials Management
- Waste Management
- Noise
- Contaminated Land

Occupational Health and Safety:

- General Facility Design and Operation
- Communication and Training
- Physical Hazards
- Chemical Hazards
- Biological Hazards
- Radiological Hazards
- Personal Protective Equipment (PPE)
- Special Hazard Environments

- Monitoring

Community Health and Safety:

- Water Quality and Availability
- Structural Safety of Project Infrastructure
- Life and Fire Safety (L&FS)
- Traffic Safety
- Transport of Hazardous Materials
- Disease Prevention
- Emergency Preparedness and Response

Construction and Decommissioning:

- Environment
- Occupational Health & Safety
- Community Health & Safety

5.5.4 IFC's Project Developers's Guide To Utility-Scale Solar Photovoltaic Power Plants (2015)

While no Industry Sector EHS Guidelines have been developed for PV Solar Power, the IFC has published a Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (IFC, 2015). Chapter 8 of the Project Developer's Guide pertains to Permits, Licensing and Environmental Considerations, and states that in order to deliver a project which will be acceptable to international lending institutions, environmental and social assessments should be carried out in accordance with the requirements of the key international standards and principles, namely the Equator Principles and IFC's Performance Standards (IFC PS).

Some of the key environmental considerations for solar PV power plants contained within the Project Developer's Guide include:

- Construction phase impacts (i.e., OHS, temporary air emissions from dust and vehicle emissions, noise related to excavation, construction and vehicle transit, solid waste generation and wastewater generation from temporary building sites and worker accommodation).
- Water usage (i.e., the cumulative water use requirements).
- Land matters (i.e., land acquisition procedures and the avoidance or proper mitigation of involuntary land acquisition / resettlement).
- Landscape and visual impacts (i.e., the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities).

- Ecology and natural resources (i.e., habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species).
- Cultural heritage (i.e., impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction).
- Transport and access (i.e., impacts of transportation of materials and personnel).
- Drainage / flooding (i.e., flood risk associated with the site).
- Consultation and disclosure (i.e., consulting with key authorities, statutory bodies, affected communities and other relevant stakeholders as early as possible).
- Environmental and Social Management Plan (ESMP) (i.e., compile an ESMP to ensure that mitigation measures for relevant impacts are identified and incorporated into project construction procedures and contracts).

5.5.5 Sustainability Imperative

The following guideline documents were considered amongst others:

- DEAT (2005) Guideline 3: General Guide to Environmental Impact assessment Regulations 2005, Integrated Environmental Management Guideline Series, DEAT, Pretoria.
- DEAT (2005) Guideline 4: Public Participation, in support of the EIA Regulations 2005,
- Integrated Environmental Management Guideline Series, DEAT, Pretoria.
- DEAT (2006) Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations 2005, Integrated Environmental Management Guideline Series, DEAT, Pretoria.
- DEAT, (2002). Integrated Environmental Management, Information Series 2: Scoping;
- DEAT, (2002). Integrated Environmental Management, Information series 3: Stakeholder Engagement;
- DEAT, (2002). Integrated Environmental Management, Information Series 4: Specialist Studies;
- DEAT, (2002). Integrated Environmental Management, Information Series 12: Environmental Management Plans;
- DWAF, (2008). Updated manual for the identification and delineation of wetlands and riparian areas. Department of Water affairs and Forestry. Pretoria. South Africa.
- DEAT, (2004). Integrated Environmental Management Information Series, DEAT, Pretoria.
- DEAT, (2010). NEMA Draft Implementation guideline. Public participation.
- DEAT, (2010). NEMA Draft Implementation guideline. Companion Document on the Environmental Impact Assessments Regulations

Changes to these guidelines following the amendments to NEMA and the EIA Regulations have been considered.

The general approach to this EIA study has been guided by the principles of IEM and the **EIA Guideline for Renewable Energy Projects (DEA, 2013)** to assist project planning, financing, permitting, and implementation for both developers and regulators, in order to promote efficient, effective, and expedited authorisation processes. Therefore, IEM is a procedure for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (DEAT, 1992). The IEM guidelines intends to encourage a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

Further to the above guidelines, other best practice guideline documents from other provinces and also international sources have been used in the scoping process and has also been used in the EIA phase. Among these guidelines are those developed by the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP)[14], which include:

- Guideline for Determining the Scope of Specialist Involvement in EIA Processes;
- Guideline for the Review of Specialist Input into the EIA Process;
- Guideline for Involving Biodiversity Specialists in EIA Processes;
- Guideline for Involving Heritage Specialists in EIA Processes;
- Guideline for Involving Visual and Aesthetic Specialists in EIA Processes;
- Guideline for Involving Economists in EIA Processes;
- Guideline for Involving Hydro Geologists in EIA Processes;
- Guideline for Environmental Management Plans;
- Guideline for Involving Social Assessment Specialists in EIA Processes; and,
- Guideline on Need and Desirability.

International Guidelines used include:

- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and the Institute of Environmental Management and Assessment, 2002).

The EAP and the specialists involved with the proposed Solar Energy Facility have and shall ensure these guidelines are used and implemented where applicable and appropriate.

5.5.6 Policy On Renewable Energy

The White Paper on Renewable Energy supplements the government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998), which pledges '*Government support for the development, demonstration and implementation of renewable energy sources for both small and large-scale applications*'.[15]

The Government's overall vision for the role of renewable energy in its energy economy is:

[14] The Western Cape Provincial guidelines were considered in the absence of Free State Province Guidelines.
[15] The Department of Minerals and Energy. White Paper on Renewable Energy. November 2003.

- An energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation.

The purpose of this White Paper is to set out government’s principles, goals and objectives for renewable energy. It furthermore commits government to a number of enabling actions to ensure that renewable energy becomes a significant part of its energy portfolio over the next ten years.

With an increasing demand in energy predicted and growing environmental concerns about fossil fuel-based energy systems, the development of large-scale renewable energy supply schemes is strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising the environmental impacts.

6 NEED AND DESIRABILITY

Appendix 3 of the 2014 EIA Regulations (GNR 326), as amended requires that an EIA Report includes a motivation for the need and desirability of the proposed development, including the need and desirability of the activity in the context of the preferred location. The Department of Environmental Affairs' updated Need and Desirability Guideline Document (2017) were referenced to provide the following estimation of the activity in relation to the broader societal needs. The concept of need and desirability can be explained in terms of its two components, where need refers to time, and desirability refers to place (i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed?).

The overall need for alternative, so-called 'green energy', is in light of the known environmental burdens associated with the impact of coal power generation through which most of our country's electricity is currently being generated. Associated aspects such as air pollution, water use and carbon tax are discussed in order to further explain the need and desirability for 'green energy' projects in general. This section provides an overview need and desirability of the proposed project. This is expanded upon in the relevant specialists' (most notably the socio-economic specialist) impact assessments.

6.1 Need And Desirability from an international perspective

From an international perspective, the need and desirability of the proposed project, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa, as a country, is a signatory to a number of international treaties and initiatives, including the United Nation's Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address global socio-economic challenges such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanisation, environment, and social justice. The SDGs consist of 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7[16] of the SDGs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable, and modern energy for all. The following targets and indicators have been set for Goal 7 (**Table** 6-1):

Table 6-1: List of Targets under Goal 7 of the Sustainable Development Goals of the United Nations Development Program.

Targets	Indicators
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 Proportion of population with access to electricity. 7.1.2 Proportion of population with primary reliance on clean fuels and technology.
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2.1 Renewable energy share in the total final energy consumption.
7.3 By 2030, double the global rate of improvement in energy efficiency.	7.3.1 Energy intensity measured in terms of primary energy and GDP.

[16] United Nation's Development Programme's (UNDP's) Sustainable Development Goals. Website: https://southafrica.un.org/en/sdgs/7

Targets	Indicators
7.A By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	7.A.1 Mobilised amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.
7.B By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1 Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

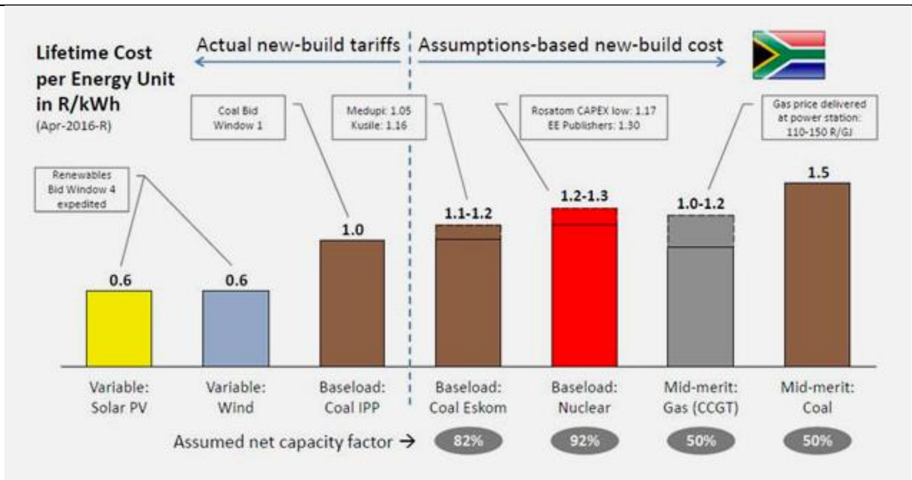

Figure 6-1: Comparative analysis based on IPP announcements

The proposed project would contribute positively towards Goal 7 (and specifically 7.2.1) of the SDGs through the following:

- By generating up to 240 MW (contracted capacity) of affordable and clean energy.
- Solar power technology is currently regarded as the best available technology and one of the cleanest electricity generation technologies, as it does not result in the release of emissions during its operation.
- A study[17] published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent Independent Power Producer (IPP) announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the Department of Mineral Resources and Energy's Renewable Energy (RE) IPP and Coal Baseload IPP Procurement Programmes, found that solar PV and wind were up to 40% cheaper than new baseload coal (i.e. R0.62/kWh for PV and wind vs R1.03 for coal). Please refer to **Figure 6-1.**

[17] Bischof-Niemz, T. & Fourie, R. 2016 Cost of new power generators in South Africa Comparative analysis based on recent Independent Power Producer (IPP) announcements. Web Address: https://energyandmines.com/2016/10/renewables-40-cheaper-than-coal-south-africas-csir-study/#post/0

- By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

The Kyoto Protocol (1997) is also relevant to the need for the development of the 240 MW Buffalo 1 Solar Park Facility from an international perspective. The protocol calls for the overall reduction of South Africa's GHG emissions through actively cutting down on using fossil fuels (especially coal-based fuels), or by utilising more renewable resources such as solar, wind or hydroelectricity. The development of the proposed project will add capacity to the renewable energy sector of the country and strengthen the commitment and action plan to achieve the requirements, as set out in the protocol, through the generation of energy without the emission of GHGs.

6.2 Need And Desirability from a national perspective

The current situation in South Africa is that Eskom's fleet of coal-fired power stations is on average over 40 years old, and its performance is deteriorating due to age and maintenance issues. This has resulted in constant power cuts across the country over the recent years. The construction of two of Eskom's biggest power stations, namely, Medupi and Kusile, was delayed and has been set back by numerous design flaws, which has further exacerbated the issue of power outages in South Africa.

In order to address the issue of load shedding, government is focused on two overriding objectives: first, to improve the performance of Eskom's existing power stations; and second, to add as much new generation capacity to the grid as possible, as quickly as possible as noted in the DMRE's IRP for Electricity[18].

In addition to this the National Development Plan (NDP) envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates; that is socially equitable through expanded access to energy at affordable tariffs; and that is environmentally sustainable through reduced emissions and pollution. Historically, coal has provided the primary fuel resource for baseload electricity generation in South Africa. Consequently, Eskom, who is the main electricity generating company in the country, generates approximately 85% of the country's electricity from coal resources (Stats SA, 2016[19]), resulting in a large carbon footprint. Taking into consideration the need to ensure adequate supply of electricity and meet international obligations in terms of addressing climate change, Government has identified the need to diversify the energy mix within the country.

The proposed project is proposed in specific response to the above, including to the National Government initiatives and the REIPPPP. The REIPPPPP was initiated in order to give effect to the requirements of the IRP with regards to renewable energy targets. As a result, the need and desirability of the 240 MW Buffalo 1 Solar Park Facility from a national perspective can largely be linked from the project's alignment with national government key transmission corridors, policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in Chapter 5). The following key plans have been developed by National Government to consider South

[18] 2019 Integrated Resource Plan (IRP) for Electricity. Web Address: https://www.energy.gov.za/IRP/2019/IRP-2019.pdf
[19] Stats SA, 2016. Web Address: http://www.statssa.gov.za/publications/Report-41-01-02/Report-41-01-022016.pdf

Africa's current energy production, projected future demands, and provides the necessary framework within which energy generation projects can be developed:

- Integrated Energy Plan (IEP); and,
- Integrated Resource Plan (IRP).

These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production. It is our understanding that the above-mentioned energy plans have been extensively researched and are updated on an on-going basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African context.

The IEP is intended to provide an overview of South Africa's future energy landscape and guide future energy infrastructure investments and policy development. The Plan[20] considers the three pillars of sustainable development, and **Figure 6-2** list the eight key energy planning objectives.

In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statements regarding solar energy's contribution to the diversified energy mix:

- Solar should play a much more significant role in the electricity generation mix than it has done historically and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV. Solar PV includes large scale installations for power generation which supply to the grid and individual, off-grid solar home systems and rooftop panels.
- Several interventions which could enhance the future solar energy landscape are recommended as follows: − Large scale CSP projects with proven thermal storage technologies and hybridisation / industrial steam application projects should be incentivised in the short to medium term. In the long term, the existing incentives could be extended to promote locally developed CSP technology storage solutions and large-scale solar fuel projects.
- A thorough solar resource assessment for South Africa should continue to be undertaken in the Northern Cape Province and extended to other provinces deemed to have high solar radiation levels.
- Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions.

[20] Akom, K. & Shongwe, Thokozani & Joseph, M.K. (2021). South Africa's integrated energy planning framework, 2015-2050. Journal of Energy in Southern Africa. 32. 68-82. 10.17159/2413-3051/2021/v32i1a8517.

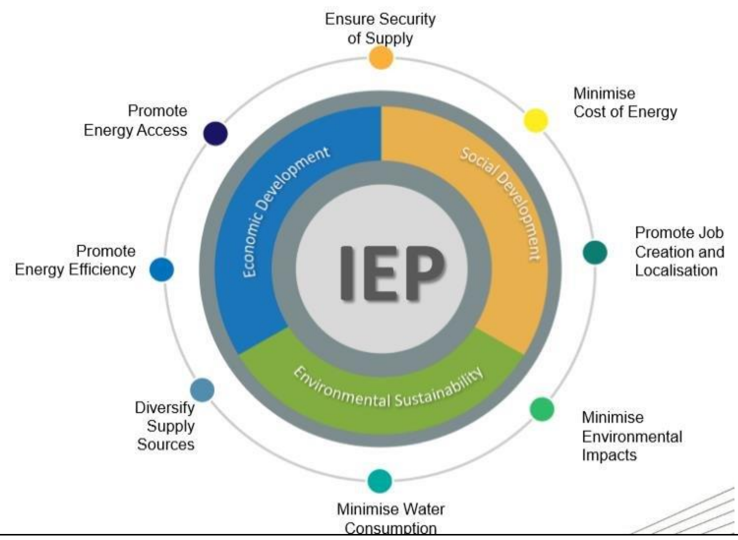

Figure 6-2: Eight Key Energy Objectives as listed in the IEP, 2016

A number of IPP Procurement Programmes have been initiated to secure electricity generated from a range of resources from the private sector (i.e., from Independent Power Producers, or IPPs). Under these Programmes, IPPs are invited to submit proposals for the finance, construction, operation, and maintenance of electricity generation facilities for the purpose of entering into an Implementation Agreement with the DMRE and a Power Purchase Agreement (PPA) with Eskom as the buyer. Provision has been made for new additional capacities in the IRP 2019 (refer to **Figure** 6-3**).**

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 / 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

- Installed Capacity
- Committed/Already Contracted Capacity
- Capacity Decommissioned
- New Additional Capacity
- Extension of Koeberg Plant Design Life
- Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 6-3: Anticipated additional capacities proposed in the IRP 2019

The IRP2010 contained capacity allocations for electricity generated from renewable technologies, and it is against these allocations that the then Minister of Energy issued Ministerial Determinations for renewable energy, which included the technologies of solar PV, wind, solar CSP, landfill gas, biomass, biogas and hydro.

In terms of solar the following provision has been made for the following new additional capacity by 2030: 6,000MW[21] of solar PV.

In addition to the policy considerations detailed above, Government has prioritised post COVID-19 turnaround plans in terms of renewable energies within the Just Energy Transition (JET), coupled with key development objectives of the various spheres of government. These policies share the same principles, such as:

- The utilisation, application and investment in renewable energy resources in South Africa is considered to be an essential means of reducing the carbon footprint of the country;
- Diversifying the national economy;
- Reducing poverty; and,
- Providing critical additional energy to that of Eskom.

Government has compiled an Economic Reconstruction and Recovery Plan[22] which was presented to Parliament in October 2020. According to this plan, the economic survey will rely on a massive investment in infrastructure, including energy, telecommunications, ports and rail.

The plan recognises energy security as the most important prerequisite for the recovery agenda and states that renewed investment in a diversified energy mix can be achieved within a short time horizon, while alleviating a crippling energy crisis and facilitating a necessary transition to a less carbon-intensive economy. One of the key commitments of the plan is therefore to implement the IRP 2019 without delay to provide a substantial increase in the contribution of renewable energy sources by 2030, alongside other sources including battery storage, gas and clean coal. The transition to green energy is recognised as contributing towards the realisation of the low-carbon, climate-resilient and inclusive economy envisaged by the National Development Plan. The development of the proposed project can be regarded as a mechanism for securing additional power generation capacity for input to the national grid, reducing the reliance for electricity on Eskom.

As the proposed project will make use of renewable energy technology and would aim to contribute positively towards reducing South Africa's GHG emissions. It is envisioned that the facility will comply with all applicable legislation and permitting requirements. In addition, by making use of solar technology, the facility would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the DWS National Water

[21] IRP 2019 Web address: https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html

[22] South African Economic Reconstruction and Recovery Plan 2020. Web Address: https://www.gov.za/sites/default/files/gcis_document/202010/south-african-economic-reconstruction-and-recovery-plan.pdf

Resource Strategy 2 (2013) (i.e., transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

Table 6-2 summarises the key questions and thought process which has been followed during the Scoping Process and the EIA Phase to ensure the needs motivation has been adequately assessed.

Table 6-2 Needs motivation and assessment guideline

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**EIA outcome response**
1.	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?		
	1.1.	How were the following ecological integrity considerations taken into account? • Threatened Ecosystems; • Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure; • Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"); • Conservation targets; • Ecological drivers of the ecosystem; • Environmental Management Framework; • Spatial Development Framework; and • Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)	• The study site is located on Limpopo Sweet Bushveld Thornveld vegetation which is Least threatened ecosystem as Section 52 of National Environmental Management Biodiversity Act, (Act No. 10 of 2004). • The screening tool has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e. Critical Biodiversity Areas (CBA), and other elements of high conservation importance. It has identified the Buffalo 1 Solar Park proposed location as a CBA 2, FEPA sub catchment and it is adjacent to the Tierkop Private Nature reserve.
	1.2	• How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? • What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? • What measures were explored to enhance positive impacts?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	1.3	• How will this development pollute and/or degrade the biophysical environment? • What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? • What measures were explored to enhance positive impacts?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	1.4	• What waste will be generated by this development? • What measures were explored to firstly avoid waste, and where waste could not	• Limited waste will be generated by the proposed solar park development. • Waste will be managed by the applicant and municipality, as part of their recycling efforts.

“SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**EIA outcome response**
		be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? • What measures have been explored to safely treat and/or dispose of unavoidable waste?	
	1.5	• How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? • What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? • What measures were explored to enhance positive impacts?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	1.6	• How will this development use and/or impact on non-renewable natural resources? • What measures were explored to ensure responsible and equitable use of the resources? • How have the consequences of the depletion of the non-renewable natural resources been considered? • What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? • What measures were explored to enhance positive impacts?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report..
	1.7	• How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? • Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? • What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? • What measures were taken to ensure responsible and equitable use of the resources? • What measures were explored to enhance positive impacts?	• The context of the site locality in terms of vegetation and wetlands will be included in the specialist studies, in order to provide an overall assessment. • The study site is located on Limpopo Sweet Bushveld Thornveld vegetation which is Least threatened ecosystem as Section 52 of National Environmental Management Biodiversity Act, (Act No. 10 of 2004). • The screening tool has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e. Critical Biodiversity Areas (CBA), and other elements of high conservation importance. It has identified the Buffalo 1 Solar Park proposed location as a CBA 2, FEPA sub catchment and it is adjacent to the Tierkop Private Nature reserve.

“SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**EIA outcome response**
		• Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life). • Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?) • Do the proposed location, type and scale of development promote a reduced dependency on resources?	

	1.8	• How were a risk-averse and cautious approach applied in terms of ecological impacts?
		  • What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?
		  • What is the level of risk associated with the limits of current knowledge?
		• Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?
			These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.

	1.9	• How will the ecological impacts resulting from this development impact on people's environmental right in terms following:
		  o Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?
		  o Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?
			This assessment will be concluded based on the outcomes of the various specialist studies. Should any sensitivities be observed on site, it will be reviewed and will be incorporated into the proposed site layout.

"SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES"			
Question			**EIA outcome response**
	1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	This development will create jobs for more than 150 people in the Lephalale Local Municipality. It will also help supply electricity since the country is facing loadshedding for the past years.
	1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	The study site is located on Limpopo Sweet Bushveld Thornveld vegetation which is Least threatened ecosystem. Wetland areas will be excluded during construction
	1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.

Table 6-3 summarises the key questions and thought process that has been followed during the EIA Phase to ensure the desirability of the project has been thoroughly assessed.

Table 6-3 Assessment for desirability

<table>
<tr><th colspan="4">“PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"</th></tr>
<tr><th colspan="3">Question</th><th>EIA outcome response</th></tr>
<tr><td>2.</td><td colspan="3">What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?</td></tr>
<tr><td></td><td>2.1</td><td>• The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area;
• Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.);
• Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.); and
• Municipal Economic Development Strategy ("LED Strategy").w</td><td>Lephalale is the largest of the local municipalities within the Waterberg district. It has a population of approximately 140,000. The town is expanding rapidly. The increase in population may be linked to the skills development centres and job opportunities in the Municipality because of the Waterberg coalfield.
Lephalale is defined by Limpopo Growth and Development Strategy as a coal mining and petrochemical cluster. The area is currently experiencing growth driven by mining expansion. Medupi project has already been commissioned at various phases and completion of the project has led to demobilization of staff on completed project phases. The coal to liquid project that was investigated by Sasol and currently placed on hold could broaden the opportunities for cluster formation. The local economy is dominated by the coal mine and the power station. Three clusters that are most relevant to Lephalale are firstly Coal & Petrochemical, secondly red meat and thirdly Tourism.
The most important economic benefit is likely to be the experience that will be gained with regard to solar electricity generation in Limpopo and in South Africa, considering that this forms part of a national strategic plan, but from a zero base. This experience will be essential for the roll-out of the strategy, for efficiency improvements and for the establishment of a local manufacturing supply chain for equipment requirements. The project will also make a contribution towards reducing the carbon emissions per unit of electricity generated in South Africa, albeit very small to start with.</td></tr>
<tr><td></td><td>2.2</td><td>• Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?
• Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?</td><td>These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.</td></tr>
</table>

“PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**EIA outcome response**
	2.3	• How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	2.4	• Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? • Will the impact be socially and economically sustainable in the short- and long-term?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report..
	2.5	• In terms of location, describe how the placement of the proposed development will: o result in the creation of residential and employment opportunities in close proximity to or integrated with each other; o reduce the need for transport of people and goods; o result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport); o compliment other uses in the area; o be in line with the planning for the area; o for urban related development, make use of underutilised land available with the urban edge; o optimise the use of existing resources and infrastructure; o opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement); o discourage "urban sprawl" and contribute to compaction/densification; o contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs; o encourage environmentally sustainable land development practices and processes; o take into account special locational factors that might favour the specific	• This proposed development will create job opportunities. • The study site overlaps with the Least threatened ecosystem as Section 52 of National Environmental Management Biodiversity Act, (Act No. 10 of 2004). • The context of the site locality in terms of vegetation and wetlands will be included in the specialist studies, in order to provide an overall assessment. • The context of the site locality in terms of vegetation and wetlands will be included in the specialist studies, in order to provide an overall assessment. • The cultural aspects will be covered by the Heritage Impact Assessment.

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**EIA outcome response**
		location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.); ○ the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential); ○ impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area; and ○ in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	
	2.6	• How were a risk-averse and cautious approach applied in terms of socio-economic impacts? ○ What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? ○ What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? ○ Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	2.7	• How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: ○ Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? ○ Positive impacts. What measures were taken to enhance positive impacts?	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report.
	2.8	• Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic	These impacts have been assessed by qualified specialists and their findings are included in sections 8 and 9 of this report..

“PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**EIA outcome response**
		impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
	2.9	• What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	The optimum practicable environmental layout option will be considered after the various specialist studies have been drafted.
	2.10	• What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? • Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	The optimum practicable environmental layout option will be considered after the various specialist studies have been drafted.
	2.11	• What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	The proposed solar development will create new job opportunities, both during construction and operation.
	2.12	• What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	These measures will be included in the project specific EMPr to be included in the EIAR.
	2.13	• What measures were taken to: o ensure the participation of all interested and affected parties; o provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation; o ensure participation by vulnerable and disadvantaged persons; o promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means; o ensure openness and transparency, and access to information in terms of the process; o ensure that the interests, needs and values of all interested and affected	The Public participation process is discussed in section 3 of this report

“PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**EIA outcome response**
		parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge; and o ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were be promoted?	
	2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	The main issue for this area is job creation, which will be discussed in the EIAR, based on specialist input.
	2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	These measures will be included in the project specific EMPr to be included in the EIAR.
	2.16	• Describe how the development will impact on job creation in terms of, amongst other aspects: o the number of temporary versus permanent jobs that will be created; o whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area); o the distance from where labourers will have to travel; o the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits); and o the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 residential jobs, etc.).	The detail aspects of this will be assessed by the EIAR.
	2.17	• What measures were taken to ensure: o that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment; and o that actual or potential conflicts of interest between organs of state were	All relevant parties were informed during the PPP stage. The DSR will also be shared with all relevant stakeholders

"PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT"			
Question			**EIA outcome response**
		resolved through conflict resolution procedures?	
	2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	This assessment will be concluded based on the outcomes of the various specialist studies.
	2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	This assessment will be concluded based on the outcomes of the various specialist studies. The EMPr will include the long-term operational phase.
	2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	The proposed management measures of all specialists will be included in the EIAR and site-specific EMPr. The EMPr will include the short-term construction impacts as well as the long-term operational phase.
	2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	This will be depicted in the final proposal alternative, which will include all the impacts and proposed mitigation measures.
	2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	This will be included in the EIAR. It will be a combination of the outcomes of the specialist studies and proposed mitigation measures.

6.3 Motivation For the Proposed Project

This project forms part of the promulgated IRP 2010-2030 plan that identified electricity generation technology (specifically renewable energy – solar PV) to meet the expected demand growth up to 2030. This project aims to produce distributed generation and to provide off-grid electricity.

The Buffalo 1 Solar Park Facility is proposed in response to the identified objectives of National and Provincial Government and Local and District Municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Buffalo 1 Solar Park Facility under the DMRE's REIPPP Programme or possibly a similar private programme, with the aim of distributing the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the IRP published by the Department of Minerals Resources and Energy, with the Buffalo 1 Solar Park Facility set to inject up to 240MW of electricity into the national grid. Similarly, the location of the new generation in the Limpopo Province is important in the context of the JET. The Buffalo 1 Solar Park Facility will provide valuable jobs and socio-economic benefits that are required in an area where coal fired generation will be phased out over the next 30 years in South Africa. This project will be vitally important if the JET is to be successfully implemented and is a transition for everyone.

Permanent job creation on the proposed project could be 30 people. More jobs will emerge within the value chain for the manufacturing of components. An important new range of renewable energy industry skills will be acquired, which are essential for the local competitiveness of this industry.

7 ALTERNATIVES

In accordance with the requirements of Appendix 3 of the 2014 EIA Regulations (GNR 326), as amended, reasonable and feasible alternatives, including but not limited to site and technology alternatives, as well as the "do-nothing" alternative should be considered. All identified, feasible and reasonable alternatives are required to be identified in terms of social, biophysical, economic and technical factors. Several other renewable energy facilities are planned within the broader study area, supporting the suitability of the area for renewable energy projects.

In terms of the EIA Regulations 2014, as amended the definition of "alternatives" in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity; and,
- the operational aspects of the activity.

The other critical aspects in the definition of project alternatives are terms such as 'reasonable', 'practicable', 'feasible' or 'viable'. Given the understanding, there are essentially two types of alternatives, the incrementally different (modifications) alternatives to the project; and the fundamentally (totally) different alternatives to the project:

- Incrementally different (modifications) alternatives to the project; and,
- Fundamentally (totally) different alternatives to the project.

7.1 Consideration of fundamentally different alternatives

Fundamentally different alternatives are usually assessed at a strategic level and EIA practitioners recognise the limitations of project specific EIAs to address fundamentally different alternatives. Electricity generating alternatives have been addressed as part of the NIRP published by the NERSA and the Integrated Strategic Electricity Plan (ISEP) undertaken by Eskom. Environmental aspects are considered and integrated into the NIRP and ISEP using the strategic environmental assessment approach, focusing on environmental life-cycle assessments, water-related issues and climate change considerations.

Fundamentally different renewable energy options that were initially considered included the following energy generation through:

- Hydro generation;
- Wind generation; and,
- Solar generation.

Fundamental Alternative 1: Hydro generation was rejected as the site is not located close to a prominent and sufficient water resource to generate hydro-electricity. This option was thus not further investigated.

Fundamental Alternative 2: Electricity generation through wind turbines was investigated. The recommended wind speed for a commercial wind turbine is around 144km/h to 259km/h. The average wind speed in the Lephalale and project area is 13.6 km/h to 16.7 km/h[23]. Hence, due to the local climatic conditions, a wind energy facility was not considered suitable as the area does not have the required wind resources. This alternative was therefore regarded as not feasible and has not been evaluated further in this report.

Fundamental Alternative 3: Electricity from solar generation was investigated as the site is located a relatively high solar irradiation area (**Figure 7-1**) with the shortest day with 10 hours and 41 min sunlight and the longest day with 13 hours and 36min sunlight.

[23] Weather Park: Web Address: https://weatherspark.com/y/92853/Average-Weather-in-Lephalale-South-Africa-Year-Round

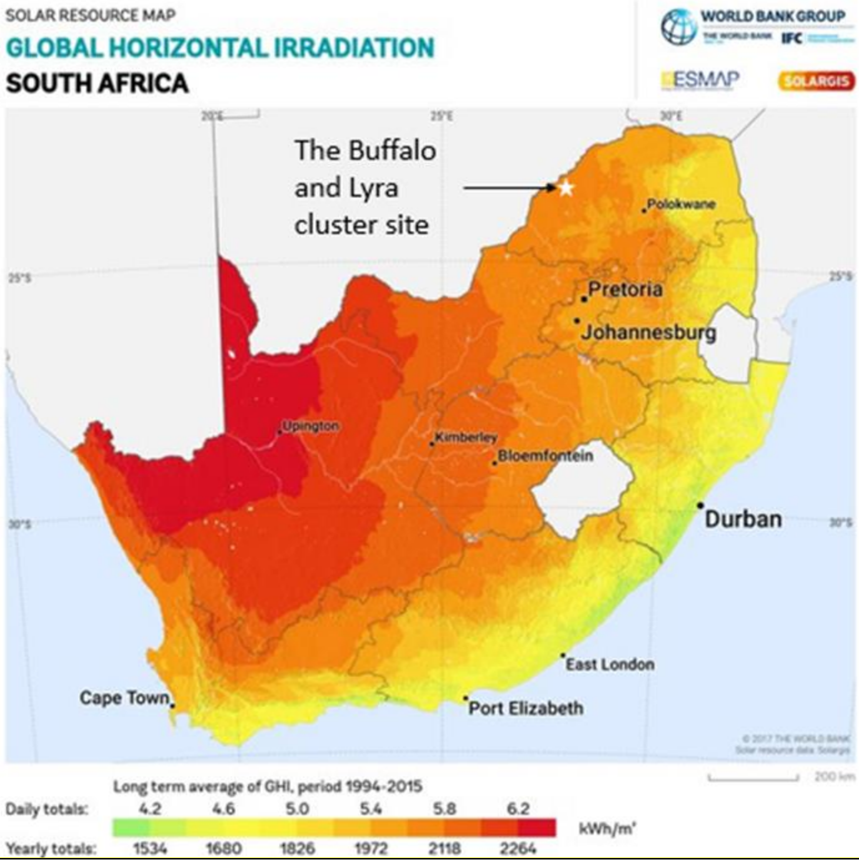

Figure 7-1: Global Horizontal Irradiation Values for South Africa (SOLAR GIS, 2021).

For this reason, the option of a solar facility was perused whereby the proposed project, a Solar Energy Facility with capacity of up to 240MW and associated infrastructure proposed to be developed by an IPP and intended to form part of the DMRE's REIPPP Programme, or another similar programme.

7.2 Consideration of incrementally different alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives for:

- The properties on which, or location where the activity is proposed to be undertaken;
- The type of activity to be undertaken;
- The design or layout of the activity;
- The technology to be used in the activity; and,
- The operational aspects of the activity.

In addition, the option of not implementing the activity (i.e., the "do-nothing" alternative) must also be considered.

The sections below describe the incrementally different alternatives being considered as part of the proposed project. Where no alternative is being considered, a motivation has been provided as required by the EIA Regulations 2014, as amended.

7.2.1 Property of location alternatives

Several sites have been inspected in order to find out the best solution for the two PV power plants. The following selection criteria were applied:

- Connection availability and proximity
- Land availability
- Proper land surface area (minimum 500 ha)
- Current land use
- Low environmental impact (low biodiversity)
- Low agricultural potential
- High solar radiance
- Socio-economic issues (land cost and local community unemployment)

The macro area of Lephalale and surrounding farms was investigated, due to the high value of solar irradiation and to the presence of high-voltage Eskom substations (Eskom Medupi).

The following properties have been found suitable and available:

- Farm Buffelsjagt 744-LQ

7.2.2 Design and layout alternatives

The proposed layout will consider the existing roads, infrastructure, as well as sensitive areas, e.g. drainage lines, topography. The location of the planned footprint will be further assessed (and amended - if required) in the Draft and Final Environmental Impact Assessment Reports, once all the specialist studies (ecological, avifauna, wetland delineation, agricultural, geo-technical and geo-hydrological, visual, heritage) are available. All inputs and comments arising from the Public Participation Process will be taken into account.

For Buffalo 1 Solar Park, two layout plans have been proposed, because the location of the on-site substations will depend on the connection solution proposed by Eskom (Eskom Medupi 132kV or 400kV busbar).

The 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 the fixed mounting solution.

The selected tracking system is the horizontal single-axis tracker (SAT), which doesn’t differ from the fixed system, except for the presence of the tracking devices and the orientation of the rows of the PV arrays (north - south instead of west – east direction). The technology of mounting systems is under continuous evolution. Consequently, the 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 currently planned footprint (500 ha) and the height of the structures (PV modules and support frames) will be maximum 4.5 m above the ground level.

Both fixed and horizontal single-axis tracking solutions grant the reversibility of the development in respect of the terrain's morphology, geology and hydrogeology. This means that 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.

7.2.3 Activity alternatives

Carina Energy (Pty) Ltd is a renewable energy project developer and as such is only considering renewable energy activities in accordance with the need for such development within the IRP. Considering the available renewable energy resources within the area and the current significant restrictions placed on other natural resources such as water, it is considered that solar energy (Alternative 1) is the preferred option for the development of a renewable energy facility within the identified project site. No other activity alternatives are being considered within this S&EIA process.

7.2.4 Technology alternatives

The alternative to PV for producing energy from the sun is the thermal solution. There are different forms of this technology: linear Fresnel, parabolic trough or tower. These technologies can also be with or without thermal storage and they can use diathermic oils or, the more sophisticated ones can use water and/or molten salts.

The final choice made was the PV option because these kinds of projects results:

- Lower construction costs;
- Lower operating and maintenance costs;
- It is simpler, quicker and more experienced technology; and
- Lower environmental impact, considering that, amongst other factors, the PV Solution is regarded as the most water efficient option.

Another alternative to PV for producing energy from the sun is electrical energy form 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.

Renewable energy technology alternatives

Few technology options are available for solar facilities, and the use of those that are considered are usually differentiated by weather and temperature conditions that prevail in the area, so that optimality is obtained by the final site selection. Solar energy is considered to be the most suitable renewable energy technology for this area, based on the site location, ambient conditions and energy resource availability.

The S&EIA process considered the development of a SPV facility would be the most appropriate land use for the particular site. Proposed activity alternatives that have been assessed during the EIA phase included the following:

- Solar photovoltaic (PV) facility – Solar energy is considered to be the most suitable renewable energy resource for this specific site, based on the locality of the site, ambient conditions and the availability of energy resources, which in this case would be solar irradiation (indicated as an area of high irradiation – 2093 kWh/m²/annum). Solar PV technology is also preferred when compared to Concentrated Solar Power technology (discussed below) because of the lower visual profile.

- Concentrated solar power (CSP) facility - A CSP has a high visual impact and requires large volumes of water; this is a major constraint for this type of technology considering the water challenges and limitation experienced not only in the country but also the local area. While the irradiation values are high enough to generate sufficient solar power, the water constraints render this alternative not feasible. It must also be noted that the IRP no longer includes the use of CSP as part of the energy mix of the county. Therefore, this alternative will not be considered further in this report.

When considering PV as a technology choice, several types of panels are available, including inter alia:

- Bifacial PV panels;
- Monofacial PV panels;
- Fixed mounted PV systems (static / fixed-tilt panels); and,
- Single-axis tracking or double-axis tracking systems (with solar panels that rotate around a defined axis to follow the sun's movement).

The primary difference between PV technologies available relate to the extent of the facility, as well as the height of the facility (visual impacts), however the potential for environmental impacts remains similar in magnitude. Fixed mounted PV systems are able to occupy a smaller extent and have a lower height when compared to tracking PV systems, which require both a larger extent of land, and are taller in height. However, both options are considered to be acceptable for implementation from an environmental perspective.

The PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance. The impacts associated with the construction, operation, and decommissioning of the facility are anticipated to be the same irrespective of the PV panel type selected for implementation. Once environmental constraining factors have been determined through the S&EIA process Carina Energy (Pty) Ltd will consider various solar panel options. The preferred option will be informed by efficiency as well as environmental impact and constraints (such as sensitive biophysical features). The PV panels proposed, will comprise solar panels which once installed, will stand no more

than 8m above ground level. The solar panels will include centralised inverter stations, or string inverters mounted above ground.
Carina Energy (Pty) Ltd therefore confirms PV solar energy technology as the preferred technology alternative for the development of the project. No further technology alternatives are considered within this EIA Report.

Solar PV technologies

Very few technological options exist as far as PV technologies are concerned; those that are available are usually differentiated by climatic conditions that prevail. The impacts of the different PV technologies on the environment are very similar. The construction, operation and decommissioning activities associated with the facility will all be the same, irrespective of the chosen technology. Both technology alternatives are considered reasonable and relevant to this application, based on the current technology available and potential engineered simplification of solar tracking systems in the coming years. As technological advances within PV technologies are frequent the Applicant may apply for either of the two technology alternatives and no preferred option is specified by the Applicant.

The Fixed and Tracking PV panel technologies are both considered for the proposed Buffalo 1 Solar Park. The different solar PV panel technologies are briefly discussed in the following sub-headings:

- Fixed / mounted PV panels; and,
- Tracking PV panels (these solar panels rotate to follow the sun's movement/trajectory).

It is important to note that while both types are detailed and assessed in this report, no specific technology is proposed as that preferred for authorisation, as both are expected to have similar impacts due to their design and functions being closely related. Therefore, the assessment proposes both technologies for authorisation (i.e. PV panels of Fixed / mounted PV- or Tracking PV panels), to allow the proponent to determine the precise technology when the project is implemented, on the understanding that further investigation into the specific technologies available at the time of being awarded preferred bidder status will allow for one of two to be selected and ultimately developed.

7.2.4.1.1 Fixed mounted PV system

In a fixed mounted PV System (**Plate** 4-1**),** the PV panels are installed at a pre-determined angle from which they will not move during the lifetime of the plant's operation. The limitations imposed on this system due to its static placement are countered by the fact that the PV panels are able to absorb incident radiation reflected from surrounding objects. In addition, the misalignment of the angle of the PV panels have been shown to only marginally affect the efficiency of energy collection. There are advantages which are gained from fixed mounted systems, and includes the following:

- The maintenance and installation costs of a fixed mounted PV system are lower than that of a tracking system, which is mechanically more complex given that these PV mountings include moving panels;
- Fixed mounted PV systems are an established technology with a proven track record in terms of reliable functioning. In addition, replacement parts are able to be sourced more economically and with greater ease than with alternative systems; and,

- Fixed mounted systems are robustly designed and able to withstand greater exposure to winds than tracking systems.

A typical fixed structure will have two rows of twenty (20) modules (2 strings). The modules are placed in portrait arrangement. The foundation technology is usually a direct-driven (rammed) installation, with a ramming depth subject to the soil characteristics, or reinforced concrete strip footings.

7.2.4.1.2 Single / Dual Axis Tracking System

In a dual axis tracking system, PV panels are fixed to mountings which track the sun's trajectory. There are various tracking systems namely a single axis tracker or a dual axis tracker. A 'single axis tracker' will track the sun from east to west, while a 'dual axis tracker' will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight. Tracking systems are a new technology and, as such, are more complex to operate in South Africa. This is due to:

- A high degree of maintenance is required due to the nature of the machinery used in the system, which consists of numerous components and moving parts. A qualified technician is required to carry out regular servicing of these tracking systems, which are normally located in remote areas;
- The cost of the system is necessarily higher than a fixed mounted system due to the maintenance required for this system and given that separate mountings need to be placed apart from one another to allow for their tracking movement; and,
- A power source is needed to mechanically drive the tracking system and this would offset a certain portion of the net energy produced by the plant.

However, the additional improvements in capacity factor and efficiency may make a tracking system attractive despite these challenges. This can only be determined with a financial model during the more detailed design phase of the project.

Battery Energy Storage System technology alternatives

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

The preferred technology for the 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. Please see **Figure** 7-2

Figure 7-2: Typical illustration of a Battery Energy Storage System Technology

The preferred technology is therefore Lithium-ion battery cells with solid rechargeable electrolyte. Batteries housed within containers which are fully enclosed and self-contained. It is envisioned that the batteries will arrive on site.

Flow Batteries

Flow-battery technologies provide alternative means for power smoothing through on-site battery storage. For this technology, energy is stored as an electrolyte in the flow cells. Options include Sodium polysulfide/bromine (PSB) flow batteries, Vanadium Redox (VRB) flow batteries, and Zinc-Bromine (ZNBR) flow batteries which would be contained in small bunded areas. The footprint of a Redox Flow Battery (RFB) system is approximately 150 m x 100 m, with a height of 8 m. For this technology, energy is stored as an electrolyte in the flow cells. The system consists of two electrolyte storage tanks that are contained within a 2.5 m high berm wall, which prevents leakage of the electrolyte chemical into the surrounding environment.

With a simple flow battery, it is straightforward to increase the energy storage capacity by increasing the quantity of electrolyte stored in the tanks. The electrochemical cells can be electrically connected in series or parallel, so determining the power of the flow battery system. They store and release energy through a reversible electrochemical reaction between two electrolytes (chemical reactants), which are separated by a membrane through which charging, and discharging occurs. These batteries provide an energy output greater than or equal to lead acid batteries, and their storage capacity is dependent upon the size of the electrolyte tanks while the power output is dependent on the size of the reaction stack (Parsons, 2017).

Flow batteries are a technology of battery which requires mechanical systems (pumps, pipes, and tanks) and are therefore inherently more complex than a solid-state battery (for example, lithium-ion, lead or advanced lead acid batteries discussed above). The greatest advantage these batteries exhibit is their scalability and their longer duration discharge cycles which are more cost efficient when compared to solid-state batteries (Parsons, 2017). The most successful and widespread of these batteries use vanadium and zinc-bromine chemistries.

7.2.5 Access route alternatives

Recommendations from the specialists advised that sensitive areas be avoided and advise that the internal access roads and MV Cabling must be utilise the existing main access road to the north and all other infrastructure will remain within low-sensitive green developable area. No other roads have been assessed.

7.2.6 Connection alternatives

For Buffalo 1 Solar Park, two Connection Alternatives have been proposed:

a) **Connection Alternative 1 @ 400kV**: to the **400 kV busbar** of the **Eskom Medupi Substation**, via the **Powerline Corridor 1**, **12 km long**.

In this case, the following connection infrastructure is required:

- **one 132 kV power line (double circuit), approximately 10.0 km long**, connecting the on-site 132kV switching station to the 132 kV busbar of the 132kV/400kV step-up substation and 400kV switching station to be built in proximity of the Eskom Medupi Main Transmission Substation (Connection Alternative 1 @ 400kV)
- **one 132kV/400kV step-up substation** with high-voltage power transformers, stepping up the voltage to 400kV, and one 400kV busbar with metering and protection devices (switching station), to be built in proximity of the Eskom Medupi Main Transmission Substation (MTS) (Connection Alternative 1 @ 400kV)
- **one 400 kV power line, approximately 1.3 km long,** connecting the on-site 400kV switching station to the 400 kV busbar of the Eskom Medupi Main Transmission Substation (MTS) (Connection Alternative 1 @ 400kV)

b) **Connection Alternative 2 @ 132kV**: to the **132 kV busbar** of the **Eskom Medupi Substation**, via the **Powerline Corridor 2**, **13 km long**.

In this case, the following connection infrastructure is required:

- **one 132 kV power line (double circuit), approximately 13.2 km long**, connecting the on-site 132kV switching station to the 132 kV busbar of the Eskom Medupi Substation (Connection Alternative 2 @ 132kV).

The preferred connection solution will be indicated in the Final EIA, depending on the indication of Eskom Cost Estimate Letter and on the inputs and comments received during the Public Participation Process.

Please find below **Table** 7-1 summarizing the **Connection Alternatives for Buffalo 1 Solar Park**:

Table 7-1. Connection Alternatives.

Alternative connection solutions	**Buffalo 1 Solar Park**
Alternative Powerline Corridor 1	12 km
Connection Alternative 1	Eskom Medupi substation @ 400kV
132 kV Powerline (double circuit)	10.0 km
400kV substation / switching station	next to Eskom Medupi substation
400 kV Powerline	1.3 km long
Alternative Powerline Corridor 2	14 km
Connection Alternative 2	Eskom Medupi substation @ 132kV
132 kV Powerline (double circuit)	13.2 km
400kV substation / switching station	NA
400 kV Powerline	NA

7.3 The “no-go” alternative

The assessment of alternatives must at all times include the No-Go option as a baseline against which all other alternatives must be measured. The option of not implementing the activity or excluding sensitive areas from development have been assessed to the same level of detail as the other feasible and reasonable alternatives. The No-Go option focussed on the existing rights on the property, including the approved PV facility, and this includes all the duty of care and other legal responsibilities that apply to the owner of the property.

7.3.1 “Do-Nothing” Alternative

The ‘do-nothing’ alternative is the option of not constructing and operating the proposed project. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with a Solar Energy Facility. There will be no energy for the national grid, no job creation and the site will remain as is. The ‘do-nothing’ alternative may result in the continuation of electricity shortages in the country, forcing people to source alternative energy sources for cooking such as wood due to a lack of access to sustainable energy supply. Uncontrolled wood harvesting could lead to habitat fragmentation. As these practices are not monitored, it is difficult to determine the overall cumulative impact of illegal wood harvesting.

In addition to the above, environmental pollution and the emission of CO_2 from the combustion of fossil fuels through the implementation of conventional power plants remain a threat to the environment. The use of fossil fuels is reportedly responsible for ~70% of GHG emissions worldwide. The approach to addressing climate change needs to include a shift in the way that energy is generated and consumed. Worldwide, many solutions and approaches are being developed to reduce emissions. However, it is important to acknowledge that the most cost-effective solution in the short-term is not necessarily the least expensive long-term solution. This holds true not only for direct project costs, but also indirect project costs such as impacts on the environment. Renewable energy is currently considered a 'clean source of energy' with the potential to contribute greatly to a more ecologically, socially, and economically sustainable future. The challenge however is to ensure that solar energy projects are able to meet all economic, social and environmental sustainability criteria through the appropriate placement of these facilities.

In terms of establishing a Solar Facility, the 'do-nothing' alternative may likely result in minimising the cumulative environmental impact on the farms, although it is expected that pressure to develop the site for renewable energy purposes will be actively pursued due to the same factors which make the site a viable option for renewable energy development. The 'do-nothing' alternative has been assessed as part of the EIA Phase (refer to Section 9 in this EIA Report).

Should the 'do-nothing' alternative be selected to reject the whole proposed project, it is anticipated that there will be impacts at a local and broader scale. From a local perspective, the identified site, which is zoned for agricultural purposes, would not be impacted on from an environmental perspective, and could be utilised for future agricultural activities. However, at a broader scale, the potential benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. Although the proposed facility is only proposed to contribute 240 MW to the grid capacity, it would assist in meeting the growing electricity demand through the country and would also assist in augmenting government's renewable energy goals.

Based on the current need in the country for cleaner and more reliable power supply, this option is not recommended.

7.3.2 Excluding sensitive areas alternative

The 'excluding sensitive areas' alternative identifies environmental sensitive areas on the proposed properties and exclude them from the development footprint.

The exclusion of sensitive areas" on the site was considered by the various specialists. Sensitive areas (terrestrial, aquatic and heritage) were excluded from the original footprint, hence reducing the footprint to 500ha. Based on the recommendations and mitigation measures from the specialists, this option deemed to be the selected option whereby sensitive environmental areas are avoided, but still providing the opportunity for social and economic investment and job creation in the region.
Some sensitive environmental areas have been identified on the proposed farms, and these are clearly indicated in the final layout map as No-Go areas (**Figure** 0-5). Conservation and preservation management recommendations have been included in the EMPr.

8 DESCRIPTION OF RECEIVING ENVIRONMENT

The proposed solar park development is located within the Savannah Biome within the Limpopo Sweet Bushveld type (Mucina & Rutherford, 2006). The following sections are a description of the characteristics of the study area that may be affected by the proposed solar park development.

8.1 Regional setting

Carina Energy (Pty) Ltd, are proposing the development, construction and operation of a renewable energy generation facilities (Photovoltaic Power Plants) and associated infrastructure, and structures on Farm Buffelsjagt 744-LQ, located within the Lephalale Local Municipality, Waterberg District Municipality, Limpopo Province.

Limpopo is the northernmost province of South Africa. It is named after the Limpopo River, which forms the province's western and northern borders. Limpopo is the link between South Africa and countries further afield in sub-Saharan Africa. Limpopo contains much of the Waterberg Biosphere, a massif of approximately 15,000 km^2 (5,800 sq mi) which is the first region in the northern part of South Africa to be named a UNESCO Biosphere Reserve[24]. The proposed **Buffalo 1 Solar Park** is not located in the Waterberg Biosphere. Please see **Figure 8.1**. There are five local municipalities located in the Waterberg District Municipality namely, Bela-Bela, Lephalale, Modimolle-Mookgophong, Mogalakwena and Thabazimbi. Key economic drivers in the District Municipality include agriculture (beef cattle, sunflowers, maize, peanuts, bananas, litchis, pineapple, mangoes and pawpaws), game hunting, tourism and mining.

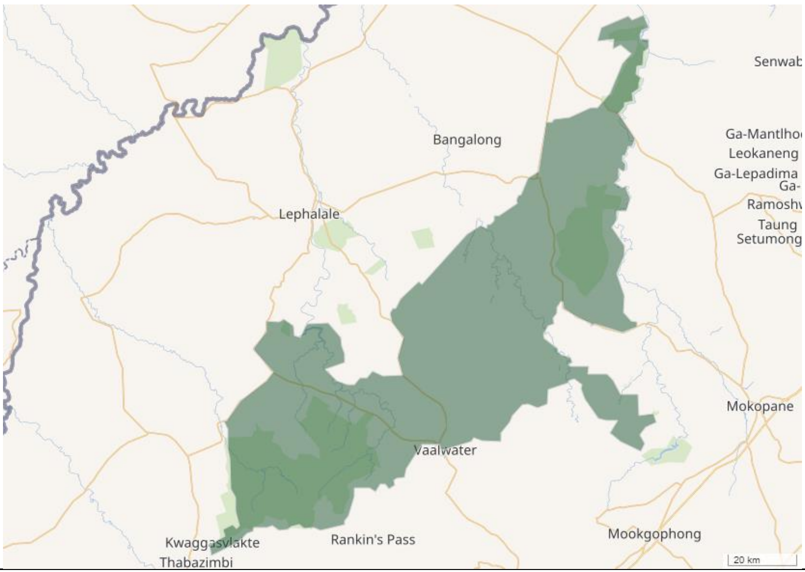

Figure 8-1: Waterberg Biosphere

[24] C.Michael Hogan, Mark L. Cooke and Helen Murray, The Waterberg Biosphere, Lumina Technologies, 22 May 2006. "Lumaw". Archived from the original on 24 March 2007. Retrieved 23 December 2006.

Lephalale Local Municipality (Municipal code: LIM362) is located within the Waterberg District Municipality and has a population of around 115767[25]. The majority of the people living in Lepahale Local Municipality speak Northern Sotho and Tswana. Lephalale, also known as Ellisras, is a coal mining town. A major influence and economic driver in the town was the development of the Grootegeluk Coal Mine, whereby work commenced in December 1974 on building the mine and one year later in December 1975, the actual quarrying of the mine commenced.

The Lephalale Municipality (LM) area comprises two (2) urban nodes, namely Lephalale/Onverwacht and Marapong (Provincial Growth Point), as well as the surrounding Witpoortjie/Thabo Mbeki rural area (Provincial Growth Point), that accommodates both commercial and communal mixed-farming practices.

An industrial area is also slowly developing near Onverwacht, while a heavy industrial zone has been earmarked near the Steenbokpan turnoff.

The **Buffalo 1 Solar Park** is located in close proximity to the Medupi Eskom Power plant and also Marapong – the Provincial Growth Point. Historically the site was used for agricultural practises. Based on the available Google Earth imagery, there has been limited changes in the land use of the study site itself, since 1985 (**Figure** 8-2).

[25] "Statistics by place". Statistics South Africa. Retrieved 27 September 2015.

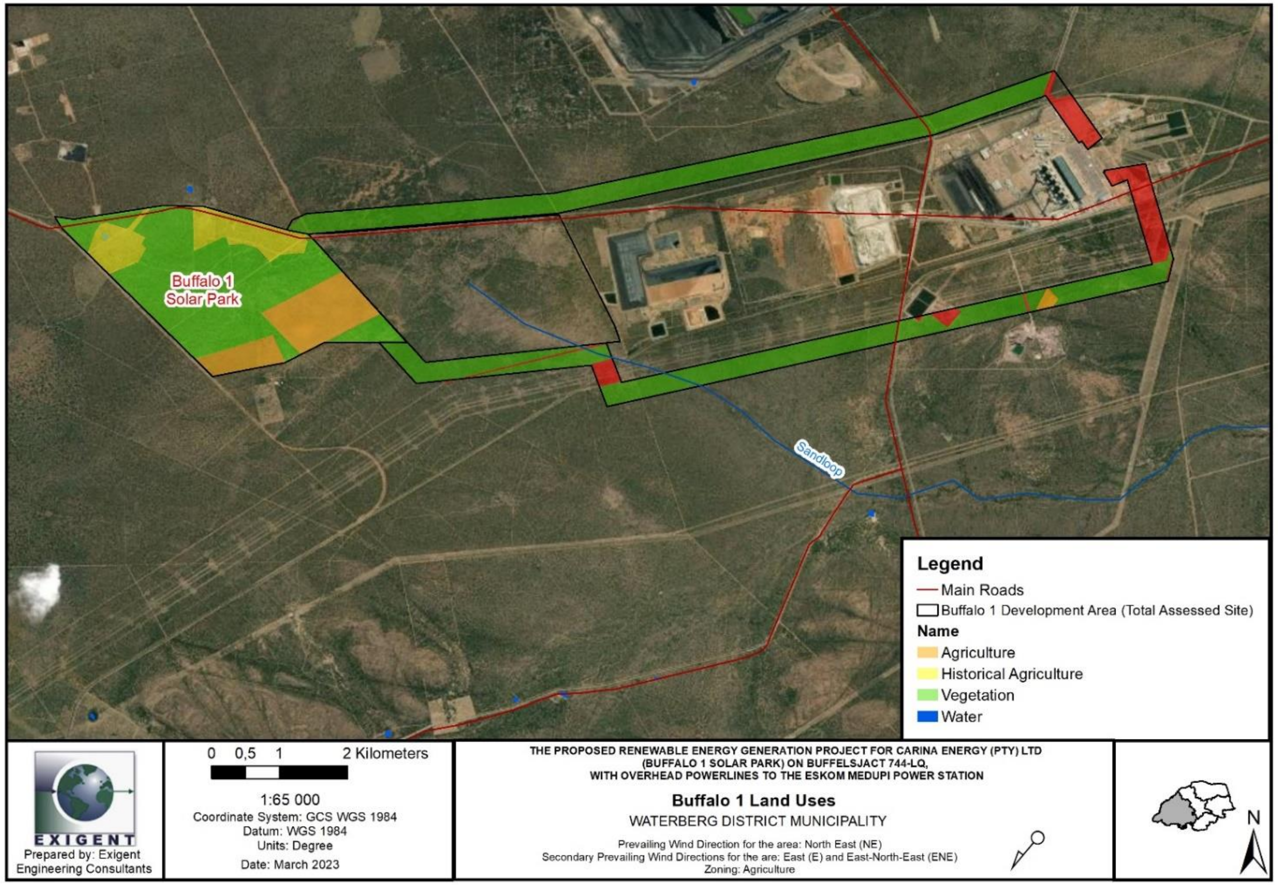

Figure 8-2. Current land uses on the proposed site.

Farm Buffelsjagt 744-LQ is used as agricultural unit mostly for grazing purposes and the land use status is “Agriculture”. The new rights as approved by the Lephalale Municipality would however permit the use of the existing farm portion for a Renewable Energy Generation Project (PV Solar Plant).

The proposed solar park development will not permanently affect the agricultural or grazing value of the site as the re-growth of grass will take place under the panels as the mounting systems are at least 1m above ground level. The renewable energy facility is expected to have a lifespan of approximately 30 to 40 years and the power plant infrastructure would be decommissioned once it has reached the end of its economic life: all structures will be removed, and the land will return to agricultural land. This will enable natural re-growth of indigenous vegetation and fauna re-population as well as the reuse of the area for agricultural and grazing purposes.

The Buffalo 1 Solar Park proposed site is located west of the Medupi substation in an area that is already affected by various electrical overhead power lines. Surrounding land uses of the proposed site include vacant lad used for agriculture and the Medupi Eskom Substation Power Plant (**Figure** 8-3)

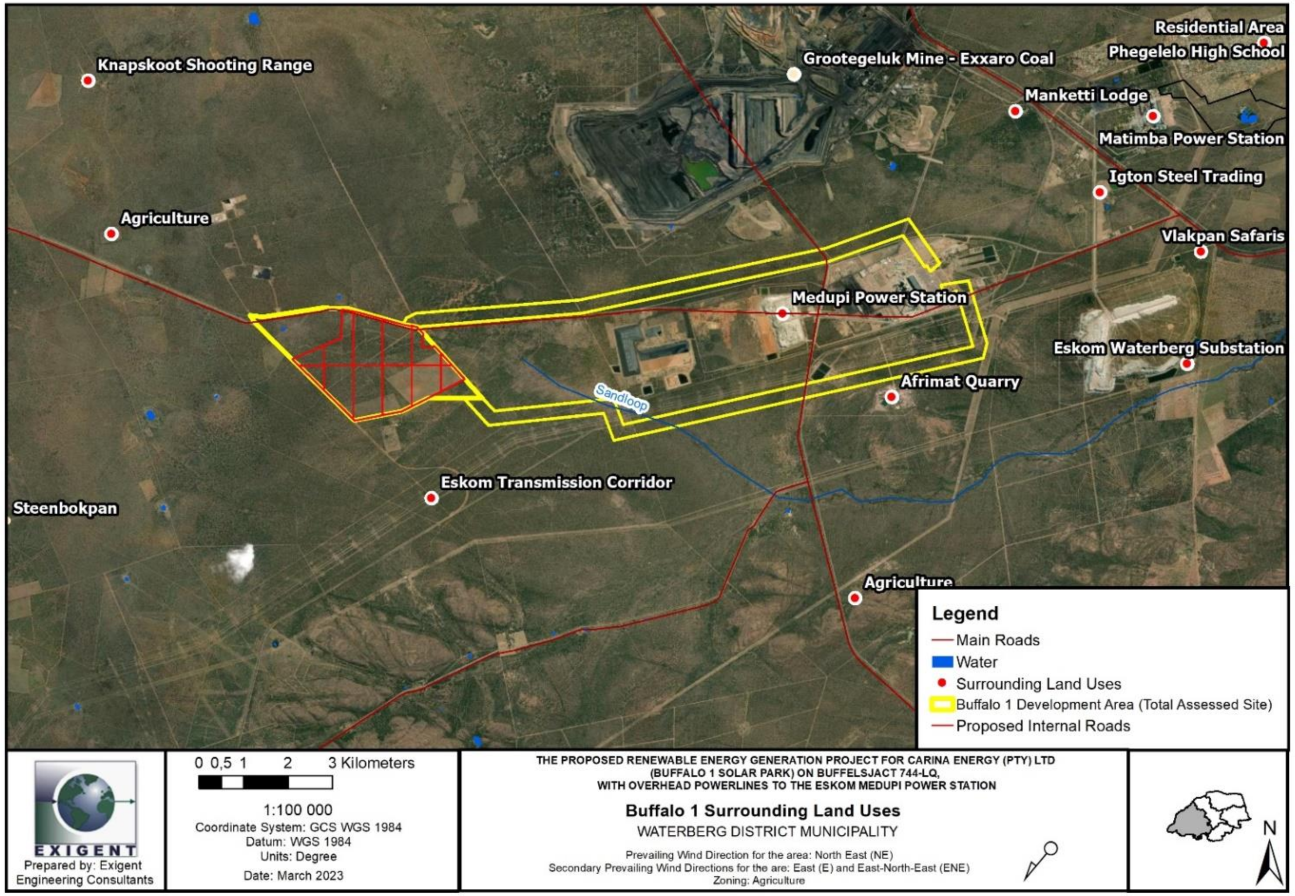

Figure 8-3. Surrounding land uses to the proposed site.

8.2 Climate

8.2.1 Temperature

This place is located in the southern hemisphere. Summer begins in December and ends at the end of January. In Lephalale, the summers are long, hot, and partly cloudy and the winters are short, cool, dry, and clear. The monthly distribution of average daily maximum temperatures (**Figure** 8-4) shows that the average midday temperatures for Lephalale range from 22.3°C in June to 31.9°C in January. The region is the coldest during July when the mercury drops to 3.7°C on average during the night.

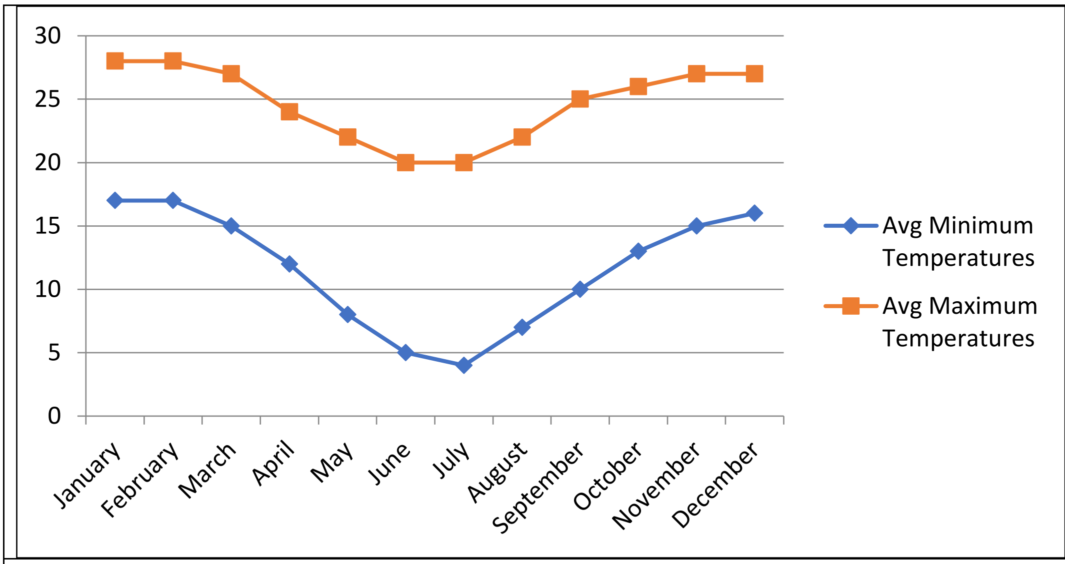

Figure 8-4. Average maximum and minimum temperatures for the Lephalale area (http://limpopo.lodgeguide.co.za/Limpopo_Info-travel/climate_limpopo-ellisras.html)

8.2.2 Rainfall

The area in general is characterized by summer rainfall with dry winters including the shoulder months of May and September (Figure 8-5).

Climate in the broad sense is a major determinant of the geographical distribution of species and vegetation types. However, on a smaller scale, the microclimate, which is greatly influenced by local topography, is also important.

The proposed development site falls within the Limpopo Sweet Bushveld vegetation type, where summer rainfall and dry winters occur. The climate area varies, becoming both warmer and drier from south to north. The long-term average annual rainfall is around 400-600 mm per year, with most rainfall occurring mainly during summer.

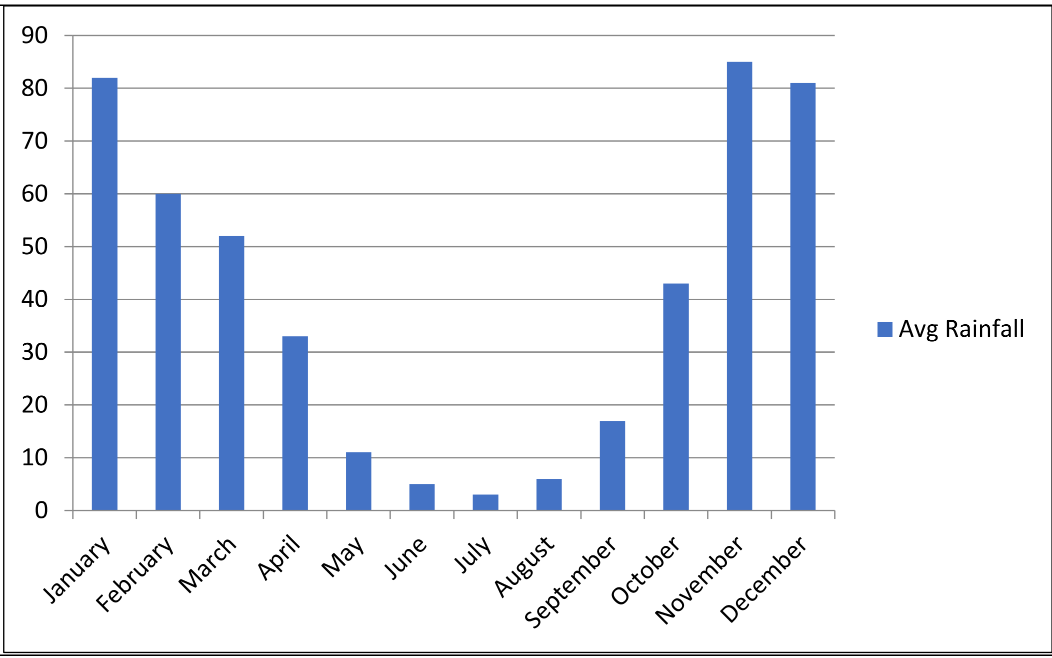

Figure 8-5. Average monthly rainfall for the Lephalale area (http://limpopo.lodgeguide.co.za/Limpopo_Info-travel/climate_limpopo-ellisras.html)

8.2.3 Hours of sunshine

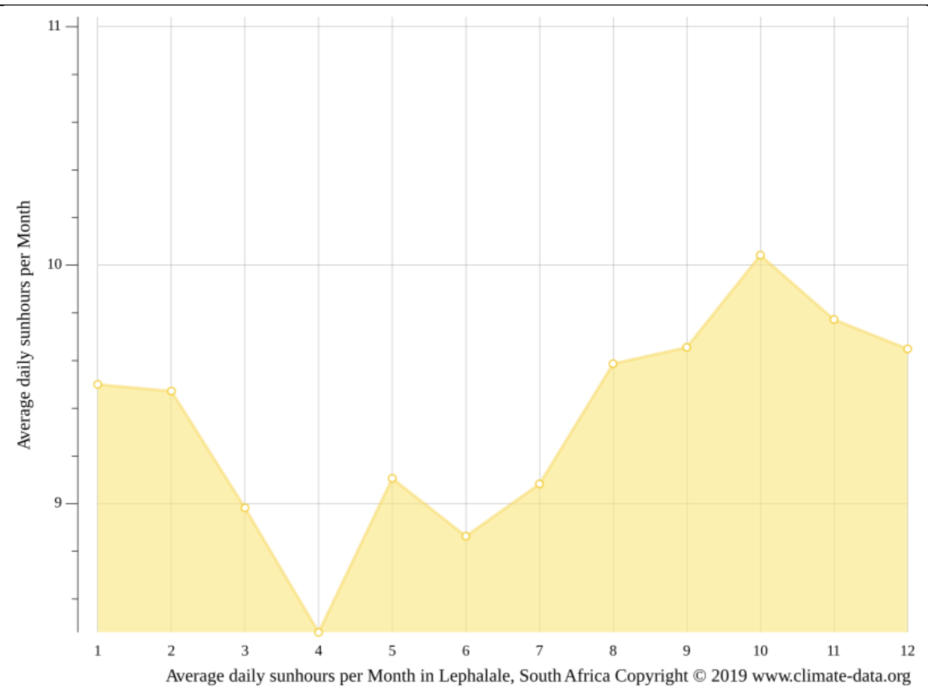

Figure 8-6: Average daily sunhours per month

In Lephalale, the month with the most daily hours of sunshine is October with an average of 10.04 hours of sunshine. In total there are 311.3 hours of sunshine throughout October. Around 3412.21 hours of sunshine are counted in Lephalale throughout the year. On average there are 112.17 hours of sunshine per month (**Figure** 8-6).

8.2.4 Wind

The windiest month (with the highest average wind speed) is October (8 km/h) in Lephalale[26]. The calmest month (with the lowest average wind speed) is June (4 km/h).

The predominant wind direction (**Figure 8.7**) at Lephalale is north-north-east (10 %) with lesser wind component from the north-east (9.5%) and north (6.5%). Wind speeds are generally slow to moderate with no wind speeds exceeding 6 m/s being recorded. Wind speeds of less than 1 m/s, which are designated as calm, occur 47.18 % of the time.

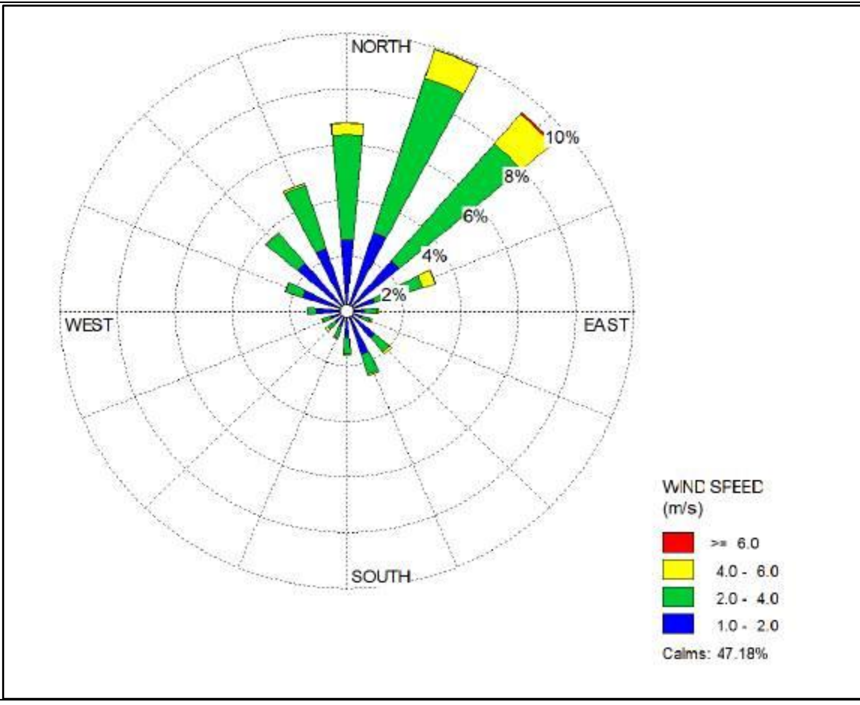

Figure 8-7:Surface wind rose for Bergfontein Meteorological Station in Lephalale for the period 2006 – 2008 (Adapted from Gondwana Environmental Solutions, 2009)

[26] Weather data: https://www.climatestotravel.com/climate/south-africa/lephalale#:~:text=The%20average%20wind%20speed%20is%206%20kph%20%284,there%20are%20remarkable%20differences%20between%20night%20and%20day. Date accessed 11April 2023.

8.2.5 Climate change

Climate change projections for the region indicate high-range warming with temperature increases from 1.5 – 2.5°C as well as more very hot days (> 35°C) in the next 30 years[27]. It is anticipated that there will be an increase in annual rainfall by as much as 100 mm/year, together with more extreme convective rainfall events and the associated increases in lightning strikes. Along with 1998 and 2010, 2014, 2015 and 2016 are widely recognised as the warmest years on record. The regional distribution of temperature increases is not uniform, however, and some regions have experienced greater change than others.

There is strong evidence that the average land-surface temperature has increased across Africa over the last century (Figure 8-8), and that this warming has been particularly marked since the 1970s with the decade of the 2000s being the warmest (Figure 8-9)[28].

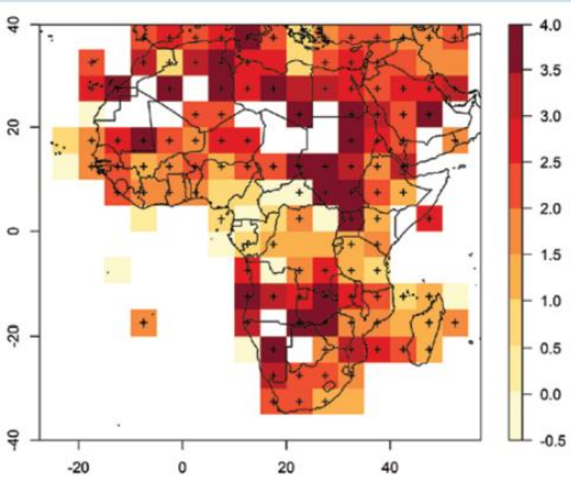

Figure 8-8: Observed trends in annual average near-surface temperature (°C per decade) over Africa for the period 1961-2014 based on CRUTEM4v data. Crosses indicate grid boxes where the trend is statistically significant. White areas indicate incomplete or missing data.

[27] Stocker, T., Qin, D., Plattner, G., Tignor, M., Allen, S., Boschung, J., Nauels, A., Xia, Y., Bex, B. & Midgley, B. 2013b, "IPCC, 2013: Climate Change 2013: The physical science basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change", Cambridge Univ. Press, Cambridge

[28] Davis-Reddy, C.L. and Vincent, K. 2017: Climate Risk and Vulnerability: A Handbook for Southern Africa (2nd Ed), CSIR, Pretoria, South Africa.

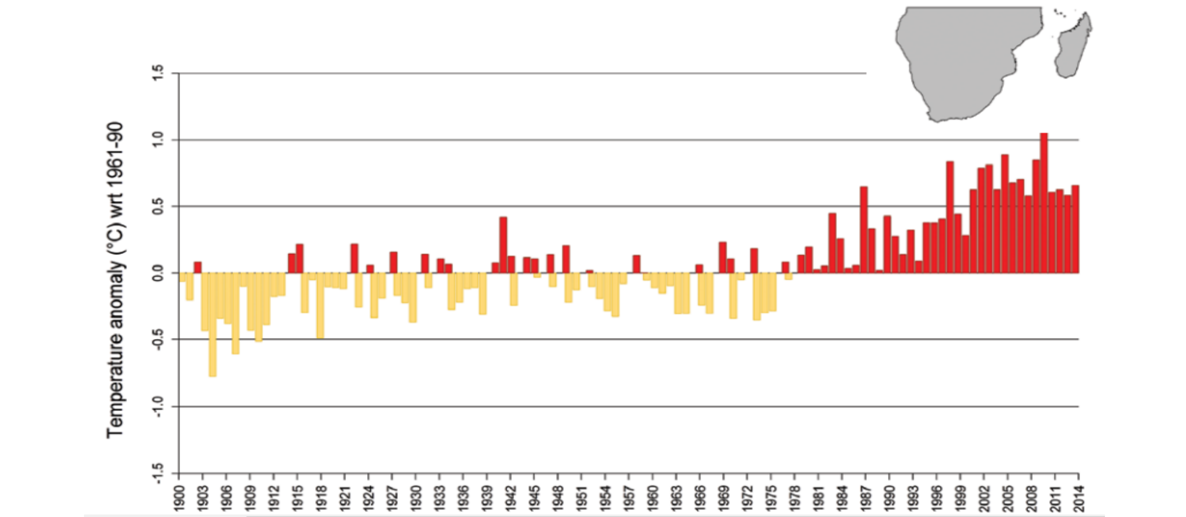

Figure 8-9: Mean annual temperature anomaly (°C) over southern Africa from 1901 to 2014 with respect to the long-term average climatology 1961-1990; based on the gridded CRUTEMv4 data set. Red represents a positive anomaly and yellow a negative temperature anomaly.

8.3 Biophysical characteristics of the project area

8.3.1 Topography

The topography is characterised by slightly undulating plains with wetlands and / or drainage channels bisecting the area. 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 between 900 and 940 meters above mean sea level (AMSL).

8.3.2 Geology

The study area is underlain by aeolian sand and sediments of the Karoo Supergroup. The Karoo supergroup is represented by the Eendragtpan, Grootegeluk and Swartrant Formations. Underlying the quaternary sediments south of the Eensaamheid fault, is underlain by sediments of the Magalakwena formation of the Waterberg Group (**Figure** 8-11).

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, geology and associated soil types is presented in **Table** 8-1 below as classified by the Environmental Potential Atlas, South Africa (ENPAT, 2000). The major geological formation in Lephalale Municipality includes Arenite, Gneiss and Sedimentary formation. Our study site is generally flat, making it suitable for development, the terrain is level plain with some relief.

In the Spatial Development Framework of Lephalale Local Municipality the study area is classified as having soils that are freely drained and structure less. They are highly erodible and have low natural fertility. The dominant soil types of the site are soils with calcrete and surface limestone layers, brownish sandy, clayey-loamy soils on the plains and low-lying areas, with shallow, gravelly, sandy souls on the slightly undulating areas.

Table 8-1 Land types, geology and dominant soil types of the proposed development site

Land type	Soils	Geology
Ae252	Red-yellow apedal, freely drained soils; red, high base status, > 300 mm deep (no dunes)	Shale, sandstone, mudstone and coal of the Karoo Sequence.
Bd46	Plinthic catena: eutrophic; red soils not widespread upland duplex and margalitic soils rare	Sandstone and conglomerate of the Kransberg Subgroup, Waterberg Group
Ah86	Red-yellow apedal, freely drained soils; red and yellow, high base status, usually < 15% clay	Sandstone and mudstone of the Matlabas Subgroup, Waterberg Group; undifferentiated shale, sandstone and coal of the Karoo Sequence; also alluvium.

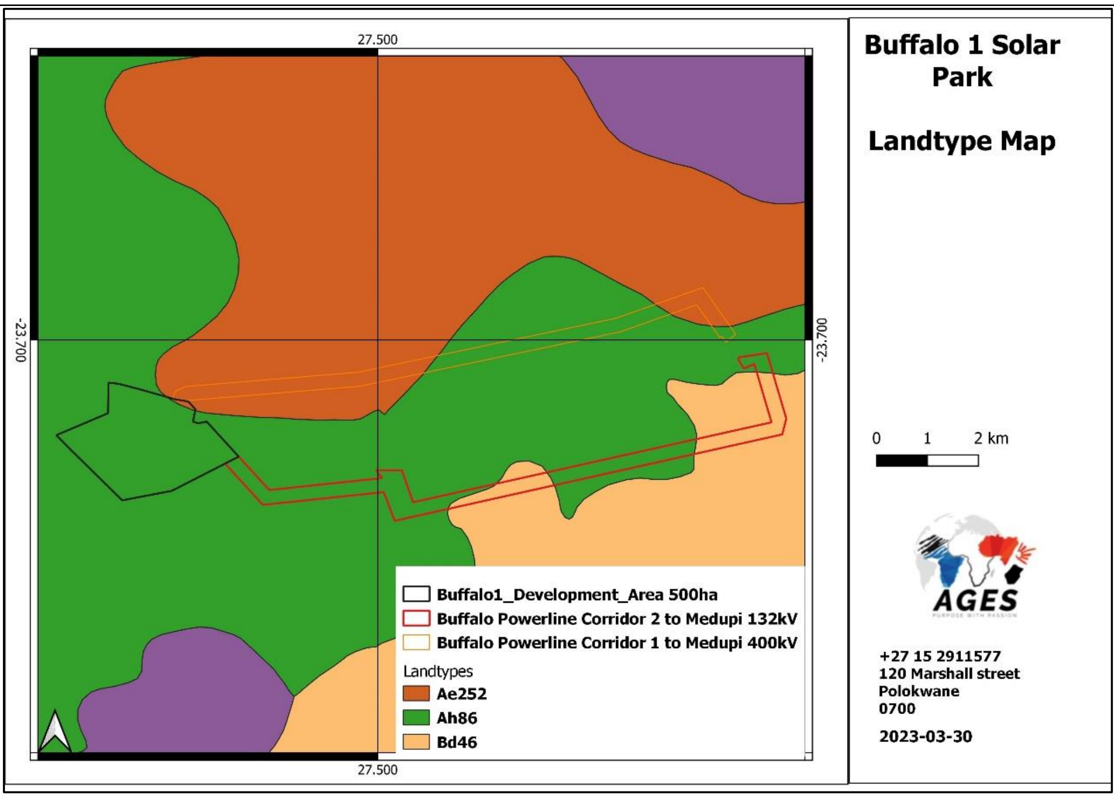

Figure 8-10. Land types of the project area

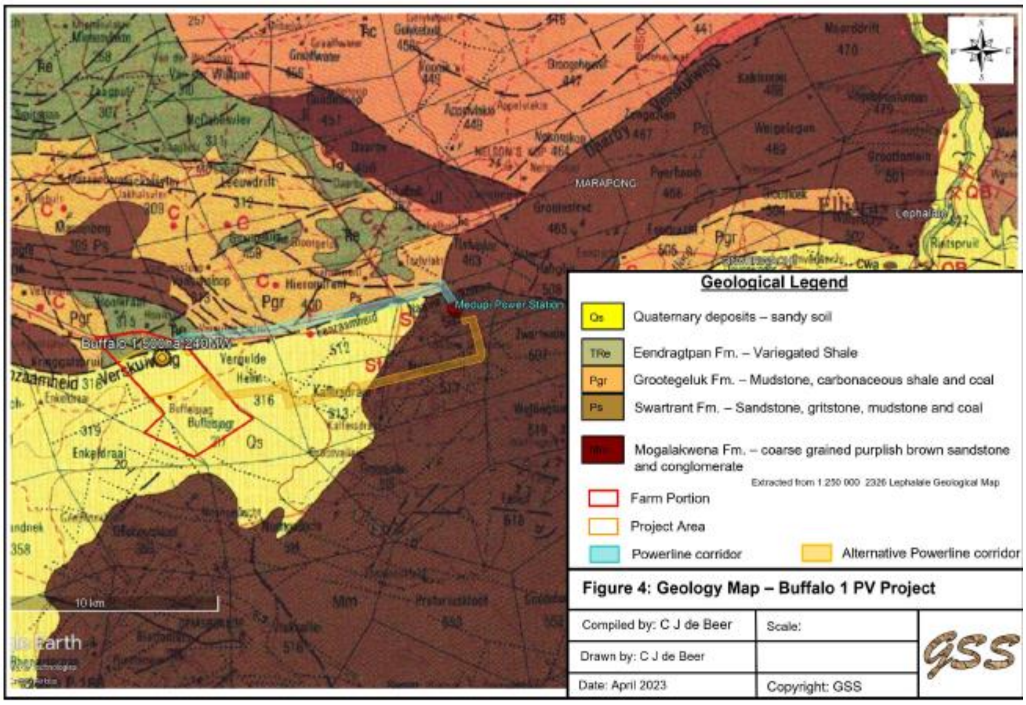

Figure 8-11. Geological map of Buffalo 1 Solar Park area

More than 60% of Lephalale Local Municipality area has moderate or better soil potential, but climate (especially rainfall) is the greatest limiting factor, so that irrigation is the preferred method of cultivation to obtain long-term results. The agricultural potential of the area is intimately associated with topographical, pedological (soil) and climate determinants.

8.3.3 Geotechnical properties of the site

The project area straddles the local watershed between the A42J A41E quaternary catchments. The karoo sediments are generally regarded as a poor aquifer. With groundwater occurring in the fractured rock mass. The fracture network is, although extensive not well interconnected, horizontal bedding plane fractures tend to be extensive but interconnecting fractures are not well developed. The occurrence of shale and mudrock act as aquatards and dolerite sills and dykes act as flow boundaries. The quaternary catchment is endorheic with no surface outflow.

The proposed development site is located on a gently east facing valley floor land facet. No major drainage affects the site. On-site drainage occurs as sub surface flow through the quaternary cover onto the bedrock contact. No surface drainage features are present on the proposed development area. The average elevation of the site is 935mamsl, with the highest point along the western boundary at 945mamsl and the lowest point at the south-eastern corner (920mamsl).

8.3.4 Land-use

The Buffalo 1 Solar Park is close to Medupi Substation. Farm Buffelsjagt 744-LQ (500 ha) is used as an agricultural unit mostly for grazing purposes and the land use status is “Agriculture”. The new rights as approved by the Lephalale Municipality would however permit the use of the existing farm portion for a Renewable Energy Generation Project (PV Solar Plant).

Lephalale has a well-established history of mining since the early 1970’s that are dominated by Exxaro’s coal mines in the area. The **Buffalo 1 Solar Park** property is located west of the Medupi substation in an area that is already affected by various electrical overhead power lines and on the northeast of the site there is Grootegeluk Coal mine.

8.3.5 Soil types and agricultural potential

Soil types were classified into broad classes (**Figure** 8-12)

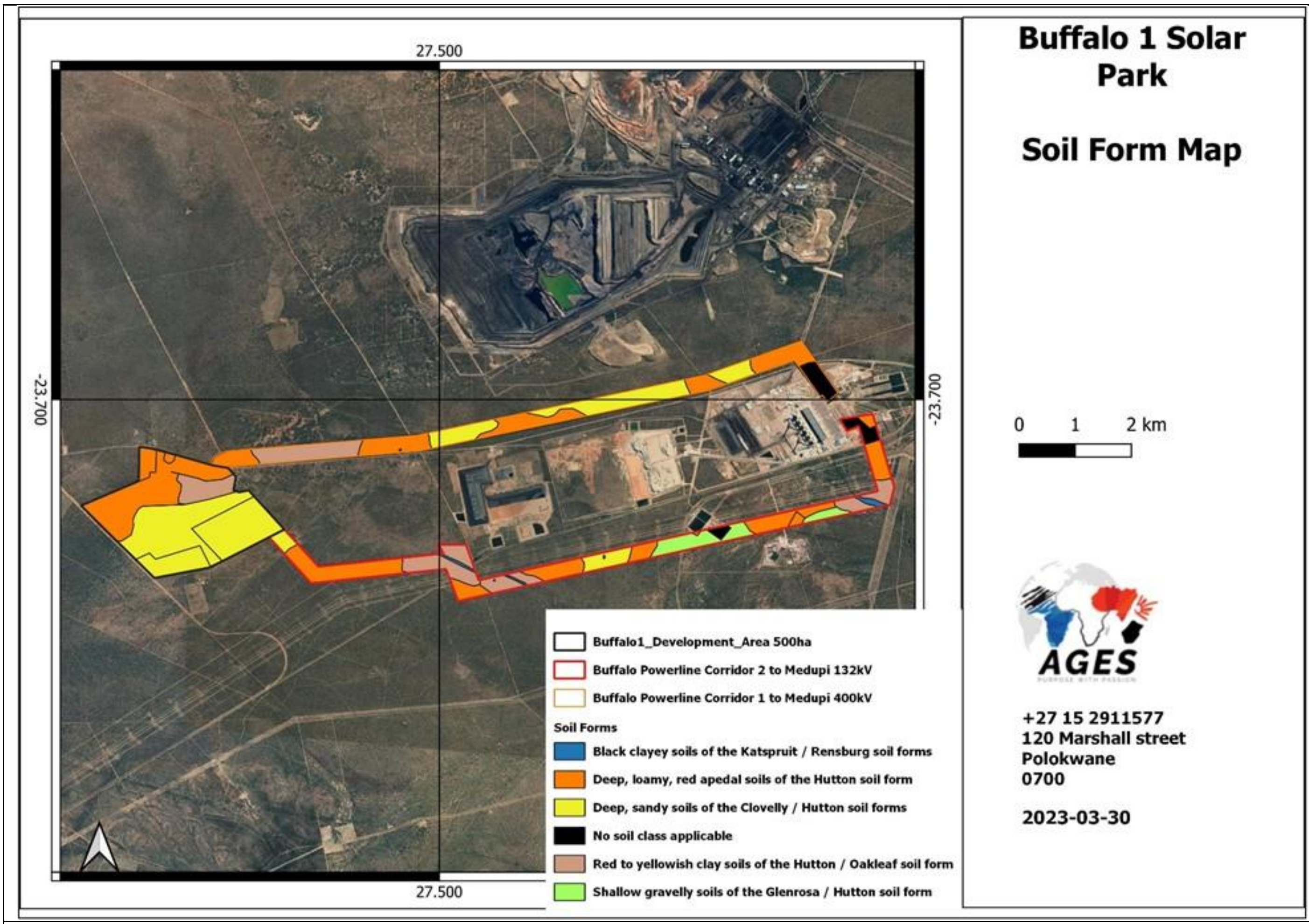

Figure 8-12. Soil Form map

Moisture and water availability will be affected by a temperature increase, regardless of any change in rainfall. Higher temperatures increase the evaporation rate, thus reducing the level of moisture available for plant growth, although other climatic elements are involved. A warming of 1°C, with no change in precipitation, may decrease yields of wheat and maize in the core cropping regions such as the US by about 5%. A very large decrease in moisture availability in the drier regions of the world would be of great concern to the subsistence farmers that farm these lands. Reduced moisture availability would only exacerbate the existing problems of infertile soils, soil erosion and poor crop yields. In the extreme case, a reduction in moisture could lead to desertification. The classes as classified for South Africa are shown in Table 8-2: Moisture availability classes as derived from seasonal rainfall and evaporationTable 8-2

Table 8-2: Moisture availability classes as derived from seasonal rainfall and evaporation

Moisture availability class	Summer rain season (R/0.25PET)	Winter rain season (R/0.4PET)	Agricultural Potential
1	>34	>34	Conducive to rain-fed arable agriculture
2	27-34	25-34	Conducive to rain-fed arable agriculture
3	19-26	15-24	Conducive to rain-fed arable agriculture
4	**12-18**	**10-14**	**Marginal for rain-fed arable agriculture**
5	6-12	6-9	Conditions too dry for rain-fed arable agriculture
6	<6	<6	Conditions too dry for rain-fed arable agriculture

The soils on the proposed development site are classified as class 4, which suggest that climatic conditions are marginal for rain-fed arable agriculture.

The grazing potential of these areas is medium to high. The most suitable and optimal utilization of the area would be grazing by livestock or wildlife. The soils are however susceptible to erosion and over grazing is a distinct and widespread risk.

Figure 8-13. Grazing potential

8.3.6 Surface water

The screening tool has identified wetlands as high sensitivity for the Buffalo 1 Solar Park site. It has also indicated that the site is potentially located in a quaternary catchment freshwater ecosystem priority area. National Freshwater Priority Areas (NFEPA) wetlands are identified on the proposed development site. Please see below.

The study area lies completely within the Limpopo Water Management Area (WMA) and entirely within the Limpopo Plains ecoregion. The study area falls within the Mokolo River Catchment, which drains into the Limpopo River to the north. The Mokolo River catchment covers an area of 8 387 km^2. The catchment stretches from the Waterberg Mountains though the upper reaches of the Sand River and includes the Mokolo Dam and a few small tributaries that join the main Mokolo River up to its confluence with the Limpopo River. The site is located within the A42J and A41E quaternary catchment and is situated in the Limpopo Water Management Area. Drainage occurs as sheet-wash into the drainage channels on site that eventually drains into the major river namely the Mokolo River that occurs to the east of the project area.

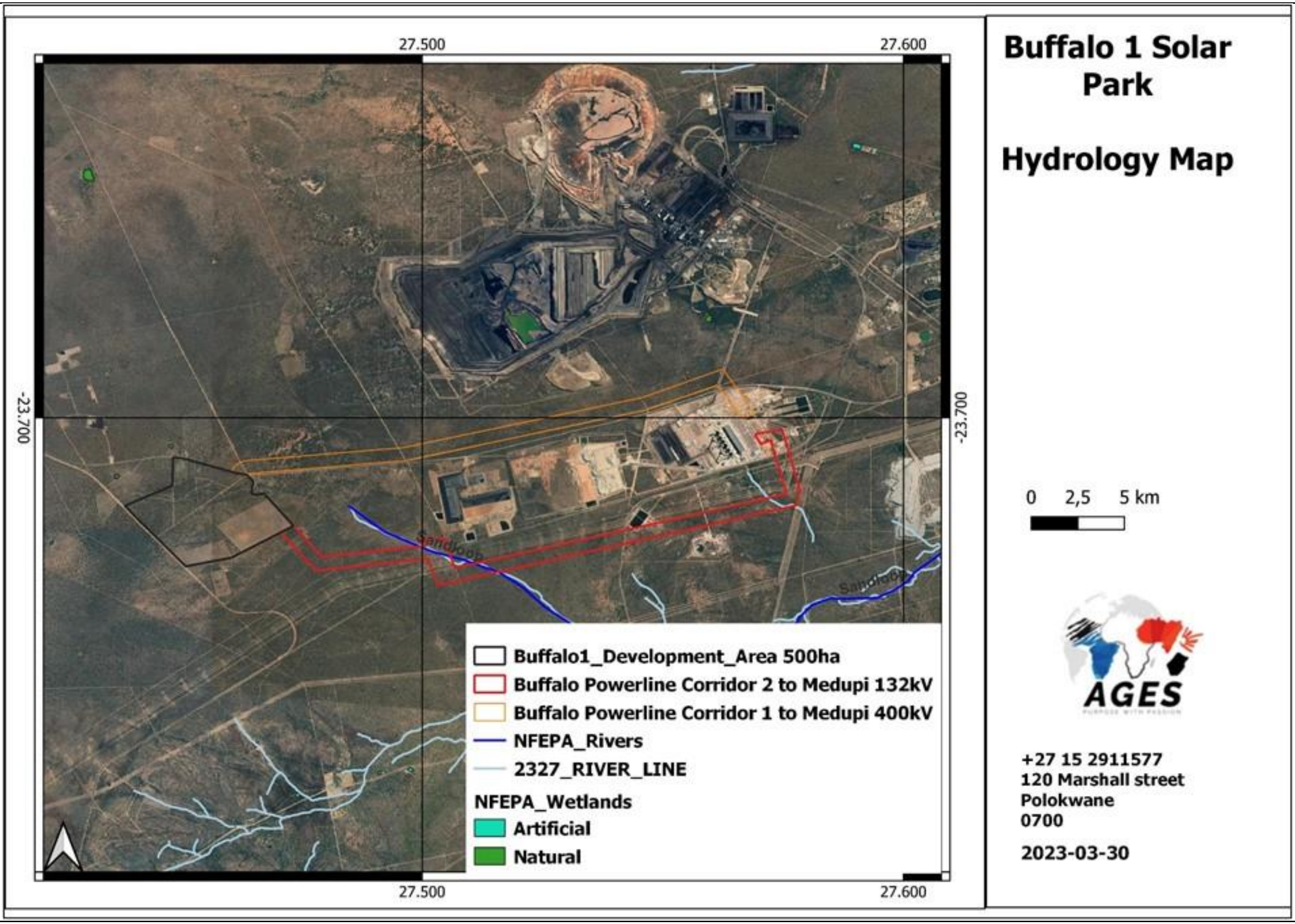

Figure 8-14: Location of the project area in relation to NFEPA Rivers and SWSA

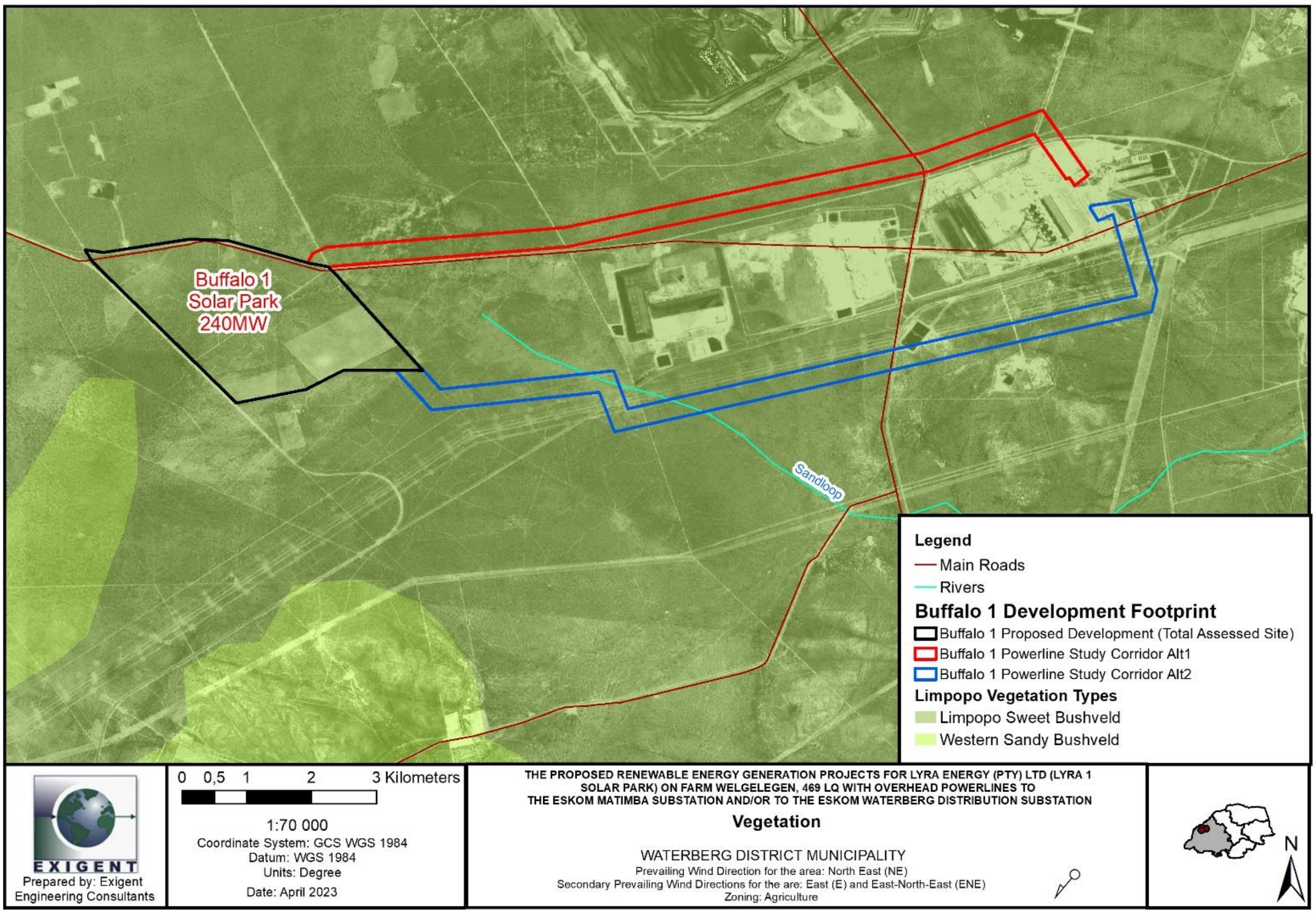

Figure 8-15. Surrounding vegetation

8.3.7 Groundwater

Drainage occurs as sub surface flow on the bedrock contact below the aeolian sand horizon from where it percolates through the fractured rock mass to the fractured rock aquifer located within the Karoo Sedimentary succession. A s a result drainage lines are poorly developed, and streams are mostly ephemeral.

The project area straddles the local watershed between the A42J A41E quaternary catchments. The karoo sediments are generally regarded as a poor aquifer. With groundwater occurring in the fractured rock mass. The fracture network is, although extensive not well interconnected, horizontal bedding plane fractures tend to be extensive but interconnecting fractures are not well developed. The occurrence of shale and mudrock act as aquatards and dolerite sills and dykes act as flow boundaries. The quaternary catchment is endorheic with no surface outflow. No shallow groundwater conditions were observed therefore the corrosion potential for steel structures placed in the soil is regarded as low.

8.3.8 Avifauna

During the single assessment performed in the summer (11th to the 16th of April 2023), 84 species were recorded during the point counts and 9 during the incidental counts. Some species were observed both as incidental records and during the point counts. The total number of individual species accounts for approximately 28,7% of the total number of expected species. Most bird species identified within the study area are common species known to nest within or utilise the woodland, pans and riparian woodland in the region and may be either permanently or occasionally present within the study area. In general terms the open old field patches could attract the Secretarybird, White-bellied Korhaans, and White Stork and Abdim's Stork. The grassland patches are also a favourite foraging area for non-Red Data game birds such as Swainson's Spurfowl and Helmeted Guineafowl. This in turn could attract large raptors because of both the presence and accessibility of prey. Many habitat generalist species utilize this habitat type predominantly for foraging and hunting purposes. One of the expected SCC was recorded within the site during the survey period within point counts, i.e., *Leptoptilos crumenifer* (Marabou Stork).

The broadleaved woodland occurring in the study area (footslopes) has quite a higher diversity of birds because of the crossover of habitats. Typical examples of broad-leaved-woodland birds are Pallid Flycatcher, Greencapped Eremomela, White-bellied Korhaan and Meyer's Parrot. 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** 8-3):

Table 8-3. Red data list of potential fauna for the study area

English Name	Conservation status	Probable habitat in area
BIRDS (SABAP 2 LIST SPECIES)		
Tawny Eagle	Endangered	Medium
Abdim's Stork	Near Threatened	Medium
European Roller	Near Threatened	Medium
Lanner Falcon	Vulnerable	Low
Cape Vulture	Endangered	Low – dependant on carcasses
Marabou Stork	Near Threatened	Medium
Yellow-billed Stork	Endangered	Medium
Martial Eagle	Endangered	Medium

The screening tool identified medium sensitivity for the fauna. Seven (7) of the species observed within the PAOI are regarded as priority species and are listed below (**Table** 8-4).

Table 8-4: Summary of Priority Species recorded within and around the proposed development.

Scientific Name	Common Name	Sources	Collision	Electrocution	Disturbance/Habitat Loss

Circaetus cinereus	Brown Snake Eagle	X	X	X	
Circaetus pectoralis	Black-chested Snake Eagle	X	X	X	
Haliaeetus vocifer	African Fish Eagle	X	X	X	
Leptoptilos crumenifer	Marabou Stork	X	X	X	
Lophotis ruficrista	Red-crested Korhaan	O	X		
Phalacrocorax lucidus	White-breasted Cormorant	O	X		
Scopus umbretta	Hamerkop	O	X	X	

The most abundant species was the Uraeginthus angolensis (Blue Waxbill) with a relative abundance of 0.117 and a frequency of occurrence of 47.423% (**Table** 8-5). Additional ubiquitous species comprised of Cercotrichas leucophrys (White-browed Scrub Robin) and Corythaixoides concolor (Grey Go-away-bird) with a frequency of occurrence of 52.577% and 46.392%, respectively (**Table** 8-5).

Table 8-5: Relative abundance and frequency of occurrence of dominant avifauna species recorded during the standardised point counts within and around the proposed development during the field survey.

Scientific Name	Common Name	Relative abundance	Frequency
Uraeginthus angolensis	Blue Waxbill	0.117	47.423
Urocolius indicus	Red-faced Mousebird	0.075	20.619
Streptopelia capicola	Ring-necked Dove	0.055	35.052
Cercotrichas leucophrys	White-browed Scrub Robin	0.052	52.577
Corythaixoides concolor	Grey Go-away-bird	0.050	46.392
Quelea quelea	Red-billed Quelea	0.045	5.155
Tockus rufirostris	Southern Red-billed Hornbill	0.044	26.804
Tockus leucomelas	Southern Yellow-billed Hornbill	0.042	30.928
Cisticola chiniana	Rattling Cisticola	0.036	29.897
Numida meleagris	Helmeted Guineafowl	0.032	8.247
Dendroperdix sephaena	Crested Francolin	0.032	24.742
Batis molitor	Chinspot Batis	0.031	26.804
Sylvietta rufescens	Long-billed Crombec	0.029	25.773
Bubalornis niger	Red-billed Buffalo Weaver	0.021	6.186
Turdoides jardineii	Arrow-marked Babbler	0.019	6.186
Urolestes melanoleucus	Magpie Shrike	0.019	8.247
Lophoceros nasutus	African Grey Hornbill	0.017	20.619
Camaroptera brevicaudata	Grey-backed Camaroptera	0.016	17.526
Curruca subcoerulea	Chestnut-vented Warbler	0.015	17.526
Tricholaema leucomelas	Acacia Pied Barbet	0.015	16.495

Observing and monitoring flight paths and nesting sites of SCC and/or priority species are important in ascertaining habitat sensitivity and evaluating the impact risk significance of any proposed development. No specific flight paths were noted. A few nests were observed during the field investigation, mainly on pylons. A potential White-backed Vulture nest was observed, but there was no activity during the site visit. Therefore, no buffers recommended at this stage around the nest.

8.3.9 Fauna and flora

The development site lies within the Savannah biome, which is the largest biome in Southern Africa. It is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). The environmental factors delimiting the biome are complex and include altitude, rainfall, geology and soil types, with rainfall being the major delimiting factor. Fire and grazing also keeps the grassy layer dominant. The most recent classification of the area by Mucina & Rutherford is the Limpopo Sweet Bushveld vegetation type.

Three major fauna habitats were observed in the area namely:

- Mixed woodland.
- Old fields.
- Riparian habitats / open water habitats.

The Limpopo Sweet Bushveld Thornveld vegetation type has a least threatened conservation status, with 19% transformed and 1% statutorily conserved. This vegetation type in its pristine state is characterized by short open woodland, in disturbed areas thickets of *Acacia erubescens*, *A. melifera* and *Dischostachys cinerea*.

The following vegetation units were identified during the survey.

1. *Senegalia mellifera – Vachellia nilotica* clay thornveld
2. Mixed *Senegalia nigrescens* – Combretum - *Grewia* woodland
3. Combretum *apiculatum* woodland.
4. Mixed Combretum – *Terminalia – Sclerocarya - Grewia* sandveld.
5. *Boscia- Grewia* shrubveld.
6. Dense *Vachellia tortilis – Dichrostachys* cinerea thickets.
7. Secondary old fields:
8. Hydrological features:

o River channel with riparian woodland & floodplains.
o Endorheic depressions.

The screening tool has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e. Critical Biodiversity Areas (CBA), and other elements of high conservation importance. It has identified the Buffalo 1 Solar Park is located in a CBA 2 and is adjacent to the Tierkop Private Nature Reserve and approximately 4.48 km from Koedoe Private Nature Reserve. A species of concern in this area is the *Corchorus psammophilus*.

The vegetation units for the solar development are presented in **Figure** 8-16. Most of the vegetation unts have a medium sensitivity rating and the terrestrial specialist supported development of the site provided that mitigation measures be implemented.

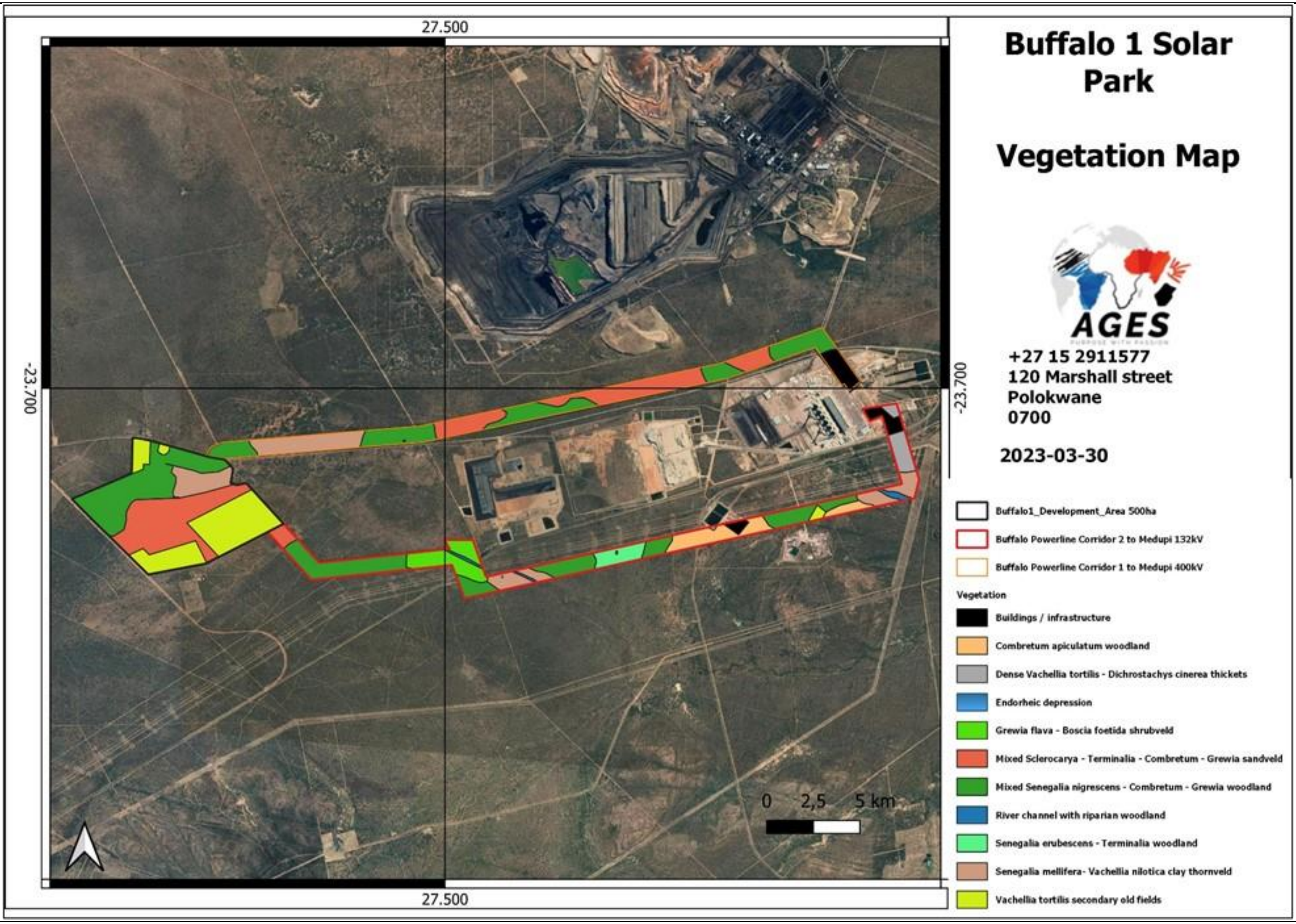

Figure 8-16: Vegetation Unit Map of the proposed development site.

Species of conservation concern

Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient – Insufficient Information (DDD). It should also be noted that not all species listed as protected are threatened or vice versa.

A list of SCC plant species previously recorded in the study area in which the proposed development is planned was obtained from the Plants of Southern Africa (POSA) database of SANBI. According to the SANBI POSA database for the area, no red listed species occur in the project area. One red listed species were also flagged by the EIA screening tool, ***Corchorus psammophilus***

The *Corchorus psammophilus* is a plant from the family Malvacea and is range restricted occurring endemically to the Limpopo Sweet Bushveld sandy flats and open *Terminalia sericea* veld.

Figure 8-17: Photo of *Corchorus psammophilus* (Photos taken by Sandy Gusha, souce: inaturalist.org[29])

Protected trees

The survey taken by the terrestrial specialist noted that the following protected tree species occurs within the study area (**Table** 8-6):

Table 8-6: Protected trees

Tree species	Habitat
Sclerocarya birrea	Sandy to gravelly soils on site
Combretum imberbe	Loamy to clayey soils
Boscia albitrunca	Sandy to sandyloam soils
Vachellia erioloba	Sandy to sandyloam soils

Protected plants (LEMA)

Plant species are also protected in the Limpopo Province according to the Limpopo Environmental Management Act. 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 project.

After a detailed survey the following listed protected plant species listed in the act was found on the project area:

[29] Sandy Gusha (Corchorus psammophilus) · iNaturalist: https://www.inaturalist.org/taxa/582788-Corchorus-psammophilus

- *Spirostachys africana* (riparian zones)
- *Ammocharis coranica* (sandy soils).
- *Boophane disticha* (sandy soils).
- *Harpagophytum procumbens* (sandy soils).

Mammals

From a mammal habitat perspective, it was established that two habitats are very prominent on the study site, namely aquatic, arboreal and terrestrial habitat which forms part of the proposed development site. The pans and riparian zones support wetland-associated vegetation cover on the study site. The remainder of the site occurs in the terrestrial habitat and is not of great ecological significance. The habitat consists of open to closed woodland with varying soil depths. Termitaria or moribund termitaria, which are the preferred habitat for some mammal species, do not occur in the proposed development site.

The broader adjacent habitats are extensions of those present on site. The surrounding habitat will still be utilized by mammals such as antelopes, small predators, small mammals and rodents. Therefore, the expected mammalian richness is considered High.

Antelope species such as kudu, bushbuck, duiker and steenbok still roam this area (dung, spoor identified) and are not restricted by game fences while the farm also has introduced game species such as giraffe, zebra, blue wildebeest nyala and impala. Smaller mammal species such as honey badgers and serval can become habituated to anthropogenic influences, while other species will rather move away from the development areas and will seldom use the area. Predators that still roam freely in the area include smaller predators such as black backed jackal, while larger predators such as leopard, brown hyena, caracal, serval and honey badger still occur at low densities in the area. The dominant species composition therefore comprises of widespread taxa with unspecialised life history traits.

According to the existing databases and field survey the following number of fauna species included in the IUCN red data lists (**Table** 8-7) can potentially be found in the study area

Table 8-7: IUCN Red data list species

English Name	Conservation status	Probable habitat in area
MAMMALS		
Brown Hyena	Near Threatened (2015)	Low
Leopard	Vulnerable (2016)	Low
Roan Antelope	Endangered (2016)	Confined to game reserves / farms
Serval	Near Threatened (2016)	Medium
Blasius's Horseshoe Bat	Near Threatened (2016)	Low
Smithers' Horseshoe Bat	Near Threatened (2016)	Low

English Name	Conservation status	Probable habitat in area
(Southern African) Tsessebe	Vulnerable (2016)	Confined to game reserves / farms
Sensitive species 5	Vulnerable (2016)	Low
Ground Pangolin	Vulnerable (2016)	Low

Birds

Most bird species identified within the study area are common species known to nest within or utilise the woodland, pans and riparian woodland in the region and may be either permanently or occasionally present within the study area. In general terms the open old field patches could attract the Secretary bird, White-bellied Korhaans, and White Stork and Abdim's Stork. The grassland patches are also a favourite foraging area for non-Red Data game birds such as Swainson's Spurfowl and Helmeted Guineafowl. This in turn could attract large raptors because of both the presence and accessibility of prey. Many habitat generalist species utilize this habitat type predominantly for foraging and hunting purposes.

The riparian vegetation consists of an open non-perennial river system with exposed sandbanks bordered with dense riparian vegetation. The river system is non-perennial though and therefore waterbirds will only periodically utilize this area for foraging. Due to the nature of the river, fish are not likely to occur in it and birds that feed on fish thus won't be attracted to the site. Frogs might occur during the summer months in the pools and will attract bird species such as Hadeda, herons and hamerkops. The dominant vegetation within the riparian zone includes/consists of large Vachellia and broadleaved trees, which grow taller due to the availability of water when compared to trees further away from the river.

The old fields occurring adjacent to the project area support bird species such as crowned plovers, crested guineafowls, francolin species as well as the birds of prey. Although this microhabitat is in a degraded state, the area is a popular habitat for bird species, especially as foraging area, while species such as crowned plover and other smaller non-passerine birds also breed on the ground in this area.

There is a long list of red data bird species that have a geographical distribution that includes the site. The presence of the habitat of these species is mostly confined to the riparian woodlands and open water areas associated with the pans and the Mokolo River, although the probability of finding these species on site are low, and most habitats is in a fragmented and degraded state.

According to Birdlife South Africa, the study area falls outside of any Important Bird Areas (IBA), identified within South Africa (www.birdlife.org.za). The conservation status of many of the bird species that are dependent on rivers and wetlands reflects the critical status of these areas nationally, with many having already been destroyed. In the study area, the riverine areas represent permanent water sources.

Microphyllous woodland usually supports much higher bird numbers compared to the broadleaved woodlands. The area represents microphyllous woodland and supports many smaller bird species such as Ashy Tit, Pied Babbler, Kalahari Robin, Burntnecked Eremomela, Desert Barred Warbler, Marico Flycatcher, PriritBatis, Crimsonbreasted Shrike, Longtailed Shrike, Threestreaked Tchagra, Great Sparrow, Whitebrowed Sparrowweaver, Scalyfeathered Finch, Violeteared Waxbill and Blackcheeked Waxbill.

The broadleaved woodland occurring in the study area (footslopes) has quite a higher diversity of birds because of the crossover of habitats. Typical examples of broad-leaved-woodland birds are Pallid Flycatcher, Greencapped Eremomela, White-bellied Korhaan and Meyer's Parrot.

Herpetofauna (reptiles and amphibians)

Species such as the southern rock python, the black mamba, puff adder, boomslang, vine snake, spotted bush snake and several members of the green snakes (*Philothamnus* spp.) is expected to occur in the study area., although the presence of these snakes is dependent on the presence of their prey species (rodents, frogs etc.). The general habitat type for reptiles consists of open to very dense bushveld, with limited available habitat for diurnally active and sit-and-wait predators, such as terrestrial skinks and other reptiles. Arboreal species are the more prominent components of the local herpetofauna.

The amphibians appear to be poorly represented on site. The only near threatened amphibian which has been recorded from this area is the giant bullfrog (*Pyxicephalus adspersus*), for which the arable land provides ideal dispersal area. This species has been recorded from this quarter degree grid cell, while the African bullfrog (P. edulis) has not, although one might expect it also to occur here. Though there may be suitable habitat for Giant Bullfrog (*Pyxicephalus adspersus*) at the site, the presence of the species at the site is unconfirmed. The most probable habitat to find bullfrogs is in the sandy terrain in the vicinity of pans. The riparian zone of the Sandloop River probably harbours several amphibian species but no hotspot for amphibian diversity is known from the site.

The development activities should allow the python species to still have optimal living conditions on the remainder of the area. Although highly charismatic, individuals could be killed by workers when encountered on the cropland development footprints, since P. natalensis is highly valued in the “muthi” trade (Branch, 1988). Environmental education of the workers should therefore be considered a high priority.

Crocodiles are listed as Vulnerable and do occur in the Mokolo River periodically, although the development will not impede the habitat of the crocodiles.

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 8-8**).**

Table 8-8: Red Data List of potential herpetofauna that may occur in the proposed site.

English Name	Conservation status	Probable habitat in area
HERPETOFAUNA		
Southern African Python	Vulnerable	Low
Nile Crocodile	Vulnerable	Moderate
Northern Crag Lizard	Near Threatened (SARCA 2014)	Low

Insect and invertebrates

Insects and spiders are very good indicators of the plant diversity and ecological sensitivity of an area. Butterflies can be used in the field as indicators of biodiversity. An insect and spider desktop survey were done in addition to the field observations.

All the potential invertebrate habitats are well represented by a high family richness of insects and spiders. Spiders occur throughout all the habitats, and both web builders and active hunters find their ways in trapping and actively hunt around for potential food.

8.3.10 Site sensitivity verification

Following the ecological surveys, the classification of the study area into different sensitivity classes and development zones was based on information collected at various levels on different environmental characteristics. Factors which determined sensitivity classes were as follows:

- Presence, density and potential impact of development on rare, endemic and protected plant species.
- Conservation status of vegetation units.
- Soil types, soil depth and soil clay content.
- Previous land-use.
- State of the vegetation in general as indicated by indicator species.

Below included is the sensitivity map for the proposed solar development, (Figure 8-18 and Figure 8-19). Only criteria applicable to the specific vegetation units were used to determine the sensitivity of the specific unit.

The vegetation associated with the water courses and wetlands has a high sensitivity with a high conservation priority. No major alteration of these important drainage areas is recommended, especially considering it to form part of an important catchment. The potential to impact on the habitat is high and therefore a sufficient buffer zone of 32 meters is applicable for the development site or the floodline zone (**Figure** 8-18**)**

Many threatened species are woodland and wetland specialists, linked to these habitats either for breeding, feeding or shelter. Major impacts on wetland and riparian areas 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 (licence for eradication of protected plants, IWUL application etc.). The best route option for the proposed powerline corridor would be Option Corridor 1 due to a smaller distance covered. This option also has no drainage crossings compared to Option Corridor 2.

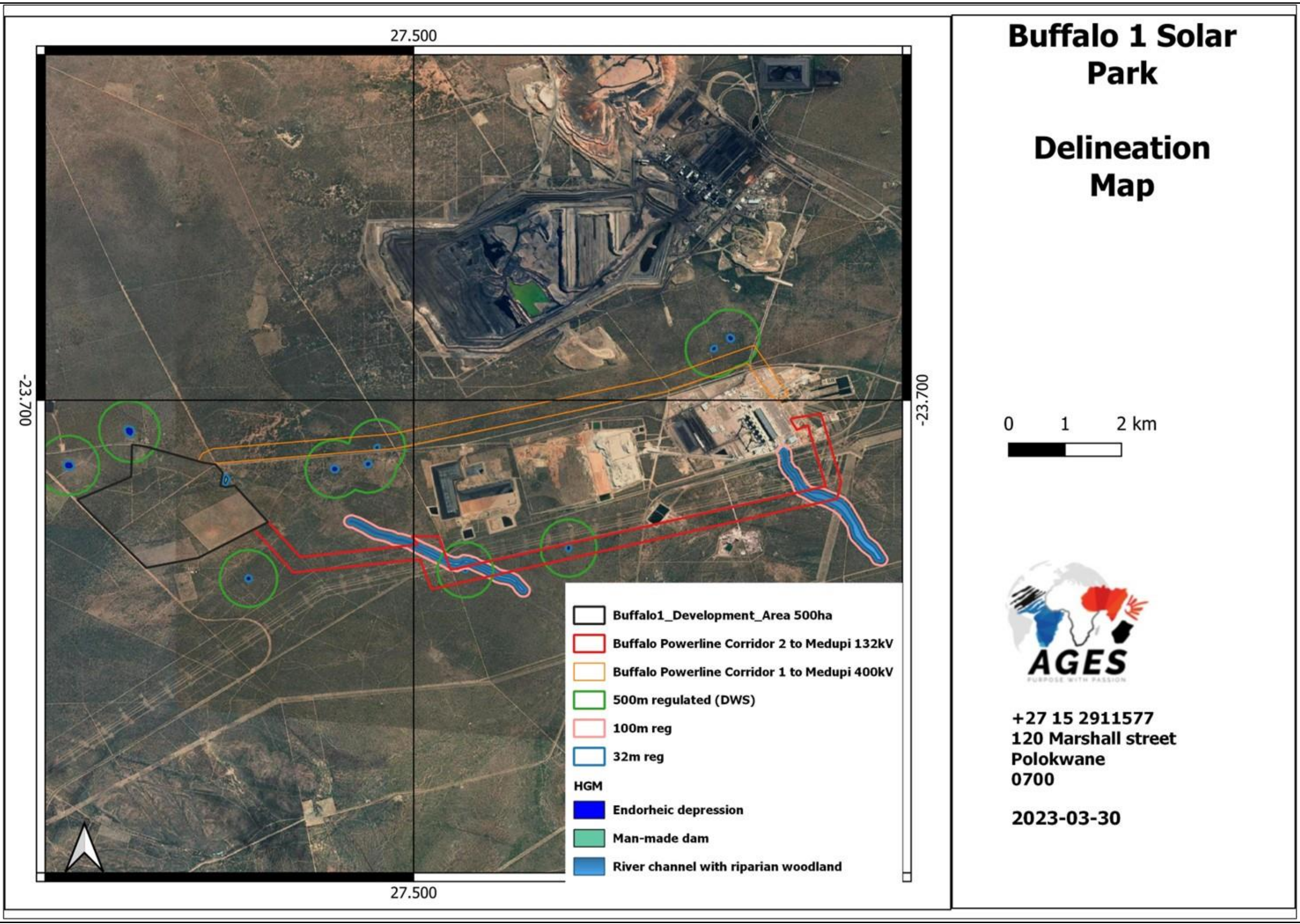

Figure 8-18: Sensitivity Map of the project area

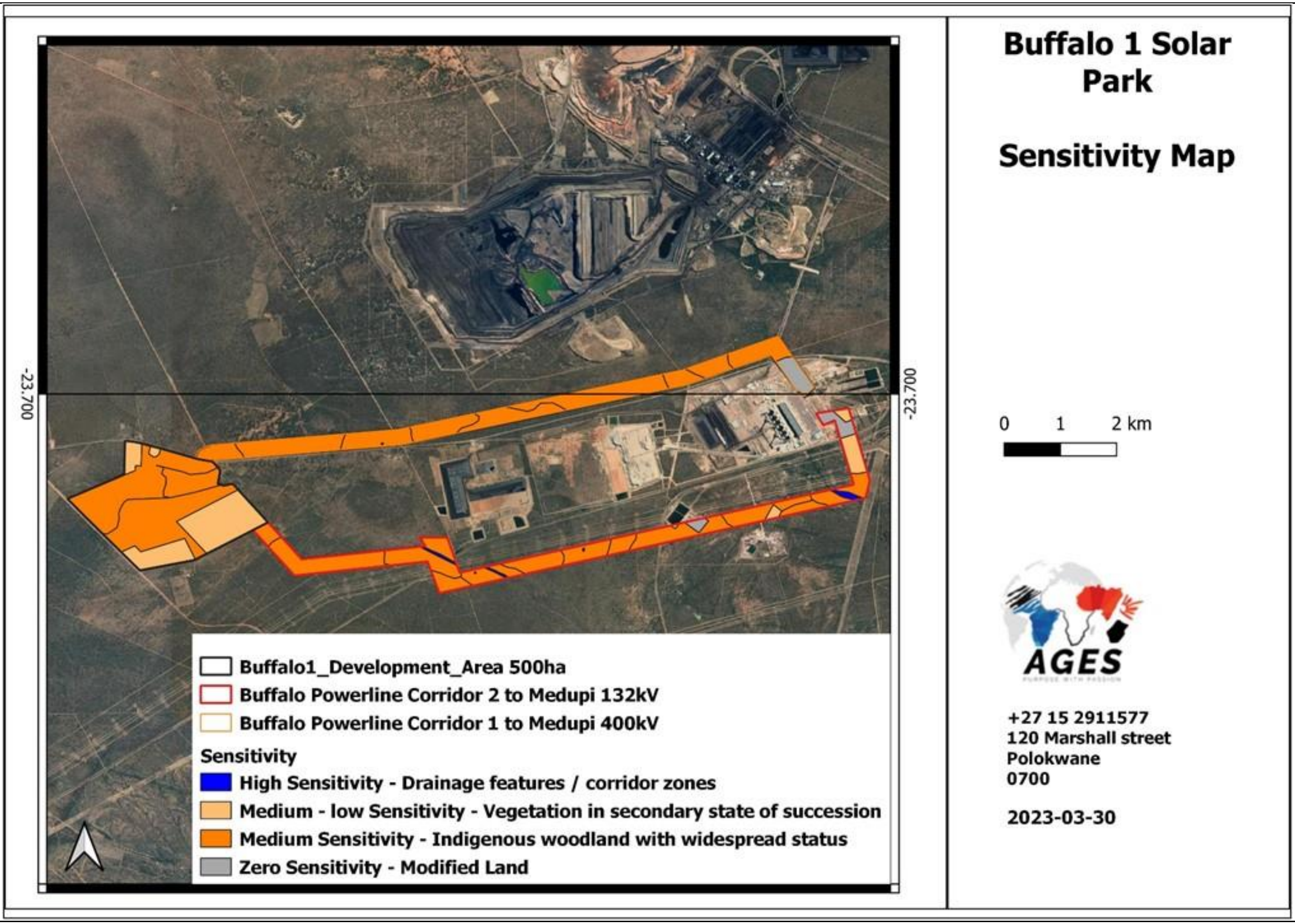

Figure 8-19: Sensitivity Map of the project area

8.3.11 Conservation and protected areas

The Limpopo Biodiversity Conservation Plan is a spatial component of a bioregional plan (i.e., map of CBA and associated land-use guidelines). The Limpopo Conservation Plan categories for the developments are presented in **Figure** 8-20.

The following can be concluded regarding developments:

- Most of the proposed development footprints represent by Other Natural Remaining, there is a Section of No natural area. At the edge of the development there is CBA2.
- The powerline connection alternatives represent Other Natural Areas (ONA). The management objective for this area would allow the proposed solar development and associated infrastructure.

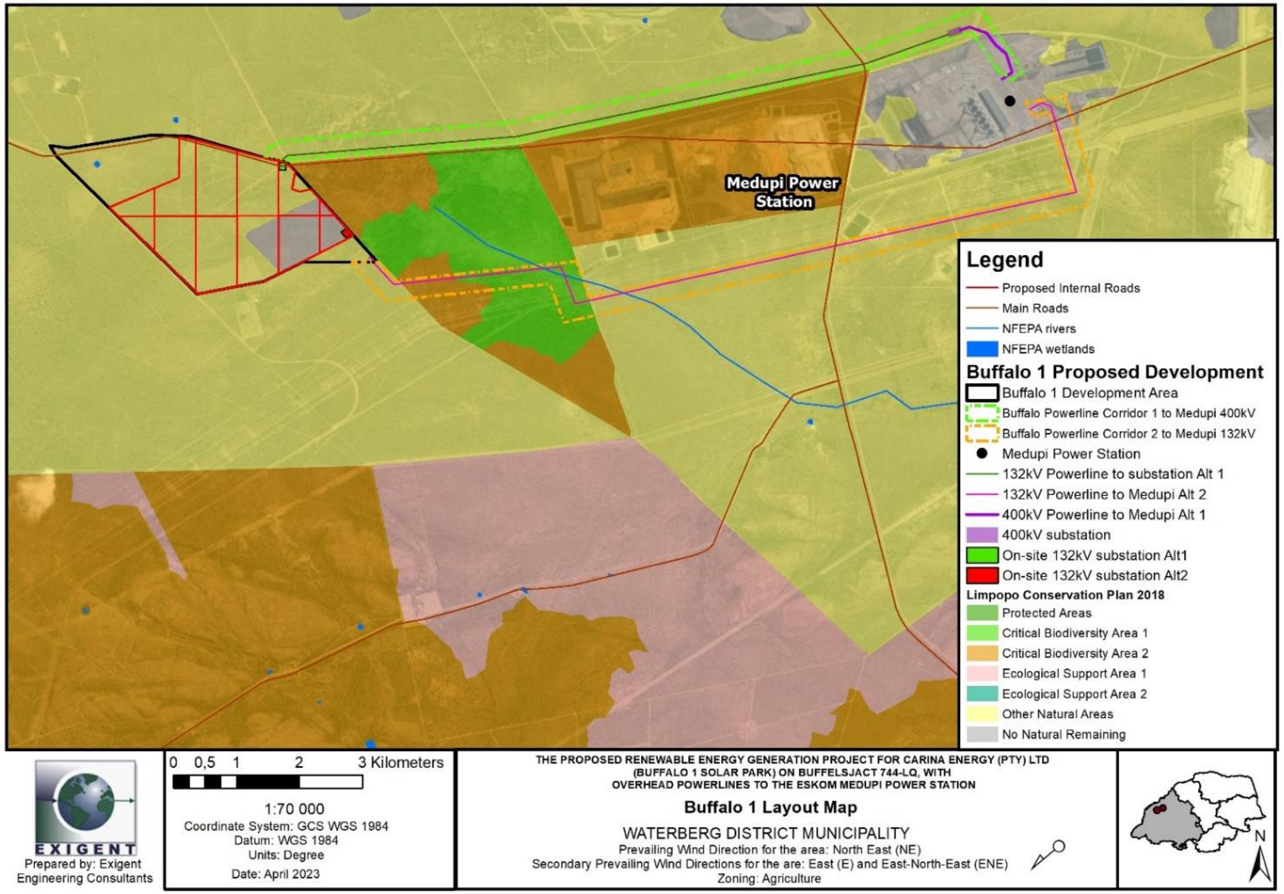

Figure 8-20: Conservation status of Buffalo 1 Solar Park

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 D'Nyala Nature Reserve that occurs to the east of the project area **(**Figure 8-21).

The 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. The area to the east of the project area represents the Limpopo Central Bushveld NPAES although the development of the solar power plant will not impede on any of the NPAES (**Figure** 8-21).

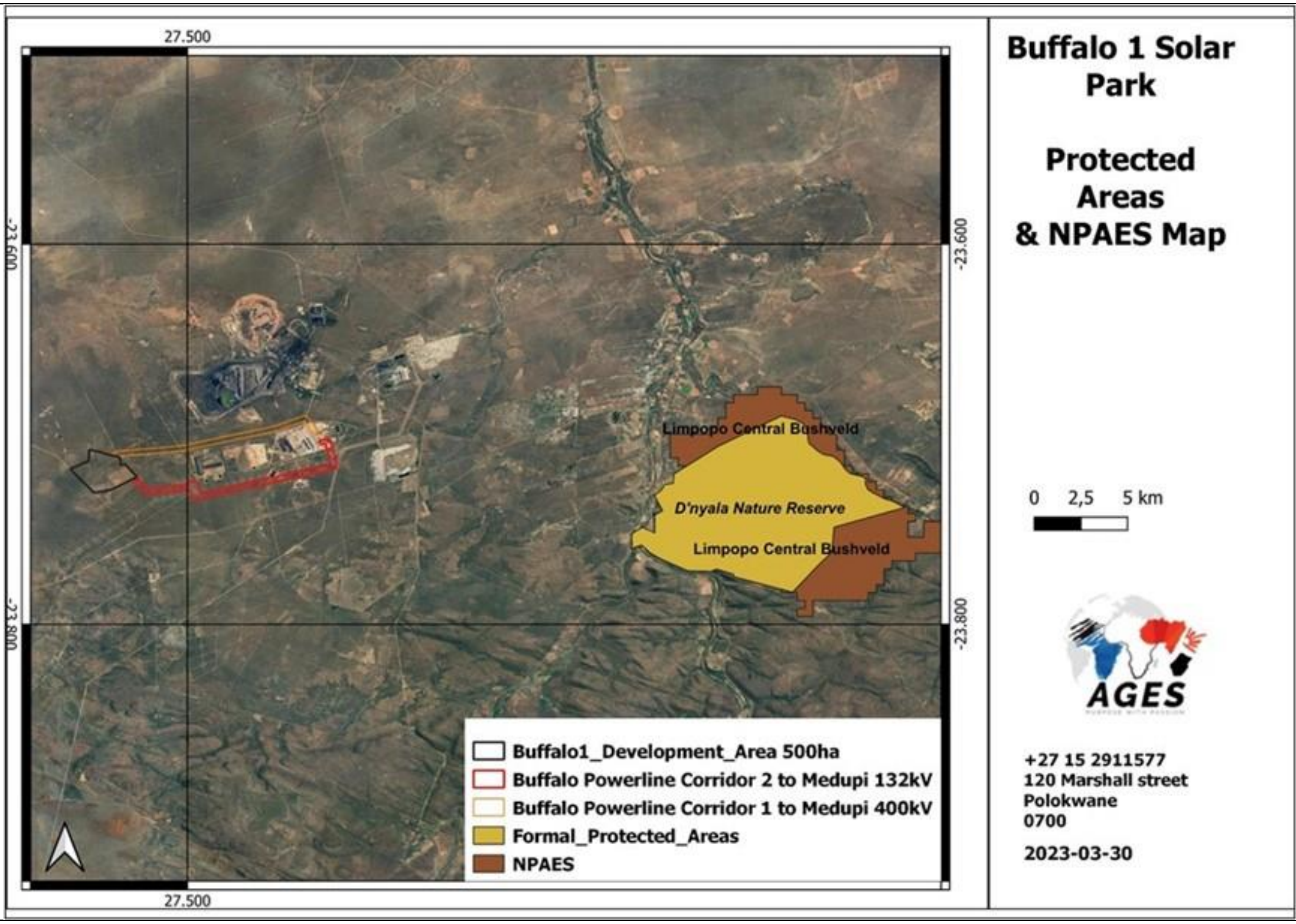

Figure 8-21: Location of the project in relation to listed protected areas

8.3.12 Heritage and paleontological resources

The project area is situated about 30km west of Lephalale along the road that runs along the northern edge of the Eskom Medupi power station. The project area is a large property that is completely fenced off with a game fence. The main activities within the project area are hunting related with various associated structures scattered throughout the landscape. These include built hides, water reservoirs, netted wildlife loading areas and various kraal structures. Existing infrastructure within the project area mainly consists of large powerline corridors that cross the landscape as well as various small gravel roads that subdivide the project area into smaller camps. The surrounding environment consists of dense wooded vegetation and extremely overgrown ground vegetation such as tall grasses and shrubs.

The proposed site lies on the potentially fossiliferous Grootegeluk Formation (Equivalent of the Vryheid Formation, Ecca Group, Karoo Supergroup) that could preserve fossil plants of the Glossopteris flora. Most of the site is on Quaternary sands that have a lower sensitivity and might have fragmented transported fossils (Figure 8-22).

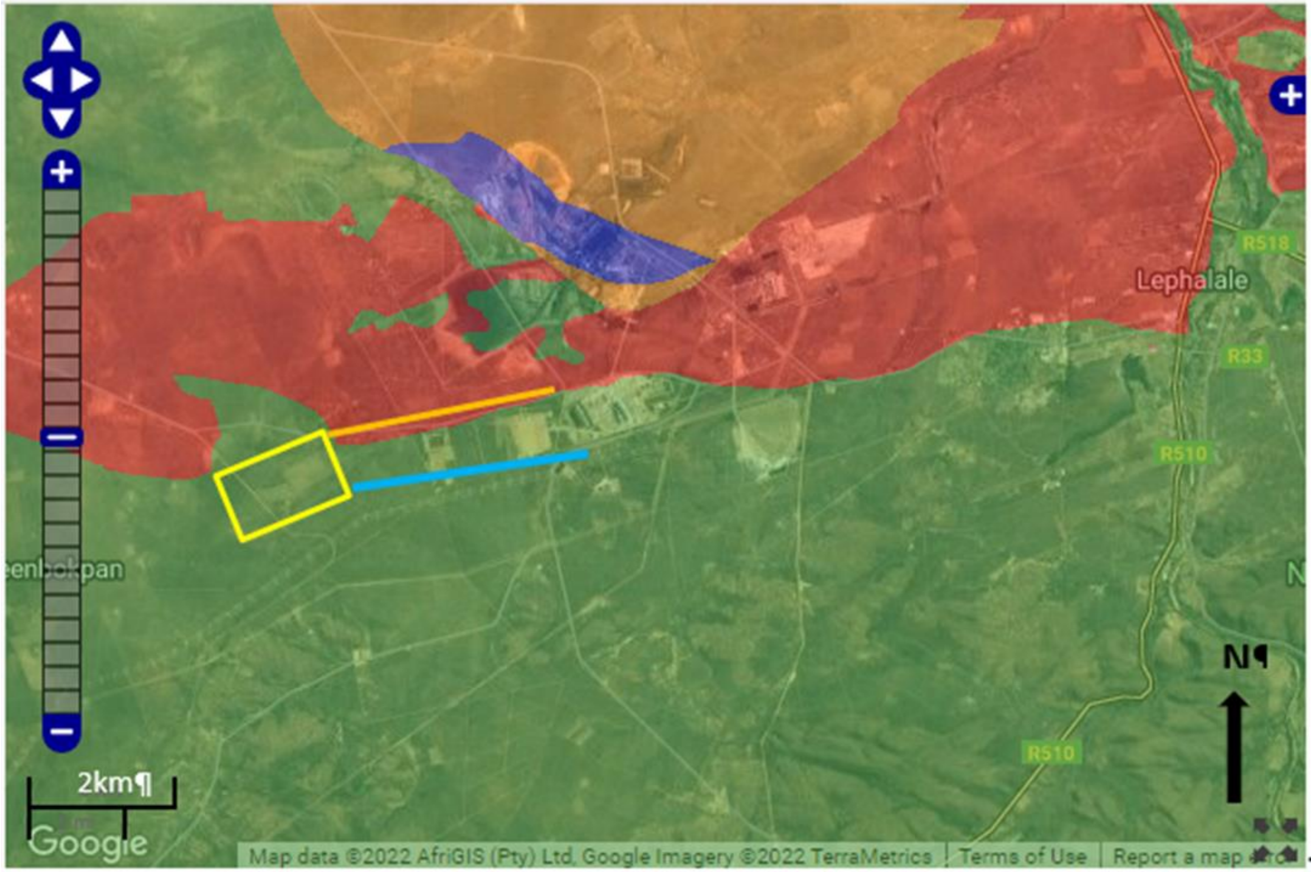

Figure 8-22: SAHRIS palaeosensitivity map for the site for the proposed Buffalo 1 Solar Park shown within the blue rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

8.3.13 Landscape (solar) and visual resources

The study area comprises gently undulating land originally covered with savannah bushveld, Limpopo Sweet Bushveld and Western Sandy Bushveld (Mucina and Rutherford 2006), is small patches south of the site, characterised by a grassy ground layer and a distinct upper layer of trees and shrubs. In its pristine state, this vegetation type is characterised by short open woodland (comprised of many species of tall trees); in disturbed areas thickets of *Acacia erubescens, A. melfera* and *Dischostachys cineriea*.

The study area's landscape has, however, been transformed by mining and power generating and distribution infrastructure. The Project site is located in close proximity to the Eskom Medupi Power Station. Northwest of the site is the Grootgeluk Coal mine, and a number of Eskom distribution powerlines criss-cross the area. Immediately north of the arrays, is a powerline servitude that connects to Matimba substation.

The majority of the study area is dominated by farms with grazing as the main activity, and a few game farms that could attract some tourism activity. The study area can be roughly divided into the following four landscape types:

- Mining and power generation and distribution infrastructure (far western sector of the study area)
- Natural bushveld for grazing and game farming (immediately west, north and south of the site) with a municipal landfill site south west of the site
- and urban residential and residential nature estates to the south east of the project site (
- Township residential (Marapong).

The project site is in the natural bushveld type. The visual resource value of these landscape types is rated in **Table** 8-9

Table 8-9: Value of the Visual Resource

High None	**Moderate** Natural bushveld associated with grazing and game farms and nature based residential estates	**Low** Marapong Township and power generation and distribution and mining
This landscape type is considered to have a *high* value because it is a: Distinct landscape that exhibits a positive character with valued features that combine to give the experience of unity, richness and harmony. It is a	This landscape type is considered to have a *moderate* value because it is a: Common landscape that exhibits some positive character, but which has evidence of alteration /	This landscape type is considered to have a *low* value because it is a: Minimal landscape generally negative in character with few, if any, valued features.

landscape that may be of particular importance to conserve, and which has an intense sense of place.	degradation/ erosion of features resulting in areas of more mixed character.	
Sensitivity: It is sensitive to change in general and will be detrimentally affected if change is inappropriately dealt with. The Project site is partially located in this landscape type	Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with. **The Project site is located in this landscape type**	Sensitivity: It is not sensitive to change in general and change.

8.4 Socio-economic context of the area

The proposed development is situated in Ward 3 of Lephalale Local Municipality, within the Waterberg District, Limpopo Province The main economic sectors include mining and tourism

8.4.1 Provincial overview

Limpopo is the northernmost province of South Africa and covers approximately 125 754 km^2. It is named after the Limpopo River, which forms the province's western and northern borders. The province is made up of three former homelands of Lebowa, Gazankulu and Venda and the former parts of the Transvaal province.

Traditional leaders and chiefs still form a strong backbone of the province's political landscape. Established in terms of the Limpopo House of Traditional Leaders Act, Act 5 of 2005, the Limpopo House of Traditional Leaders' main function is to advise government and the legislature on matters related to custom, tradition and culture including developmental initiatives that affect rural communities.

Limpopo Province shares international borders with districts and provinces of three countries: Botswana's Central and Kgatleng districts to the west and northwest respectively, Zimbabwe's Matabeleland South and Masvingo provinces to the north and northeast respectively, and Mozambique's Gaza Province to the east. Limpopo is the link between South Africa and countries further afield in sub-Saharan Africa. Limpopo Province is divided into five district municipalities (Figure 8-23).

The population of Limpopo consists of several ethnic groups distinguished by culture, language and race. 97.3% of the population is Black, 2.4% is White, 0.2% is Coloured, and 0.1% is Indian/Asian. The province has the smallest percentage and second smallest total number of White South Africans in the country; although there a number of localities with a White majority, notably Hoedspruit and Modimolle. It also has the highest Black percentage out of all the provinces.

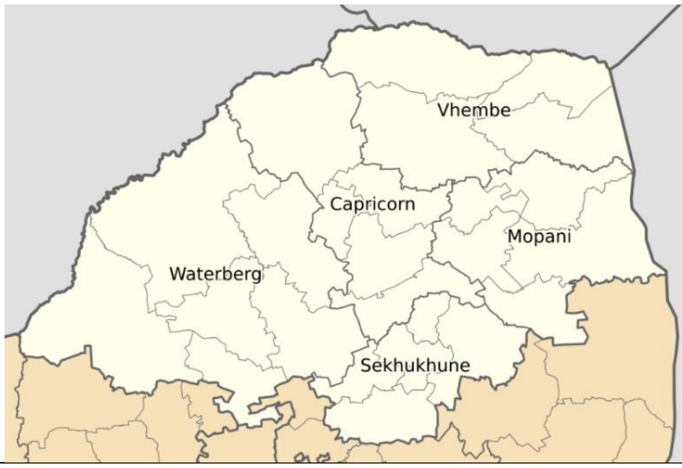

Figure 8-23: District Municipalities in Limpopo.

The Northern Sotho people make up the largest percentage of the population, making 52% of the province. The Tsonga people comprise about 24.0% of the province; the Tsonga also comprise about 11.5% of Mpumalanga province since the southern part of their homeland, Gazankulu, was cut off from Limpopo and allocated to Mpumalanga. The Venda make up about 16.7%. Afrikaners make up the majority of Limpopo's White population, about 95,000 people; English-speaking Whites number just over 20,000. Vhembe district has the smallest share of White people in Limpopo, about 5,000 total, while the Waterberg district has the largest share of Whites, with more than 60,000 Whites residing there. Coloureds and Asians/Indians make up a very small percentage of the province's total population[30].

Majority of Limpopo residents live in rural areas, this has given rise to a new phenomenon of rural development, where the residents have invested in building lavish homes on their tribal land. According to STATSSA[31] 96.2% of Limpopo lives in formal housing, this figure is above the national average of 84.0%. This makes Limpopo the province with the highest percentage of people living in formal housing in South Africa.

8.4.2 Municipal level overview

Waterberg District Municipality

The Waterberg District Municipality is situated in the north-east of the Limpopo Province. The municipality contains much of the Waterberg Biosphere, a UNESCO designated Biosphere Reserve. The Waterberg Biosphere is a massif of approximately 654,033 hectare.

[30] https://en.wikipedia.org/wiki/Limpopo.
[31] "STATISTICAL RELEASE P0318: General Household Survey 2020" (PDF). www.statssa.gov.za. 2 December 2021.

The ecosystem can be characterised as a dry deciduous forest or Bushveld. Within the Waterberg there are archaeological finds dating to the Stone Age, and nearby are early evolutionary finds related to the origin of humans.

The majority of the people speaks Northern Sotho (60.42%) and Setswana (12.30%).

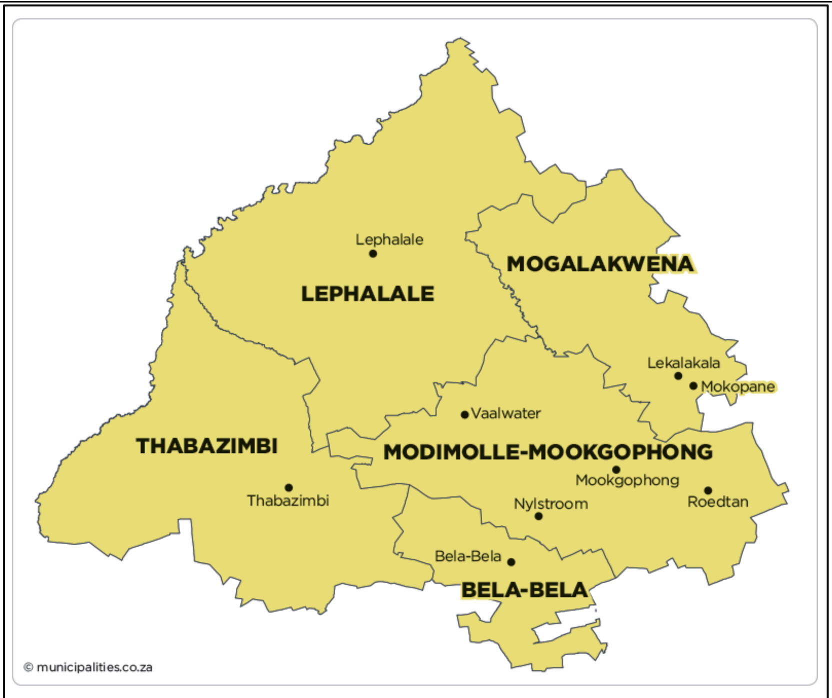

Figure 8-24: Waterberg District Municipality and the Location of Lephalale Municipality

8.4.2.2 Lephalale Local Municipality

Lephalale Local Municipality (LIM 362) is one of 5 Local Municipalities in the Waterberg District Municipality. Lephalale Local Municipality is named after the local river, a tributary of the Limpopo River, which has been the source of life to the people of this area for centuries. The town of Lephalale is located a mere 280 km from Tshwane and is a recognised gateway to Botswana and other Southern African countries. Lephalale is the home of the Medupi Power Station that is currently under construction.

According to the Mayor, Cll. Louisa Shongwe, Lephalale Local Municipality is currently one of the fastest growing municipalities in the country and governs a town that has the potential to become the future hub of power generation in South Africa[32].

[32] http://www.lephalale.gov.za/

8.4.2.2.2 Demographics, population groups and languages

Lephalale is the fastest growing town in the Waterberg district. There are 115 767 people in the district. 9 out of every 10 residents (90,1%) are black African, followed by whites at 7,9%, with other population groups making up the remaining 2%. Amongst those aged 20 years and older, 37% have secondary education, 23,5% have completed matric, 11,6% have some form of higher education, 17,8 completed/have some primary education[33]. Please see **Figure** 8-25**.**

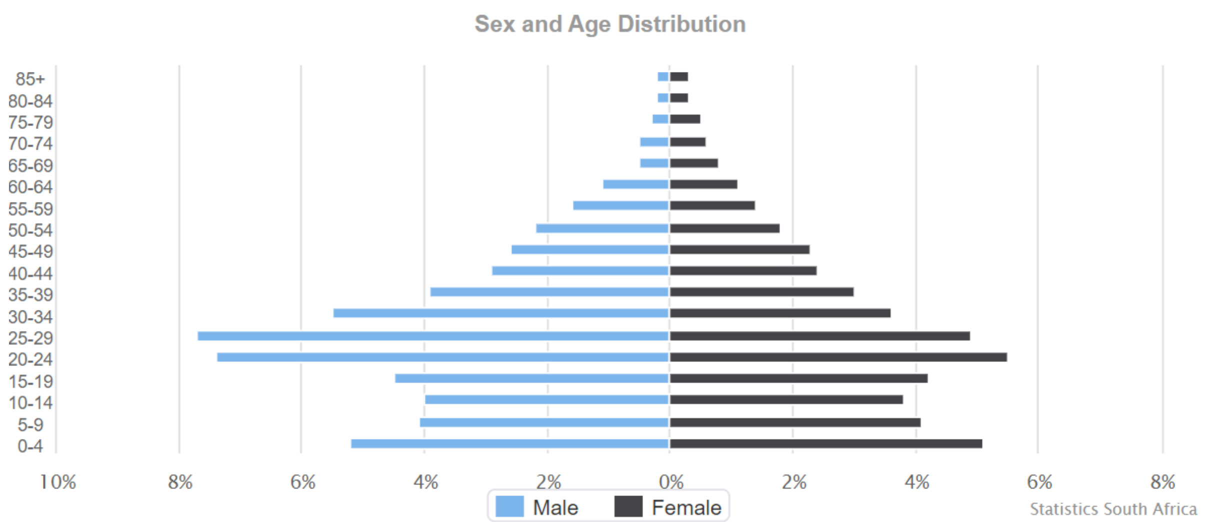

Figure 8-25: Population pyramid of the Lephalale Local Municipality (Statistics South Africa)

8.4.2.2.3 Living conditions

There are 29 880 households in the municipality, with an average household size of 3,4 persons per household. 67,0% of households have access to piped water either in their dwelling or in the yard and 22,0% access piped water on a community stand with a distance less than 200m from dwelling.

8.4.2.2.4 Economy

Of the 45 527 economically active (employed or unemployed but looking for work) people in the municipality, 22,2% are unemployed. 26,9% of the 26 368 economically active youth (15 – 34 years) in the municipality are unemployed. The building site of the Medupi Power Station and the operational Matimba Power Station are the largest sources of employment together with agricultural activities such as cattle, poultry, and game farming.

[33] https://www.statssa.gov.za/?page_id=993&id=lephalale-municipality

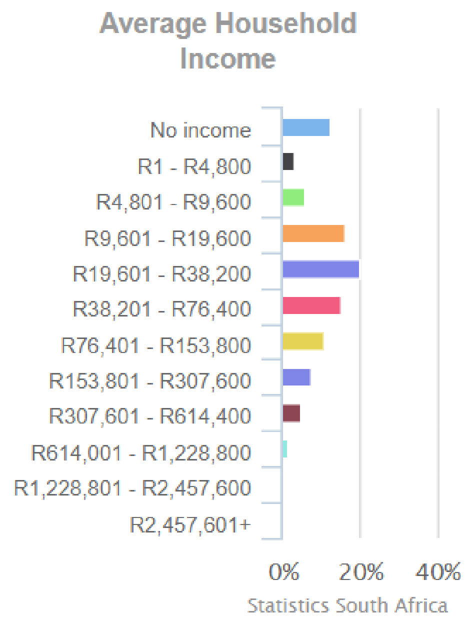

Figure 8-26: Average Household Income for the Lephalale Local Municipality.

8.4.2.2.5 EMPLOYMENT

In 2021, the estimated number of employed was 33,700 people, of whom 84% (28,170) were in the formal sector. By the end of 2021, employment levels had still not recovered to the pre-COVID19 level of 2019. The largest employer was the agriculture sector (6,234 employees), which is mostly concentrated on irrigation activities along the Palala River.

The labour-intensive community services sector is also a large employer, especially of unskilled employees for domestic and gardening work. This also applies to the construction sector and to a lesser extent to the trade and catering sector. Although coal mining contributes most to gross value added, it is a more modest employer, absorbing only 12.6% of all local employees.

Half of the formally employed people (50%) are classified as semi-skilled, 16% as skilled and 36% as unskilled (Quantec). The number of unemployed people was estimated to be 10,330 in 2021 (Quantec). This translated to a strict unemployment rate of 23%, which has deteriorated from 19% in 2019. The rapid deterioration is indicative of the completion (termination) of development work on Medupi Power Station and the associated expansion of Grootegeluk Coal Mine.

8.4.2.2.6 CRIME

There has been a slight decline in crime statistics reported by the Lephalale Police Station. Contact crimes are the exception, but the overall crime situation appears to have improved in the short term. Despite the improvement, the crime situation in the region is still unacceptably high and remains a matter of concern.

9 DESCRIPTION OF ENVIRONMENTAL ISSUES AND IMPACTS IDENTIFIED

The aim of the Environmental Impact Report is to identify any potential biophysical and social impacts, associated with the proposed development and then undertake the relevant specialist assessments (as approved in the Scoping Report). The findings of an EIA, on a particular project proposal, conventionally are presented to stakeholders (including decision-makers) in the form of a written report. An EIR forms the basis for review by I&APs and for decision-making. The EIR does not define whether a project is "good" or "bad." It provides a neutral, independent assessment of a proposed project's impacts on the environment. The purpose of an EIR is to provide the decision-makers with an understanding of the environmental consequences of approving a project by giving them useful, reliable and sufficient information.

The EIR in addition to the DFFE Screening tool (**Appendix I**) was used to determine various theme sensitivities within the proposed development footprint. Based on protocols (as stipulated in Government Notices No. 320), the level (Low, Medium, High, or Very high) of these sensitivities were either confirmed or disputed by the site verifications (undertaken by the EAP or specialists).

The various theme sensitivities, and potential biophysical and social impacts were identified by means of:

- Review of available literature;
- Desktop screening assessments; and,
- Site verifications by qualified specialists.

A broad range of potential environmental impacts that may have a significant impact on the environment have been identified. The potential impacts are likely to present themselves during the three main phases of the project life cycle namely;

Construction phase: these potential impacts are likely to be mainly localised and generally of high significance if un-mitigated, but could be reduced to low significance if mitigation measures and environmental management practices are implemented;

Operational phase: this phase is unlikely to have more significant and substantive impacts if mitigated and managed; and,

Decommissioning phase: these impacts are very similar to those of the construction phase, they will be generally localised with low significant impacts.

The different aspects pertaining to the environment must be considered when assessing the impact of the development on the environment. Table 9-1 indicates some of the environmental issues associated with the development that will be addressed in the EIA and management measures in the EMPr. It also indicates if investigations additional to those already done will be necessary to assess this impact.

Table 9-1 Potential environmental issues

ASPECT	ISSUE TO BE CONSIDERED	INVESTIGATIONS
PHYSICAL		
Soil	Loss of agricultural land	Land use specialist Study
	Erosion	EMPr Land use specialist Study
Hydrology and geohydrology	Potential pollution of the groundwater	EMPr Land use specialist Study
	Change in runoff and potential impacts on	
BIODIVERSITY		
Vegetation	Habitat fragmentation, clearing of vegetation	Vegetation and wetland Specialist study
	Alien species may establish due to disturbance during construction, as well as landscaping activities	
	Loss in Red Listed plant species	
	Impact on the wetlands	
FAUNA		
Fauna	Impact on animal species	EMPr Ecological Impact Assessment
HERITAGE		
Heritage	The site may impact on heritage artefacts.	Heritage Impact Assessment.
SOCIO-ECONOMIC		
Socio-economic	The impact on the surrounding community should the land use of the study area change to solar park.	EMPR Socio-economic Impact study
AVIFAUNA		
Avifauna	The impact of the proposed development on the birds	EMPR Avifauna Impact Assessment

9.1 Outcome of the DFFE web-based screening tool

In terms of GNR 960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations, as amended the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulations 19 and 21 of the EIA Regulations 2014, as amended.

The requirement for the submission of a Screening Report (included as **Appendix I** of the EIA Report) for the proposed project is applicable as it triggers Regulations 19 and 21 of the EIA Regulations 2014, as amended.

Table 9-2 provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the project site under consideration.

9.2 Specialist studies

As per the Screening Report and recommendations in the approved Scoping Report the following specialist studies was undertaken to inform the impact statement (Table 9-2).

Table 9-2: Sensitivity of the environmental themes and studies to be undertake in terms of these sensitivities.

ENVIRONMENTAL THEME	SENSITIVITY	MINIMUM REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
Agriculture Theme	High	Agricultural Impact Assessment	An Agricultural Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F1**.
Animal Species Theme	Medium	Terrestrial Animal Species Impact Assessment	A Terrestrial Animal Species Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F4.**
Aquatic Biodiversity Theme	Very High	Aquatic Biodiversity Impact Assessment	An Aquatic Biodiversity Assessment has been submitted as part of the EIA process. Please refer to **Appendix F2.**
Archaeological and Cultural Heritage Theme	High	Heritage Impact Assessment	A Heritage Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F7**.
Avian Theme	Very High	Avifaunal Impact Assessment	An Avifaunal Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F3**.
Civil Aviation (Solar PV) Theme	Low	No investigation required.	No significant impacts on the civil aviation installation are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.
Defence Theme	Low	No investigation required.	No negative impacts on the defence installation are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.
Landscape (Solar) Theme	Very High	Visual Impact assessment	A Visual Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F9**.
Palaeontology Theme	Very High	Palaeontological Impact assessment	Palaeontological Impact assessment have been undertaken as part of the EIA process. Please refer to **Appendix F12**.
Plant Species Theme	Medium	Terrestrial Plant Species Impact Assessment	Forms part of the A Terrestrial Biodiversity, Animal and Plant Species Impact Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F4.**
RFI Theme	Low	Compliance Statement	Not to be undertaken. The South African SKA Project Office and SARAO have been registered as a key stakeholder on this environmental process and has been given the opportunity to provide comments and input in terms of the Astronomy Geographic Advantage Act and potential impact to SKA.
Terrestrial Biodiversity Theme	Very High	Terrestrial Biodiversity Specialist Assessment	Forms part of the Terrestrial Biodiversity, Animal and Plant Specialist Assessment has been undertaken as part of the EIA process. Please refer to **Appendix F4.**
Geotechnical Assessment	Low	Geotechnical Investigation	A Geotechnical Investigation was undertaken as part of the EIA process (**referrer to Appendix F6**).
Socio-Economic Assessment	Positive- High	Socio-Economic Assessment	A Socio-Economic Assessment has been undertaken as part of the EIA process. Please

ENVIRONMENTAL THEME	SENSITIVITY	MINIMUM REQUIRED INVESTIGATION	DISCUSSION / COMPLIANCE
			refer to **Appendix F8**

The following specialists and specialist studies have been appointed (Table 9-3) to undertake the specialist studies during the Environmental Impact Assessment Phase.

Table 9-3: Specialist studies during the Environmental Impact Assessment Phase

Specialist Assessment	Specialist And Company	Appendix
Avifaunal Assessment	Andrew Husted (The Biodiversity Company)	Appendix F3
Agricultural Assessment	Dr Barend Henning (AGES)	Appendix F1
Terrestrial Biodiversity, Plant- and Animal Species Assessment	Dr Barend Henning (AGES)	Appendix F4
Wetland and Riparian	Dr Barend Henning (AGES)	Appendix F10
Aquatic Biodiversity Specialist	Paul Da Cruz (Scientific Aquatic Services)	Appendix F2
Heritage and Archaeological Assessment	Jaco van der Walt (Beyond Heritage)	Appendix F7
Palaeontological Assessment	Prof Marion Bamford (Marion Bramford Consulting)	Appendix F12
Socio-economic Impact Assessment	Glen Steyn (Glen Steyn and Associates cc.)	Appendix F8
Visual Impact Assessment	Graham Young (Graham A Young Landscape Architect)	Appendix F9
Geo-technical Assessment	Carel de Beer (Geotechnical Specialist Services)	Appendix F6
Engineering Services	George Hatting (GMH Consulting Engineers)	Appendix F5

9.3 Impact Assessment Methodology

9.3.1 General methodology

The impacts will be evaluated by applying the methodology as described below. The impact is defined and the significance is rated from Low to High as indicated in the table below with an explanation of the impact magnitude and a guide that reflects the extent of the proposed mitigation measures deemed necessary.

For each potential impact, the **EXTENT** (Spatial scale), **MAGNITUDE** (degree of the impact), **DURATION** (time scale), **IRREPLACEABILITY** (loss of resources) and the **REVERSIBILITY** (degree to which the proposed impact can be reversed) and **PROBABILITY** (occurrence) will be assessed by the EAP as well as the Specialists. The assessment of the above criteria will be used to determine the significance of each impact, with and without the implementation of the proposed mitigation measures. The scale to be used to assess these variables and to define the rating categories are tabulated in the **Table** 9-4 below.

Table 9-4: Aspect and Impact methodology for the risk assessment.

Criteria by which impacts is to be assessed

ASPECT	IMPACT RATING
Status of the impact: A statement of whether the impact is positive (a benefit), negative (a cost), or neutral.	
Direct impacts	Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
Indirect impacts	Impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not **manifest** immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
Cumulative impacts	Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
Nature of the impact: The evaluation of the nature is impact specific. Most negative impacts will remain negative, however, after mitigation, significance should reduce: • Positive. • Negative.	
Extent: A description of whether the impact would occur on a scale limited to within the study area (local), limited to within 5 km of the study area (area); on a regional scale i.e. Local Municipality (region); or would occur at a national or international scale.	

Local	1
Area	2
Region	3
National	4
International	5

Duration:
A prediction of whether the duration of the impact would be Immediate and once-off (less than one month), more than once, but short term (less than one year), regular, medium term (1 to 5 years), Long term (6 to 15 years), Project life/permanent (> 15 years, with the impact ceasing after the operational life of the development or should be considered as permanent).

Immediate	1
Short term	2
Medium term	3
Long term	4
Project life/permanent	5

Severity(extent +duration + intensity)

Criteria by which impacts is to be assessed

ASPECT	IMPACT RATING

Intensity: This provides an order of magnitude of whether or not the intensity (magnitude/size/frequency) of the impact would be negligible, low, medium, high or very high. This is based on the following aspects:

- an assessment of the reversibility of the impact (permanent loss of resources, or impact is reversible after project life);
- whether or not the aspect is controversial;
- an assessment of the irreplaceability of the resource loss caused by the activity (whether the project will destroy the resources which are easily replaceable, or the project will destroy resources which are irreplaceable and cannot be replaced);
- the level of alteration to the natural systems, processes or systems.

Negligible	The impact does not affect physical, biophysical or socio-economic functions and processes.	1
Low/potential harmful	The impact has limited impacts on physical, biophysical or socio-economic functions and processes.	2
Medium/slightly harmful	The impact has an effect on physical, biophysical and socio-economic functions and processes, but in such a way that these processes can still continue to function albeit in a modified fashion.	3
High/Harmful	Where the physical, bio-physical and socio-economic functions and processes are impacted on in such a way as to cause them to temporarily or permanently cease.	4
Very high/Disastrous	Where the physical, bio-physical and socio-economic functions and processes are highly impacted on in such a way as to cause them to permanently cease.	5

Incidence (frequency + probability)

Frequency: This provides a description of any repetitive, continuous or time-linked characteristics of the impact: Once Off (occurring any time during construction or operation); Intermittent (occurring from time to time, without specific periodicity); Periodic (occurring at more or less regular intervals); Continuous (without interruption).

Once Off	Once	1
Rare	1/5 to 1/10 years	2
Frequent	Once a year	3
Very frequent	Once a month	4
Continuous	≥ Once a day/ per shift	5

Probability of occurrence: A description of the chance that consequences of that selected level of severity could occur during the exposure.

Highly unlikely	The probability of the impact occurring is highly unlikely due to its design or historic experience.	1
Improbable	The probability of the impact occurring is low due to its design or historic experience.	2
Probable	There is a distinct probability of the impact occurring	3
Almost certain	It is most likely that the impact will occur	4
Definite	The impact will occur regardless of any prevention measures	5

Criteria by which impacts is to be assessed

<table>
<tr><th>ASPECT</th><th>IMPACT RATING</th></tr>
<tr><td>Risk rating</td><td>The risk rating is calculated based on input from the above assessments. The incidence of occurrence is calculated by adding the Extent of the impact to the duration of the impact. The Severity of the impact is calculated based on input from the extent of the impact, the duration and the intensity.

Risk = Severity (extent +duration + intensity) x Incidence (frequency + probability)
Significance: The significance of the risk based on the identified impacts has been expressed qualitatively as follows:
○ low – the impact is of little importance/insignificant, but may/may not require minimal management
○ medium - the impact is important, management is required to reduce negative impacts to acceptable levels.
○ high - the impact is of great importance, negative impacts could render development options or the entire project unacceptable if they cannot be reduced to acceptable levels and/or if they are not balanced by significant positive impacts, management of negative impacts is essential.

<table><tr><td>Low risk</td><td>0 – 50</td></tr><tr><td>Medium risk</td><td>51 – 100</td></tr><tr><td>High risk</td><td>101 – 150</td></tr><tr><td>Low positive</td><td>0 – 50</td></tr><tr><td>Medium positive</td><td>51 – 100</td></tr><tr><td>High positive</td><td>101 – 150</td></tr></table></td></tr>
</table>

Specialist studies also considered cumulative impacts associated with similar developments within the broader project site. The purpose of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e., whether the addition of the proposed project in the area will increase the impact). In this regard, specialist studies considered whether the construction of the proposed development will result in:

- Unacceptable risk;
- Unacceptable loss;
- Complete or whole-scale changes to the environment or sense of place; and/or,
- Unacceptable increase in impact.

A conclusion regarding whether the proposed SPV development will result in any unacceptable loss or impact considering all the projects proposed in the area is included in the respective specialist reports.

As the project developer has the responsibility to avoid or minimise impacts and plan for their management (in terms of the requirements of NEMA and the 2014 EIA Regulations (GNR 326)), as amended, the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. A facility EMPr and a generic substation EMPr that include all the mitigation measures recommended by the specialists for the management of significant impacts are included as Appendix H1.

9.3.2 Aquatic specific methodology

Due to the sensitive nature of aquatic environments, the assessment was done in accordance to the "Protocol for the criteria for the assessment and reporting of impacts on aquatic biodiversity for activities requiring environmental authorisation, as Published in GN No. 320 ,Government Gazette 43110 (20 March 2020)" that require the calculation of the Present Ecological State (PES) of water bodies and the Ecological Importance and Sensitivity (EIS) of the identified watercourses/wetlands and/or aquatic features/habitats.

The PES refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem. The PES of the identified watercourses/wetlands and/or aquatic features/habitats, was determined and discussed as per the Table 9-5 below.

Table 9-5: Criteria for PES calculations

Ecological Category	Score	Description
A	>90 – 100%	**Unmodified**, natural and pristine.
B	>80 – 90%	**Largely natural**. A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged
C	>60 – 80%	**Moderately modified**. Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged
D	>40 – 60%	**Largely modified**. A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	>20 – 40%	**Seriously modified**. The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	0-20%	**Critically/Extremely modified**. Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The EIS of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (**Table** 9-6). Both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred.

Table 9-6: Criteria for EIS calculations

EIS Categories	Score	Description
Low/Marginal	**D**	Not ecologically important and/or sensitive on any scale.

EIS Categories	Score	Description
		Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
Moderate	**C**	Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
High	**B**	Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
Very High	**A**	Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

9.4 Potential Environmental Impacts And Proposed Mitigation Measures

This section serves to assess the significance of the positive and negative environmental impacts (direct and indirect) expected to be associated with the development of the proposed project and associated infrastructure. This assessment has considered the construction of a solar PV facility with a contracted capacity of up to 240MW, within a development footprint of approximately 500ha.

The full extent of the project site (~1366.59 ha) was considered through the Scoping Phase of the EIA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desktop evaluations and detailed in-field surveys. The identification of a development footprint for the solar PV facility within the project site was undertaken by the developer through consideration of the sensitive environmental features and areas, and application of a mitigation hierarchy which aimed at avoidance as the first level of mitigation. The specialist assessments undertaken as part of this EIA process have considered the development footprint (which was provided by the developer) as well as recommended No-Go areas (refer to **Figure** 0-5).

The construction and operation of Photovoltaic modules on a large scale can result in negative local environmental impacts e.g. on landscapes and sustainable land use (including protected areas, etc.). The negative environmental impacts from solar energy installations are much lower in intensity than those produced by conventional energies, but they still have to be assessed and mitigated.

On the other hand, solar generated power also has a number of positive impacts when considering the greater scheme of electricity generation. One of these is the fact that solar power is one of the cleanest renewable resources available. While many of the negative impacts may be on a local scale, the positive impacts may have a global reach. This chapter discusses the impacts (negative and positive) likely to be associated with the project.

9.4.1 Quantification of areas of disturbance on the site

Site-specific impacts associated with the construction and operation of the proposed project relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat and impacts on soils. In order to assess the impacts associated with the proposed SPV Facility, it is necessary to understand the extent of the affected area.

Wherever possible, existing access roads will be utilised to access the project site and development footprint, essentially reducing the extent of disturbance resulting from access road construction. It is unlikely that access roads will need to be upgraded as part of the proposed development.

In order to identify and effectively assess the potential environmental impacts of the proposed development, an environmental criteria checklist (**Table** 9-7) was used and completed as follow.

Table 9-7: Identification of Potential Impacts.

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
1. SURFACE WATER AND GROUNDWATER				
1.1	Negative effect on surface water quality and water flow.	Yes	-	• The project could involve construction or decommissioning activities within surface watercourses during construction; • Surface water turbidity, EC, and TDS may be increased by the erosion of construction areas (limited to construction and decommissioning phases only); • The construction and operation of the development will not involve any abstraction of water from a watercourse and will also not involve the usage or storage of significant amounts of water; and, • Surface runoff patterns will not be significantly altered by the project. • During operational phase and in the event of containment failure of the BESS, or in the event of a fire, the molten electrolyte (sulphuric acid-based solution) or sodium hydroxide may contaminate the soil and groundwater.
1.2	Negative effect on groundwater quality and water flow.	Yes	-	• The project will not involve any groundwater abstraction, yet; • There is potential for groundwater contamination due to accidental spills of hazardous substances during the construction, maintenance, and decommissioning phases of the project; and, • The impact on groundwater quality and flow is therefore likely to be of very low significance. • During operational phase and in the event of containment failure of the BESS, or in the event of a fire, the molten electrolyte (sulphuric acid based solution) or sodium hydroxide may contaminate the soil and groundwater.
2. SOILS (GEOLOGY) AND TOPOGRAPHY				
2.1	Negative impact of soils.	Yes	-	• The project will involve the construction of concrete foundations, in some instances where required, for the PV panels and other site associated infrastructure, which is likely to have impact on topsoil loss, compaction of soils and soil erosion; • Although the total area to be disturbed (foundation footprint) is minimal compared to typical construction sites, mitigation measures will have to be put in place to manage these impacts; and,

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
				• The more significant impact on soils, will come from clearing activities, the construction of roads, and trenches for the cabling.
2.2	Loss of agricultural land-use.	Yes		• Land will be occupation by PV panels and associated infrastructure, for the duration of the project in all the phases of the project; • Positive impacts include the enhanced agricultural potential through increased financial security for farming operations, and improved security against stock theft and other crime.
2.3	Soil erosion due to alteration of the surface run-off characteristics.	Yes	-	• Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, the establishment of hard standing areas and roads, and the presence of panel surfaces. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.
3.	**ECOLOGICAL IMPACT**			
3.1	Negative impact on vegetation and fauna.	Yes	-	• The project will entail vegetation clearance and ground cover clearing during the construction phase. This is likely to have some form of impact on vegetation and fauna on the site; • A detailed Ecological Impact Assessment was undertaken to determine the significance of this impact; and, • However, from the site visits undertaken as part of the Scoping Report, the site appears to be in an already transformed or impacted state.
3.2	Negative impact on wetlands and riparian vegetation.	-yes		• The project site has wetlands and watercourses and the ecological impact investigation was conducted to report findings; and, • The development layout avoids significant sensitive areas, which shall be deemed as No-Go areas. Suitable buffer areas were assigned to sensitive wetland and marshy areas that should be maintained during the construction and operational phase.
3.3	Negative impact on Birds and Avian Species.	Yes -		• Solar PV projects are not known to have negative impacts on birds, however, a study was undertaken, even though layout avoids significant sensitive areas.
4.	**HERITAGE IMPACT**			
4.1	Negative impact on graveyards, rock art, historical buildings, archaeological site and artefacts etc.	-	No	• Sites or features of heritage, archaeological and cultural importance observed within the greater area were identified and buffers assigned and incorporated into the layout plan to avoid; and, A Heritage Impact Assessment was conducted during the EIA phase in order to confirm this.
5.	**NOISE IMPACT**			
5.1	Negative impact on of noise on surrounding receptors (residential areas, institutions, and business sites).	Yes	-	• The construction of the PV structures is likely to have some noise impact on the surrounding but there are generally no sensitive receptors near the site; and, • The Operational phase of Solar PVs is not known to have any significant noise impact.
6.	**VISUAL IMPACT**			

NO.	CRITERIA	YES	NO	DESCRIPTION AND COMMENTS
6.1	Negative impact on Aesthetically pleasing and scenic landscape.	Yes	-	• The construction of PV structures is likely to have some impact on the viewscape
7. SOCIO-ECONOMIC IMPACT				
7.1	Negative impact on neighbourhood and community character.	Yes	-	• There are currently industrial and mining development in the area and the PV facilities will therefore not significantly change the neighbourhood and community character, and • It is important to note that neighbourhood or community effects are subjective in nature
7.2	Negative impact job creation		No	• Job opportunities will involve about 200 contractors during the 24 months construction phase and approximately 30-40 full time individuals
7.4	Negative impact on the local economy or the municipal economy.	-	No	• No negative impact anticipated, but rather a positive economic impact as a result of increased tax base, job creation, increased capacity of electricity in the area, especially green power; • Job opportunities will involve about three thousand man-months during the 18 months construction phase and approximately 15-20 full time individuals during the 25 years or even up to 30 years of operation; • Reliable income will be generated by the farming enterprises through the lease of the land to the energy facility; • Likely to improve security against stock theft and other crime; and, • A Socio-Economic Assessment was undertaken.

*Yes = Means the impact is identified as a potential impact is discussed further at EIA Phase.

9.4.2 Impact of vegetation loss and disturbance of habitats

The installation of the solar PV modules arrays, and associated infrastructure, is likely to result in the loss of vegetation and disturbance of habitats, and this can consequently affect, alter and/or fragment ecosystems on the site. Although some parts of the site have already been transformed or disturbed through agriculture, there are areas which were intact, and have active ecosystems on the site. These important habitats could be affected if due care in the planning and implementation of mitigation measures, to avoid negative impacts, is not taken during the project phases.

Activities and risk factors associated with the construction and operation phases of the project include the following:

<u>Construction:</u>

- Site clearing and exploration activities for site establishment.
- Vegetation clearing could impact protected plant species. Vegetation clearing would also lead to the loss of vegetation communities and habitats for fauna and avifauna and potentially the loss of faunal as well as avifaunal species, habitats and ecosystems. On a larger and cumulative scale (if numerous and uncontrolled developments are allowed to occur in the

future) the loss of these vegetation communities and habitats may potentially lead to a change in the conservation status of the affected vegetation type as well as the ability of this vegetation type and associated features to fulfil its ecological responsibilities (functions). The above impact is most likely to be of low significance due to the fact that most of the development area is situated within an area which has been somewhat degraded due to long term overgrazing.

- Loss of topsoil and soil erosion.
- Movement of construction vehicles and placement of infrastructure within the boundary of the drainage lines may lead to the disturbance of these habitats, removal of vegetation cover and a potential increase in erosion which may eventually spread into downstream areas.
- Presence and operation of construction machinery on the project site. This will create a physical impact as well as generate noise, potential pollution and other forms of disturbance at the site.
- Soil compaction and increased erosion risk would occur due to the loss of plant cover and soil disturbance created during the construction phase. This may potentially impact the downstream watercourses, wetlands and aquatic habitats, mainly due to an increase of surface water and silt inflow from the surrounding disturbed areas (these potential impacts on downslope wetland features have been assessed within the freshwater resource study and assessment). These potential impacts may result in a reduction in the buffering capacities of the landscape during extreme weather events.
- Human presence and uncontrolled access to the site may result in negative impacts on fauna and flora through poaching of fauna and uncontrolled collection of plants for traditional medicine or other purpose and other forms of disturbance such as fire.
- Invasion by alien plants may be attributed to excessive disturbance to vegetation, creating a window of opportunity for the establishment of these alien invasive species. In addition, regenerative material of alien invasive species may be introduced to the project site by machinery traversing through areas with such plants or materials that may contain regenerative materials of such species.

<u>Operation:</u>

- The PV panels as well as the hard surfaces created by the development may lead to increased runoff (reduction in infiltration) and the potential interception and channelling of surface runoff, particular on surfaces with a steeper gradient. This may potentially lead to:
  - A modification to the surface runoff and infiltration patterns;
  - Increased erosion;
  - Sedimentation of the downslope areas; and,
  - Impairment of nearby located freshwater resource features' functions and services.
- The facility will require management and if this is not done effectively, it could impact adjacent intact areas through impacts such as erosion and the invasion of alien plant species.

<u>Decommissioning:</u>

- During decommissioning, the potential impacts will be very similar to that of the Construction Phase, although with slightly lower significance.

9.5.2.1 Fauna & flora impacts during construction

9.5.2.1.1 Direct habitat destruction

The construction phase of the development and associated infrastructure will result in loss of and damage to natural habitats if the vegetation is cleared for the development of the solar plant. Rehabilitation of some areas would be possible but there is likely to be long-term damage in large areas. Most habitat destruction will be caused during the construction phase. Vegetation communities are likely to be impacted on a small spatial scale in comparison to the extent of the vegetation communities' total area in the region.

The impact of the habitat destruction will be on the flora and fauna of the study area in the following ways:

• The construction will lead to the loss of individual plants such as grasses, forbs, trees, and shrubs that will be cleared on the footprint area. This will mostly occur during the construction phase.

• Loss of threatened near-threatened and endemic taxa: The anticipated loss of some of the natural habitats that support endemic species will result in the local displacement of endemic listed flora.

• Due to habitat loss and construction activities animals will migrate from the construction area and animal numbers will decrease.

- Loss of threatened, “near-threatened” and conservation important taxa: The anticipated loss of the natural woodland will result in the local displacement of some fauna species. In some cases, isolated populations of threatened fauna might be removed from the area, although no such populations or knowledge thereof was found in the study area. This impact could also take place because of hunting and snaring of animals in natural areas not used for the mine or its infrastructure.

- Changes in the community structure: It is expected that the faunal species composition will shift, due to an anticipated loss in habitat surface area. In addition, it is predicted that more generalist species (and a loss of functional guilds) will dominate the study area. Attempts to rehabilitate will attract taxa with unspecialized and generalist life-histories. It is predicted that such taxa will persist for many years before conditions become suitable for succession to progress.

9.5.2.1.2 Habitat fragmentation

The construction of the development and associated infrastructure will result in natural movement patterns being disrupted for a limited period and, to a varying degree depending on how different species react to these barriers will result in the fragmentation of natural populations, although the impact will be minimal and restricted to the construction phase.

9.5.2.1.3 Increased soil erosion and sedimentation

The construction activities associated with the development may result in widespread soil disturbance and is usually associated with accelerated soil erosion. Soil erosion promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous flora.

9.5.2.1.4 Soil and water pollution

Construction work for the proposed development will always carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on fauna and flora. During the constructional phase heavy machinery and vehicles would be the main contributors to potential pollution problems.

9.5.2.1.5 Air pollution

The environmental impacts of wind-borne dust, gases and particulates from the construction activities associated with the proposed development are primarily related to human health and ecosystem damage. The proposed development will typically comprise the following sources and associated air quality pollutants:

- Materials handling operations (truck loading & unloading, tipping, stockpiling).

- Vehicle entrainment on paved and unpaved roads.
- Windblown dust-fugitive emissions.

One of the primary impacts on the biophysical environment is linked to emission of dusts and fumes from both the transportation system. Dust pollution will impact the most severe during the construction phase. Construction vehicles and equipment are the major contributors to the impact on air quality. Dust is generated during site clearance for the construction of infrastructure. Diesel exhaust gasses and other hydrocarbon emissions all add to the deterioration in air quality during this phase. Vehicles travelling at high speeds on dirt roads significantly aggravate the problem.

Although the potential for severe fugitive dust impacts is greatest within 100 m of dust-generating activities, there is still the potential for dust to affect vegetation up to five kilometres or more downwind from the source. Dust deposited on the ground may cause changes in soil chemistry (chemical effects) and may over the long-term result in changes in plant chemistry, species composition and community structure. Sensitivities to dust deposition of the various plant species present in the area are not known. It is therefore difficult to predict which species may be susceptible.

Poor air quality results in deterioration of visibility and aesthetic landscape quality of the region, particularly in winter due to atmospheric inversions.

9.5.2.1.6 Spread and establishment of alien invasive species

Continued movement of vehicles on and off the site during the construction phase will result in a risk of importation of alien species. Vehicles often transport many seeds, and some may be of invader species, which may become established along the access road, especially where the area is disturbed. The construction carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

9.5.2.1.7 Negative effect of human activities and road mortalities

An increase in human activity on the site and surrounding areas is anticipated. The risk of snaring, killing, and hunting of certain faunal species is increased. If staff compounds are erected for construction workers, the risk of pollution because of litter and inadequate sanitation and the introduction of invasive fauna and flora are increased. The presence of many construction workers or regular workers during the construction phase on site over a protracted period will result in a greatly increased risk of uncontrolled fires arising from cooking fires, improperly disposed cigarettes etc.

Large numbers of fauna are also killed daily on roads. They are either being crushed under the tyres of vehicles in the case of crawling species, or by colliding with the vehicle itself in the case of avifauna or flying invertebrates. The impact is intensified at night, especially for flying insects, as result of their attraction to the lights of vehicles.

9.5.2.1.8 Overall risk rating

The study site is located in the Limpopo Sweet Bushveld Thornveld vegetation which is Least threatened ecosystem as Section 52 of National Environmental Management Biodiversity Act, (Act No. 10 of 2004). The Sweet Bushveld Thornveld.

No threatened species or species of conservation concern (SCC) (or sensitive species as defined by the Screening Tool) (as identified by the Screening Tool) were observed within the development footprint during the site visit. There is a possibility that a plant species of conservation concern may inhabit the area of the proposed development footprint, although this is very unlikely. At this stage, no pre-construction walk through has been recommended given the low probability that any species of conservation would inhabit the footprint. To reduce the potential loss of Sweet Bushveld Thornveld vegetation, it is expected that areas between the solar panels be kept as natural as possible, and a rehabilitation plan be compiled by Botanical/Rehabilitation specialist.

If all mitigation measures are implemented, the likelihood of significant impacts occurring, and the consequence of the impacts are significantly reduced to acceptable levels (see risk ratings and potential impacts). All risk, their ratings and specific mitigation measures can be viewed in Risk ratings and potential impacts section below (**Table** 9-8).

Table 9-8: Risk ratings in terms of impacts on the fauna and flora.

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Terrestrial Biodiversity Impact Assessment																		
Construction Phase																		
Clearing of vegetation for construction of infrastructure, access roads etc.	Habitat destruction & Fragmentation	**WOM**	Negative	Local	1	Permanent	5	Very High	5	**11**	Continuous	5	Definite	5	**10**	**110**	Negative High Risk	Refer to Sections 5.4.1.2 and 5.4.2.2
		WM	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	
Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation in wetlands	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Continuous	5	Definite	5	**10**	**100**	Negative Medium Risk	Refer to section 5.4.3.2
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Very Frequent	4	Almost Certain	4	**8**	**56**	Negative Medium Risk	
Exposure of soils to rainfall and wind during construction	Dust pollution	**WOM**	Negative	Area	2	Long Term	4	Very High	5	**11**	Continuous	5	Definite	5	**10**	**110**	Negative High Risk	Refer to section 5.4.4.2

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Very Frequent	4	Almost Certain	4	**8**	**56**	Negative Medium Risk	
	Heavy machinery and vehicle movement on Local	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost Certain	4	**7**	**56**	Negative Medium Risk	Refer to section 5.4.5.2
			WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	**25**	Negative Low Risk	
	Continued movement of personnel and vehicles on and off the site during the construction phase, as well as occasional delivery of materials required for maintenance	Spreading of alien invasive species	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Very Frequent	4	Almost Certain	4	**8**	**72**	Negative Medium Risk	Refer to section 5.4.6.2
			WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Frequent	3	Probable	3	**6**	**36**	Negative Low Risk	
	Construction of infrastructure, access roads etc.	Negative effect of human	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Very Frequent	4	Almost Certain	4	**8**	**72**	Negative Medium Risk	Refer to section 5.4.7.2

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
	activties on fauna and flora and road mortalities on fauna	**WM**	Negative	Local	1	Medium Term	3	Low	2	**6**	Frequent	3	Probable	3	**6**	**36**	Negative Low Risk	
Operational Phase																		
Clearing of vegetation for construction of support infrastructure, access roads etc.	Habitat destruction / fragmentation of fauna habitats	**WOM**	Negative	Local	1	Permanent	5	High	4	**10**	Frequent	3	Definite	5	**8**	63	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Long Term	4	Medium	3	**8**	Rare	2	Almost certain	4	**6**	32	Negative Low Risk	
Increased hardened surfaces around infrastructure and exposed areas	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Frequent	3	Definite	5	**8**	80	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Rare	2	Almost certain	4	**6**	42	Negative Low Risk	
Vehicle movement on site for	Spreading and	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Almost certain	4	**7**	63	Negative Medium Risk	Refer to Construction Phase mitigation

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
	maintenance	establishment of alien invasive species	**WM**	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Probable	3	**5**	30	Negative Low Risk	
	Vehicle movement on site for maintenance	Habitat degradation due to dust	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Very Frequent	4	Definite	5	**9**	90	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Frequent	3	Almost certain	4	**7**	49	Negative Low Risk	
	Vehicle movement on site for maintenance	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost certain	4	**7**	56	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	25	Negative Low Risk	
	Vehicle movement on site for maintenance	Road mortalities of fauna / impact of human activities on site	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Almost certain	4	**7**	63	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Probable	3	**5**	30	Negative Low Risk	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Decommissioning Phase																		
Rehabilitation of site	Improvement of habitat through revegetation / succession over time	**WOM**	Positive	Local	1	Long Term	4	Low	2	**7**	Frequent	3	Probable	3	**6**	42	Positive Low	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the development areas. • Rehabilitate all the land where infrastructure has been demolished. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitation areas until the area is self-
		WM	Positive	Local	1	Permanent	5	Medium	3	**9**	Very Frequent	4	Definite	4	**8**	72	Positive Medium	
Demolition of infrastructure / rehabilitation of site	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	
Demolition of infrastructure / rehabilitation of site	Spreading and establishment of alien invasive species	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent – Magnitude	Geographical Extent – Score	Duration – Magnitude	Duration – Score	Intensity – Magnitude	Intensity – Score	Magnitude/ Severity – Score	Frequency – Magnitude	Frequency – Score	Probability – Magnitude	Probability – Score	Incidence – Score	Risk rating – Score	Risk rating – Magnitude	Mitigation Measures
Demolition of infrastructure / rehabilitation of site	Habitat degradation due to dust	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Very Frequent	4	Definite	4	**8**	80	Negative Medium	sustaining. • Diversion trenches and storm water measures must be maintained • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The development areas will be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities will continue till closure of the mine is approved. • Monitor and manage invader
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Frequent	3	Probable	3	**6**	42	Negative Low	
Vehicle movement on site for rehabilitation	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Probable	3	**6**	48	Negative Medium	
		WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Possible	2	**4**	20	Negative Low	
Vehicle movement on site for rehabilitation	Road mortalities of fauna / impact of human activities on site	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
																			species and alien species on the rehabilitated land until the natural vegetation can outperform the invaders or aliens. Refer to mitigation measures for the construction phase needed during the closure phase that are relevant

9.4.3 Agricultural Impact

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 mitigation of the overall impacts on soils (compaction, erosion) will be easier on the flatter areas associated with the development.

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.

Exposure of soils to rainfall and wind may lead to atmospheric contamination from fugitive dust and increased erosion of the site and sedimentation of local water courses. An increase in the movement of construction vehicles will result in an increase in the dust levels in the area. The following impacts will occur during the different phases of the solar plant and associated infrastructure:

- **Soil compaction** occurs when soil particles are pressed together, reducing pore space between them. Heavily compacted soils contain few large pores and have a reduced rate of both water infiltration and drainage from the compacted layer. In addition, the exchange of gases slows down in compacted soils, causing an increase in the likelihood of aeration-related problems. Finally, while soil compaction increases soil strength (the ability of soil to resist being moved by an applied force), compacted soil also means that roots must exert greater force to penetrate the compacted layer. In the case of the construction, operational and decommissioning activities associated with the proposed solar plant, soil compaction will be caused by regular heavy vehicle movement (wheel impact) and laydown areas of stockpiles on soils during construction. If mitigation measures are not implemented the effect of the compaction will negatively affect the soil structure of soils on the site.

- **Soil erosion and sedimentation**: Development activities may further result in widespread soil disturbance and is usually associated with accelerated soil erosion, particularly in the study area during the summer months that receives high rainfall. Soil is especially prone to erosion once the topsoil has been stripped, leaving the subsoil exposed to wind and water erosion. Any soils left exposed throughout the construction phase could lead to significant erosion of the soils in the vicinity of the development. Soil, sediments and associated contaminants are transported into streams, rivers and other water bodies, resulting in the loss or alteration of habitats for aquatic organisms, as well as changes in water quality. The hardened surfaces and compacted soils of the development area will also lead to an increase in surface run-off during storm events which will likely be discharged via stormwater outlet points, concentrating flows leaving the development area. Soil erosion also promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous fauna and flora.

- **Soil pollution:** Construction work of the magnitude contemplated for the proposed solar plant will always carry a substantial risk of soil pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. Building waste, batching plants, sewage and domestic waste are also potential contributors to this problem. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on soil chemical composition.

- **Loss of land capability**: This impact involves the loss of land available for farming and tourism: The area where the solar plant is proposed is in an area used for game farming, livestock grazing and some crop farming although solar plant development activities also occur in the broader area. 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 plant will result in a total loss of the land capability as it currently is and will change the current land use from agriculture and grazing to residential land-use

Table 9-9: Quantitative impact assessment for the solar plant development phases on the soils and land capability

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Terrestrial Biodiversity Impact Assessment																			
Construction Phase																			
	Heavy machinery and vehicle movement on Local	Soil Compaction	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Continuous	5	Definite	5	**10**	**100**	Negative Medium Risk	Refer to Sections 8.1
			WM	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	
	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation in wetlands	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Continuous	5	Definite	5	**10**	**100**	Negative Medium Risk	Refer to section 8.2
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Very Frequent	4	Almost Certain	4	**8**	**56**	Negative Medium Risk	
	Heavy machinery and vehicle movement on Local	Spillages of harmful substance	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost Certain	4	**7**	**56**	Negative Medium Risk	Refer to section 8.3

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
		s	**WM**	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	**25**	Negative Low Risk	
	Topsoil & subsoil stripping	Loss of Land capability	**WOM**	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	Refer to section 8.4
			WM	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	
Operational Phase																			
	Soil compaction	Heavy machinery and vehicle movement on site, laydown areas of	**WOM**	Negative	Local	1	Permanent	5	High	4	**10**	Frequent	3	Definite	5	**8**	63	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Long Term	4	Medium	3	**8**	Rare	2	Almost certain	4	**6**	32	Negative Low Risk	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
		overburden and topsoil stockpiles																	
	Increased hardened surfaces around infrastructure and exposed areas	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Frequent	3	Definite	5	**8**	80	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Rare	2	Almost certain	4	**6**	42	Negative Low Risk	
			WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Probable	3	**5**	30	Negative Low Risk	
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Frequent	3	Almost certain	4	**7**	49	Negative Low Risk	
	Vehicle movement on site for maintenance	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost certain	4	**7**	56	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	25	Negative Low Risk	
	Operation of solar plant & associated infrastructure	Loss of Land capability	**WOM**	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	Refer to Construction Phase

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent: Magnitude	Geographical Extent: Score	Duration: Magnitude	Duration: Score	Intensity: Magnitude	Intensity: Score	Magnitude/ Severity: Score	Frequency: Magnitude	Frequency: Score	Probability: Magnitude	Probability: Score	Incidence: Score	Risk rating: Score	Risk rating: Magnitude	Mitigation Measures
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Frequent	3	Probable	3	**6**	**36**	Negative Low Risk	mitigation
Decommissioning Phase																		
Rehabilitation of site	Improvement of land capability and grazing land through revegetation / succession over time	**WOM**	Positive	Local	1	Long Term	4	Low	2	**7**	Frequent	3	Probable	3	**6**	42	Positive Low	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the mining areas.
		WM	Positive	Local	1	Permanent	5	Medium	3	**9**	Very Frequent	4	Definite	4	**8**	72	Positive Medium	
Demolition of infrastructure / rehabilitation of site	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	• Rehabilitate all the land
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Frequent	3	Probable	3	**6**	42	Negative Low	where infrastructure has been demolished. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitation areas until the area is self-sustaining. • Diversion trenches and storm water measures
	Vehicle movement on site for rehabilitation	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Probable	3	**6**	48	Negative Medium	
			WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Possible	2	**4**	20	Negative Low	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
																			must be maintained • Water management facilities will stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The development areas will be shaped to make it safe. • All the monitoring and

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence		Risk rating	Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
																			reporting on the management and rehabilitation issues to the authorities will continue till closure of the mine is approved. • Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation can outperform

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
																			the invaders or aliens. Refer to mitigation measures for the construction phase needed during the closure phase that are relevant

9.4.4 Aquatic Impact

The proposed development will have a potential direct or indirect impact on the instream and riparian habitat. Mitigation (including rehabilitation) of the impacts should rather focus on the management of stormwater, erosion prevention and connection with the larger system. Indirect impacts could occur because of construction activities (dust, spillages etc.).

Impact on the characteristics of the watercourse i.e. flow regime, habitat, biota, water quality and geomorphology due to construction within floodline zone

The construction activities associated with the proposed solar development will potentially have an impact on the wetland areas and water levels, whether it is through direct or indirect impacts. The clearance of vegetation for the solar development will either have a direct or indirect impact on the wetlands and smaller drainage channels. Loss of the riparian and instream habitat will also result in permanent loss or displacement of the invertebrates, birds and small mammals dependant on the wetland vegetation for feeding, shelter and breeding purposes.

Soil compaction and increased risk of sediment transport and erosion

The use of heavy machinery during the construction process of the development will result in the compaction of soil, resulting in decreased infiltration of rainwater and increased surface run-off volumes and velocities leading to a greater erosion risk. The hardened surfaces of the road and compacted soils of the proposed development area will also lead to an increase in surface run-off during storm events which will likely be discharged via stormwater outlet points, concentrating flows leaving the exposed areas. This can lead to erosion and channel incision in the wetland / riparian zones and change the downstream habitat. This could result in higher velocity flows with greater erosive energy which can result in channel incision and gully erosion downstream within the channel riparian zones.
Soil erosion also promotes a variety of terrestrial ecological changes associated with disturbed areas, including the establishment of alien invasive plant species, altered plant community species composition and loss of habitat for indigenous fauna and flora.
The development will cause insignificant changes to the sediment regime of the area considering that no major rivers or drainage channels occur on site.

Soil and water pollution

Construction work will also carry a risk of soil and water pollution, with large construction vehicles contributing substantially due to oil and fuel spillages. If not promptly dealt with, spillages or accumulation of waste matter can contaminate the soil and surface or ground water, leading to potential medium/long-term impacts on fauna and flora.

Spread and establishment of alien invasive species

The construction almost certainly carries by far the greatest risk of alien invasive species being imported to the site, and the high levels of habitat disturbance also provide the greatest opportunities for such species to establish themselves, since most indigenous species are less tolerant of disturbance. The biggest risk is that seeds of noxious plants may be carried onto the site along with materials that have been stockpiled elsewhere at already invaded sites.

Continued movement of personnel and vehicles on and off the site, as well as occasional delivery of materials required for maintenance, will result in a risk of importation of alien species throughout the life of the project.

Furthermore, the spread of the alien invasive species through the area will be accelerated when seeds are carried by stormwater into the drainage features and riparian zones on the site that will cause environmental degradation and indigenous species to be displaced.

Table 9-10: Impact rating assessment matrix of the Buffalo 1 Solar Park and associated infrastructure on the wetlands / riparian zones of the site

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Aquatic Biodiversity Impact Assessment																			
Construction Phase																			
	Clearing of vegetation for construction of infrastructure, access roads etc.	Impact on the characteristics of the watercourse i.e. flow regime, habitat, biota, water quality and geomorphology due to construction within	**WOM**	Negative	Local	1	Permanent	5	Very High	5	**11**	Continuous	5	Definite	5	**10**	**110**	Negative High Risk	Refer to Sections 5.4.2
			WM	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
		floodline zone (road crossings etc.)																	
	Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation in wetlands	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Continuous	5	Definite	5	**10**	**100**	Negative Medium Risk	Refer to section 5.5.2
			WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Very Frequent	4	Almost Certain	4	**8**	**56**	Negative Medium Risk	
	Heavy machinery and vehicle movement on Local	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost Certain	4	**7**	**56**	Negative Medium Risk	Refer to section 5.6.2
			WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	**25**	Negative Low Risk	
	Continued movement of personnel and vehicles on and off the site during the	Spreading of alien invasive species	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Very Frequent	4	Almost Certain	4	**8**	**72**	Negative Medium Risk	Refer to section 5.7.2

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
	construction phase, as well as occasional delivery of materials required for maintenance		**WM**	Negative	Local	1	Medium Term	3	Low	2	**6**	Frequent	3	Probable	3	**6**	**36**	Negative Low Risk	
Operational Phase																			
	Clearing of vegetation for construction of support infrastructure, access roads etc.	Impact on the characteristics of the watercourse i.e. flow regime, habitat, biota, water quality and geomorphology due to	**WOM**	Negative	Local	1	Permanent	5	High	4	**10**	Frequent	3	Definite	5	**8**	63	Negative Medium Risk	Refer to Construction Phase mitigation
			WM	Negative	Local	1	Long Term	4	Medium	3	**8**	Rare	2	Almost certain	4	**6**	32	Negative Low Risk	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
	construction within floodline zone																	
Increased hardened surfaces around infrastructure and exposed areas	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Frequent	3	Definite	5	**8**	80	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Rare	2	Almost certain	4	**6**	42	Negative Low Risk	
Vehicle movement on site for maintenance	Spreading and establishment of alien invasive species	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Almost certain	4	**7**	63	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Probable	3	**5**	30	Negative Low Risk	
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Frequent	3	Almost certain	4	**7**	49	Negative Low Risk	
Vehicle movement on site for maintenance	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost certain	4	**7**	56	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	25	Negative Low Risk	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Decommissioning Phase																		
Rehabilitation of site	Improvement of riparian habitat through revegetation / succession over time	**WOM**	Positive	Local	1	Long Term	4	Low	2	**7**	Frequent	3	Probable	3	**6**	42	Positive Low	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the development areas. • Rehabilitate all the land where infrastructure has been demolished. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitation areas until the area is self-sustaining. • Diversion trenches
		WM	Positive	Local	1	Permanent	5	Medium	3	**9**	Very Frequent	4	Definite	4	**8**	72	Positive Medium	
Demolition of infrastructure / rehabilitation of site	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	
Demolition of infrastructure / rehabilitation of site	Spreading and establishment of alien invasive species in	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
	wetlands																	and storm water measures must be maintained
Vehicle movement on site for rehabilitation	Spillages of harmful substances in wetlands	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Probable	3	**6**	48	Negative Medium	• Water management facilities must stay operational and maintained and monitored until such a stage is reached where it is no longer necessary. • The development areas must be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities must continue till closure of the site is approved. • Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation
		WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Possible	2	**4**	20	Negative Low	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
																			can outperform the invaders or aliens. Refer to mitigation measures for the construction phase needed during the closure phase that are relevant

9.4.5 Avifauna Impact

Potential impacts were evaluated against the data captured during the fieldwork and from a desktop perspective to identify relevance to the project site, specifically the proposed development footprint area.

During the construction phase (**Table** 9-11) vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise pollution. Increased human presence can lead to poaching and the increase in vehicle traffic and heavy machinery will potentially lead to roadkill.

The principal impacts of the operational phase (**Table** 9-12) are electrocution, collisions, fencing, chemical pollution due to chemical cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the “lake effect” (Lovich & Ennen, 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. This “lake-effect” hypothesis has not been substantiated or refuted to date (Visser et al, 2019). It can however be said that the combination of powerlines, fencing and large infrastructure will influence avifauna species. Visser et al (2019) performed a study at a utility-scale PV SEF in the Northern Cape and found that most of the species affected by the facility were passerine species. This is due to collisions with solar panels from underneath. During a predator attack while foraging under the panels, individuals may alight and then collide with the panel. Larger species were said to be more influenced by the facilities when they were found foraging close by and were disturbed by predators which resulted in collisions with infrastructure.

A single field assessment during the wet season (11th – 16th of April 2023) 84 species were recorded during the point counts. One species recorded was a SCC i.e., *Leptoptilos crumenifer* (Marabou Stork). Seven (7) risk species were recorded in the field investigation. These are species at risk for collisions, electrocutions or sensitive to habitat loss.

Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties. Fencing of the PV site can influence birds in six ways (BirdLife South Africa, 2015):

- Snagging – occurs when a body part is impaled on one or more barbs or razor points of a fence;
- Snaring – when a bird’s foot/leg becomes trapped between two overlapping wires;
- Impact injuries – birds flying into a fence, the impact may kill or injure the bird;

- Snarling – when birds try and push through a mesh or wire stands, ultimately becoming trapped (uncommon);
- Electrocution – electrified fence can kill or severely injure birds; and
- Barrier effect – fences may limit flightless birds including moulting waterfowl from resources.

Chemical pollution from PV cleaning, if not environmentally friendly will result in either acute or chronic affects. Should this chemical penetrate into the surrounding environment, it would impact populations on a larger scale and not just species found in and around the PV footprint

The SEI of the proposed PAOI was found to be medium, highly likely due to the overall disturbance in the area, such as the mine, power station, roads and fences, existing power line infrastructure and human settlements, influence the. SCC behaviour results in the low abundance of SCC observed in the area and therefore the overall avifauna sensitivity is medium sensitivity. However, the sensitivity can be assumed to be Impacts were identified as being High to Medium in the Construction Phase (**Table** 9-11), most of which could be reduced to Medium to Low, and even Absent with the application of mitigation measures. Impacts in the operational phase (**Table** 9-12) are expected to be Medium and can be reduced to Medium to Low with mitigation measures. Decommissioning phase impacts (**Table** 9-13) are expected to be Medium and can be reduced to Low with mitigation measures. Cumulative impacts are Medium for the project in isolation and in consideration with Buffalo 2, Lyra 1 and Lyra 2 PV facility proposed in the area.

Table 9-11: Impact Rating on Avifauna during Construction phase

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
Habitat destruction within the project footprint	5	2	4	5	5	110	4	1	3	3	4	56
	Permanent	Area	High/Harmful	Continuous	Definite	**High**	Long Term	Local	Medium/slightly harmful	Frequent	Almost certain	**Medium**
Destruction, degradation and fragmentation of surrounding habitats	4	2	3	3	4	63	3	1	2	3	3	30
	Long Term	Area	Medium/slightly harmful	Frequent	Almost certain	**Medium**	Medium Term	Local	Low/potential harmful	Frequent	Probable	**Low**
Displacement/emigration of avifauna community (including SCC) due to noise pollution	4	2	3	3	4	63	3	1	2	3	3	30
	Long Term	Area	Medium/slightly harmful	Continuous	Almost certain	**Medium**	Medium Term	Local	Low/potential harmful	Frequent	Probable	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
Direct mortality from persecution or poaching of avifauna species and collection of eggs	4	2	3	3	4	63	2	1	2	3	3	30
	Long Term	Area	Medium/slightly harmful	Frequent	Almost certain	**Medium**	Short term	Local	Low/potential harmful	Frequent	Probable	**Low**
Direct mortality from increased vehicle and heavy machinery traffic	4	2	3	3	4	63	2	1	2	3	1	25
	Long Term	Area	Medium/slightly harmful	Frequent	Almost certain	**Medium**	Short term	Local	Low/potential harmful	Frequent	Highly unlikely	**Low**
Chemical pollution associated with dust suppressants	4	3	4	3	4	77	2	2	2	3	1	24
	Long Term	Region	High/Harmful	Frequent	Almost certain	**Medium**	Short term	Area	Low/potential harmful	Frequent	Highly unlikely	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance

Table 9-12: Impact Rating on Avifauna during Operational phase

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
Collisions with infrastructure associated with the PV Facility, e.g., connection line	5	2	4	3	4	77	4	2	3	3	4	63
	Permanent	Area	High/Harmful	Frequent	Almost certain	**Medium**	Long Term	Area	Medium/slightly harmful	Frequent	Almost certain	**Medium**
Electrocution due to infrastructure associated with the PV Facility, e.g. connection line	5	2	4	3	4	77	4	2	3	3	4	63
	Permanent	Area	High/Harmful	Frequent	Almost certain	**Medium**	Long Term	Area	Medium/slightly harmful	Frequent	Almost certain	**Medium**
Direct mortality from roadkills, persecution or poaching of avifauna species and collection of eggs	4	2	3	3	4	63	3	1	2	3	3	35
	Long Term	Area	Medium/slightly harmful	Frequent	Almost certain	**Medium**	Medium Term	Local	Low/potential harmful	Frequent	Probable	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
Direct mortality from persecution or poaching of avifauna species and collection of eggs	4	3	3	3	3	60	4	2	2	3	2	40
	Long Term	Region	Medium/slightly harmful	Frequent	Probable	**Medium**	Long Term	Area	Low/potential harmful	Frequent	Improbable	**Low**
Direct mortalities and hinderance of movement from fencing infrastructure	5	3	3	3	3	66	4	2	2	3	3	48
	Permanent	Region	Medium/slightly harmful	Frequent	Probable	**Medium**	Long Term	Area	Low/potential harmful	Frequent	Probable	**Low**
Pollution due to chemicals	4	3	3	3	3	60	4	2	2	3	3	48

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
used to keep the PV panels clean	Long Term	Region	Medium/slightly harmful	Frequent	Probable	**Medium**	Long Term	Area	Low/potential harmful	Frequent	Probable	**Low**

Table 9-13: Impact Rating on Avifauna during Decommissioning Phase

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
Direct mortality due to earthworks, vehicle collisions and persecution	5	3	3	3	3	666	2	2	3	3	2	35
	Permanent	Region	Medium/slightly harmful	Frequent	Probable	**Medium**	Short Term	Area	Medium/slightly harmful	Frequent	Improbable	**Low**
Direct mortality due to infrastructure including collisions with PV infrastructure, connection line, electrocution with connection line, fences etc	5	3	3	3	4	77	2	2	3	3	1	28
	Permanent	Region	Medium/slightly harmful	Frequent	Almost certain	**Medium**	Short Term	Area	Medium/slightly harmful	Frequent	Highly unlikely	**Low**
Continued habitat degradation due to Invasive Alien Plant encroachment and erosion	5	3	3	3	4	77	2	2	2	3	2	30
	Permanent	Region	Medium/slightly harmful	Frequent	Almost certain	**Medium**	Short Term	Area	Low/potential harmful	Frequent	Improbable	**Low**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance

9.4.6 Archaeological and Heritage Impact

Impacts to heritage resources without mitigation within the project footprint will be permanent and negative and occur during the pre-construction and construction activities. It is assumed that the pre-construction and construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can impact on heritage features and impacts include destruction or partial destruction of non-renewable heritage resources. Impacts during the operation phase is considered to affect the cultural landscape and sense of place.

The main cause of impacts to archaeological resources is physical disturbance of the material itself and its context during removal of topsoil and vegetation as well as the excavations associated with the establishment of infrastructure. In terms of this project the main source of impacts will happen during the following activities.

- Establishment of new roads and upgrade of existing roads;
- Earthworks for temporary infrastructure including laydown areas;
- Visual impact of the PV Facility on the landscape and sense of place;
- Excavation and levelling of the PV facility footprint;
- Trenches for cables and erection of powerlines;
- Influx of people into the area that impact on heritage sites;
- Excavations during construction of the sub stations.

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure. These activities can have a negative and irreversible impact on heritage features if any occur. Impacts include destruction or partial destruction of non-renewable heritage resources.

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. Potential impacts include destruction or partial destruction of non-renewable heritage resources (**Table** 9-14**).**

Table 9-14: Impact assessment on the Project area during the pre-construction and construction phase.

Aspect	**Pre-Mitigation**	**Post-Mitigation**
Phase	Pre-Construction And Construction	
Status if impact	Direct	Direct
Nature of impact	Negative	Negative
Extent	1	1
Duration	1	1
Intensity	1	1
Severity (E + D + Int)	1 + 1 + 1 = 3	1 + 1 +1 = 3
Probability	2	1
Frequency	1	1
Incidence (F + P)	1 + 2 = 3	1 + 1 = 2
Risk (S x I)	3 x 3= 9 LOW RISK	3 x 2 = 6 = LOW RISK

Only the construction phase could have any impact on the palaeontology because this is when the ground will be excavated and any fossils, if present, would be removed (**Table** 9-15). During the operational and decommissioning phases no new ground will be excavated so there will be no impact.

Table 9-15: Impact Rating for the Buffalo 1 Solar Park and grid alternates where mitigation is the removal of fossils from the project footprint.

ASPECT	Rating Pre-mitigation	Rating Post-mitigation
Phase	PLANNING	
Status if impact		
Nature of impact		
Extent		
Duration		
Intensity		
Severity (E + D + Int)		
Frequency		
Probability		
Incidence (F + P)		
Risk (S x I)		
ASPECT	**Rating Pre-mitigation**	**Rating Post-mitigation**
Phase	CONSTRUCTION	
Status if impact	Direct	Direct
Nature of impact	Negative	Positive
Extent	1	1
Duration	1	1
Intensity	3	1
Severity (E + D + Int)	1 + 1 + 3 = 5	1 + 1 +1 = 3
Probability	3	1
Frequency	1	1
Incidence (F + P)	1 + 3 = 4	1 + 1 = 2
Risk (S x I)	**5 x 4 = 20 = LOW RISK**	**3 x 2 = 6 = LOW RISK**

9.4.7 Visual Impact

Visual receptors include people living in, visiting, or travelling through or adjacent to the study area. Two main public roads cross the study area, the D1675 local district road the passes along the northern boundary of the site and the Kuipersbuld Road that passes immediately south east of the Medupi Power Station and then south and out of the study area. The other main sensitive receptor group is people visiting farms/game farms or homesteads located in the west and/or north of the Project site.

Activities associated with the Project will be visible to varying degrees from varying distances about the Project site. However, due to the density of the bushveld (tall trees and shrubs) surrounding the site, most views towards these activities would be screened by the vegetation. Based on observation during the site visit, even close up/foreground views to the solar arrays and other infrastructure from the immediate surrounds of the site, would mostly be blocked by existing dense vegetation, especially during the summer months when the plants are in full leaf. The exception to this is along the northern boundary where, from within the road reserve, Project activities would be highly visible as vegetation would be cleared to the boundary line to accommodate the proposed layout alternatives.

During the construction phase, the Project's visibility will be influenced due to the physical presence of preparatory activities, primarily earthworks, clearing of vegetation, dust and building works for the PV arrays and the 132kV powerline. During the operational phase, the visibility of the Project will be caused by the established solar PV arrays and associated on-site infrastructure, including the substation, BESS and 132kV powerline.

Project components are planned within a landscape which has a high visual absorption capacity (VAC) due to the presence of tall vegetation and the flat topography of the study area. Added to the screening effect of the vegetation, the low height of the PV arrays (i.e. maximum 4,5m above ground level) and the relative low perspective of viewers (there are no raised vantage points from which the site(s) would be visible), the visibility of project activities is low. The landscape would 'absorb' most visual changes and/or block views to the site, however, the project would be highly visible from the D1675.

The solar PVs and other infrastructure would displace extensive areas of vegetation across the Project site and reduce the absorption capacity of the landscape in the immediate vicinity of the site along the D1675 road. It is therefore imperative that only the proposed footprint of the solar arrays and the associated infrastructure areas be cleared, that all remaining vegetation be retained and that a 20m no-build buffer (with retained and added vegetation) be established around the PV arrays along the D1675 boundary. There are no locations where the entire solar PV project could be seen in one view. General visibility is considered low for the Project.

According to the results tabulated below in Table 9-16, the intensity of visual impact will be moderate (during the construction and operational phases without mitigation), for foreground views for users of the D1675 public road immediately north of the site, negligible to none for the remainder of the study area. At decommissioning, when all infrastructure is dismantled and removed, and the site is rehabilitated the intensity of visual impact reduces to negligible.

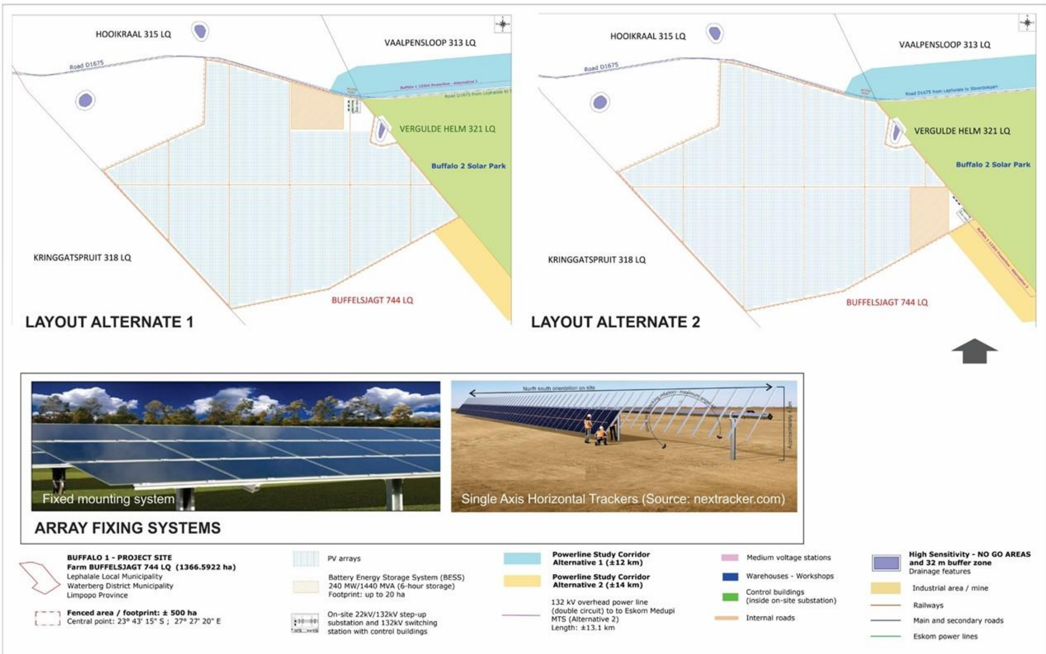

Figure 9-1: PV layout options assessed during the visual impact assessment.

Table 9-16: *Intensity* of visual impact without mitigation during construction and operational phases for Layout Option 1 with Corridor Alternate 1 and Layout Option 2 with Corridor Alternate 2

	Moderate - Users of the D1675 district road north of the site for **Layout Option 1 with Corridor Alternate 1**	**Low** Users of the D1675 district road north of the site for **Layout Option 2 with Corridor Alternate 2**	**Negligible to None** - Homesteads west and south of the site - The remainder of the study area
Major loss of or alteration to key elements / features / characteristics of the baseline in the immediate vicinity of the site. i.e. Pre-development landscape or view and / or introduction of elements considered to be uncharacteristic when set within the attributes of the receiving landscape. **Result:** **A *high* scenic quality impact would result.**	Partial loss of or alteration to key elements / features / characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that may be prominent but may not necessarily be substantially problematic when set within the attributes of the receiving landscape. **Result:** **A *moderate* scenic quality impact would result over an intense by localized area.**	Minor loss of or alteration to key elements / features / characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that may not be problematic when set within the attributes of the receiving landscape. **Result:** **A *low* scenic quality impact would result.**	Very minor or no loss or alteration to key elements/features/characteristics of the baseline. i.e. Pre-development landscape or view and / or introduction of elements that is not problematic with the surrounding landscape – approximating the 'no change' situation. **Result:** ***Negligible* to *no* scenic quality impacts would result.**

Significance of Visual Impact LAYOUT OPTION 1 WITH CORRIDOR OPTION 1

Construction phase

The severity of the worst-case impact on the visual environment during the construction phase is assessed to have a medium intensity over a localized area (but extends beyond the site boundary) and would occur over the medium-term (less than five years). The incidence of the unmitigated impact along with the severity of impact results in a medium risk rating. The predicted significance of impact is therefore MEDIUM. The implementation of mitigation measures would not significantly reduce the anticipated impact, which would remain MEDIUM negative.

Operational Phase

The severity of the worst-case impact on the visual environment during the operational phase is assessed to have a medium intensity over a localized area (but extends beyond the site boundary) and would occur over the long-term (project life). The incidence of the unmitigated impact along with the severity of impact results in a medium risk rating. The predicted significance of impact is therefore MEDIUM negative. The implementation of mitigation measures can reduce the impact to LOW.

Decommissioning Phase

The severity of the worst-case impact on the visual environment during the decommissioning phase is assessed to have a low intensity over a localized area (but extends beyond the site boundary) and would occur over the medium-term (less than five years). The incidence of the unmitigated impact along with the severity of impact results in a low risk rating. The predicted significance of impact is therefore LOW. The implementation of mitigation measures would reduce the anticipated impact, but the significance of impact would remain LOW negative.

Table 9-17: Determining the SEVERITY of Visual Impact – Layout Option 1 with Corridor Option 1

Project Phase	***Unmitigated* summary of the rated visual impact for all phases of the Project**				***Mitigated* summary of the rated visual impact for all phases of the Project**			
	Extent	**Duration**	**Intensity**	**SEVERITY**	**Extent**	**Duration**	**Intensity**	**SEVERITY**
Construction	Local 1	Med Term 3	Medium 3	**7**	Local 1	Med Term 3	Medium 3	**7**
Operational	Local 1	Project life 5	Medium 3	**9**	Local 1	Project life 5	Low 2	**8**
Decommissioning	Local 1	Med Term 3	Low 2	**7**	Local 1	Med Term 3	Low 2	**6**

Table 9-18: SIGNIFICANCE of Visual Impact (Risk rating) Layout Option 1 with Corridor Option 1

Potential Visual Impact i.e. change to the landscape characteristics and key views caused by the physical presence of Project activities	ENVIRONMENTAL SIGNIFICANCE							
	Unmitigated				Mitigated			
	Severity	x	Incidence (Freq + prop)	RISK	Severity	x	Incidence (Freq + prop)	RISK
Construction	**7**		4 +4	**56**	**7**		4 +4	**56**
Operational	**9**		4 +4	**72**	**8**		3 +3	**48**
Decommissioning	**7**		3 +3	**46**	**6**		2 +2	**24**
CONFIDENCE RATINGS								
Degree of Confidence of the significance assessment[34]	At the time of drafting the report, the outcome of the I&AP process was not known. If sensitives of the local community are high, the impact rating may be slightly modified upwards.							**M**
Degree to which the impact can be mitigated	Mitigation is feasible, and the impact can be reversed with mitigation from moderate to low during the construction and operational phases.							**M**
Loss of resources	The existing bushveld will be transformed changing the aesthetic and sense of place of the general area for the site. Surrounding areas will not be affected significantly.							**M**
Reversibility	After decommissioning the site could be rehabilitated back to its original topography and vegetative cover.							**Fully rev.**

Significance of Visual Impact LAYOUT OPTION 2 WITH CORRIDOR OPTION 2

Construction phase

The severity of the worst-case impact on the visual environment during the construction phase is assessed to have a medium intensity over a localized area (but extends beyond the site boundary) and would occur over the medium-term (less than five years). The incidence of the unmitigated impact along with the severity of impact results in a low risk rating. The predicted significance of impact is therefore Low. The implementation of mitigation measures would not significantly reduce the anticipated impact, which would remain Low negative.

Operational Phase

The severity of the worst-case impact on the visual environment during the operational phase is assessed to have a medium intensity over a localized area (but extends beyond the site boundary) and would occur over the long-term (project life). The incidence of the unmitigated impact along with the severity of impact results in a medium risk rating. The predicted significance of impact is therefore MEDIUM negative. The implementation of mitigation measures can reduce the impact to Low.

[34] Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. If sensitives of the local community are not known or extremely high, the impact rating may be modified, particularly the rating with mitigation.

Decommissioning Phase

The severity of the worst-case impact on the visual environment during the decommissioning phase is assessed to have a low intensity over a localized area (but extends beyond the site boundary) and would occur over the medium-term (less than five years). The incidence of the unmitigated impact along with the severity of impact results in a low risk rating. The predicted significance of impact is therefore Low. The implementation of mitigation measures would reduce the anticipated impact, but the significance of impact would remain Low negative.

Table 9-19: Determining the SEVERITY of Visual Impact – Layout Option 2 with Corridor Option 2

Project Phase	*Unmitigated* summary of the rated visual impact for all phases of the Project				*Mitigated* summary of the rated visual impact for all phases of the Project			
	Extent	Duration	Intensity	SEVERITY	Extent	Duration	Intensity	SEVERITY
Construction	Local 1	Medium 3	Low 2	**6**	Local 1	Medium 3	Low 2	**6**
Operational	Local 1	Project life 5	Medium 3	**9**	Local 1	Project life 5	Low 2	**8**
Decommissioning	Local 1	Medium 3	Low 2	**6**	Local 1	Medium 3	Low 2	**6**

Table 9-20: SIGNIFICANCE of Visual Impact (Risk rating) Layout Option 2 with Corridor Option 2

Potential Visual Impact i.e. change to the landscape characteristics and key views caused by the physical presence of Project activities	ENVIRONMENTAL SIGNIFICANCE							
	Unmitigated				Mitigated			
	Severity	x	Incidence (Freq + prop)	RISK	Severity	x	Incidence (Freq + prop)	RISK
Construction	6		4 +4	48	6		4 +4	48
Operational	9		4 +3	63	8		3 +2	40
Decommissioning	6		3 +3	36	6		3 +2	35
CONFIDENCE RATINGS								
Degree of Confidence of the significance assessment[35]	At the time of drafting the report, the outcome of the I&AP process was not known. If sensitives of the local community are high, the impact rating may be slightly modified upwards.							M
Degree to which the impact can be mitigated	Mitigation is feasible, and the impact can be reversed with mitigation from moderate to low during the construction and operational phases.							M
Loss of resources	The existing bushveld will be transformed changing the aesthetic and sense of place of the general area for the site. Surrounding areas will not be affected significantly.							M

[35] Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified. Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact. If sensitives of the local community are extremely high, the impact rating may be modified, particularly the rating with mitigation.

Reversibility	After decommissioning the site could be rehabilitated back to its original topography and vegetative cover.	**Fully rev.**

9.4.8 Socio-Economic Impact

Operational Phase

9.4.8.1.1.1 Contribution to the Constrained National Electricity Grid

The project will contribute up to 240MW to a constrained national grid, thereby reducing the need for load shedding with its negative consequences for economic production, growth and job creation; and maintenance of equipment. The impact is positive and direct, with a high significance, because the extent is national and the duration is long term. The risk of negative socio-economic impacts is negligible.

9.4.8.1.1.2 Capital Formation and Investment Attraction

Capital investment of approximately R4.8bn will be required (240 MW at R20m/MW) of which a substantial proportion is likely to be foreign capital as indicated by the REIPPPP projects that have been procured to date. The impact is positive and direct with indirect and cumulative benefits, giving it a high significance. Risks of negative socio-economic impacts are negligible.

9.4.8.1.1.3 Reduction in CO2 Emissions per Unit of Electricity Generated

CO2 emissions for 240 MW of solar energy will be reduced relative to coal fired power generation, which is the current national standard. The quantity of CO2 potentially avoided by this project will be approximately 800,000 tons per year based on the average Eskom emission factor of 1.015 tons/MWh and assuming that the PV modules will be mounted on trackers. This impact is positive and direct with high significance on the area, but moderate from a national perspective and no negative socio-economic impacts.

9.4.8.1.1.4 Lower Tariffs per Unit will Reduce Inflationary Pressure

Lower and declining electricity tariffs from solar energy compared to fossil fuel generated electricity (solar and wind energy tariffs are approximately R0.50/kWh, compared to the coal tariff of R1.03/kWh). This will have a mitigating effect on administered prices and therefore on inflation. The economic impact of the proposed project will therefore be direct and positive with a moderate significance. The effect is national and permanent, but the intensity is low, given the large basket of expenses that impact on household and business affordability. Low-income consumers are likely to experience any inflation relief the most.

9.4.8.1.1.5 Promotion of the Solar Energy Value Chain

Every new solar project that is developed in South Africa makes the establishment of an industry to support local manufacturing of components more viable. The footprint for such industry development has already been created in various industrial parks in South Africa. The economic impact of the proposed project will therefore be positive. Significance may initially be low to moderate, considering that Buffalo 1 may be the third solar park in the area after Tom Burke and the Lephalale Solar project that was recently announced by Exxaro. However, considering the pipeline of 4 other solar project applications in the vicinity, see section 4.3 above, it is anticipated that critical mass can be achieved to manufacture and service some of the components and equipment within the local economy. The positive cumulative impact is therefore expected to improve to moderate within a five-year horizon.

There will be no negative impacts on community relocation. Cluster development within the solar energy value chain will contribute to consolidation of the Lephalale urban complex as a service centre for the local renewable energy industry development.

9.4.8.1.1.6 Job Creation and Skills Development

Permanent job creation on the proposed project could be 80 people, with an additional 200 for almost 2 years during the construction phase. Albeit important, these numbers are relatively low in the context of current unemployment in Lephalale Municipality, which is in the order of 12,600 (see section 3.3). However, the positive and cumulative impacts could increase to moderate within a five-year horizon, considering the pipeline of solar PV project development proposals for Lephalale. It is anticipated that the job creation figures indicated above, could treble before 2030 and increase even further as the development of the local solar PV value chain gathers momentum during this period.

An important new range of renewable energy industry skills will be acquired, which are essential for the local competitiveness of this industry. This direct socio-economic impact is positive, but with a low significance, which will also increase over time as the development of the local solar PV value chain gathers momentum.

The high and semi-skilled labour requirements for the proposed project(s) are likely to be available within Lephalale given the industrial history of several decades of power station operation. The proposed project will also provide skills development opportunities for unskilled labour.

9.4.8.1.1.7 Community Development

In terms of REIPPPP prescriptions, developers are expected to contribute 1.5% of turnover to community development in the vicinity of the project. Although this commitment has not yet been formalised, it could and should be structured in a way that will contribute meaningfully to the quality of life of a local community who could be identified, probably in Marapong, and engaged in consultation with the local municipality. The impact is positive, but with a low significance initially in terms of the methodology for impact calculation. The impact on the local community itself could be significant and could be replicated from there. As with job creation and skills development discussed above, the cumulative positive impact is expected to increase by a factor of at least 3 as the development of the local solar PV value chain gathers momentum over the next 5 years.

9.4.8.1.1.8 Change in Land Use

The proposed change in land use from grazing to solar PV energy generation is positive and direct, but modest in view of the site size, which is only 500 hectares. The land capability is low and classified as grazing (see figure 5 above). The land is currently unused. The gross value added and the employment that can be created on the proposed 500ha site, is significantly higher for solar electricity generation compared to grazing.

9.4.8.1.1.9 Risk of Vandalism

Vandalism of property is a risk associated with high levels of poverty. This impact is potentially negative, considering the high value of solar PV panels. Mitigation measures will be required in the form of equipment design and on-site security.

Construction Phase

9.4.8.1.1.10 Promotion of the Solar Energy Value Chain

Almost the entire impact of the proposed project on the local solar energy industry value chain referred to in section 5.1.5 above will occur before and during the construction phase, because this is when the components will be required. As indicated, this impact is positive, with a low significance, because critical mass for value chain development will require more than one project. However, the cumulative impact of construction for the Buffalo 1 Solar Park, with that of the proposed Lephalale Solar Park (announced by Exxaro) and those of other proposed solar parks in the pipeline for the Lephalale, will be more significant and positive.

9.4.8.1.1.11 Job Creation and Skills Development

Approximately 200 construction and panel installation jobs are expected to be created for a 240MW project, for a period of approximately 2 years. Skills development, especially for panel installation, will contribute meaningfully to the viability of other potential solar project developments in Limpopo Province. This impact will be positive, but with relatively low significance due to its short duration. Significance of the positive cumulative impact could increase by a factor of 3 as other solar projects in the pipeline for Lephalale move into the implementation phase.

9.4.8.1.1.12 Crime and Social Disruption

Construction projects are associated with increased levels of crime and disruption to established local social relationships. The risk of an increase in infections could also arise when contractors are recruited from a different location. This impact could be negative, albeit low. The significance can be further reduced by way of mitigation measures that should include an appropriate security, workplace safety and accommodation protocols that the main contractor and all subcontractors should adhere to.

9.4.8.1.1.13 Conclusion on Socio-Economic Assessment

The socio-economic impact of the proposed Buffalo 1 Solar Park is 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. The site is suitable for the proposed project from a physical and an irradiation perspective. Significantly more value will be added and jobs created (with marketable skills training) compared to the current land use. The surrounding area has been used for coal mining, power stations and electricity transmission for decades. There will be no need to relocate any communities. Jobs will be created for labour residing in the adjacent Lephalale-Marapong urban complex within a comfortable daily commuting distance. The urban complex can also provide the first level of component, equipment and service requirements.

The cumulative impact will be more positive than the impact of the proposed Buffalo 1 Solar Park alone. This is because other solar projects in the pipeline in the vicinity of Lephalale will contribute towards the achievement of critical mass that is needed to establish a viable local industry for servicing the projects and supplying/manufacturing the components and equipment that are required.

The net positive impacts will be forgone in the no-go project alternative. The proposed site is suitable for the project, although other sites in the vicinity could be equally suitable. The proposed project area can accommodate more than one solar project.

Table 9-21: Summary of Socio-Economic Impacts During the Operational Phase

Aspect	Impact Rating
Contribution to the Constrained National Energy Grid	Positive - High
Capital Formation and Investment Attraction	Positive - High
Reduction in CO_2 Emissions	Positive - Moderate
Lower Electricity Tariffs – Reducing Inflationary Pressure	Positive - Moderate
Promotion of the Solar Energy Value Chain	Positive – Low to Moderate
Job Creation and Skills Development	Positive - Low
Community Development	Positive - Low
Change in Land-Use	Positive - Low
Risk of Vandalism	Negative - Low

Table 9-22: Summary of Socio-Economic Impacts During the Construction Phase

Aspect	Impact Rating
Promotion of the Solar Energy Value Chain	Positive - Low
Job Creation and Skills Development	Positive - Low
Crime and Social Disruption	Negative - Low

9.4.9 Geotechnical Impact

No problem soils that will have a significant impact on the planned PV structures have been identified. The transported aeolian sand is prone to collapse settlement when very loose to loose but the soil encountered on site is mostly medium dense. The clayey soil has low shrinkage limits therefore only low expansiveness is expected under lightly loaded structures. Foundation preparation will be able to handle settlement and collapse. No Perched or shallow groundwater conditions were observed in any of the trial holes. The water table across the proposed development area is deeper than 3m.

9.6 Cumulative and Indirect Impacts

This section describes the likely cumulative impacts of the project on the environment. It identifies the scope of the assessment, the potential cumulative environmental effects, which may require associated mitigation measures to be addressed.

The following section provides details on existing, and project being proposed in the geographical area of evaluation (**Table** 9-23)

Table 9-23: A summary of related facilities, that may have a cumulative impact, in a 30 km radius of the project site.

Map reference nr	EIA reference nr	Application Title	Distance from proposed development area
Approved as indicated in the Screening Tool document (Buffalo 1 Solar Park)			
1	12/12/20/2306	Exxaro Photovoltaic Plant	13.6 km
2	12/12/20/2152	Delta Solar Park	3.7 km
	14/12/16/3/3/2/700		
3	14/12/16/3/3/2/444	Vangpan Solar Park	10.5 km
4	14/12/16/3/3/2/300	Lephalale Solar Park	

A desktop assessment of other EIA's in the area also indicated that some other land use changes occurred in close proximity to the **Buffalo 1 Solar Site** as noted in the 2009 EIA for the proposed construction of a Eskom General Landfill and Hazardous Waste Storage Facility[36] (DEAT ref 12/12/20/1399) (located south west of the proposed site), the 2009 EIA for the proposed development of coal mining activities west of Lephalale (located north west of the proposed site)[37] and the 2020 Integrated Water and Waste Management Plan for the Temo Mine project near Steenbokpan, Limpopo Province (located south west of the proposed project)[38].

The process of assessing cumulative impacts require an awareness of other developments in an area, and then to understand how a new proposed development will likely add to specific impacts. A simplified cumulative impact and mitigation planning process flow is illustrated below (**Figure** 9-2**)**

[36] Govender, G. 2009. Environmental Impact Assessment for the proposed construction of an Eskom General Landfill and Hazardouswaste storage facility in Lephalale, Limpopo Province. July 2009. DEAT Ref 12/12/20/1399

[37] Van Schalkwyk, J. 2009.Heritage Scoping Assessment of the proposed development of coal mining activities west of Lephalale, Limpopo Province.

[38] Gutu, A. 2020 Integrated Water and Waste Management Plan for the Water Use Licence Application for the Temo Mine Project near Steenbokpan,,Limpopo Province. Report No NAM5335.

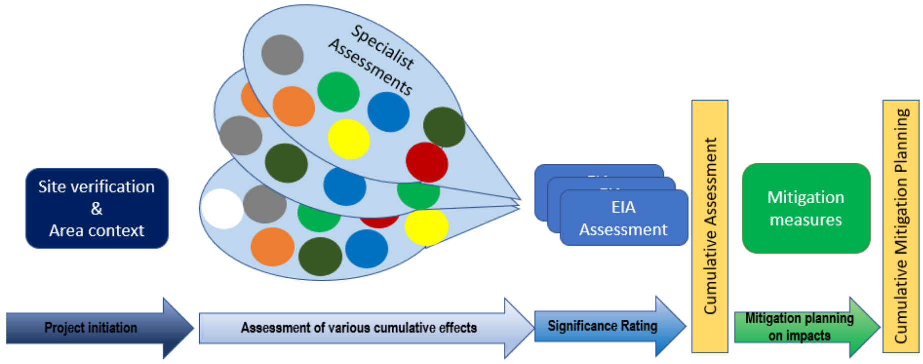

Figure 9-2: Cumulative impact assessment process flow

9.4.10 Cumulative Impacts

Cumulative impacts are those Impacts that result from incremental changes caused by other past, present or reasonably foreseeable actions together with the project (EU, 1999). Cumulative effects can simply be defined as the total impact that a series of developments, either present, past or future, will have on the environment within a specific region over a particular period of time (DEAT, 2004). The DEAT 2004 Guideline document on Cumulative Effects Assessment list various types of cumulative effects. Only two types of cumulative effects are applicable in this instance, namely i) Fragmentation and ii) Triggers and Thresholds. In this EIA document, the cumulative effects that the proposed solar development may have, have been assessed as part of the existing environmental assessment and process. The

Table 9-24 below shows the various impacts, which have been considered for cumulative impact assessment during the EIA phase of the proposed project.

Table 9-24: Potential Cumulative impacts.

POTENTIAL IMPACT	CONSIDERED FOR POTENTIAL CUMULATIVE IMPACT
Air Quality	No
Archaeological and Cultural Heritage and Palaeontological	No
Avian	Yes
Agriculture	Yes
Flora	No
Fauna	No
Surface and Groundwater	No
Social Impact	Yes
Visual Impact	Yes
Local Economy	Yes

The full integrated consequence of cumulative effects was evaluated for the solar park and involved the key cause-and-effect relationships between human activities and resources using a network diagram

(**Figure** 9-3). The diagram represent temporary as well as long term effects and positive and negative effects that could be expected from a solar development.

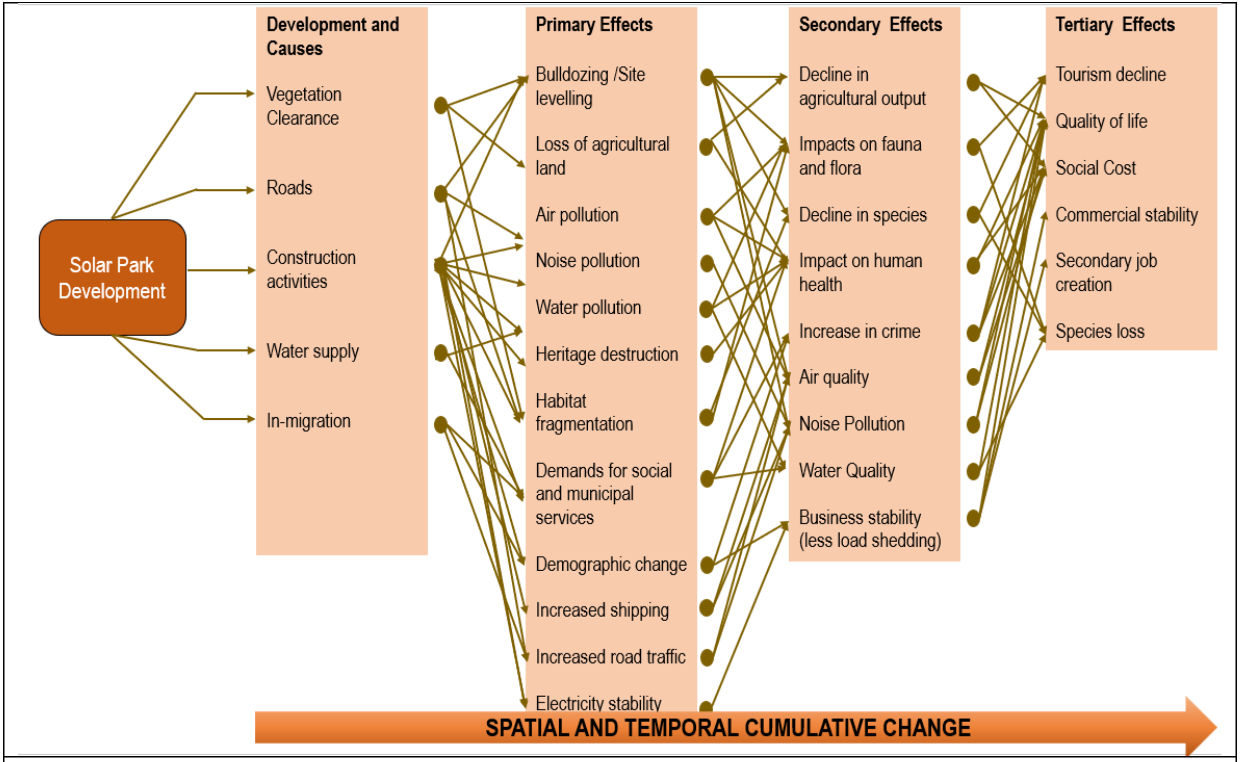

Figure 9-3: Key cause-and effect diagram indicating positive and negative interactions.

It is anticipated that the potential negative cumulative effects associated with the **Buffalo 1 Solar Park** will be due to the fragmentation of undeveloped land (which is either under agriculture, game farming, grazing or natural veld) and some other areas such as short term impacts on water resources and potential longer term visual impacts.

There is however also expected to be significant positive cumulative effects as a result of the fundamental changes by moving away from electricity generation from fossil fuels to more sustainable resources such as solar generation, business and community stability, quality of life and secondary job creations.

By applying a 30km spatial boundary around the proposed development and considering past, present and reasonably foreseeable developments the following key effects are discussed on more detail below.

Cumulative Agricultural Impact

Overall, because of the restricted nature of solar plants and few or no emissions and pollutants into air when operational, soil and water cumulative impacts to the environment are limited (if compared for example to emissions from fossil fuel burning). Ultimately, solar power plants could reprieve the pressures to use fossil fuels that are associated with numerous cumulative impacts and habitat losses. There are still some farming practices that could continue on land under solar development such as agrivoltaics[39]. Building resilience in renewable energy and food production is a fundamental challenge in today's changing world, especially in regions susceptible to heat and drought such as Lephalale.

9.6.1.1 Cumulative Social Impacts

The cumulative impact will be more positive than the negative impact of the proposed Buffalo 1 Solar Park alone. Aside from lessening the impacts of load shedding in the country, a more sustainable source of energy is anticipated to help businesses continue operation as normal whilst providing opportunities for downstream business to develop and employ people. The limited negative social impact (such as crime and illegal harvesting) is anticipated during the construction phase only. The long term stability and opportunities outweigh the short term negative anticipated impacts. Also by adding the Buffalos 1 Solar Park to other solar projects in the pipeline in the vicinity of Lephalale will contribute towards the achievement of critical mass that is needed to establish a viable local industry for servicing the projects and supplying/manufacturing the components and equipment that are required. It is anticipated that the additional electricity will aid in reducing the current load shedding taking place in the country.

9.6.1.2 Cumulative Avifauna Impacts

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). Relevant activities and impacts include dust deposition, noise and vibration, loss of corridors or habitat, disruption of waterways, groundwater drawdown, groundwater and surface water depletion, and transport activities. 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 279 718 ha, but when considering the transformation (19 208 ha) that has taken place within this radius, 260 510 ha of intact habitat remains, according to the 2018 National Biodiversity Assessment. Therefore, the area within 30 km of the project has experienced approximately 6.87% loss in natural habitat. Considering this context, the project footprint for the proposed development (according to the provided layout), and similar projects that exist in the 30 km region (Including the others e.g., Buffalo 2, Lyra 1 and Lyra 2) measuring a maximum of 8 004 ha (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 2.72% (the sum of all related developments as a percentage of the total remaining habitat). **Table** 9-25 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 9-25: Loss of habitat within a 30 km radius of the project

	Total Habitat	Total Loss	Tot. Remaining Habitat (ha)	Total Historical	Cumulative Projects (ha)	Tot. Remaining	Cumulative Habitat Lost

[39] Source: https://www.futurity.org/agrivoltaics-farming-solar-panels-2152772/. Date accessed 8 May 2023.

	(ha)	(ha)	(Remnants)	Loss (%)		Habitat (ha)	(%)
Approximate Solar development cumulative effects (Spatial)	279,718	19,208	260,510	**6.87%**	8004	**253,425**	**2.72**

The overall cumulative impact assessment is presented in **Table** 9-26 and **Figure** 9-4 below. Approximately 6.87% of the habitat has already been lost, and as discussed above the proposed solar developments will result in a further cumulative loss of approximately 2.72% from only similar developments (Solar, approved and in process) in the area, as such the cumulative impact from the proposed development is rated as medium **(Table** 9-26**).** 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.

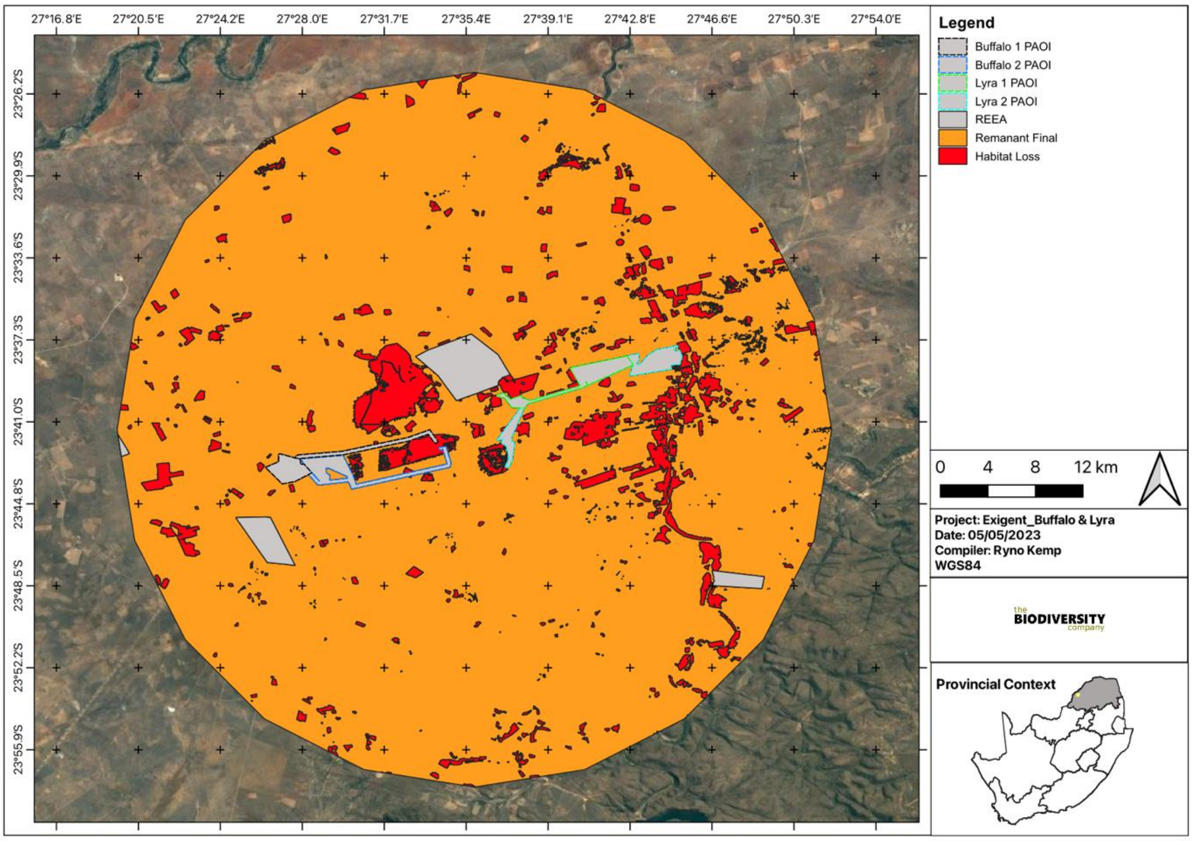

Figure 9-4: Map illustrating the additional renewable energy developments within the landscape overlaid onto the remnant vegetation types

Table 9-26: Cumulative Impacts to avifauna associated with the proposed project

Impact	Project in Isolation						Cumulative Effect					
	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance	Duration of Impact	Extent	Intensity	Frequency	Probability of Impact	Significance
Loss of habitat, and disruption of surrounding ecological corridors.	4	2	3	3	3	54	5	3	3	3	4	77
	Long term	Area	Medium/slightly harmful	Frequent	Probable	**Medium**	Permanent	Region	Medium/slightly harmful	Frequent	Almost certain	**Medium**

9.6.1.3 Cumulative Aquatic Impacts

Corridors and linkages of areas with similar habitat are present in the local district where several solar power plants are planned. Watercourses and wetlands are avoided by the proposed footprint so that steppingstone corridors (pans) and a network of linked corridors (active channels with riparian zones) remain. No habitats of threatened species that could easily be isolated (for example beetles with flightless females) are known to be impacted locally in the larger study area. Overall because most of the Lephalale area appears to be ideal to avoid very sensitive habitats such as larger pristine wetlands and avoid highly sensitive habitat pockets of Threatened species, the development of a few solar plants appear to be more ideal on a national scale than at many other areas. Therefore, an important mitigation measure is to leave corridors with indigenous vegetation in between solar plants and their associated infrastructure.

Overall, because of the restricted nature of solar plants and few or no emissions and pollutants into air when operational, soil and water cumulative impacts to the environment are limited (if compared for example to emissions from fossil fuel burning). Ultimately, solar power plants could reprieve the pressures to use fossil fuels that are associated with numerous cumulative impacts and habitat losses.

Figure 9-5: Cumulative impacts of the proposed solar plant developments within a 30km radius of the project area

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Aquatic Biodiversity Impact Assessment																		
Construction Phase																		
Clearing of vegetation for construction of infrastructure, access roads etc.	Impact on the characteristics of the watercourse i.e. flow regime, habitat, biota, water quality and geomorphology due to construction within floodline zone (road	**WOM**	Negative	Local	1	Permanent	5	Very High	5	**11**	Continuous	5	Definite	5	**10**	**110**	Negative High Risk	Refer to Sections 5.4.2
		WM	Negative	Local	1	Permanent	5	High	4	**10**	Continuous	5	Almost Certain	4	**9**	**90**	Negative Medium Risk	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
	crossings etc.)																	
Topsoil & subsoil stripping, exposure of soils to wind and rain during construction causing erosion and sedimentation in wetlands	Soil erosion and sedimentation	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Continuous	5	Definite	5	**10**	**100**	Negative Medium Risk	Refer to section 5.5.2
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Very Frequent	4	Almost Certain	4	**8**	**56**	Negative Medium Risk	
Heavy machinery and vehicle movement on Local	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost Certain	4	**7**	**56**	Negative Medium Risk	Refer to section 5.6.2
		WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	**25**	Negative Low Risk	
Continued movement of personnel and vehicles on and off the site during the construction phase, as well as occasional delivery of materials required for maintenance	Spreading of alien invasive species	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Very Frequent	4	Almost Certain	4	**8**	**72**	Negative Medium Risk	Refer to section 5.7.2
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Frequent	3	Probable	3	**6**	**36**	Negative Low Risk	

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Operational Phase																		
Clearing of vegetation for construction of support infrastructure, access roads etc.	Impact on the characteristics of the watercourse i.e. flow regime, habitat, biota, water quality and geomorphology due to construction within floodline zone	**WOM**	Negative	Local	1	Permanent	5	High	4	**10**	Frequent	3	Definite	5	**8**	63	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Long Term	4	Medium	3	**8**	Rare	2	Almost certain	4	**6**	32	Negative Low Risk	
Increased hardened surfaces around	Soil erosion and	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Frequent	3	Definite	5	**8**	80	Negative Medium Risk	Refer to Construction Phase mitigation

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
infrastructure and exposed areas	sedimentation	**WM**	Negative	Local	1	Medium Term	3	Medium	3	**7**	Rare	2	Almost certain	4	**6**	42	Negative Low Risk	
Vehicle movement on site for maintenance	Spreading and establishment of alien invasive species	**WOM**	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Almost certain	4	**7**	63	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Probable	3	**5**	30	Negative Low Risk	
Vehicle movement on site for maintenance Vehicle movement on site for maintenance	Habitat degradation due to dust Spillages of harmful substances (water pollution)	**WOM**	Negative	Area	2	Long Term	4	High	4	**10**	Very Frequent	4	Definite	5	**9**	90	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Medium Term	3	Medium	3	**7**	Frequent	3	Almost certain	4	**7**	49	Negative Low Risk	
Vehicle movement on site for maintenance	Spillages of harmful substances	**WOM**	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Almost certain	4	**7**	56	Negative Medium Risk	Refer to Construction Phase mitigation
		WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Probable	3	**5**	25	Negative Low Risk	
Decommissioning Phase																		

Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
				Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
Rehabilitation of site	Improvement of riparian habitat through revegetation / succession over time	WOM	Positive	Local	1	Long Term	4	Low	2	**7**	Frequent	3	Probable	3	**6**	42	Positive Low	• Plant vegetation species for rehabilitation that will effectively bind the loose material and which can absorb run-off from the development areas. • Rehabilitate all the land where infrastructure has been demolished. • Monitor the establishment of the vegetation cover on the rehabilitated sites to the point where it is self-sustaining. • Protect rehabilitation areas until the area is self-sustaining. • Diversion trenches and storm water measures must be maintained • Water management facilities must stay operational and maintained and
		WM	Positive	Local	1	Permanent	5	Medium	3	**9**	Very Frequent	4	Definite	4	**8**	72	Positive Medium	
Demolition of infrastructure / rehabilitation of site	Soil erosion and sedimentation	WOM	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	
Demolition of infrastructure / rehabilitation of site	Spreading and establishment of alien invasive species in wetlands	WOM	Negative	Area	2	Long Term	4	Medium	3	**9**	Frequent	3	Probable	3	**6**	54	Negative Medium	
		WM	Negative	Local	1	Medium Term	3	Low	2	**6**	Rare	2	Possible	2	**4**	24	Negative Low	
Vehicle movement on site for rehabilitation	Spillages of harmful substances in wetlands	WOM	Negative	Area	2	Medium Term	3	Medium	3	**8**	Frequent	3	Probable	3	**6**	48	Negative Medium	
		WM	Negative	Local	1	Short Term	2	Low	2	**5**	Rare	2	Possible	2	**4**	20	Negative Low	

	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Geographical Extent		Duration		Intensity		Magnitude/ Severity	Frequency		Probability		Incidence	Risk rating		Mitigation Measures
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude	Score	Magnitude	Score	Score	Score	Magnitude	
																			monitored until such a stage is reached where it is no longer necessary. • The development areas must be shaped to make it safe. • All the monitoring and reporting on the management and rehabilitation issues to the authorities must continue till closure of the site is approved. • Monitor and manage invader species and alien species on the rehabilitated land until the natural vegetation can outperform the invaders or aliens. Refer to mitigation measures for the construction phase needed during the closure phase that are relevant

9.6.1.4 Cumulative Fauna and Flora Impacts

Corridors and linkages of areas with similar habitat are present in the local district where several solar power plants are planned. Watercourses and wetlands are avoided by the proposed footprint so that steppingstone corridors (pans) and a network of linked corridors (active channels with riparian zones) remain. No habitats of threatened species that could easily be isolated (for example beetles with flightless females) are known to be impacted locally in the larger study area. Overall because most of the Lephalale area appears to be ideal to avoid very sensitive habitats such as larger pristine wetlands and avoid highly sensitive habitat pockets of Threatened species, the development of a few solar plants appear to be more ideal on a national scale than at many other areas. Therefore, an important mitigation measure is to leave corridors with indigenous vegetation in between solar plants and their associated infrastructure.

Overall, because of the restricted nature of solar plants and few or no emissions and pollutants into air when operational, soil and water cumulative impacts to the environment are limited (if compared for example to emissions from fossil fuel burning). Ultimately, solar power plants could reprieve the pressures to use fossil fuels that are associated with numerous cumulative impacts and habitat losses.

9.6.1.1 Cumulative Visual Impacts

The cumulative impact of the Project is <u>low</u>. The existing Medupi Power station and powerlines, south and east of the stie, contribute to the cumulative effect of power infrastructure in the sub-region. The intervisibility and the Project along with the proposed Buffalo 1 solar PV project is low based on the other power infrastructure in the immediate area. The intervisibility of approved solar PV projects in the region, their location is insignificant as these installations would never be viewed together. The combined effect of existing power infrastructure and associated mines and the proposed Buffalo 1 and 2 solar power developments would cause a minor change the nature, sense of study and character of the sub-region's landscape's baseline.

The significance of the cumulative impact of these projects on the visual environment during their operational phases is assessed to have a <u>low intensity</u> and over the <u>long-term</u> with an unmitigated <u>sub-regional</u> impact mostly being contained to the sites and is assessed to be <u>low</u> significance. However, the cumulative impact with effective management measures is <u>negligible</u>, i.e. No influence on the decision.

9.6.1.2 Conclusion regarding cumulative impacts

Cumulative impacts are expected to occur with the development of the proposed project 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 proposed project is to test and determine whether the development will be acceptable within the Lephalale 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 proposed project and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- There will be no significant loss of sensitive and significant aquatic features. The cumulative impact is therefore acceptable.
- There will be no unacceptable risk to avifauna with the development of the proposed project and other renewable energy projects within the surrounding area, provided the recommended mitigation measures are implemented. The cumulative impact is therefore acceptable.
- Cumulative impact of loss of agricultural land use will not have an unacceptable negative impact on the agricultural production capability of the area.
- There will be no unacceptable loss of heritage resources associated with the development. There will also be no unacceptable impacts to the cultural landscape as a result of the development of the SPV facility.

Based on the specialist's cumulative assessment and findings, the development of the proposed and its contribution to the overall impact of all renewable energy projects to be developed within a 30km radius, it can be concluded that the cumulative impacts will not result in unacceptable, high cumulative impacts and will not result in a whole-scale change of the environment.

9.4.11 Indirect Impacts

Indirect Impacts on the environment are those impacts, which are not a direct result of the project, often produced away from or as a result of a complex pathway. Sometimes referred to as second or third level impacts, or secondary impacts.

The proposed project will not only supply renewable electricity to the National grid, but also contribute to the sustainable development of the local community. This includes the supply of zero-emitting renewable energy to the national grid, saving the coal and water resources and improving the local energy infrastructure. A small number of direct new jobs will be created by the solar energy facility during their operation. However, both skilled and unskilled labour is required during the construction of supporting service infrastructure.

10 CONCLUSIONS AND RECOMMENDATIONS

This section of the EIA Report includes the following information required in terms of Appendix 3: Scope of Assessment and Content of Environmental Impact Assessment Reports as per the legal requirements.

10.1 Evaluation of the Buffalo 1 Solar Park

The preceding sections of this report, together with the specialist studies contained within Appendices F provide a detailed assessment of the potential impacts that may result from the development of the

proposed project. This section concludes the environmental assessment of the solar facility, based in the Limpopo, by providing a summary of the results and conclusions of the assessment of both the project site and development footprint for the solar energy facility. In so doing, it draws on the information gathered as part of the EIA process, the knowledge gained by the environmental specialists and the EAP and presents a combined and informed opinion of the environmental impacts associated with the project.
Effort was made to include the recommendations of all the specialists into the final layout of the SPV Facility design and placement on the site (**Figure** 0-5).

10.2 Recommendations from the various specialists

10.2.1 Agricultural Recommendation

Based on Part 1 of the Regulation of Conservation of Agricultural Resources Act 43 of 1983, the proposed area, earmarked for the development of the solar plant and associated infrastructure can be classified as having soil potential that vary from Medium to Low.

The density of the vegetation and grazing capacity of the land would allow grazing and crop cultivation under irrigation in the area, especially on the larger farm portions that can sustain economically viable grazing and crop cultivation. The proposed solar development will cause a loss of grazing and agricultural value of the land to a certain extent, although site specific mitigation will ensure that the land can still be utilized for grazing during and after the lifespan of the development.

The land capability of the site is mostly restricted to livestock grazing due to the climatic conditions. The potential impacts associated with the proposed development are soil disturbance (erosion, compaction), loss of land capability, and soil pollution (spillages). 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 site should subsequently be considered as being moderate value grazing land with limited potential for arable agriculture considering the climatic conditions. The final land use will be agricultural grazing. Mitigation measures are provided in this report for the identified impacts and provided the management and rehabilitation measures stipulated in this report are strictly adhered to, the renewable energy development could be supported.

10.2.2 Geotechnical Recommendations

The Geotechnical specialist recommended that the applicant Conduct a design level geotechnical investigation at a sample density of one trial pit per 10-15 hectares to fill-in and improve the resolution of the soil profile variability and to focus on the founding conditions at the proposed infrastructure locations and laydown areas. Conduct installation trials and pull test of different pile profiles and sand screws to optimize the installation length and profile best suited for the soils encountered on site. Linear investigation along the final alignment selection of the overhead powerline route.

10.2.3 Aquatic Recommendation

The riparian / wetland delineation for the project was done according to the criteria set by the Aquatic Biodiversity Compliance Protocols (2020), Department of Water Affairs and Forestry (2003) and the National Wetland Classification System for South Africa (SANBI, 2009). The soils, vegetation associated with wetlands and landscape were all used as parameters in identifying the wetlands and riparian zones.

One wetland type was identified namely endorheic depressions (natural and man-made). The floodplain river (Sandloop River) and its tributaries can be classified as 'River channels', although these drainage channels are not wetlands in the 'true' sense of the word but should rather be described as water courses as stipulated in the National Water Act. Baseline soil information, landscape profile and vegetation were used to confirm riparian and terrestrial properties within the study area. The impacts associated with the construction site is reflected in the results of the PES assessment which indicates that the riparian zones, wetlands and watercourses are 'Moderately Modified'.

The EIS of the drainage system on site are moderate and are ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.

An impact assessment was conducted for the wetlands and riparian zones on site in addition to the mitigation measures recommended to ensure the protection of the riverine ecosystems. Impacts relating to the proposed development on the watercourses / riparian zones are as follows:

- Impact on the characteristics of the watercourse i.e., flow regime, habitat, biota, water quality and geomorphology due to construction within floodline zone.
- Soil erosion and sedimentation.
- Water pollution from spillages, vehicle emissions and dust.
- Spread and establishment of alien invasive species in wetlands.

Specific mitigation measures need to be implemented in the areas surrounding the riparian zones and water courses to prevent any negative impacts other than the impacts that will be caused during the solar power plant development.

Provided that all the mitigation measures and recommendations surrounding the watercourses and riparian zones are strictly adhered to the development of the solar power plant can be supported.

10.2.4 Avifaunal Recommendation

Management measures include ensuring the construction footprint is kept small and industry-standard mitigations are put into place for solar panels, fencing and electrical infrastructure, among other measures.

Mitigation measures as described in the avifauna specialist report can be implemented to reduce the significance of the risk to an acceptable residual risk level. It is the opinion of the specialist that the project may be favourably considered, on condition that all the mitigation and recommendations provided in this report and other specialist reports are implemented.

10.2.5 Terrestrial Ecology Recommendation

All aspects of the environment, especially living organisms, are vulnerable to disturbance of their habitat. If we can bring about a more integrated approach to living within our ecosystems, we are much more likely to save the fundamental structure of biodiversity. Positive contributions can be made even on a small scale such as within the proposed solar development. All stakeholders, such as business, government and environmental groups need to be involved to the impacts associated with the development from causing a significant loss.

The proposed development should avoid sensitive areas such as wetlands, while also allowing corridors of indigenous woodland outside the development footprint to be preserved. Where sensitive areas of natural vegetation cannot be avoided, a few mitigation measures have been recommended to minimise and/or offset impacts (licence application for eradication of protected species, buffer zones around wetlands). Negative impacts can be minimised by strict enforcement and compliance with an Environmental Management Plan which considers the recommendations for managing impacts detailed above.

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.

10.2.6 Socio-Economic Recommendation

The socio-economic impact of the proposed Buffalo 1 Solar Park is positive and the application is supported, provided that all the mitigation measures proposed by specialist consultants are implemented. The two socio-economic mitigation measures proposed are firstly that appropriate security, workplace safety and accommodation protocols are implemented by the main contractor during the construction phase that all subcontractors should adhere to. Secondly, mitigation measures will be required in the form of equipment design and on-site security to reduce the risk of vandalism during the operations phase.

The project is consistent with development policies at the national, provincial and local government levels. The site is suitable for the proposed project from a physical and an irradiation perspective. Significantly more value will be added and jobs created (with marketable skills training) compared to the current land use.

The surrounding area has been used for coal mining, power stations and electricity transmission for decades. There will be no need to relocate any communities. Jobs will be created for labour residing in the adjacent Lephalale-Marapong urban complex within a comfortable daily commuting distance. The urban complex can also provide the first level of component, equipment and service requirements.

The cumulative impact will be more positive than the impact of the proposed Buffalo 1 Solar Park alone. This is because other solar projects in the pipeline in the vicinity of Lephalale will contribute towards the achievement of critical mass that is needed to establish a viable local industry for servicing the projects and supplying/manufacturing the components and equipment that are required.

The net positive impacts will be forgone in the no-go project alternative. The proposed site is suitable for the project, although other sites in the vicinity could be equally suitable. The proposed project area can accommodate more than one solar project. A considerable local advantage is the capacity of the existing Eskom high voltage transmission network to upload the electricity generated from the proposed Buffalo 1 Solar Park.

10.2.7 Palaeontology And Heritage Recommendations

Based on the fossil record but confirmed by the site visit and walk through there are no fossils of the Glossopteris flora/fauna even though fragmentary fossils have been recorded from rocks of a similar age and type in South Africa. 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 fossils may occur in below the ground surface in the shales of the Swartrand Formation 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. This mitigation process must be added to the EMPr.

The possibility of the occurrence of subsurface finds cannot be excluded. Therefore, 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 therefor chance find procedures should be put in place as part of the EMP. A short summary of chance find procedures is discussed below and monitoring guidelines applicable to the Chance Find procedure is discussed below and monitoring guidelines for this procedure are provided in Section 10.5.

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- If during the pre-construction phase, construction, operations or closure phases of this project, any person employed by the developer, one of its subsidiaries, contractors and subcontractors, or service provider, finds any artefact of cultural significance or heritage site, this person must cease work at the site of the find and report this find to their immediate supervisor, and through their supervisor to the senior on-site manager.

- It is the responsibility of the senior on-site Manager to make an initial assessment of the extent of the find and confirm the extent of the work stoppage in that area.
- The senior on-site Manager will inform the ECO of the chance find and its immediate impact on operations. The ECO will then contact a professional archaeologist for an assessment of the finds who will notify the SAHRA.

10.2.8 Visual Recommendations

Visually preferred option: Layout Alternative 2 and Corridor 2 are the preferred options as the transmission line infrastructure will be adjacent to existing powerlines and away from potentially sensitive views and would be 'absorbed' into this context. Layout Alternative 1 and Corridor 1 would, however, impact on users of the D1675 road and appear in a landscape context that currently has no other power infrastructure.

The solar PVs and other infrastructure would displace extensive areas of vegetation across the Project site and reduce the absorption capacity of the landscape in the immediate vicinity of the site along the D1675 road. It is therefore imperative that only the proposed footprint of the solar arrays and the associated infrastructure areas be cleared, that all remaining vegetation be retained and that a 20m no-build buffer (with retained and added vegetation) be established around the PV arrays along the D1675 boundary.

In considering mitigating measures, three rules are considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management/maintenance) and acceptable (within the framework of the existing landscape and land use policies for the area).

The following generic mitigation measures are suggested for the Project and should be included in the Environmental Management Plan Report (EMPr). The following general actions are recommended:

Planning and site development

- With the preparation of the land within the full extent of the Project site(s) onto which activities will take place, the minimum amount of existing vegetation and topsoil should be removed.
- Specifications with regards to the placement of construction camps (if required), as well as a site plan of the construction camp, indicating waste areas, storage areas and placement of ablution facilities, should be included in the EMPr. These areas should either be screened or positioned in areas where they would be less visible from the public road north of the Project site.
- When possible, construction activities should be limited to between 08:00 and 17:00 or in conjunction with the ECO and neighbours of the Project site.
- Adopt responsible construction practices that strictly contain the construction/establishment activities to demarcated areas.
- Building or waste material discarded should be undertaken at an authorised location, which should not be within any sensitive areas.

Earthworks and vegetation

- Earthworks should be executed so that only the footprint and a small 'construction buffer zone' around the proposed activities are exposed. In all other areas, the naturally occurring vegetation should be retained, especially along the periphery of the site adjacent to the D1675.
- 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.
- Disturbed soil must be exposed for the minimum time possible once cleared of vegetation to avoid prolonged exposure to wind and water erosion and to minimise dust generation.
- Maintain a 20m buffer (minimum) of existing vegetation around the arrays. Complement this buffer zone by introducing indigenous evergreen trees that are endemic to the area.

Structures and associated infrastructure

- Paint all structures (structural support for the arrays and BESS containers etc.) with colours that reflect and compliment the colours of the surrounding landscape – avoid shiny materials.

Good housekeeping

- "Housekeeping" procedures should be developed for the Project to ensure that the project site and lands adjacent to it are kept clean of debris, garbage, graffiti, fugitive trash, or waste generated on-site; procedures should extend to control of "track out" of dirt on vehicles leaving the active construction site and controlling sediment in stormwater runoff.
- During construction, temporary fences surrounding the material storage yards and laydown areas should be covered with 'shack' cloth (khaki coloured) or shade cloth.
- Operating facilities should be actively maintained during operation.

Lighting

- Light pollution is largely the result of bad lighting design, which allows artificial light to shine outward and upward into the sky, where it is not wanted, instead of focusing the light downward, where it is needed. Ill designed lighting washes out the darkness of the night sky and radically alters the light levels in rural areas where light sources shine as 'beacons' against the dark sky and are generally not wanted.
- Of all the pollutions faced, light pollution is perhaps the most easily remedied. Simple changes in lighting design and installation yield immediate changes in the amount of light spilled into the atmosphere. The following are measures that must be considered in the lighting design of the Project, particularly at the management and service platforms:
- Install light fixtures that provide precisely directed illumination to reduce light "spillage" beyond the immediate surrounds of the site i.e. lights are to be aimed away from adjacent D1675 road.
- Minimize the number of light fixtures to the bare minimum, including security lighting.
- Avoid high pole top security lighting along the periphery of the site and at the substation and BESS areas, and use only lights activated on illegal entry to the site.

10.2.9 ALTERNATIVES RECOMMENDATIONS

Various alternatives were assessed in the report and with input from the various specialist and their recommendations the following alternatives is recommended:

Table 10-1: Recommended alternatives to be authorised.

Alternatives	Alternative Options	Reason for selected alternative	Selected / Recommended Alternative
Fundamental Alternatives	Hydro Wind Solar	Hydro generation was rejected as the site is not located close to a prominent and sufficient water resource to generate hydro-electricity. This option was thus not further investigated. The recommended wind speed for a commercial wind turbine is around 144km/h to 259km/h. The average wind speed in the Lephalale and project area is 4km/h to 8km/h . Hence, due to the local climatic conditions, a wind energy facility was not considered suitable as the area does not have the required wind resources. Electricity from solar generation was investigated as the site is located a relatively high solar irradiation area with the shortest day with 10 hours and 22 min sunlight and the longest day with 13 hours and 55min sunlight.	Solar Generation
Incremental Alternatives	Property	Based on the various selection criteria's (section 7.2. in this report) the Farm Buffelsjagt 744-LQ was selected as the most suitable property.	Farm Buffelsjagt 744-LQ
	Design and Layout	The proposed layout considered the existing roads, infrastructure, as well as sensitive areas, e.g. drainage lines, topography. An overall sensitivity map (combining all specialist recommendations) has been compiled. This has led in the reduction of the original footprint of the development as take into consideration the recommendations of the various specialists. Three overall layouts were considered. The first entailed the consideration of developing the whole site. This was rejected by the specialists and the development site was reduced to avoid sensitive areas. Based on the reduced development area – two layout options (considering the placement of the on-site substations) were then considered. Layout Alternative 2 have been recommended by the visual specialist as the transmission line infrastructure will be adjacent to existing powerlines and away from potentially sensitive views and would be 'absorbed' into this context. Layout Alternative 1 and Connection Alternative 1 would, however, impact on users of the D1675 road and appear in a landscape context that currently has no other power infrastructure.	Please refer to **Appendix C** for the final proposed Layout.
	Activity	Carina Energy (Pty) Ltd is a renewable energy project developer and as such is only considering renewable energy activities in accordance with the need for such development within the IRP.	Solar renewable energy
	Technology (Solar types)	Two solar technology alternatives were considered. This included i) solar photovoltaic (PV) facility and a ii) concentrated solar power (CPS) facility. Solar PV is recommended due to availability of suitable renewable energy resource for this specific site, locality of the	Solar Photovoltaic (PV) Facility

Alternatives	Alternative Options	Reason for selected alternative	Selected / Recommended Alternative
		site, ambient conditions and lower visibility than a CPS facility at the site.	
	Technology (Solar PV)	The Fixed and Tracking PV panel technologies are both considered for the proposed Buffalo 1 Solar Park. 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.	Fixed and Tracking PV panels
	Technology (Battery Storage Systems)	Solid State Batteries" (Lithium-Ion technology) and/or "Flow Batteries" (Redox-flow technology) have been assessed as the two technology alternatives for the BESS. Both BESS technologies will be pre-assembled and containerised with limited risk for a spillage.	Solid State Batteries" (Lithium-Ion technology) and/or "Flow Batteries" (Redox-flow technology)
	Access Routes Alternatives	Recommendations from the specialists advised that sensitive areas be avoided and advise that the internal access roads and MV Cabling must be utilise the existing main access road to the north.	Use existing access roads.
	Connection corridors	Two connection servitude alternatives has been assessed namely Powerline Corridor 1 (connecting to the north of the PV Facility) and Powerline Corridor 2 (connecting to the south of the PV Facility). The two corridors have been assessed by the various specialists and subsequent to the various recommendations it is recommended that Powerline Corridor 2 is selected as it will be located adjacent to existing powerlines feeding into the Eskom Medupi Power Station.	Powerline Corridor 2
	No-Go options	Two no-go options were considered. This include the "**do-nothing**" option that will result in no PV facility being build on the selected site. Although there will be no environmental impacts on-site, the 'do-nothing' alternative may result in the continuation of electricity shortages in the country, forcing people to source alternative energy sources for cooking such as wood due to a lack of access to sustainable energy supply. Uncontrolled wood harvesting in various areas could lead to habitat fragmentation. Based on the current need in the country for cleaner and more reliable power supply and the overwhelming positive social impact for the proposed project, this option is not recommended. The "**exclusion of sensitive areas**" on the site was also considered and various specialist input was required. Sensitive areas (terrestrial ,aquatic and heritage) were excluded from the original footprint and based on the recommendations and mitigation measures from the specialists, this option deemed to be the selected option.	Exclusion of sensitive areas

10.3 Concluding Recommendations

The preferred activity was determined by the developer to be the development of a renewable energy facility on site using solar as the preferred technology, due to the availability of a strong solar resource, available grid capacity, benign topography, and good access. A technically viable development footprint was proposed by the developer considering environmental sensitivities identified in the scoping study and assessed as part of the EIA process. The assessment of the development footprint within the project site was undertaken by independent, qualified specialists and their findings have informed the results of this EIA Report.

From a review of the relevant policy and planning framework, it was concluded that the project is well aligned with the policy framework, and a clear need for the project is seen from a policy perspective at a local, provincial and National level.

The specialist findings have indicated that there are no identified fatal flaws associated with the implementation of the development footprint within the project site subject to implementation of the recommended mitigation measures. The developer has designed a project development footprint in response to the identified sensitive environmental features and areas present within the project site. This approach is in line with the application of the mitigation hierarchy, where all the sensitive areas which could be impacted by the development have been avoided (i.e., tier 1 of the mitigation hierarchy). The layout for the PV facility and associated infrastructure assessed within this EIA Report is located outside of the sensitive areas and features regarded to be no-go for development and is therefore considered to be acceptable for implementation.

The nature of the visibility of the project (mostly screened by vegetation) and the limited number of people that could be affected, suggests that glint and glare is not a significant issue associated with the Project.

The impacts that are expected to remain after the avoidance of the sensitive areas by the facility layout have been reduced to acceptable levels through the recommendation of specific mitigation measures by the specialists. The minimisation of the significance of the impacts is in line with tier 2 of the mitigation hierarchy. Therefore, impacts can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

From a social perspective, overwhelming positive and limited negative impacts are expected. The implementation of the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of the **Buffalo 1 Solar Plant**.

Through the assessment of the development footprint within the project site, it can be concluded that the development of the **Buffalo 1 Solar Plant** will not result in unacceptable environmental impacts (subject to the implementation of the recommended mitigation measures).

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, the avoidance of the sensitive environmental features within the project site, as well as the potential to further minimise the impacts to acceptable levels through mitigation, this project is supported.

The Buffalo 1 Solar Park with a contracted capacity of up to 240MW includes the following infrastructure (to be included within an authorisation issued for the project):

- PV modules and mounting structures (monofacial or bifacial) with fixed, single or double axis tracking mounting structures;
- Associated stormwater management infrastructure;
- BESS;
- Site- and internal access roads ;
- Auxiliary buildings (Control room, general office, access control and security building, kitchen area with ablution facilities, small workshop, and a store);
- Ablution facilities and associated infrastructure;
- Temporary laydown area during the construction phase (which will be a permanent laydown area for the BESS during the operational phase);
- On-site substation;
- Grid connection infrastructure including medium-voltage cabling between the project components and the facility substation (underground cabling will be used where practical);
- Perimeter fencing; and,
- Rainwater and/or groundwater storage tanks and associated water transfer infrastructure.
- The internal access roads and MV Cabling will utilise the existing main access road to the north and all other infrastructure will remain within low-sensitive green developable area.

The following key conditions would be required to be included within an authorisation issued for the proposed project:

- Following the final design of the Buffalo 1 Solar Park, a final layout must be submitted to DFFE for review and approval prior to commencing with construction. Micro-siting must take all recommended mitigation measures into consideration. No development is permitted within the identified No-Go areas as detailed in Figure 0-5
- All mitigation measures detailed within this EIA Report, as well as the specialist reports contained within Appendices F are to be implemented.
- The EMPr (for the facility and onsite substation) as contained within Appendix H of this EIA Report should form part of the contract with the Contractors appointed to construct and maintain the solar facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of the proposed project is considered key in achieving the appropriate environmental management standards as detailed for this project.
- An Environmental Site Officer (ESO) must form part of the on-site team to ensure that the EMPr is implemented and enforced and an Environmental Control Officer (ECO) must be appointed to oversee the implementation activities and monitor compliance for the duration of the construction phase.

- A preconstruction walk-through of the final development footprint for protected species that would be affected and that can be translocated must be undertaken. The survey must also cover sensitive habitats and species that are required to be avoided. Permits from the relevant provincial authorities, will be required to relocate and/or disturb listed plant species.
- Prevent birds from nesting in substation infrastructure through exclusion covers or spikes if required (determined on a case-by-case basis).
- The implementation of the development exclusion zones identified as No-Go areas. It is recommended that the watercourse, two depression wetlands, unchanneled valley-bottom wetland and Commandants Pan as well as portions of the surrounding natural undisturbed terrestrial grasslands, must be adequately buffered out. No current or future development is allowed to take place within these buffered zones.
- The BESS to be installed on-site will not exceed eight metre (8 m) to minimise the visual impact.
- It is expected that areas between the solar panels be kept as natural as possible, if and where reasonable practically feasible, to reduce the potential loss of grassland vegetation;.
- All other relevant environmental permits must be obtained prior to the construction of the facility.

A validity period of a minimum of **40 years** of the Environmental Authorisation is requested, should the project obtain approval from DFFE.

10.4 EAP opinion on authorization and motivation

It is the reasoned opinion of the EAP that the Buffalo 1 Solar Park is acceptable within the landscape and can reasonably be authorised subject to implementation of the refined optimised facility layout and the mitigation and enhancement measures recommended by the specialists.

11 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Programme (EMPr) has been compiled in accordance with Regulation 33 of the EIA Regulations 2014, as amended. The EMPr is attached as **Appendix H** to the Draft EIR and aim to provide practical management measures to be introduced in order to ensure that impacts as a result of the proposed projects are minimised and prevented where possible.

11.1 Proposed mitigation measures of impacts

This section highlights the mitigation measures recommended in the Environmental Impact Assessment Guideline for Renewable Energy in terms of section 24J of the NEMA, published on 16 October 2016. In terms of the above-mentioned guideline, an IPP project that triggers the need for a Scoping & EIR process under the EIA Regulations 2014, as amended should include project-specific measures designed to mitigate negative impacts and enhance positive impacts, and be informed by good industry practice and are to be included in the EMPr.

The project-specific measures designed to mitigate negative impacts and enhance positive impacts, potential measures include but are not limited to the following:

- Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats and chance fossil finds
- Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;
- Utilise existing roads and servitudes as much as possible to minimise project footprint;
- Site projects to avoid construction too near to pristine natural areas and communities;
- Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;
- Fence sites as appropriate to ensure safe restricted access;
- Ensure dust abatement measures are in place during- and post-construction;
- Implement waste management as per the requirements in the EMPr, and,
- Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.

Detailed mitigation measures have been outlined in the EMPr, which has been compiled as part of the EIR phase. Mitigation of impacts in this report will follow the following approach:

- **Avoiding or preventing** the impact through the early consideration of opportunities and constraints and development alternatives (positive planning) and by modifying the proposal accordingly;
- **Reducing or minimising** negative impacts and maximising benefits, by considering alternatives and modifying the proposal;
- **Rectifying** negative impacts by restoring the affected environment to its previous condition, or rehabilitating it for a different land use; and as a 'last resort',
- **Providing an offset to compensate** for the residual negative impact on biodiversity or ecosystem services, by replacing or providing 'like for like or better' substitutes for these impacts. In cases where residual impacts affect threatened, unique or irreplaceable biodiversity, offsets are not an option as substitutes do not exist.

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