PROPOSED 300 MW LEEUWSPRUIT SOLAR 2 PHOTOVOLTAIC PROJECT SOUTH OF KROONSTAD, FREE STATE PROVINCE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DFFE REFERENCE NO.: 14/12/16/3/3/2/2305

DRAFT

JUNE 2023

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TITLE AND APPROVAL PAGE

Project Name:	300 MW Leeuwspruit Solar 2 Photovoltaic Project south of Kroonstad, Free State Province
Report Title:	Environmental Impact Assessment Report
Authority Reference:	14/12/16/3/3/2/2305
Report Status:	Draft

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EXECUTIVE SUMMARY

A. PROJECT BACKGROUND AND MOTIVATION

Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa (SA) on coal to produce electricity. Leeuwspruit Solar 2 (Pty) Ltd (the "Applicant") has proposed the development of Leeuwspruit Solar 2 up to 300MW Solar Photovoltaic (PV) Project south of Kroonstad, in the Free State Province (the "Project"). The electricity generated by the Project will be transferred via 132 kV powerlines from the facility substation to a new 132/400 kV Main Transmission Substation (MTS) (note that the MTS is being assessed in a separate application for Environmental Authorisation)

The Applicant intends to bid for the current and future Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and/or other renewable energy markets within SA.

This document serves as the **draft Environmental Impact Assessment (EIA) Report** for the proposed Project.

B. PROJECT LOCATION

The Project Area is located approximately 19km to the south of Kroonstad's central business district (CBD) and falls within Ward 2 of the Moqhaka Local Municipality (MLM) and Fezile Dabi District Municipality (FDDM). in the Free State Province. The site is accessible via the N1 and existing gravel roads, located to the west of the site.

C. LEGISLATION AND GUIDELINES CONSIDERED

Pertinent legislation that has possible bearing on the proposed Project from an environmental perspective is briefly discussed in this EIA Report.

The relationship between the Project and the following key pieces of environmental legislation is also explained:

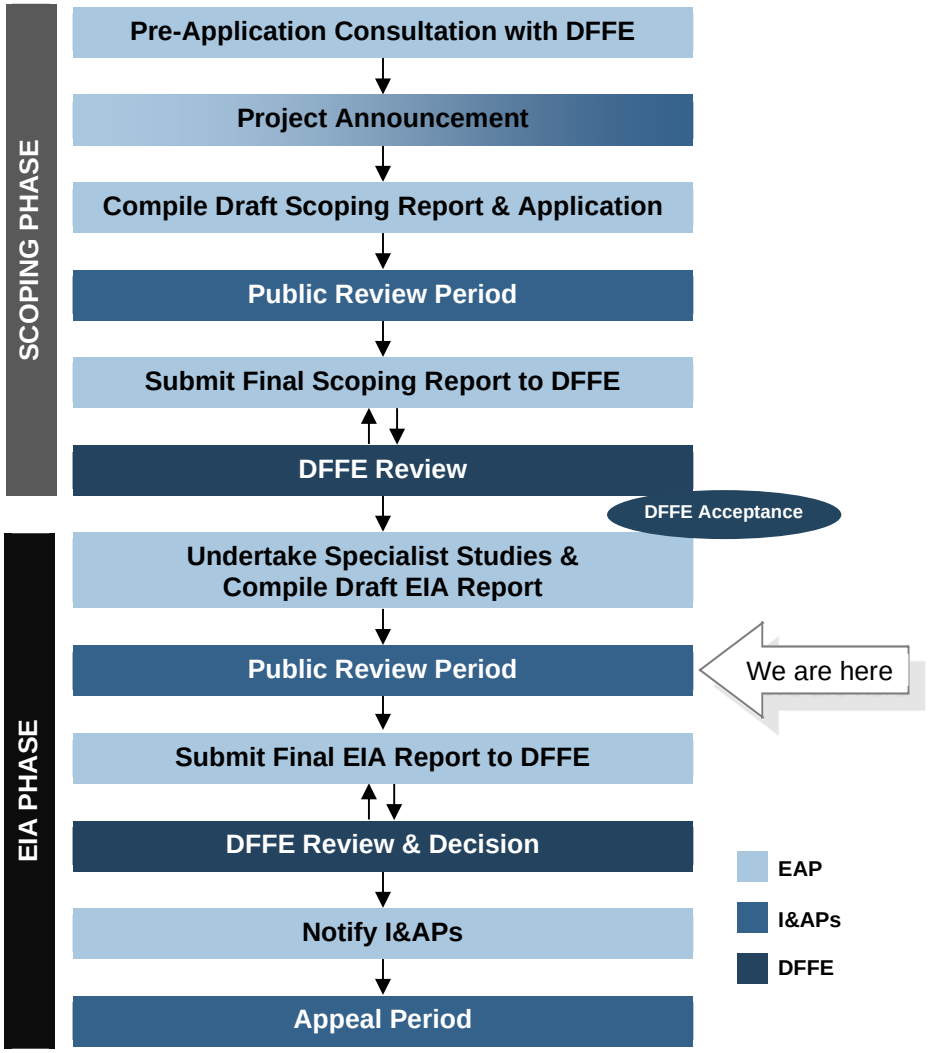
- National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Water Act (Act No. 36 of 1998);
- National Environmental Management Air Quality Act (Act No. 39 of 2004);
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004); and
- National Heritage Resources Act (Act No. 25 of 1999).

D. SCOPING AND EIA PROCESS

The process for seeking Environmental Authorisation for the Project under the NEMA is being undertaken in accordance with the EIA Regulations of 2014 (as amended), published under Government Notice (GN) No. 982 in Gazette No. 38282 of 4 December 2014 and amended by GN

326 of 7 April 2017 published in Gazette No. 40772 (the "EIA Regulations"). In terms of NEMA, the lead decision-making authority for the environmental assessment is the Department of Forestry, Fisheries and the Environment (DFFE). Nemai Consulting was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Project.

Based on the types of activities involved the requisite environmental assessment for the Project is a Scoping and Environmental Impact Reporting (S&EIR) process. An outline of the process is provided in the diagram to follow. DFFE accepted the Scoping Report and Plan of Study for the EIA on 11 May 2023, which allowed the commencement of the EIA phase.



Overview of S&EIR Process

E. PROJECT'S TECHNICAL DESCRIPTION

The technical details of the proposed Project are captured below.

Technical details of the proposed Project

No.	Component	Description / Dimensions	
		Layout Alternative 1	**Layout Alternative 2**
1.	Height of PV panels	Up to 5.5 m.	Up to 5.5 m.
2.	Area of PV Array	Up to approximately 445.5 ha	Up to approximately 440 ha.
3.	Area occupied by substations	Up to 1 ha	Up to 1 ha.
4.	Area and capacity of on-site substation	High voltage (132 kV)	It is estimated that the maximum size of each facility substation will not exceed 1 ha. The facility substation will collect the power from the facility and transform it from medium voltage (up to 33 kV) to high voltage (132 kV).
5.	BESS	Area up to ± 5ha	Area up to ± 5ha.
6.	Area occupied by both permanent and construction laydown areas	Temporary: Up to 7ha Permanent: Up to 1 ha (located within the area demarcated for temporary construction laydown)	Temporary construction laydown area up to 7 ha. Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown).
7.	Area occupied by buildings	Up to 1.5 ha	Up to 1.5 ha.
8.	Length of internal roads	Up to 33 km	Up to 33 km.
9.	Width of internal roads	The internal roads will be up to 6 m wide. The access roads will be up to 8 m wide.	Internal Roads up to 6 m wide. Main Access Road up to 8 m wide.
10.	Proximity to grid connection	±7.30 km	Approximately 8 - 11 km.
11.	Height of fencing	Up to 3.5m	Up to 3.5m.
12.	Type of fencing	Type will vary around the site, welded mesh, palisade and electric fencing	Type will vary around the site, welded mesh, palisade and electric fencing.

The EIA Report provides an overview of the components of the proposed Solar PV Facility, as well as the BESS and grid connection. It further explains the project life-cycle, as well as the resources required to execute the Project.

The alternatives under consideration for the Project include layout alternatives, technology alternatives and the no-go option.

F. PROFILE OF THE RECEIVING ENVIRONMENT

The EIA Report provides a general description of the status quo of the receiving environment in the Project Area. This serves to provide the context within which the assessment was conducted and allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Project.

The receiving environment is explained in terms of the following:

- ❑ Land Use and Land Cover
- ❑ Climate
- ❑ Geology
- ❑ Agriculture
- ❑ Air quality
- ❑ Noise

- ❑ Soils
- ❑ Topography
- ❑ Surface Water
- ❑ Terrestrial Ecology
- ❑ Socio-Economic Environment
- ❑ Cultural Heritage
- ❑ Palaeontological Features
- ❑ Planning
- ❑ Transportation

G. SPECIALIST STUDIES

The specialist studies 'triggered' by the nature of the proposed development and its receiving environment, which aimed at addressing the key issues and compliance with legal obligations, include the following:

1. Terrestrial Biodiversity Assessment (including a Terrestrial Animal Species Study - Giant Girdled Lizard);
2. Freshwater Assessment;
3. Avifauna Impact Assessment;
4. Agricultural Compliance Statement;
5. Heritage Impact Assessment;
6. Social Impact Assessment;
7. Visual Impact Assessment;
8. Palaeontological Impact Assessment; and
9. Transport Impact Assessment.

The information obtained from the respective specialist studies was incorporated into the EIA Report in the following manner (amongst others):

- ❑ The information was used to complete the description of the receiving environment in a more detailed and site-specific manner;
- ❑ A summary of each specialist study is provided, focusing on the approach to each study, key findings and conclusions drawn;
- ❑ The specialists' impacts assessments and the identified mitigation measures were included in the overall project impact assessment;
- ❑ The evaluations performed by the specialists on the alternatives of the Project components were taken into consideration in the identification of the most favourable options; and
- ❑ Salient recommendations made by the specialists were taken forward to the final Conclusions.

H. IMPACT ASSESSMENT

The EIA Report assessed the pertinent environmental impacts that could potentially be caused during the pre-construction, construction and operational phases of the Project.

Impacts were identified as follows:

- ❑ Impacts associated with listed activities contained in the EIA Regulations' Listing Notices;
- ❑ Impacts identified during the Scoping phase;
- ❑ An appraisal of the Project's activities and components;
- ❑ An assessment of the receiving biophysical, social, economic and built environments;

- Findings from specialist studies;
- Issues highlighted by environmental authorities; and
- Comments received during public participation from Interested and Affected Parties (I&APs).

The impacts and the proposed management measures are discussed on a qualitative level and thereafter quantitatively assessed to ultimately determine the significance of the impacts. The assessment considered impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is evaluated.

The proposed mitigation of the impacts associated with the Project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The Environmental Management Programme (EMPr) for the PV Site and Generic EMPr's for the Power Line and Substation provide a comprehensive list of mitigation measures for specific elements of the Project, which extends beyond the impacts evaluated in the body of the EIA Report.

The implications of the "no-go option" are also assessed. The "no go option" was considered in light of the motivation as well as the need and desirability of the overall Project. Should the proposed Project not go ahead, any potentially significant environmental issues associated with the Project would be irrelevant and the status quo of the local receiving environment would not be affected by the Project-related activities. The objectives of this Project would, however, not be met. This will *inter alia* mean that the Project's intended benefits will not materialise. The "no-go option" is thus not preferred.

Cumulative impacts in relation to the Project were assessed individually in the EIA Report and mitigation measures were developed for each of the impact categories.

I. ANALYSIS OF ALTERNATIVES

The extent of the site allows for the identification of layout/design alternatives to manage impacts to environmental sensitivity. Layout Alternative 1 constitutes the initial layout contemplated during the Scoping Phase. During the course of the EIA process, the layout was revised based on the findings of the fieldwork of the Terrestrial and Aquatic Ecologists to avoid sensitive features. The new layout is known as Layout Alternative 2.

Based on the technical and environmental considerations, Layout Alternative 2 was identified as the Best Practicable Environmental Option (BPEO).

J. PUBLIC PARTICIPATION

The EIA Report provides the details of the following tasks undertaken as part of the public participation process:

- Maintaining the database of I&APs;
- Review period for the draft EIA Report;

- Notification of review of the draft EIA Report;
- Means of accessing the draft EIA Report; and
- Comments received on the draft EIA Report.

K. CONCLUSIONS

The following key tasks were undertaken during the EIA phase for the proposed Project:

- The specialist studies identified in the Plan of Study for the EIA were undertaken and the findings were incorporated into the EIA Report in terms of understanding the environmental status quo and sensitive features, assessing the potential impacts and establishing concomitant mitigation measures, as well as identifying the preferred alternatives;
- Potentially significant impacts pertaining to the pre-construction, construction and operational phases of the Project were identified and assessed, and mitigation measures were provided; and
- Alternatives for achieving the objectives of the proposed activity were considered, and the BPEO was identified. The “no-go” option is not supported when considering the implications of not implementing the Project.

Attention is drawn to specific sensitive environmental features for which mitigation measures are included in the EIA Report and EMPr’s. A combined sensitivity map overlaid with the Project’s BPEO is also provided.

An Environmental Impact Statement is also provided, which includes highlighting key findings from the EIA, which may also influence the conditions of the Environmental Authorisation (if granted).

With the selection of the BPEO, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the EMPr’s, it is believed that the significant environmental aspects and impacts associated with this Project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the Project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
June 2023	Draft for Review by Authorities and the Public	0	

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LIST OF ACRONYMS & ABBREVIATIONS

AC	Alternating Current
AEL	Atmospheric Emission Licence
ASAPA	Association for Southern African Professional Archaeologists
BESS	Battery Energy Storage System
BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Area
CBD	Central Business District
CCTV	Closed-Circuit Television
COD	Commercial Operation Date
CPV	Concentrated Photovoltaics
C&R	Comments and Response
CR	Critically Endangered
CRR	Comments and Responses Report
DALRRD	Department of Agriculture, Land reform and Rural Development
DARD	Department of Agriculture and Rural Development
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DEL	Department of Employment and Labour
DEM	Digital Elevation Model
DESTEA	Department of Economic, Small Business Development, Tourism and Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DC	Direct Current
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EHS	Environmental, Health, and Safety
EMF	Electromagnetic Field
EMI	Electromagnetic Interference
EMPr	Environmental Management Programme
EMS	Environmental Management System
EN	Endangered
EPC	Engineering, Procurement and Construction
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
FDDM	Fezile Dabi District Municipality
FSDPRT	Free State Department of Police, Roads and Transport
FSHRA	Free State Heritage Resources Authority

GHG	Greenhouse Gas
GIS	Geographical Information System
GN	Government Notice
GPS	Global Positioning System
HGM	Hydrogeomorphic
HIV/AIDS	Human Immunodeficiency Virus, Acquired Immunodeficiency Syndrome
HV	High Voltage
I&APs	Interested and Affected Parties
IBA	Important Bird & Biodiversity Area
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
KZN	KwaZulu-Natal
LC	Least Concern
mamsl	Metres above mean sea level
MLM	Moqhaka Local Municipality
MTS	Main Transmission Substation
Na	Sodium
NaS	Sodium-Sulphur
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act (Act No. 59 of 2008)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NPAES	National Protected Area Expansion Strategy
NT	Near Threatened
NWA	National Water Act (Act No. 36 of 1998)
NWM	National Wetland Map
OHS	Occupational Health and Safety
ONAs	Other Natural Areas
PAOI	Project Area of Influence
POSA	Plants of Southern Africa
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PS	Performance Standards
PSSA	Palaeontological Society of South Africa
PV	Photovoltaic
REDZ	Renewable Energy Development Zones
REEA	Renewable Energy EIA Application
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference

S	Sulphur
S&EIR	Scoping and Environmental Impact Reporting
SA	South Africa
SAAO	South African Astronomy Observation
SABAP2	South African Bird Atlas Project 2
SACAA	South African Civil Aviation Authority
SACAD	South Africa Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency
SANS	South African National Standard
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SEF	Solar Energy Facility
SEI	Site Ecological Importance
SKA	Square Kilometre Array
SLA	Service Level Agreement
SMME	Small, Medium and Micro Enterprises
SOTER	Soil and Terrain
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
ToR	Terms of Reference
VAC	Visual Absorption Capacity
VU	Vulnerable
WMA	Water Management Area

UNITS OF MEASUREMENT

%	Percentage
°C	Degrees Celsius
ha	Hectare
hz	Hertz
km	Kilometre
kV	Kilovolt
m	Metre
m^2	Square metre
MVA	Megavolt Amperes
MW	Megawatt
MWh	Megawatt hour
V	Volt

1 PURPOSE OF THIS DOCUMENT

Nemai Consulting was appointed by Leeuwspruit Solar 2 (Pty) Ltd (the "Applicant") to conduct the Environmental Impact Assessment (EIA) for the **proposed 300MW Solar Photovoltaic (PV) Project south of Kroonstad, in the Free State Province** (the "Project").

The EIA is being undertaken according to the process prescribed in the EIA Regulations of 2014, published under Government Notice (GN) No. 982 in Gazette No. 38282 of 4 December 2014 and amended by GN 326 of 7 April 2017 published in Gazette No. 40772 (the "EIA Regulations"). The EIA Regulations were promulgated in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). This document serves as the **draft EIA Report** for the proposed Project.

To date, the Scoping phase of the overall environmental assessment for the Project has been completed. The final Scoping Report and Plan of Study for the EIA were approved by the Department of Forestry, Fisheries and the Environment (DFFE) on 10 May 2023. DFFE is the competent authority to decide on the application in terms of NEMA.

According to the EIA Regulations, the objectives of the EIA process are to undertake the following, through a consultative process:

- 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.
- Describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the development footprint on the approved site as contemplated in the accepted Scoping Report.
- Identify the location of the development footprint within the approved site as contemplated in the accepted Scoping Report 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.
- Determine the -
  - Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives.
  - Degree to which these impacts -
- Can be reversed;
- May cause irreplaceable loss of resources; and
- Can be avoided, managed or mitigated.
- Identify the most ideal location for the activity within the development footprint of the approved site as contemplated in the accepted Scoping Report based on the lowest level of environmental sensitivity identified during the assessment.
- Identify, assess, and rank the impacts the activity will impose on the development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity.

- Identify suitable measures to avoid, manage or mitigate identified impacts.
- Identify residual risks that need to be managed and monitored.

The draft EIA Report will be made available to Interested and Affected Parties (I&APs) for a 30-day review period from **03 July until 01 August 2023**. All comments that are received will be addressed in the final EIA Report and will also be included in the Comments and Responses Report. The final EIA Report will then be submitted to the DFFE for review and decision-making.

2 DOCUMENT ROADMAP

As a minimum, this EIA Report aims to satisfy the requirements stipulated in Appendix 3 of the EIA Regulations. **Table 1** below presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: EIA Report Roadmap

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
1	Purpose of this Document	–	–
2	Document Roadmap	–	–
3	Project Background and Motivation	–	–
4	Project Location	3(1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted Scoping Report, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; and (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
		3(1)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure 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; and (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.
5	Legislation and Guidelines Considered	3(1)(e)	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.
6	Scoping and EIA Process	3(1)(a)	Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae.
		3(1)(u)	An indication of any deviation from the approved scoping report, including the plan of study, including- (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and (ii) a motivation for the deviation.
		3(1)(v)	Any specific information that may be required by the competent authority.

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
7	Assumptions and Limitations	3(1)(p)	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.
8	Need and Desirability	3(1)(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.
9	Project Description	3(1)(d)	A description of the scope of the proposed activity, including- (i) all listed and specified activities triggered and being applied for; and (ii) a description of the associated structures and infrastructure related to the development.
		3(1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report.
		3(1)(h)(i)	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.
		3(1)(h)(ix)	If no alternative development footprints for the activity were investigated, the motivation for not considering such.
		3(1)(t)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.
10	Alternatives	3(1)(h)(i)	Details of the development footprint alternatives considered.
11	Profile of the Receiving Environment	3(1)(h)(iv)	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
12	Summary of Specialist Studies	3(1)(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.
13	Impact Assessment	3(1)(h)(v)	The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- (i) can be reversed; (ii) may cause irreplaceable loss of resources; and (iii) can be avoided, managed or mitigated.
		3(1)(h)(vi)	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.
		3(1)(h)(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

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
			on the geographical, physical, biological, social, economic, heritage and cultural aspects.
		3(1)(h)(viii)	The possible mitigation measures that could be applied and level of residual risk.
		3(1)(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 (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.
		3(1)(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 may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be mitigated.
		3(1)(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 Environmental Management Programme (EMPr) as well as for inclusion as conditions of authorisation.
14	Analysis of Alternatives	3(1)(h)(ix)	If no alternative development locations for the activity were investigated, the motivation for not considering such.
		3(1)(h)(x)	A concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted Scoping Report.
		3(1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.
15	Public Participation – EIA Phase	3(1)(h)(ii)	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.
16	EIA Conclusions	3(1)(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

Chapter	Title	Correlation with GN No. R. 982	GN No. R. 982 Description
			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 and identified alternatives.
		3(1)(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.
		3(1)(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.
17	References	-	-
Appendix A	Locality Maps	3(1)(c)	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale.
Appendix E	Specialists' Reports	R23(5)	Specialist Reports containing all information set out in Appendix 6 of GN No. R. 982 of 4 December 2014 (as amended).
Appendix H	EMPr's	R23(4)	Environmental Management Programme containing all information set out in Appendix 4 of GN No. R. 982 of 4 December 2014 (as amended).
Appendix G	Comments and Responses Report	3(1)(h)(ii)	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.
		3(1)(h)(iii)	A summary of the issues raised by Interested and Affected Parties (IAPs), and an indication of the manner in which the issues were incorporated, or the reasons for not including them.
Appendix I	Oath of Environmental Assessment Practitioner	3(1)(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 IAPs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to IAPs and any responses by the EAP to comments or inputs made by IAPs.
N/A		3(1)(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**.**
N/A		3(1)(w)	Any other matters required in terms of section 24(4)(a) and (b) of the Act.

3 PROJECT BACKGROUND AND MOTIVATION

The South African Government ratified the Paris Agreement in 2016, and thereby showed the country's commitment to contribute to the global effort to address the challenge of climate change. Electricity generation sources need to be diversified to ensure security of supply and reduction in the carbon footprint created by the current heavy reliance of South Africa (SA) on coal to produce electricity. The electricity demand is increasing in SA, and in order to match that demand there is a need to supply a diversified power generation that includes renewable energy technologies. These technologies include solar, wind, small utility scale hydro, biomass, biogas and energy storage that the Department of Mineral Resources and Energy (DMRE) intends to develop and implement as identified in the approved Integrated Resource Plan (IRP) 2019.

The Applicant has proposed the development of the Leeuwspruit Solar 2 up to 300MW Solar PV Project south of Kroonstad, in the Free State Province. The electricity generated by the Project will be transferred via 132 kV powerlines from the facility substation to a new 132/400 kV Main Transmission Substation (MTS) (note that the MTS is being assessed in a separate application for Environmental Authorisation).

The Applicant intends to bid for the current and future Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bid windows and/or other renewable energy markets within SA.

4 PROJECT LOCATION

4.1 Location of the Project relative to Solar Yield Area

The location of the Project in relation to SA's PV power potential is shown in **Figure 1** below. The Project Area is considered to have favourable solar irradiation levels, which makes it ideal for the production of solar power via PV Panels.

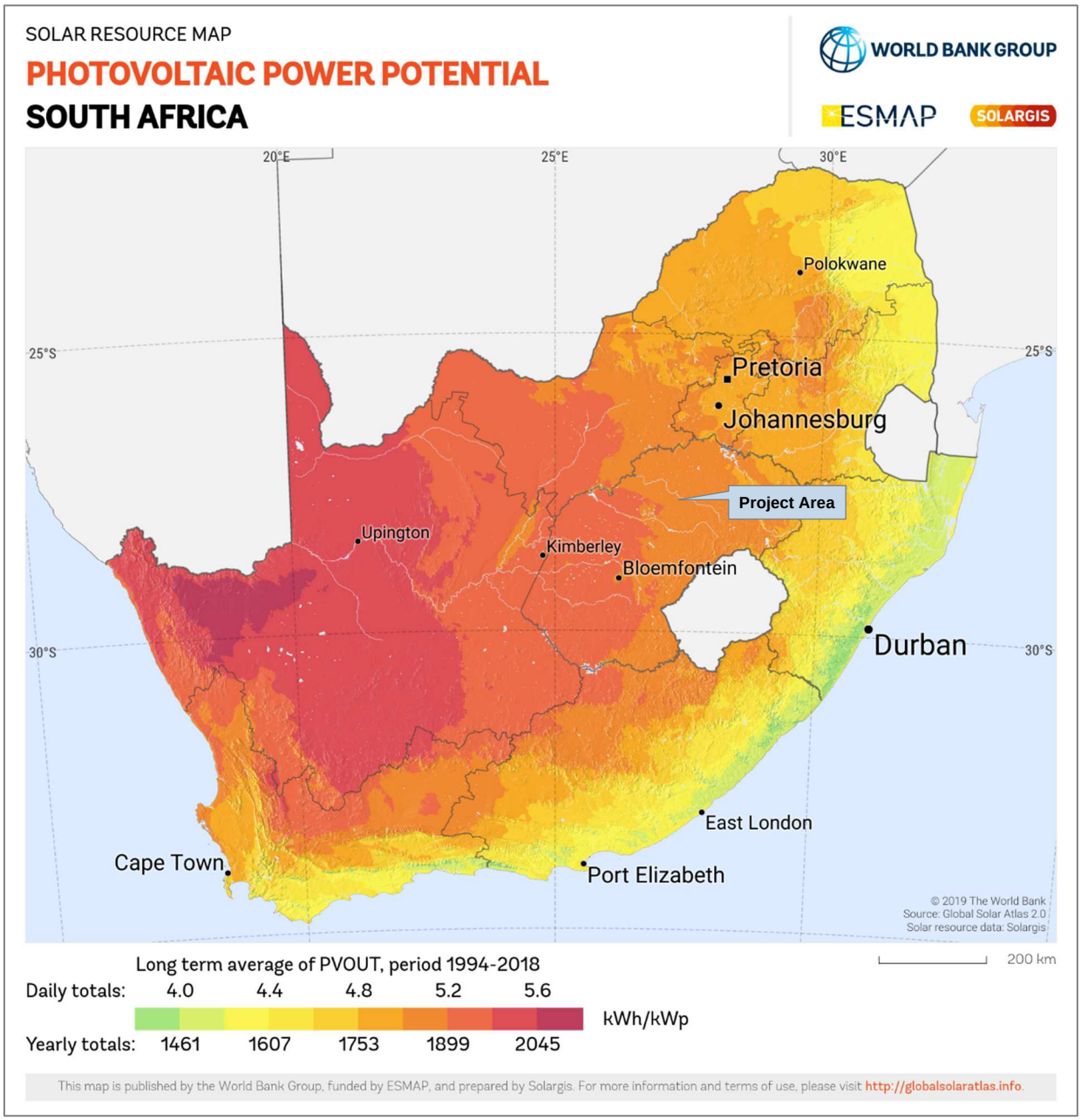


Figure 1: Location of the Project relative to PV Power Potential
(© 2019 The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis)

4.2 Geographical Context

The Project Area is located approximately 18km to the south of Kroonstad's central business district (CBD) and falls within Ward 2 of the Moqhaka Local Municipality (MLM) and Fezile Dabi District Municipality (FDDM). in the Free State Province. The site is accessible via the N1 and existing gravel roads, located to the west of the site. The locality map is provided in **Figure 2** and the alternative layouts are shown in **Figure 3** and **Figure 4** below (also contained in **Appendix A**).

The details of the affected properties are provided in **Table 2** below.

Table 2: Details of the affected properties

Layout Alternative	Farm Details	21-digit Surveyor General No.
PV Site		
Layout Alternatives 1 & 2	Portion 0 of the Farm Mooidraai 953	F02000000000095300000
	Portion 0 of the Farm Leeuwspruit 659	F02000000000065900000
	Portion 0 of the Farm Wolvekop 314	F02000000000031400000
Access Road		
Layout Alternative 1	Portion 1 of the Farm Leeuwspruit West 666	F02000000000066600001
	Remaining Extent of the Farm Leeuwspruit West 666	F02000000000066600000
	Portion 0 of the Farm Leeuwspruit 659	F02000000000065900000
	Portion 0 of the Farm Wolvekop 314	F02000000000031400000
	Portion 0 of the Farm Mooidraai 953	F02000000000095300000
	Portion 4 of the Farm Leeuwspruit West 666	F02000000000066600004
Layout Alternative 2	Portion 1 of the Farm Leeuwspruit West 666	F02000000000066600001
	Remaining Extent of the Farm Leeuwspruit West 666	F02000000000066600000
	Portion 0 of the Farm Leeuwspruit 659	F02000000000065900000
	Portion 0 of the Farm Wolvekop 314	F02000000000031400000
	Portion 4 of the Farm Leeuwspruit West 666	F02000000000066600004
Powerline Route		
Layout Alternative 1	Portion 0 of the Farm Mooidraai 953	F02000000000095300000
	Portion 0 of the Farm Oslaagte 2564	F02000000000256400000
Layout Alternative 2	Portion 0 of the Farm Mooidraai 953	F02000000000095300000
	Portion 0 of the Farm Wolvekop 314	F02000000000031400000
	Portion 0 of the Farm Oslaagte 2564	F02000000000256400000

The coordinates for the Project's layout alternative are listed in **Table 3** and shown in **Figure 5** (Alternative Layout 1) and **Figure 6** (Alternative Layout 2) below.

Table 3: Coordinates of Alternative Layouts

Project Components	Layout Alternative 1	Layout Alternative 2
PV Site property	a) 27°49'55.80"S 27°14'10.48"E b) 27°49'38.58"S 27°14'13.57"E c) 27°48'59.27"S 27°14'33.61"E d) 27°48'49.85"S 27°14'33.37"E e) 27°48'55.54"S 27°14'56.80"E f) 27°48'54.46"S 27°15'1.89"E g) 27°48'58.98"S 27°15'34.59"E h) 27°48'54.88"S 27°15'52.31"E i) 27°48'34.96"S 27°16'22.35"E j) 27°48'51.81"S 27°16'35.34"E k) 27°49'14.15"S 27°17'6.26"E l) 27°49'25.03"S 27°17'10.63"E m) 27°49'41.70"S 27°16'55.83"E n) 27°49'41.89"S 27°16'50.50"E o) 27°49'50.22"S 27°16'44.74"E p) 27°49'52.22"S 27°16'46.71"E q) 27°50'5.47"S 27°16'37.51"E r) 27°50'10.63"S 27°16'26.51"E s) 27°49'18.93"S 27°16'1.88"E t) 27°49'54.82"S 27°15'17.89"E u) 27°50'15.86"S 27°14'42.56"E	A. 27°49'3.46"S 27°15'50.81"E B. 27°50'19.81"S 27°16'10.74"E C. 27°50'35.12"S 27°15'20.49"E D. 27°50'22.38"S 27°14'51.69"E E. 27°49'55.39"S 27°14'11.05"E F. 27°48'49.43"S 27°14'33.18"E G. 27°48'57.47"S 27°15'23.92"E H. 27°49'4.90"S 27°15'19.12"E I. 27°49'5.36"S 27°14'57.18"E J. 27°49'22.04"S 27°14'46.55"E K. 27°49'39.78"S 27°14'56.49"E L. 27°49'58.12"S 27°14'46.54"E M. 27°50'15.41"S 27°14'57.00"E N. 27°50'4.04"S 27°15'3.69"E O. 27°49'55.09"S 27°15'18.78"E P. 27°50'4.19"S 27°15'30.61"E Q. 27°49'58.28"S 27°15'40.90"E R. 27°49'47.81"S 27°15'34.73"E S. 27°49'36.44"S27°15'40.38"E
Substation	1. 27°49'21.11"S 27°16'4.70"E	1. 27°49'23.38"S 27°15'59.44"E
Building Area	2. 27°49'23.38"S 27°16'6.34"E	2. 27°49'25.87"S 27°15'56.66"E
Laydown Area	4. 27°49'29.30"S 27°16'9.84"E	3. 27°49'18.09"S 27°15'52.36"E
BESS	3. 27°49'31.63"S 27°16'5.09"E	4. 27°49'30.04"S27°16'0.58"E
Access Roads	5. 27°49'14.83"S 27°16'8.33"E 6. 27°48'32.88"S 27°13'8.23"E	5. 27°49'19.56"S 27°15'41.23"E (start) 6. 27°48'58.01"S 27°15'27.23"E 7. 27°48'54.22"S 27°15'2.65"E 8. 27°48'55.24"S 27°14'57.22"E 9. 27°48'48.18"S 27°14'30.41"E 10. 27°48'48.59"S 27°14'26.33"E 11. 27°48'47.49"S 27°14'22.97"E 12. 27°48'50.38"S 27°14'14.96"E 13. 27°48'34.17"S 27°13'28.48"E 14. 27°48'33.95"S 27°13'8.01"E (end)
Powerline Route	7. 27°49'21.36"S 27°16'1.52"E 8. 27°48'51.16"S 27°16'38.04"E 9. 27°49'1.74"S 27°17'33.17"E 10. 27°49'31.73"S 27°17'48.67"E 11. 27°49'33.54"S 27°17'53.05"E 12. 27°49'59.20"S 27°18'17.21"E 13. 27°20'50.77"E 27°49'54.53"S 14. 27°49'47.66"S 27°21'7.24"E 15. 27°49'51.94"S 27°21'11.83"E	a. 27°49'22.70"S 27°15'58.64"E (start) b. 27°48'50.59"S 27°16'37.59"E c. 27°49'1.17"S 27°17'33.58"E d. 27°49'32.95"S 27°17'51.15"E e. 27°49'59.99"S 27°18'16.76"E f. 27°49'53.17"S 27°20'51.74"E g. 27°49'46.27"S 27°21'8.61"E h. 27°49'52.95"S 27°21'13.46"E (end)

Figure 2: **Regional locality map (Layout Alternative 2 shown)**

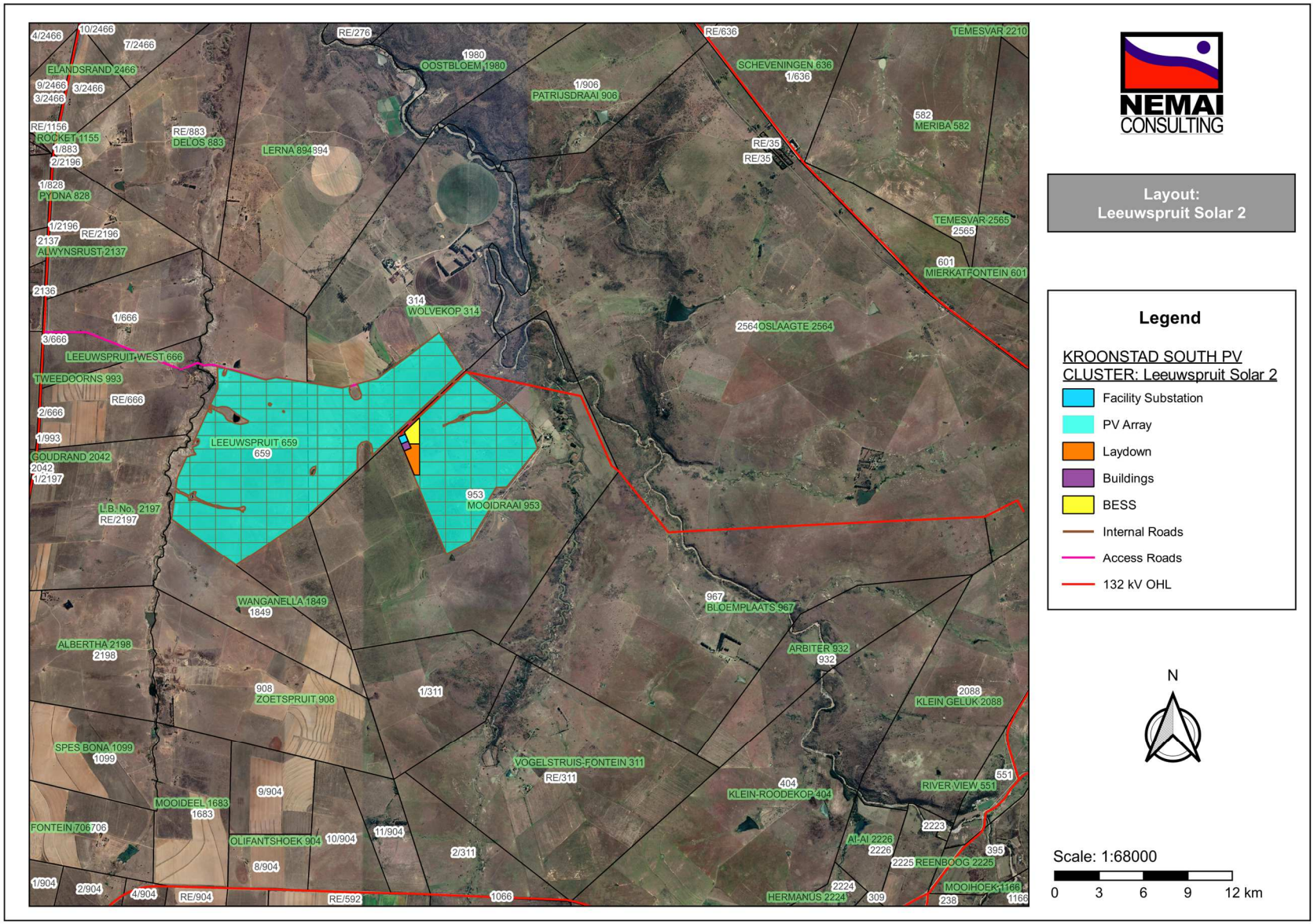


Figure 3: Layout map for Alternative 1

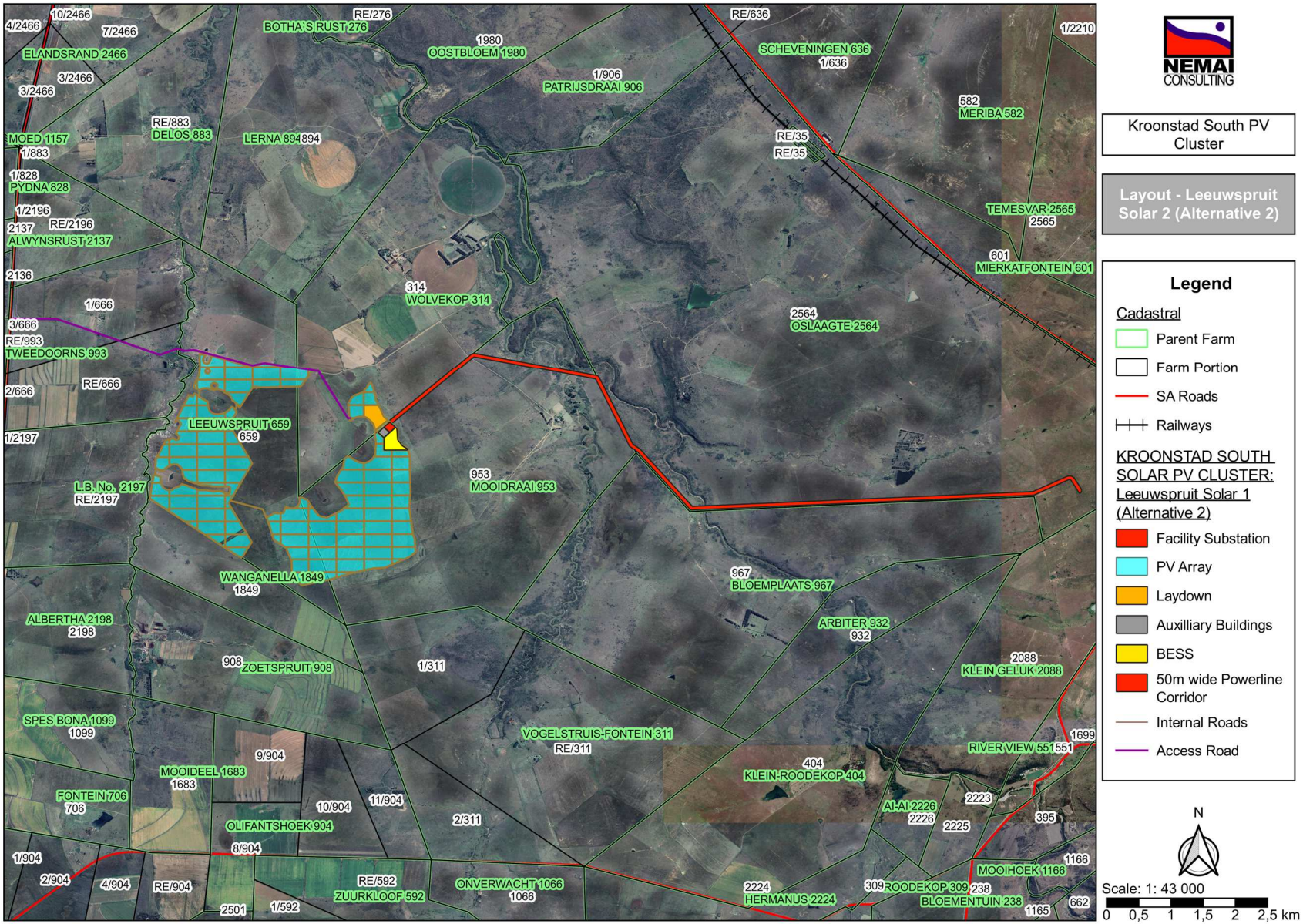


Figure 4: **Layout map for Alternative 2**

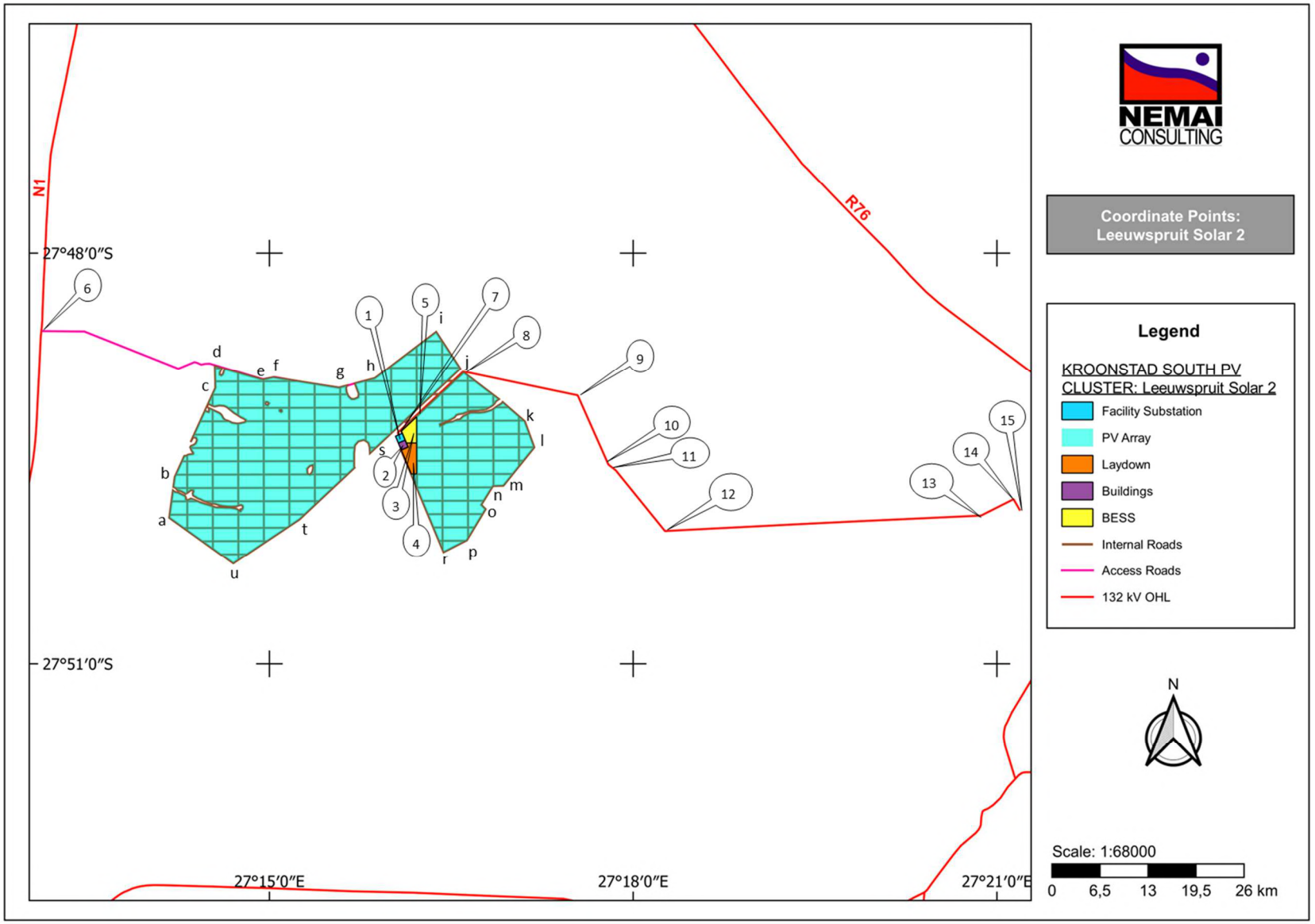


Figure 5: **Project's coordinate points for Alternative 1**

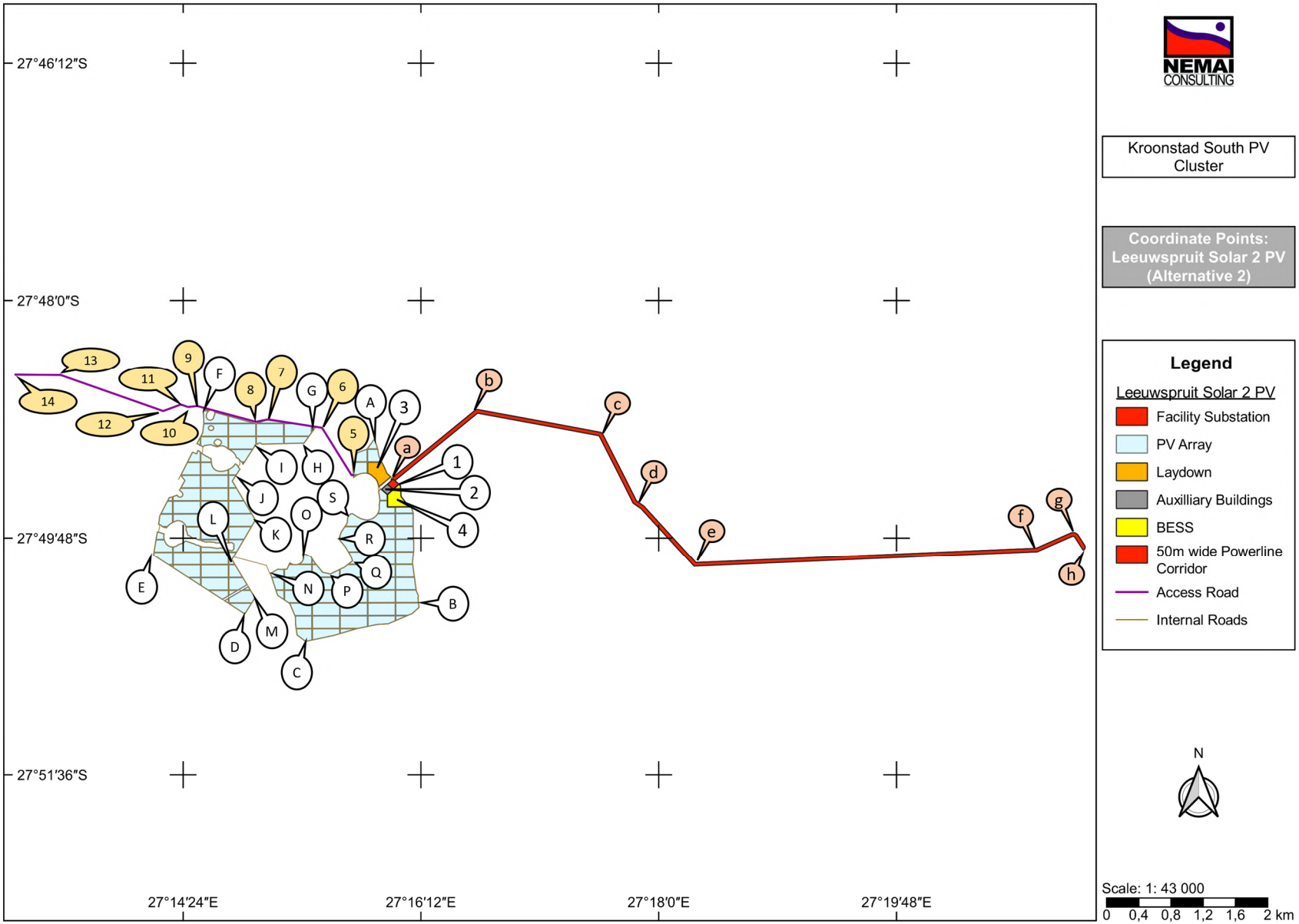


Figure 6: **Project's coordinate points for Alternative 2**

5 LEGISLATION AND GUIDELINES CONSIDERED

5.1 International Finance Corporation - Performance Standards & Guidelines

Where relevant, the Project would strive to satisfy and incorporate the International Finance Corporation (IFC) Performance Standards (PS), which serve as an international benchmark for identifying and managing environmental and social risks.

The IFC PS offer a framework for understanding and managing environmental and social risks for high profile, complex, international and potentially high impact projects. The IFC PS encompass the following eight topics:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety, and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

IFC's Environmental, Health, and Safety (EHS) Guidelines provide technical guidelines with general and industry-specific examples of good international industry practice to meet IFC PS.

5.2 Legislation

5.2.1 Environmental Statutory Framework

The legislation that has possible bearing on the proposed Project from an environmental perspective is captured in **Table 4** below. Note this list does not attempt to provide an exhaustive explanation, but rather represents an identification of some of the most appropriate sections from pertinent pieces of legislation.

Table 4: Environmental Statutory Framework

Legislation	Description and Relevance
Constitution of the Republic of South Africa (No. 108 of 1996)	▪ Chapter 2 – Bill of Rights. ▪ Section 24 – Environmental Rights.
National Environmental Management Act (Act No. 107 of 1998)	▪ Key sections (amongst others): o Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment).

<table>
<tr><th>Legislation</th><th colspan="2">Description and Relevance</th></tr>
<tr><td></td><td colspan="2">o Section 28 – Duty of care and remediation of environmental damage.
▪ Environmental management principles.
▪ Authorisation type – Environmental Authorisation.
▪ Authorities – DFFE (national) (competent authority for this application) and the Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) (provincial).</td></tr>
<tr><td>EIA Regulations</td><td colspan="2">▪ Purpose - regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.</td></tr>
<tr><td rowspan="3">GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)</td><td colspan="2">▪ Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA.
▪ The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of the EIA Regulations. However, according to Regulation 15(3) of the EIA Regulations, Scoping and Environmental Impact Reporting (S&EIR) must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities.
▪ The following activities under Listing Notice 1 are relevant to this Project:</td></tr>
<tr><td>GN No. R.983 – Activity 11(i):

The development of facilities or infrastructure for the transmission and distribution of electricity—
(i) <u>outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts</u>; or
(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more;
excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is —
(a) temporarily required to allow for maintenance of existing infrastructure;
(b) 2 kilometres or shorter in length;
(c) within an existing transmission line servitude; and
(d) will be removed within 18 months of the commencement of development.</td><td>The Project will require 132 kV electrical infrastructure. This includes an on-site substation with a capacity of up to 132kV, as well as 132kV powerline infrastructure.</td></tr>
<tr><td>GN No. R.983 – Activity 12(ii)(a) & (c):

The development of -
(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or
(ii) <u>infrastructure or structures with a physical footprint of 100 square metres or more</u>;
where such development occurs -
(a) <u>within a watercourse</u>;
(b) in front of a development setback; or
(c) <u>if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse</u>; -

excluding -
(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;
(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;
(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;</td><td>Crossing of watercourses by infrastructure associated with the Project., as well as Solar PV infrastructure within 32m of watercourses.

The proposed PV facility is located within 32m of watercourses located on the site. In addition, the existing access road and proposed powerline traverse watercourses along their respective routes. The access road will need to be expanded/upgraded to suit the project needs and to allow for heavy motor vehicles to access the construction site.</td></tr>
</table>

Legislation	Description and Relevance	
	(dd) where such development occurs within an urban area; *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*	
	GN No. R.983 – Activity 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 from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	*The existing access road and proposed powerline traverse watercourses along their respective routes. The access road will need to be expanded/upgraded to suit the project needs and to allow for heavy motor vehicles to access the construction site.*
	GN No. R.983 – Activity 24(ii): *The development of a road -* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road -* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter.*	*New roads will be required for the projects (construction and operational phases).* *The internal roads will be up to 6 m wide and main access roads will be up to 8 m wide. With the inclusion of side drains and gavel embankments, the width of the road may exceed the threshold of this activity.* *Also, the bell mouths/turning radii at the road intersections will be wider than 8m.*
	GN No. R.983 – Activity 28(ii): *Residential, mixed, retail, commercial, industrial or institutional developments where* *such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(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.*	*Footprint of Project on land that was previously used for agricultural purposes, outside of an urban area.*
	GN No. R.983 – Activity 48(i)(a) & (c): *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or*	*Expansion of existing farm roads and the access road within 32m of watercourses.*

Legislation	Description and Relevance	
	(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; *where such expansion occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding—* *(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 23 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves.*	
	GN No. R.983 – Activity 56(ii) *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas.*	*The existing access road/access point for would need to be widened by more than 6 m to accommodate heavy vehicle turning.* *The existing road is wider than 8m in some places.*
GN No. R. 984 of 4 December 2014 (as amended) (Listing Notice 2)	▪ Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. ▪ The investigation, assessment and communication of potential impact of activities must follow a S&EIR process, as prescribed in regulations 21 to 24 of the EIA Regulations. ▪ The following activities under Listing Notice 2 are relevant to this Project:	
	GN No. R.984 – Activity 1: *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, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs -* *(a) within an urban area; or* *(b) on existing infrastructure.*	*The proposed Project involves the development of a PV facility with a total generation capacity of up to 300MW renewable solar energy.*
	GN No. R.984 – Activity 15: *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	*Cumulative area to be cleared for entire Project (except linear components) will exceed 20 hectares.*
GN No. R. 985 of 4 December 2014 (as amended) (Listing Notice 3)	▪ Purpose - list activities and identify competent authorities under sections 24(2), 24(5) and 24D of NEMA, where environmental authorisation is required prior to commencement of that activity in specific identified geographical areas only. ▪ The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of the EIA Regulations. However, according to Regulation 15(3) of the EIA Regulations, S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities.	

Legislation	Description and Relevance	
	▪ The following activities under Listing Notice 3 are relevant to this Project:	
	GN No. R.985 – Activity 4 - (b)(i)(bb) & (ee): *The development of a road wider than 4 metres with a reserve less than 13,5 metres.* *b. Fee State:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas.* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.*	*New internal roads will be wider than 4m and are located within a priority focus area for expansion according to the National Protected Area Expansion Strategy (NPAES), CBAs in terms of the Free State Biodiversity Plan.*
	GN No. R.985 – Activity 12 - (b)(i), (ii) & (iv): *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* *b. Free State:* *i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004.* *ii. Within critical biodiversity areas identified in bioregional plans.* *iv. Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.*	*More than 300 square meter of indigenous vegetation will be cleared as part of the development. The footprint of the project is within a CBAs in terms of the Free State Biodiversity Plan, threatened ecosystems, and within 100m of watercourses (PV facility, access road and power line).*
	GN No. R.985 – Activity 14(ii)(a) & (c) - (b)(i)(bb), (ff) & (hh): *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *b. Free State:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas.* *(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 PV facility, access road and power line are located within 32m of watercourses within the following sensitive areas:* ▪ *Priority focus area for expansion according to the NPAES;* ▪ *CBAs in terms of the Free State Biodiversity Plan; and* ▪ *Within 5km from the Seredipendie Private Nature Reserve.*
	GN No. R.985 – Activity 18 - (b)(i)(bb), (ee), (gg) & (hh):	*Existing access roads would need to be widened by more than 4 m*

Legislation	Description and Relevance	
	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. *b. Free State* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas.* *(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 area of a biosphere reserve.* *(hh) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.*	*to accommodate heavy vehicle turning, within the following sensitive areas:* ▪ *Priority focus area for expansion according to the NPAES;* ▪ *CBAs in terms of the Free State Biodiversity Plan;* ▪ *Within 100m of watercourses.* ▪ *Within 5km from the Seredipendie Private Nature Reserve (associated with the powerline)*
	GN No. R.985 – Activity 23(ii)(a) & (c) – (b)(i)(bb), (ee) & (gg): *The expansion of—* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(b) in front of a development setback adopted in the prescribed manner; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *b. Free State:* *i. Outside urban areas:* *(bb) National Protected Area Expansion Strategy Focus areas.* *(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 area of a biosphere reserve.*	*The proposed access road may need to be expanded/upgraded by 10m^2 or more within 32m of watercourses to suit the project needs and to allow for heavy motor vehicles to access the construction site, within the following sensitive areas:* ▪ *Priority focus area for expansion according to the NPAES;* ▪ *CBAs in terms of the Free State Biodiversity Plan; and* ▪ *Within 5km from the Seredipendie Private Nature Reserve.*
National Water Act (Act No. 36 of 1998)	▪ Sustainable and equitable management of water resources. ▪ Key sections (amongst others): o Chapter 3 – Protection of water resources. o Section 19 – Prevention and remedying effects of pollution. o Section 20 – Control of emergency incidents. o Chapter 4 – Water use. ▪ Authorisation type – General Authorisation / Water Use Licence (*required for the Project*). ▪ Authority – Department of Water and Sanitation (DWS).	
National Environmental Management: Waste Act (Act No. 59 of 2008)	▪ Management of waste. ▪ Key sections (amongst others): o Section 16 – General duty in respect of waste management. o Chapter 5 – licensing of waste management activities listed in GN No. R. 921 of 29 November 2013 (as amended). ▪ Authorisation type – Waste Management Licence (*not required for the Project*). ▪ Authority – DFFE (national) and DESTEA (provincial).	

Legislation	Description and Relevance
National Environmental Management Air Quality Act (Act No. 39 of 2004)	▪ Air quality management. ▪ Key sections (amongst others): o Section 32 – Dust control. o Section 34 – Noise control. ▪ Authorisation type – Atmospheric Emission License (*not required for the Project*). ▪ Authority – DFFE (national), DESTEA (provincial) and municipality.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	▪ Management and conservation of the country's biodiversity. ▪ Protection of species and ecosystems. ▪ Authorisation type – Permit (*relevance to the Project to be confirmed*). ▪ Authority – DFFE (national) and DESTEA (provincial).
National Forests Act (Act No. 84 of 1998)	▪ Supports sustainable forest management and the restructuring of the forestry sector, as well as protection of indigenous trees in general. ▪ Section 15 – Authorisation required for impacts to protected trees. ▪ Authorisation type – Licence (*relevance to the Project to be confirmed*). ▪ Authority – DFFE.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	▪ Protection and conservation of ecologically viable areas representative of SA's biological diversity and natural landscapes.
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	▪ Equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. ▪ Key sections (amongst others): o Section 22 – Application for mining right. o Section 27 – Application for, issuing and duration of mining permit. o Section 53 – Use of land surface rights contrary to objects of Act. ▪ Authorisation type – Mining Permit / Mining Right (*not required for the Project*). ▪ Authority – Department of Mineral Resources and Energy (DMRE).
National Heritage Resources Act (Act No. 25 of 1999)	▪ Key sections: o Section 34 – protection of structure older than 60 years. o Section 35 – protection of heritage resources. o Section 36 – protection of graves and burial grounds. o Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent, etc. ▪ Authorisation type – Permit (*relevance to the Project to be confirmed*). ▪ Authority – South African Heritage Resources Agency (SAHRA) and Free State Heritage Resources Authority (FSHRA).
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	▪ Control measures for erosion. ▪ Control measures for alien and invasive plant species. ▪ Authority – Free State Department of Agriculture and Rural Development (DARD).
Free State Province Nature Conservation Ordinance 8 of 1969	▪ Provides for the listing of certain protected plant species.
Occupational Health & Safety Act (Act No. 85 of 1993)	▪ Provisions for Occupational Health & Safety. ▪ Authority – Department of Employment and Labour (DEL). ▪ Relevant regulations, such as Electrical Installation Regulations, Construction Regulations, etc.
Hazardous Substance Act (No 15 of 1973) and Regulations	▪ Provides for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products. ▪ Provides for the division of such substances or products into groups in relation to the degree of danger. ▪ Provides for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products.

The relationship between the Project and certain key pieces of environmental legislation is discussed in the subsections to follow.

5.2.2 National Environmental Management Act

NEMA is the framework legislation regulating the environment in SA. According to Section 2(3) of NEMA, "*development must be socially, environmentally and economically sustainable*", which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed Project requires authorisation in terms of NEMA and the EIA is being undertaken in accordance the EIA Regulations, which consist of the following:

- ❑ EIA procedure - GN No. R 982 (4 December 2014), as amended;
- ❑ Listing Notice 1 - GN No. R 983 (4 December 2014), as amended;
- ❑ Listing Notice 2 - GN No. R 984 (4 December 2014), as amended; and
- ❑ Listing Notice 3 - GN No. R 985 (4 December 2014), as amended.

The Project triggers activities under Listing Notices 1, 2 and 3, and thus needs to be subjected to a Scoping and Environmental Impact Reporting (S&EIR) process. The listed activities are explained within the context of the Project in **Table 4** above and **Table 5** below.

Table 5: Listed Activities Triggered by the Project

Project Components	Relevant Listed Activities	Description of relevance
Solar PV Plant	***GN No. R.983 (as amended)***	
	Activity 12(ii)(a) & (c)	The proposed PV facility is located within 32m of watercourses.
	Activity no. 28(ii)	Footprint of proposed Solar PV Plant on land that was previously used for agricultural purposes, outside of an urban area.
	GN No. R.984 (as amended)	
	Activity no. 1	The planned generation capacity of the proposed Solar PV Plant is up to 320MW with BESS.
	Activity no. 15	Although the project footprint covers a combined area of approximately 480 ha (preferred layout), the total area of indigenous vegetation to be cleared will be less due to disturbances on the site related to agricultural practices. Vegetation will be cleared for the hardstanding infrastructure, roads, and PV array structure foundations.
	GN No. R.985 (as amended)	
	Activity 12 - (b)(i), (ii) & (iv)	More than 300 square meter of indigenous vegetation will be cleared as part of the development. The footprint of the PV facility is within a CBAs in terms of the Free State Biodiversity Plan, threatened ecosystems, and within 100m of watercourses.
	Activity 14(ii)(a) & (c) - (b)(i)(bb), (ff) & (hh)	The proposed PV facility is located within 32m of watercourses within the following sensitive areas: priority focus area for expansion according to the NPAES; CBAs in terms of the Free State Biodiversity Plan; and within 5km from the Seredipendie Private Nature Reserve.
Power Line & Facility Substation	***GN No. R.983 (as amended)***	
	Activity no. 11(i)	The Project will require 132 kV electrical infrastructure. This includes an on-site substation with a capacity of up to 132kV, as well as 132kV powerline infrastructure.
	Activity 12(ii)(a) & (c)	The proposed power line traverses watercourses along its route.
	Activity 19	The proposed power line traverses watercourses along its route.
	Activity no. 28(ii)	Footprint of proposed facility substation and powerline on land that was previously used for agricultural purposes, outside of an urban area.
	GN No. R.985 (as amended)	

Project Components	Relevant Listed Activities	Description of relevance
	Activity 12 - (b)(i), (ii) & (iv)	More than 300 square meter of indigenous vegetation will be cleared as part of the development. The footprint of the power line is within a CBAs in terms of the Free State Biodiversity Plan, threatened ecosystems, and within 100m of watercourses (PV facility, access road and power line).
	Activity 14(ii)(a) & (c) - (b)(i)(bb), (ff) & (hh)	The proposed access road is located within 32m of watercourses within the following sensitive areas: priority focus area for expansion according to the NPAES; CBAs in terms of the Free State Biodiversity Plan; and within 5km from the Seredipendie Private Nature Reserve.
Roads	***GN No. R.983 (as amended)***	
	Activity 12(ii)(a) & (c)	The proposed access road passes within 32m of watercourses. The access road will need to be expanded/upgraded to suit the project needs and to allow for heavy motor vehicles to access the construction site.
	Activity 19	The existing access road traverses watercourses along its route. The access road will need to be expanded/upgraded to suit the project needs and to allow for heavy motor vehicles to access the construction site.
	Activity 24(ii)	The internal roads will be up to 6 m wide and main access roads will be up to 8 m wide. With the inclusion of side drains and gavel embankments, the width of the road may exceed the threshold of this activity. Also, the bell mouths/turning radii at the road intersections will be wider than 8m.
	Activity 48(i)(c)	Expansion of the access road within 32m of watercourses.
	Activity 56(ii)	The existing access road/access point for would need to be widened by more than 6 m to accommodate heavy vehicle turning. The existing road is wider than 8m in some places.
	GN No. R.985 (as amended)	
	Activity 4 - (b)(i)(bb) & (ee)	New internal roads will be wider than 4m and are located within a priority focus area for expansion according to the NPAES, CBAs in terms of the Free State Biodiversity Plan.
	Activity 12 - (b)(i), (ii) & (iv)	More than 300 square meter of indigenous vegetation will be cleared as part of the development. The footprint of the access road is within a CBAs in terms of the Free State Biodiversity Plan, threatened ecosystems, and within 100m of watercourses (PV facility, access road and power line).
	Activity 14(ii)(a) & (c) - (b)(i)(bb), (ff) & (hh)	The proposed power line is located within 32m of watercourses within the following sensitive areas: priority focus area for expansion according to the NPAES; CBAs in terms of the Free State Biodiversity Plan; and within 5km from the Seredipendie Private Nature Reserve.
	Activity 18 - (b)(i)(bb), (ee), (gg) & (hh)	Existing access roads would need to be widened by more than 4 m to accommodate heavy vehicle turning, within the following sensitive areas: priority focus area for expansion according to the NPAES; CBAs in terms of the Free State Biodiversity Plan; within 5km from the Seredipendie Private Nature Reserve; and within 100m of watercourses.
	Activity 23(ii)(a) & (c) – (b)(i)(bb), (ee) & (gg)	The proposed access road may need to be expanded/upgraded by 10m^2 or more within 32m of watercourses to suit the project needs and to allow for heavy motor vehicles to access the construction site, within the following sensitive areas: priority focus area for expansion according to the NPAES; CBAs in terms of the Free State Biodiversity Plan; and within 5km from the Seredipendie Private Nature Reserve.

Note that the dimensions of the Project's proposed infrastructure and components should be regarded as approximates due to the dynamic nature of the planning and design process. As a conservative approach, all activities that could possibly be triggered by the Project were included in the Application Form that was submitted to the DFFE with the draft Scoping Report. During the EIR phase the list of activities was refined, based on the findings of the specialist studies and comments received from DFFE on the Scoping Report. Hence, an amended Application Form was compiled and will be submitted to DFFE with the draft EIA Report.

5.2.3 National Environmental Management: Waste Act

Amongst others, the purpose of the National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA) includes the following:

1. To reform the law regulating waste management in the country by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
2. To provide for institutional arrangements and planning matters;
3. To provide for specific waste management measures;
4. To provide for the licensing and control of waste management activities;
5. To provide for the remediation of contaminated land; and
6. To provide for compliance and enforcement.

"Waste" is defined in NEM:WA as "*any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act*".

Schedule 3 of the NEM:WA groups waste into two categories, namely hazardous waste and general waste. The classification of waste determines the associated management and licencing requirements. ''Hazardous waste'' is defined as "*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 and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles*".

GN No. R. 921 of 29 November 2013 (as amended) contains a list of waste management activities that have, or are likely to have, a detrimental impact on the environment. If any of the waste management activities are triggered in Category A and Category B, a Waste Management Licence is required. Activities listed in Category C need to comply with the relevant National Norms and Standards.

No authorisation will be required in terms of NEM:WA, as the Project will not include any listed waste management activities. The following is noted with regards to waste management for the Project:

- Construction phase –
  - Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM:WA; and
  - The Environmental Management Programme (EMPr) (contained in **Appendix H**) makes suitable provisions for waste management, including the storage, handling and disposal of waste.

- Operational phase –
  - Minimum volumes of waste will be generated during the operational phase;
  - Waste from the on-site office and workshop will be sent to licenced municipal waste disposal sites; and
  - Waste generated during maintenance or replacement of panels and inverters will be sent to suitable disposal sites.

5.2.4 National Water Act

The purpose of the National Water Act (Act No. 36 of 1998) (NWA) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use; protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and droughts.

The Department of Water and Sanitation (DWS) is the custodian of SA's water resources.

Some key definitions from this Act include:

- "*Pollution*" – the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it (a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or (b) harmful or potentially harmful;
- "*Waste*" – includes any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted; and
- "*Water resource*" – includes a watercourse, surface water, estuary, or aquifer.

The regulated area of a watercourse, in terms of Section 21(c) and (i) water uses, is defined as follows in Government Gazette No. 40229 of 26 August 2016:

- The outer edge of the 1 in 100 year flood line and /or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

- In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to Section 144 of the NWA); or
- A 500 m radius from the delineated boundary (extent) of any wetland or pan.

Based on the above definition of the regulated area of a watercourse, the Project entails the following activities that constitute water uses in terms of Section 21 of the NWA:

- Section 21(c) - Impeding or diverting the flow of water in a watercourse; and
- Section 21(i) - Altering the bed, banks, course or characteristics of a watercourse.

The Applicant will seek authorisation from DWS in terms of the NWA for the above water uses associated with the Project.

The findings from the Freshwater Assessment are included in **Section 12.4** below.

5.2.5 National Environmental Management: Air Quality Act

The purpose of the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) is to reform the law regulating air quality by providing measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development. This Act aims to promote justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government, and for specific air quality measures.

Some key definitions from this Act include:

- "*Air pollution*" – any change in the composition of the air caused by smoke, soot, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances.
- "*Atmospheric emission*" or "*emission*" – any emission or entrainment process emanating from a point, non-point or mobile source that results in air pollution.
- "*Non-point source*" – a source of atmospheric emissions which cannot be identified as having emanated from a single identifiable source or fixed location, and includes veld, forest and open fires, mining activities, agricultural activities and stockpiles.
- "*Point source*" – single identifiable source and fixed location of atmospheric emission, and includes smoke stacks and residential chimneys.

NEM:AQA provides for the listing of activities which result in atmospheric emissions that pose a threat to health or the environment. No person may without an Atmospheric Emission Licence (AEL) conduct any such listed activity. No AEL is required for the Project. Provision is made in the EMPr to manage impacts to air quality as a result of the Project during the construction phase.

5.2.6 National Environmental Management: Biodiversity Act

The purpose of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) is to provide for the management and conservation of SA's biodiversity within the framework of NEMA.

The Act allows for the publication of provincial and national lists of ecosystems that are threatened and in need of protection. The list should include:

- *Critically Endangered Ecosystems*, which are ecosystems that have undergone severe ecological degradation as a result of human activity and are at extremely high risk of irreversible transformation.
- *Endangered Ecosystems*, which are ecosystems that, although they are not critically endangered, have nevertheless undergone ecological degradation as a result of human activity.
- *Vulnerable Ecosystems*, which are ecosystems that have a high risk of undergoing significant ecological degradation.
- *Protected Ecosystems*, which are ecosystems that are of a high conservation value or contain indigenous species at high risk of extinction in the wild in the near future.

Similarly, the Act allows for the listing of endangered species, including critically endangered species, endangered species, vulnerable species and protected species. A person may not carry out a restricted activity (including trade) involving listed threatened or protected species without a permit.

The Regulations on the management of Listed Alien and Invasive Species were promulgated on 1 August 2014. The Listed Invasive Species were also published on this date and were subsequently amended in GN 864 of 29 July 2016.

Some key definitions from this Act include:

- "*Alien species*" –
  - A species that is not an indigenous species; or
  - An indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
- "*Biological diversity*" or "*biodiversity*" – the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part and also includes diversity within species, between species, and of ecosystems.
- "*Indigenous* species" – a species that occurs, or has historically occurred, naturally in a free state in nature within the borders of the Republic, but excludes a species that has been introduced in the Republic as a result of human activity.

- "*Invasive species*" – any species whose establishment and spread outside of its natural distribution range -
  - Threaten ecosystems, habitats or other species or have demonstrable potential; and
  - May result in economic or environmental harm or harm to human health.
- "*Species*" – a kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes any sub-species, cultivar, variety, geographic race, strain, hybrid or geographically separate population.

The Regulations on the management of Listed Alien and Invasive Species were promulgated on 1 August 2014. The Listed Invasive Species were also published on this date and were subsequently amended in GN 864 of 29 July 2016.

The implications of NEM:BA for the Project *inter alia* include the requirements for managing invasive and alien species, protecting threatened ecosystems and species, as well as for rehabilitating the areas affected by the Project (outside of the development footprint).

The findings from the Freshwater Assessment and Terrestrial Biodiversity Assessment that were undertaken for the Project are included in **Section 12.4** and **Section 12.5** below, respectively.

5.2.7 National Heritage Resources Act

The purpose of the National Heritage Resources Act (Act No. 25 of 1999) (NHRA) is to protect and promote good management of SA's heritage resources, and to encourage and enable communities to nurture and conserve their legacy so it is available to future generations.

In terms of Section 38 of the NHRA, certain listed activities require authorisation from provincial agencies, which include the following:

- The construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site -
  - Exceeding 5 000 m^2 in extent; or
  - Involving three or more existing erven or subdivisions thereof; and
- The re-zoning of a site exceeding 10 000 m^2 in extent.

The findings from the Heritage Impact Assessment and Palaeontological Impact Assessment that were undertaken for the Project are included in **Section 12.9** and **Section 12.10** below, respectively.

5.3 Governance of Energy in SA

SA has expressed and entrenched its commitment to promoting the use of renewable energy and implementing Energy Efficiency through the following (amongst others):

- SA is a signatory to various international treaties and conventions relating to climate change and greenhouse gas (GHG), such as –
  - United Nations Framework Convention on Climate Change;
  - Kyoto Protocol; and
  - Paris Agreement.
- SA has developed the following related policy frameworks –
  - White Paper on Energy Policy (1998);
  - White Paper on Renewable Energy (2003);
  - Integrated Energy Plan (2003);
  - IRP 2010;
  - IRP 2019
  - National Climate Change Response White Paper (2011);
  - Post-2015 National Energy Efficiency Strategy;
  - The National Development Plan (2030);
  - Climate Change Bill (2018); and
  - Carbon Tax Bill (2019).
- SA has developed the following related legal frameworks –
  - Electricity Regulation Act (Act No. 4 of 2006);
  - National Energy Act (Act No. 34 of 2008); and
  - Income Tax Act (1962) - tax incentive provided for Section 12L.
- The former Department of Environmental Affairs (DEA), which is now known as DFFE, developed EIA Guideline for Renewable Energy Projects (2015).
- SA's related voluntary instruments include –
  - South African National Standard (SANS) 941 energy-efficiency of electrical and electronic equipment; and
  - SANS 50001 energy management standard.

5.4 Guidelines

The following guidelines were considered during the preparation of the EIA Report:

- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010);
- Guideline on Need and Desirability (DEA, 2017);
- Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010);
- EIA Guideline for Renewable Energy Projects (DEA, 2015); and

- Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

5.5 National and Regional Plans

The following regional plans, amongst others, were considered during the preparation of the EIA Report:

- MLM's Integrated Development Plan (IDP) and Spatial Development Framework (SDF);
- Free State Biodiversity Plan (2015) (Collins, 2016); and
- Relevant national, provincial and local policies, strategies, plans and programmes.

5.6 Renewable Energy Development Zones

A Strategic Environmental Assessment (SEA) was undertaken by the former DEA, which is now known as DFFE, in order to identify geographical areas most suitable for the rollout of wind and solar PV energy projects and the supporting electricity grid network. These areas are referred to as Renewable Energy Development Zones (REDZs), in which development will be incentivised and streamlined. The proposed Project footprint in relation to the REDZs is shown in **Figure 7** below.

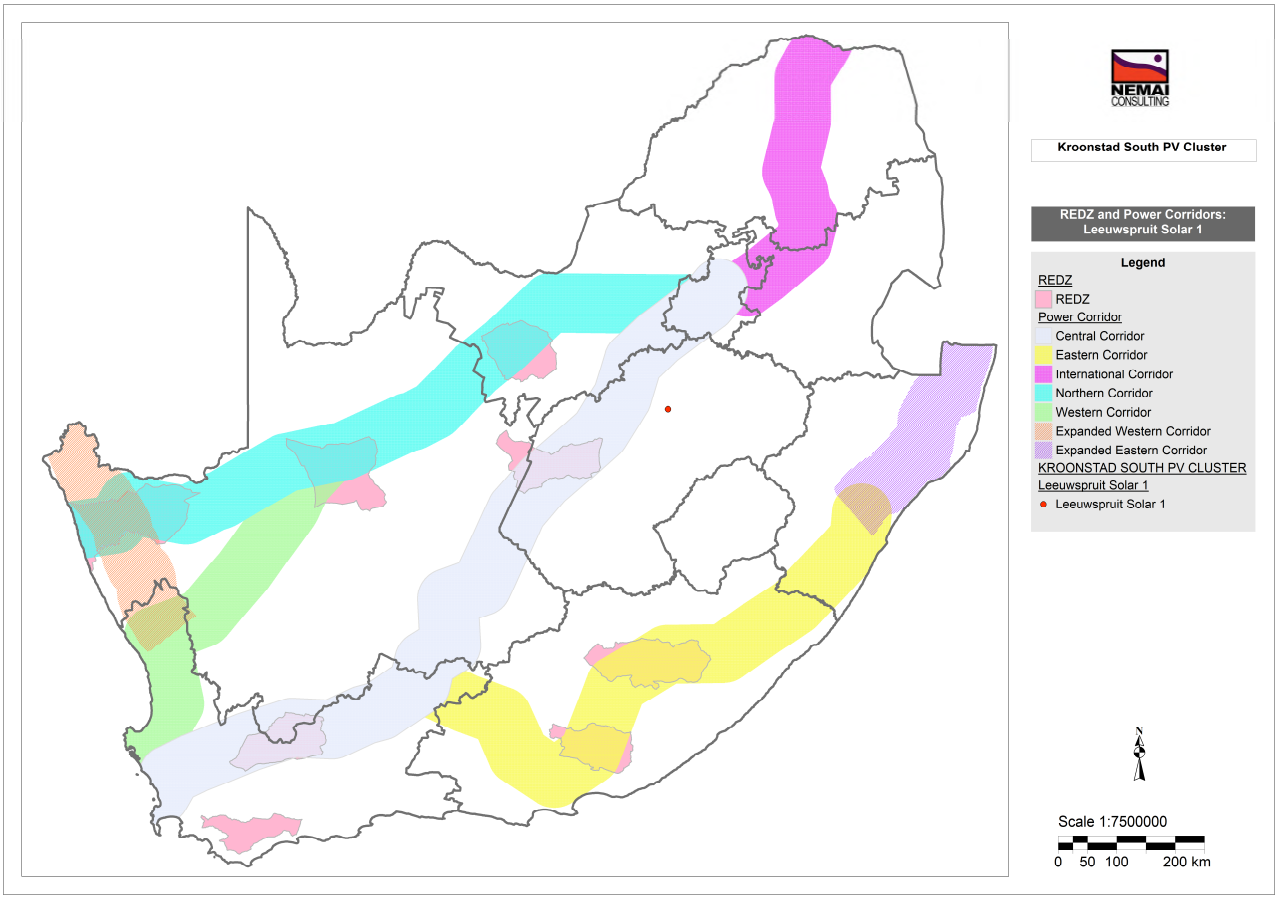


Figure 7: The Project in relation to REDZs

As shown in **Figure 7** above, the Project is not located within any REDZs or Strategic Transmission Corridors. According to GNR 114 of 16 February 2018, where an Application for Environmental Authorisation for large scale wind or solar PV facilities is being made and these facilities fall outside of the REDZs then these applications will be considered in terms of the requirements of the EIA Regulations.

6 SCOPING AND EIA PROCESS

6.1 Environmental Assessment Authorities

In terms of NEMA the competent authority for the environmental assessment is DFFE, as the application is for a renewable energy project (large scale solar PV development) and the Applicant intends to bid for current and future REIPPPP bid windows.

Due to the geographic location of the Project in the Free State, DESTEA is regarded as one of the key commenting authorities in terms of NEMA during the execution of the EIA, and all documentation will thus be copied to this Department.

Various other authorities with jurisdiction over elements of the receiving environment or project activities will also be consulted during the course of the EIA. Refer to the database of Interested and Affected Parties (I&APs) contained in **Appendix F** for a list of the government departments.

6.2 Environmental Assessment Practitioner

Nemai Consulting was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Project. In accordance with Appendix 2, Section 2(1)(a) of the EIA Regulations, this section provides an overview of Nemai Consulting and the company's experience with EIA's, as well as the details and experience of the EAP's that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy. The company is a 100% black female owned company, with a level 1 BBBEE rating. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng) and Durban (KZN).

The core members of Nemai Consulting that are involved with the S&EIR process for the Project are captured in **Table 6** below, and their respective Curricula Vitae are contained in **Appendix D**. The oath of the EAP is contained in **Appendix I**.

Table 6: Scoping and EIA Core Team Members

Name	Qualifications	Selected Experience - Renewable Energy & Bulk Power Projects
D. Henning (22 years' experience)	MSc (River Ecology)	▪ Matjhabeng 400 MW Solar PV Power Plant with 80 MW (320 MWh) Battery Energy Storage Systems, Free State Province, SA. ▪ Beaufort West 75MW Solar PV Project, Western Cape, SA. ▪ Paradise 100MW Solar PV with 40MW Battery Energy Storage Systems Project south of Bloemfontein, Free State Province, SA.

Name	Qualifications	Selected Experience - Renewable Energy & Bulk Power Projects
		▪ Extraction of Gas and Electric Power Production Plant in the Rubavu District, Rwanda. ▪ Impompomo Hydropower Plant, Mpumalanga, SA. ▪ Hydropower Plant within Hydraulic Network at Rand Water's Zoekfontein Site, Gauteng Province, SA. ▪ Neptune-Poseidon Transmission Line, including 200km of 400 kV transmission line, Eastern Cape, SA. ▪ Makalu B (Igesi) Substation and Associated Transmission Loop-In Lines, Free State Province, SA. ▪ Anderson Dinaledi Transmission Line, including 80km of 132 kV transmission line with substations, North-West Province, SA.
D. Naidoo (25 years' experience)	BSc Eng (Chem)	▪ Bronkhorstspruit Biogas Plant, Gauteng Province, SA. ▪ Construction of the Xina Solar One Parabolic Trough Technology 100MW Solar Plant, Northern Cape Province, SA. ▪ Construction of the Biotherm Solar Photovoltaic Power Plants, Northern Cape, SA. ▪ Construction of the Roodeplaat Wind Farm, Eastern Cape, SA. ▪ North-South Strengthening Scheme, including 300km of 400 kV transmission line with substations, Mpumalanga, SA. ▪ Mookodi-Mahikeng 400 kV Transmission Line, North-West Province, SA. ▪ Watershed 275/88/132 kV Substation, North-West Province, SA.
J. Davis (10 years' experience)	BSc Hons Geography and Environmental Sciences	▪ Parys up to 200MW Solar PV and BESS Hybrid Project near the town of Parys, in the Free State Province. ▪ Ferrum-Upington 400kV Powerline, Northern Cape ▪ SERE Solar Photovoltaic Plant Phase 1A and associated infrastructure, Western Cape Province. ▪ Emkhiweni 400kV Powerline Route Deviations, Mpumalanga and Limpopo Provinces. ▪ Proposed Emkhiweni Substation and 400KV Line from Emkhiweni Substation to Silimela, Mpumalanga and Limpopo Provinces.

6.3 Environmental Screening

According to GN 960 of 5 July 2019, an application for Environmental Authorisation must be accompanied by the report generated by the National Web Based Environmental Screening Tool ("Screening Tool"), as contemplated in Regulation 16(1)(b)(v) of the EIA Regulations.

The aims of the Screening Tool include the following:

- ❑ To screen a proposed site for any environmental sensitivity;
- ❑ To provide site specific EIA process and review information;
- ❑ To identify related exclusions and/or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site; and
- ❑ To allow for a Screening Report to be generated.

The Screening Report for the Project was appended to the Application Form.

6.4 Environmental Assessment Triggers

The process for seeking authorisation under NEMA is being undertaken in accordance with the EIA Regulations, promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved the requisite environmental assessment for the project is a S&EIR process. Refer to **Section 5.2.1** and **Section 5.2.2** above for the Project's legal framework and specifically the activities triggered in terms of Listing Notices 1, 2 and 3 of the EIA Regulations.

6.5 S&EIR Process

6.5.1 Formal Process

An outline of the S&EIR process for the proposed Project is provided in **Figure 8** below. The objectives of the EIA process, based on the EIA Regulations, are captured in **Section 1** above.

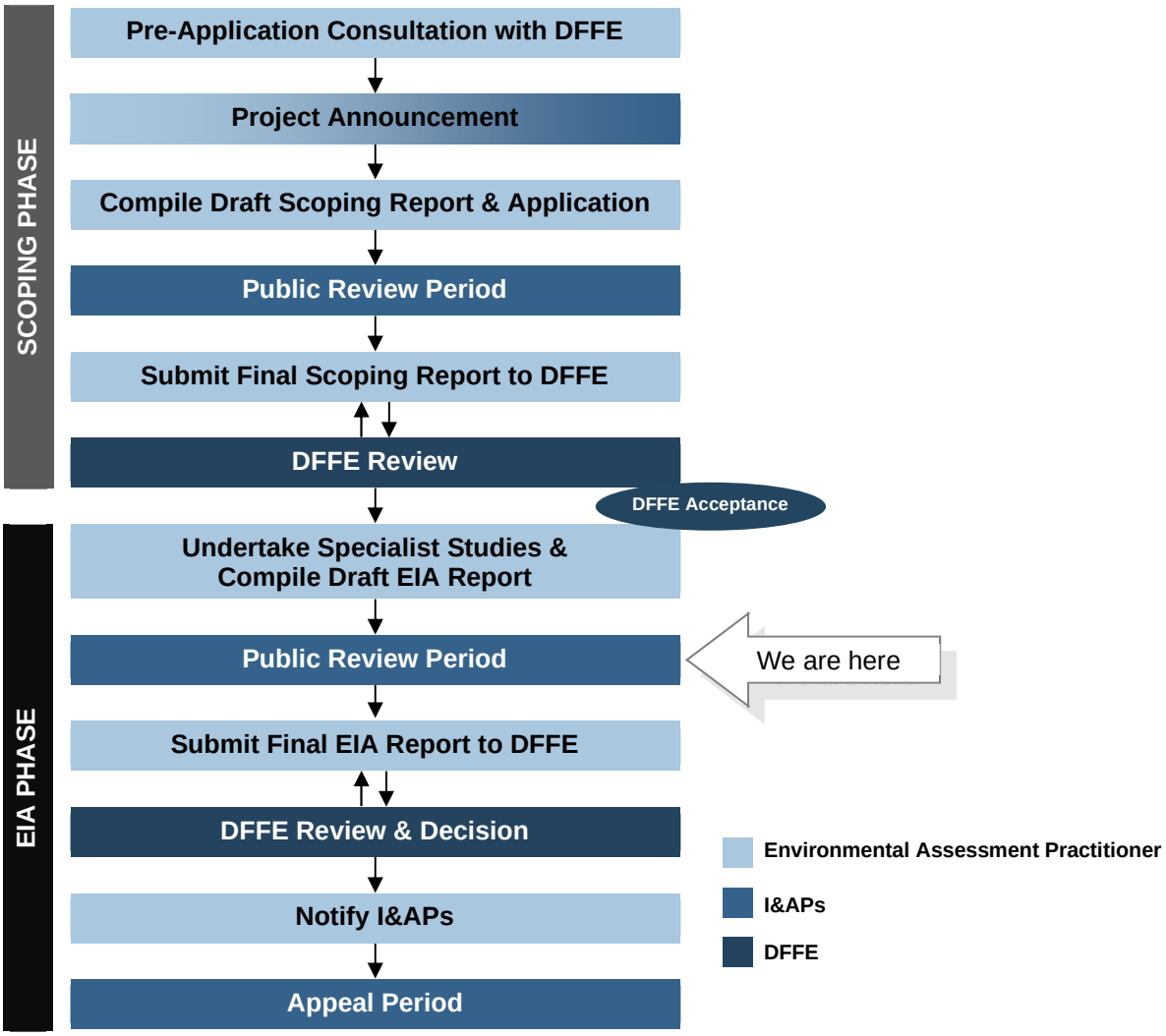


Figure 8: S&EIR process outline

6.5.2 The EIA Process to Date

The following key milestones have been reached to date as part of the EIA process:

1. A Pre-Application Meeting was held with DFFE on 31 January 2023.
2. A draft Scoping Report, which conformed to Appendix 2 of the EIA Regulations, was compiled. This document included the following salient information (amongst others):
   a. A Scoping-level impact assessment to identify potentially significant environmental issues for detailed assessment during the EIA phase;
   b. Screening and investigation of feasible alternatives to the project for further appraisal during the EIA phase; and
   c. A Plan of Study, which explained the approach to be adopted to conduct the EIA for the proposed project.
3. The Application for Environmental Authorisation and draft Scoping Report were submitted to DFFE on 9 February 2023.
4. The draft Scoping Report was lodged for public review from 13 February to 15 March 2023.
5. The final Scoping Report was submitted to DFFE on 10 March 2023.
6. DFFE accepted the Scoping Report and Plan of Study for the EIA on 12 May 2023 (refer to **Appendix B**), which allowed the commencement of the EIA phase.

6.6 Amended Application Form

An amended Application Form is contained in **Appendix C**, which includes a refinement of the listed activities triggered by the Project and additional properties affected by the revised layout.

6.7 Alignment with the Plan of Study

The Plan of Study, which was contained in the Scoping Report and was accepted by DFFE, explained the approach to be adopted to conduct the Environmental Impact Reporting phase for the proposed Project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 7** below.

Table 7: Alignment of EIA Report with Plan of Study

No.	Plan of Study Requirement	Reference to Section in EIA Report
1.	Assess potentially significant environmental issues identified during Scoping through: 1. Applying an appropriate impact assessment methodology. 2. Conducting specialist studies. 3. Identifying suitable mitigation measures.	• **Section 12** • **Section 13**
2.	Assessment of feasible alternatives.	• **Section 14**
3.	Specialist studies to be completed in accordance with Terms of Reference.	• **Section 12** • **Appendix E**
4.	Public participation to include the following: • Update the database of I&APs.	**Section 15**

No.	Plan of Study Requirement	Reference to Section in EIA Report
	• Allow for the review of the draft EIA Report. • Compile and maintain a Comments and Responses Report (CRR). • Notification of DFFE's decision.	
5.	EIA Report to satisfy the minimum requirements stipulated in Appendix 3 of the EIA Regulations.	**Section 2**
6.	Authority Consultation.	**Section 15**

6.8 Addressing DFFE's Requirements

The manner in which DFFE's specific requirements, as listed in the letter received from this Department for the acceptance of the Scoping Report (refer to **Appendix B**), have been attended to are described in **Table 8** below.

Table 8: DFFE's Specific Requirements - Acceptance of the Scoping Report

DFFE's Requirements	Response/Status
(a) Listed Activities	
• It is noted that certain listed activities applied for will be confirmed during the EIA Phase. Please ensure that only listed activities that are triggered by the proposed development are applied for, in the amended application form and draft EIAr for the proposed development.	The listed activities contained in **Table 4** and **Table 5** above are the same as those contained in the amended Application Form (**Appendix C**).
• Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description. In addition, the onus is thus on the applicant and the environmental assessment practitioner (EAP) to ensure that all the applicable listed activities are included in the application. Failure to do so may result in unnecessary delays in the processing of the application.	The listed activities contained in **Table 4** and **Table 5** above are the same as those contained in the amended Application Form (**Appendix C**). The listed activities triggered are explained in the context of the Project in **Table 4** and **Table 5** above. The findings of the specialist studies were considered in confirming the listed activities triggered.
• If the activities applied for in the application form differ from those mentioned in the final EIAr, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following link: https://www.environment.gov.za/documents/forms.	The listed activities contained in **Table 4** and **Table 5** above are the same as those contained in the amended Application Form (**Appendix C**).
(b) Coordinates	
• You are requested to provide coordinates (start, middle and end point) of other associated infrastructures (such as access roads) in degrees, minute, and seconds.	The coordinates of the proposed infrastructure are provided in **Section 4.2** above.
(c) Public Participation	
• Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAr. This includes but is not limited to the Eskom, Local and District Municipality, Department of Agriculture, the South African Heritage Resources Agency (SAHRA), The South African Civil Aviation Authority (SACAA), The Department of Transport, The Department of Water and Sanitation (DWS), DALRRD, The South African National Roads Agency Limited (SANRAL), The Endangered Wildlife Trust (EWT), The Endangered Wildlife Trust (EWT), Square Kilometre Array (SKA),The South African Astronomy Observation (SAAO) and the Department of	Copies of the draft EIA Report will be provided to the key regulatory and commentary authorities listed in **Section 15** below. Comments received on the draft EIA Report will be appended to the final EIA Report, which will be submitted to DFFE. These comments will also be incorporated into the CRR.

DFFE's Requirements	Response/Status
Environment, Forestry and Fisheries: Directorate Biodiversity and Conservation.	
• Please ensure that all issues raised, and comments received during the circulation of the draft SR and draft EIAr from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the final EIAr. Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments.	The CRR contained in **Appendix G** includes comments received during the Scoping phase. The CRR will be updated with comments received during the review of the draft EIA Report.
• A Comments and Response trail report (C&R) must be submitted with the final EIAr. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Appendix 1 of this comments letter. Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "noted" is not regarded as an adequate response to I&AP's comments.	The CRR is contained in **Appendix G**.
• Comments from I&APs must not be split and arranged into categories. Comments from each submission must be responded to individually.	The CRR, which is contained in **Appendix G**, does not categorise the comments received.
• The Public Participation Process must be conducted in terms of Regulation 39, 40, 41, 42, 43 & 44 of the EIA Regulations, 2014, as amended.	The approach to Public Participation during the EIA phase is explained in **Section 15** below.
• The EAP is requested to contact the Department to make the necessary arrangements to conduct a site inspection prior to the submission of the final EIAr.	The EAP will liaise with the DFFE Case Officer once the draft EIAr is submitted to the Department.
(d) Cumulative Assessment	
• Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following: ◦ Identified cumulative impacts must be clearly defined, and where possible the size of the identified impact must be quantified and indicated, i.e., hectares of cumulatively transformed land. ◦ Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. ◦ The cumulative impacts significance rating must also inform the need and desirability of the proposed development. ◦ A cumulative impact environmental statement on whether the proposed development must proceed..	Potential cumulative impacts associated with the Project and these other renewable energy applications are discussed in **Section 13.29**.
(e) Specialist assessments	
• The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: ▪ A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other associated infrastructures that they have assessed and are recommending for authorisations. ▪ Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed. ▪ Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is	Provision was made in the terms of reference for the specialist studies to cater for these requirements. Potential cumulative impacts associated with the Project are discussed in **Section 13.28** below.

DFFE's Requirements	Response/Status
allowed; therefore, no development of associated infrastructure including access roads is allowed in the `no-go' areas. ▪ Should the specialist definition of 'no-go' area differ from the Departments definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable. ▪ All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA. ▪ Should a specialist recommend specific mitigation measures, these must be clearly indicated. ▪ Regarding cumulative impacts: o Clearly defined cumulative impacts and where possible the size of the identified impact must be quantified and indicated, i.e., hectares of cumulatively transformed land. o A detailed process flow to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. o Identified cumulative impacts associated with the proposed development must be rated with the significance rating methodology used in the process. o The significance rating must also inform the need and desirability of the proposed development. o A cumulative impact environmental statement on whether the proposed development must proceed.	
• Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice.	The specialists did not provide contradicting recommendations.
• It is further brought to your attention that Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation, which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. "the Protocols"), and in Government Notice No. 1150 of 30 October 2020 (i.e. protocols for terrestrial plant and animal species), have come into effect. Should this study be required, the specialist assessments must be conducted in accordance with these protocols. • The screening tool output: ▪ The screening tool and the gazetted protocols (GN R320 of 20 March 2020 and GN R 1150 of 30 October 2020) require a site sensitivity verification to be completed to either confirm or dispute the findings and sensitivity ratings of the screening tool. ▪ It is the responsibility of the EAP to confirm the list of specialist assessments and to motivate in the assessment report, the reason for not including any of the identified specialist studies including the provision of photographic evidence of the site situation. The site sensitivity verification for each of the recommended studies, as per the protocols, must be compiled and attached.	The relevant specialist studies complied with the requirements of these Protocols. Site sensitivity verifications were undertaken by the Specialists and are included in their respective reports as a separate chapter, as has been accepted by DFFE in other applications. **Section 12.2** below provide the reasons for excluding certain specialist studies that were identified during Environmental Screening.
• Additionally, the protocols specify that an assessment must be prepared by a specialist who is an expert in the field and is SACNASP registered for e.g.an aquatic assessment must be	**Section 12** below provides the SACNASP registration details of the relevant specialists.

DFFE's Requirements	Response/Status
prepared by a specialist registered with SACNASP, with expertise in the field of aquatics sciences.	
• Please be reminded that section 2(3) of NEMA requires developments to be socially, environmentally and economically sustainable, while section 2(4)(i) of NEMA requires the social, economic and environmental impacts of activities, including disadvantages and benefits, to be considered, assessed and evaluated.	Refer to the specialist summary under **Section 12** and the impact assessments under **Section 13**.
• Specialist findings and recommendations must be separated per project.	Refer to the specialist summary under **Section 12.**
• The following Specialist Assessments will form part of the EIAr: ▪ Terrestrial Ecological Impact Assessment; ▪ Aquatic Impact Assessment and Delineation; ▪ Heritage Impact Assessment; ▪ Agricultural Impact Assessment; ▪ Social Impact Assessment; ▪ Visual Impact Assessment; and ▪ Desktop Palaeontological Impact Assessment.	An Avifauna Impact Assessment, Girdled Lizard Study and Transport Impact Assessment were also undertaken. Specialist studies are summarized under **Section 12** and the reports can be found under **Appendix E.**
(f) General	
• Recommendations of conditions to be included in the EA, must be done per project.	Refer to **Section 16.3** below.
• Details of the future plans for the site and infrastructure after decommissioning in 20-30 years and the possibility of upgrading the proposed infrastructure to more advanced technologies must be indicated.	The Applicant provided the following response: *Ideally, the power purchase agreement (PPA) with Eskom and Implementation and Direct Agreement with the Department of Energy will be renegotiated at the end of the project lifespan (20 – 25years) in which case the facility won't be decommissioned. In the unlikely event that this isn't possible, various components of the proposed SEF which are decommissioned will be reused, recycled or disposed of in accordance with the relevant regulatory requirements. Some components may also be traded or sold as there is an active second-hand market for scrap metal. The decommissioning phase of the project is also expected to create skilled and unskilled employment opportunities*.
• The EAP must provide landowner consent for all farm portions affected by the proposed project, whether the project component is linear or not, i.e. all farm portions where the access road, solar panels and associated infrastructure is to be located.	Regulation 39(1) of the EIA Regulations requires the proponent, if not the owner or person in control of the land on which the activity is to be undertaken, to obtain written consent of the landowner or person in control of the land in order to undertake such activity on that land. In line with Regulation 39(2)(a), the need to obtain landowner consent does not apply to linear activities. Therefore, the Project proponent has obtained written consent from the landowner for the activities related to the Solar PV facility. Landowner consent for the access road and powerline route are not included with this application, as per the EIA Regulations.
• Please also ensure that the EIAr includes the period for which the Environmental Authorisation is required and the date on which the activity will be concluded as per Appendix 3 of the NEMA EIA Regulations, 2014, as amended	Refer to **Section 16.3** below.
• Kindly include contextual reference to the larger cluster of projects for Mopane 2 -5, including the current grid application.	Refer to **Section 13.29.2.2** below.
• Please try to collate the appendices instead of having a separate PDF file for each page e.g. Appendix A could be one PDF document instead of 6 different documents.	This requirement was complied with.

6.9 Other Applications in Project Area

DFFE created the SA Renewable Energy EIA Application (REEA) Database, which contains spatial data for renewable energy applications for Environmental Authorisation. It includes spatial and attribute information for both active (in process and with valid authorisations) and non-active (lapsed or replaced by amendments) applications.

A map is contained in **Figure 76** below, which shows that there are five approved renewable energy applications within a 30 km radius of the PV Site.

In addition, there is a cluster of renewable energy developments in the area south of Kroonstad that consist of the following projects (refer to **Section 13.29.2.3** below):

- Leeuwspruit Solar 1 (located less than 400m to the east of the Project);
- Leeuwspruit Solar 2 (this Project);
- Oslaagte Solar 1 (located approximately 4km to the north-east of the Project);
- Oslaagte Solar 2 (located approximately 3.7km to the north-east of the Project); and
- Oslaagte Solar 3 (located approximately 4km to the east of the Project).

7 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations accompany the EIA process:

- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change during the detailed design phase.
- Regardless of the analytical and predictive method employed to determine the potential impacts associated with the Project, the impacts are only predicted on a probability basis. The accuracy of the predictions is largely dependent on the availability of environmental data and the degree of understanding of the environmental features and their related attributes.
- The following assumptions, gaps and limitation were noted as part of the Specialist Studies:
  - Freshwater Assessment (van Rooyen, 2023) –
    - This report is based on the information and layout received from the Applicant;
    - The findings, observations, conclusions and recommendations are based on the author's best professional and scientific knowledge; and
    - The assessment of wetlands presented in this report is limited to the proposed project footprint and does not include the extended 500 m radius regulated area of the Leeuwspruit Solar 2 PV Facility. Therefore, this report cannot be used for WUL application.
  - Terrestrial Biodiversity Assessment (Human, 2023) –
    - The assessment area was based on the area provided by the client and any alterations to the route and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
    - The area was only surveyed during a single season and therefore, this assessment does not consider temporal trends;
    - Only a single season survey will be conducted for the respective studies, this would constitute a wet season survey with its limitations;
    - Some winter flowering plants could have been missed due to the wet season survey timing
    - It must be noted that during the survey, only a fraction of the expected geophytes was visible due to their variable emergence patterns.
    - Whilst every effort is made to cover as much of the project area as possible, representative sampling is completed and by its nature, it is possible that some plant and animal species that are present across the project area were not recorded during the field investigations.
  - Avifauna Impact Assessment (Steyn, 2023) –
    - The assessment area was based on the area provided by the client and any alterations to the footprint and/or missing GIS information pertaining to the assessment area would have affected the assessment.

  - Fieldwork was undertaken for the cluster, whereas reporting has made consideration for the separate Solar PV projects.
  - No nocturnal assessments were conducted due to safety risks.
- Heritage Impact Assessment (Kitto, 2023) –
  - This assessment assumes that all the information regarding the project footprint is correct and current.
  - The project area traverses various properties separated by fences, and access was often restricted by heavily eroded farm roads, localised flooding due to the rainy (summer) season and extremely dense vegetation (acacia thicket) in some areas.
  - The large area of the project footprint meant that it was not feasible to undertake a pedestrian survey of the whole area and the fieldwork therefore comprised a combination of vehicle and pedestrian investigation. The extremely dense and long vegetation in several areas meant that archaeological and heritage visibility was low in those areas. It should be noted that the Alternative 2 layout was provided to the specialist subsequent to the field survey so only portions of this footprint were included in the survey. Therefore, there is a possibility that some heritage resources were not identified, specifically, graves or burial sites. A chance find protocol is provided in the study.
- Palaeontological Desktop Assessment (Butler, 2023) –
  - The focal point of geological maps is the geology of the area and the sheet explanations of the Geological Maps were not meant to focus on palaeontological heritage. Many inaccessible regions of SA have never been reviewed by palaeontologists and data is generally based on aerial photographs alone. Locality and geological information of museums and universities databases have not been kept up to date or data collected in the past have not always been accurately documented.
  - Comparable Assemblage Zones in other areas is also used to provide information on the existence of fossils in an area which has not documented in the past. When using similar Assemblage Zones and geological formations for Desktop studies it is generally assumed that exposed fossil heritage is present within the footprint. A field-assessment will thus improve the accuracy of the desktop assessment. A field survey was undertaken.
- Visual Impact Assessment (Viljoen, 2023) –
  - Determining the value, quality and significance of a visual resource or the significance of the visual impact that any activity may have on it, in absolute terms, is not achievable. Visual perception is by nature a subjective experience, as it is influenced largely by personal opinions and world views. For instance, what one viewer may experience as an intrusion in the landscape, another may regard as positive. Such differences in perception are greatly influenced by culture, education, and socio-economic background. A degree of subjectivity is therefore bound to influence the rating of visual impacts. It is therefore impossible to conduct a visual assessment without relying to some extent on the opinion of an experienced consultant, which is inherently subjective. The subjective opinion of the visual consultant is however unlikely to materially influence

the findings and recommendations of this study, as a wide body of scientific knowledge exists in the industry of Visual Impact Assessment, on which findings are based.
    - A once-off field survey was sufficient to characterise the baseline visual characteristics of the site.
    - The primary objective of this study was to assess the visual environment.
    - The fieldwork relevant to this study was a once-off assessment that was conducted.
    - A preliminary layout was available. Detailed dimensions, such as the vertical offset of proposed surface infrastructure above ground level, were however not available and were assigned based on experience from similar infrastructure in previous projects.
    - All viewsheds were based on terrain level. As such these viewsheds do not incorporate distractive views in the form of vegetation or land use (infrastructure, buildings, etc.).
    - This study did not include an illumination or social assessment.
    - The assessment of impacts and recommendation of mitigation measures was informed by the site-specific aspects identified and based on the assessor's working knowledge and experience with similar activities.
- Social Impact Assessment (Tanhuke & Chidley, 2023) -
    - The information obtained during the public participation phase provides a comprehensive account for the community structure and community concerns for the Project.
    - The study was done with the information and the time frames available to the specialist at the time of executing the study. The specialist took an evidence-based approach in the compilation of this report and did not intentionally exclude information which is relevant to the assessment.
    - No relocation of families will take place for this Project.
- Agricultural Compliance Statement (Gouws, 2023) –
    - The observations are accepted as representative of the soil conditions. The author feels confident that this is the case.
    - There were sufficient observations made that no gaps in knowledge or data is expected.
- Transport Impact Assessment (Patandin, 2023) -
    - This study is based on the project information provided by the Client.
    - According to the Eskom Specifications for Power Transformers (Eskom Power Series, Volume 5: Theory, Design, Maintenance and Life Management of Power Transformers), the following dimensional limitations need to be kept when transporting the transformer – total maximum height 5 000mm, total maximum width 4 300mm and total maximum length 10 500mm.
    - Maximum vertical height clearances along the haulage route is 5.2m for abnormal loads.
    - Imported elements will be transported from the most feasible port of entry, which is deemed to be Richards Bay Port.
    - If any elements are manufactured within SA, these will be transported from their respective manufacturing centres, which would be either in the greater Johannesburg area, Pinetown/Durban or Cape Town.

- All haulage trips will occur on either surfaced national and provincial roads or existing gravel roads.
- Construction materials will be sourced locally as far as possible.

8 NEED AND DESIRABILITY

This section serves to expand on the motivation for the proposed Project that is provided in **Section 3** above. The format contained in the Guideline on Need and Desirability (DEA, 2017) was used in **Table 9** below.

Table 9: Need for and desirability of the proposed Project

Question No.	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?:* *1.1.1. Threatened Ecosystems.* *1.1.2. 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.* *1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").* *1.1.4. Conservation targets.* *1.1.5. Ecological drivers of the ecosystem.* *1.1.6. Environmental Management Framework.* *1.1.7. Spatial Development Framework.* *1.1.8. Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).*	The following specialist studies have been undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Aquatic Assessment; ▪ Terrestrial Biodiversity Assessment; ▪ Avifaunal Assessment; and ▪ Girdled Lizard Study. The findings of the above studies are presented in the EIA Report. Layout Alternative 1 constitutes the initial layout contemplated during the Scoping Phase. During the course of the EIA process, the layout was revised based on the findings of the fieldwork of the ecological studies to avoid sensitive features. The new layout is known as Layout Alternative 2. The Project will provide clean energy which is in line with several global and international responsibilities. Management objectives are included in the EIA Report and EMPr to safeguard the sensitive ecological features. An Agricultural Impact Assessment has been undertaken and the findings are presented in the EIA Report. The Applicant intends to bid for the current and future REIPPPP bid windows and/or other renewable energy markets within SA. The REIPPPP is a competitive tender process that was designed to facilitate private sector investment into grid-connected renewable energy generation in SA.
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?	Potential disturbances to ecosystems may include the following: ▪ Clearance of large areas of indigenous vegetation associated with the construction footprint of the PV facility and associated infrastructure; ▪ Potential loss of sensitive environmental features; ▪ Pollution of water resources; ▪ Soil destabilisation and subsequent erosion; and ▪ Proliferation of alien and invasive species. The following specialist studies have been undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Aquatic Assessment; ▪ Terrestrial Biodiversity Assessment; ▪ Avifaunal Assessment; and ▪ Girdled Lizard Study.

Question No.	Response
	The findings of the above studies are presented in the EIA Report. Layout Alternative 1 constitutes the initial layout contemplated during the Scoping Phase. During the course of the EIA process, the layout was revised based on the findings of the fieldwork of the ecological studies to avoid sensitive features. The new layout is known as Layout Alternative 2. Mitigation measures are included in the EIA Report and EMPr to minimise disturbances to ecosystems, according to the mitigation hierarchy.
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?	The Project may cause surface water, groundwater, soil, air, noise and light pollution during the construction and operational phases. Environmental sensitivities were established through ground-truthing by specialists, these were overlaid on the scoping phase layout. The layout was revised to minimise impacts to sensitive ecological features. The above impacts were assessed during the EIA Phase and mitigation measures are included in the EIA Report and EMPr to manage these impacts.
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not 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?	The waste to be generated by the Project includes the following: ▪ Construction – o Waste generated from site preparations (e.g. plant material), domestic waste, surplus and used building material, and hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags). Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at the construction camp) and will be removed at regular intervals and disposed of at approved waste disposal sites. All the waste disposed of will be recorded. o Wastewater will include sewage, and water used for washing purposes. ▪ Operation – o Refuse (domestic waste) generated during the operational phase will be removed on a weekly basis and will be disposed of at a permitted waste disposal facility. Mitigation measures to manage all waste and wastewater generated during the construction and operational phases are included in the EMPr.
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?	Potential disturbances to cultural heritage may include the following: ▪ Possible direct impacts to graves, heritage resources and on below-ground archaeological deposits and fossils as a result of ground disturbance. ▪ Possible impacts to the cultural landscape as a result of the introduction of incompatible structures and infrastructure to the rural landscape A Heritage Impact Assessment was undertaken and the findings are presented in the EIA 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	During the construction phase electricity will be obtained from diesel generators and / or temporary supply via cables from the site power grid. No alternative energy sources were considered for the generation of electricity. The generation of

Question No.	Response
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?	electricity will be derived from a renewable energy source, namely, the sun. During the operational phase electricity will be sourced from this renewable energy-generation facility itself and/or from the existing electrical infrastructure on the property.
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? *1.7.1. 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).* *1.7.2. 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?)* *1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?*	The Solar PV Power Plant with BESS proposes to generate electricity from a renewable energy resource, namely the sun. In addition, some of this electricity will be stored in the BESS and will be discharged during evening peak hours when there is no sun. The total generation capacity of the Project will be 65MW renewable solar energy. The use of the resource will not jeopardise the integrity of the resource. Impacts to the receiving environment were assessed during the EIA Phase and are presented in the EIA Report. The proposed development is a renewable energy project and will be generating cleaner energy to assist SA in moving away from more 'dirty' forms of energy generation and to diversify the energy mix.
1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts? *1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?* *1.8.2. What is the level of risk associated with the limits of current knowledge?* *1.8.3. 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?*	The following specialist studies have been undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Aquatic Assessment; ▪ Terrestrial Biodiversity Assessment; ▪ Avifaunal Assessment; and ▪ Girdled Lizard Study. The findings of the above studies are presented in the EIA Report. Layout Alternative 1 constitutes the initial layout contemplated during the Scoping Phase. During the course of the EIA process, the layout was revised based on the findings of the fieldwork of the ecological studies to avoid sensitive features. The new layout is known as Layout Alternative 2.
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following: *1.9.1. 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*	Potential impacts to the social environment include the following: ▪ Construction phase – o Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes); o Safety and security;

Question No.	Response
measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? *1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?*	○ Use of local road network; ○ Nuisance from dust and noise; ○ Consideration of local labourers and suppliers in area – stimulation of local economy (positive impact); and ○ Transfer of skills (positive impact). ▪ Operational phase – ○ Direct and indirect economic opportunities as a result of the Project; and ○ Threats to human and animal health from electromagnetic field. A Social Impact Assessment was undertaken, and the findings are presented in the EIA Report. Mitigation measures to manage impacts to the social environment are included in the EMPr.
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.)?	The areas affected by the proposed Project footprint are rural in nature. The Project Area is located approximately 19km to the south of Kroonstad's CBD. The entire site is used for cattle grazing, which was assessed as part of the Agricultural Impact Assessment.
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?	Refer to the response to question no. 1 above.
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?	There were no site alternatives considered. The layout was assessed by the respective specialists during the EIA Phase. Options under consideration are presented in **Section 10** below. The BPEO was identified in **Section 14** below, taking into consideration of the specialists' findings.
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?	Other renewable energy applications that have been made within a 30km radius of the PV Site, according to DFFE's REEA Database, and the associated cumulative impacts, are discussed in **Section 13.29** below.
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?: *2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,* *2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),* *2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and* *2.1.4. Municipal Economic Development Strategy ("LED Strategy").*	The socio-economic environment is discussed in **Section 11.8** below. The following is noted from a planning perspective: ▪ The Project will contribute towards both National and Provincial targets for renewable energy and Eskom's target for Independent Power Producer (IPPs), as well as assist in meeting the increasing electricity demands in SA and specifically in the grid network. ▪ The Project falls within an area used for grazing. An Agricultural Impact Assessment was undertaken during the EIA Phase and the findings are presented in **Section 12.8** and **13.16**. ▪ The PV Site and power line are located outside of the urban edge and should not impact on future urban expansion. ▪ According to the findings from the National Web Based Environmental Screening Tool, the PV Site has low sensitivity in terms of the relative civil aviation theme.
2.2. 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?	Refer to the response to question no. 1.9 above.

Question No.	Response
2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
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?	
2.5. In terms of location, describe how the placement of the proposed development will: *2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,* *2.5.2. reduce the need for transport of people and goods,* *2.5.3. 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),* *2.5.4. compliment other uses in the area,* *2.5.5. be in line with the planning for the area,* *2.5.6. for urban related development, make use of underutilised land available with the urban edge,* *2.5.7. optimise the use of existing resources and infrastructure,* *2.5.8. 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),* *2.5.9. discourage "urban sprawl" and contribute to compaction/densification,* *2.5.10. 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,* *2.5.11. encourage environmentally sustainable land development practices and processes,* *2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),* *2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),* *2.5.14. 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* *2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?*	2.5.1. The Project will result in increased economic activity, as well as increased opportunities for employment and for SMMEs. 2.5.2. Not deemed to be relevant, due to the nature of the development. 2.5.3. Goods will be transported to site from Johannesburg and Richard's Bay predominantly according to the Transport Impact Study. People may need to be transported from the surrounding areas during construction, and less so during operation. 2.5.4. The area is rural in nature with agriculture being the main land use practice, and generally grazing. These animals can be moved to another part of the farm without any impact on farming income (Gouws, 2023). 2.5.5. Refer to the response to question no. 2.1 regarding planning. 2.5.6. The PV Site and power line are located outside of the urban edge and should not impact on future urban expansion. 2.5.7. The resources and services required for construction and operation are discussed in **Section 9.8** below. 2.5.8. The Project does not include the expansion of any bulk infrastructure. 2.5.9. Not deemed to be relevant, due to the nature of the development. 2.5.10. Not deemed to be relevant, due to the nature of the development. 2.5.11. Provision is made in the EMPr to manage the impacts associated with the Project. 2.5.12. Locational factors that favour the proposed site include the favourable solar irradiation levels, short distance to grid connection point, flat topography, suitable site access and availability of land. 2.5.13. The socio-economic benefits associated with the Project were identified in the Social Impact Assessment. 2.5.14. Refer to the response to question no. 1.5 above. 2.5.15. Refer to the response to question no. 2.1 above regarding planning.
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts? *2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?* *2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic*	The findings of the Social Impact Assessment are included in **Section 12.12**, and assumptions and limitations are included under **Section 7**.

Question No.	Response
vulnerability and sustainability) associated with the limits of current knowledge? *2.6.3. 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?*	
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: *2.7.1. 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?* *2.7.2. Positive impacts. What measures were taken to enhance positive impacts?*	Refer to the responses to questions no. 1.9 and 2.1 above. The assessment of potential social impacts is contained in **Section 13.27**.
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 impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Refer to the responses to questions no. 1.7 and 1.10 above.
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	The BPEO has been identified, taking into consideration the specialists' findings (refer to **Section 14**).
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?*	
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 areas affected by the proposed Project footprint are rural in nature. The PV Site is vacant, used for grazing. Consent has been provided by the landowner for the proposed development.
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?	The findings of the Social Impact Assessment are included in the EIA Report. Mitigation measures to manage these impacts are included in the EMPr. Also refer to the response to question no. 1.9 above.
2.13. What measures were taken to: *2.13.1. ensure the participation of all interested and affected parties,* *2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,* *2.13.3. ensure participation by vulnerable and disadvantaged persons,* *2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,* *2.13.5. ensure openness and transparency, and access to information in terms of the process,* *2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into*	**Section 15** below provides an overview of the public participation process, which includes the following: ▪ Public Participation during the Announcement and Scoping Phases; ▪ Maintenance of the database of I&APs; ▪ Period to review the draft EIA Report; ▪ Notification of review of the draft EIA Report; ▪ Means of accessing the draft EIA Report; and ▪ Commenting on the draft EIA Report. Comments received from authorities and I&APs during the process are included in the CRR and will be submitted with the final EIA Report.

Question No.	Response
account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and *2.13.7. 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 findings of the Social Impact Assessment are included in the EIA Report. Also refer to the responses to questions no. 1.9 and 2.5 above.
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?	Health and safety related risks associated with the Project during the construction and operational phases are assessed in the EIA Report. These risks are addressed through mitigation measures that are included in the EMPr. Additional management requirements will be included in the Project's Occupational Health and Safety system.
2.16. Describe how the development will impact on job creation in terms of, amongst other aspects: *2.16.1. the number of temporary versus permanent jobs that will be created,* *2.16.2. 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),* *2.16.3. the distance from where labourers will have to travel,* *2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and* *2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).*	The Project will have a beneficial impact on local employment during the construction and operational phases. The exact number of employment opportunities was not available at the time of writing the report. Labour will be sourced locally first and thereafter from surrounding areas, where necessary.
2.17. What measures were taken to ensure: *2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and* *2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?*	SA's commitment to renewable energy is reflected in its ratification of the Paris Agreement and the country's long-term energy planning iterations. Solar power represents a large component of the needed diversification of SA's electricity system. According to the Department of Energy (2017), energy is by nature an intergovernmental issue, cutting across energy security, economic prosperity, employment and environment, among others. In recognising these benefits, clean energy has been incorporated into the broader policy framework. The White Paper on Renewable Energy of 2003 is one of SA's policy documents that laid the foundation for the promotion of renewable energy technologies such as solar, hydro, biomass and wind (http://www.energy.gov.za/files/renewables_frame.html). Through this policy document, a ten year target of how renewable energy technologies could diversify the country's energy mix and secure cleaner energy was set. The Applicant intends to bid for the current and future REIPPPP bid windows and/or other renewable energy markets within SA. The REIPPPP is a competitive tender process that was designed to facilitate private sector investment into grid-connected renewable energy generation in SA.

Question No.	Response
	According to the IDP (MLM, 2022), KPA 1 (Service Delivery and Infrastructures Development) states that one of the municipal strategies to be pursued it to roll out solar energy in any identified areas at prescribes standards.
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?	The Solar PV Plant proposes to generate electricity from a renewable resource, namely the sun. The total generation capacity of the Project will be up to 300MW renewable solar energy. Some of the electricity generated from the renewable energy source will be stored in the BESS which may generate electricity during peak evening hours when the sun goes down. During the distribution of electricity, as the energy source is renewable, there will be no Greenhouse Gas Emissions (GHG), such as Carbon Dioxide, that will be released into the atmosphere, thus providing a clean environment for the local community and public in general. Impacts to the receiving environment were assessed through various specialist studies that are included in the EIA Report. See **Section 13**.
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The intention is for the mitigation measures that were included in the EIA Report and EMPr to be realistic and for the residual risks to be managed to an acceptable level.
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?	Ideally, the power purchase agreement (PPA) with Eskom and Implementation and Direct Agreement with the Department of Energy will be renegotiated at the end of the project lifespan (20 – 25years) in which case the facility won't be decommissioned. In the unlikely event that this isn't possible, various components of the proposed SEF which are decommissioned will be reused, recycled or disposed of in accordance with the relevant regulatory requirements. Some components may also be traded or sold as there is an active second-hand market for scrap metal. The decommissioning phase of the project is also expected to create skilled and unskilled employment opportunities. Decommissioning of facilities that require environmental authorisation such as the solar PV facility is also a listed activity in terms of NEMA and will thus require the decommissioning and closure to be approved by the relevant authorities at the time, based on the current legislative framework. However, it is also not possible to predict the legal framework in 25 years' time. For the purposes of this EIA, it is assumed that the facility will eventually be decommissioned, and the site rehabilitated.
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?	The BPEO was identified, taking into consideration the specialists' findings (see **Section 14**).
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?	Other renewable energy applications that have been made within a 30km radius of the PV Site, according to DFFE's REEA Database, and the associated cumulative impacts, are discussed in **Section 13.29** below.

9 PROJECT DESCRIPTION

9.1 Solar Technology

Solar energy facilities operate by converting solar energy into a useful form (i.e. electricity). The use of solar energy for electricity generation is a non-consumptive use of a natural resource and consumes no fuel for continuing operation. Solar power produces an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as fossil fuel power generation technologies do.

9.2 PV Technology Overview

PV technology produces direct current (DC) which is then converted to alternating current (AC) via power electronic inverters. The main technology categories are crystalline modules (mono or poly), thin film, and concentrated photovoltaics (CPV). **Figure 9** below provides an overview of a typical Solar PV Power Plant.

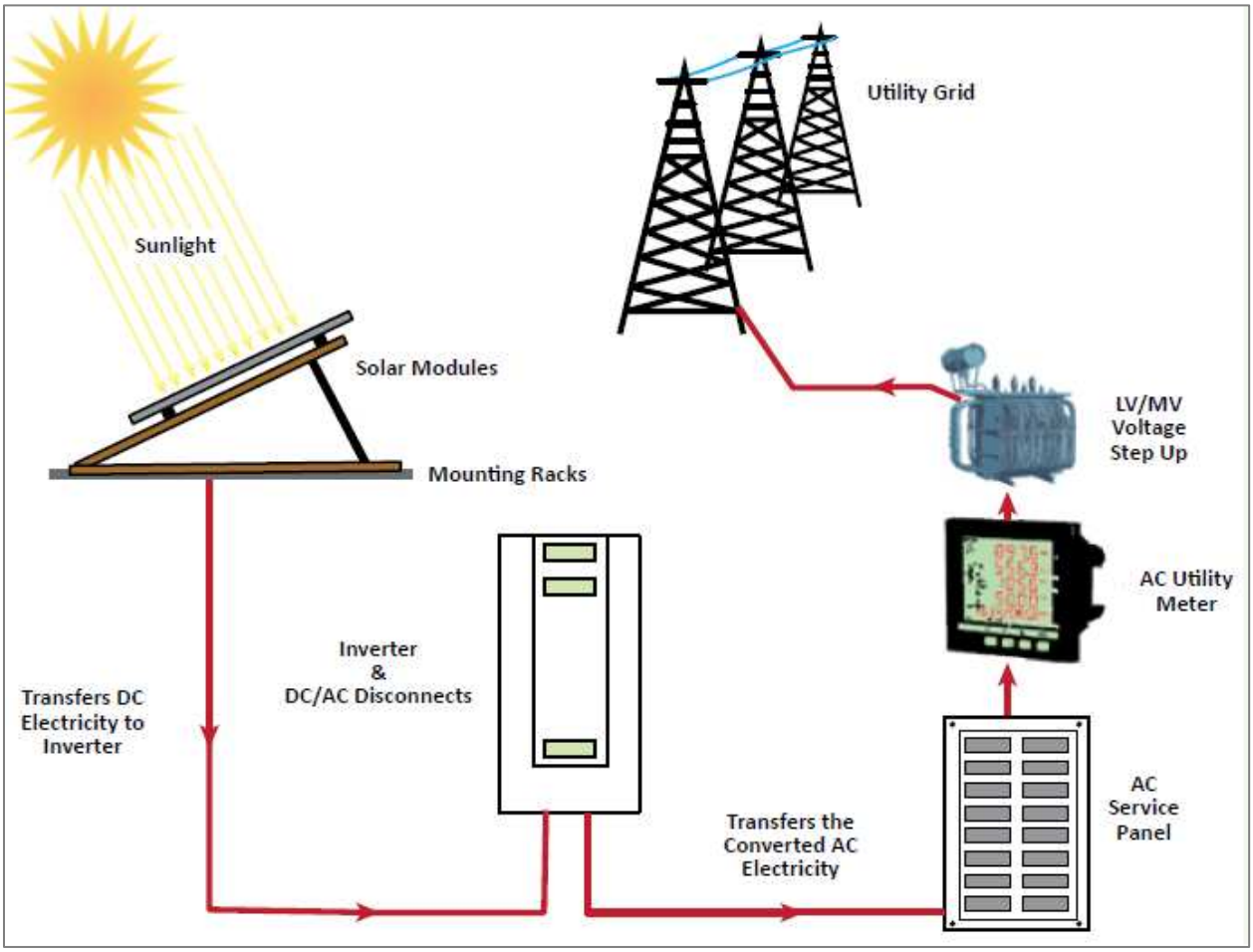


Figure 9: Overview of Solar PV Power Plant (IFC, 2015)

9.3 Project Overview

9.3.1 Overview of Technical Details

The technical details of the proposed Solar PV Plant are captured in **Table 10** below.

Table 10: Technical details of the proposed Project

No.	Component	Description / Dimensions	
		Layout Alternative 1	Layout Alternative 2
1.	Height of PV panels	Up to 5.5 m.	Up to 5.5 m.
2.	Area of PV Array	Up to approximately 445.5 ha	Up to approximately 440 ha.
3.	Area occupied by substations	Up to 1 ha	Up to 1 ha.
4.	Area and capacity of on-site substation	High voltage (132 kV)	It is estimated that the maximum size of each facility substation will not exceed 1 ha. The facility substation will collect the power from the facility and transform it from medium voltage (up to 33 kV) to high voltage (132 kV).
5.	BESS	Area up to ± 5ha	Area up to ± 5ha.
6.	Area occupied by both permanent and construction laydown areas	Temporary: Up to 7ha Permanent: Up to 1 ha (located within the area demarcated for temporary construction laydown)	Temporary construction laydown area up to 7 ha. Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown).
7.	Area occupied by buildings	Up to 1.5 ha	Up to 1.5 ha.
8.	Length of internal roads	Up to 33 km	Up to 33 km.
9.	Width of internal roads	The internal roads will be up to 6 m wide. The access roads will be up to 8 m wide.	Internal Roads up to 6 m wide. Main Access Road up to 8 m wide.
10.	Proximity to grid connection	±7.30 km	Approximately 8 - 11 km.
11.	Height of fencing	Up to 3.5m	Up to 3.5m.
12.	Type of fencing	Type will vary around the site, welded mesh, palisade and electric fencing	Type will vary around the site, welded mesh, palisade and electric fencing.

9.3.2 Project Layout

The alternative layouts are shown in **Figure 3** and **Figure 4** above. The desirability of the earmarked site for the development of the proposed Solar PV Plant is due to the following key characteristics:

- **Solar Irradiation**: The feasibility of a solar facility is dependent on the direct solar irradiation levels (refer to **Section 4.1** above).
- **Topography**: The suitability of the surface area is an important characteristic for the construction and operation of solar facilities. Most of the site has a low gradient slope and is suitable for this development.
- **Grid connection**: The electricity generated by the Project will be transferred via 132kV powerline from the facility substation to a new 132/400 kV Main Transmission Substation (MTS).

- **Extent of site**: The overall extent of the site is sufficient for the installation of the PV facility.
- **Site access**: The site is accessible via the N1 and existing gravel roads, located to the west of the site.

The following factors were considered in determining the layouts (amongst others):
- Requirements of the PV Plant;
- Understanding of sensitive features on the site (e.g., watercourses); and
- Existing servitudes and infrastructure.

9.3.3 Components of the Proposed Solar PV Project

The Project consists of the following systems, sub-systems or components (amongst others):
- PV modules and mounting structures which will consist of either Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems.
- Inverters and transformers.
- Battery Energy Storage System (BESS) area up to 5ha.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance.
- Facility grid connection infrastructure, including:
  - 33kV cabling between the project components and the facility substation;
  - A 132kV facility substation; and
  - 33kV or 132kV cabling or powerline between the facility substation and the proposed MTS.
- Temporary construction laydown area up to 7 ha.
- Permanent laydown area up to 1 ha (to be located within the area demarcated for the temporary construction laydown).
- Internal roads will be up to 6 m wide, to allow access to the Solar PV modules for operations and maintenance activities.
- Main access road is up to 8 m wide. The site is accessible via the N1 and existing gravel roads, located to the west of the site.

The components of the proposed Solar PV Facility are discussed below. Reference Source: Solar Power Plant - Types, Components, Layout and Operation (https://www.electricaltechnology.org/).

9.3.3.1 Solar PV Panels/Modules

A PV panel is the most important component of a solar power plant. It is made up of small solar cells. This is a device that is used to convert solar photon energy into electrical energy.

Generally, silicon is used as a semiconductor material in solar cells. The typical rating of silicon solar cells is 0.5 V and 6 Amp. And it is equivalent to 3 W power. The number of cells is connected in series or parallel and makes a module. The number of modules forms a solar panel.

According to the capacity of power plants, a number of plates are mounted and a group of panels is also known as a PV array.

9.3.3.2 Single Axis Trackers

The following information was sourced from Solar Basics: Single-Axis Tracking (https://www.powerflex.com/).

A solar tracking system adjusts the position of a solar panel along an axis. This is done to ensure a small angle of incidence or the angle that sunlight hits a solar panel. Since the energy output of a solar system increases as the angle of incidence decreases, keeping this angle as small as possible is ideal. Active trackers rely on powered machineries such as gears and motors to move solar panels, whereas passive trackers achieve motion via compressed fluid that shifts sides when heated by the sun, changing the tilt of the panel along with it. Some trackers keep panels aligned with the sun by moving them in the opposite direction of the earth's rotation, and others determine an optimal panel angle based on latitude and longitude data obtained through GPS.

In addition to varying methods of motion, solar trackers differ in terms of the number of axes on which they move. Single axis tracking systems tilt on one axis, tracking the sun as it moves from east to west during the day.

An example of PV modules mounted on a single axis tracker is shown in **Figure 10** below.

Figure 10: Example of PV Module mounted on Single Axis Tracker
(source: Single-ACES – Atlantic Clean Energy Supply – Official Site [https://atlanticces.com/])

The trackers are mounted on steel posts installed in the ground. Concrete bases are sometimes also used. The site would need to be cleared of all trees to prevent shading of the PV modules. The ground between the trackers is sometimes left grassed.

9.3.3.3 Inverters

The following information was sourced from “A Guide to Solar Inverters: how they work and how to choose them” (https://solarmagazine.com/).

A solar inverter is really a converter. Inverters are installed to convert the DC electrical power into AC electrical power, which is used in the grid. The frequency of the AC electricity is synchronised to the grid, which in South Africa is 50 Hz, but varies slightly. The purpose of the inverters is to maximise and control the conversion of power from the DC modules to low voltage AC (i.e., less than 1000 V).

String inverters have multiple inputs for connecting the strings from the trackers. String inverters are normally installed on steel structures under the shade of the PV modules.

9.3.3.4 Low Voltage AC Cabling

AC cables are installed from the inverters to the distribution box located adjacent to the medium voltage transformers. These cables are installed underground in trenches.

9.3.3.5 Medium Voltage Step-Up Transformers

The purpose of medium voltage transformers is to step-up the low voltage to medium voltage. In order to distribute the combined electrical power from a block of tracker rows the voltage is required to be increased. Transformers will typically be in the order of 2.5 MVA capacity and similar in appearance to the type as shown in **Figure 11** below.

Figure 11: Example of Medium Voltage Transformer
(source: https://www.ulaginoli.com/)

Transformers will typically be filled with oil for cooling the transformer windings. The cooling oil is circulated through radiator fins mounted on the side of the transformer. The oil remains in the transformer. Oil spills from transformers need to be contained by providing drip trays and special care taken to clean up the spill should it occur.

9.3.3.6 Medium Voltage AC Cabling

Medium voltage AC cabling from the transformers to the high voltage substation is buried in trenches underground. The cables are protected from accidental damage by placing brightly coloured orange danger tape in the trench and sometimes concrete slabs. Cable routes are indicated with concrete cables markers on the ground at bend points, road crossings etc.

9.3.3.7 High Voltage Substations

The medium voltage cables are connected to a medium voltage switchgear room located in a substation yard. High voltage transformers step the medium voltage up to high voltage.

Figure 12: Example of High Voltage Substation
(source: https://www.protogenenergy.com/)

A typical HV Substation will look like the substation shown in **Figure 12** above, with large ground mounted transformers and outdoor high voltage switchgear with overhead conductors and steel lattice structures. The yard is fenced off and only authorised personnel are allowed inside the high voltage yard (see example shown in **Figure 13** below).

Figure 13: Example of High Voltage Transformers
(source: https://www.electricityforum.com/)

9.3.3.8 Guardhouses, Operation, Maintenance and Visitor Centre Buildings

Guardhouses, Operation, Maintenance and Visitor Centre Buildings are required for the facility. Buildings will be single story.

The purpose of the buildings is to provide space for staff working on site for the operation and maintenance of the facilities, including storage space for spare parts, tools, etc. Computers will be installed for monitoring the electricity generation and reporting on the condition of the plant. Toilets, kitchens, water, wastewater, and electricity will be required for staff and visitors.

Sustainable building principals will be used including use of rainwater harvesting, energy efficient lighting, insulation, etc.

9.3.3.9 Roads

Existing roads are located on the site. These will serve as the entrance roads to the site. The existing access from main roads may need to be upgraded. The internal roads will vary from 4m to 6m wide and will be gravel, with the exception of paving close to the buildings for parking and access into the buildings. The entrance road will be up to 8 m wide.

The basic layout consists of rows of single axis trackers, similar to that shown in **Figure 14** below.

Figure 14: Example of Roads Between Trackers and Medium Voltage Substations
(source: https://ecoinventos.com/)

9.3.3.10 Fencing, Security and Lighting

Fencing is required to secure the site. Due to the voltage of the DC wiring (up to 1500 V) and high value of the plant the site must be secured. Details of the fencing is still to be finalised and may include electric fencing.

CCTV cameras and security lighting may be installed as part of the security for the plant.

9.3.3.11 Stormwater Infrastructure

The topography of the site is relatively flat, which simplifies the management of stormwater runoff as high velocities in surface drainage channels and pipes underground drainage systems need not be dealt with. Furthermore, surface stormwater drainage channels can be employed to advantage (easier to maintain than an underground pipe system).

9.4 Battery Energy Storage System

9.4.1 Types of Electrical Energy Storage Systems

Electrical Energy storage systems consist of Mechanical, Chemical, Electrical, Thermal and Electrochemical systems. **Figure 15** below summarizes the various Electrical Energy Storage systems. Solid State technology was selected as the preferred solution to meet the requirements of the Project.

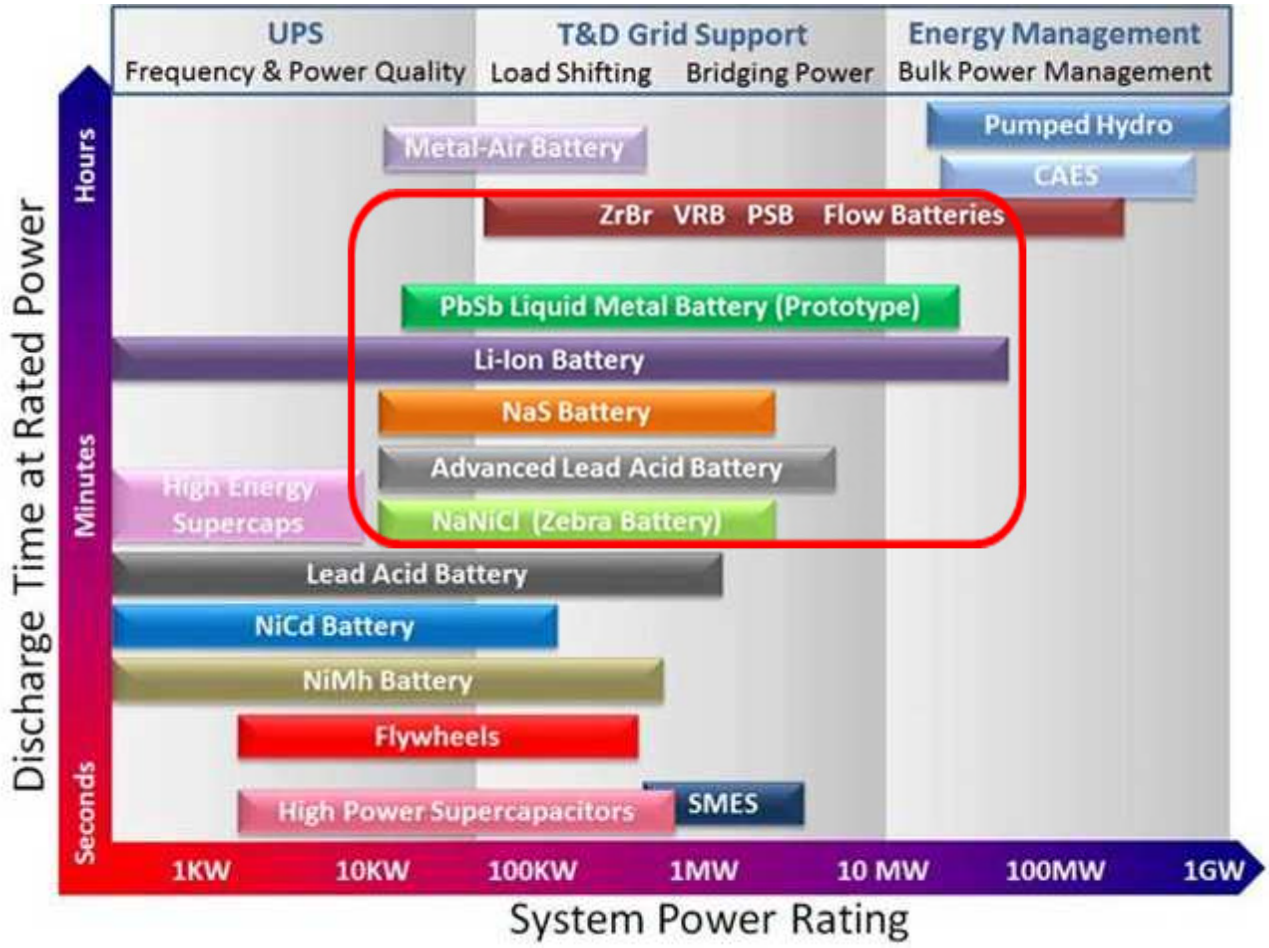


Figure 15: Grid Energy Storage Technologies and Applications
(Adapted from Climate Policy Initiative for the Energy Transitions Committee)

As per https://www.smart-energy.com/, “Batteries, the oldest, most common and widely accessible form of storage, are an electrochemical technology comprised of one or more cells with a positive terminal named a cathode and negative terminal or anode. Batteries encompass a range of chemistries. The best known and in widespread use in portable electronic devices and vehicles are lithium-ion and lead acid. Others solid-state battery types are nickel-cadmium and sodium-sulphur, while zinc-air is emerging. Another category is flow batteries with liquid electrolyte solutions, including vanadium redox and iron-chromium and zinc-bromine chemistries”.

9.4.2 The Project’s BESS Infrastructure

The total footprint of the BESS is up to a maximum of 5 ha. The technology will be the commercially proven solid-state battery systems, which include Lithium Ion technology.

As per https://www.smart-energy.com/, “This type of technology is widely used in mobile phones and electric vehicles. It is also predominantly used in large utility scale projects”. The batteries generally arrive on site from the factory fully-assembled and pre-tested in containerised/modular enclosures.

The number of containers required will depend on the specific manufacturer. The approximate dimensions of each container will be up to a maximum of 12 m long, 3 m wide and 3 m high. Level and fenced off platforms would be created for the battery storage areas of approximately 3 000 m². The location of the battery energy storage facility will be adjacent to the solar power plant's on-site substation.

An example of similar utility scale BESS is shown in **Figure 16** below.

Figure 16: Example of BESS installation
(https://biiworld.com/)

The containers are environmentally friendly during their life-cycle. However, the Lithium in the technology is considered hazardous / dangerous goods. Used batteries will be removed by the suppliers. Batteries containing chemistries that when charged are a fire risk, and at the end of their life need to be recycled. With regard to the fire risk, the battery storage area will have a non-flammable buffer area to prevent the spread of fire. The BESS will have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression as per fire and electrical regulations.

9.5 Grid Connection

The electricity generated by the proposed Solar PV Plant will be transferred to the national Eskom grid via 132 kV powerlines from the facility substation to a new 132/400 kV MTS (note that the MTS is being assessed in a separate application for Environmental Authorisation).

For Layout Alternatives 1 and 2 the approximate length of the 132kV powerline is approximately 10 km.

Examples of a 132 kV transmission line as well as a high voltage transmission line connecting to a substation are shown in **Figure 17** and **Figure 18** below, respectively.

Figure 17: **Example of a 132 kV transmission line**

Figure 18: **Example of High Voltage Transmission Line Connecting to Substation**

9.6 Implementation Programme

Key milestones during the Project's implementation programme include the following:

- ❑ Preferred Bidder Status: Q4 2023;
- ❑ Financial Close: Q2 2023;
- ❑ Notice to proceed (commencement of construction): Q4 2023; and
- ❑ Commercial Operation Date (COD): Q1 2025.

9.7 Project Life-Cycle

The project life-cycle for a typical Solar PV Plant includes the following primary activities (high level outline only):

- ❑ Feasibility phase - This phase includes confirming the feasibility of the Project by evaluating and addressing the following (amongst others) –
  - Solar resource assessment;
  - Site selection;
  - Project land allocation;
  - Project yield assessment;
  - Permitting and licensing;
  - Legal agreements;
  - Socio economic development;
  - Industrialisation and localisation;
  - Project cost determination;
  - Project financing; and
  - Risk analysis.
- ❑ Design phase - This phase includes the following (amongst others) –
  - Confirming key design features such as the type of PV module to be used, tilting angle, mounting and tracking systems, inverters, and module arrangement;
  - Confirming specifications for the components of the Solar PV Plant and BESS;
  - Preparing detailed designs (layout, civil, electrical);
  - Preparing construction plans;
  - Preparing the Project schedule; and
  - Preparing the commissioning plans.
- ❑ Construction phase – During the implementation of the Project, the following construction activities will be undertaken –
  - Pegging the footprint of the development;
  - Establishing access roads;
  - Preparing the site (fencing, clearing, levelling and grading, etc.);
  - Establishing the site office;

- Establishing laydown areas and storage facilities;
- Transporting equipment to site;
- Undertaking civil, mechanical and electrical work; and
- Reinstating and rehabilitating working areas outside of permanent development footprint.

❑ Operational phase - Once the solar park is up and running the facility will be largely self-sufficient. Operational activities associated with the maintenance and control of the Solar PV Plant will include the following (amongst others) –

- Testing and commissioning the facility's components;
- Cleaning of PV modules;
- Controlling vegetation;
- Managing stormwater and waste;
- Conducting preventative and corrective maintenance; and
- Monitoring of the facility's performance.

❑ Decommissioning –

- PV panels are guaranteed to produce at least 80% of their rated power for 20 to 30 years. In practice, PV panels will perform satisfactorily well beyond this timeframe. At the end of the 20-30 year lifespan, two scenarios exist for the PV panels:

▪ The old, redundant panels can be disposed of (at a registered disposal facility designated for this purpose); or

▪ The panels can be recycled, by either using their components to fix or make new panels, or be donated for use elsewhere (e.g., for the electrification of rural schools and clinics).

- It is unlikely that the PV Park will be decommissioned after 30 years. Instead, the facility will continually be reconditioned as the PV panels are recycled and replaced with more advanced technology, as it becomes available.
- In the event that the facility must be decommissioned, the decommissioning phase will include measures for complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for a future desirable use.

9.8 Resources and Services required for Construction and Operation

This section briefly outlines the resources that will be required to execute the Project. Note that provision is made in the EMPr to manage impacts associated with aspects listed below, as relevant.

9.8.1 Raw Materials

Construction

Material required for construction purposes, including fencing and construction material (e.g., cement, sand, aggregate, etc.), will be sourced from suitable suppliers. The PV modules and other components of the facility will also be sourced from accredited suppliers.

Operation

During the operational phase, few raw materials will be required. Material such as consumable spares will be used for the operation of the facility.

9.8.2 Water

Construction

During construction, the Contractor will require water for potable use by construction workers and water will also be used in the construction of the foundations and other components of the Project. The necessary negotiations will be undertaken with the MLM or landowners to obtain water from approved sources.

Operation

Water use requirements for a Solar PV Plant during the operational phase depends on the technology and climate conditions at the site. In general, solar power technologies use relatively low volumes of water for cleaning solar collection and reflection surfaces like PV panels, as well as for domestic consumption by the staff.

Water will be supplied by the MLM, with a water connection to the site.

9.8.3 Sanitation

Construction

Sanitation services will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier.

Operation

Sewage from the buildings and toilets across the site will be discharged into various septic tank systems. The soakaway systems will be designed with sufficient spare capacity to accommodate the possibility of excessive usage above the anticipated average. This option is the most cost-effective system for this Project. It is to be considered that a well-constructed and maintained septic tank should be odourless and problem free.

Should the receiving environment be regarded as sensitive, then the use of honey sucker services from an independent contractor will be considered.

9.8.4 Waste

Construction

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g., at the construction camp) and will be removed at regular intervals and disposed of at licenced waste disposal sites. According to the IDP (MLM, 2022), the Kroonstad landfill site does not meet

minimum operational requirements due to lack of personnel and equipment. The Steynsrus and Viljoenskroon landfill sites are operational and will be considered for the Project.

Wastewater, which refers to any water adversely affected in quality through construction-related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g., equipment, staff); and
- Drainage over contaminated areas (e.g., workshop, equipment storage areas).

Suitable measures will be implemented to manage all wastewater generated during the construction period.

Operation

Refuse generated during the operational phase will be removed on a weekly basis and will be disposed of at licenced waste disposal sites.

9.8.5 Roads

Construction

Temporary access roads will be created during the construction phase. The areas affected by temporary roads will be reinstated, as they will not be used permanently in the operational phase.

Operation

The site is accessible via the N1 and existing gravel roads, located to the west of the site (see **Figure 19** below).

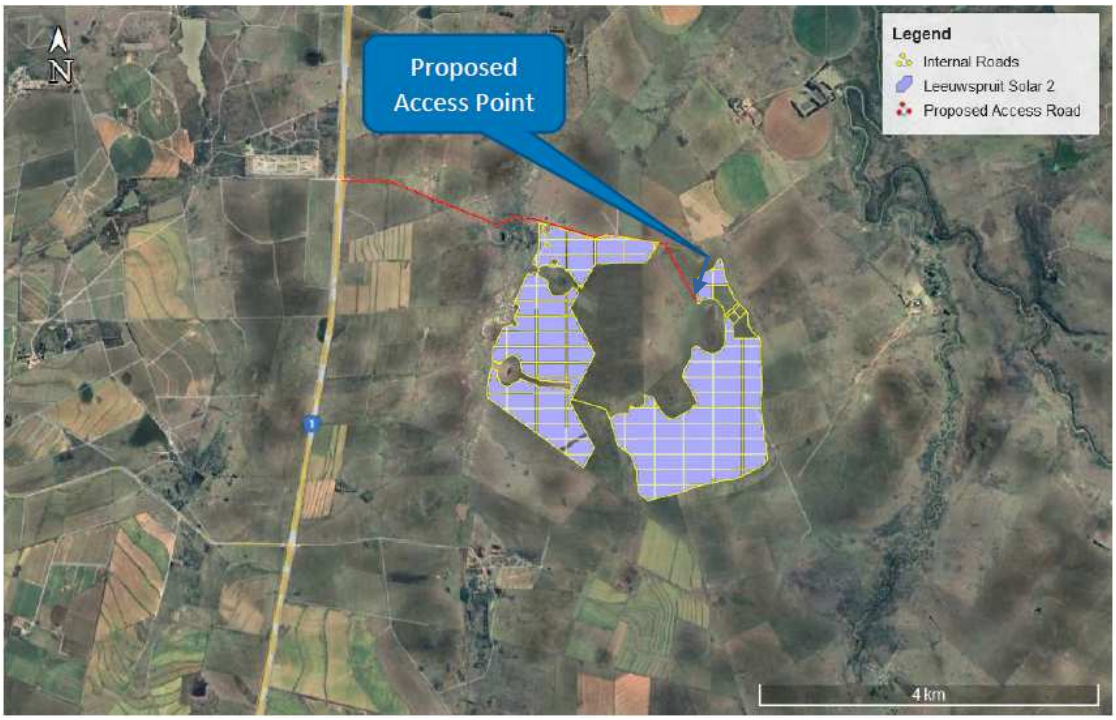


Figure 19: External roads towards project site (Patandin, 2023) (Layout Alternative 2)

9.8.6 Stormwater

Construction

Best environmental practices will be implemented during construction to manage stormwater. These measures will be included in the EMPr.

Operation

The stormwater run-off along the main access road will be controlled by side swales and dispersed in a controlled manner at regular intervals. Stormwater run-off from the buildings will be disposed of through soakaways. A formal piped stormwater system is not envisaged for the wider site. Water will be managed on the surface and dispersed into natural drainage routes.

9.8.7 Electricity

Construction

The EPC Contractor will be responsible for the supply of electricity during construction. The electricity supply will be obtained from diesel generators and / or temporary supply via cables from the site power grid.

Operation

The electricity will be supplied by the plant during daylight hours (off-peak times – 07:00 to 17:00). The BESS will supply electricity during night hours (peak times – 05:00 to 07:00 and 17:00 to 19:00). During other times electricity will be supplied from the power grid.

9.8.8 Laydown Areas

Construction

A laydown area will be required during the construction phase. The proposed temporary laydown area of approximately 7 ha will be located next to the MTS.

Operation

A 1 ha permanent laydown area will be utilised during the operational phase.

9.8.9 Construction Workers

Construction

The appointed Contractor will mostly make use of skilled labour for the construction of the facility and its associated infrastructure. In those instances where casual labour is required, the Applicant will request that such persons are sourced from local communities, as far as possible.

10 ALTERNATIVES

10.1 Introduction

Alternatives are the different ways in which the Project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for a project.

The sub-sections to follow discuss the project alternatives considered during the EIA process. A comparative analysis of feasible alternatives from environmental (including specialist input) and technical perspectives is provided in **Section 14** below.

10.2 Site Alternatives

No site alternatives are proposed for this Project. Favourable location factors for the PV Site include suitable solar irradiation levels, short distance to grid connection point, flat topography, suitable site access and availability of land.

10.3 Layout / Design Alternatives

The extent of the site allows for the identification of layout/design alternatives to manage impacts to environmental sensitivity. Layout Alternative 1 constitutes the initial layout contemplated during the Scoping Phase. During the course of the EIA process, the layout was revised based on the findings of the fieldwork of the Terrestrial and Aquatic Ecologists to avoid sensitive features. The new layout is known as Layout Alternative 2. The alternative layouts are further discussed in **Section 14** below.

10.4 Technology Alternatives

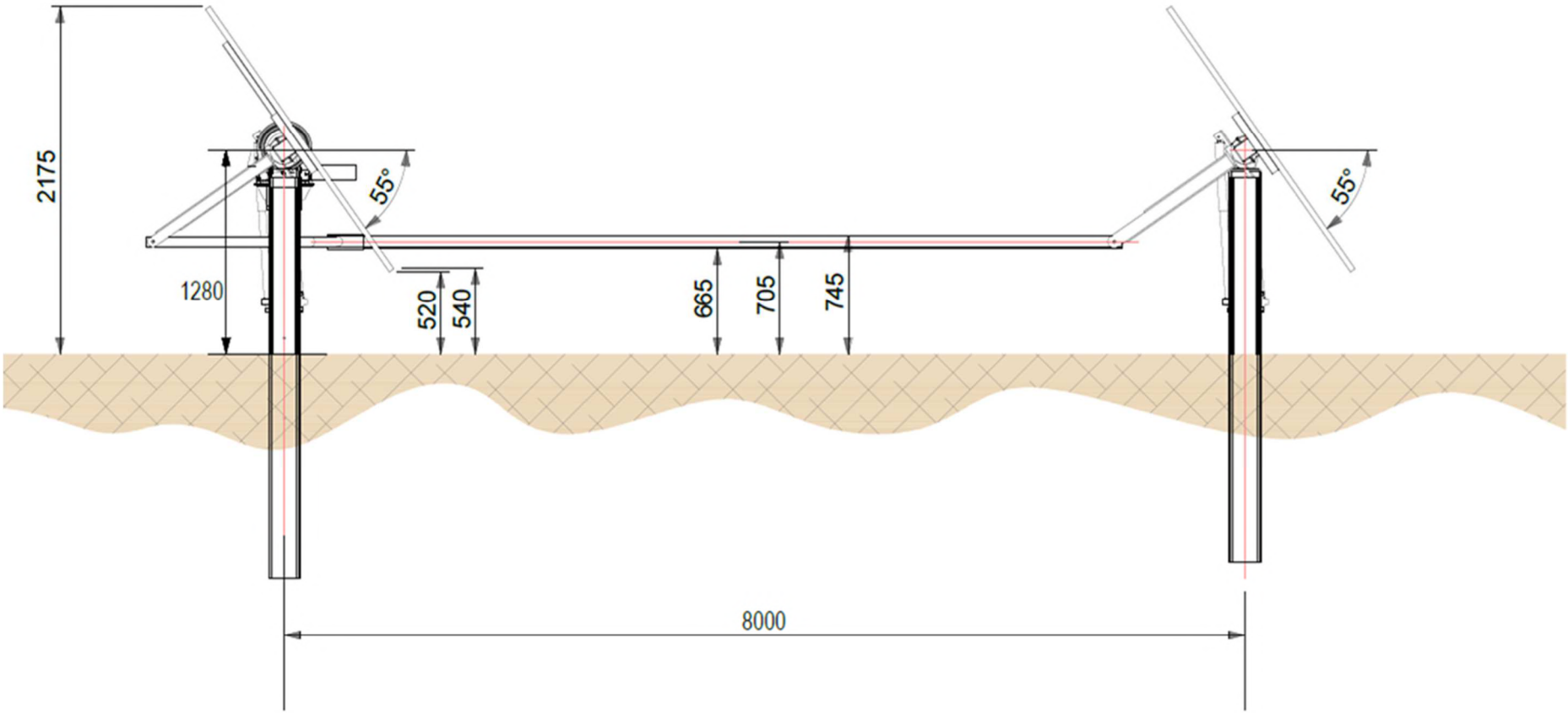
10.4.1 PV Technology

Solar PV technology consists of either monofacial or bifacial solar panels mounted on either a fixed-tilt, single-axis tracking, and/or double-axis tracking system. A side view of an example of a tracker mounting structure is provided in **Figure 21** below.

A bifacial solar panel receives irradiation on both sides of the panel, which increases the yield, while monofacial solar panels that only receive power on one of its sides (see **Figure 20** below).

Figure 20: Monofacial (top) and bifacial (bottom) solar panels
(https://www.bluestemenergysolutions.com/bifacial-versus-monofacial-solar-panels-an-analysis/)

The choice of PV technology will be selected during the final design phase, and as such, is not presented as alternatives in this EIA. It should be noted that the choice of panel technology will not affect any of the impacts or the outcome of the EIA.



NTS

Figure 21: Side view of proposed tracker mounting structure

10.4.2 BESS Technology

The BESS can be broken into solid state and flow battery systems (refer to **Section 9.4** above).

A single battery technology, namely solid state, is anticipated to be implemented for the Project.

10.5 No-Go Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the Project is included in the assessment of the alternatives.

The “no-go option” is evaluated in **Section 13.28** below to understand the implications of the Project not proceeding.

11 PROFILE OF THE RECEIVING ENVIRONMENT

11.1 Introduction

This section provides a general description of the status quo of the receiving environment in the Project Area. This serves to provide the context within which the EIA was conducted. The study area includes the entire footprint of the Project, including the proposed Solar PV Plant and the power line (100m wide corridor assessed). This section allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed Project. The potential impacts to the receiving environment are discussed in **Section 13** below.

Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. The reader is referred to **Section 12** below for more elaborate descriptions of the specialist studies and their findings for specific environmental features.

11.2 Land Use and Land Cover

The Project is located approximately 18km to the south of Kroonstad's CBD. The areas affected by the proposed Project footprint are rural in nature. Views of the Project's PV Site are provided in **Figure 22** below.

Figure 22: Eastern (left) and North-western (right) views of the PV Site

The land cover is shown in **Figure 23** below. According to Gouws (2023), the site is used for cattle farming.

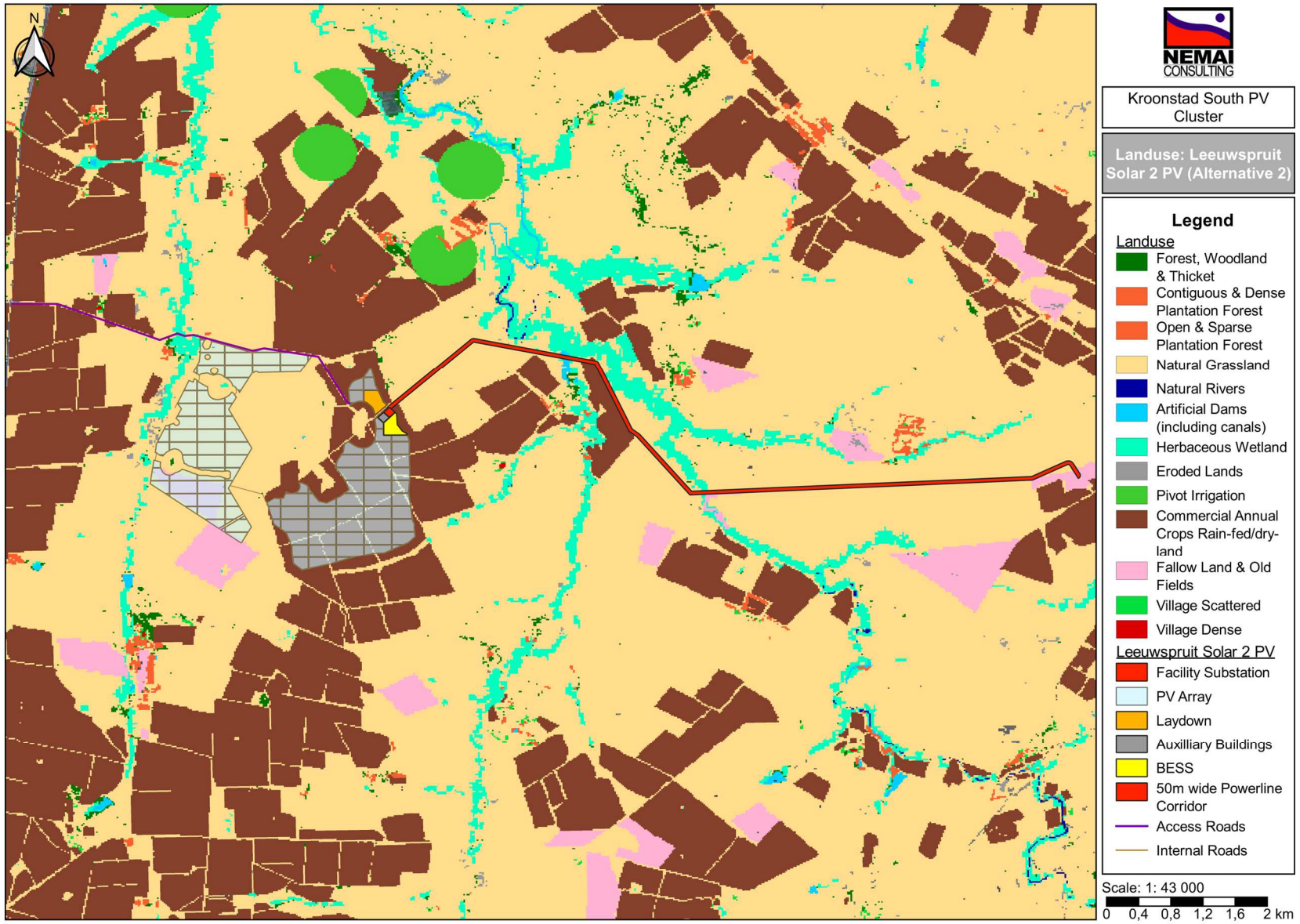


Figure 23: **Land cover in Project Area (Layout Alternative 2 shown)**

11.3 Climate

The climate here is considered to be a local steppe climate. There is little rainfall throughout the year. This climate is considered to be BSk according to the Köppen-Geiger climate classification.

The mean minimum and maximum temperatures over the year are shown in **Figure 24** below. The temperature averages 17.4°C. February is the warmest month of the year. The temperature in February averages 22.6°C. The lowest average temperatures in the year occur in July, when it is around 9.7°C.

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	22.6 °C (72.7) °F	21.9 °C (71.4) °F	20.5 °C (68.9) °F	16.9 °C (62.4) °F	13.3 °C (55.9) °F	9.9 °C (49.8) °F	9.7 °C (49.5) °F	13 °C (55.5) °F	17.3 °C (63.2) °F	20 °C (67.9) °F	21.2 °C (70.2) °F	22.2 °C (72) °F
Min. Temperature °C (°F)	16.7 °C (62.1) °F	16.3 °C (61.3) °F	14.7 °C (58.4) °F	11 °C (51.7) °F	6.7 °C (44) °F	3.1 °C (37.6) °F	2.6 °C (36.6) °F	5.4 °C (41.7) °F	9.4 °C (48.8) °F	12.5 °C (54.6) °F	14.2 °C (57.5) °F	16 °C (60.8) °F
Max. Temperature °C (°F)	28.9 °C (84) °F	27.9 °C (82.2) °F	26.8 °C (80.2) °F	23.4 °C (74) °F	20.5 °C (68.9) °F	17.5 °C (63.6) °F	17.7 °C (63.8) °F	21.2 °C (70.1) °F	25.4 °C (77.7) °F	27.6 °C (81.6) °F	28.5 °C (83.3) °F	28.8 °C (83.9) °F
Precipitation / Rainfall mm (in)	105 (4)	83 (3)	73 (2)	47 (1)	21 (0)	12 (0)	7 (0)	15 (0)	15 (0)	60 (2)	70 (2)	107 (4)
Humidity(%)	55%	57%	56%	56%	52%	51%	44%	37%	32%	38%	43%	51%
Rainy days (d)	10	9	8	5	2	1	1	2	2	6	8	10
avg. Sun hours (hours)	10.8	10.5	9.8	9.1	9.0	8.8	9.1	9.6	10.2	10.7	11.1	11.2

Figure 24: Average minimum and maximum temperatures in Kroonstad (Data: 1991 – 2021)
(Copyright © 2022 www. climate-data.org)

The greatest amount of precipitation occurs in December, with an average of 107mm as shown in Figure **25** below.

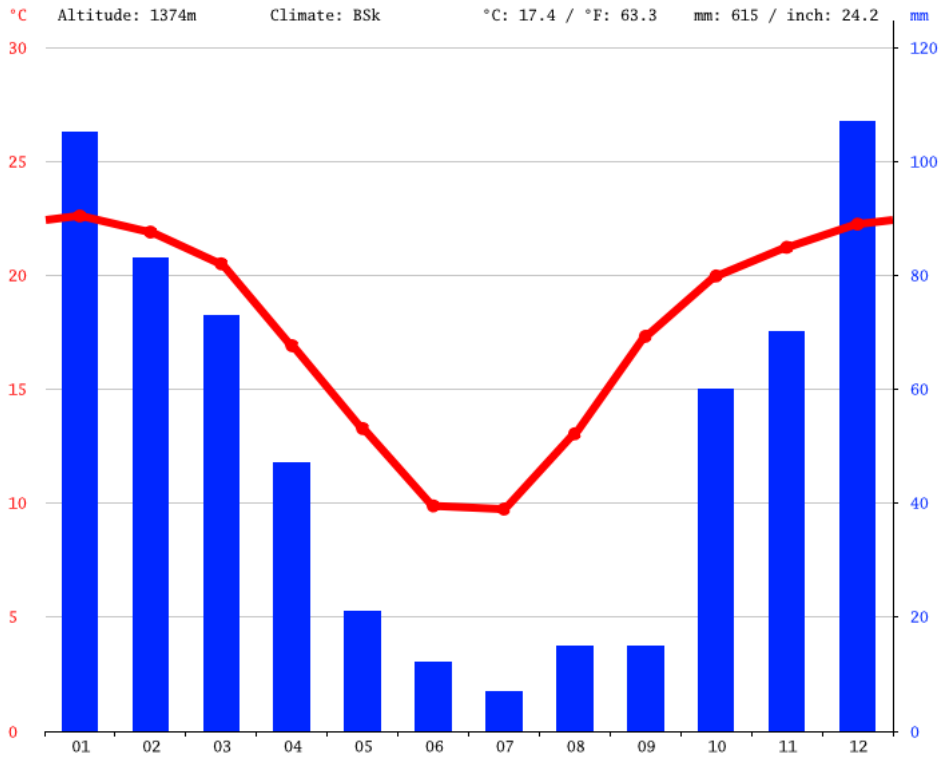


Figure 25: Average precipitation for the year
(Copyright © 2022 www. climate-data.org)

11.4 Geology and Soil

The Project Area is underlain by Sedimentary mudstones and sandstone mainly of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) as well as those of the Ecca Group (Karoo Supergroup) found in the extreme northern section of this grassland, giving rise to vertic, melanic and red soils (typical forms are Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg.

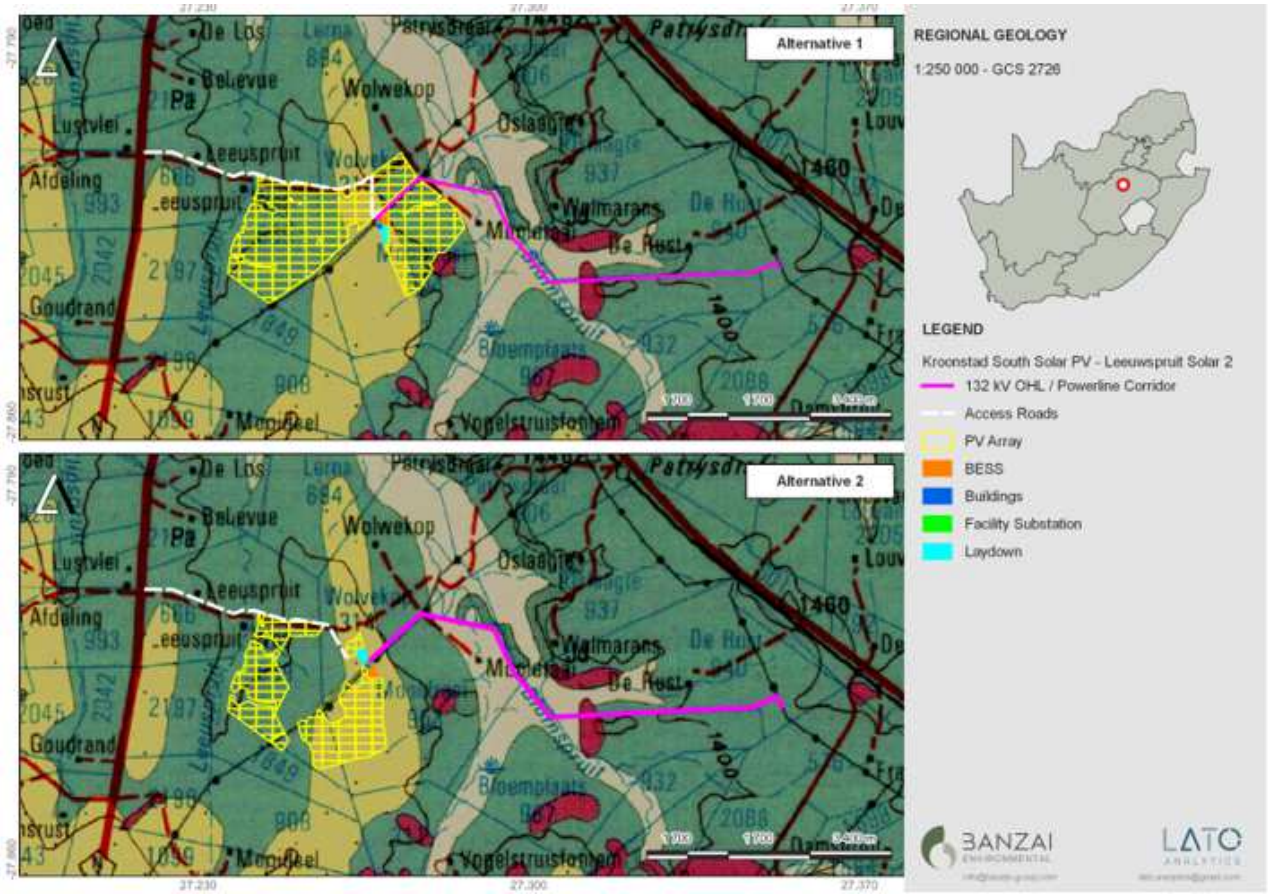


Figure 26: Extract of the 1:250 000 Kroonstad 2726 (2000) Geological Map (Council for Geosciences, Pretoria). The proposed development is underlain by Quaternary aeolian sand (Os, yellow), the Adelaide Subgroup (Pa, green) (Beaufort Group, Karoo Supergroup) as well as Jurassic dolerite (Jd, red) (Butler, 2023)

The following soil types were identified in the Project Area as part of the Agricultural Compliance Statement (Gouws, 2023) (see **Figure 27** below):

- Gs/R is shallow greyish brown soils with scattered rock outcrops. These soils are sometimes cultivated but is low potential cropping land. The dominant soil forms that occur on this unit is Glenrosa and Cartref.
- Cv/Oa are greyish and yellowish-brown topsoil that overlies greyish subsoil. The soils are very susceptible to compaction and erosion.
- Duplex 300 soils are moderately deep greyish brown soils. The Swartland soils are highly erodible, but where the structured layer is deeper than 500mm, it is sometimes ploughed. The soil has a medium potential for crop production.

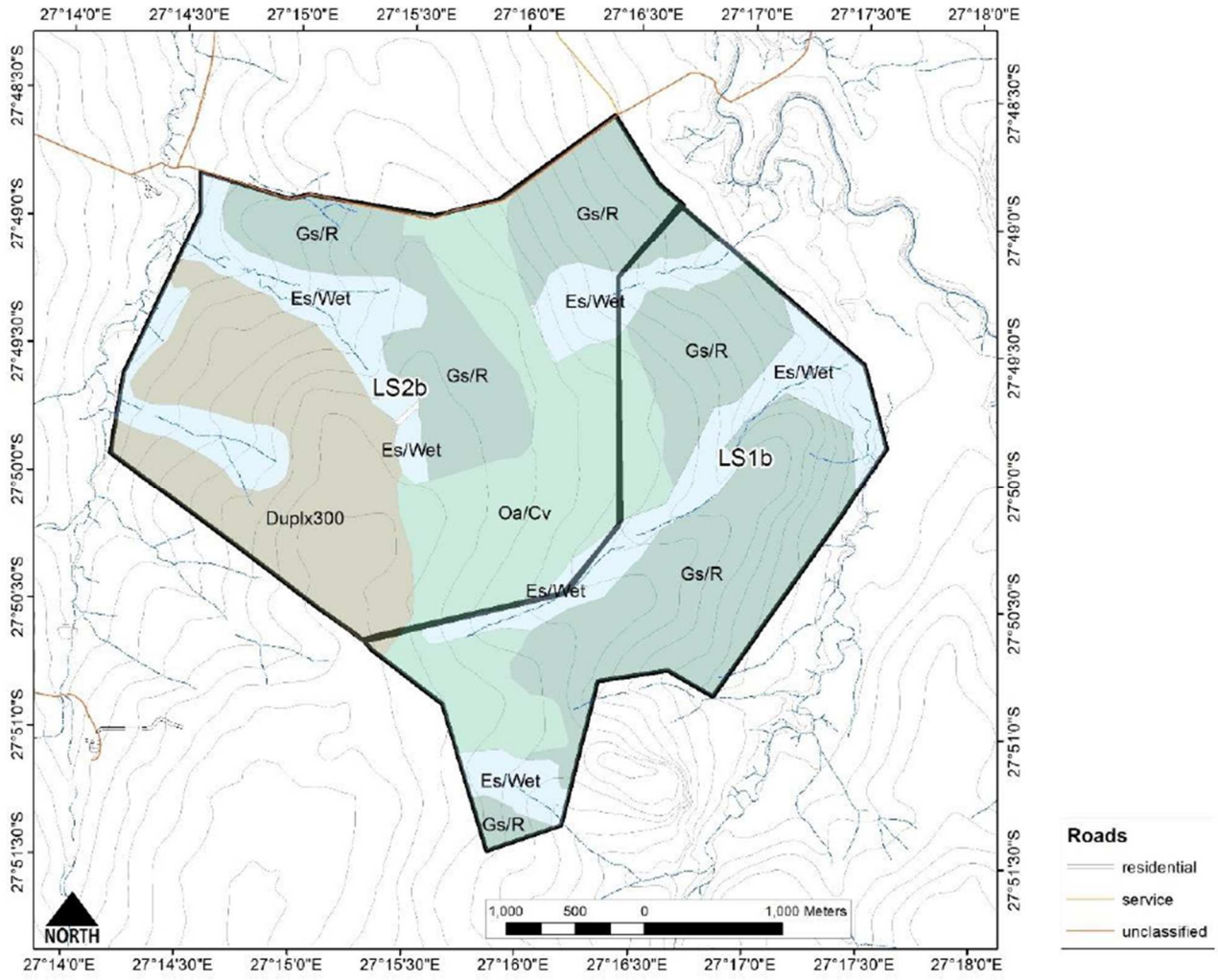


Figure 27: **Soil map (reconnaissance soil survey) (Gouws, 2023)**

According to Gouws (2023), the mudstone of the Beaufort formations are notorious for their high erodibility, which was also encountered on the site (refer to **Figure 28** below).

Figure 28: **Left - sheet erosion. Right - Erodible soils common in the Project Area (Gouws, 2023)**

11.5 Topography

In terms of the SOTER database (see **Figure 29** below), the landform encountered at most of the PV Site and power line route is characterised as a plain at a medium and high level.

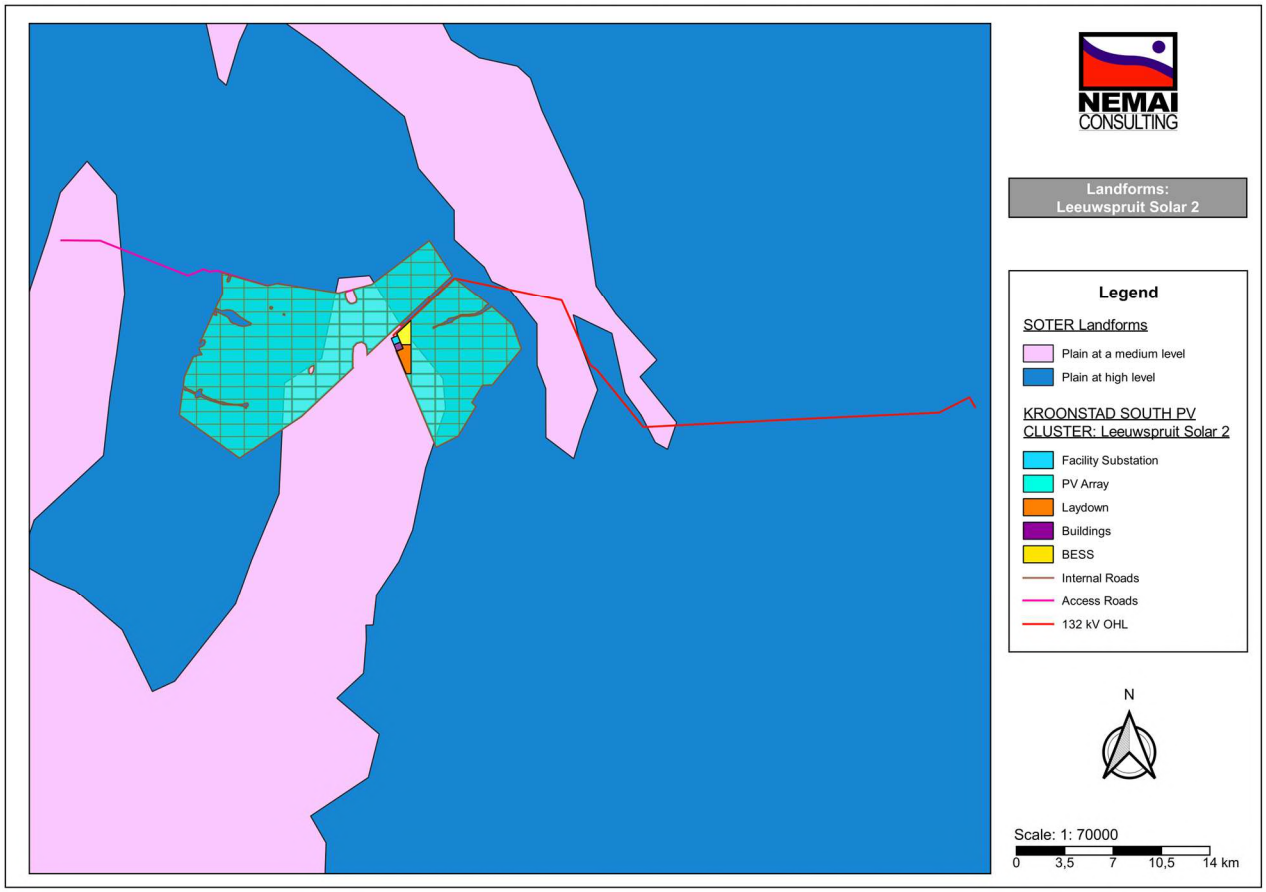


Figure 29: SOTER Landforms (Layout Alternative 1 shown)

The findings of the Visual Impact Assessment that was undertaken for the Project are contained in **Section 12.10** below. According to Viljoen (2023), the site elevation ranges from approximately 1382 to 1439 metres above mean sea level (mamsl). The terrain is predominantly flat, with a few small hills scattered throughout the area. The topography or terrain morphology of the region is broadly described as plains with low to moderate relief. The main topographical feature on the site is a drainage line to the east of the Project Area that flows from south to north. According to Viljoen (2023), the topography is considered to have a moderate value.

The Visual Impact Assessment identified the following sensitive receptors (Viljoen, 2023):

- People who live or work in the area, and who will be frequently exposed to the project components (resident receptors); and
- People who travel through the area and are only temporarily exposed to the project components (transient receptors). The N1 highway and R76 are the main roads located near the proposed site. The roads situated near the site are predominately used for access to the surrounding areas, tourism attractions, residential areas, commercial areas and agricultural activities. The

Project Area may potentially be visible from the N1 and R76 while the visibility may be reduced due to vegetation obstructing the view from the roads at certain points.

11.6 Surface Water

The information contained in the sub-sections to follow was extracted from the Freshwater Assessment (van Rooyen, 2023). Refer to **Sections 12.4** below for a synopsis of the study. The specialist report is contained in **Appendix E1**.

11.6.1 Water Management Area and Quaternary Catchment

The Project Area is situated within the middle region of the Vaal Water Management Area (WMA) (see **Figure 30**). The major rivers within this region are the Schoonspruit, Rhenoster, Vals, Vet and Vaal rivers. The Middle Vaal is very dependent on the water releases from the Upper Vaal region to meet its bulk water requirements for urban, mining, and industrial sectors. In addition, local resources are mainly being used for irrigation and smaller towns (DWAF, 2004). Within the Vaal WMA, mining activities (gold mines) threatens water quality while large volumes of water are returned via treated effluent to the river systems from the urban areas and mine dewatering which further places stress on the water quality of this sub-catchment (DWAF, 2004).

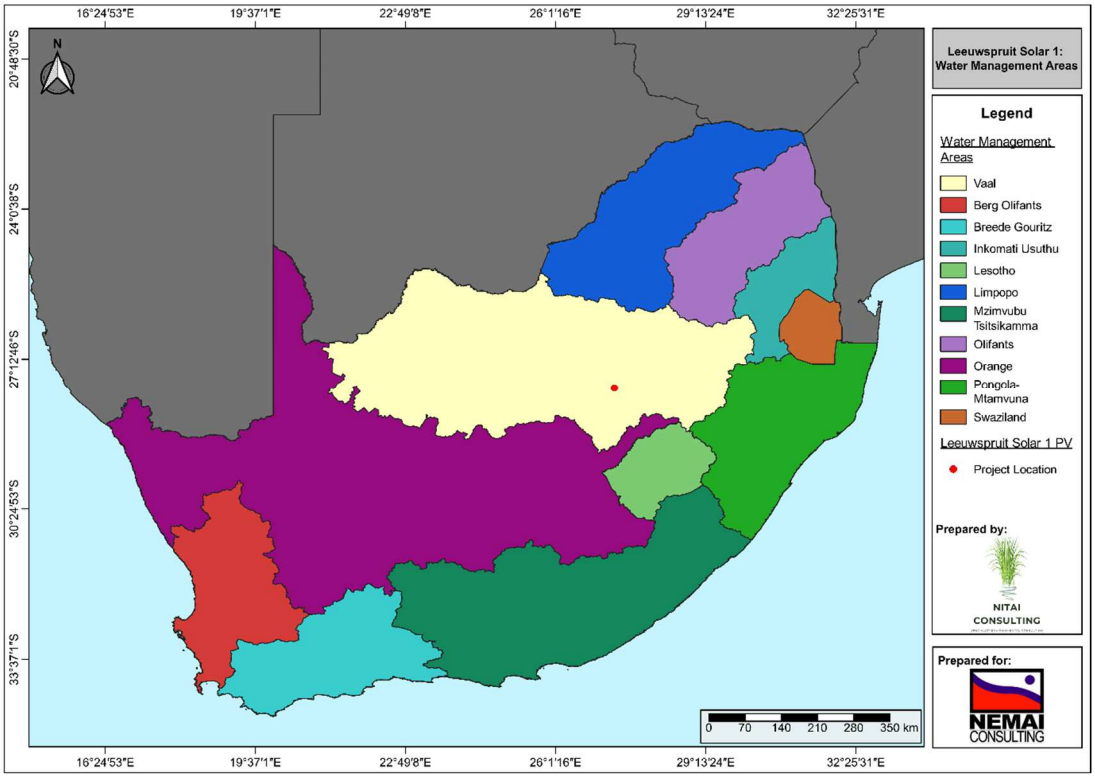


Figure 30: Project Area in relation to WMA's (van Rooyen, 2023)

The Project Area is located within the C60F Quaternary Catchment (Enslinspruit and Blomspruit sub-catchment) (see **Figure 31**). According to DWS (2014), the Present Ecological State (PES) as

well as the Ecological Importance and Sensitivity (EIS) for the C60F Quaternary Catchment is C (Moderately modified) and C (Moderate), respectively. The Recommended Ecological Category (REC) for both the Enslinspruit and Blomspruit sub-catchments has been determined as C (Moderate) (DWS, 2014).

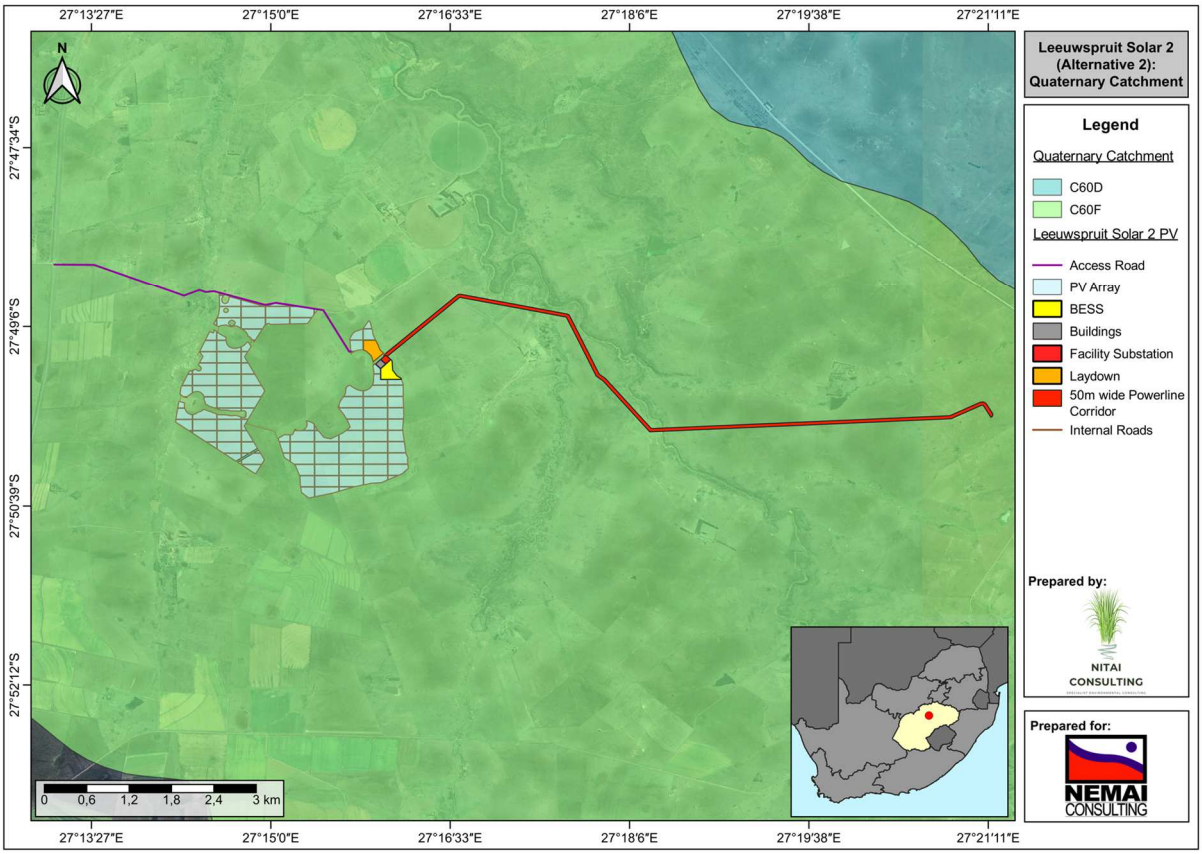


Figure 31: Project Area in relation to Quaternary Catchment (van Rooyen, 2023) (Layout Alternative 2 shown)

11.6.2 Watercourses

The map in **Figure 32** below shows the Project Area in relation to watercourses. The Blomspruit (a tributary of the Vals River) is the largest perennial river that flows in a northerly direction before draining into the Vals River further north. In addition, the Enslinspruit (a tributary of the Blomspruit) flows adjacent to the study area and drains into the Blomspruit in the north. Several small non-perennial rivers are also found within the central, eastern and southern parts of the Project Area. A few agricultural dams are located along these non-perennial rivers. The Enslinspruit and Blomspruit form part of the larger Vals River Catchment, which is a tributary of the Vaal River and originates in the Eastern Free State near the town Bethlehem and flows westerly from upstream of Kroonstad past Khotsong and Bothaville before draining into the Vaal River.

Within the footprint of the Project Area there is one hydrogeomorphic (HGM) unit according to the National Biodiversity Assessment (NBA) 2018 National Wetland Map (NWM) 5 (see **Figure 33**).

Two Depression wetlands are located with 500 m of the PV site. From the NWM 5 spatial data, the majority of wetlands close to the Project Area are of least concern and are poorly protected.

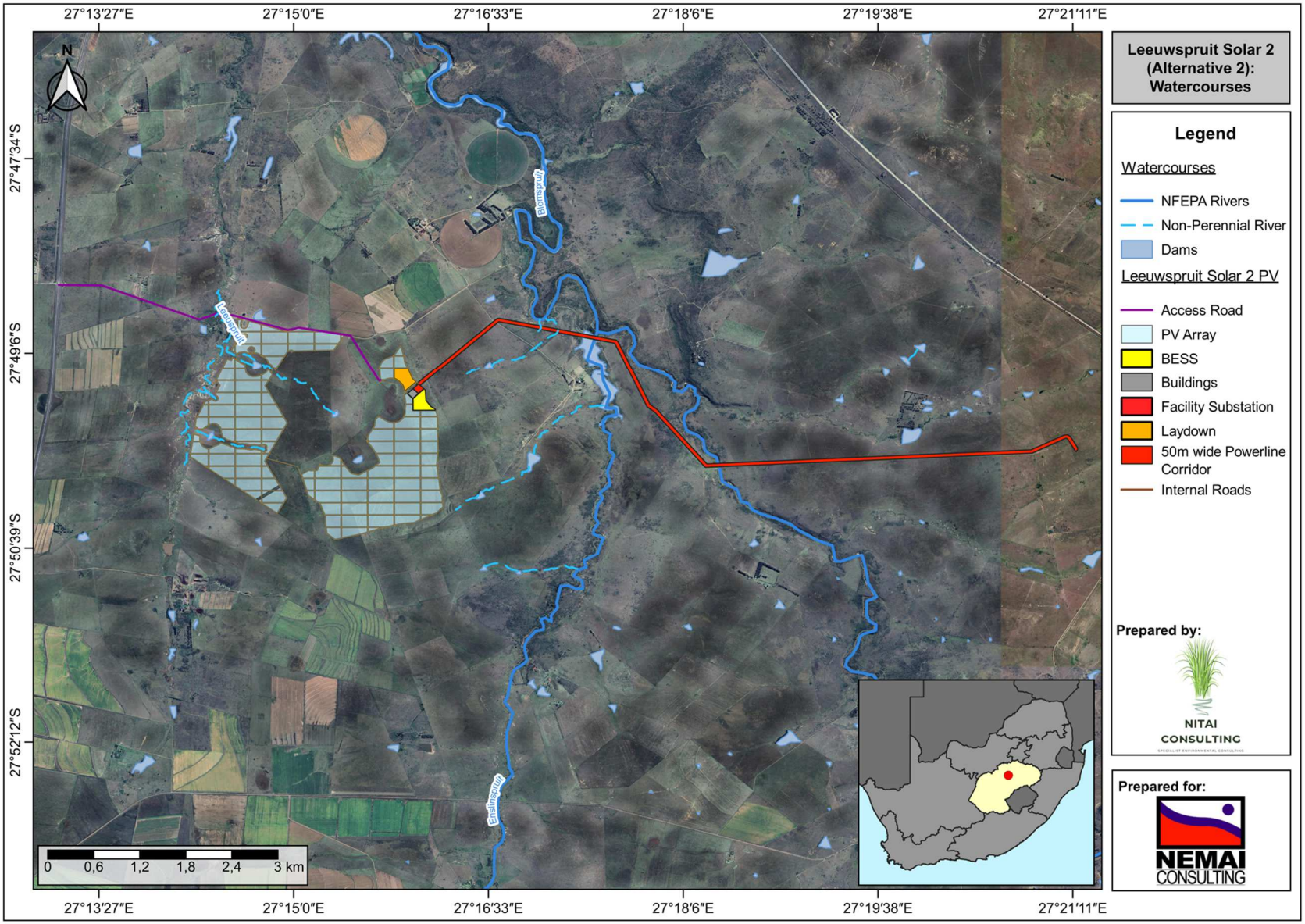


Figure 32: **Watercourses in relation to Project Area (van Rooyen, 2023) (Layout Alternative 2 shown)**

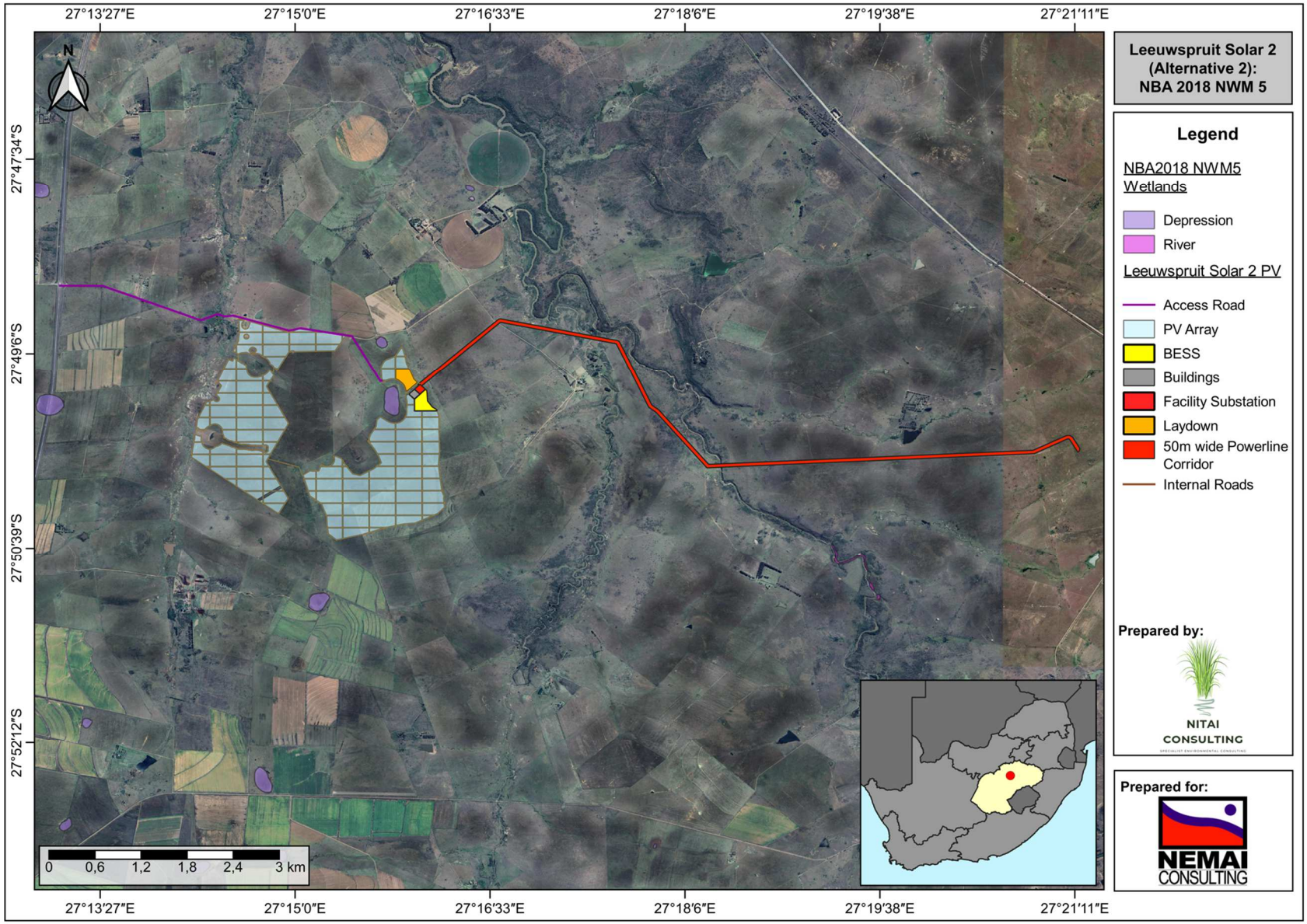


Figure 33: **NBA 2018 NWM 5 wetland HGM units in relation to Project Area (van Rooyen, 2023) (Layout Alternative 2 shown)**

11.7 Terrestrial Ecology

Information contained in the sub-sections below was extracted from the following specialist studies:

- Terrestrial Biodiversity Assessment (Human, 2023) - refer to **Sections 12.5** below for a synopsis of the study. The specialist report is contained in **Appendix E2**; and
- Avifauna Impact Assessment (Steyn, 2023) - refer to **Sections 12.6** below for a synopsis of the study. The specialist report is contained in **Appendix E3**.

11.7.1 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC). The Project Area for Alternative 1 overlaps with LC and EN ecosystems, while Alternative 2 overlaps with a LC ecosystem save for a small section of the powerline route (see **Figure 34**).

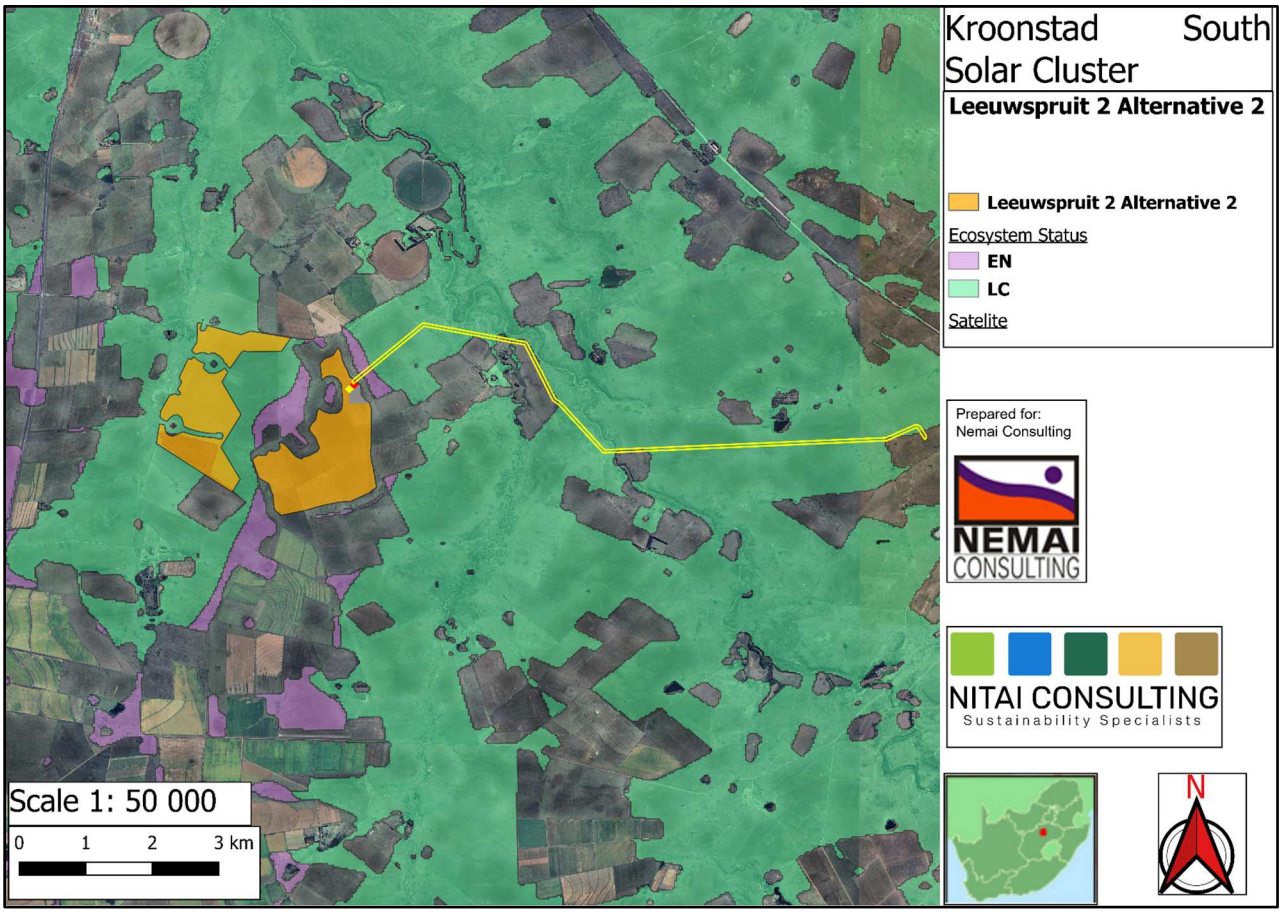


Figure 34: **Ecosystem threat status associated with the Project Area (Human, 2023) (Layout Alternative 2)**

11.7.2 Protected Areas

According to the protected area spatial datasets from SAPAD (2022) and SACAD (2022), the Seredipendie Private Nature Reserve is located to the south-east of the site with the project powerline falling within 5km (see **Figure 35**). The powerline route also overlaps with a priority focus area for expansion according to the 2017 National Protected Area Expansion Strategy (NPAES) dataset (see **Figure 36**).

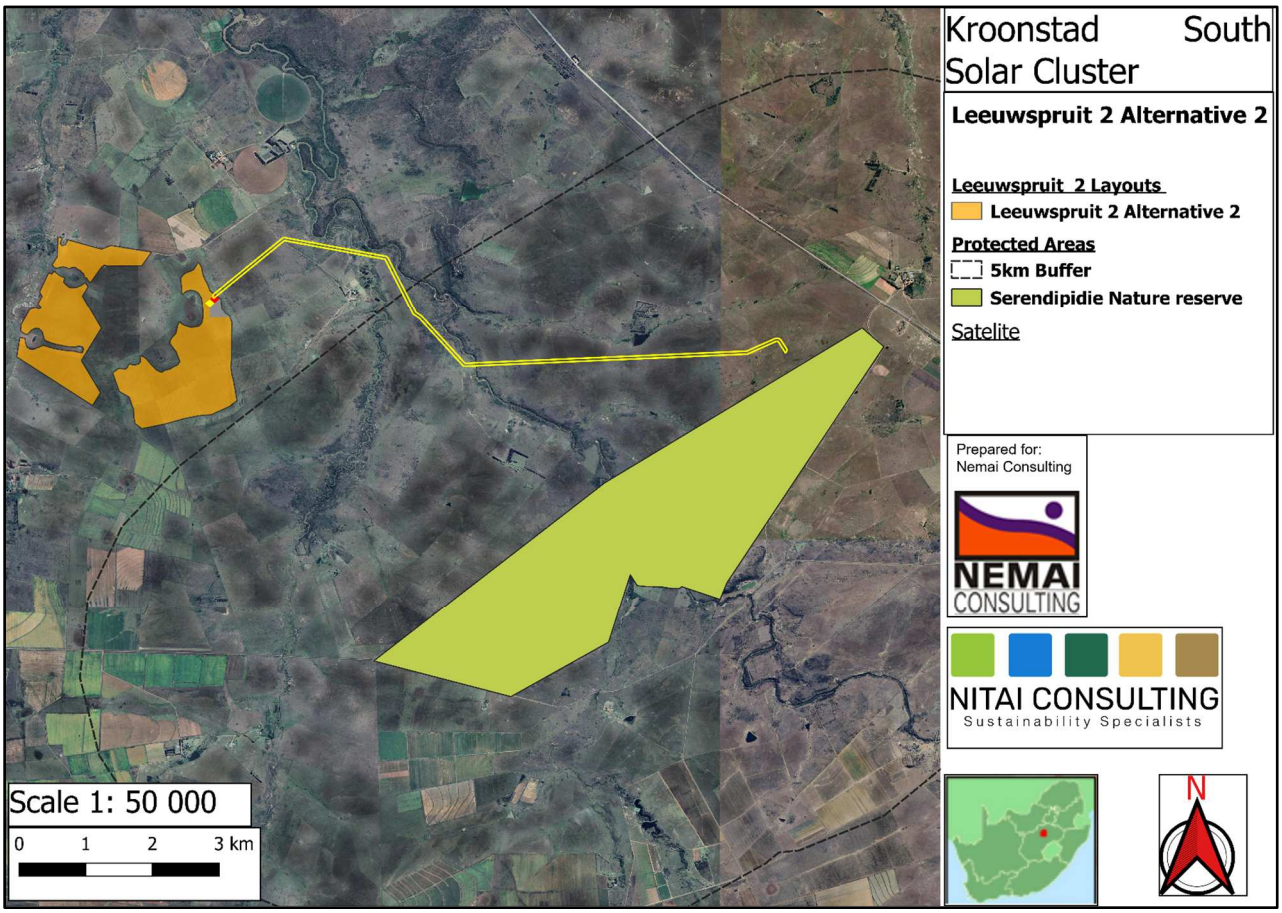


Figure 35: Project Area in relation to Protected Areas (Human, 2023) (Layout Alternative 2)

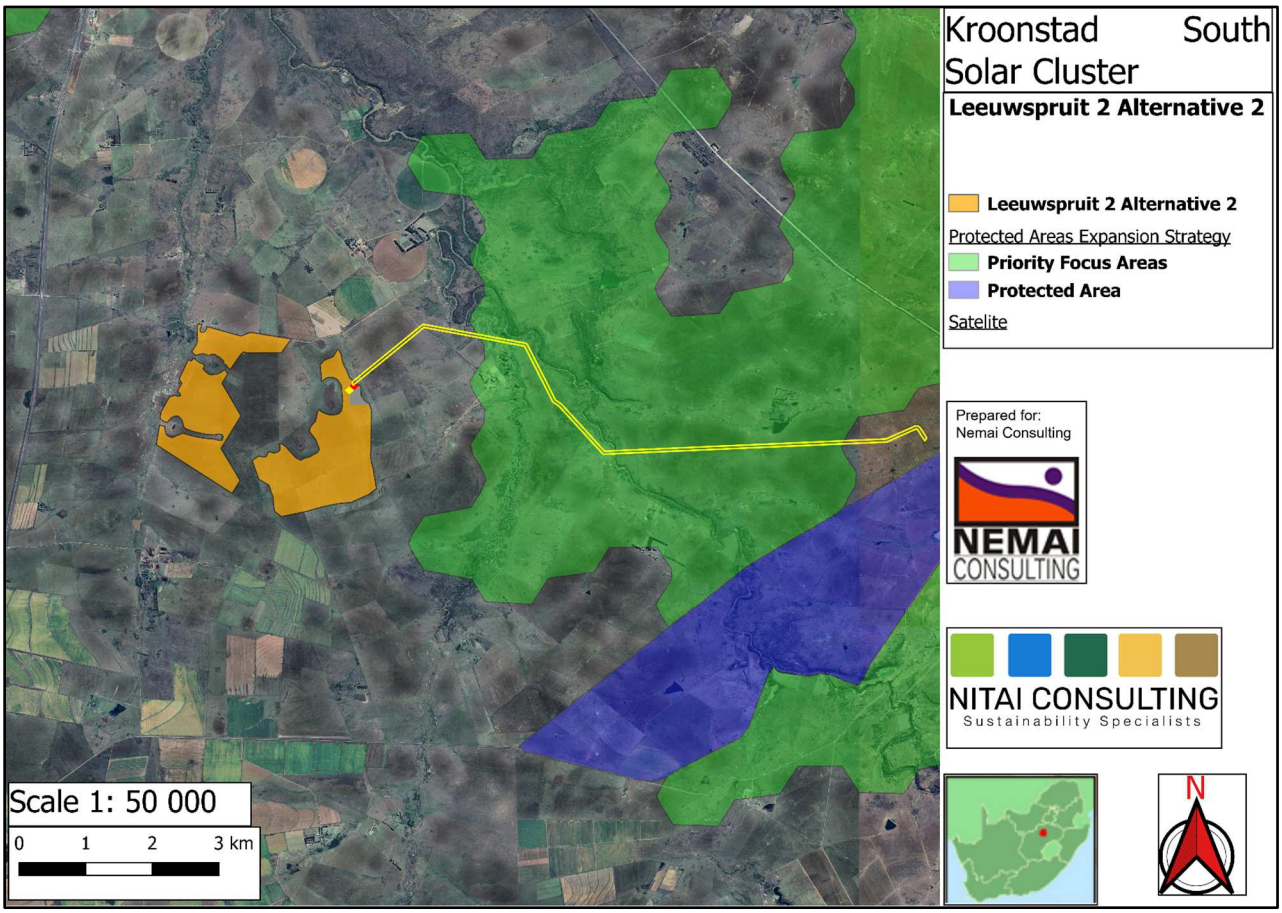


Figure 36: Project Area in relation to NPAES (Human, 2023) (Layout Alternative 2)

11.7.3 Critical Biodiversity Areas and Ecological Support Areas

The Free State Biodiversity Plan (2015) (Collins, 2016) presents the following categories based on biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1;
- Critical Biodiversity Area 2;
- Ecological Support Area 1;
- Ecological Support Area 2;
- Other Natural Area;
- Protected Area; and
- Degraded.

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services.

Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in

delivering ecosystem services. Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs.

Degraded areas are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations).

According to the Free State Biodiversity Plan, the Project Area falls within CBA1, CBA2, ESA1, ESA2, Other and Degraded areas (see **Figure 37**).

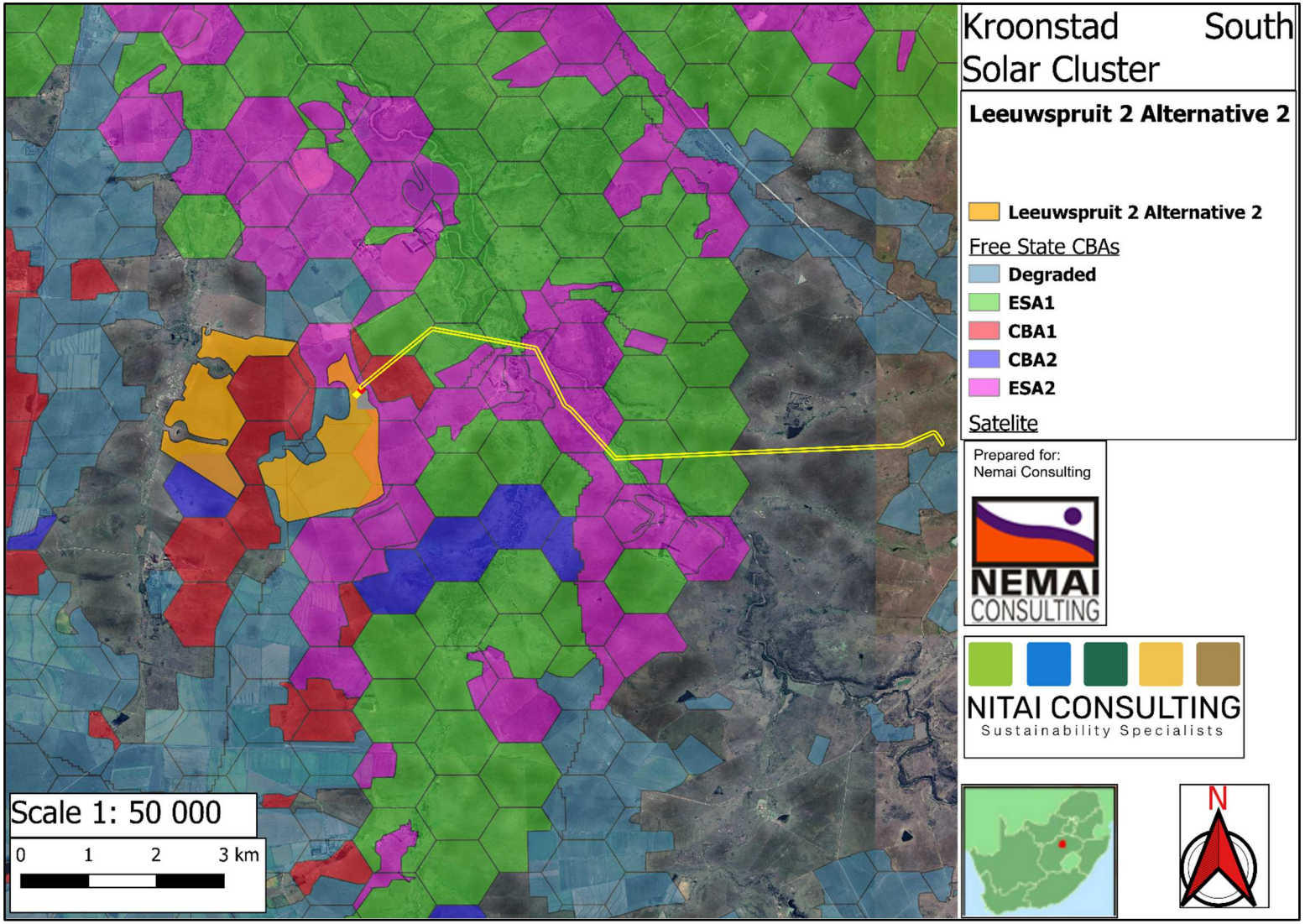


Figure 37: **Project Area in relation to the Free State Biodiversity Plan (Layout Alternative 2)**

11.7.4 Flora

11.7.4.1 Biome and Vegetation Type

The Project Area is situated within the Grassland Biome and falls within the Central free Sate Grassland and the Vaal-Vat Sandy Grassland (see **Figure 38**).

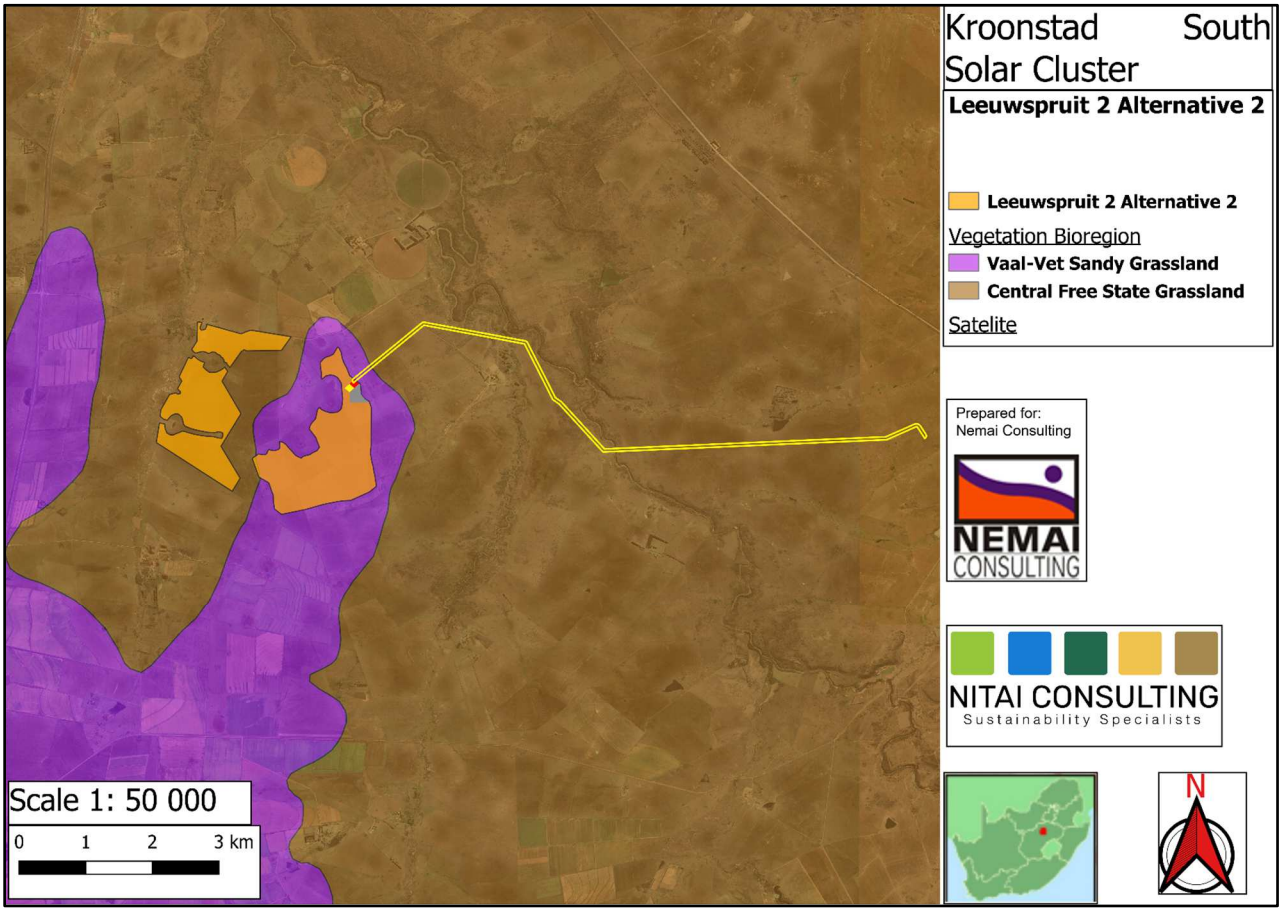


Figure 38: Vegetation type associated with the Project Area (Human, 2023)

The conservation status of the different Central Free State Grassland and Vaal-Vet Sandy Grassland types occurring in the Project Area is presented in **Table 11** and **Table 12** below, respectively.

Table 11: Conservation status of Central Free State Grassland types occurring in Project Area (SANBI, 2021)

Ecosystem Detail	Central free State Grassland
Reference number	Gh6
Threat status	LC (Least Concern)
Listed under criterion	(No Criteria for LC)
Biome	Grassland
Original area	1601284 (ha)
Remaining area	66 %
Protected area	2.3 %
Description	A broad zone from around Sasolburg in the north to Dewetsdorp in the south. Other major settlements located within this unit include Kroonstad, Ventersburg, Steynsrus, Winburg, Lindley and Edenville. Undulating plains supporting short grassland, in natural condition dominated by Themeda triandra while Eragrostis curvula and E.

	chloromelas become dominant in degraded habitats. Dwarf karoo bushes establish in severely degraded clayey bottomlands. Overgrazed and trampled low-lying areas with heavy clayey soils are prone to Acacia karroo encroachment. Pressures & threats: Agriculture is a key pressure on this ecosystem type, with 3958.7 km^2 of the ecosystem consisting of croplands and a further 879.11 km^2 of old fields. Urban development has added to the pressures with 203.19 km^2 of the ecosystem consisting of built-up areas. Approximately 187.2 km^2 covered by artificial water bodies. Additionally, the ecosystem is degraded by erosion and bush encroachment, especially by dwarf karoo shrubs (Mucina & Rutherford, 2006).
Notes	Central Free State Grassland has experienced low rates of natural habitat loss and biotic disruptions, placing this ecosystem at low risk of collapse. Scope: Global & national status (global extent assessed).

Table 12: Conservation status of different Vaal-Vet Sandy Grassland types occurring in the Project Area (SANBI, 2021)

Ecosystem Detail	Vaal-Vet Sandy Grassland
Reference number	Gh10
Threat status	Endangered
Listed under criterion	A (Criterion A)
Biome	Grassland
Original area	2284382 (ha)
Remaining area	28 %
Protected area	0.7 %
Description	South of Lichtenburg and Ventersdorp, stretching southwards to Klerksdorp, Leeudoringstad, Bothaville and to the Brandfort area north of Bloemfontein. Plains-dominated landscape with some scattered, slightly irregular undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element. Dominance of Themeda triandra is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall. Pressures & threats: This ecosystem has a broad range of pressures. This ecosystem has experienced a loss in natural habitat of approximately 1 139.14 km^2 in the last 28 years (1990-2018). These spatial declines have been primarily driven by agriculture, with 13757 km^2 of the ecosystem consisting of croplands and a further 2092 km^2 of old fields. Urban development has also been a pressure with 262.74 km^2 of the ecosystem consisting of built-up areas. Additionally, mining has transformed 97.19 km^2 of the ecosystem. Artificial water bodies cover 102.26 km^2. It is further degraded by overgrazing (Mucina & Rutherford, 2006).
Notes	Trigger Sub-Criteria: A3 - National land cover data show that Vaal-Vet Sandy Grassland has experienced extensive spatial declines of approximately 72 % since 1750. Scope: Global & national status (global extent assessed)

11.7.4.2 Expected Flora Species

Based on the Plants of Southern Africa (BODATSA-POSA, 2019) database, 41 plant species could potentially occur in the Project Area.

The Screening Tool did not identify any Species of Conservation Concern (SCC) and rated the area's sensitivity in terms of the relative plant species theme as "Low".

11.7.4.3 Field Survey

A total of 70 tree, shrub, herbaceous and graminoid plant species were recorded in the Project Area during the field assessment (see **Table 13**). Nine Invasive Alien Plant species were recorded within the Project Area. Four of these species are listed under the Alien and Invasive Species List 2020, Government Gazette No. GN1003 as Category 1b.

Table 13: Flora species recorded in the Project Area (Human, 2023)

Family	Taxon	Common name	Protection Status	Endemism	Invasive/ Protected
Amaranthaceae	*Alternanthera pungens,*	Paper Thorn	LC	Not Indigenous, naturalised	
Amaranthaceae	*Gomphrena celosioides*	Batchelor's button	LC	Not Indigenous, naturalised	
Amaranthaceae	*Guilleminea densa,*	Small matweed	LC	Not Indigenous, naturalised	
Amaranthaceae	*Kyphocarpa angustifolia*	Silver Burrweed	LC	Indigenous	
Asparagaceae	*Asparagus laricinus*	Emperor's asparagus	LC	Indigenous	
Asteraceae	*Arctotis arctotoides,*	Botter blom	LC	Indigenous	
Asteraceae	*Felicia muricata*	Bloublommetjie	LC	Indigenous; Endemic	
Asteraceae	*Geigeria burkei,*	Vermeerbos	LC	Indigenous	
Asteraceae	*Helichrysum acutatum*	Sticky Everlasting	Protected FS	Indigenous	Protected FS Schedule 6
Asteraceae	*Helichrysum nudifolium*	Hottentot's Tea	Protected FS	Indigenous	Protected FS Schedule 6
Asteraceae	*Helichrysum rugulosum*	Wrinkly Everlasting	Protected FS	Indigenous	
Asteraceae	*Nidorella hottentotta,*	Grassland Vleiweed	LC	Indigenous	
Asteraceae	*Nidorella resedifolia*	Stinkkruid	LC	Indigenous	
Asteraceae	*Senecio inaequidens*	Canary Weed	LC	Indigenous	
Asteraceae	*Seriphium plumosa*	Bankrupt bush	LC	Indigenous	
Asteraceae	*Tagetes minuta*	Khaki weed	LC	Not indigenous; Naturalised; Invasive	
Asteraceae	*Xanthium strumarium*	Large Cocklebur	LC	Not indigenous; Naturalised; Invasive	NEMBA 1b
Asphodelaceae	*Aloe greatheadii var davyana*	Spotted leaf Aloe	Protected FS	Indigenous	Protected FS Schedule 6
Caryophyllaceae	*Pollichia campestris*	Barley Sugar Bush	LC	Indigenous	
Cyperaceae	*Bolboschoenus glaucus,*	Glaucus tuber-bulrush	LC	Indigenous	
Cyperaceae	*Bulbostylis hispidula,*	Slender Sedge	LC	Indigenous	
Cyperaceae	*Cyperus congestus,*	Purple Umbrella Sedge	LC	Indigenous	
Cyperaceae	*Cyperus denudatus,*		LC	Indigenous	
Cyperaceae	*Cyperus fastigiatus,*		LC	Indigenous	
Cyperaceae	*Kyllinga alba*	Witbiesie	LC	Indigenous	
Cyperaceae	*Kyllinga erecta,*	Greater Kyllinga	LC	Indigenous	
Dipsacaceae	*Scabiosa columbaria*	Rice Flower	LC	Indigenous	
Ebenaceae	*Diospyros lycioides*	Bluebush	LC	Indigenous	
Fabaceae	*Vachelia nilotica*	Scented-pod Acacia	LC	Indigenous	

Family	Taxon	Common name	Protection Status	Endemism	Invasive/ Protected
Fabaceae	*Vachelia robusta*	Ankle thorn	LC	Indigenous	
Geraniaceae	*Monsonia glauca*	Grey Dysentery-Herb	LC	Indigenous	
Hyacinthaceae	*Massonia jasminiflora*	Hedgehog lily	LC	Indigenous	
Juncaceae	*Juncus oxycarpus,*		LC	Indigenous	
Lamiaceae	*Leonotis leonurus*	Wild dagga	LC	Indigenous	
Lamiaceae	*Ocimum americanum,*	Wild Basil	LC	Indigenous	
Malvaceae	*Hermannia boraginiflora*	Doll's Rose	LC	Indigenous	
Malvaceae	*Hibiscus trionum,*	Venice Mallow	LC	Indigenous	
Phyllanthaceae	*Phyllanthus angolensis*		LC	Indigenous	
Poaceae	*Aristida canescens*	Pale Three Awn	LC	Indigenous	
Poaceae	*Aristida congesta subsp. barbicollis,*	Spreading Three Awn	LC	Indigenous	
Poaceae	*Aristida congesta subsp. congesta*	Tassle Three-Awn	LC	Indigenous	
Poaceae	*Brachiaria serrata,*	Velvet Signal Grass	LC	Indigenous	
Poaceae	*Chloris virgata*	Feather-top Chloris	LC	Indigenous	
Poaceae	*Cymbopogon caesius,*	Broad-leaved Turpentine Grass	LC	Indigenous	
Poaceae	*Cymbopogon pospischilii*	Bushveld turpentine Grass	LC	Indigenous	
Poaceae	*Cynodon dactylon,*	Couch Grass	LC	Indigenous	
Poaceae	*Eragrostis chloromelas,*	Blue Lovegrass	LC	Indigenous	
Poaceae	*Eragrostis curvula,*	Weeping Love Grass	LC	Indigenous	
Poaceae	*Eragrostis gummiflua*	Gum Grass	LC	Indigenous	
Poaceae	*Eragrostis obtusa*	Dew Grass	LC	Indigenous	
Poaceae	*Eragrostis superba,*	Saw tooth love Grass	LC	Indigenous	
Poaceae	*Hyparrhenia hirta*	Common Thatching grass	LC	Indigenous	
Poaceae	*Melinis repens,*	Natal Red Top	LC	Indigenous	
Poaceae	*Panicum coloratum,*	Bamboeskweek	LC	Indigenous	
Poaceae	*Panicum maximum,*	Guinea Grass	LC	Indigenous	
Poaceae	*Perotis patens.*	Cat's tail	LC	Indigenous	
Poaceae	*Setaria pumila*	Garden Bristle Grass	LC	Indigenous	
Poaceae	*Setaria sphacelate var torta*	Creeping Bristle Grass	LC	Indigenous	
Poaceae	*Sporobolus africanus.*	Rats tail dropseed	LC	Indigenous	
Poaceae	*Sporobolus ioclados*	Pan Dropseed	LC	Indigenous	

Family	Taxon	Common name	Protection Status	Endemism	Invasive/ Protected
Poaceae	*Sporobolus pyramidalis,*	Vlei Grass	LC	Indigenous	
Poaceae	*Themeda triandra*	Red Grass	LC	Indigenous	
Poaceae	*Tragus berteronianus,*	Carrot Seed Grass	LC	Indigenous	
Poaceae	*Urochloa mossambicensis*	Bushveld Signal Grass	LC	Indigenous	
Polygonaceae	*Persicaria lapathifolia*	Dock-leaved Smartweed	LC	Not Indigenous, Invasive	
Rubiaceae	*Oldenlandia herbacea*	False Spurry	LC	Indigenous	
Rubiaceae	*Pygmaeothamnus zeyheri,*	Common Sand Apple	LC	Indigenous	
Solanaceae	*Solanum elaeagnifolium*	Silverleaf Nightshade	LC	Not Indigenous, Invasive	NEMBA 1b
Solanaceae	*Solanum mauritianum*	Bugweed	LC	Not Indigenous, Invasive	NEMBA 1b
Verbenaceae	*Verbena bonariensis*	Wild Verbena	LC	Not Indigenous, Invasive	NEMBA 1b
Verbenaceae	*Verbena tenuisecta*		LC	Not indigenous; Naturalised	

The grassland areas contain variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad classification of the habitat units identified on site, which also reflects relatively uniform plant species compositional units, is as follows (refer to **Figure 63** below):

- Endangered Vaal-Vet Sandy Grassland and Healthy Grassland –
  - This habitat type is dominated by perennial grass swards of good condition and no erosion. Overall, this habitat has a high species richness and is characteristic of the vegetation bioregion. Forb diversity is high with a few geophytic forbs found throughout the area as well. Dominant grass species are *Themeda triandra*, *Setaria sphacelata* var. *sphacelata*, *Cynodon dactylon, Panicum maximum, Eragrostis obtusa, Urochloa mossambicensis, Chloris virgata* and *Setaria pumila.* Dominant forb species were *Felicia muricata*, *Helichrysum nudifolium, Nidorella resedifolia, Commelina benghalensis, Indigofera melanadenia, Bulbostylis hispidula, Scabiosa columbaria, Hypoxis hemerocallidea, Dipcadi gracillimum, Hypoxis linearis* and *Pollichia campestris*.
- Slightly Disturbed Grasslands –
  - Any areas where the original vegetation is modified due to disturbance, such as trampling, over- or under grazing, or some other factors. These areas will take longer to restore to natural grassland, even with removal of the drivers of the disturbance. These areas are mainly categorized by the presence of some pioneer plants as well as opportunistic first invaders due to subclimax states and secondary succession. Non-grass species diversity usually consists of re-seeding species filling the seedbank, and sometimes animal- and/or bird-dispersed woody species. The seeds of these plants are long lived and have well established seed dormancy and can survive in the seebank for extended periods of time contributing to slower recovery. Plants found in these areas are *Tragus berteronianus, Hyparrhenia hirta, Cymbopogon pospischilii, Perotis patens, Nidorella hottentotta,*

Helichrysum rugulosum, Crabbea hirsuta, Aristida congesta subsp. *barbicollis, Aristida canescens.*

- ❑ Aquatic Habitats/ Wetlands –
  - The wetlands were mapped and delineated by and aquatic specialist using various databases and ground truthing. There are wetlands within the study area scattered through the footprint. These wetlands are in moderate condition with some erosion and only some exotic plants.
- ❑ Alien species –
  - These species are found throughout the site but with fairly low densities but especially around disturbed areas. The presence of *Seriphium plumosum* and is worrying since this is an aggressive invader of grassy areas. Plantago media was also found in vast areas over the disturbed habitat unit. The natural habitat will become lost due to the presence of the invasive and alien species if an intensive eradication plan is not followed.
- ❑ Transformed areas –
  - Areas where natural habitat no longer exists due to development of infrastructure, such as roads, buildings, and other hard surfaces.

11.7.5 Fauna

11.7.5.1 Expected Fauna Species

Amphibians

Based on the International Union for Conservation of Nature (IUCN) Red List Spatial Data, 15 amphibian species are expected to occur within the area. None are regarded as threatened.

Reptiles

Based on the IUCN Red List Spatial Data, 20 reptile species are expected to occur within the area.

One species, namely the Giant Girdled Lizard (*Smaug giganteus*) (shown in **Figure 39**), is regarded as vulnerable. They are under threat from the muthi trade, open cast mining and agriculture. Their threat status is directly aligned to the conservation status of SA's grasslands and habitat fragmentation is probably the single greatest factor in isolating populations that cannot disperse and may ultimately sink below effective population size and ultimately disappear (Reilly, 2023). A separate specialist study was undertaken to confirm the presence of this species.

Figure 39: Smaug giganteus photographed on 28 April 2023 east of the Kroonstad South Cluster (Reilly, 2023)

Mammals

The IUCN Red List Spatial Data lists 57 mammal species that could be expected to occur within the Project Area. This list excludes large mammal species that are limited to protected areas. Two of these expected species are regarded as vulnerable and three are considered near threatened (see **Table 14**).

Table 14: Threatened mammal species expected to occur within the Project Area (Human, 2023)

Family	Taxon	Common name	Status
Felidae	*Felis nigripes*	Black footed cat	Vulnerable (2016)
Nesomyidae	*Mystromys albicaudatus*	South African Vlei-rat	Vulnerable (2016)
Hyaenidae	*Parahyaena brunnea*	Brown Hyena	Near Threatened (2016)
Muridae	*Otomys auratus*	Southern Vlei-rat	Near Threatened (2016)
Mustelidae	*Hydrictis maculicollis*	Spotted necked Otter	Near Threatened (2016)

11.7.5.2 Field Survey

The findings from the field survey that formed part of the Terrestrial Biodiversity Assessment include the following:

- No reptile species were recorded in the Project Area during the field survey. However, there is the possibility of several species being present, as certain reptile species are secretive and longer-term surveys are required to ensure adequate sampling.

- No amphibian species were recorded in the Project Area during the field survey. However, due to the presence of various wetlands across the Project Area providing suitable habitat there is a possibility of amphibian species being present.
- Three mammal species were observed during this survey, namely Ground Squirrel, Common Warthog and Suricate/ meerkat (based on either direct observation or the presence of visual tracks and signs). None of the species recorded are regarded as a SCC.

The findings from the field survey that formed part of the Terrestrial Animal Species Specialist Report for the Giant Girdled Lizard (Reilly, 2023) Assessment include the following:

- Layout Alternative 1 –
  - This area overlaps significantly with two ESA's, which are highly sensitive as far as girdled lizards are concerned. The sandier soils (Avalon and Clovelly) of elements of the Vaalvet Sandy Grassland are suitable habitat in this area. A search centered on an area indicated by the landowner as historically having girdled lizards. These are upper landscapes to the southwest are grasslands used for grazing primarily and interspersed with drainage lines and streams. The latter dominated by shrubs and stunted trees are not suitable habitat. No evidence was found of burrows or lizards in the areas covered on 28 April 2023, although the EWT Highlands Grassland Field Officer confirmed presence of lizards in this area and adjacent properties in the preceding week.
- Layout Alternative 2 –
  - The sensitivity of the Alternative 2 site is regarded as low since all the sensitive areas are avoided and no suitable habitat for girdled lizards are found in this area.

11.7.6 Avifauna

A separate Avifauna Impact Assessment (Steyn, 2023) was undertaken for the Project and the information to follow was extracted from this study. Refer to **Sections 12.6** below for a synopsis of the study. The specialist report is contained in **Appendix E3**.

11.7.6.1 Important Bird & Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. **Figure 40** below shows that the Project Area is located 39 km from the Willem Pretorius Game Reserve IBA.

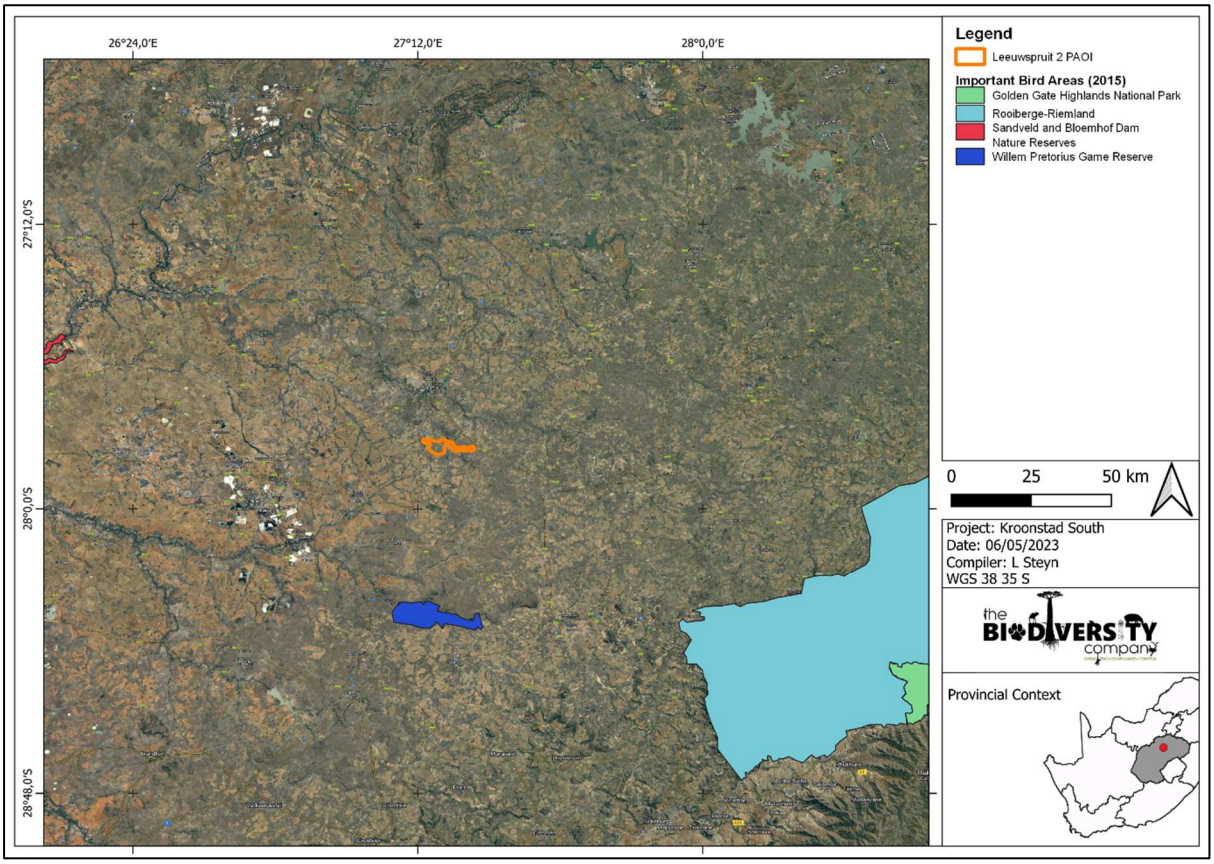


Figure 40: **Project Area in relation to the nearest IBA (Steyn, 2023) (Layout Alternative 2)**

11.7.6.2 Expected Avifauna Species

The SABAP2 Data lists 280 avifauna species that could be expected to occur within the Project Area of Influence (PAOI) defined by the Avifaunal Specialist. Seventeen (17) of these expected species are regarded as threatened. Three (3) of the species have a low likelihood of occurrence due to the expected lack of suitable habitat in the PAOI, these species can however very likely still move over the PAOI and can still be influenced by the development.

11.7.6.3 Field Survey

First Field Survey

During the first assessment performed in the spring (19 to 23 December 2022), 93 species were recorded during the point counts and 17 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 33% of the total number of expected species.

Two SCC was recorded during the survey period i.e., *Eupodotis caerulescens* (Blue Korhaan) and *Sagittarius serpentarius* (Secretarybird) observed (see **Figure 41**). **Figure 42** shows the location of the observed species.

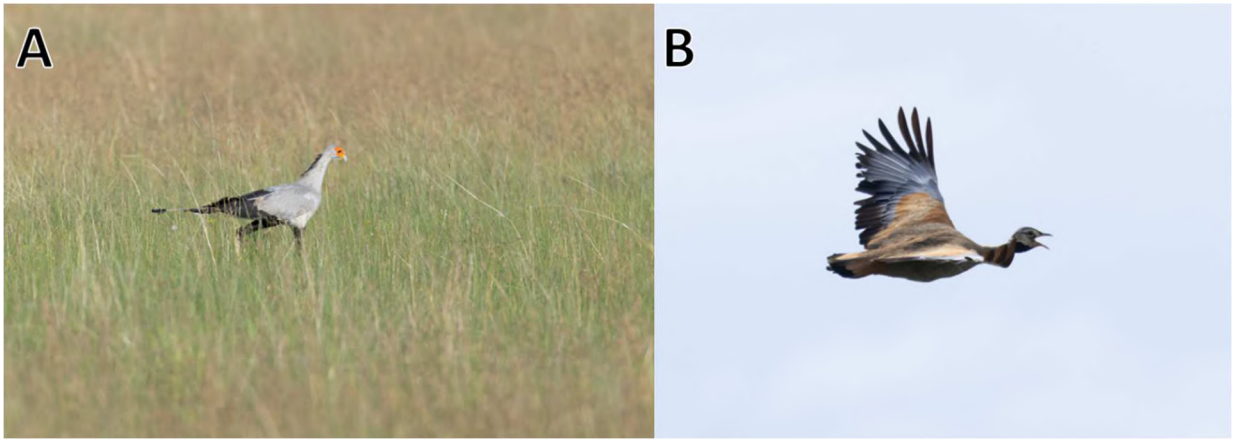


Figure 41: **Photographs illustrating A) Secretary bird and B) Blue Korhaan recorded in the PAOI (Steyn, 2023)**

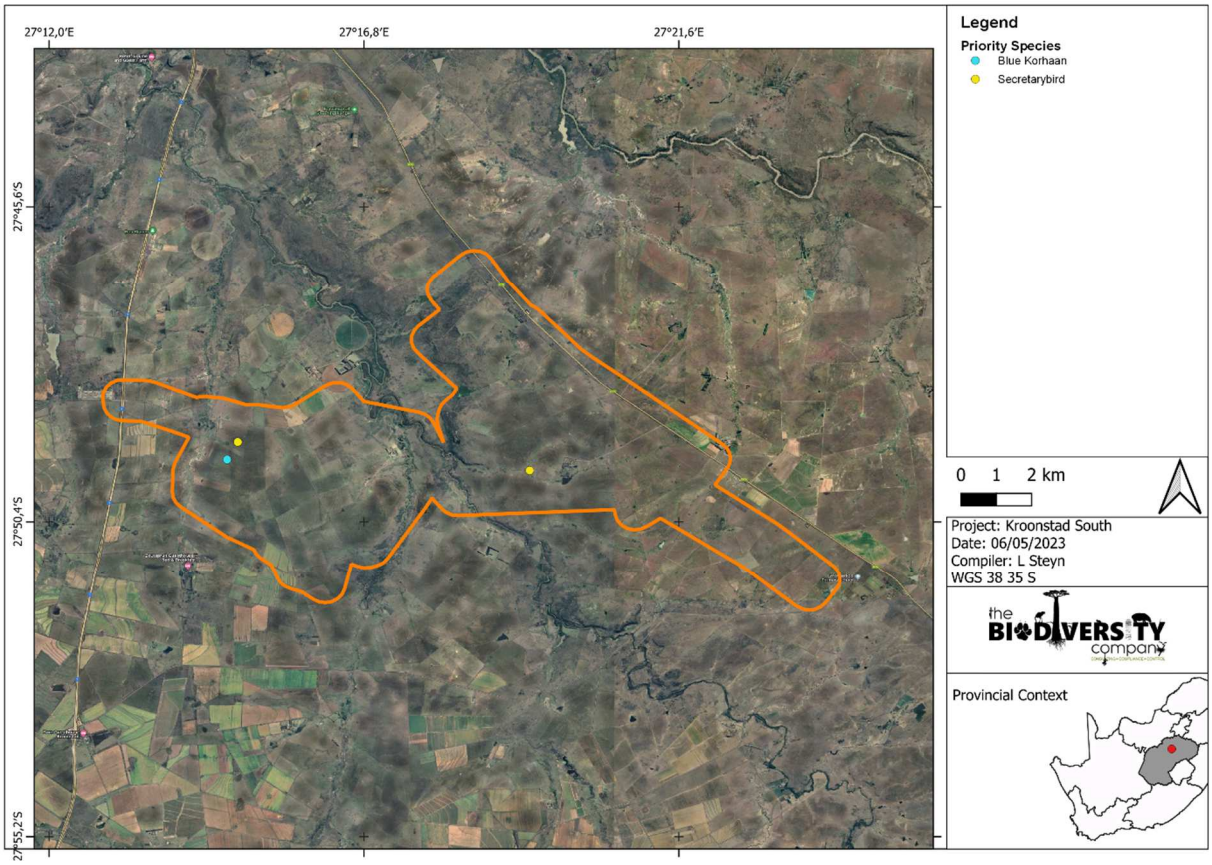


Figure 42: **Location of the SCC during the first assessment (Steyn, 2023)**

'Priority Species' are those avifauna that are particularly susceptible to energy developments, and although these priority species were developed for Wind Energy developments, the type of impact is congruent with Solar Energy Facilities (SEFs), i.e., collision, electrocution, and habitat loss. Even though the panels may not pose an extensive collision risk for larger avifauna species, power lines associated with the infrastructure, guidelines (anchor lines) and connection lines do pose a risk. The fence could also pose a collision risk for various species. Fifteen (15) of the species observed within the PAOI are regarded as priority species (**Table 15**).

Table 15: Summary of Priority Species recorded within and around the proposed PAOI during the first assessment (Steyn, 2023)

Common Name	Scientific Name	Collisions	Electrocutions	Habitats Loss
Black-headed Heron	*Ardea melanocephala*	x	x	
Black-winged Kite	*Elanus caeruleus*		x	
Blue Korhaan	*Eupodotis caerulescens*	x		x
Common Ostrich	*Struthio camelus*			x
Egyptian Goose	*Alopochen aegyptiaca*	x		
Greater Kestrel	*Falco rupicoloides*		x	
Grey Heron	*Ardea cinerea*	x	x	
Hamerkop	*Scopus umbretta*	x		
Northern Black Korhaan	*Afrotis afraoides*	x		x
Purple Heron	*Ardea purpurea*	x	x	
Red-billed Teal	*Anas erythrorhyncha*	x		
Secretarybird	*Sagittarius serpentarius*	x		
Spur-winged Goose	*Plectropterus gambensis*	x		
White-faced Whistling Duck	*Dendrocygna viduata*	x		
Yellow-billed Duck	*Anas undulata*	x		

Second Field Survey

During the second assessment performed in the summer (6 to 10 March 2023), 109 species were recorded during the point counts and 34 during the incidental counts. Black-winged Pratincole (*Glareola nordmanni*) were observed during the second survey. These birds were observed on three occasions and 170 birds were observed. **Figure 43** are photographic evidence of the species while **Figure 44** shows the location of the observed.

Figure 43: Photographs illustrating some of the Black-winged Pratincole recorded within the proposed PAOI during the second field survey (Steyn, 2023)

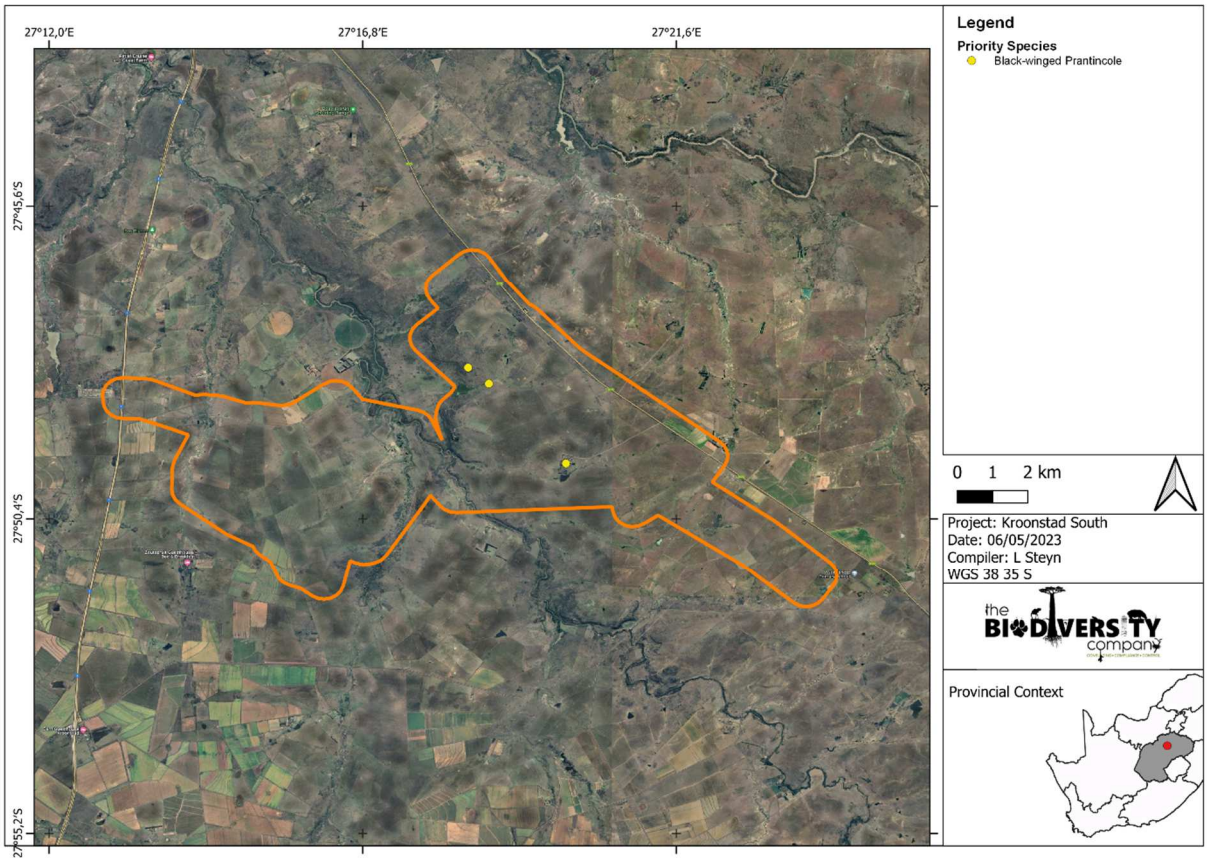


Figure 44: Location of the SCC during the second assessment (Steyn, 2023)

Eighteen (18) of the species observed within the PAOI are regarded as priority species (**Table 16**).

Table 16: Summary of Priority Species recorded within and around the proposed PAOI during the second assessment (Steyn, 2023)

Common Name	Scientific Name	Collisions	Electrocutions	Habitats Loss
African Sacred Ibis	*Threskiornis aethiopicus*		x	
Amur Falcon	*Falco amurensis*		x	
Black Sparrowhawk	*Accipiter melanoleucus*	x	x	
Black-headed Heron	*Ardea melanocephala*	x	x	
Black-winged Kite	*Elanus caeruleus*		x	
Black-winged Pratincole	*Glareola nordmanni*			x
Common (Steppe) Buzzard	*Buteo buteo*	x	x	
Common Ostrich	*Struthio camelus*			x
Egyptian Goose	*Alopochen aegyptiaca*	x		
Glossy Ibis	*Plegadis falcinellus*		x	
Greater Kestrel	*Falco rupicoloides*		x	
Grey Heron	*Ardea cinerea*	x	x	
Hamerkop	*Scopus umbretta*	x		
Northern Black Korhaan	*Afrotis afraoides*	x		x

Common Name	Scientific Name	Collisions	Electrocutions	Habitats Loss
Pale Chanting Goshawk	*Melierax canorus*		x	
South African Shelduck	*Tadorna cana*	x		
White-faced Whistling Duck	*Dendrocygna viduata*	x		
Yellow-billed Duck	*Anas undulata*	x		

Fine-Scale Habitat Use

Fine-scale habitats within the landscape are important in supporting a diverse avifauna community as they provide differing nesting, foraging and reproductive opportunities. During the field assessment three habitat units were identified from an avifauna perspective. They were Transformed-Degraded Grassland, Grassland and Water Resource.

The delineations of these habitats are shown in **Figure 45** and are discussed below:

- Grassland –
  - The majority of the PAOI comprised of grassland which is typically characterised by open grassland areas with scattered medium to large tree/shrubs clustered together. Some portions of this habitat consist of old agricultural fields that have recovered, the avifauna species compositions in these areas were the same resulting in the grouping of these habitats. Avifauna species found here included Ant-eating Chats, Northern Black Korhaan, and Zitting Cisticola.
- Degraded- Transformed Grassland –
  - This habitat is areas associated with housing, agriculture, some main roads where the edge of the road has been degraded, and areas where overgrazing has taken place. Some portions of this habitat type is still semi natural while others have been completely transformed. Avifauna species that were found here included Pied Crow, Cape Turtle Dove and Helmeted Guineafowl.
- Water resource –
  - The water resources found in the PAOI consisted of wetlands, rivers, farm dams and pans. The habitat adjacent to these features were incorporated into this habitat classification as the avifauna species compositions here differed from that of the adjacent grasslands. Avifauna species found here included Yellow-billed Ducks, White-faced Whistling Ducks, Grey Heron and Little Grebe.

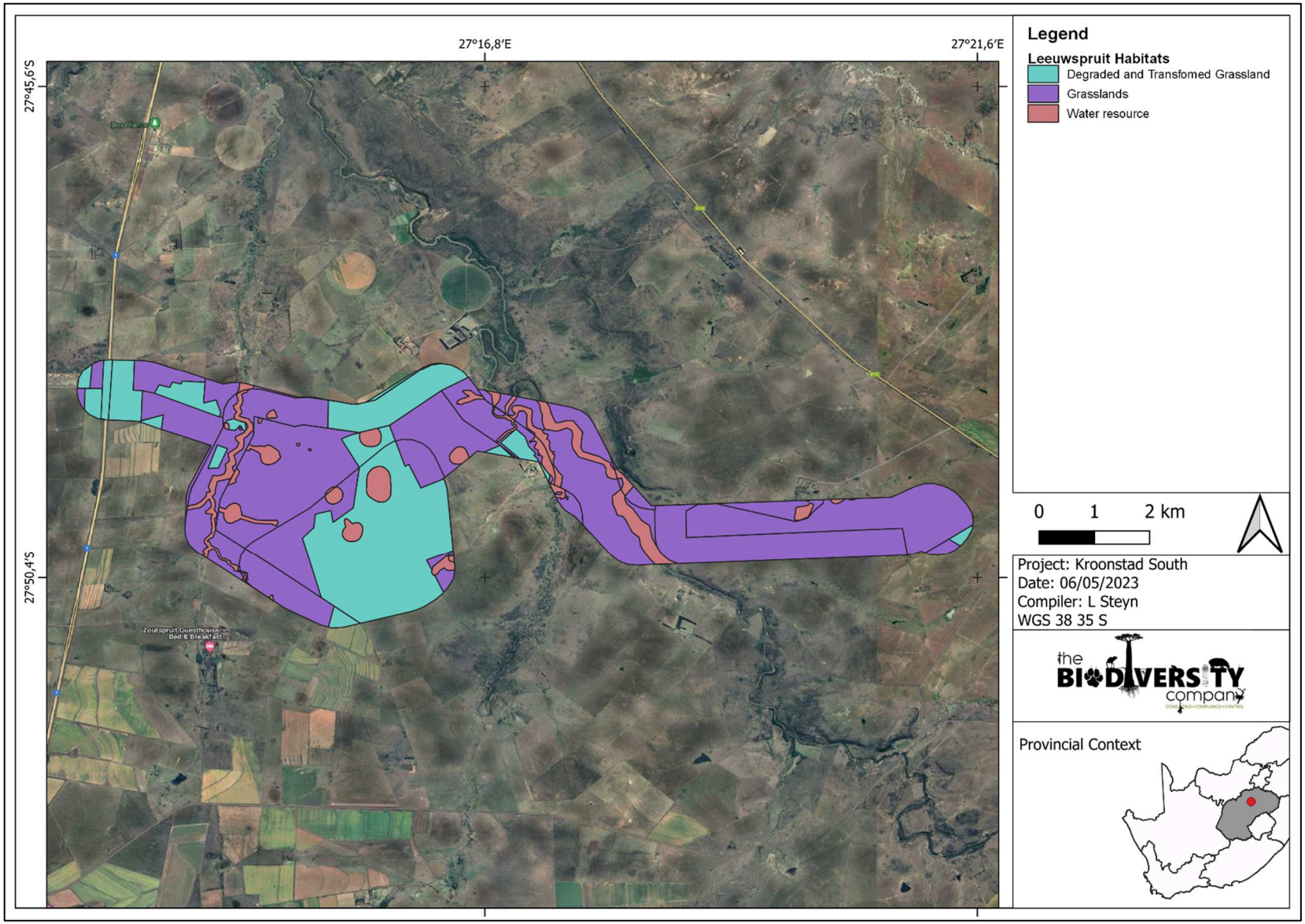


Figure 45: **Map illustrating the habitat types delineated within the PAOI (Steyn, 2023) (Layout Alternative 2)**

11.8 Socio-Economic Environment

11.8.1 Municipal Profile

The Project Area is located in Ward 2 of MLM. Demographic information for the MLM (FS201) is presented in **Table 17** below.

Table 17: Demographic information for the KLM (https://municipalities.co.za/demographic/1041/moqhaka-local-municipality)

	Community Survey 2016	Census 2011
Population	154 732	160 532
Age Structure		
Population under 15	24.5%	27.0%
Population 15 to 64	67.8%	66.4%
Population over 65	7.7%	6.5%
Dependency Ratio		
Per 100 (15-64)	47.6	50.5
Sex Ratio		
Males per 100 females	97.0	98.1
Population Growth		
Per annum	-0.84%	n/a
Labour Market		
Unemployment rate (official)	n/a	35.2%
Youth unemployment rate (official) 15-34	n/a	47.2%
Education (aged 20 +)		
No schooling	3.8%	5.4%
Matric	31.5%	27.8%
Higher education	6.7%	8.6%
Household Dynamics		
Households	53 601	45 661
Average household size	2.9	3.2
Female headed households	40.9%	40.9%
Formal dwellings	85.9%	88.7%
Housing owned	62.1%	56.1%
Household Services		
Flush toilet connected to sewerage	89.7%	85.6%
Weekly refuse removal	84.0%	84.9%
Piped water inside dwelling	48.6%	57.7%
Electricity for lighting	96.3%	93.3%

The following information was sourced from the municipal SDF (MLM, 2022).

- **Demographic Profile –**
  - The area of jurisdiction of the MLM is situated in the southern part of the FDDM, the latter comprising a total of 488 036 residents. As a consequence of a growth potential of - 0.45 % the past 10 years, the total residents in the Moqhaka Region is 160 532.

- The Free State growth potential for the past 10 years was calculated at 0.14 %. The Moqhaka population presents 33 % of the Fezile Dabi District and comprises a total of 45 661 households; 31 % of the households in the district. The general tendency of migration from rural to urban areas is also occurring in the area (82 % urban and 18 % rural), as is the case in the rest of the Free State Province.
- The majority of the rural population is active within the agricultural sector.
- A large portion of the population (27 %) is composed of the age category 15 years and younger. The specific age distribution implicates a future average to high population growth under normal conditions. A fairly low percentage (6.5 %) of the region's population is composed of the age category 65 years and older. Both tendencies emphasise that population growth could, under normal conditions, be expected in the region. The largest portion of the population (66.4 %) is composed of the age category of 15 years to 64 years.

❑ **Economic and Employment Profile –**

- The most recent unemployment statistics for the Moqhaka Region indicates the average unemployment as 35.2 %.
- Comparing the different Local Municipalities in the Fezile Dabi Region, it appears that the percentage of the population employed is the lowest for the Ngwathe Region (64.8 %) and the Moqhaka Region (64.8 %) while the Metsimaholo Region has the highest employment figure (67.9 %) followed by the Mafube Region (66.6 %).
- The impact of international trade and competition in agricultural products might result in an agricultural sector that is internationally less competitive. The latter implies a negative effect on economic growth leading to a possible loss in employment and further depopulation of the rural area.
- Mining remains one of the primary economic sectors within MLM through both De Beers and Lace Mine diamond within +- 15km from Kroonstad CBD.
- Manufacturing through locally based small enterprises in for example agriculture has been identified as critical in growing the national export base necessary to grow the economy. The Free State has identified areas within agriculture machinery to grow and strengthen the manufacturing sector within Moqhaka.

❑ Long Term Economic opportunities –

- The agricultural sector of the region, particularly in the Viljoenkroon area, is extremely prominent. The latter results in industrial development that is agricultural orientated.
- Future economic growth in the agricultural sector exists, considering small scale processing industries and intensive farming activities where possible.
- Gold is actively mined by Harmony Gold in the Vaal Reefs area. Three shafts are currently being mined and the mining operations are considered, by the company, as a long-term mining endeavour.
- The region, similar to the Fezile Dabi District, experienced growth as a weekend tourist destination - specific reference is made to game ranches and guesthouses on farms.

- Supplementary development and effective marketing of the existing tourist destinations have potential for economic growth - reference is made to the Stokkiesdraai and Wawielpark resorts adjacent the Vaal River in the Viljoenskroon area and revitalisation of the Kroonpark resort as a favoured inland destination.

Further information regarding the social profile of the Project Area is provided in the Social Impact Assessment (Tanhuke & Chidley, 2023).

11.9 Agriculture

The Agricultural Impact Assessment (Gouws, 2023) found that the entire site is used for cattle farming and that the veld is in relatively good condition with a large percentage of palatable grass species (see **Figure 46**).

Figure 46: Views of site showing grazing (Gouws, 2023)

A synopsis of the Agricultural Impact Assessment is provided in **Section 12.7** below.

11.10 Air quality

Potential sources of air pollution in the region include the following:

- ❑ Fugitive dust emissions from agricultural activities;
- ❑ Vehicle exhaust emissions from vehicles traveling on paved and unpaved roads, including on N1 and other surrounding roads;
- ❑ Biomass burning (veld fires);
- ❑ Domestic fuel burning;
- ❑ Industrial operations;
- ❑ Waste treatment and disposal; and
- ❑ Other fugitive dust sources such as wind erosion from exposed areas.

Receptors to air quality pollution include people residing in surrounding settlements and farm dwellings, ecological features (fauna and flora), livestock and crops.

11.11 Noise & Vibration

In terms of the local acoustical environment, the background noise levels are expected to be typical of rural areas. Noise in the greater area emanates primarily from anthropogenic sources in towns, farming operations (e.g., use of farming equipment), vehicles on the surrounding road network, human activities in surrounding settlements and trains passing on railway lines.

Sensitive receptors to noise and vibration include surrounding communities, sensitive faunal species, and livestock.

11.12 Cultural Heritage & Palaeontological Features

11.12.1 Cultural Heritage

The information to follow was obtained from the Heritage Impact Assessment (Kitto, 2023) (contained in **Appendix E5**). Refer to **Sections 12.9** below for a synopsis of the study.

The Heritage Impact Assessment provides an overview of the archaeological and historical context of the general region, covering the Stone Age, Iron Age, Historic/Colonial Period, and the recent/ modern history.

An assessment of available historical topographical maps was undertaken to establish a historic layering for the study area. As can be seen in **Figure 47** (Layout Alternative 1) and **Figure 48** (Layout Alternative 2) below, which show the 1:50 000 map sheet 2727CD Wonderhoek Edition 1 1960, the map depicts three heritage features within the Leeuwspruit Solar 2 footprint for Alternative 1 layout. One site is a grave or cemetery (depicted as a “+” symbol) and there are two homestead sites (depicted as hut symbols). A farmstead is depicted just outside the east-central section of the footprint and another outside the northwest corner. The Alternative 2 Layout depicts only one heritage feature within the footprint boundaries, this is a grave or cemetery. The other heritage features depicted are located outside the Alternative 2 footprint. These include the two farmsteads outside the east-central and the northwest boundaries, as well as the group of homesteads and two single homesteads.

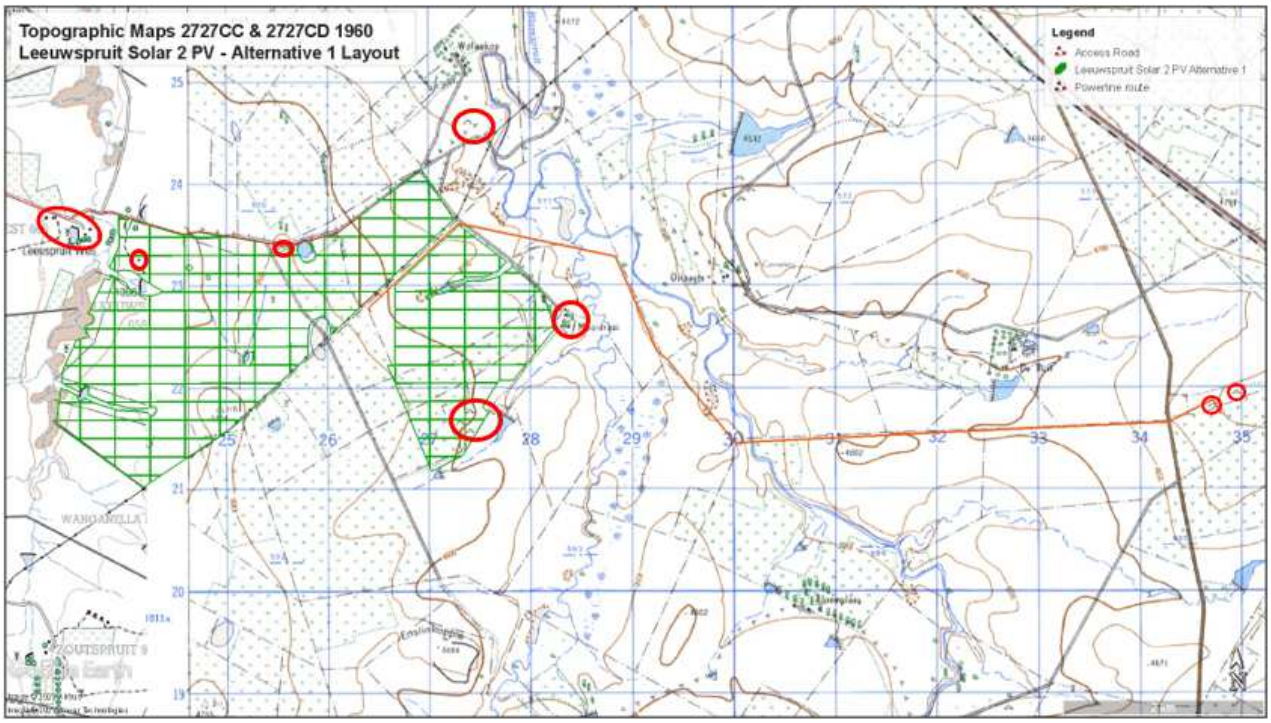


Figure 47: Heritage features in relation to Project Area (Layout Alternative 1) based on topographic map 2727CD Ed 1 1960 (Kitto, 2023)

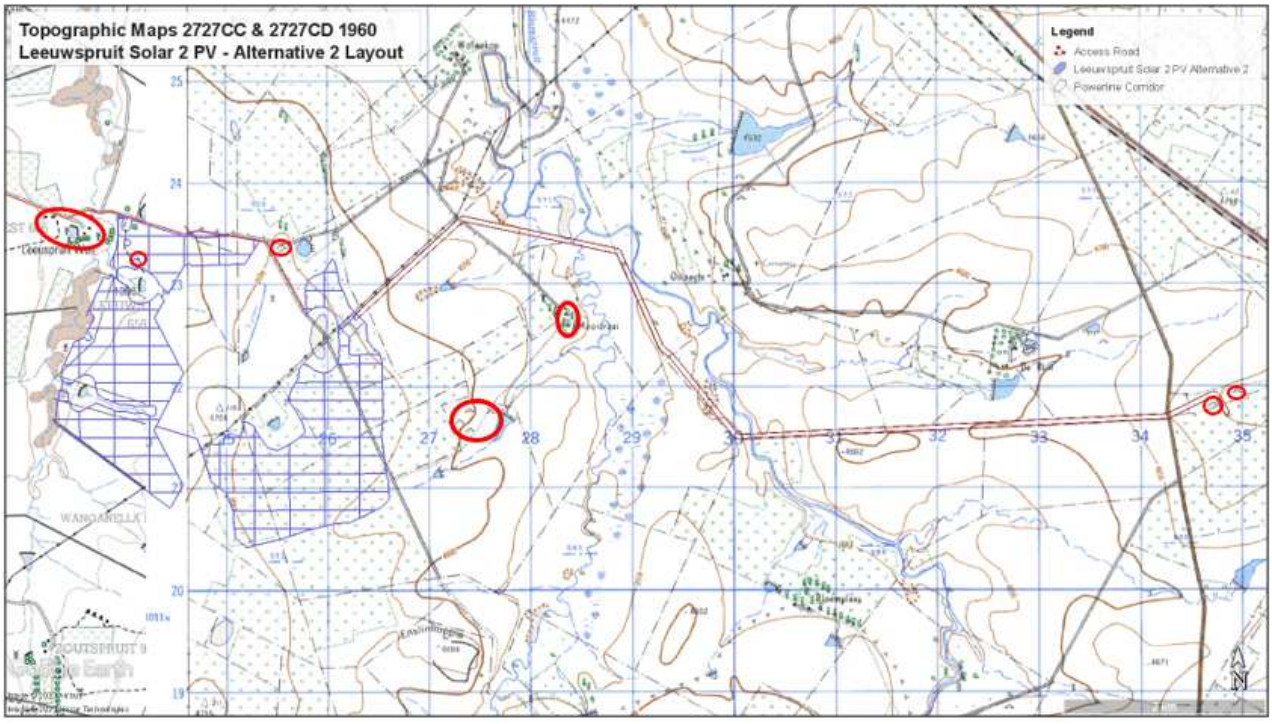


Figure 48: Heritage features in relation to Project Area (Layout Alternative 2) based on topographic map 2727CD Ed 1 1960 (Kitto, 2023)

11.12.2 Palaeontological Features

The information to follow was obtained from Palaeontological Impact Assessment (Butler, 2023) (contained in **Appendix E6**). Refer to **Sections 12.10** below for a synopsis of the study.

The study area is underlain by Quaternary aeolian sand, Adelaide Subgroup (Beaufort Group, Karoo Supergroup) as well as Jurassic Dolerite. The potential fossiliferous sedimentary bedrocks of the Adelaide Subgroup could have been thermally metamorphized by overlying dolerite sills compromising their palaeontological sensitivity. The PalaeoMap of the South African Heritage Resources Information System (SAHRIS) indicates that the Palaeontological Sensitivity of Quaternary sands is Moderate, the Adelaide Subgroup has a Very High Palaeontological Sensitivity while the Jurassic Dolerite is igneous in origin and has a Zero Palaeontological Sensitivity (see **Figure 49**). The Palaeontological Sensitivity for the proposed development is Very High based on the Screening Tool.

A site-specific field survey of the development footprint was conducted on 13 May 2023. No fossiliferous outcrop was detected in the proposed development. This could be attributed to the lack of outcrops as well as the lush grassy vegetation in the area.

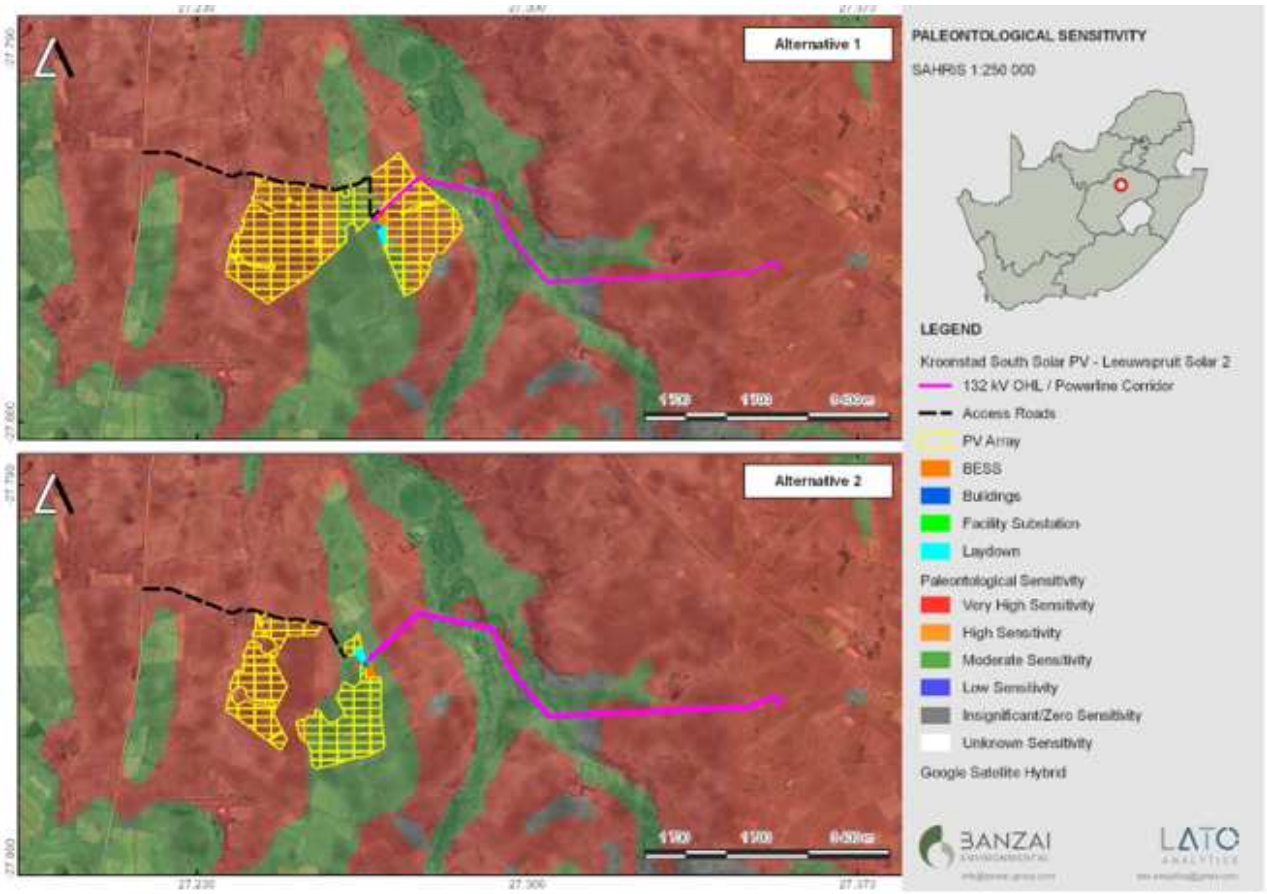


Figure 49: Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the proposed site (Butler, 2023) (Red = Very High; Green = Moderate)

11.13 Planning

The following is noted from a planning perspective:

- The proposed power line follows property boundaries for most of its route.
- The proposed PV Site and power line are located outside of the urban edge and should not impact on future urban expansion.
- In the event that the Solar PV Plant must be decommissioned, the decommissioning phase will include measures for complying with the prevailing regulatory requirements, rehabilitation and managing environmental impacts in order to render the affected area suitable for a future desirable use.
- Other renewable energy applications that have been made within a 30km radius of the PV Site, according to DFFE's REEA Database (refer to **Section 13.29.2.2**). The nearest approved PV plant is located approximately 11.5km to the northwest of the Project Area.

11.14 Transportation

The transportation network surrounding the Project Area is shown in **Figure 50** below.

The site is accessible via the N1 (located to the west of the site) and existing gravel roads (including the Wolwekop Road). The R76 runs to the east of the power line route.

According to the Free State Department of Police, Roads and Transport (FSDPRT) (Maree pers. comm., 2023), tertiary roads T410, T411, T413 and T416 (statutory road reserve width of 16 meters) will be affected by the proposed solar energy facilities (part of overall Kroonstad cluster). The planned site access road follows tertiary roads T410 and T416.

A Transport Impact Assessment (Patandin, 2023) was undertaken for the Project contained in **Appendix E9**). Refer to **Sections 12.13** below for a synopsis of the study.

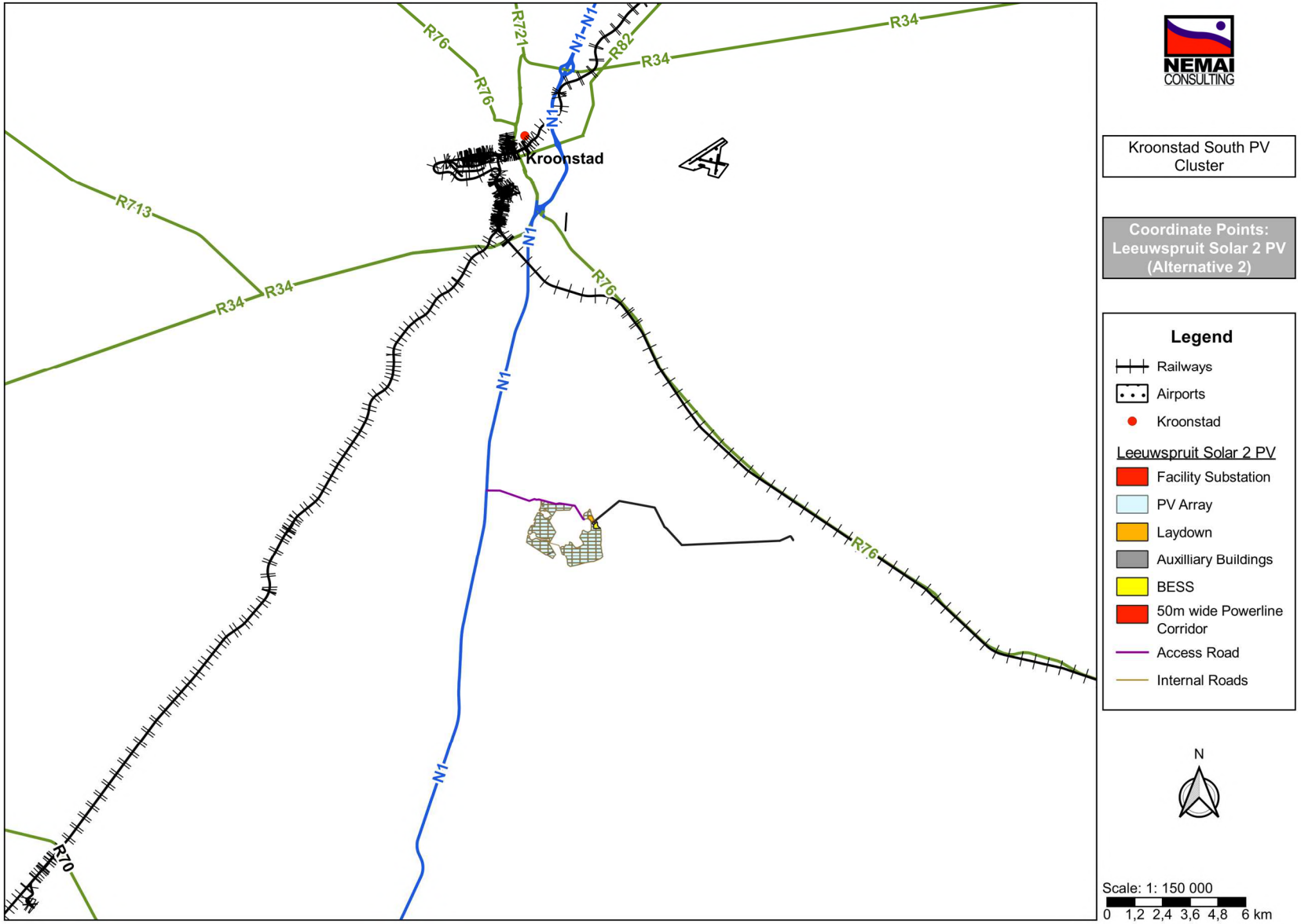


Figure 50: **Transportation network in relation to Project Area (Layout Alternative 2)**

12 SUMMARY OF SPECIALIST STUDIES

12.1 Specialist Studies undertaken as part of the EIA

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite specialist studies triggered during Scoping. According to Münster (2005), a 'trigger' is "*a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input*".

The requisite specialist studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include the following:

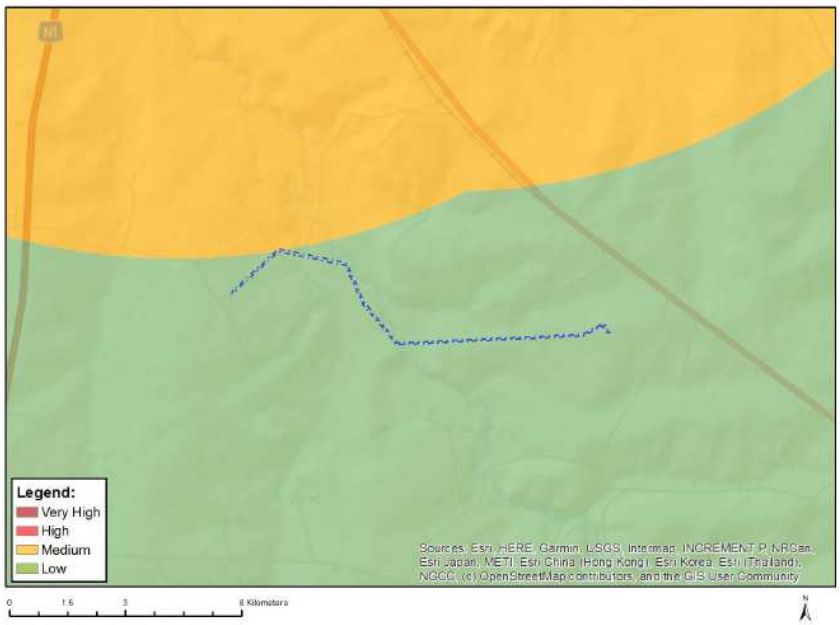
1. Terrestrial Biodiversity Assessment;
2. Freshwater Assessment;
3. Avifauna Impact Assessment;
4. Terrestrial Animal Species Study (Giant Girdled Lizard);
5. Agricultural Compliance Statement;
6. Heritage Impact Assessment;
7. Social Impact Assessment;
8. Visual Impact Assessment;
9. Palaeontological Impact Assessment; and
10. Transport Impact Assessment.

12.2 Excluded Specialist Studies identified during Environmental Screening

As mentioned in **Section 6.3** above, a Screening Report for the proposed Project was compiled by means of the Screening Tool, which was appended to the Application Form. **Table 18** below lists the specialist studies that were identified in the Screening Report, but which were not deemed to be necessary.

Table 18: Specialist studies identified in the Screening Report that are deemed unnecessary

Specialist Study identified in Screening Report	Reason for not undertaking the Specialist Study
Civil Aviation Assessment	The map that was created by the Screening Tool showed low civil aviation sensitivity in terms of the Project Area, as there are no major or other types of civil aviation aerodromes in proximity to the PV site. The Screening Tool showed low civil aviation sensitivity for the powerline corridor except for the edge of the northern most bend, which showed medium. The edge of the northern most bend of the powerline corridor falls approximately 13.5km from the small Buitenzorg airfield. Given the distance from the airfield, and that only a few meters of the corridor infringe into the medium sensitivity it is unlikely that the Project will impact on the airflield. Following the site appraisal, the low sensitivity of the Project Area in terms of the Civil Aviation theme is confirmed. It was thus not deemed necessary to undertake this study.

Specialist Study identified in Screening Report	Reason for not undertaking the Specialist Study
	MAP OF RELATIVE CIVIL AVIATION (SOLAR PV) THEME SENSITIVITY  MAP OF RELATIVE CIVIL AVIATION THEME SENSITIVITY  **Civil Aviation Theme Sensitivity PV Site and Powerline – Screening Tool** The South African Civil Aviation Authority (SACAA) is mandated with controlling, promoting, regulating, supporting, developing, enforcing, and continuously improving levels of safety and security throughout the civil aviation industry. The SACAA was included in the Project notification. They will further be afforded the opportunity to review the draft EIA Report and to provide comments.
Defence Assessment	The map that was created by the Screening Tool showed that the Project Area has low sensitivity in terms of the relative defence theme.

Specialist Study identified in Screening Report	Reason for not undertaking the Specialist Study
	MAP OF RELATIVE DEFENCE THEME SENSITIVITY  MAP OF RELATIVE DEFENCE THEME SENSITIVITY  **Defence Theme Sensitivity PV Site and Powerline – Screening Tool** Upon interrogation of the surrounding environment, through the site visit, desktop review and satellite imagery, no evidence was found of any military or defence operations or installations. The low sensitivity of the site in terms of the defence theme is confirmed. It was thus not deemed necessary to undertake this study.
Radio Frequency Interference (RFI) Assessment	The map that was created by the Environmental Screening Tool showed that the Project Area has low sensitivity in terms of the relative RFI theme.

Specialist Study identified in Screening Report	Reason for not undertaking the Specialist Study
	MAP OF RELATIVE RFI THEME SENSITIVITY  **RFI Theme Sensitivity – Screening Tool** Research (e.g., United States Federal Aviation Admiration, 2010) suggests that RFI from PV installations poses a low risk. PV systems equipment such as step-up transformers and electrical cables are not sources of electromagnetic interference because of their low frequency of operation and PV panels themselves do not emit EMI. The only component of a PV array that may be capable of emitting EMI is the inverter. Inverters, however, produce extremely low frequency EMI similar to electrical appliances and at a distance of 46 m from the inverters the EM field is at or below background levels. Standard engineering mitigations will be implemented to address RFI at the PV site, as necessary. The low sensitivity of the site in terms of the RFI theme is confirmed. It was thus not deemed necessary to undertake this study.

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the remaining specialist assessments that were identified by the Screening Tool were undertaken for the Project (refer to list of studies triggered in **Section 12.1** above).

12.3 Incorporating the Findings from Specialist Studies

The *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005) was used for including the findings of the specialist studies into the EIA Report. Key considerations included the following:

- Ensuring that the specialists have adequately addressed I&APs' issues and specific requirements prescribed by environmental authorities;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and
- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

The information obtained from the respective specialist studies was incorporated into the EIA Report in the following manner:

- The assumptions and limitations identified in each study were included in **Section 7** above;
- The information was used to complete the description of the receiving environment (**Section 11**) in a more detailed and site-specific manner;
- A summary of each specialist study is contained in the sub-sections to follow (**Sections 12.4 – 12.13** below), focusing on the approach to each study, key findings and conclusions drawn;
- The specialists' impacts assessments, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 13** below;
- The evaluations performed by the specialists on the alternatives were included in **Section 14** below to identify the most favourable option;
- Specialist input was obtained to address comments made by I&APs that related to specific environmental features pertaining to each specialist discipline; and
- Salient recommendations made by the specialists were taken forward to the final EIA Conclusions in **Section 16** below.

Refer to **Appendix E** for declarations from the respective specialists.

12.4 Aquatic Assessment

A summary of the Freshwater Assessment (van Rooyen, 2023) follows. The specialist report is contained in **Appendix E1**.

12.4.1 Details of the Specialist

The details of the specialists that undertook the Wetland Delineation and Risk Assessment follow.

Organisation:	Nitai Consulting
Name:	Divan van Rooyen/Antoinette Bootsma
Qualifications:	PhD Environmental Science
No. of years' experience:	1 year/18years
Affiliation (if applicable):	SACNASP (Candidate Natural Scientist – Environmental Science (Registration No. 151272)); IAIA (Membership No. 7063); South African Aquatic Scientists (SASAqS – Membership No. SASAQS0101/ SACNASP Registration No. 400222-09.

12.4.2 Objectives of the Study

The objectives of this study included identifying watercourses in the Project Area and verifying the aquatic biodiversity sensitivity in terms of Screening Tool. The study aimed to comply with the relevant Protocol for Aquatic Biodiversity.

12.4.3 Methodology

The assessment included the following tasks (amongst others):

- Identifying and mapping of wetlands. The National Wetland Classification Systems (NWCS) developed by SANBI was considered for this study.
- Delineating wetland areas in accordance with the DWS guideline;
- Determining the PES;
- Determining the EIS;
- Determining buffer requirements; and
- Undertaking a risk-based impact assessment.

12.4.4 Key Findings of the Study

12.4.4.1 Identification of Watercourses

The following is noted in terms of the delineated wetlands in the Project Area:

- Layout Alternative 1 (**Figure 51**) – Two HGM units, namely a Depression (Dep) and Channel Valley-Bottom (CVB), were identified within and close to the Alternative 1 layout. One small artificial Dep wetland is located within a farm road (near the Blomspruit) and was identified to be adjacent the proposed Powerline Corridor. The majority of the footprint comprised of terrestrial habitat.
- Layout Alternative 2 (**Figure 52**) – the revised layout has accommodated the presence of the Dep wetlands. As such, the study area is outside the delineated boundaries of the wetlands.

The following is noted in terms of rivers and drainage lines in the Project Area:

- Layout Alternative 1 (**Figure 53**) – One large non-perennial river (Leeuspruit) was identified to be in close proximity of the site. In addition to Leeuspruit, several small non-perennial rivers were identified within the PV footprint in the eastern and western portion. Two small non-perennial rivers flow westerly before draining into the Leeuspruit. The two non-perennial rivers in the eastern portion flow easterly before draining into the Enslinspruit and Blomspruit.
- Layout Alternative 2 (**Figure 54**) – the revised layout avoids the non-perennial rivers.

Photographs indicating the general environment around areas of interest within the study area are shown in **Figure 55** below.

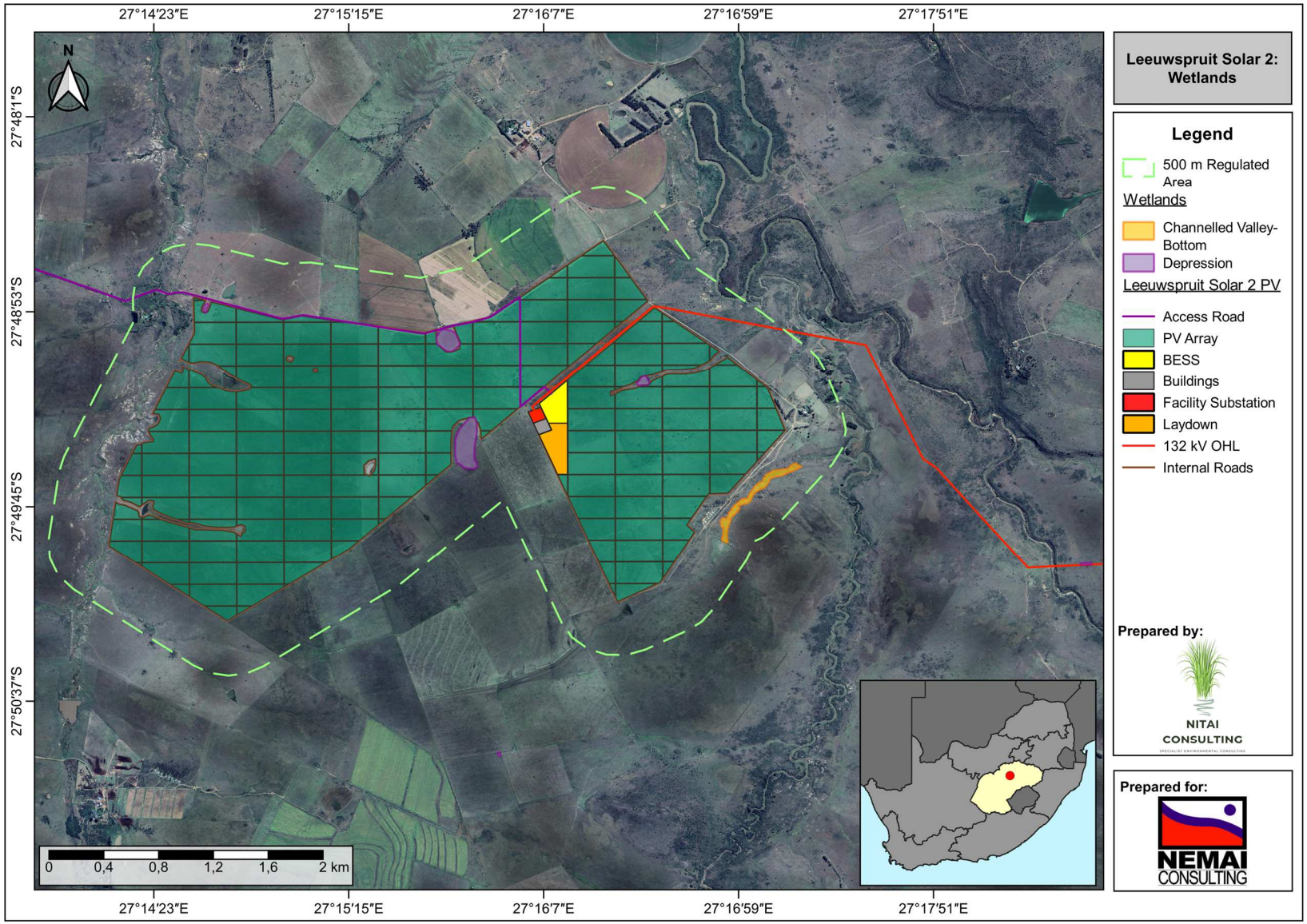


Figure 51: **Wetlands in relation to Layout Alternative 1 (van Rooyen, 2023)**

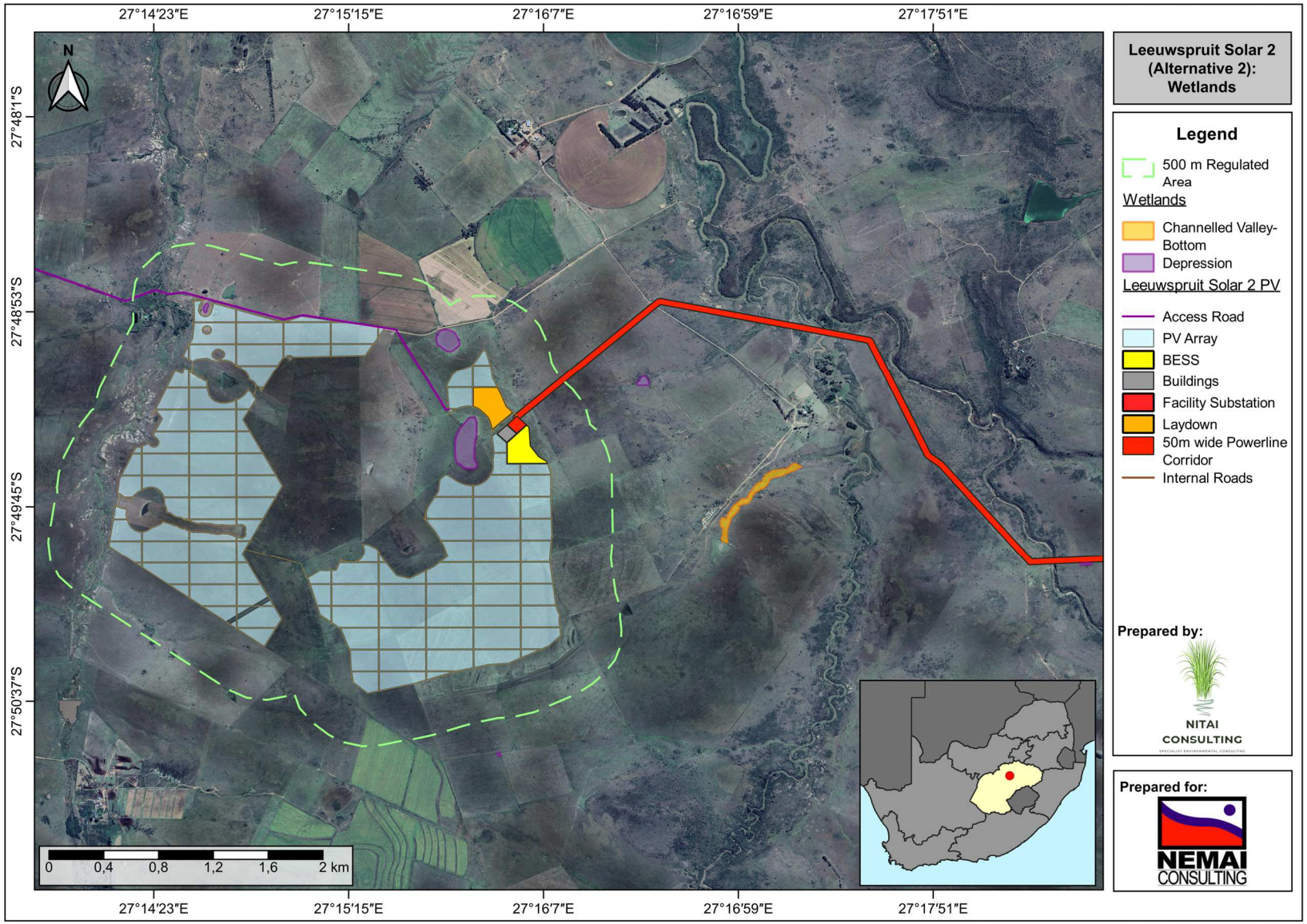


Figure 52: **Wetlands in relation to Layout Alternative 2 (van Rooyen, 2023)**

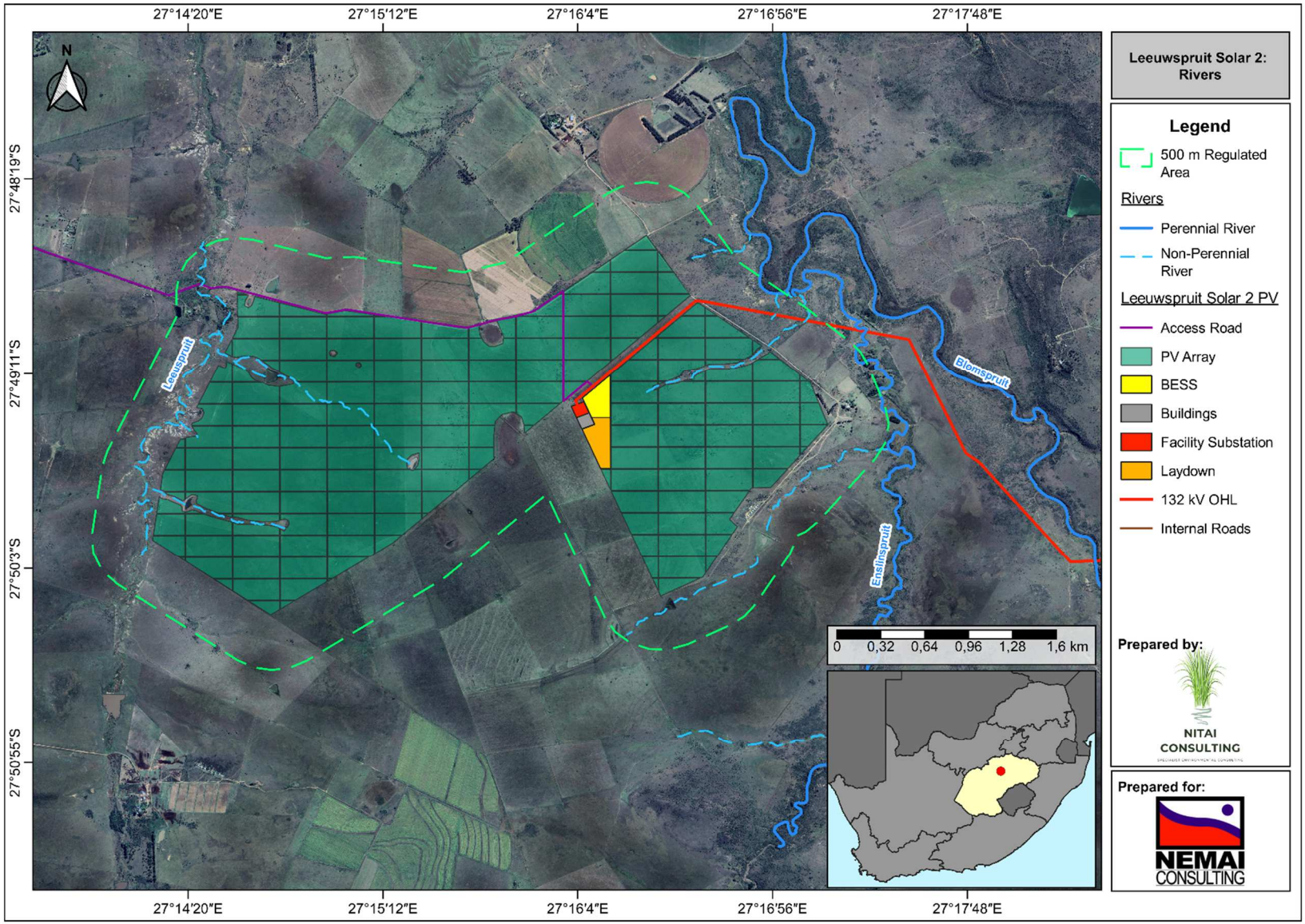


Figure 53: **Rivers and drainage lines in relation to Layout Alternative 1 (van Rooyen, 2023)**

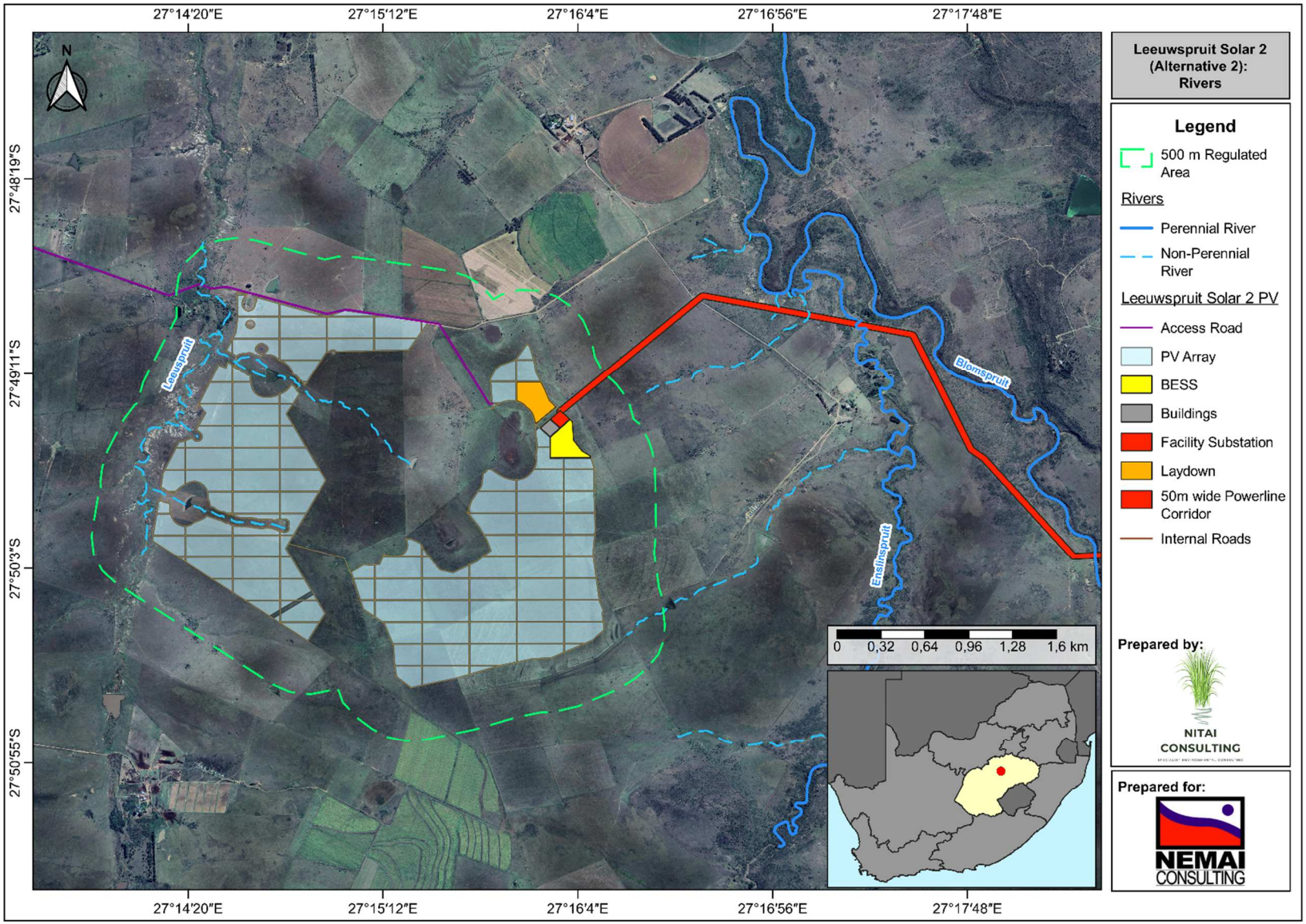


Figure 54: **Rivers and drainage lines in relation to Layout Alternative 2 (van Rooyen, 2023)**

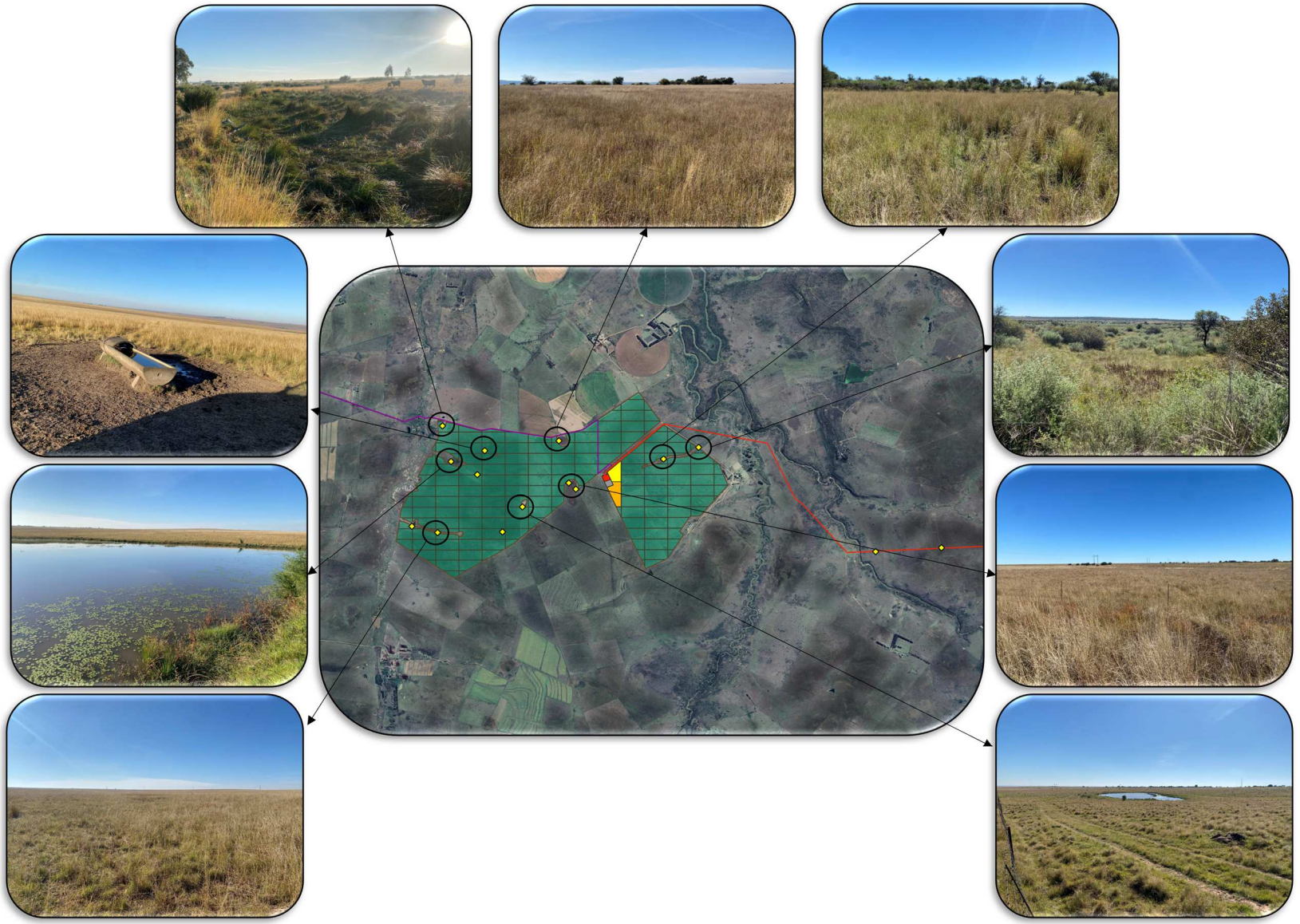


Figure 55: **Photographs indicating the general environment around areas of interest within the study area (van Rooyen, 2023)**

12.4.4.2 Verification of Site Sensitivity – Screening Tool

According to the Screening Tool, the sensitivity of the Aquatic Biodiversity Theme in the Project Area is Very High (see **Figure 56**) where Layout Alternative 1 encroaches into a wetland. The sensitivity for the remainder of the site is Low. The Very High sensitivity was confirmed as part of the specialist study.

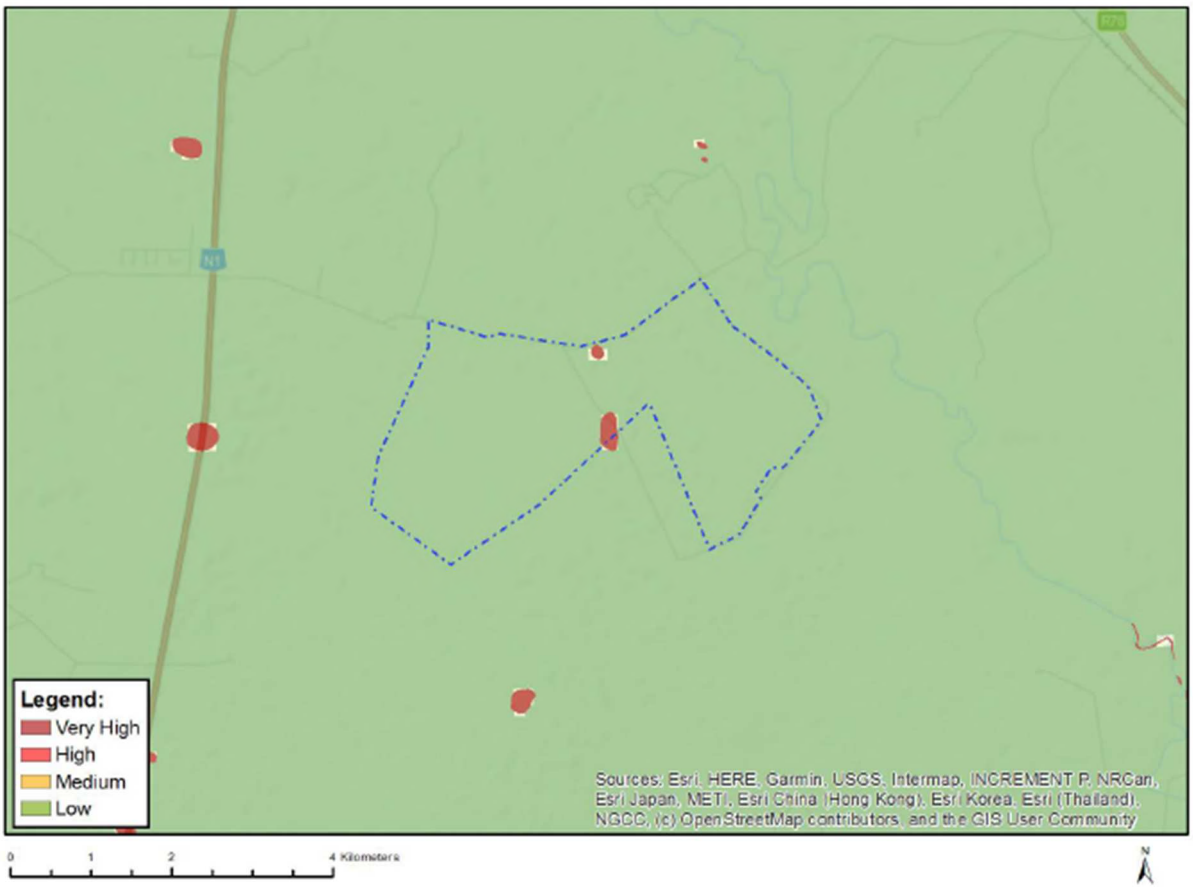


Figure 56: Sensitivity of Aquatic Biodiversity Theme - Screening Tool (van Rooyen, 2023) (Layout Alternative 1)

Ground truthing the Alternative 1 layout with site visits during Fall (11 – 13 April 2023), the study area was confirmed to be classified as Very High sensitivity due to the PV site encroaching into a few non-perennial rivers and wetlands. In addition, majority of the Alternative 1 layout was classified as Low sensitivity whereas the watercourses and its associated buffer zone was classified as High and Medium sensitivity, respectively. As a result, the PV site layout has been revised and the Alternative 2 layout (preferred layout) is outside of these identified watercourses as well as its buffer zones. Therefore, the Alternative 2 layout has an overall Low sensitivity to freshwater features. Importantly, based on these sensitivity classifications, the Preferred Alternative for the proposed development is Alternative 2.

Buffer zones for all watercourses (wetlands and rivers) were determined based on the current condition of these watercourses. The buffer zones determined for the wetland and rivers were

based on the Macfarlane and Bredin (2017) guidelines. As such, the minimum buffer zones were determined as 32 m.

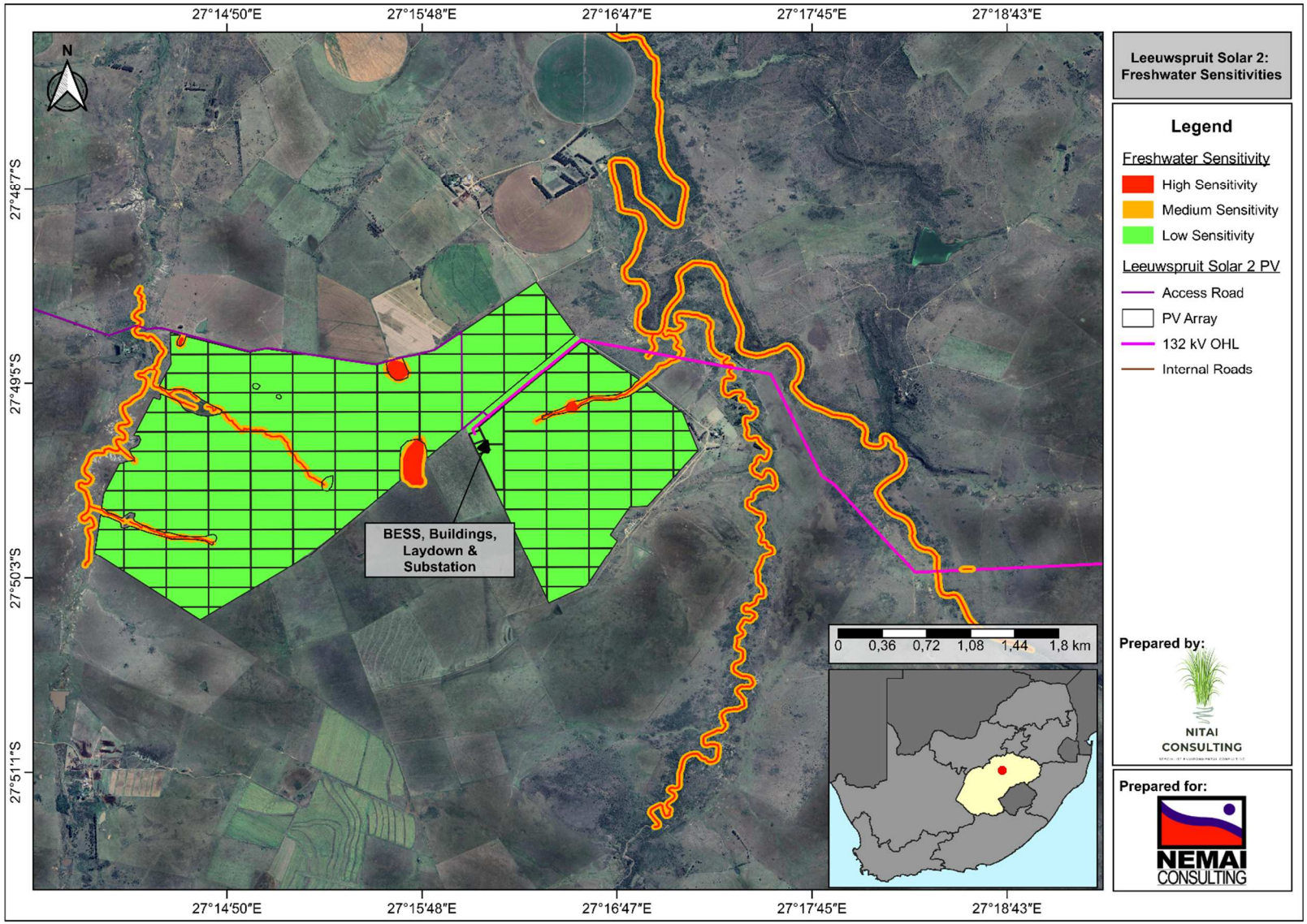


Figure 57: **Ground-truthed sensitivity of Aquatic Biodiversity for Layout Alternative 1 (van Rooyen, 2023)**

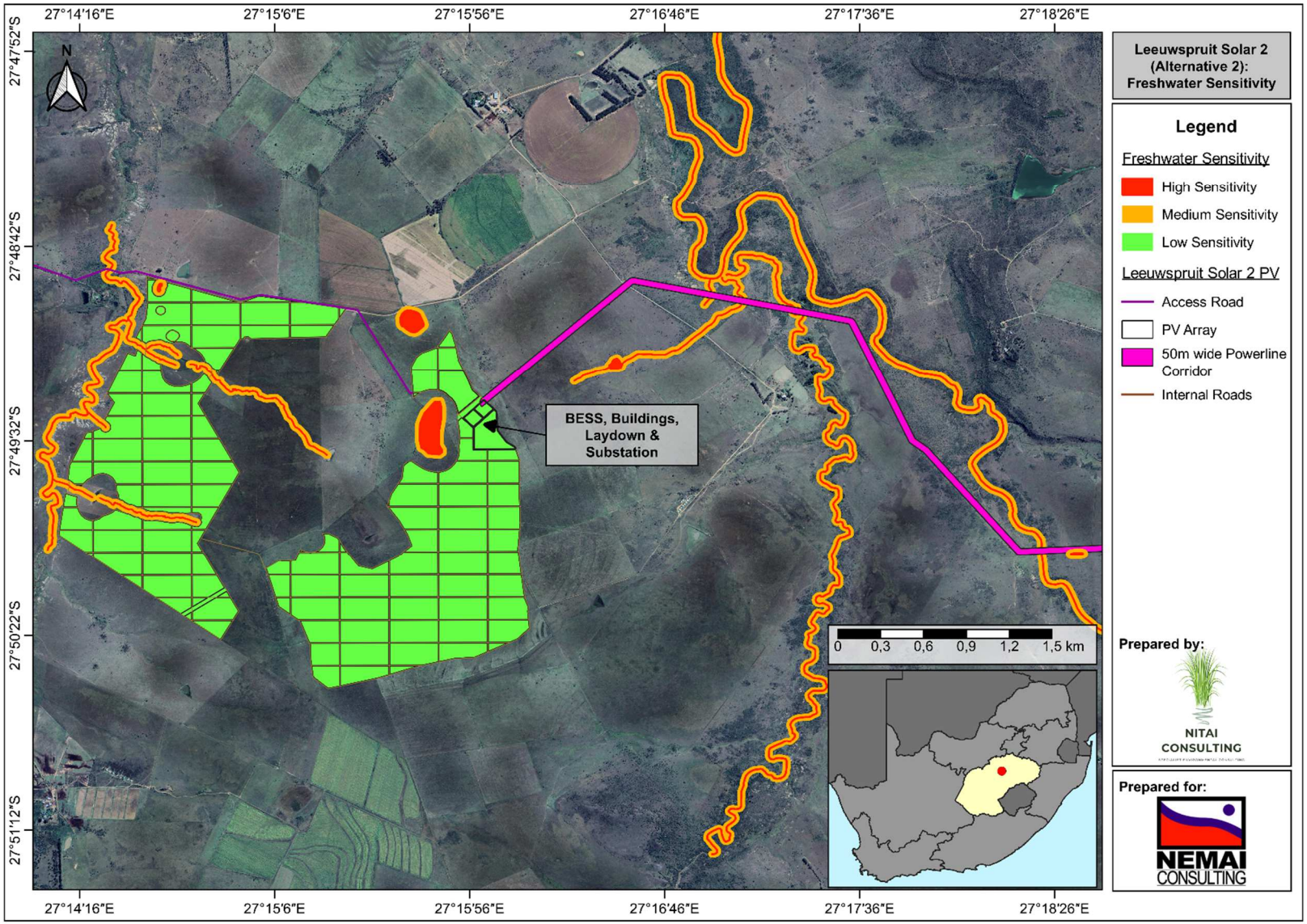


Figure 58: **Ground-truthed sensitivity of Aquatic Biodiversity for Layout Alternative 2 (van Rooyen, 2023)**

12.4.5 Impact Assessment

Refer to **Section 13.12.2** below for the results from the impact assessment from this study.

12.4.6 Conclusions

The original layout (Layout Alternative 1) was revised based on the findings of the fieldwork. Layout Alternative 2 takes into account all sensitive freshwater features and does not encroach into the 32 m buffer zones of watercourses.

Layout Alternative 1 is associated with high sensitivity as it impacts directly on watercourses. However, Layout Alternative 2, which is preferred layout, has low sensitivity in terms of freshwater features. Therefore, it is the opinion of the specialist that the activities will not have a significant impact on the associated watercourses, given that Alternative 2 layout is used, and the mitigation measures and best practise pollution control are followed.

Finally, the revised layout therefore takes the freshwater sensitivities into account and is outside of these sensitive freshwater areas. Therefore, it is the opinion of the specialist that the development of the Leeuwspruit Solar 2 PV Facility (using Alternative 2 as final layout) can continue as the activities will have a Low impact on the associated watercourses.

12.5 Terrestrial Biodiversity Assessment

A summary of the Terrestrial Biodiversity Assessment (Human, 2023) follows. The specialist report is contained in **Appendix E2**.

12.5.1 Details of the Specialist

The details of the specialists that compiled the Terrestrial Biodiversity Assessment follow.

Organisation:	Nitai Consulting
Name:	H.E. Human
Qualifications:	M-Tech Degree Nature Conservation
No. of years' experience:	13
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 147031)

12.5.2 Objectives of the Study

The study aimed to comply with the relevant Protocols for Terrestrial Biodiversity, Terrestrial Plant Species and Terrestrial Animal Species.

12.5.3 Methodology

The assessment included the following tasks (amongst others):

- ❑ Existing data layers were incorporated into GIS software to establish how the proposed Project might interact with any ecologically important features.
- ❑ A botanical assessment was undertaken, which encompassed an assessment of all the vegetation units and habitat types within the Project Area. This focused on an ecological assessment of habitat types as well as identification of any Red Data species within known distribution of the Project Area. The fieldwork methodology included timed meanders, sensitivity analysis based on structural and species diversity, identification of protected floral species, and identification of floral red-data or red-listed species (SCC).
- ❑ A faunal assessment was undertaken, which included the following:
  - The faunal desktop assessment encompassed –
    - o Compilation of expected species lists;
    - o Identification of any Red Data or SCC potentially occurring in the area; and
    - o Emphasis was placed on the probability of occurrence of species of provincial, national and international conservation importance.
  - The field survey component of the assessment utilised a variety of sampling techniques including, but not limited to, the following -
    - o Visual observations;
    - o Active hand-searches, used for species that shelter in or under particular micro-habitats;
    - o Identification of tracks and signs; and
    - o Utilisation of local knowledge.
  - Various field guides and texts were consulted for identification purposes in the field during the survey.

Field surveys were undertaken in January and April 2023.

12.5.4 Key Findings of the Study

A description of the terrestrial ecological features in the Project Area is contained in **Section 11.7** above. Key findings from the study follow.

12.5.4.1 Habitat Survey and Site Ecological Importance

The main habitat types in the Project Area were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey. The site occurs within natural grassland with sensitive areas in the form of healthy Vaal-Vet Sandy Grassland and slightly disturbed (light to moderate) grassland adjacent to these areas.

The grassland areas contain variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad

classification of the habitat unit on site, which also reflects relatively uniform plant species compositional units, is as follows:

- Healthy Grassland / Endangered Vaal-Vet Sandy Grassland;
- Disturbed Grassland;
- Wetlands / Aquatic Habitats;
- Alien species; and
- Transformed areas.

12.5.4.2 Verification of Site Sensitivity – Screening Tool

The sensitivity in terms of the Terrestrial Biodiversity Theme identified by the Screening Tool is shown to be Very High (see **Figure 59**) as the Project Area encroaches into CBA1, CBA 2, ESA1, ESA2, NPAES and an Endangered Ecosystem (i.e., Vaal-Vet Sandy Grassland).

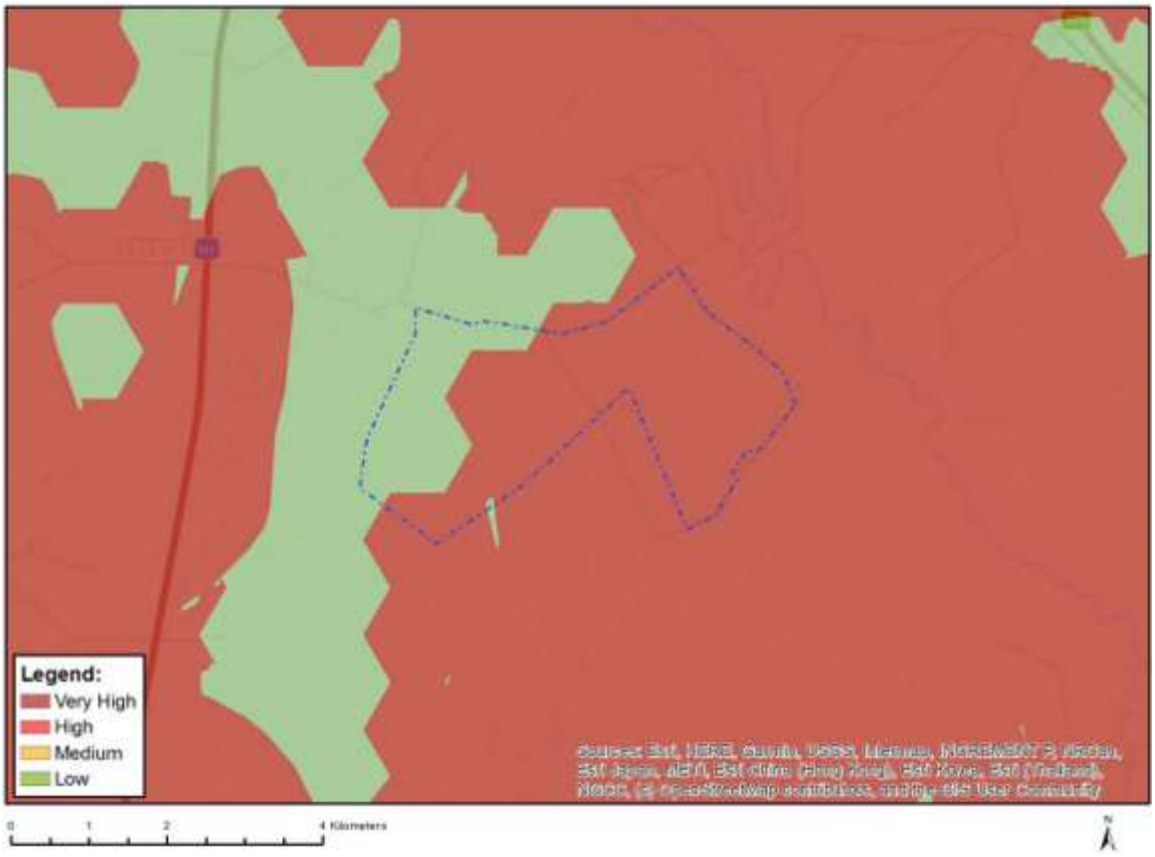


Figure 59: Sensitivity of Terrestrial Biodiversity Theme - Screening Tool (Human, 2023) (Layout Alternative 1)

According to the Screening Tool the sensitivity in terms of the Plant Species Theme is Low (see **Figure 60**). The Screening Tool shows the sensitivity in terms of the Animal Species Theme to be Medium due to potential presence of *Hydrictis maculicolis* and Sensitive species 15 as well as Low (see **Figure 61**).

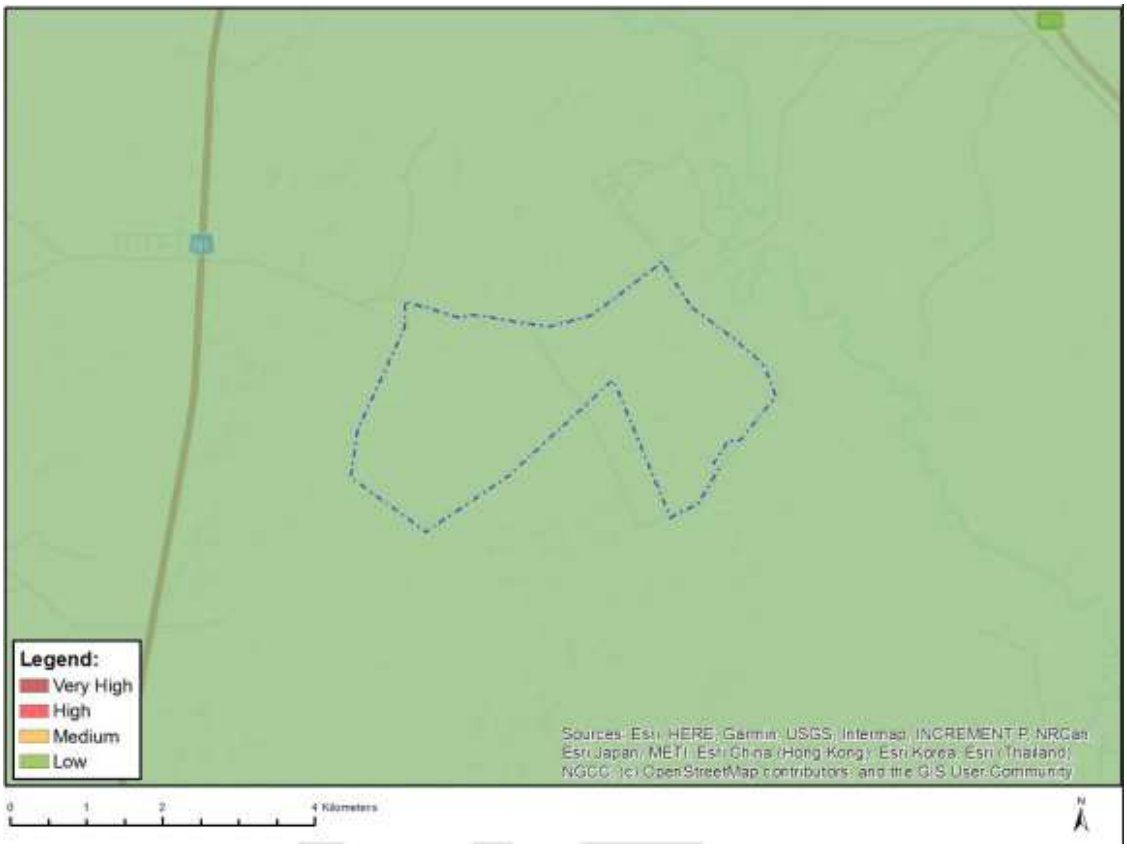


Figure 60: **Sensitivity of Plant Species Theme - Screening Tool (Human, 2023) (Layout Alternative 1)**

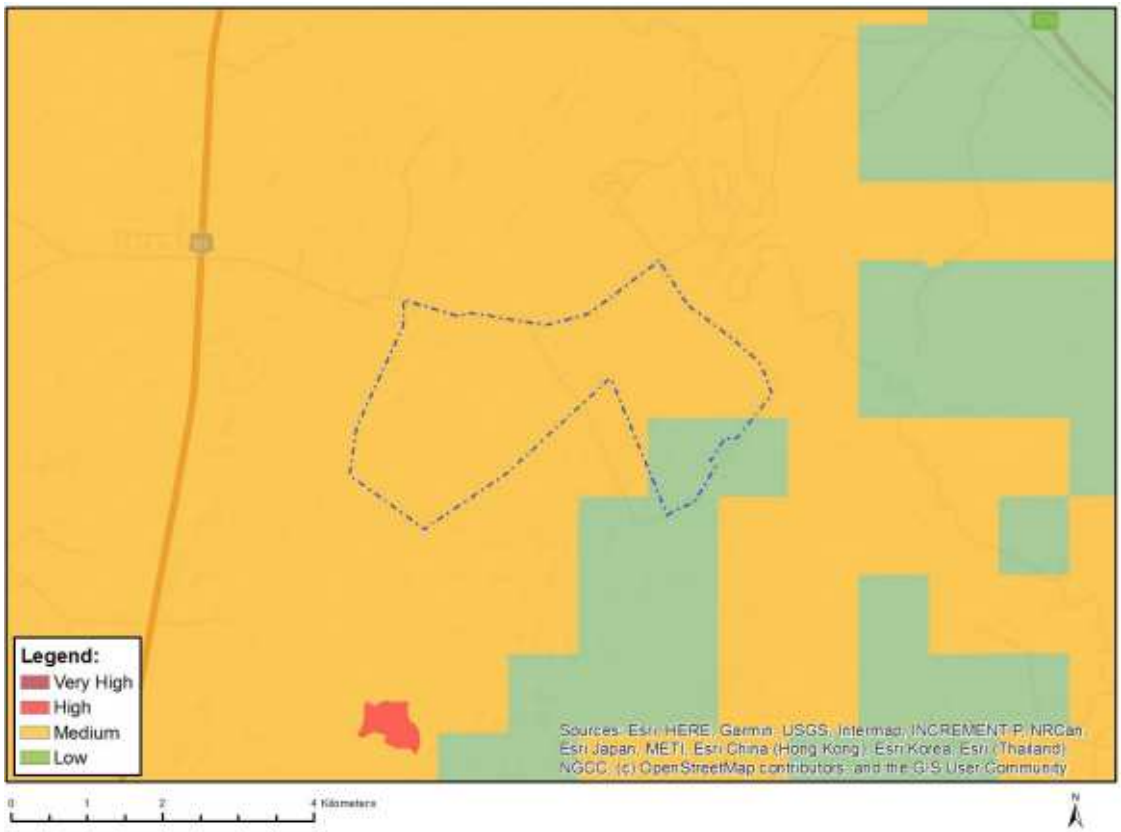


Figure 61: **Sensitivity of Animal Species Theme - Screening Tool (Human, 2023) (Layout Alternative 1)**

The Terrestrial Biodiversity Assessment found that the Disturbed Grassland, Alien Invasives and Transformed habitats does not corroborate the screening tool's 'Very High' sensitivity of the biodiversity theme and should rather be considered of medium sensitivity since there is remaining natural habitat but in disturbed condition. The plant sensitivity was indeed found to be low and corroborates the screening toll's results although 5 provincially protected species were found, but these are of least concern according to IUCN data. The animal sensitivity theme is corroborated since there was suitable habitat found for SCC animal species to be resident and consequently the sensitivity should be high and medium and not medium and low as the screening tool suggests.

12.5.4.3 Site Ecological Importance

The 5 terrestrial habitat types that were delineated were allocated a sensitivity category, or Site Ecological importance (SEI), which is presented in **Table 19** below.

Table 19: Summary of SEI assessment of habitat types delineated within Project Area (Human, 2023)

Habitat Type	Receptor resilience	Biodiversity Importance	SEI
Endangered Vaal-Vet Sandy Grassland	Medium	High	High
Disturbed Central Free State Grassland	Medium	Medium	Medium
Wetlands	Medium	Low	Low
Aquatic Habitats	Medium	Low	Low
Alien species	Medium	Low	Low
Transformed areas	Medium	Low	Low

Guidelines for development activities within the different SEI ratings are as follows:

- Very High – Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
- High – Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the area of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
- Medium – Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
- Low - Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.

The sensitivity of each of the habitat types delineated within the Project Area for Layout Alternative 1 and Layout Alternative 2 are mapped in **Figure 62** and **Figure 63** below, respectively.

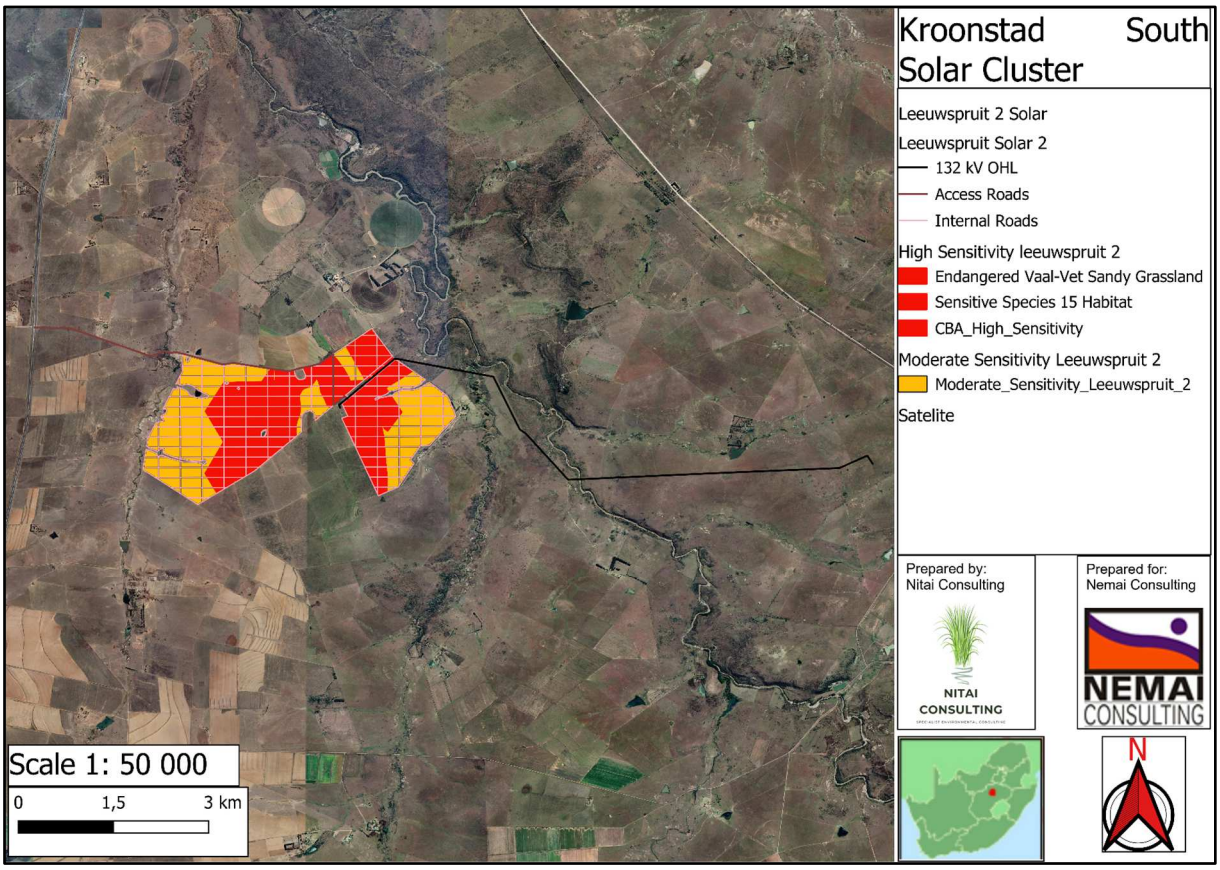


Figure 62: **Biodiversity SEI delineation for Layout Alternative 1 (Human, 2023)**

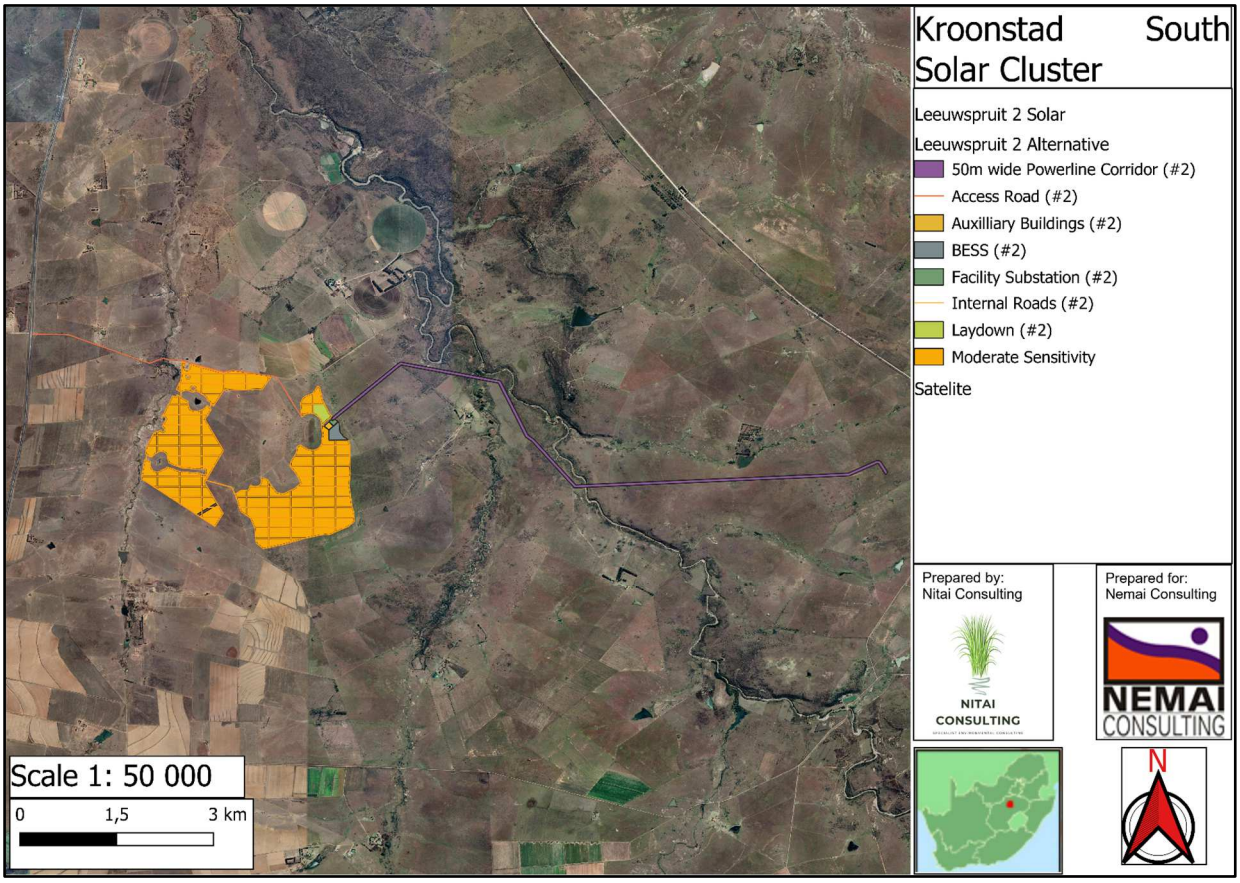


Figure 63: **Biodiversity SEI delineation for Layout Alternative 2 (Human, 2023)**

12.5.5 Impact Assessment

Refer to **Section 13.13** below for the results from the impact assessment from this study.

12.5.6 Conclusions

Alternative 1 is considered to have high to low impact and alternative 2 is considered to have a moderate to low negative impact on the terrestrial ecosystem associated with the project area after implementation of mitigation measures. Layout Alternative 2 is the preferred alternative as it avoids areas of high sensitivity. No fatal flaws were identified for the proposed Project. It is the opinion of the Specialist that the project location may be favourably considered on condition that all prescribed mitigation measures and supporting recommendations are implemented.

12.6 Avifauna Impact Assessment

A summary of the Avifauna Impact Assessment (Steyn, 2023) follows. The specialist report is contained in **Appendix E3**.

12.6.1 Details of the Specialist

The details of the specialists that undertook the Avifauna Impact Assessment follow.

Organisation:	The Biodiversity Company	
Name:	Dr L. Steyn	A. Husted
Qualifications:	PhD Biodiversity and Conservation	MSc Aquatic Health
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 119992)	SACNASP Professional Natural Scientist (Registration No.: 400213/11)

12.6.2 Objectives of the Study

The study aimed to comply with the Protocol for Terrestrial Animal Species. In addition, based on the size of the PV facility and the associated risk, a Regime 2 assessment was undertaken in terms of the Birds and Solar Energy Best Practice Guidelines (BirdLife South Africa, 2017).

The scope of the study included the following:

- ❑ Desktop assessment to identify the relevant ecologically important geographical features within the Project Area of Influence (PAOI) and surrounding landscape;
- ❑ Desktop assessment to compile an expected species list and possible avifauna SCC that potentially occur within the PAOI;
- ❑ Description of the baseline avifauna species and Functional Feeding Guild (FFG) composition assemblage within the PAOI;
- ❑ Delineate site sensitivity or sensitivities i.e., the Site Ecological Importance (SEI) within the context of the avifauna species assemblage of the PAOI;

- Identify the manner that the proposed development impacts the avifauna community and evaluate the level of risk of these potential impacts; and
- Provide mitigation measures to prevent or reduce the possible impacts.

12.6.3 Methodology

The assessment included the following tasks (amongst others):

- Various sources were reviewed as part of the desktop assessment and for compiling the expected species list; and
- Two field surveys were undertaken during the 19th to the 23rd of December 2022 and from the 6th to 10th of March 2023. Sampling consisted of standardized point counts as well as random diurnal incidental surveys.

12.6.4 Key Findings of the Study

A description of the avifaunal features in the Project Area is contained in **Section 11.7.6** above. Key findings from the study follow.

12.6.4.1 Verification of Site Sensitivity – Screening Tool

The Animal Species Theme sensitivity, as indicated in the Screening Report, was derived to be Medium (see **Figure 64**) due to the likely presence of mammal and herpetofauna species.

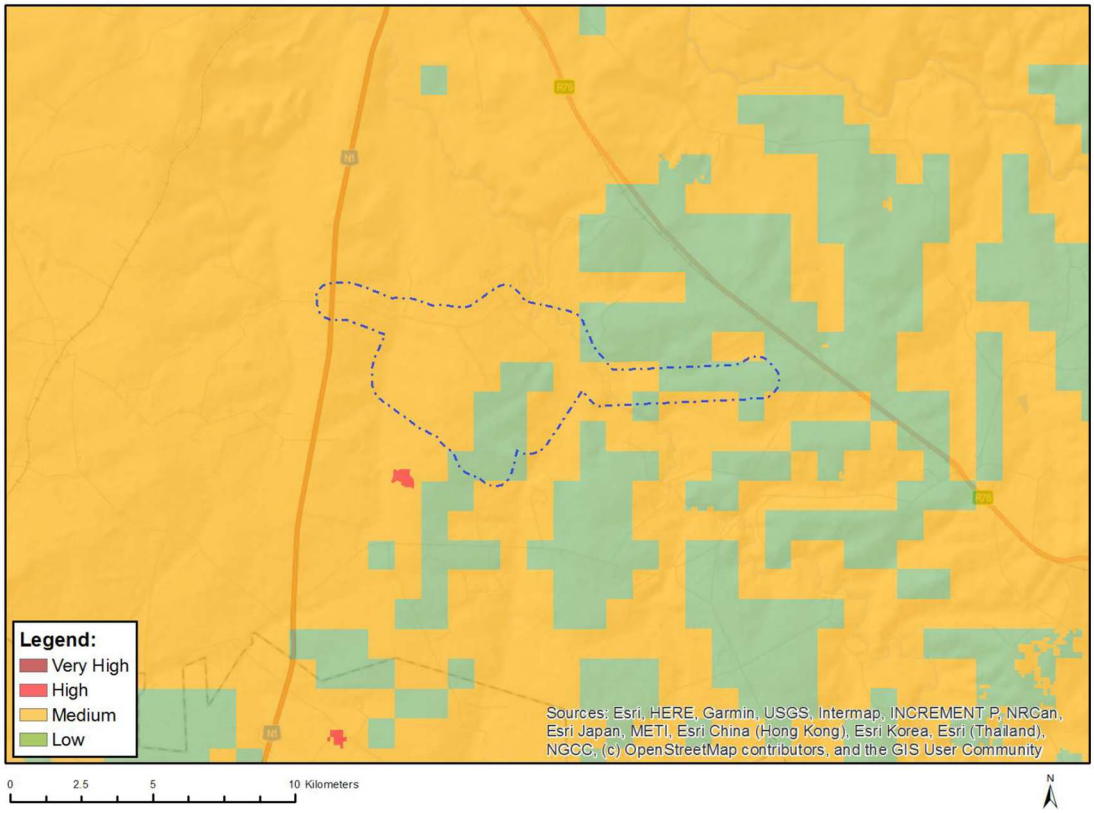


Figure 64: Sensitivity of Relative Animal Species Theme - Screening Tool (Steyn, 2023) (Layout Alternative 2)

12.6.4.2 Site Ecological Importance

All habitats within the assessment area of the proposed project were allocated a sensitivity or SEI category (see **Table 20**). The SEI of the PAOI within an avifauna context was based on both the field results and desktop information. The SEI of the habitat types delineated are illustrated in **Figure 65**. The water resources are where the Black-winged Pratincoles were observed, while in the grasslands the Secretarybird and Blue Korhaan were found. All the habitats also have a further potential to support additional SCC.

Table 20: SEI Summary of habitat types delineated within field assessment area of PAOI (Steyn, 2023)

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	SEI
Grassland	High Confirmed or highly likely occurrence of CR, EN, VU species. Presence of Rare species	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity	**Medium**	Medium Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality	**Medium**
Transformed-Degraded Grassland	Low No confirmed or highly likely populations of SCC.	Low Almost no habitat connectivity but migrations still possible	**Low**	High Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition	**Very Low**
Water resources	. High Confirmed or highly likely occurrence of CR, EN, VU species. Presence of Rare species	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity	**Medium**	Low Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality	**High**

The interpretation of the SEI in the context of the proposed Project is provided in **Table 21**.

Table 21: Guidelines for interpreting SEI in the context of the proposed development activities (Steyn, 2023)

SEI	Interpretation in relation to proposed development activities
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

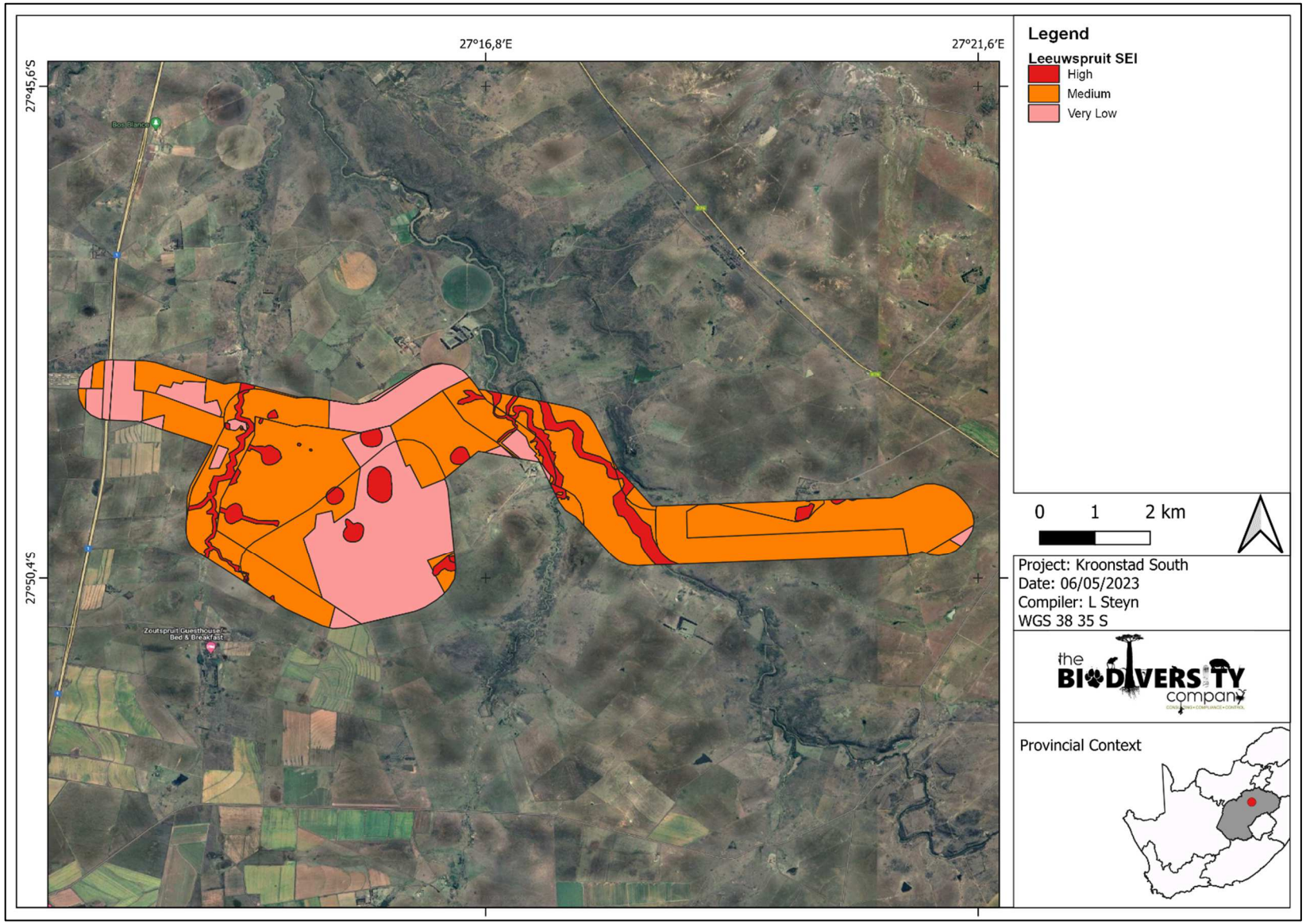


Figure 65: SEI of the proposed PAOI within an avifauna context (Steyn, 2023)

12.6.5 Impact Assessment

Refer to **Section 13.15** below for the results from the impact assessment from this study.

12.6.6 Conclusions

During the avifaunal assessment three SCC were observed, namely the Blue Korhaan (*Eupodotis caerulescens*; LC (Regional), NT (Global)); Secretarybird (*Sagittarius serpentarius*; VU, EN) and Black-winged Pratincole (*Glareola nordmanni*; NT, NT). The Black-winged Pratincoles were observed on three occasions and a total of 150 birds were recorded. Two Blue Korhaans and two Secretarybirds were observed. Fifteen and eighteen priority species respectively were recorded in the first and second survey. These species are at risk of either habitat loss, collisions or electrocutions. If the mitigation measures and recommendations are implemented these risks can be reduced to moderate. Nests of seven species were observed of which five are priority species. A 100 m buffer were placed around the priority species nests. If the nests are in the development footprint then these nests must be regarded as no go buffers for the duration of the breeding season (January- April), if the nests can be found just outside of the development areas then these nests and their buffers must be treated as long term (for the lifetime of the development) no go areas.

Three habitats were delineated in the assessment namely, Grassland, Degraded-transformed grassland and Water Resources. All these habitats support a number of avifauna species with the grasslands being the most species rich. The Water Resources were given a high SEI rating based on the SCC that are dependent on this habitat for both water and habitation. The overall impact of the Project is regarded as acceptable should the mitigation measures and recommendations be implemented. Layout Alternative 2 is the preferred layout.

The main expected impacts of the proposed PV facility and associated infrastructure include the following:

- Habitat loss and fragmentation;
- Electrocutions; and
- Collisions.

Considering the above, it is the opinion of the Specialist that the Project may be favourably considered, on condition that all the mitigation measures, monitoring and recommendations provided in this report and other specialist reports are implemented.

12.7 Terrestrial Animal Species Study - Giant Girdled Lizard

A summary of the Terrestrial Animal Species Study (Giant Girdled Lizard) (Reilly, 2023) follows. The specialist report is appended to the Terrestrial Biodiversity Assessment in **Appendix E2**.

12.7.1 Details of the Specialist

The details of the specialist that undertook the study follow.

Organisation:	ECOFIN & BK REILLY CONSULTING ECOLOGISTS
Name:	B.K. Reilly
Qualifications:	PhD Nature Conservation
No. of years' experience:	40
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 400164/08)

12.7.2 Objectives of the Study

During the Scoping Phase the EWT indicated that the Project Area falls within the distribution of the Giant Girdled Lizard (*Smaug giganteus*) and requested a walk-through survey to confirm the presence or absence of this species.

12.7.3 Methodology

Initial interaction with the primary consultant established the terms of reference and information was gleaned on their site surveys of the vegetation and general habitat. They provided comprehensive maps covering the sensitivity of the area and other basic information. A field walk-through survey was undertaken on the 27th and 28th April. This was preceded by vehicle reconnaissance to establish the boundaries of the sites, general familiarization, proposed development footprints and likely habitats. Likely habitats were then traversed on foot with the primary objective to identify burrows either abandoned or active. Special attention was given to more open sandy areas. An English pointer was also used to range the area in conjunction with the walk through as reptiles give off a strong scent. Informal conversations were held with landowners, managers and farm labourers on the potential occurrence and whereabouts of lizards and these areas used as focal points. Active interaction was undertaken with the EWT Highlands Grassland Field Officer before and during the survey on their findings from recent field surveys.

12.7.4 Key Findings of the Study

Presence of girdled lizards could not be confirmed in the walk-through survey of the Kroonstad South Clusters. Historical evidence (previous 10 years) and confirmation by the EWT survey of April 2023 does confirm their presence in the surrounding areas of the Kroonstad South Cluster.

The sensitivity for Layout Alternative 1 is rated as low within the degraded grassland and woodland habitats since there is suboptimal habitat remaining, but high within the historical (remnants) habitat, which coincided with more suitable sandier soils. With consideration of Layout Alternative 2 the sensitivity is low since all sensitive areas and features have been avoided. The proposed powerline passing through the habitat should not pose a problem to any girdled lizards due to the linear nature of the development and no complete destruction of suitable habitats.

In areas of low sensitivity, no mitigation is required but for areas of high sensitivity the area should be totally avoided (except for the powerline), or extensive mitigation measures are required in terms of substantial offsets, relocation of individuals the creation of corridors and buffer areas.

12.8 Agricultural Compliance Statement

A summary of the Agricultural Compliance Statement (Gouws, 2023) (contained in **Appendix E4**) follows.

12.8.1 Details of the Specialist

The details of the specialist that undertook the Agricultural Impact Assessment follow.

Organisation:	Index
Name:	Dr A. Gouws
Qualifications:	PhD Integrated Land Use Modelling
No. of years' experience:	39
Affiliation (if applicable):	▪ Council of Natural Sciences.No:400036/93, Category: Agricultural sciences. ▪ Member of the Soil Science Society of South Africa

12.8.2 Objectives of the Study

The study aimed to comply with the Protocol for the Agriculture Theme.

The objectives of the study include the following:

- ❑ Determine the agricultural potential in the Project's footprint;
- ❑ Determine impacts of the Project from an agricultural perspective;
- ❑ Suggest suitable mitigation measures to address the identified impacts.

12.8.3 Methodology

The sensitivity verification entailed a review of existing information on soils and topography on a desktop level to determine areas with high sensitivity. The desktop verification was done through use of satellite imagery. Thereafter, a site survey was undertaken on 25 April 2023.

Soil profiles were augured to determine soil depth, clay content estimated by hand and to determine land conditions. Capability classification is according to the guidelines published on the AGIS website of the National Department of Agriculture (NDA) was used to determine the capability of soils and their agricultural potential.

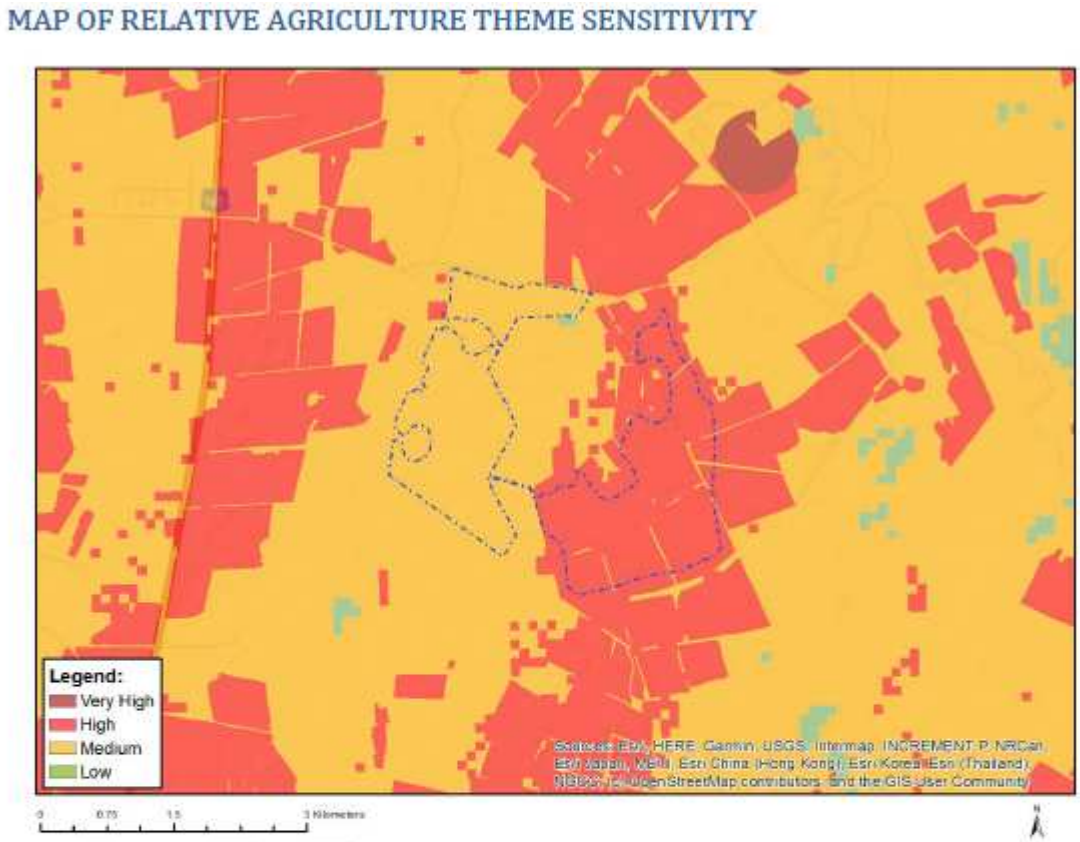
The report compared the current crop land and the environmental sensitivity as identified by the Screening Tool with the present situation.

12.8.4 Key Findings of the Study

12.8.4.1 Verification of Site Sensitivity – Screening Tool

The Screening Tool indicates the following (see **Figure 66**):

- Field crop boundary - cultivated land occurs on the north central portion of the property; and
- Land sensitivity to agriculture is moderate (Category 6 and 7) and some isolated portions that is moderately high (Category 9 and 10).



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;09. Moderate-High/10. Moderate-High
High	Annual Crop Cultivation / Planted Pastures Rotation;Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate
Medium	Land capability;06. Low-Moderate/07. Low-Moderate/08. Moderate

Figure 66: Sensitivity of Agriculture Theme - Screening Tool

The outcome of the site sensitivity verification found the following:

- Field crop boundary - The survey disagrees with the screening tool. There is no cultivated land on the proposed PV site. The entire site is used for cattle farming.

- Land capability -
  - The environmental sensitivity of nearly all land, according to the tool is indicated as moderately sensitive. This was confirmed by the site investigation; no highly sensitive areas were confirmed during the site visit.
  - Using the same guidelines as in AGIS (DALRRD), the land has low/moderate arable potential. The land indicated as highly sensitive, is medium sensitive because it is highly prone to erosion and already has dongas and sheet erosion.

12.8.5 Conclusions

There will be no permanent loss of high potential land and only limited loss of agricultural production from the cattle farming. The development takes place on low and medium potential land that has at best medium sensitivity related to agriculture.

It is the Specialist's opinion that there is no reason to prevent the Project from being implemented from an agricultural perspective.

12.9 Heritage Impact Assessment

A summary of the Heritage Impact Assessment (Kitto, 2023) (contained in **Appendix E5**) follows.

12.9.1 Details of the Specialist

The details of the specialist that undertook the Phase 1 Cultural Heritage Impact Assessment follow.

Organisation:	Nitai Consulting
Name:	Jennifer Kitto
Qualifications:	BA Archaeology and Social Anthropology; BA (Hons) Social Anthropology
No. of years' experience:	24
Affiliation (if applicable):	Association of Southern African Professional Archaeologists (ASAPA) - Technical member No.444

12.9.2 Objectives of the Study

The objectives of this study included the following:

- Undertake a Heritage Impact Assessment in accordance with the NHRA;
- Identify and map all heritage resources in the area affected, as defined in Section 2 of the NHRA, including archaeological sites on or near (within 100m of) the proposed development;
- Assess the significance of such resources in terms of the heritage assessment criteria as set out in the regulations;
- Assess the impacts of the Project on such heritage resources;
- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study;

- Identify heritage resources to be monitored; and
- Comply with specific requirements and guidelines of FSHRA and SAHRA.

12.9.3 Methodology

The methodology employed during this study consisted of the following:

- An archaeological and historical literature survey was undertaken;
- A survey of Heritage Impact Assessments for projects in the region by various heritage consultants was conducted;
- Various databases were consulted; and
- An assessment of available historical topographical maps was undertaken to establish a historic layering for the study area.

12.9.4 Key Findings of the Study

12.9.4.1 Archaeological and Cultural Heritage Sensitivity - Screening Tool

The Screening Tool was accessed for information on the cultural-heritage sensitivity of the general region. This tool indicated that the Archaeological and Cultural Heritage Sensitivity of the Project Area is Low for both Layout Alternative 1 and Alternative 2 (see **Figure 67** and **Figure 68**).

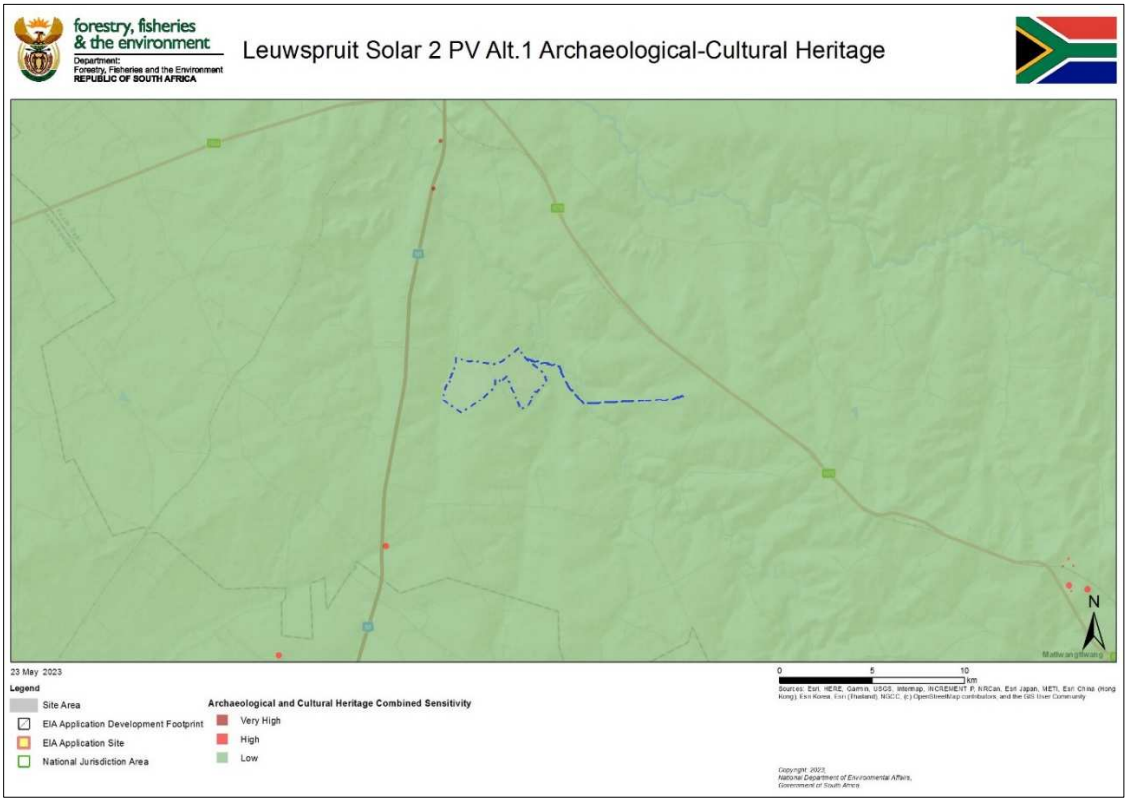


Figure 67: Sensitivity of Archaeological Cultural Heritage Theme - Screening Tool (Layout Alternative 1) (Kitto, 2023)

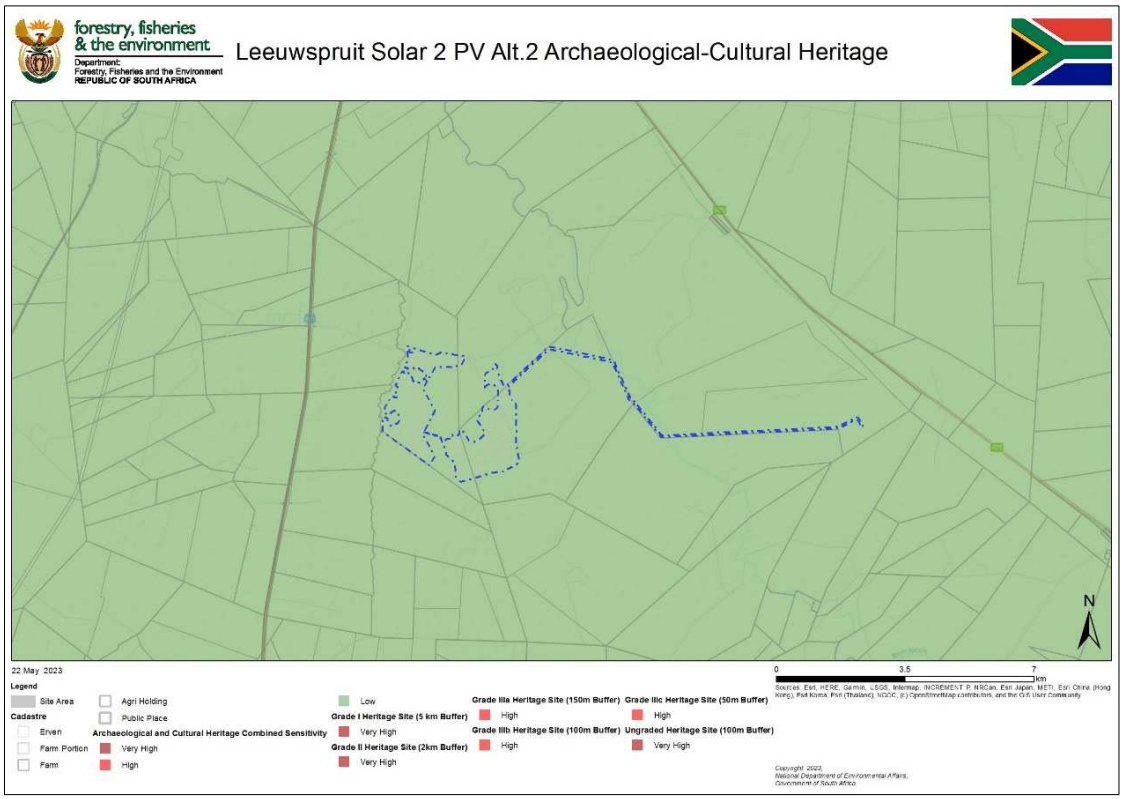


Figure 68: Sensitivity of Archaeological Cultural Heritage Theme - Screening Tool (Layout Alternative 2) (Kitto, 2023)

12.9.4.2 Impact Statement

The general overview from the historical desktop study has shown that various archaeological and historical resources can be expected to occur in the Project Area.

The examination of the earliest edition (1960) of the 1:50 000 topographical maps produced by overlying the maps with satellite imagery (Google Earth) has shown that three heritage features are depicted within the Leeuwspruit Solar 2 footprint for Alternative 1 layout. One site is a grave or cemetery and there are two homestead sites. A farmstead is depicted just outside the east-central section of the footprint and another outside the northwest corner. The Alternative 2 Layout depicts only one heritage feature within the footprint boundaries, this is the grave or cemetery. The other heritage features depicted are located outside the Alternative 2 footprint.

The Site Survey fieldwork provided confirmation of the heritage resources occurring within and close to project area footprint. The field survey identified a total of four heritage resources, two of which comprise demolished historical structures/remains (one being a probable homestead – Leeuw 05). One site is an informal graveyard containing approximately 15-20 stone-packed graves (Leeuw 04). One site (Leeuw 02) is located just outside the boundary of the general project footprint (Alternative 1), and comprises several extant historical farm buildings, which are still occupied (see **Figure 69** below).

Figure 69: **Heritage Sensitivity Map based on the site inspection (Kitto, 2023)**

12.9.5 Impact Assessment

Refer to **Section 13.17** below for the results from the impact assessment from this study.

12.9.6 Conclusions

Four heritage resource sites were identified in total, three within the general project area and one outside. One is an informal graveyard (Leeuw-04), two contain the remains of demolished structures (Leeuw 05 and Leeuw-03), and the site located just outside the project area comprises an extant historical farmhouse and outbuildings (Leeuw 02).

The impact significance of the project on graves is high before mitigation as the graveyard site (Leeuw 04) and site with potential infant burials (Leeuw 05) are both located inside the proposed PV array area of the project footprint for Alternative 1 and Alternative 2. Although these two sites are avoided in the layout design of Alternative 2, there is a possibility of indirect impact. Site Leeuw 04 is protected by section 36 of the NHRA and the 30m buffer must be demarcated clearly as a “no go” area. However, implementation of the mitigation measures required should reduce the impact to low.

The impact significance of the proposed project on protected historical structures is low as only one extant historical structure site was identified (Leeuw 02) which is situated outside the project footprint boundary – Alternative 1. This is likely to be 60 years or older and is protected by section 34 of the NHRA. Two sites comprising the demolished remains of structures were also identified: one is a possible homestead (Leeuw 05) and the other comprises several scattered pieces of concrete, some with metal bars embedded (Leeuw-03). These two sites are avoided in the layout design of Alternative 2. As noted above, there is still a possibility of indirect impact. The 30m buffer zones must be demarcated clearly as a “no go” area for these two sites. However, implementation of the mitigation measures required (set out in Table 11,) should retain the impact as low.

The impact significance of the proposed project on archaeological sites or material is low as no such sites or material were identified. However, as such material is usually located subsurface, there is a possibility that it could be uncovered during site clearance or construction activities.

No fatal flaws were identified during this study, therefore, it is the considered opinion of the heritage specialist that the construction of the proposed Leeuwspruit Solar 2 PV project within the footprint can proceed. There are no objections from a heritage perspective if the recommendations and mitigation measures contained in this report and in the palaeontological assessment are implemented before any site clearance or construction activities are undertaken. The Alternative 2 layout is preferred as this has been designed to avoid all the identified heritage sites.

12.10 Palaeontological Impact Assessment

A summary of the Palaeontological Impact Assessment (Butler, 2023) (contained in **Appendix E6**) follows.

12.10.1 Details of the Specialist

The details of the specialist that undertook the Palaeontological Desktop Assessment follow.

Organisation:	Banzai Environmental
Name:	E. Butler
Qualifications:	MSc Zoology (specializing in Palaeontology)
No. of years' experience:	30
Affiliation (if applicable):	Member of the Palaeontological Society of South Africa (PSSA)

12.10.2 Objectives of the Study

The general objectives of a Palaeontological Impact Assessment include the following:

- To identify the palaeontological importance of the rock formations in the footprint;
- To evaluate the palaeontological magnitude of the formations;
- To clarify the impact on fossil heritage; and
- To suggest how the developer might protect and lessen possible damage to fossil heritage.

12.10.3 Methodology

The following sources were reviewed as part of this study:

- Geological map 1:100 000, Geology of the Republic of South Africa (Visser, 1984);
- Spatial data of the proposed development from the EAP;
- 1:250 000 2726 Kroonstad (2000) Geological Map (Council of Geoscience, Pretoria); and
- Updated geology produced by the Council of Geosciences, Pretoria.

A field survey was conducted on 13 May 2023.

12.10.4 Key Findings of the Study

12.10.4.1 Palaeontological Sensitivity

The Screening Tool indicates that the Palaeontological Sensitivity of the development is Very High (dark red) to Moderate (orange).

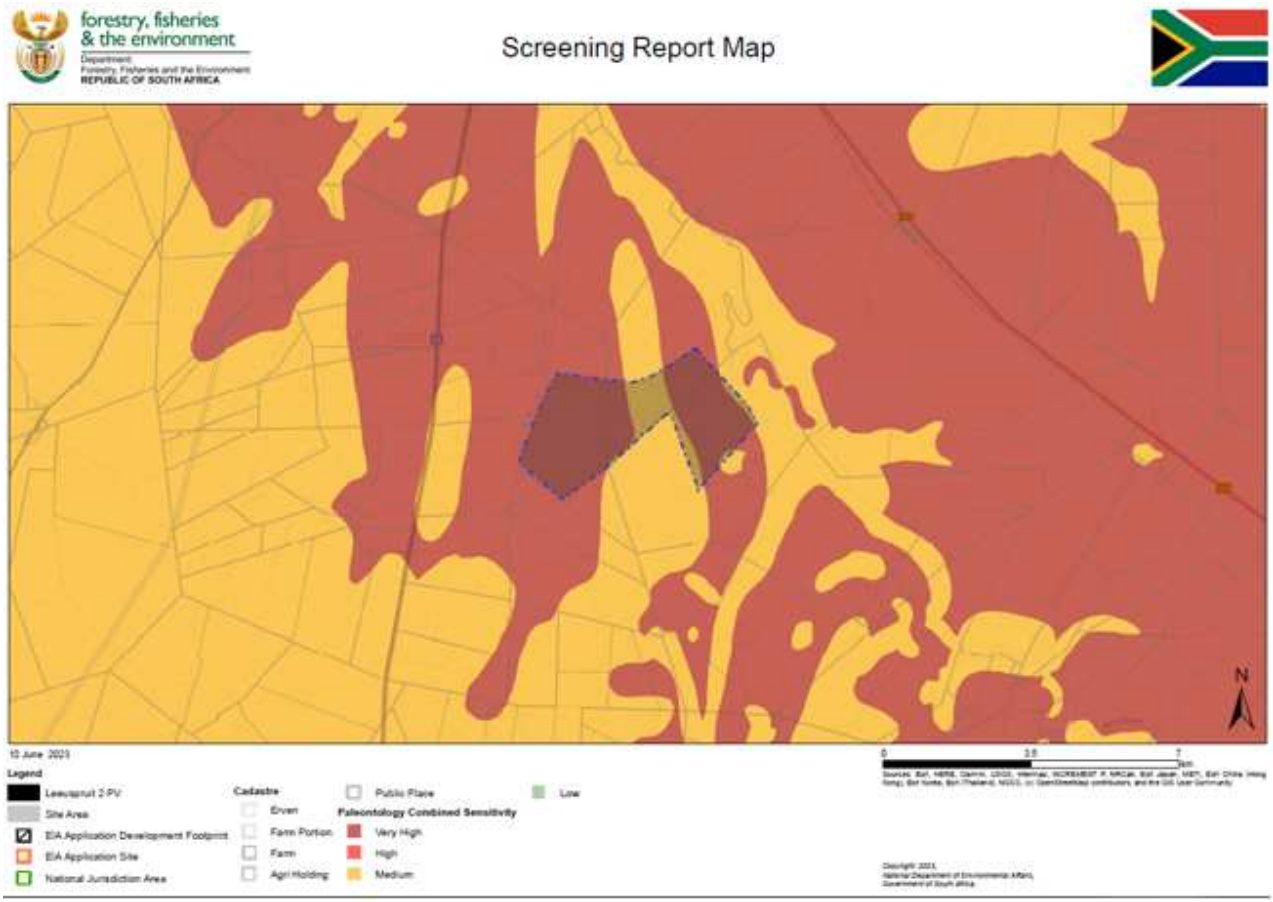


Figure 70: **Palaeontological Sensitivity - Screening Tool (Layout Alternative 1) (Butler, 2023)**

Two layout alternatives have been proposed for the Project. Layout Alternative 1 is the original layout and Alternative 2 has been revised after specialist input. As the geology of the two layouts are the same there is preference between the alternatives from a Palaeontological Perspective.

No fossiliferous outcrop was detected in the proposed development footprint during the field survey. This could be attributed to the lack of outcrops as well as the lush grassy vegetation in the area.

Based on the site investigation as well as desktop research it is concluded that fossil heritage of scientific and conservational interest in the development footprint is rare. This is in contrast with the High Sensitivity allocated to the development area by the SAHRIS Palaeosensitivity Map and Screening Tool. A medium Palaeontological Significance has been allocated for the construction phase of the PV development pre-mitigation and a low significance post mitigation. The construction phase will be the only development phase impacting Palaeontological Heritage and no significant impacts are expected to impact the Operational and Decommissioning phases.

The Cumulative impacts of the development near Kroonstad is considered to be Low and falls within the acceptable limits for the project.

12.10.5 Impact Assessment

Refer to **Section 13.18** below for the results from the impact assessment from this study.

12.10.6 Conclusions

It is considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area. The construction of the development may thus be permitted in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources. It is consequently recommended that no further palaeontological heritage studies, ground truthing and/or specialist mitigation are required pending the discovery of newly discovered fossils. If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations the Chance Find Protocol must be implemented.

12.11 Visual Impact Assessment

A summary of the Visual Impact Assessment (Viljoen, 2023) (contained in **Appendix E8**) follows.

12.11.1 Details of the Specialist

The details of the specialist that undertook the Visual Impact Assessment follow.

Organisation:	Environmental Assurance (Pty) Ltd	
Name:	Richard Viljoen	Carl Schoeman
Qualifications:	MSc Environmental Science	MSc Environmental Management
Affiliation (if applicable):	-	SACNASP (Pr. Sci. Nat.) 114848

12.11.2 Objectives of the Study

The purpose of the Visual Impact Assessment included the following:

- Describing the existing visual characteristics of the proposed site and its environment;
- Determining areas from which the proposed development will be visible.
- Assess the significance of the visual impacts determined to be caused by the proposed development; and
- Recommendation of possible mitigation measures.

12.11.3 Methodology

An initial desktop site assessment was conducted to determine suitable locations regarding the Visual Impact Assessment. The result of the desktop study is the identification of areas or activities, which could possibly contribute to the deterioration of the visual characteristics of the area.

Site baseline characterisation (and subsequent fieldwork) occurred on the 25th and 26th of April 2023 for the visual assessment. The site baseline characterisation was conducted to undertake the visual assessment of the current characteristics of the receiving environment. The field survey included photographic evidence at the various viewpoints, which were used as a basis for determining the potential visual ability and visual impacts of the proposed development. Various viewpoints were identified based on the sensitivity and visual impact of the area.

The assessment was conducted following the methodology:

- Site visit and orientation;
- Describing the landscape character or visual baseline;
- Review of available aerial photography and topographical maps;
- Determining the area/s where the project will be visible from;
- Determining the visual resource value of the landscape;
- Determine the visual absorption capacity of the receiving visual landscape;
- Determining the receptor sensitivity to the proposed project;
- Determine the magnitude of the impact, by considering the visibility, visual intrusion and visual exposure;
- Assessing the impact significance; and
- Recommending mitigation measures to reduce the potential visual impacts of the Project.

12.11.4 Key Findings of the Study

12.11.4.1 Visual Absorption Capacity

The majority of vegetation cover is predominately dominated by grasses, shrubs and scattered trees, while the topographical characteristics (flat to gentle) which can conceivably result in a low Visual Absorption Capacity (VAC). The visual resource value of the study area has been determined to be moderate and the VAC of the study area has been rated as low. Therefore, a high weighting factor in terms of VAC is applied during the impact assessment.

12.11.4.2 Visual Receptor Sensitivity

Receptor sensitivity refers to the degree to which an activity will impact the receptors and depends on how many persons see the project, how frequently they are exposed to it and their perceptions regarding aesthetics.

The following ratings were applied to the identified visual receptor groups (shown in **Figure 71**):

- Resident Receptors: Resident receptors comprise a high number of people (incidence factor) living around the proposed project area:
  - People living and working in the surrounding areas will rate a moderate value (sensitivity factor) to the project; and
- Transient Receptors: People travelling through and near the proposed site will be high as the proposed site is located near the N1 and R76 (being the main roads to access these areas),

constituting a high number of people (incidence factor). It is expected that travellers will attach a moderate degree of value to the current setting and visual character of the proposed site (sensitivity factor) due to the activities already established in the area. Hence, this receptor group has also been given a moderate sensitivity rating.

Based on the receptor sensitivity assessment, a high weighting factor in terms of this aspect is applied during the impact magnitude determination.

12.11.4.3 Theoretical Visibility

Theoretical visibility was determined by conducting a Viewshed analysis and using GIS software with three-dimensional topographical modelling capabilities:

- The Digital Elevation Model (DEM) for the Viewshed analysis was acquired; and
- A 10 km area surrounding the site was used due the topography of the area.

The Viewshed was modelled on the above-mentioned DEM and the layout, using Esri ArcGIS for Desktop software, 3D Analyst Extension. A viewshed was modelled to account for the PV facility and its associated infrastructure, that will be constructed (see **Figure 72**).

When considering the viewshed analysis, the visibility rating is moderate.

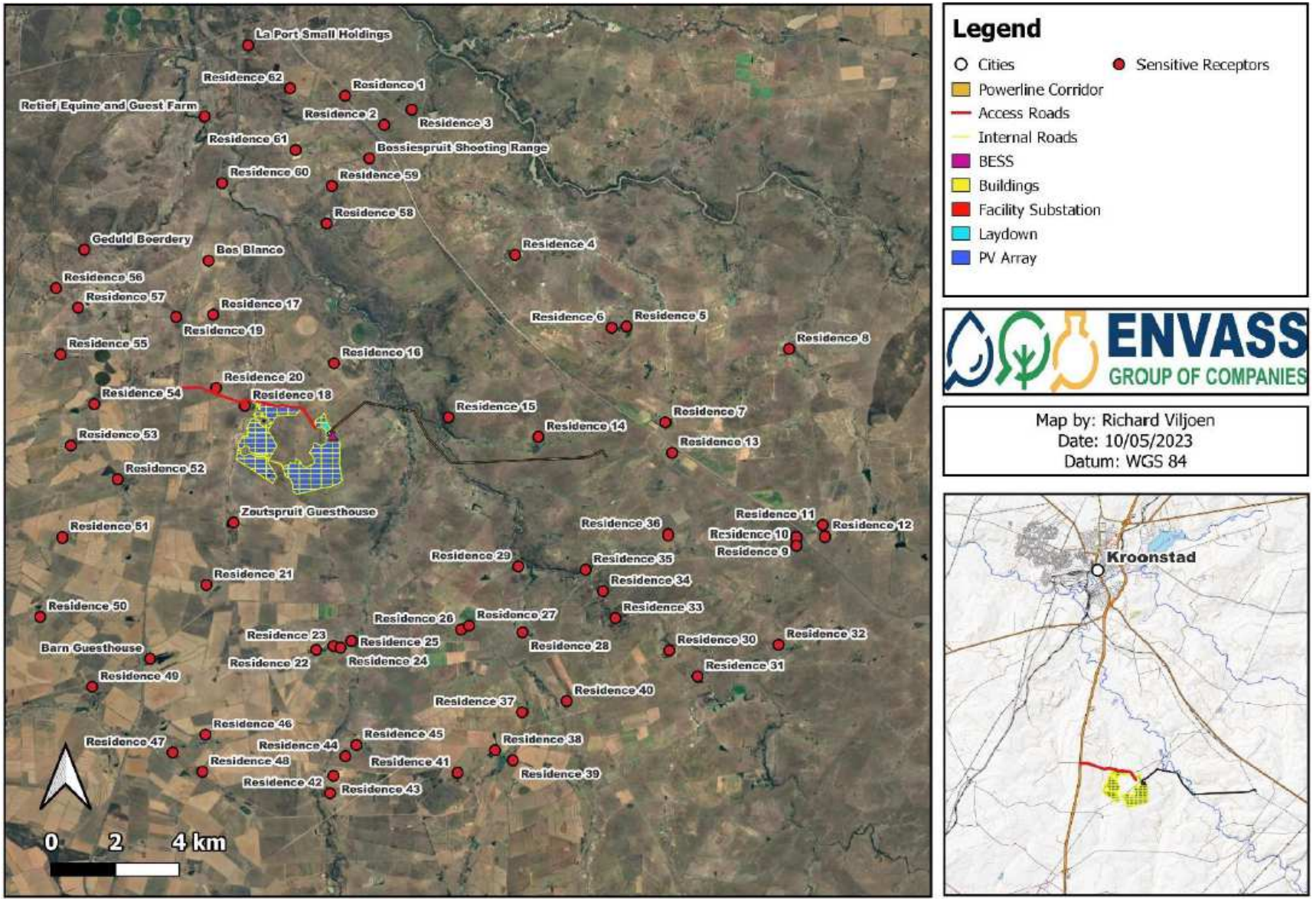


Figure 71: **Sensitive Receptors for the proposed Project (Viljoen, 2023) (Layout Alternative 2 shown)**

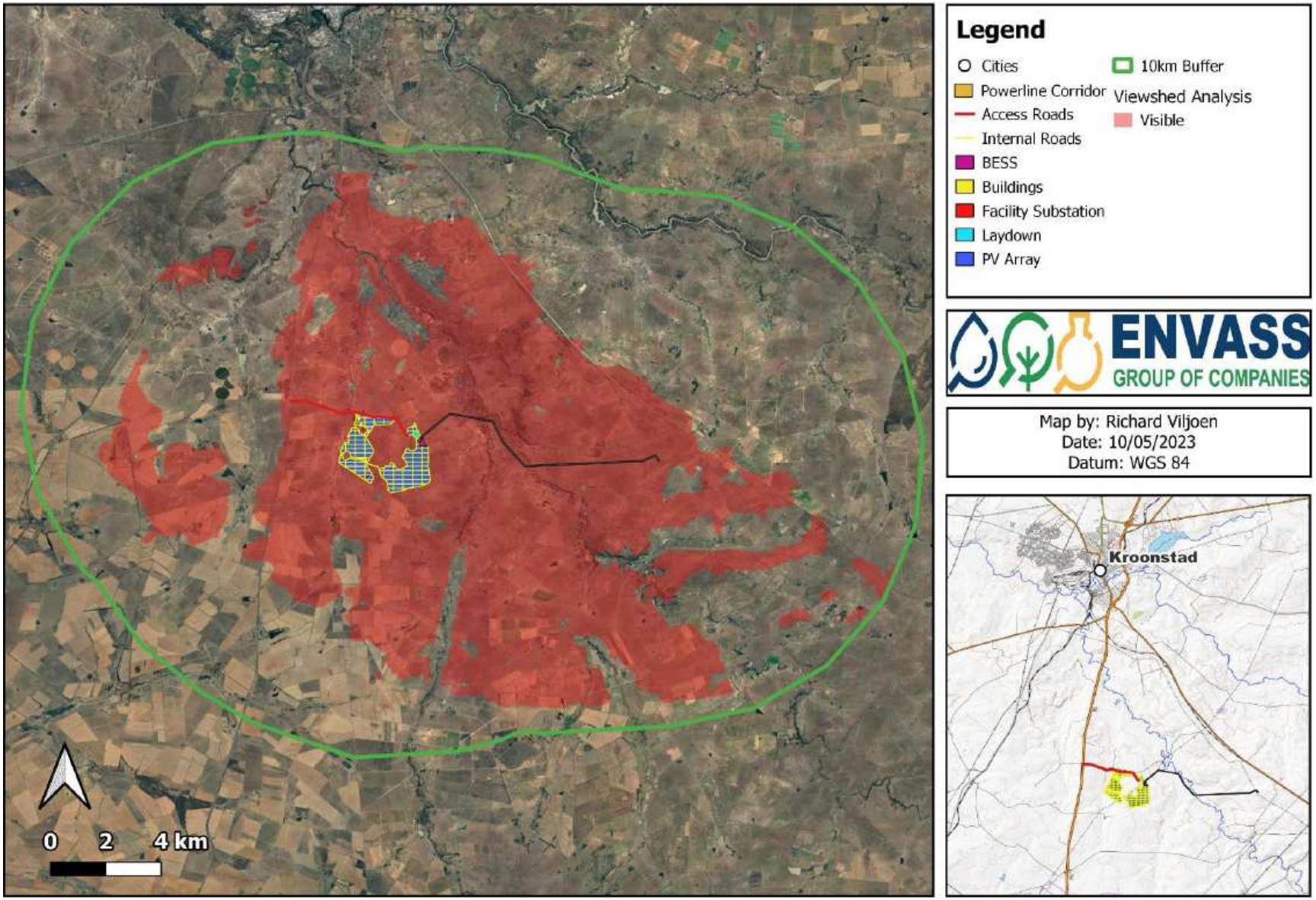


Figure 72: **Viewshed analysis for the proposed Project (Viljoen, 2023) (Layout Alternative 2 shown)**

12.11.4.4 Visual Intrusion

Visual intrusion deals with how well the project components fit into the ecological and cultural aesthetic of the landscape. An object will have a greater negative impact on scenes considered to have a high visual quality than on scenes of low quality.

Given that the study area has a low VAC (due to vegetation and the flat to gentle landscape) and moderate visual resource value, the proposed Project will have a moderate (without mitigation measures) visual intrusion on surrounding sensitive receptors. Ensuring that vegetation is retained on the periphery of these areas, and wherever possible, lights be directed downwards as to avoid illuminating the sky and limit the reflection from the solar panels, the visual impact on the surrounding environment will be moderate depending on the proximity to the sensitive receptors.

The altered visual environment during the construction and operational phases will lead to moderate (without mitigation measures) levels of visual intrusion, with moderate levels of compatibility with the surrounding land uses as well as moderate visual contrast. The level of visual intrusion because of the proposed Project, with specific mention of vegetation clearing, removal of topsoil and solar PV infrastructure, is considered to be moderate (without mitigation measures) during the construction and operational phases, in line with the low VAC. The perceived visual impacts associated with the construction and operational phases are moderately (without mitigation measures) intrusive to the receiving environment.

12.11.4.5 Visual Exposure

For the purposes of this assessment, close-range views (equating to a high level of visual exposure) are views over a distance of 500 m or less, medium-range views (equating to a moderate level of visual exposure) are views of 500 m to 2 km, and long-range views are over distances greater than 2 km (low levels of visual exposure). Limited sensitive receptors are located within 2 km of the site and are limited to people working in the area, residents and the number of farms surrounding the site.

For the purposes of this assessment, visual exposure in terms of all identified impacts has therefore been rated as low as the majority of the high sensitivity, sensitive receptors, are located more than 5 km from the project site.

12.11.4.6 Results

Results of the visual impact assessment indicated that from a visual perspective, the proposed Project and related activities are the main project components that are expected to result in a visual impact. Receptors located within 2km of the proposed site will have the moderate (without mitigation) visual impact. Within a 5 km radius of the proposed Project, residential areas and farming communities will have a low (without mitigation) visual impact. Beyond the 5 km study area, there are some areas where the development is discernible. However, the visual impacts are generally of moderate to low magnitude and impact. Local low and high-level vegetation will provide

limited screening; however, the proposed solar PV facility and associated infrastructure can conceivably be visible to the sensitive receptors located near the proposed project boundary. The visual impacts associated with the Project and associated infrastructure will occur once construction has been completed and will be long term in nature.

Based on the results of the impact assessment, the majority of the potential visual impacts were considered to be moderate before mitigation and with the successful implementation this can be reduced to low. With regards to the proposed activities, due to the terrain of the proposed boundary, vegetation, VAC, and current land uses, the proposed activities are expected to result in a moderate visual impact on the receiving environment. The proposed activities will have a long-term temporal visual impact, due to the very nature of the Project and associated infrastructure. The activity will have a localised visual impact over a long-term duration. The activity will be able to continue with the implementation of appropriate mitigation strategies during the construction, operational and decommissioning phases.

12.11.5 Impact Assessment

Refer to **Section 13.19** below for the results from the impact assessment from this study.

12.11.6 Conclusions

The project site and surrounding area can be characterized by residential, commercial, tourism, and agricultural activities. According to the REEA Database, there are three (3) renewable energy applications have been made for properties located near the project site. The proposed site ranges from approximately 1382 to 1439 metres above mean sea level (mamsl). predominantly flat, with a few small hills and rocky outcrops scattered throughout the area. The landscape is characterized by open grasslands, and scattered trees, typical of the Highveld region of South Africa. The surrounding areas comprises with a mix of residential activities, agricultural, tourism and commercial activities. The vegetation in the area consists mainly of grasses, shrubs, and scattered trees.

Several potential risks to the receiving aesthetic and visual environment as a result of the proposed activities have been identified, relating to impacts on the visual character and sense of place, visual intrusion and visual exposure and visibility. The significance of these impacts may be reduced should appropriate and effective mitigation measures be implemented. The proposed Project and associated infrastructure can conceivably have a moderate impact on the visual environment, while secondary impacts, such as dust emission, solar glint and glare and lighting at night, will also manifest as visual disturbances from project initiation. The study area comprises of residential activities, agricultural and commercial activities which have had a visual impact on the natural environment. Therefore, the proposed project has been predicted to have a moderate impact before mitigation on the visual environment. After appropriate and effective mitigation measures the impact is rated as moderate to low.

The proposed activities should therefore have a moderate to low visual impact on the receiving environment and is thus not fatally flawed from a visual impact perspective. The Layout Alternative 2 is preferred for site design as it results in reduced visual impacts compared to Layout Alternative 1. This is primarily due to the decreased size of the infrastructure in Layout Alternative 2.

Considering the project, it is the Specialist's opinion that the proposed activities be allowed, provided that the findings within this report are considered along with the recommendations made towards the management of the proposed activity.

12.12 Social Impact Assessment

A summary of the Social Impact Assessment (Tanhuke & Chidley, 2023) (contained in **Appendix E7**) follows.

12.12.1 Details of the Specialist

The details of the specialist that undertook the Social Impact Assessment follow.

Organisation:	Nemai Consulting	
Name:	C. Chidley	C. Tanhuke
Qualifications:	BA (Economics); BSc Eng (Civil); MBA	BA Environmental Management (Geography)

12.12.2 Objectives of the Study

The key objectives of the Social Impact Assessment included the following:

- Describe the social baseline conditions that may be affected by the Project;
- Determine the specific local social impacts of the Project;
- Identify the potential social issues associated with the Project;
- Suggest suitable mitigation measures to address the identified impacts; and
- Make recommendations on preferred options from a social perspective.

12.12.3 Methodology

The Social Impact Assessment sets out the social baseline of the study area; predicts social impacts and makes recommendations for mitigating negative social impacts.

The baseline study is based on both primary and secondary data. Primary data was collected directly from engagements with community members, landowners and business owners. Secondary data was accessed through SA economic and social databases. Articles and internet searches were also used and are referenced in the text and in the reference sections of this report.

The profile of the baseline conditions includes describing the current status quo of the community; including information on a number of social and economic issues such as:

- Demographic data.
- Socio-economic factors such as income and population data.
- Access to services.
- Institutional environment.
- Social Organization (Institutional Context); and
- Statutory and Regulatory Environment.

12.12.4 Key Findings of the Study

The Project Area has few social receptors surrounding the site, and the Project has a low footprint on the social environment. The social and economic impacts of the Project are expected to be positive in the sense that the local economy will be stimulated and broadened. The negative impacts are limited in nature and scope and can be successfully mitigated by changes to the layouts of the panels and management rules and practises.

12.12.5 Impact Assessment

Refer to **Section 13.27** below for the results from the impact assessment from this study.

12.12.6 Conclusions

It is concluded by the Specialist that the Project, once the recommended mitigation measures have been implemented, has a nett positive impact on the social environment of the regional study area.

12.13 Transport Impact Assessment

A summary of the Transport Impact Assessment (Patandin, 2023) (contained in **Appendix E9**) follows.

12.13.1 Objectives of the Study

The objectives of the Transport Impact Assessment include the following:

- Assess activities related to traffic movement for the construction and operation (maintenance) phases of the facility;
- Recommend a preliminary route for the transportation of the components to the proposed site;
- Recommend a preliminary transportation route for the transportation of materials, equipment and people to site; and
- Recommend alternative or secondary routes where possible.

12.13.2 Methodology

The study considered the traffic impact on the surrounding road network in the vicinity of the site during the construction and operational phases.

This study was informed by the following:

- Site visit and project assessment
- Traffic and Haul Route Assessment
- Site layout, access points and internal roads assessment per site.

12.13.3 Key Findings of the Study

This study addressed the following key issues associated with the Project:

- The preferred Port of Entry for imported components is Richards Bay.
- The proposed access point is located too close to a curve, which would affect the shoulder sight distance requirements. It is recommended to move the proposed access point to approximately 400m to the west from the curve (see **Figure 73**).
- It needs to be ensured that the gravel sections of the haulage routes remain in good condition and will hence need to be maintained during the additional loading of the construction phase and then reinstated after construction is completed. The gravel roads will require grading with a grader to obtain a flat even surface and the geometric design of these gravel roads needs to be confirmed at detailed design stage.
- The construction phase traffic, although significant, will be temporary and can be mitigated to an acceptable level.
- During operation, it is expected that staff and security will periodically visit the facility. The traffic generated during this phase will be minimal and will not have an impact on the surrounding road network.
- The construction and decommissioning phases of a development is the only significant traffic generator and therefore noise and dust pollution will be higher during this phase. The duration of this phase is short term i.e., the impact of the traffic on the surrounding road network is temporary and solar facilities, when operational, do not add any significant traffic to the road network.

Figure 73: Proposed access point and recommended access point (Patandin, 2023)

12.13.4 Impact Assessment

Refer to **Section 13.23** below for the results from the impact assessment from this study.

12.13.5 Conclusions

The development is supported from a transport perspective provided that the recommendations and mitigations are adhered to. The impacts associated with the facility are acceptable with the implementation of the recommended mitigation measures and can therefore be authorised.

13 IMPACT ASSESSMENT

13.1 General

This section focuses on the pertinent environmental impacts that could potentially be caused during the pre-construction, construction and operational phases of the Project.

Note that an 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

Potential impacts were identified as follows:

- Impacts associated with listed activities contained in the EIA Regulations' Listing Notices;
- Impacts identified during the Scoping phase;
- An appraisal of the Project's activities and components;
- An assessment of the receiving biophysical, social, economic and built environments;
- Findings from specialist studies;
- Issues highlighted by environmental authorities; and
- Comments received during public participation from IAPs.

13.2 Impacts associated with Listed Activities

As mentioned, the Project requires Environmental Authorisation for certain activities listed in the EIA Regulations, which serve as triggers for the EIA. The potential impacts associated with the key listed activities are broadly stated in **Table 22** below.

Table 22: Potential Impacts associated with the key listed activities

Listed Activities	Potential Impact Overview
GN No. R. 983 of 4 December 2014 (as amended) (Listing Notice 1)	
GN No. R.983 – Activity 11(i): The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	• Impacts associated with the footprint of the physical infrastructure (proposed power line). • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species, ecosystems, agricultural land) along the proposed power. • Visual impact associated with the proposed power line. • Cumulative impacts associated with aligning the proposed power line alongside existing linear developments.

Listed Activities	Potential Impact Overview
GN No. R.983 – Activity 12(ii)(a) & (c): *The development of -* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs -* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; -* *excluding -* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*	• Impacts associated with the footprint of the physical infrastructure within 32 m of watercourses. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working alongside watercourses. • Destabilisation of affected watercourses • Reduction in water quality of receiving watercourses due to improper management of storm water, hazardous material and sanitation. • Altering the drainage of the site.
GN No. R.983 – Activity no. 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 from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	• Construction activities within 32 m of watercourses. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working in-stream and alongside the watercourse. • Destabilisation of affected watercourses.
GN No. R.983 – Activity 24(ii): *The development of a road -* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road -* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter.*	• Impacts associated with access roads. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Traffic disruptions during construction. • Impacts to watercourses at crossings (access road, and power line). • Impacts associated with obtaining access from Tertiary Roads.
GN No. R.983 – Activity no. 28(ii): *Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:*	• Clearance of large areas associated with the construction footprint of the PV Site and associated infrastructure. • Loss of agricultural land. • Socio-economic impacts associated with construction activities.

Listed Activities	Potential Impact Overview
(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or *(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.*	
GN No. R.983 – Activity 48(i)(a) & (c): *The expansion of—* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding—* *(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 23 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves*	• Impacts associated with the footprint of the physical infrastructure within 32 m of watercourses. • Adverse effects to resource quality (i.e. flow, in-stream and riparian habitat, aquatic biota and water quality) associated with working near to the dams/watercourses. • Reduction in water quality of receiving dams/watercourses due to improper management of storm water, hazardous material and sanitation.
GN No. R.983 – Activity 56(ii): *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas*	• Impacts associated with access roads. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Traffic disruptions during construction. • Impacts to watercourses at crossings (access road, and power line). • Impacts associated with obtaining access from Tertiary Roads.
GN No. R. 984 of 4 December 2014 (as amended) (Listing Notice 2)	
GN No. R.984 – Activity no. 1: *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, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs -* *(a) within an urban area; or* *(b) on existing infrastructure.*	• Impacts associated with generating electricity from the Solar PV Plant. • Impacts associated with the footprint of the physical infrastructure. • Impacts to land use. • Potential loss of sensitive environmental features (e.g. heritage resources, sensitive fauna and flora species). • Visual impacts. • Soil destabilisation and subsequent erosion. • Proliferation of alien and invasive species. • Socio-economic impacts. • Traffic impacts.
GN No. R.984 – Activity no. 15: *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	• Clearance of large areas of indigenous vegetation associated with the construction footprint of the PV Site and associated infrastructure. • Potential loss of sensitive environmental features (e.g. sensitive fauna and flora species). • Visual impacts. • Soil destabilisation and subsequent erosion.

Listed Activities	Potential Impact Overview
	• Proliferation of alien and invasive species. • Socio-economic impacts associated with construction activities.
GN No. R. 985 of 4 December 2014 (as amended) (Listing Notice 3)	
GN No. R.985 – Activity 4 - (b)(i)(bb), (ee) & (gg): The development of a road wider than 4 metres with a reserve less than 13,5 metres.	Impacts associated with building new internal roads within a priority focus area for expansion according to the National Protected Area Expansion Strategy (NPAES), CBAs in terms of the Free State Biodiversity Plan, and within 5km from the Seredipendie Private Nature Reserve.
GN No. R.985 – Activity 12 - (b)(i), (ii) & (iv): The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.	The clearance indigenous vegetation and potential loss of sensitive fauna and flora species within a CBAs in terms of the Free State Biodiversity Plan, threatened ecosystems, and within 100m of watercourses (PV facility, access road and power line).
GN No. R.985 – Activity 14(ii)(a) & (c) - (b)(i)(bb), (ff) & (hh): *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.*	• Impacts to biodiversity within priority focus area for expansion according to the NPAES, CBAs in terms of the Free State Biodiversity Plan and within 5km from the Seredipendie Private Nature Reserve. • Effects to resource quality associated with working near to dams/watercourses.
GN No. R.985 – Activity 18 - (b)(i)(bb), (ee), (gg) & (hh): *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.*	Impacts to biodiversity as a result of the widening of roads within the following sensitive areas: priority focus area for expansion according to the NPAES; CBAs in terms of the Free State Biodiversity Plan; within 5km from the Seredipendie Private Nature Reserve; and within 100m of watercourses.
GN No. R.985 – Activity 23(ii)(a) & (c) – (b)(i)(bb), (ee) & (gg): *The expansion of—* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs—* *(a) within a watercourse;* *(b) in front of a development setback adopted in the prescribed manner; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.*	• Impacts to biodiversity within priority focus area for expansion according to the NPAES, CBAs in terms of the Free State Biodiversity Plan and within 5km from the Seredipendie Private Nature Reserve. • Effects to resource quality associated with working near to dams/watercourses.

13.3 Comments Raised by Organs of State and I&APs

The comments raised by authorities (both regulatory and commenting) and I&APs to date during the execution of the EIA are captured and addressed in the CRR (refer to **Appendix G**).

The consolidated comments raised by authorities and I&APs have been succinctly grouped into the following main categories (*note: please refer to the CRR for a comprehensive and accurate representation of the issues raised*):

- Environmental Legal Framework –
  - Approvals in terms of environmental legislation governing the Project.
  - Site biodiversity sensitivity to be determined.
- Ecology –
  - Presence of SCC and risks posed by the Project.
- Socio-economic impacts –
  - Safety and security threats.
- Agriculture –
  - Fire hazards posed by Project activities.
- Existing infrastructure –
  - Impacts to existing infrastructure and associated requirements of custodians / owners of existing infrastructure.
  - Maintenance of roads.
- Civil aviation –
  - Obstacle evaluation.
  - Safety of flight for aerodromes in close vicinity as well as communication, navigation and surveillance equipment.
- Technical information –
  - Technical details and layout for the proposed facility.
- EIA Process –
  - Confirm listed activities triggered and assess related impacts.
  - Details of project components.
  - Sufficiently detailed layout and sensitivity maps.
  - Specialist studies –
    - Requirements for terms of reference.
    - Include limitations and methodologies.
    - Compliance with Protocols.
    - Registration of specialists.
    - Specialist studies based on Screening Tool.
    - Understanding of ‘no-go’ areas.
    - Address contradicting recommendations.
    - Detailed/practical mitigation measures.
    - Assessment of cumulative impacts.
    - Reporting on identified Environmental Themes and adherence to Screening Tool.
  - Cumulative impact assessment to consider other similar projects within a 30km radius of the proposed development site.

- Assessment of the impacts and mitigation measures for each of the listed activities applied for.
- Assessment of alternatives.
- Requirements for the EMPr.
- Public Participation:
  - Requirements for public participation process.
  - Landowner consent to be obtained.
  - Compliance with regulated requirements.
  - Recording and addressing comments from registered I&APs and organs of state.
  - Involvement of authorities and stakeholders.
- Recommendations regarding conditions to be included in the Environmental Authorisation.
- Future plans for the site and infrastructure after decommissioning.
- Site visit with DFFE.

These issues received further attention during the investigations in the EIA phase, including the environmental specialist studies.

13.4 Project Activities

In order to understand the impacts related to the Project it is necessary to unpack the activities associated with the project life-cycle, as done in the sub-sections to follow.

13.4.1 Project Phase: Pre-construction

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the pre-construction phase are listed in **Table 23** below.

Table 23: Simplified List of Activities associated with Pre-Construction Phase

Project Phase: Pre-construction
Project Activities
• Negotiations and agreements with the affected landowner, stakeholders and authorities
• Lease Agreement
• Registration of power line servitude
• Detailed engineering design
• Detailed geotechnical investigations, including geophysical investigations
• Survey and mark development
• Procurement process for Contractor
• Review Contractor's method statements (as relevant)
• Establish new access roads and undertake selective improvements to existing access roads to facilitate the delivery of construction plant and materials
• Arrangements for accommodation of construction workers (off site)
• The building of a site office and ablution facilities
• Confirmation of the location and condition of all structures and infrastructure on the PV Site
• Determining and documenting the conditions of the roads to be used during construction
• Fencing off of PV Site

Project Phase: Pre-construction
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation
• Pre-construction environmental survey
• Develop Environmental Monitoring Programme
• Barricading of sensitive environmental features
• Obtain permits for impacts to SCC, if avoidance is not possible (if required)
• Obtain permits if heritage resources are to be impacted on and for the relocation of graves (if required)
• On-going consultation with I&APs
• Other activities as per EMPr

13.4.2 Project Phase: Construction

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the construction phase are listed in **Table 24** below.

Table 24: Simplified List of Activities associated with Construction Phase

Project Phase: Construction
Project Activities
• Site establishment
• Relocation of existing structures and infrastructure
• Prepare access roads
• Establish construction laydown area
• Bulk fuel storage
• Delivery of construction material
• Transportation of equipment, materials and personnel
• Storage and handling of material
• Construction employment
• Site clearing (as necessary)
• Excavation
• Concrete Works
• Mechanical and Electrical Works
• Electrical supply
• Material delivery and offloading
• Construction of PV Plant infrastructure
• Stockpiling
• Stringing of power line
• Waste and wastewater management
High Level Environmental Activities
• Diligent compliance monitoring of the EMPr, Environmental Authorisation and other relevant environmental legislation
• Implement Environmental Monitoring Programme
• Reinstatement and rehabilitation of construction domain (as necessary)
• On-going consultation with I&APs
• Other activities as per EMPr

13.4.3 Project Phase: Operation

Some of the main Project activities, as well as high-level environmental activities, to be undertaken in the operational phase are listed in **Table 25** below.

Table 25: Simplified List of Activities associated with Operational Phase

Project Phase: Operation
Project Activities
• Testing and commissioning the facility's components
• Cleaning of PV modules
• Servitude access arrangements and requirements
• Routine maintenance inspections of power line and servitude
• Controlling vegetation
• Managing stormwater and waste
• Conducting preventative and corrective maintenance
• On-going consultation with directly affected parties
• Monitoring of the facility's performance
High Level Environmental Activities
• On-going consultation with I&APs
• Other activities as per EMPr for Operational Phase

13.5 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact.

The environmental aspects that have been identified for the proposed Project, which are linked to the project activities, are provided in **Table 26** below. Note that only high level aspects are provided.

Table 26: Environmental Aspects associated with Project Life-Cycle

Project Phase: Pre-construction
Environmental Aspects
• Inadequate consultation with landowner and other relevant stakeholders
• Inadequate environmental and compliance monitoring
• Poor construction site planning and layout
• Site-specific environmental issues not fully understood
• Land occupancy by temporary buildings, provisional on-site facilities and storage areas
• Inaccurate pre-construction environmental survey
• Absence of relevant permits (e.g. for protected fauna and flora, heritage resources), where applicable
• Lack of barricading of sensitive environmental features
• Poor waste management
• Absence of ablution facilities

Project Phase: Construction
Environmental Aspects
• Inadequate consultation with landowner
• Inadequate environmental and compliance monitoring
• Lack of environmental awareness creation
• Indiscriminate site clearing
• Poor site establishment
• Poor management of access and use of access roads
• Disruptions to traffic
• Poor transportation practices
• Poor fencing arrangements

Project Phase: Construction
• Erosion
• Disruptions to existing services
• Disturbance of topsoil
• Poor management of excavations
• Inadequate storage and handling of material
• Inadequate storage and handling of hazardous material
• Poor maintenance of equipment and plant
• Poor management of labour force
• Pollution from ablution facilities
• Inadequate management of construction camp
• Poor waste management practices – hazardous and general solid, liquid
• Wastage of water
• Poor management of pollution generation potential
• Damage to significant flora (if encountered)
• Damage to significant fauna (if encountered)
• Inadequate stormwater management
• Damage to cultural heritage and palaeontological features (if encountered)
• Poor reinstatement and rehabilitation

Project Phase: Operation
Environmental Aspects
• Inadequate environmental and compliance monitoring
• Inadequate management of access, routine maintenance and maintenance works
• Inadequate management of vegetation
• Inadequate stormwater management
• Pollution caused by cleaning of panels
• Impacts caused by fire, explosion or leaks associated with BESS
• Pollution caused by dangerous good (e.g. transformer oils) associated with substation
• Inadequate management of light pollution
• Failure to comply with health, safety and environmental specifications

13.6 Potentially Significant Environmental Impacts

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable.

Note that it is not the intention of the impact assessment to evaluate all potential environmental impacts associated by the Project's environmental aspects, but rather to focus on the potentially significant direct, indirect and cumulative impacts identified during the Scoping phase and any additional issues uncovered during the EIA phase.

The potentially significant environmental impacts associated with the Project, as listed in **Table 27** below, were identified through an appraisal of the following:

- ❑ Project-related components and infrastructure (see **Section 9**);
- ❑ Activities associated with the project life-cycle (i.e. pre-construction, construction and operation);
- ❑ Nature and profile of the receiving environment and potential sensitive environmental features and attributes (see **Section 11**);
- ❑ Findings from specialist studies (see **Section 12**);

- ❑ Understanding of direct and indirect effects of the Project as a whole (see **Section 13**);
- ❑ Comments received during public participation (see **Section 15**); and
- ❑ Legal and policy context (see **Section 5**).

It is noted that the potentially significant environmental impacts listed in **Table 27** were evaluated as part of the specialist studies and suitable mitigation measures were identified where it was found that these impacts could possibly occur. These impacts are assessed in **Sections 13.9 – 13.28** below.

Table 27: Potentially Significant Environmental Impacts associated with the Project

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
Land Use	▪ Sterilisation of land for other land use types. ▪ Setbacks / conditions associated with surrounding land and infrastructure. ▪ Fire risks to land use.	▪ Sterilisation of land for other land use types up to the decommissioning of the Project (if applicable). ▪ Servitude restrictions. ▪ Fire risks to land use.
Geology	▪ Suitability of geological conditions to support the Solar PV Plant to be confirmed through detailed geotechnical investigations.	▪ Suitability of geological conditions to support the Solar PV Plant to be confirmed through detailed geotechnical investigations.
Geohydrology	▪ Groundwater pollution due to spillages and poor construction practices. ▪ Utilisation of boreholes, if required.	▪ Groundwater pollution due to poor operation and maintenance practices. ▪ Utilisation of boreholes, if required.
Topography	▪ Visual impacts. ▪ Erosion of areas cleared for construction purposes. ▪ Crossing topographic features (watercourses).	▪ Visual impact caused by proposed Project infrastructure and landscape transformation. ▪ Crossing topographic features (watercourses). ▪ Glint and glare from solar panels.
Soil	▪ Soil erosion due to clearance and inadequate stormwater management. ▪ Soil compaction. ▪ Soil contamination due to spillages and poor construction practices. ▪ Loss of topsoil.	▪ Soil erosion due to inadequate stormwater management. ▪ Soil contamination due to poor operation and maintenance practices.
Surface Water	▪ Alteration of drainage over the PV Site. ▪ Surface water pollution due to spillages and poor construction practices. ▪ Encroachment of construction activities into watercourses and their buffer zones. ▪ Impacts where access roads and ancillary infrastructure cross / are in close proximity to watercourses (e.g., sedimentation, loss of vegetation, destabilisation of watercourse structure).	▪ Sedimentation through silt-laden runoff, caused by inadequate stormwater management. ▪ Damage to the PV facility and towers of the power line from major flood events. ▪ Water resources could be contaminated through inadequate storage and handling of hazardous materials, leaks from the BESS and poor management of waste and wastewater. ▪ Water use requirements of the Project need to be satisfied.
Flora & Fauna	▪ Habitat loss / fragmentation. ▪ Potential loss, disturbance or displacement of protected fauna and flora species. ▪ Human - animal conflicts. ▪ Noise and vibration impacts to fauna. ▪ Nights lights may affect nocturnal faunal species. ▪ Illegal harvesting and poaching of faunal and floral species by construction workers.	▪ Habitat fragmentation (e.g., barriers to animal movement). ▪ Shading out of plants by solar panels. ▪ Reflection of sunlight from the solar panels could adversely affect birds. ▪ Risk to birds from collision with infrastructure and from electrocution. ▪ Electrical faulting from birds. ▪ Chemical pollution associated with cleaning the PV panels. ▪ Proliferation of invasive alien species in disturbed areas.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Pollution of the biophysical environment from poor construction practices. ▪ Proliferation of invasive alien species in disturbed areas. ▪ Fire risks to fauna and flora.	▪ Fire risks to fauna and flora.
Socio-economic Environment	▪ Influx of people seeking employment and associated impacts (e.g., foreign workforce, cultural conflicts, squatting, demographic changes). ▪ Safety and security. ▪ Use of local road network. ▪ Nuisance from dust and noise. ▪ Consideration of local labourers and suppliers in area – stimulation of local economy (positive impact). ▪ Transfer of skills (positive impact).	▪ Direct and indirect economic opportunities as a result of the Project. ▪ Threats to human and animal health from electromagnetic field (power line and on-site substation).
Air Quality	▪ Dust from the use of dirt roads by construction vehicles. ▪ Dust from bare areas that have been cleared for construction purposes. ▪ Emissions from construction equipment and machinery. ▪ Tailpipe emissions from construction vehicles.	▪ The efficiency of the solar plant could be reduced if the modules are soiled (covered) by particulates/dust. ▪ Impacts to air quality caused by the operation and maintenance of the facility include dust from the use of dirt roads and tailpipe emissions from vehicles.
Noise	▪ Localised increases in noise may be caused by construction activities.	N/A
Agriculture	▪ Loss of fertile soil through land clearance. ▪ Soil erosion. ▪ Loss of topsoil. ▪ Risk of harm to livestock from construction activities. ▪ Fire risk to agriculture.	▪ Loss of possible future agricultural land use due to direct occupation by the development footprint. ▪ Soil erosion due to inadequate stormwater management. ▪ Fire risk to agriculture.
Historical and Cultural Features	▪ Possible direct impacts on below-ground archaeological deposits and fossils as a result of ground disturbance.	▪ Possible impacts to the cultural landscape as a result of the introduction of incompatible structures and infrastructure to the rural landscape.
Existing Structures & Infrastructure	▪ Setbacks / conditions associated with surrounding land and infrastructure. ▪ Crossing of existing infrastructure by power line.	▪ Setbacks / conditions associated with surrounding land and infrastructure. ▪ Disturbances to infrastructure traversed by power line during maintenance activities.
Transportation	▪ Increase in traffic on the local road network. ▪ Transportation of materials and construction personnel to site. ▪ Impacts to road conditions. ▪ Speeding and reckless driving by construction personnel. ▪ Construction vehicles accessing and leaving the sites via N6 national road. ▪ Use of oversized vehicles/abnormal loads, as required. ▪ Risks to other road users.	▪ Transportation of maintenance materials, as well as operational and maintenance personnel, to site. ▪ Safe access, taking into consideration the high speed environment along the N6. ▪ Hazard posed to road users by sun glare off PV panels.
Aesthetics	▪ Landscape transformation. ▪ Visual impacts associated with construction activities.	▪ Landscape transformation. ▪ Inadequate reinstatement and rehabilitation of construction footprint. ▪ Light pollution. ▪ Glint and glare from PV facility. ▪ High visibility of power lines to visual receptors.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
Health	▪ Hazards related to construction work. ▪ Increased levels of dust and particulate matter. ▪ Increased levels of noise. ▪ Water (surface and ground) contamination. ▪ Poor water and sanitation. ▪ Communicable diseases. ▪ Psychosocial disorder (e.g. social disruptions). ▪ Safety and security. ▪ Lack of suitable health services.	▪ Hazards related to operation and maintenance work. ▪ Fire and explosion risks during BESS operation.

The cumulative impacts are discussed in **Section 13.28** below.

The findings of the specialists are of particular importance in terms of understanding the impacts of the Project and managing these during the project life-cycle, as these studies focused on the significant environmental issues identified during the execution of the EIA. As can be seen from the various impact assessments performed by the specialists, there are a host of cross-cutting impacts that are addressed in a number of these studies. The mitigation measures proposed by the specialists for these similar types of impacts are regarded as complementary and they are aligned with best practices and principles.

13.7 Impact Assessment Methodology

The impacts and the proposed management thereof are first discussed in **Section 13.9** to **Section 13.27** below on a qualitative level and thereafter quantitatively assessed by evaluating the nature, extent, magnitude, duration, probability and ultimately the significance of the impacts (refer to methodology provided in **Table 28** below). Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

The assessment considers impacts before and after mitigation, where in the latter instance the residual impact following the application of the mitigation measures is determined.

In the case of the specialist studies, some of the impact assessment methodologies deviated from the approach shown in **Table 28** below. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

Table 28: Quantitative Impact Assessment Methodology

Nature (/Status) The project could have a positive, negative or neutral impact on the environment.
Extent • Local - extend to the site and its immediate surroundings. • Regional - impact on the region but within the province. • National - impact on an interprovincial scale. • International - impact outside of SA.

Magnitude
Degree to which impact may cause irreplaceable loss of resources.
- Low - natural and social functions and processes are not affected or minimally affected.
- Medium - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration
- Short term - 0-5 years.
- Medium term - 5-11 years.
- Long term - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability
- Almost certain - the event is expected to occur in most circumstances.
- Likely - the event will probably occur in most circumstances.
- Moderate - the event should occur at some time.
- Unlikely - the event could occur at some time.
- Rare/Remote - the event may occur only in exceptional circumstances.

Significance
Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-
0 – Impact will not affect the environment. No mitigation necessary.
1 – No impact after mitigation.
2 – Residual impact after mitigation.
3 – Impact cannot be mitigated.

13.8 Impact Mitigation

13.8.1 Mitigation Hierarchy

Impacts are to be managed by assigning suitable mitigation measures, where the objectives are to:

- ❑ Find more environmentally sound ways of executing an activity;
- ❑ Enhance the environmental benefits of a proposed activity;
- ❑ Avoid, minimise or remedy negative impacts; and
- ❑ Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate (or remediate); and/or (4) compensate for the environmental impacts.

The proposed mitigation of the impacts associated with the Project includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices.

Note that the mitigation measures in the subsequent sections are not intended to be exhaustive, but rather focus on the potentially significant impacts identified. The EMPr's (contained in **Appendix H**) provide a comprehensive list of mitigation measures for specific elements of the Project and the receiving environment, which extends beyond the impacts evaluated in the body of the EIA Report.

13.8.2 EMPr Framework

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

The content of an EMPr must either contain the information set out in Appendix 4 of the EIA Regulations or must be a generic EMPr relevant to an application as identified and gazetted by the Minister in a Government Notice. Once the Minister has identified, through a Government Notice, that a generic EMPr is relevant to an application for Environmental Authorisation, that generic EMPr must be applied by all parties involved in the EA process, including, but not limited to, the Applicant and the Competent Authority.

In accordance with the above, the following EMPr's were developed for the Project:

- Generic EMPr for the development and expansion for overhead electricity transmission and distribution infrastructure (contained in **Appendix H2**);
- Generic EMPr for the development and expansion of substation infrastructure for the transmission and distribution of electricity (contained in **Appendix H3**); and
- Normal EMPr for the Solar PV Plant (contained in **Appendix H1**).

All liability for the implementation of the EMPr (as well as the EIA findings and Environmental Authorisation, if granted) lies with the Applicant.

The following considerations and assumptions accompany the compilation of the EMPr for the Solar PV Plant:

- The EMPr is guided by the following principles, based on Lochner (2005) -
  - **Continuous improvement -** The Applicant should be committed to review and to continually improve environmental management, with the objective of improving overall environmental performance;
  - **Broad level of commitment** - A broad level of commitment is required from all levels of management as well as the workforce in order for the implementation of the EMPr to be successful and effective; and
  - **Flexible and responsive** - The implementation of the EMPr needs to be responsive to new and changing circumstances. The EMPr report is a dynamic "living" document that will need to be updated regularly throughout the duration of the project life-cycle.
- Compliance with the EMPr must be audited in terms of Regulation 34 of the EIA Regulations.
- The EMPr provides the framework for the overarching environmental management requirements for the project life-cycle. Following detailed design and planning, the EMPr may need to be revised to render the management actions more explicit and accurate to the final project specifications. Any amendments to the EMPr must be undertaken in accordance with Regulations 35 – 37 of the EIA Regulations.

- The EMPr will be linked to the project's overall Environmental Management System (EMS) (if applicable), where the EMS constitutes an iterative process that aims to achieve continuous improvement and enhanced environmental performance.
- Although every effort has been made to ensure that the scope and level of detail of the EMPr are tailored to the level of environmental risk (i.e., type and scale of activity and the sensitivity of the affected environment) and the project- and site-specific conditions, certain of the environmental management requirements within the EMPr may be regarded as generic to make provision for activities that may take place as part of the overall Project.

13.9 Land Use

13.9.1 Impact Description

Land is required for constructing the proposed infrastructure associated with the Solar PV Plant. In addition, a servitude will be required for the proposed power line (grid connection).

The areas affected by the proposed Project footprint are rural in nature. The Project's PV Site is vacant and used for cattle grazing. The utilisation of the land for the Project has been secured by the Applicant with the landowner. The land use at the site earmarked for the proposed Solar PV Plant will change to accommodate the proposed development. Following decommissioning, the land can be rehabilitated to a desired end state (e.g., returned to agricultural use).

13.9.2 Impact Assessment

Environmental Feature	**Land Use**
Relevant Alternatives & Activities	**All physical infrastructure and ancillary structures that form part of the Project**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Change of land use at site earmarked for Solar PV Plant. • Impacts of power line on agricultural land use.	• Remove the minimum amount of vegetation required during construction to build hardstanding areas, power line towers, PV module structures and roads. • Rehabilitate areas impacted on during construction. • Return the site to a desired end stated at the end of the operational phase.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-term	almost certain	3
After Mitigation	-	local	medium	short-term	moderate	1

13.10 Soils

13.10.1 Impact Description

During the construction phase areas will be cleared of vegetation, which may lead to soil erosion. Erosion could also take place in the absence of suitable stormwater management. The EMPr includes suitable storm water management measures to prevent the occurrence of erosion.

Soil may be polluted by poor storage or handling of material, spillages and inadequate housekeeping practices. Specific mitigation measures are contained in the EMPr, where the primary objective is the effective and safe management of materials on site, in order to minimise the impact of these materials on the biophysical environment. The same objective applies to the correct management and handling of hazardous substances (e.g., fuel, transformer oil, batteries).

13.10.2 Impact Assessment

Environmental Feature	**Soils**
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Soil erosion. • Soil compaction. • Soil pollution.	• Stabilisation of cleared areas to prevent and control erosion. • Manage drainage from sites to minimise erosion. • Reinstate and rehabilitate disturbed areas to prevent future erosion. • See mitigation measures regarding hazardous substances & waste.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.11 Geohydrology

13.11.1 Impact Description

Groundwater may be impacted by the Project as follows:

- Possible influence on groundwater flow as a result of trenching and building of infrastructure and structures associated with the development footprint during construction. This will be confirmed as part of the geotechnical investigations during the Project's design phase;
- Use of groundwater during construction and operational phases; and
- Potential contamination of groundwater during construction and operational phases as a result of inadequate management of wastewater and spillages of dangerous goods.

13.11.2 Impact Assessment

Environmental Feature	Geohydrology
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Groundwater pollution. • Groundwater use. • Impacts to groundwater flow.	• Provide suitable protection of groundwater during excavations. • All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. • Provide sufficient and suitable sanitation facilities during construction and operational phases, which shall conform to all relevant health and safety standards and codes. • Reduce sediment loads in water from dewatering operations. All dewatering shall be done through temporary sediment traps (e.g. constructed out of geo-textiles and hay bales). • If any groundwater is to be used during the construction and operational phases, it will need to comply with the provisions of the NWA.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.12 Surface Water

13.12.1 Hydrology

13.12.1.1 Impact Description

The perennial Enslinspruit and Blomspruit is located to the east and north of the study area, respectively. Several watercourses were identified within the study area (Dep wetlands and rivers). The PV footprint traverses the boundaries of several Dep wetlands while a CVB wetland is located adjacent to the south eastern boundary. Additionally, one artificial Dep wetland was identified (near the Blomspruit) along the proposed Power Corridor. Non-perennial rivers also flow across the Project Area and drain into the Enslinspruit and Blomspruit. Alternative 2 presents a revised layout that attempts to avoid all direct encroachment into watercourses (except for road and power line crossings). The access road (existing gravel road) and power line route traverse watercourses.

Potential impacts related to the movement of water over the PV Site include the following:

- ❑ The development may alter the drainage on the site and cause an increase in runoff;
- ❑ Impacts where infrastructure cross watercourses;
- ❑ Impacts caused by inadequate stormwater management at the PV Site; and
- ❑ Damage to the development from major flood events.

13.12.1.2 Impact Assessment

Environmental Feature	Hydrology
Relevant Alternatives & Activities	**Construction and operational activities**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Alteration of drainage over site. • Watercourse crossings. • Inadequate stormwater management. • Damage caused by floods.	• Structures such as the substation and buildings are to be developed outside of the 1:100 year floodline of any watercourse. Should any other structures be developed within the 1:100 year floodline of any watercourse then water use authorisation in terms of the NWA will be required and the structures will need to be able to withstand the 1:100 year flood event. • Design suitable stormwater drainage system for the PV Site. • Identify appropriate protection measures during the design stage, taking into consideration foundation stability, access road stability, and electrical connections (amongst others). • Erosion protection measures to be installed where there are possibilities of surface water sheet flow causing erosion. • The construction camp shall not be situated nearer than 100m or within the 1:100 year flood line of any watercourse. • Stabilisation of watercourses at crossings (access roads, power line and ancillary infrastructure). • Carry out earthworks in phases across the PV Site to reduce the total area of disturbed ground at any one time.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	long-term	likely	2
After Mitigation	-	local	low	long-term	unlikely	1

13.12.2 Aquatic Ecosystems

The findings from the Freshwater Assessment (van Rooyen, 2023) follow. The specialist report is contained in **Appendix E1**.

13.12.2.1 Impact Description

Potential impacts to watercourses identified and delineated in the Project Area include surface water pollution, erosion, change in sediment characteristics, loss of habitat, impacts to the structure and functioning of the watercourses, and introduction and spread of alien and invasive species during the construction and operational phases of the Project.

13.12.2.2 Impact Assessment

The tables to follow were obtained from the Freshwater Assessment (van Rooyen, 2023).

Table 29: Impacts to hydrological function (van Rooyen, 2023)

Nature: Changes to flood regimes of the watercourse through, for example, flood suppression, unseasonal flooding or the loss of flood attenuation capacity.				
ACTIVITY: Sources include the compaction of soil, vegetation removal, redirecting surface water, changes to the surface water characteristics or through construction of roads.				
	Alternative 1		**Alternative 2**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Moderate (3)	Unlikely (2)	Unlikely (2)	Unlikely (2)
Duration	Medium (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Regional (3)	Local (2)	Regional (3)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**36 (Low to Moderate)**	**16 (Low)**	**18 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Moderate (3)	Unlikely (2)	Minor (1)	Rare (1)
Duration	Medium term (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Regional (3)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Minor (2)	Minor (2)
Significance	**36 (Low to Moderate)**	**16 (Low)**	**12 (Low)**	**6 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Positive
Reversibility	Low	Moderate	Moderate	High
Irreplaceable loss of resources?	High	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	
Mitigation: • The entire footprint should avoid the delineated boundaries of watercourses as well as its buffer zones (except for road & powerline crossings); • The area is still likely prone to erosion around these areas should poor stormwater management be implemented. As such, a comprehensive stormwater management plan is required for the project; • Effective stormwater and erosion management plans should be in place during both the construction and operational phases. This should also be monitored as part of the EMPr; • Appropriate stormwater structures should be in place to control run-off and minimize erosion; • All stormwater runoff from the panels should enter the systems through diffuse channels fitted with flow attention/energy dissipation structures; • Stormwater runoff and runoff from the cleaning of panels would be increased and therefore increases the erosion potential in the surrounding areas; • Panels should be fitted with stormwater gutters to control the runoff in an ecologically sensitive manner to prevent erosion; • With regards to the powerline and road construction, the recommended buffer zones must be strictly adhered to during the construction phase with the exception when activities and structures required to traverse the watercourse. Pylons should be constructed outside the delineated				

watercourses;
- All areas where vegetation was cleared should be re-vegetated in order to limit the erosion potential;
- Sedimentation and erosion protection measures (such as sand bags, silt traps and fences) should be installed prior to construction;
- Roads crossing low-lying areas/potentially wet areas require permeable paving in order to lower the risk of habitat damage and possible erosion;
- Inspect all pylons, road network and influences areas 1 month following the conclusion of the construction activities as well as after the first rainfall event. Routing monitoring should take place for the duration of the project. Should erosion develop, then eroded areas should be immediately addresses through appropriate measures;
- All roads traversing delineated low-lying areas should be kept to a minimum to ensure hydrological connectivity;
- Construction of watercourse crossings (if needed) must take place from existing disturbed areas;
- Prevent uncontrolled access of vehicles through the watercourse which can impact the hydrology and alluvial soil structure; and,
- All no-go areas should be clearly demarcated prior to commencement of construction activities.

Cumulative impacts: Low to moderate and could possibly include edge effects to remaining natural vegetation as the footprint activities may result in vegetation clearing. This could lead to increase in sedimentation as well as introduction of alien and invasive species.

Residual Risks: Expected to be low given that all structures are situated outside the delineated sensitive areas and that stormwater is managed effectively.

Table 30: Impacts to sediment (van Rooyen, 2023)

Nature: Change in sedimentation patterns, changes in sediment in watercourses and sub-catchment due to the removal of soil.

ACTIVITY: Construction activities and maintenance of solar plant would result in earthworks as well as causing soil and vegetation disturbances. Loss of topsoil, sedimentation in rivers that would cause an increase in turbidity. Other potential impacts include; earthworks, clearing of vegetation would result in bare soil that could be washed into the river, erosion, disturbance of slopes through road works next to watercourses.

	Alternative 1		**Alternative 2**	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Likely (4)	Moderate (3)	Unlikely (2)	Unlikely (2)
Duration	Medium term (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**44 (Moderate)**	**24 (Low to Moderate)**	**16 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Moderate (3)	Unlikely (2)	Unlikely (2)	Rare (1)
Duration	Medium term (3)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**33 (Low to Moderate)**	**16 (Low)**	**16 (Low)**	**6 (Low)**

Status (positive or negative)	Negative	Negative	Negative	Positive
Reversibility	Low	Moderate	Moderate	High
Irreplaceable loss of resources?	High	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- Install sediment traps;
- Remove topsoil and keep topsoil stockpiles free of any weeds to keep topsoil viable for rehabilitation;
- All stockpiles should be safeguarded against rain wash;
- Ensure that stockpiles are covered during windy conditions
- Remove only vegetation in areas essential for construction;
- Excess water flow should be managed efficiently to avoid any impacts on rivers;
- Protect all areas susceptible to erosion through installing erosion berms that can prevent gully formation and siltation of watercourses;
- All soil and topsoil removed should not be stockpiled within any watercourse and should take place outside delineated watercourses. All stockpiles should be protected from erosion and stored on flat surfaces;
- Avoid using chemicals for cleaning of solar panels to lower the risk of polluting soils, and in times of flow will pollute surface runoff from contaminated soils;
- Monitor sediment pollution;
- Construction activities should take place in low flow period (as much as possible). This will lower the risk of erosion, sedimentation and polluting downstream water resources;
- All stationary vehicles should be equipped with drip trays;
- Avoid parking of vehicles close to any watercourses;
- No dumping of waste or any other materials near delineated and buffered areas; and
- All areas affected by construction activities should be rehabilitated upon completion of the construction phase. Areas where vegetation was removed, should be reseeded with indigenous grasses as per recommendations from Terrestrial Report.

Cumulative impacts: Low to moderate and could possibly include edge effects to remaining natural vegetation as the footprint activities may result in vegetation clearing. This could lead to increase in sedimentation as well as introduction of alien and invasive species.

Residual Risks: Expected to be low given that all structures are situated outside the delineated sensitive areas and that stormwater is managed effectively.

Table 31: Introduction and spread of alien and invasive species (van Rooyen, 2023)

Nature: Introduction and spread of alien and invasive species.

ACTIVITY: The removal and movement of soil and vegetation could result in opportunistic invasions after such disturbances as well as the introduction of seed in building materials and on vehicles. In addition, invasions of alien vegetation species can have an impact on hydrology through reducing the water quantity entering a watercourse and it can outcompete natural vegetation and therefore decrease natural biodiversity.

	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Unlikely (2)	Rare (1)	Unlikely (2)	Rare (2)
Duration	Short term (2)	Short term (2)	Short term (3)	Short term (2)

Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Low (4)	Low (4)	Low (4)	Low (4)
Significance	**16 (Low)**	**8 (Low)**	**16 (Low)**	**8 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Rare (1)	Rare (1)	Rare (1)	Rare (1)
Duration	Short term (2)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Site-only (1)	Local (2)	Site-only (1)
Magnitude	Low (4)	Minor (2)	Low (4)	Minor (2)
Significance	**8 (Low)**	**5 (Low)**	**8 (Low)**	**5 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- Monitor for early detection, to find species when they first appear on site. This should be as per the frequency specified in the management plan and should be conducted by an experienced person. Early detection should provide a list of species and locations where they have been detected. Summer (vegetation maximum growth period) is usually the most appropriate time, but monitoring can be adaptable, depending on local conditions – this must be specified in the management plan;
- Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action; and,
- Monitor for the effect of management actions on non-target species and habitats.

Cumulative impacts: Limited alien and Invasive plant species were observed on site, cumulative impacts can be Low to Moderate. As such, continuous monitoring should be implemented during the different phases of development and rehabilitation as well as a period after rehabilitation is completed.

Residual Risks: Expected to be limited given that an Alien and Invasive Plant Management Plant forms part of the operational processes of the PV facility.

Table 32: Activities causing pollution (van Rooyen, 2023)

Nature: Surface water, groundwater and sediment pollution.

ACTIVITY: Accidental spillages of wet concrete, chemical hazardous substances, oil and diesel spillages may result in surface water, groundwater and sediment pollution.

	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**
Construction Phase				
Probability	Likely (4)	Unlikely (2)	Unlikely (2)	Unlikely (2)
Duration	Medium term (3)	Medium term (3)	Medium term (3)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)

Magnitude	Moderate (6)	Moderate (6)	Low (4)	Low (4)
Significance	**44 (Moderate)**	**22 (Low to Moderate)**	**18 (Low)**	**16 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Operational Phase				
Probability	Likely (4)	Unlikely (2)	Unlikely (2)	Unlikely (2)
Duration	Short term (2)	Short term (2)	Short term (2)	Short term (2)
Extent	Local (2)	Local (2)	Local (2)	Local (2)
Magnitude	Moderate (6)	Low (4)	Low (4)	Minor (2)
Significance	**40 (Moderate)**	**16 (Low)**	**16 (Low)**	**12 (Low)**
Status (positive or negative)	Negative	Negative	Negative	Negative
Reversibility	Low	Moderate	Moderate	Moderate
Irreplaceable loss of resources?	High	Low	Low	Low
Can impacts be mitigated?	Yes		Yes	

Mitigation:

- The development footprint should remain outside the delineated rivers, riparian and buffer zones;
- Concrete mixing should be done outside the buffer zones and should be done on an impermeable surface;
- All stationary vehicles should be equipped with drip trays;
- No servicing of vehicles or construction equipment should take place near delineated or buffer areas and should be done on an impermeable surface area;
- No washing of construction equipment is allowed in any watercourse;
- All hazardous substances should be safely stored on an impermeable surface within the construction site camp;
- No ablution facilities should be located within 50 m of watercourses and should be outside the 1:100 year flood line;
- Construction camp, storage of construction equipment and materials, and chemicals should be located outside the 1: 100 year flood line;
- No dumping of waste near or within delineated watercourses and should be adequately stored and removed from site by waste facility;
- All waste and refuse should be removed from site and disposed in adequate storage containers before being disposed at a registered landfill site;
- All accidental spillages should be rehabilitated immediately and contaminated soil should be adequately disposed off;
- No vehicle or construction machinery are allowed within the watercourse; and,
- Only use clean water in the washing of the solar panels.

Cumulative impacts: Impacted water quality will not only affect local water quality but regional water quality as well. This is considered as a significant cumulative impact.

Residual Risks: Since pollution can be controlled and to a large extent be prevented, the impact of spillages will have a significant residual impact on local watercourses and as such should be considered a significant residual risk.

13.13 Terrestrial Ecology

The findings from the Terrestrial Biodiversity Assessment (Human, 2023) follow. The specialist report is contained in **Appendix E2**.

13.13.1 Impact Description

Construction Phase

The following potential impacts on the biodiversity were considered for the construction phase of the proposed development. This phase is considered to have the largest direct impact on biodiversity.

The following potential impacts to terrestrial biodiversity were considered for the construction phase:

- Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community;
- Introduction of alien species, especially plants;
- Destruction of protected plant species;
- Displacement of faunal community due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, vibration and poaching); and
- Chemical pollution associated with dust suppressants.

Operational Phase

The following potential impacts to terrestrial biodiversity were considered for the operational phase:

- Continued fragmentation and degradation of habitats and ecosystems;
- Spread of alien and/or invasive species;
- Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration);
- Reduced dispersal of fauna;
- Chemical pollution associated with measures to keep PV clean; and
- Fencing of PV site.

13.13.1.1 Impact Assessment

The tables to follow were obtained from the Terrestrial Biodiversity Assessment (Human, 2023).

Table 33: Assessment of significance of potential impacts on the terrestrial fauna and flora (Human, 2023)

Impact 1	**Destruction, fragmentation and degradation of habitats and ecosystems**
Problem	Construction activities will require clearing of natural habitat, to be replaced by the infrastructure. This will result in permanent local loss of habitat. Daily operational activities will permanently damage habitat and fragment it further.
Type	Direct

Nature	Negative			
Phases	Construction			
	Alternative 1		**Alternative 2**	
Criteria	Without mitigation	With mitigation	Without mitigation	With mitigation
Extent	4	3	3	2
Duration	5	5	5	5
Sensitivity	4	3	2	1
Severity	3	2	3	2
Probability	5	5	5	5
Significance	75 High	65 Moderately High	65 Moderately High	50 Moderate
Mitigation actions	1. Restrict impact to development footprint only and limit disturbance in surrounding areas. 2. Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval. 3. Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.			
Monitoring	As per management plans			

Impact 2	**Spread and/or establishment of alien and/or invasive species**			
Problem	Establishment and continued spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation			
Type	Indirect			
Nature	Negative			
Phases	Construction and Operational			
	Alternative 1		**Alternative 2**	
Criteria	Without mitigation	With mitigation	Without mitigation	With mitigation
Extent	3	2	3	2
Duration	5	5	5	5
Sensitivity	4	2	2	1
Severity	3	2	3	2
Probability	4	3	4	3
Significance	60 Moderately High	33 Low	52 Moderate	30 Low
Mitigation actions	1. Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control, including monitoring specifications. 2. Undertake regular monitoring to detect alien invasions early so that they can be controlled. 3. Implement control measures.			
Monitoring	As per management plans			

Impact 3	**Ongoing displacement and direct mortality of fauna due to disturbance**	
Problem	Mortality of fauna due to higher traffic (Vehicles and staff) on site and disturbances including noise, dust, and vibrations	
Type	Direct	
Nature	Negative	
Phases	Construction and Operational	
	Alternative 1	**Alternative 2**

Criteria	Without mitigation	With Mitigation	Without mitigation	With Mitigation
Extent	3	2	3	2
Duration	4	3	4	3
Sensitivity	3	2	2	2
Severity	3	2	3	1
Probability	5	3	4	3
Significance	65 Moderately High	27 Low	48 Moderate	24 Low
Mitigation actions	Education and awareness of staff and construction personal regarding importance of faunal populations and ecosystem functioning			
Monitoring	Continued monitoring of faunal populations and awareness programs as per management plan			

Impact 4	**Reduced dispersal/migration of fauna**			
Problem	Internal roads, fencing and infrastructure will cut off migratory routes of faunal populations			
Type	Direct			
Nature	Negative			
Phases	Construction and Operational			
	Alternative 1		**Alternative 2**	
Criteria	Without mitigation	With Mitigation	Without mitigation	With Mitigation
Extent	3	2	2	2
Duration	5	5	5	5
Sensitivity	3	2	2	1
Severity	3	2	3	1
Probability	5	4	5	4
Significance	70 High	44 Moderate	60 Moderate	36 Low
Mitigation actions	Create corridors during construction phase for faunal species to move through artificial barriers			
Monitoring	Continuously monitor faunal populations as per management plans			

Impact 5	**Environmental pollution due to water runoff, spills from vehicles and erosion**			
Type	Direct and Indirect			
Nature	Negative			
Phases	Construction and Operational			
	Alternative 1		**Alternative 2**	
Criteria	Without mitigation	With mitigation	Without mitigation	With mitigation
Extent	3	2	4	1
Duration	5	5	5	5
Sensitivity	4	2	3	1
Severity	4	3	4	1
Probability	3	2	3	2
Significance	51 Moderate	24 Low	48 Moderate	16 Very Low
Mitigation actions	Proper storage of harmful fluids or powders			
Monitoring	Diligence checks as per storage SOP according to management plans			

Impact 6	**Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, and light pollution.**			
Problem	Construction and maintenance vehicles moving around on site			
Type	Direct and Indirect			
Nature	Negative			
Phases	Construction and Operational			
	Alternative 1		**Alternative 2**	
Criteria	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Extent	3	2	3	2
Duration	5	3	5	3
Sensitivity	3	2	2	1
Severity	4	3	3	2
Probability	5	5	4	3
Significance	75 High	50 Moderate	52 Moderate	24 Low
Mitigation actions	Keep within footprint, drive within speed limits, do not idle vehicle for unnecessary periods			
Monitoring	Dust monitoring. Monitor faunal populations			

Impact 7	**Staff and others interacting directly with fauna (potentially dangerous) and flora or poaching of animals and plants**			
Problem	Staff interacting/ killing/ poaching fauna or flora species			
Type	Direct			
Nature	Negative			
Phases	Construction and Operational			
	Alternative 1		**Alternative 2**	
Criteria	Without mitigation	With mitigation	Without mitigation	With mitigation
Extent	3	2	3	1
Duration	5	5	5	5
Sensitivity	4	2	3	1
Severity	4	2	3	1
Probability	4	3	4	3
Significance	64 Moderate	33 Low	52 Moderate	24 Low
Mitigation actions	Awareness training for staff on site regarding sensitive fauna and flora species, including relevant laws for protection of species			
Monitoring	Monitoring of area for snares and disturbed soil (plant poaching), monitoring of personal effects of staff			

Mitigation Measures

The following mitigation measures were recommended in the Terrestrial Biodiversity Assessment (Human, 2023).

Vegetation and habitats

- Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. All activities must be restricted within the low/medium sensitivity areas. No further loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon.
- Existing access routes, especially roads must be made use of
- All laydown, chemical toilets etc. should be restricted to medium/low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted, except in areas demarcated for permanent laydown structures. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated project areas.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species. All livestock must always be kept out of the project area, especially areas that have been recently revegetated.
- A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially negatively affecting the functioning of the ecosystem. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.
- It should be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.
- Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any threatened/protected plants in order to avoid any

damage or destruction of these specimens especially if those specimens are not destroyed by construction activities.

- Infrastructure, development areas and routes where protected plants cannot be avoided, these plants mainly being succulents/ geophytes should be removed from the soil and relocated/ re-planted in similar habitats where they should be able to resprout and flourish again instead of being destroyed as part of the construction phase.
- A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.
- Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals.
- Restrict impact to development footprint only and limit disturbance in surrounding areas.
- Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval.
- Prior to commencement of construction, compile an Alien Plant Management Plan, to be included into the EMPr during final approval.
- Prior to commencement of construction, compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control, including monitoring specifications.
- Undertake regular monitoring to detect alien invasions early so that they can be controlled.
- Prior to commencement of construction, compile and implement a stormwater management plan including monitoring specifications.
- Monitor surfaces for erosion, repair and/or upgrade, where necessary.
- Prior to decommissioning commencing, compile a Rehabilitation Plan in compliance with the regulatory requirements at the time of decommissioning.

Fauna

- A qualified Environmental Control Officer (ECO) must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated. In situations where the threatened and protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species.
- Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.
- Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods or louvres to also be used to reduce light spill.
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms

of wildlife. Speed limits (30km/h) must still be enforced to ensure that road killings and erosion is limited.

- ❑ The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments. Signs must be put up to enforce this.
- ❑ No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this.
- ❑ All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any SCC not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.
- ❑ Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight. Should the holes be left open overnight they must be covered temporarily to ensure no small fauna species fall in.
- ❑ Ensure that cables and connections are insulated successfully to reduce electrocution risk.
- ❑ Any exposed parts must be covered (insulated) to reduce electrocution risk.
- ❑ Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna.
- ❑ Use environmentally friendly cleaning and dust suppressant products.
- ❑ Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed every 50 m along the fence (with a size of 30 x 20 cm). The holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.

Alien Species

- ❑ Compile and implement an Alien Vegetation Management Plan.
- ❑ The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.
- ❑ Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site.
- ❑ A pest control plan must be put in place and implemented; it is imperative that poisons not be used.

Dust

- ❑ Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces. No non-environmentally friendly suppressants may be used as this could result in pollution of water sources.

Waste Management

- ❑ Waste management must be a priority and all waste must be collected and stored effectively.
- ❑ Litter, spills, fuels, chemicals and human waste in and around the project area.

- ❑ Provide adequate sanitation facilities. These toilets must be serviced regularly to avoid spill over and not degrade the habitat by nutrient enrichment in the form of excess nitrogen.
- ❑ The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility.
- ❑ Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site.
- ❑ Refuse bins will be emptied and secured. Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.

Environmental Awareness Training

- ❑ All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of protected species, their identification, conservation status and importance, biology, habitat requirements and management requirements as within the Environmental Authorisation and EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the “no-go” to be avoided.

Erosion

- ❑ Speed limits must be adhered to in order to reduce erosion.
- ❑ Where possible, existing access routes and walking paths must be made use of.
- ❑ Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds.
- ❑ A stormwater management plan must be compiled and implemented.

Monitoring recommendations

- ❑ Specific monitoring recommendations should be provided in the Alien Invasive Management Plan and the Rehabilitation Plan. The following are broad recommendations:
  - Alien Invasive Species -
    - o Monitor for early detection, to find species when they first appear on site. Early detection should provide a list of species and locations where they have been detected. Summer (vegetation maximum growth period) is usually the most appropriate time, but monitoring can be adaptable, depending on local conditions – this must be specified in the management plan.
    - o Monitor for the effect of management actions on target species, which provides information on the effectiveness of management actions. Such monitoring depends on the management actions taking place. It should take place after each management action.
    - o Monitor for the effect of management actions on non-target species and habitats.
  - Rehabilitated areas -

- All rehabilitated areas should be monitored to assess vegetation recovery. This should be for a minimum of three years after post-construction rehabilitation but depends on the assessed trajectory of rehabilitation (whether it is following a favourable progression of vegetation establishment or not – this depends on the total vegetation cover present, and the proportion that consists of perennial growth of desired species). For each monitoring site, an equivalent comparative site in adjacent undisturbed vegetation should be similarly monitored. Monitoring data collection should include the following:
  - Total vegetation cover and height, as well as for each major growth form;
  - Species composition, including relative dominance;
  - Soil stability and/or development of erosion features; and
  - Representative photographs should be taken at each monitoring period.
- Monitoring of rehabilitated areas should take place at the frequency and for the duration determined in the Rehabilitation Plan, or until vegetation stability has been achieved.

13.14 Giant Girdled Lizard

The findings from the Terrestrial Animal Species Study (Giant Girdled Lizard) (Reilly, 2023) follow. The specialist report is appended to the Terrestrial Biodiversity Assessment in **Appendix E2**.

13.14.1 Impact Description & Assessment

The areas are currently impacted by mixed agriculture with planted fields and pastures. Pastures have been heavily grazed with lack of fire and each camp exhibits individual unique anthropogenic derived histories. This development could have a significant impact on girdled lizard populations if Layout Alternative 1 is chosen.

The following mitigation measures are recommended for the layout alternatives:

- Layout Alternative 1 – development in this area would require significant mitigation and the following is suggested as possible scenarios –
  1. No development at all.
  2. Development with significant mitigation, which would include avoidance of all areas where Girdled Lizards occur with significant buffer zones and corridors. This would have to be mapped and include an intensive ground survey and may include translocation of animals.
  3. Point 2 above with the addition of a significant offset at a ratio of 30:1 (lizard habitat) to be managed for biodiversity conservation with the girdled lizard as flagship species.
  4. Point 3 above with the creation of a conservation trust fund based on financial value of a proportion of power generated after a pre-determined profitability is achieved to create and manage offsets, conservation areas and corridors in perpetuity. This option will meet all requirements of Environmental, Social and Governance standards and will serve as “non-financial profit” in sustainability reporting. Offsets to be owned by the trust.
  5. Points 2, 3 and 4 above can be included in any lease agreements with landowners.
- Layout Alternative 2 –

- Development of this site would not require mitigation for Girdled Lizards. This is since this development alternative avoids all suitable habitat and sensitive areas for this species. The proposed powerline passing through the habitat should not pose a problem to any girdled lizards due to the linear nature of the development and no complete destruction of suitable habitats.

*As explained in **Section 14** below, Layout Alternative 2 was identified as the preferred alternative and the mitigation measures associated with Layout Alternative 1 will thus not apply*.

13.15 Avifauna

The findings from the Avifauna Impact Assessment (Steyn, 2023) follow. The specialist report is contained in **Appendix E3**.

13.15.1 Impact Description

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”, 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 power lines, 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.

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.

13.15.2 Impact Assessment

The tables to follow were obtained from the Avifauna Impact Assessment (Steyn, 2023).

13.15.2.1 Construction Phase

Habitat destruction within the project footprint

Habitat destruction of the proposed development is inevitable. Pre-mitigation the significance of the impact is a Negative High Impact but with the implementation of mitigation measures can be reduced to a Negative Moderately High Impact. With the alternative design, the pre-mitigation impact will be high, but the post mitigation as the sensitive areas is successfully avoided will be lowered to Moderate.

Prior to mitigation (Original Design)					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
5	3	4	4	5	
Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	2	4	4	4	
Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**

Prior to mitigation (Alternative Design)					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
5	3	4	4	5	
Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	2	4	3	4	
Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Great / harmful/ ecosystem structure and function largely altered	Significant / ecosystem structure and function moderately altered	Highly likely	**Moderate**

Mitigation Actions:

- Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity. If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas;
- Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion.
- Vegetation clearing to commence only after the necessary permits have been obtained; and
- Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.

Destruction, degradation and fragmentation of surrounding habitats

Construction activities can lead to destruction of surrounding habitats. Pre-mitigation this impact has a Negative Moderately High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low impact.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
3	2	2	2	3	
One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc.;
- All solid waste must be managed in accordance with a Solid Waste Management Plan. Recycling is encouraged;

- ❑ All construction activities and roads to be within the clearly defined and demarcated areas;
- ❑ Temporary laydown areas should be clearly demarcated and rehabilitated with indigenous vegetation subsequent to end of use;
- ❑ Appropriate dust control measures to be implemented;
- ❑ Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act;
- ❑ Cement mixed on site must be mixed in a bunded area or on a removable surface such as thick plastic sheeting at least 50 m away from any wetlands or water resources; and
- ❑ All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.

Displacement/emigration of avifauna community (including SCC) due to noise pollution

Noise pollution generated from construction activities will lead to the displacement/emigration of the local avifauna community including the proximal surrounding area. This will include SCC that occur or are likely to occur within the area. Pre-mitigation this impact has a Negative Moderately High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low impact.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	4	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
3	2	2	2	3	
One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- ❑ No construction activity is to occur at night, as nocturnal species are highly dependent on sound and/or vocalisations for behavioural processes;
- ❑ All vehicles speed must be restricted to 20 km/h, to reduce the noise emitted by them; and
- ❑ If generators are to be used these must be soundproofed.

Direct mortality from persecution or poaching of avifauna species and collection of eggs

There is the possibility of construction staff poaching avifauna species and collecting eggs from the project footprint and proximal surrounding area. There is also the possibility of persecution of species that are deemed as negative in folklore. This impact was determined to have a Negative Moderately High Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	4	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	4	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Likely	**Low**

Mitigation Actions:

- ❑ All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting species and collecting eggs;
- ❑ Prior to commencing work each day, two individuals should traverse the working area in order to disturb any avifauna and so they have a chance to vacate the area; and
- ❑ Any avifauna threatened by the construction activities that does not vacate the area should be removed safely by an appropriately qualified environmental officer or removal specialist.

Direct mortality from increased vehicle and heavy machinery traffic

The increased vehicle and heavy machinery traffic associated with construction activities will lead to roadkill. This impact was determined to have a Negative Moderately High Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	4	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	1	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Highly unlikely	**Absent**

Mitigation Actions:

- ❑ All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill; and
- ❑ All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.

13.15.2.2 Operational Phase

Collisions with infrastructure associated with the PV Facility and powerlines

The proposed project comprises of components that pose a collision risk to avifauna species. This includes collisions with PV panels, connection infrastructure, powerlines and fences. This impact was determined to have a Negative High significance but can be reduced to a Negative Moderate significance with the implementation of appropriate mitigation measures.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
5	4	4	4	4	
Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**

Mitigation Actions:

- The design of the proposed solar plant must be of a type or similar structure as endorsed by the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa;
- Post-construction monitoring should be undertaken in accordance with the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017). If monitoring results indicate that excessive bird fatalities are occurring, then adaptive mitigations should be implemented. These should be discussed with avifaunal specialist and ECO prior to implementation and could include the retrofitting/incorporation of additional visual cues/diverters to existing PV panels/infrastructure.
- The air space used by the gridlines must be minimised by burying them where possible;

- ❑ Overhead cables/lines across water resource areas must be fitted with industry standard bird flight diverters in order to make the lines as visible as possible to collision-susceptible species. Shaw *et al.* (2021) demonstrated that large avifauna species mortality was reduced by 51% (95% CI: 23–68%). Recommended bird diverters such as flapping devices (dynamic device) and thickened wire spirals (static device) that increase the visibility of the lines should be fitted 5 m apart. The Inotec BFD88 bird diverter is highly recommended due to its visibility under low light conditions when most species move from roosting to feeding sites.
- ❑ Fencing mitigations:
  - Top 2 strands must be smooth wire;
  - Routinely retention loose wires;
  - Minimum distance between wires is 300 mm; and
  - Place markers on fences.

Electrocution due to infrastructure associated with the PV Facility

This impact was determined to have a Negative Moderately High significance but can be reduced to a Negative Moderate significance with the implementation of appropriate mitigation measures.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	2	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Possible	**Moderate**

Mitigation Actions:

- The design of the proposed solar plant and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa;
- Insulation where energised parts and/or grounded parts are covered with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered; and
- Perch discouragers can be used such as perch guards or spikes. Considerable success achieved by providing artificial bird safe perches, which are placed at a safe distance from the energised parts.

Direct mortality from roadkills, persecution or poaching of avifauna species and collection of eggs

There is the possibility of operational staff poaching avifauna species and collecting eggs from the project footprint and proximal surrounding area. There is also the possibility of persecution of species that are deemed as negative in folklore. This impact was determined to have a Negative Moderate Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
3	2	2	2	2	
One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**

Mitigation Actions:

- All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting avifauna species and collecting eggs.
- Signs must be put up to enforce this, should someone be caught a R1000 fine must be enforced;
- All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill; and
- All vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.

Pollution of water sources and surrounding habitat due to cleaning products of the PV panels

It is likely that the panels will be cleaned with chemicals in addition to water to ensure they function optimally. This impact was determined to have a Negative Moderate Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- ❑ Only environmentally friendly chemicals are to be used for cleaning of the panels.

Heat radiation from the BESS and PV panels

Heat radiation from the infrastructure can result in an overall increase of temperature in the surrounding area, it can also lead to veld fires. This impact was determined to have a Negative Moderate Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- ❑ The BESS must be enclosed in a structure with a non-reflective surface;
- ❑ A fire management plan needs to be put in place; and
- ❑ Grass must be kept under the panels to ensure that additional reflection is not taking place from the surface below the panels.

Encroachment of Invasive Alien Plants into disturbed areas

Invasive Alien Plants tend to encroach into disturbed areas and outcompete/displace indigenous vegetation. This will lead to a shift in the vegetation composition and structure, and consequently will cause a negative shift in the wellbeing of the avifauna community. This impact was determined to have a Negative Moderate significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	2	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

Mitigation Actions:

- An Invasive Alien Plants Management Plan must be written and implemented for the development. The developer must contract a specialist to develop the plan and the developer is responsible for its implementation;
- Regular monitoring for Invasive Alien Plants encroachment during the operation phase must be undertaken to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project; and
- All Invasive Alien Plant species must be removed/controlled using the appropriate techniques as indicated in the Invasive Alien Plants Management Plan.

13.15.2.3 Decommissioning Phase

Direct mortality due to earthworks, vehicle collisions and persecution

Decommissioning activity will likely lead to direct mortality of avifauna due to earthworks, vehicle collisions and persecution. This impact was determined to have a Negative Moderate significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	3	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderate**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	3	4	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Low**

Mitigation Actions:

- All personnel should undergo environmental awareness training including educating about not harming or collecting species;
- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate;
- Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist;
- All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected;
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner;
- Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter;
- All infrastructure must be removed if the facility is decommissioned, this includes the powerlines; and
- The PAOI must be rehabilitated, and a management plan must be in place to ensure that it is done successfully.

Continued habitat degradation due to Invasive Alien Plant encroachment and erosion

Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years. Pre-mitigation this impact has a Negative Moderately-High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low impact.

Prior to mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
4	3	3	4	4	
Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**
Post mitigation					
Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
2	2	2	4	3	
One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology highly sensitive /important	Likely	**Low**

Mitigation Actions:

- ❑ Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase;
- ❑ Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase;
- ❑ All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques; and
- ❑ There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.

13.16 Agriculture

The findings from the Agricultural Compliance Statement (Gouws, 2023) follow. The specialist report is contained in **Appendix E4**.

13.16.1 Impact Description

The potential impacts of the development from an agricultural perspective are as follows:

- Loss of high potential land –
  - No high potential or sensitive soils were found; therefore, there will not be a loss of high potential land if the project is implemented. The impact is low, temporary and totally reversable.
- Loss of agricultural production –
  - The site is used for cattle farming. These animals can be moved to another part of the farm without any impact on farming income.
  - The grazing opportunity that the farm provides cannot be replaced or mitigated on a national level. However, the farm will carry only 75 LSU livestock, which on its own, does not make a meaningful contribution on food production.
    - The impact is low on a regional or national scale.
    - The loss is temporary and will be for the medium term.
    - There will be no loss of labour opportunities. The labourer that tends the livestock can be employed elsewhere on the farm.
- Loss of agricultural infrastructure –
  - Farming infrastructure on the site can be relocated elsewhere or be re-erected after the lifespan of the project.
    - In conclusion, no agricultural infrastructure will be permanently lost.
    - There is no impact.
- Loss of soil due to erosion –
  - The soil is very erodible because of the strongly developed structure in the subsoil.
  - Runoff from hard surfaces should be dealt with by a Stormwater Management Plan. This is an engineering function and is normally addressed as part of the project design.

A quantitative impact assessment was not provided by the Agricultural Specialist as only an Agricultural Compliance Statement was deemed necessary.

13.17 Cultural Heritage

The findings from the Heritage Impact Assessment (Kitto, 2023) follow. The specialist report is contained in **Appendix E5**.

13.17.1 Impact Description

The Project Area contains some areas that are currently disturbed by farming (cattle and game) activities as well as termite mounds and many animal burrows.

The following findings were made in terms of the impact significance of the Project:

- Impact significance on graves is high before mitigation as the graveyard site (Leeuw 04) and site with potential infant burials (Leeuw 05) are both located inside the proposed PV array area of the project footprint for Alternative 1 and Alternative 2. Although these two sites are avoided in the layout design of Alternative 2, there is a possibility of indirect impact. Site Leeuw 04 is protected by section 36 of the NHRA and the 30m buffer must be demarcated clearly as a "no go" area. However, implementation of the mitigation measures required should reduce the impact to low.
- Impact significance on protected historical structures is low as only one extant historical structure site was identified (Leeuw 02) which is situated outside the project footprint boundary – Alternative 1. This is likely to be 60 years or older and is protected by section 34 of the NHRA. Two sites comprising the demolished remains of structures were also identified: one is a possible homestead (Leeuw 05) and the other comprises several scattered pieces of concrete, some with metal bars embedded (Leeuw-03). These two sites are avoided in the layout design of Alternative 2. As noted above, there is still a possibility of indirect impact. The 30m buffer zones must be demarcated clearly as a "no go" area for these two sites. However, implementation of the mitigation measures required should retain the impact as low.
- Impact significance on archaeological sites and material is low as no such sites or material were identified within the alternative layout footprints. However, due to most archaeological material occurring subsurface there is a possibility of such material being uncovered.

13.17.2 Impact Assessment

The tables to follow were obtained from the Heritage Impact Assessment (Kitto, 2023).

Table 34: Assessment of impacts on graves (Kitto, 2023)

Environmental Feature	Heritage resources –Grave site
Project life cycle	Planning, Construction and Operation
Potential Impact	Proposed Management Objectives / Mitigation Measures
Possible damage to or destruction of identified historical graves (Leeuw 04)	• The buffer of 30m must be retained around the identified grave site to ensure that during construction and operation, the graves are not damaged • The gravesite should be fenced on the 30m buffer and demarcated clearly so that work and maintenance crews are aware of the site. • The community should be consulted to identify the family/ies related to the graves regarding visitation rights. • If, for any reason, it is not possible to avoid the grave site then a Phase 2 mitigation process will need to be undertaken. During this process, the family or relevant communities will have to be consulted regarding possible options for mitigation (retention with access or removal) of the graves, and

	to obtain their permission. In addition, application will have to be made to the FSHRA or SAHRA for the necessary permits. • Sub-sections (4) and (5) of section 36 of the NHRA regarding the possibility of removal of graves must be adhered to. The exhumation and removal of graves is strongly discouraged as graves are highly significant to many people and there are many traditional, cultural and personal sensitivities concerning the removal of graves. • If any changes are made to the final design footprint prior to construction, monitoring of site clearance activities must be undertaken by a heritage specialist to identify any additional grave sites or graveyards
Potential infant burials (Site Leeuw-05)	• The buffer of 30m must be retained around the site and demarcated clearly to ensure that during construction, the site is not damaged • If any impact is anticipated, then social consultation would be required to confirm the presence of potential infant burials • If infant burials are confirmed then a Phase 2 mitigation process for grave removal will be required, as above

Alternative 1	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Permanent	Almost certain	3
After Mitigation	Negative	Local	Medium	Long- term	Moderate	2
Significance of Impact and Preferred Alternatives	Both the grave site and the homestead site (with potential infant burials) are located within the PV array area in the north-western corner of the project footprint, for Alternative 1. Therefore, mitigation as set out above will be required.					
Alternative 2	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High	Permanent	Moderate	2
After Mitigation	Negative	Local	Medium	Long- term	Unlikely	1
Significance of Impact and Preferred Alternatives	The design of the Alternative 2 layout avoids both the grave site and the homestead site (with potential infant burials) with a 30m buffer. However, the sites are still located within the general PV array area of the project footprint. Therefore, mitigation as set out above will be required.					

Table 35: Assessment of impacts on historical structures (Kitto, 2023)

Environmental Feature	Heritage resources – Historical structures (Leeuw 02; Leeuw 05)
Project life cycle	Planning, Construction and Operation
Potential Impact	Proposed Management Objectives / Mitigation Measures
Possible damage to or destruction of extant historical structures (Site Leeuw 02)	• The buffer of 30m must be retained around this site to ensure that during construction, there is no indirect impact which could damage the structures • Any proposed alteration of the structures would require a permit from the Free State PHRA •
Possible damage to or destruction of demolished remains of historical structures (Site Leeuw 05)	• The buffer of 30m must be retained around this site and demarcated to ensure that during construction, no historical-archaeological material is damaged • The materials demarcating the 30 m buffer must be highly visible and made of durable material to ensure that they are still in place during the operation of the PV site so that maintenance crews are aware of the sites.

		• If any impact is anticipated, a permit will be required for the destruction of this site (from FS PHRA or SAHRA)				
Alternative 1	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High (potential graves)	Permanent	Almost certain (Leeuw 05)	2
After Mitigation	Negative	Local	Low	Long- term	Unlikely	1
Significance of Impact and Preferred Alternatives	Site Leeuw 02 has higher significance than site Leeuw 05 as the structures are extant and can be recorded. Site Leeuw 05 has low significance for the demolished buildings, but high significance for potential infant graves. The impact will be direct and almost certain for Leeuw 05 if no mitigation measures are implemented.					
Alternative 2	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	High (potential graves)	Permanent	Moderate (Leeuw 05)	2
After Mitigation	Negative	Local	Low	Long- term	Unlikely	1
Significance of Impact and Preferred Alternatives	Site Leeuw 02 has higher significance than site Leeuw 05 as the structures are extant and can be recorded. Site Leeuw 05 has low significance for the demolished buildings, but high significance for potential infant graves. Although the design of the Alternative 2 layout avoids both sites there is a risk of indirect impact for Leeuw 05 if the recommended buffer zone and demarcation mitigation measures are not implemented.					

13.18 Palaeontology

The findings from the Palaeontological Impact Assessment (Butler, 2023) follow. The specialist report is contained in **Appendix E6**.

13.18.1 Impact Description

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle on 13 May 2023. No fossiliferous outcrop was detected in the proposed development. This could be attributed to the lack of outcrops as well as the lush grassy vegetation in the area.

Based on the site investigation as well as desktop research it is concluded that fossil heritage of scientific and conservational interest in the development footprint is rare. A medium Palaeontological Significance has been allocated for the construction phase of the PV development pre-mitigation and a low significance post mitigation. The construction phase will be the only development phase impacting Palaeontological Heritage and no significant impacts are expected to impact the Operational and Decommissioning phases.

13.18.2 Impact Assessment

The table to follow was obtained from the Palaeontological Desktop Assessment (Butler, 2023).

Table 36: Assessment of impacts on fossil heritage (Butler, 2023)

Nature of Impacts	*Loss of Fossil Heritage in or above ground surface*							
Impacts	Extent	Probability	Duration	Magnitude	Reversibility	Irreplaceable loss	Cumulative effect	Impact Significance
Pre-mitigation	Site (1)	Possible (2)	Permanent (4)	High (3)	Irreversible 4	Significant loss of resources 3	Low (2)	Negative Medium (48)
Post mitigation	Site (1)	Possible (2)	Permanent (4)	Low (1)	Irreversible (4)	Significant loss of resources (3)	Low (2)	Negative Low (16)

13.19 Visual Quality

The findings from the Visual Impact Assessment (Viljoen, 2023) follow. The specialist report is contained in **Appendix E8**.

13.19.1 Impact Description

Solar PV facilities are considered long-term in nature and long-term structures will be constructed. The primary visual impacts associated with a change from the current state of the site (fallow lands, cultivated fields and grassland vegetation) to a solar PV facility will have the greatest visual impact due to the visibility of the site from sensitive receptors.

The nature of the visual impacts will be the visual effect that the activity would have on the receiving environment. These visual impacts would be:

- The construction and operation of the proposed PV facility and its associated infrastructure may have a visual impact on the study area, especially within (but not restricted to) a 1 - 5km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility.
- Visibility from sensitive receptors. The proposed development will be visible from receptors outside the proposed project area. These include:
  - Site personnel at the operation;
  - People travelling to work and commercial activities in the surrounding areas;
  - People travelling on the surrounding access routes to their place of residence;
  - Surrounding farming communities; and
  - Surrounding residential areas.

Based on the results of the impact assessment, the majority of the potential visual impacts were considered to be moderate before mitigation and with the successful implementation this can be reduced to low. With regards to the proposed activities, due to the terrain of the proposed boundary, vegetation, VAC, and current land uses, the proposed activities are expected to result in a moderate visual impact on the receiving environment. The proposed activities will have a long-term temporal visual impact, due to the very nature of the Project and associated infrastructure. The activity will have a localised visual impact over a long-term duration. The activity will be able to continue with the implementation of appropriate mitigation strategies during the construction, operational and decommissioning phases.

13.19.2 Impact Assessment

The tables to follow were obtained from the Visual Impact Assessment (Viljoen, 2023).

Table 37: Visual Impact Assessment – Construction, Operational & Decommissioning Phases (Viljoen, 2023)

Phase	Potential Visual Impacts	Visual Significance											
		Before Mitigation						After Mitigation					
		M	D	S	P	SP	RATING	M	D	S	P	SP	RATING
Construction	Site establishment • This will involve the vegetation clearance and stripping of soil in areas designated for surface infrastructure.	6	2	3	3	33	Medium	6	2	3	2	22	Low
	Site Clearing of the project footprint: • Removal of vegetation leading to increased visual contrast and loss of VAC and increase visual intrusion on sensitive receptors. • Alteration of current landscape features impacting on landscape character and sense of place.	6	2	3	4	44	Medium	6	2	3	2	22	Low
	Construction of Solar PV facility and associated infrastructure.	6	2	3	4	44	Medium	6	2	3	2	22	Low
	Construction vehicle movement and increased human activity in and around the proposed site.	6	2	3	2	22	Low	6	2	3	1	11	Low
	General and hazardous waste management.	2	2	2	2	12	Low	2	2	2	1	6	Low
	Formation of dust plumes because of construction activities.	4	2	3	2	18	Low	4	2	3	1	9	Low
	Use of security lighting.	4	2	2	2	16	Low	4	2	2	1	8	Low
	Topographical alteration which will lead to increased visual intrusion and potential impact on sense of place.	6	2	3	4	44	Medium	6	2	3	2	22	Low

Phase	Potential Visual Impacts	Visual Significance											
		Before Mitigation						After Mitigation					
		M	D	S	P	SP	RATING	M	D	S	P	SP	RATING
Operational	Topographical alteration which will lead to increased visual intrusion and potential impact on sense of place.	6	4	3	4	52	Medium	6	4	3	2	26	Low
	Increased vehicle and human activity in and around the Solar PV facility and associated infrastructure.	6	4	3	2	26	Low	6	4	3	1	13	Low
	Night-time illumination due to security lighting and lighting associated with the Solar PV facility and associated infrastructure.	6	4	2	3	36	Medium	6	4	2	2	24	Low
	Potential visual impact of solar glint and glare as a visual distraction.	6	4	3	3	39	Medium	6	4	3	2	26	Low

Phase	Potential Visual Impacts	Visual Significance											
		Before Mitigation						After Mitigation					
		M	D	S	P	SP	RATING	M	D	S	P	SP	RATING
Decommissioning	General decommissioning and closure activities leading to visual intrusion on sensitive receptors.	6	1	3	2	20	Low	6	1	2	2	14	Low
	Dismantling and removal Solar PV facility and associated infrastructure.	6	1	3	1	10	Low	6	1	2	1	7	Low
	Cleaning, landscaping, and replacement of soils over the disturbed area.	6	1	3	1	10	Low	6	1	2	1	7	Low
	Waste generation and disposal	4	1	2	2	14	Low	4	1	2	1	7	Low
	Ineffective rehabilitation leading to landscape scarring, permanent visual contrast and a permanent alteration of the landscape character and sense of place.	6	4	3	3	39	Medium	6	1	2	3	21	Low

Management Actions for Visual Impacts

Visual mitigation can be divided into two options. Typically using a combination of the two options is most effective. The first option is an attempt to "hide" the source of the visual impact from view, by placing visually appealing elements between the viewer and the source of the visual impact. The second option aims to minimise the severity of the visual impact itself. This can be achieved in numerous ways for example limiting heights or by blending the infrastructure to match the surrounding environment.

During the construction phase, the following mitigation measures should be implemented to minimise the visual impact.

- ❑ General site management:
  - Maintain the construction site in a neat and orderly condition at all times;
  - Plan the placement of lay-down areas and any potential temporary construction camps in order to minimise vegetation clearing;
  - Ensure that rubble, litter, and disused construction materials are managed and removed regularly; and
  - Ensure that all infrastructure and the site and general surroundings are maintained in a neat and appealing way.
- ❑ Height and Orientation:
  - The height and orientation of the solar panels should be considered during the design phase. Panels should be oriented to minimize glare and reflection, and their height should be kept as low as possible to reduce their visual impact.
- ❑ Infrastructure:
  - All constructed facilities and buildings should cause minimum visual disturbance by reducing the contrast and blending in with the surrounding vegetated natural area. This could be achieved by painting rooftops and walls of buildings in the hues and tones of the surrounding vegetation and/or by adding matt paints to highly reflective surfaces, as well as sharp protruding features on the structures. All of these solutions are subject to the technical design of individual buildings and facilities and should be pursued by the technical design and/or construction team, taking into consideration added value from reduced visibility, engineering feasibility and cost.
- ❑ Dust Management:
  - Implement dust suppression using a water cart to minimise airborne dust;
  - Enforce speed limits on-site.

During the operational phase the following mitigation measures should be implemented to minimise the visual impact.

- ❑ Light pollution management:
  - Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination.

- Avoid up-lighting of structures by rather directing lighting downwards and focusing on the area to be illuminated.
- Reduce the height and angle of illumination from which floodlights are fixed as much as possible while still maintaining the required levels of illumination.
- Lighting should be shielded in areas where specific objects are to be illuminated.
- Minimise the use of lighting, where possible.
- Lighting should exclude the blue-rich wavelengths and be closer to the red-rich wavelength spectrum.
- Globes used in lighting outside areas should be warm white. This also applies to light spilling out from within buildings. A colour temperature of no more than 3000 Kelvins is recommended for lighting.
- Light intensity of illuminating lights should be limited as far as possible, i.e., to limit lighting to areas required to serve operational functionality.
- Illumination where not permanently required should be fitted with timers, motion-activated sensors or be dimmable to reduce total light emitted.

❑ Site management:

- Shape any slopes and embankments to a maximum gradient of 1:4 and vegetate, to prevent erosion and improve their appearance.
- Utilise vegetation screens as visual screening devices around the proposed project where possible, specifically buildings.
- Plant indigenous trees in landscaped areas where possible, as well as around the solar PV facility and associated infrastructure.
- Eradicate invasive alien plant species.

During decommissioning and closure phase, the following mitigation measures should be implemented to minimise the visual impact:

- Eradicate invasive alien plant species;
- Remove all built infrastructure; and
- Re-shape all footprint areas to be as natural in appearance as possible and revegetate using locally occurring vegetation.

13.20 Air Quality

13.20.1 Impact Description

Receptors to air quality pollution include people residing in surrounding settlements and farm dwellings, ecological features (fauna and flora), livestock and crops.

The Project proposes the use of a renewable resource (solar), which is a cleaner form of energy generation than using fossil fuels, with environmental benefits.

Sources of air quality impacts associated with the Project may include:

- Construction phase –
  - Dust from the use of dirt roads by construction vehicles;
  - Dust from bare areas that have been cleared for construction purposes; and
  - Emissions from construction equipment and machinery.
- Operational phase –
  - Impacts to air quality caused by the operation and maintenance of the facility include dust from the use of dirt roads and tailpipe emissions from vehicles.

Mitigation measures are included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored and managed and that regulated thresholds are not exceeded. The EMPr also includes measures to control and minimize greenhouse gas emissions by optimising the utilisation of construction resources, as well as preventing fires related to construction activities.

During the operational phase of the Solar PV Plant, local atmospheric pollution may reduce the irradiation received or contain significant levels of airborne corrosive substances. The efficiency of the solar plants be also reduced if the modules are soiled (covered) by particulates/dust.

13.20.2 Impact Assessment

Environmental Feature	**Air Quality**
Relevant Alternatives & Activities	**Construction domain of development footprint**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Excessive dust levels as a result of construction activities. • Emissions from construction equipment and machinery.	• Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g., dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be undertaken for all bare areas created by the development footprint. All dust suppression requirements should be based on the results from the dust monitoring and the proximity of sensitive receptors. • Speed limits to be strictly adhered to. • All vehicles and machinery used at the site are to be in good working condition and fitted with appropriate emission controls. • Construction plant to be operated efficiently and turned off when not in use.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium	short-term	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

Environmental Feature	**Air Quality**

Relevant Alternatives & Activities	Operation of the Solar PV Plant
Project life-cycle	**Operational phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Influence of air quality and soiling on operational efficiency of Solar PV Plant.	• An appropriate maintenance and cleaning plan is to be developed for the PV panels.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium	long-term	likely	2
After Mitigation	-	local	low	long-term	unlikely	1

13.21 Noise

13.21.1 Impact Description

Sensitive receptors to noise impacts in the study area include people residing in the surrounding rural areas, ecological receptors (fauna) and livestock.

During construction, localised increases in noise will be caused by earthworks, establishment and operating of site construction laydown area, construction of proposed infrastructure, transportation of construction workers and material, activities at the construction camp, and general construction noise.

Solar PV facilities produce electricity during the daytime hours, when the sun's rays are collected by the panels. When there is little to no irradiance, noise emitted by the equipment is significantly reduced. The main sources of noise from the Project will be the rack mounted inverters and the central step-up transformer, which are only expected to be audible to operational staff who will come in close proximity to these components. Other sources of noise include operation and maintenance vehicles and activities.

During the operational phase, power lines produce an audible sound or buzz because they are producing something called a corona discharge that is interacting with the surrounding air. The corona discharge is a side-effect of the electric field the power line generates by carrying electricity. The discharge can be greater and the buzzing louder if there is increased moisture or pollutants in the air. Under normal conditions, corona-generated noise is not audible. The noise may be audible under certain wet conditions. Conductors are selected based on factors such as audible noise, corona, and electromagnetic field mitigation. In addition, corona rings can be fitted if deemed necessary. Corona is not associated with any adverse health effects in humans or livestock.

Noise that emanates from construction and operational activities are addressed through targeted best practices in the EMPr. The associated regulated standards need to be adhered to.

Project personnel working on the construction site will experience the greatest potential exposure to the highest levels of noise and vibration. Workplace noise and vibration hazards will be managed as part of the Occupational Health and Safety Management System to be employed on site, which will include specific measures aimed at preventing hearing loss and other deleterious health impacts.

13.21.2 Impact Assessment

Environmental Feature	**Noise**
Relevant Alternatives & Activities	**Construction domain of development footprint**
Project life-cycle	**Construction phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Noise as a result of construction activities	• The provisions of SANS 10103:2008 will apply to all areas within audible distance of residents. • Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. • Noise preventative measures (e.g., screening, muffling, timing, pre-notification of affected parties) to be employed.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium	short-term	likely	2
After Mitigation	-	local	low	short-term	unlikely	1

13.22 Hazardous Substances & Waste

13.22.1 Impact Description

Improper management of hazardous substances and waste may pollute the biophysical environment (air, water and soil), and pose risks to humans, flora and fauna. It may also cause visual impacts.

Hazardous substances to be stored and used during the construction and operational phases of the Project include oil, fuel, solvents, pesticides, lithium-ion batteries (BESS), etc.

General construction waste will comprise of surplus or off-specification materials (e.g., concrete, wooden pallets, packaging paper or plastic, wood, metals, etc.) and construction debris. Domestic waste will include food waste, plastic, glass, aluminum cans and waste paper. A small proportion of the waste generated during construction phase will be hazardous and may include used oil, hydraulic fluids, waste fuel, grease and waste oil containing rags. Wastewater, including water adversely affected in quality through construction-related activities and human influence, will include sewage, water used for washing purposes (e.g., equipment, staff) and drainage over contaminated areas (e.g., workshop, equipment storage areas).

Waste types likely to be generated during routine operation and maintenance activities include dielectric fluids, clearing agents, oils, solvents, wastewater, defunct / damaged PV cells and substation components, as well as domestic waste.

Provision is made in the EMPr to manage impacts associated with hazardous substances and waste.

13.22.2 Impact Assessment

Environmental Feature	**Hazardous Substances & Waste**
Relevant Alternatives & Activities	**Storage and use of hazardous substances & generation of waste**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Environmental pollution caused by improper management of hazardous substances and waste.	• Hazardous substances shall be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations and applicable SANS and international standards. • Storage and use of hazardous materials will be strictly controlled to prevent environmental contamination and will adhere to the requirements stipulated on the Material Safety Data Sheets. • In the event of spillages of hazardous substances the appropriate clean up and disposal measures shall be implemented. • BESS to have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression as per regulatory requirements. • Waste to be disposed of at a licenced waste disposal facility. • Water used for cleaning of PV panels will not contain any harmful chemicals or additives. • Wastewater to be properly disposed of. Contaminated water will not be discharged to the environment. • Used lithium-ion batteries and PV panels are to be removed by the suppliers, who are to recycle material and recover any hazardous substances (as relevant). Provision to be made in the supply agreements between the Proponent and the selected suppliers.

	+/- Impacts	**Extent**	**Magnitude**	**Duration**	**Probability**	**Significance**
Before Mitigation	-	local	medium-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

Potential risks and related control measures associated with the BESS facility are captured in **Table 38** below. A detailed risk assessment will need to be undertaken based on the type of BESS technology selected and the final design of the Solar PV Plant. The outcomes of this risk assessment will need to be appended to the Operational EMPr (as required).

Table 38: Proposed management of risk to BESS (based on Arup, 2018)

No.	Risk	Possible Consequences	Control Measures
1	Risk posed by veld fires (external to site) to BESS facility	Damage to BESS	▪ Implementation of a fire break around the site ▪ Include measures to deal with veld fires in the Emergency Response Plan ▪ Coordination with local fire authorities ▪ Provide fire extinguishers on site
2	Damage caused to cells by an external event	Lithium Ion Cell leakage	▪ Lithium batteries do not contain free liquid electrolytes ▪ Individual cells are used which minimises extent of release
3	Damage to batteries from vehicle collision	▪ Damage to battery cells ▪ Electrical risks	▪ Use of perimeter fence around BESS facility ▪ Appropriately designed internal access roads ▪ Limit of speed limit within fenced facility ▪ Earthing system installed as per normal electrical facilities
4	Transformer oil leakage due to corrosion of tank base or leakage of oil tank	Leakage of transformer oil to environment, with resultant pollution	▪ Use of fully bunded oil storage for transformers ▪ Regular tank inspections
5	Collapse or fall of overhead electricity line onto BESS facility	Damage to BESS facility	▪ BESS facility to be located outside of power line servitude
6	Security breach into BESS facility for theft of components	Theft of equipment or risk to personnel	▪ Installation of security fencing around entire Solar PV Plant and around the BESS facility ▪ Installation of security system to monitor key areas ▪ Inspections to monitor for security breaches
7	Spread of fire across BESS facility between battery packs	Localised fire causing damage by spreading to BESS facility	▪ Separation distances between battery packs in accordance with manufacturer recommendations ▪ Adherence to fire management measures ▪ Provide fire extinguishers on site ▪ BESS area will have a non-flammable buffer area to prevent the spread of fire. ▪ BESS will have electrical and fire protection measures in the form of battery temperature monitoring, circuit breakers, fire detection and fire suppression
8	Electrocution due to electrical fault	Electrical fault causing personnel injury	▪ Normal electrical standards and installation of appropriate earthing system ▪ Use of appropriately qualified maintenance personnel
9	Lightning striking BESS facility	Lightning strike causing damage to facility or personnel	▪ Include lightning protection measures, if deemed necessary
10	High rainfall and flooding to site	Damage to electrical equipment	▪ BESS facility to be developed outside of the 1:100 year floodline of any watercourse and to be safeguarded against excessive rain.
11	High wind events and seismic events	Structural damage to equipment or battery packs	▪ Appropriate design of BESS facility, taking into consideration *inter alia* climatic and geotechnical conditions

13.23 Traffic

13.23.1 Impact Description

The information to follow was extracted from the Transport Impact Assessment (Patandin, 2023).

Construction Phase

Traffic generated by the construction of the facility will have a significant impact on the surrounding road network. The exact number of trips generated during construction will be determined by the contractor, the haulage company transporting the components to site, the staff requirements and where equipment is sourced from.

From experience on other projects of similar nature, the number of heavy vehicles per 7MW installation is estimated to range between 200 and 300 trips depending on the site conditions and requirements. For the 300MW, the total trips can therefore be estimated to be between 8 572 and 12 858 heavy vehicle trips, which will generally be made over a 12-month construction period. Choosing the worst-case scenario of 12 858 heavy vehicles over a 12-month period travelling on an average of 22 working days per month, the resulting daily number of vehicle trips is 49. Considering that the number of vehicle trips during peak hour traffic in a rural environment can roughly be estimated at around 20-40% of the average daily traffic, the resulting peak hour vehicle trips for the construction phase are approximately 10 - 20 trips.

If the panels are imported instead of manufactured within SA, the respective shipping company will be able to indicate how the panels can be packed (for example using 2MW packages and 40ft containers). These can then be stored at the port and repacked onto flatbed trucks.

It is assumed that during the peak of the construction period, 300 employees will be active on site, with the estimation of daily staff trips as follows:

- Car – 10 vehicles and 7 employees (assuming single occupant)
- Bakkie – 20 vehicles and 30 employees (assuming 1.5 occupants)
- Taxi (15 seats) – 12 vehicles and 180 employees; and
- Bus (80 seats) – 1 vehicle and 80 employees.

It is difficult to accurately estimate the construction traffic for the transportation of materials as it depends on the type of vehicles, tempo of the construction, source/location of construction material etc. However, it is assumed that at the peak of construction, approximately 200 construction vehicle trips will access the site per day.

The total estimated daily site trips at the peak of construction are 276, which consist of the following:

- Component Delivery – 33;
- Staff Trips – 43; and
- Construction Trips – 200.

The impact on the surrounding road network and the general traffic is therefore deemed nominal, with mitigation, as the 276 trips will be distributed across a 9-hour working day. The majority of the trips will occur outside the peak hours. The significance of the transport impact without mitigation measures during the construction phase can be rated as medium. However, considering that this is temporary and short term in nature, the impact can be mitigated to an acceptable level.

Operational Phase

During operation, it is assumed that approximately ten (10) full-time employees will be stationed on site and hence vehicle trips generated are low and will have a negligible impact on the external road network.

The solar modules would need to be cleaned twice a year. The Developer is investigating the availability of service and as such a worst-case scenario of transporting water to site has been assessed. The following assumptions have been made to estimate the resulting trips generated from transporting water to the site:

- 5 000 litre water bowsers to be used for transporting the water;
- Approximately 5 litres of water needed per panel;
- Assuming that a maximum of 600 000 solar modules are used, this would amount to approximately 600 vehicle trips; and
- Solar modules will be cleaned twice a year.

It is expected that these trips will not have a significant impact on external traffic. However, to limit the impact, it is recommended to schedule these trips outside of peak traffic periods and to clean the solar modules over the course of a few days i.e., spread the trips over a few days. Additionally, the provision of rainwater tanks on site would decrease the number of trips.

13.23.2 Impact Assessment

Table 39: Impact Rating - Construction Phase – Traffic Congestion (Patandin, 2023)

TRAFFIC CONGESTION CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Traffic congestion during the construction phase	• Stagger component delivery to site • Where possible, reduce the construction period • Source mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods as much as possible • Conduct regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Short-term	Almost certain	2
With Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

Table 40: Impact Rating - Construction Phase – Air Quality (Patandin, 2023)

AIR QUALITY CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Air quality will be affected by dust pollution	• Dust suppression of gravel roads during the construction phase, as required. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Short-term	Almost certain	2
With Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

Table 41: Impact Rating - Construction Phase – Noise Pollution (Patandin, 2023)

NOISE POLLUTION CONSTRUCTION PHASE						
Potential Impact	Mitigation					
Noise pollution due to the increase in traffic	• Stagger component delivery to site • Reduce the construction period as far as possible • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods					
Without Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Medium	Short-term	Almost certain	2
With Mitigation	Status	Extent	Magnitude	Duration	Probability	Significance
	Negative	Local	Low	Short-term	Likely	1

Table 42: Impact Rating – Operational Phase (Patandin, 2023)

IMPACT TABLE – OPERATIONAL PHASE
The traffic generated during this phase will be minimal and will have not have any impact on the surrounding road network. However, the Client/Facility Manager is to ensure that regular maintenance of gravel roads occurs during operation phase to minimize/mitigate dust pollution.

Table 43: Potential Impact - Decommissioning Phase (Patandin, 2023)

IMPACT TABLE – DECOMMISSIONING PHASE
This phase will have a similar impact as the Construction Phase i.e. traffic congestion, air pollution and noise pollution, as similar trips/movements are expected.

Management Actions – Traffic Impacts

The following are general mitigation measures to reduce the impact that the additional traffic will have on the road network and the environment (Patandin, 2023):

- The delivery of components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.

- Dust suppression of gravel roads located within the site boundary, including the main access road to the site and the site access road, during the construction phase, if required.
- Regular maintenance of gravel roads located within the site boundary, including the access road to the site, by the Contractor during the construction phase and by the Owner/Facility Manager during the operation phase, if required.
- The use of mobile batch plants and quarries near the site would decrease the traffic impact on the surrounding road network, if available and feasible.
- Staff and general trips should occur outside of peak traffic periods as far as possible.
- The Contractor is to ensure that all drivers entering the site adhere to the traffic laws.
- Vehicular movements within the site boundary are the responsibility of the respective Contractor and the Contractor must ensure that all construction road traffic signs and road markings (where applicable) are in place. It should be noted that traffic violations on public roads is the responsibility of Law Enforcement and the public should report all transgressions to Law Enforcement and the Contractor.
- If required, low hanging overhead lines (lower than 5.1m) e.g., Eskom and Telkom lines, along the proposed routes will have to be moved (to be arranged by haulage company) to accommodate the abnormal load vehicles. The Contractor and the Developer is to ensure that the haulage company is aware of this requirement.
- The haulage company is to provide evidence to the Contractor and the Developer that any affected overhead lines have been moved or raised.
- The preferred route should be surveyed to identify problem areas (e.g., intersections with limited turning radii and sections of the road with sharp horizontal curves or steep gradients, that may require modification). After the road modifications have been implemented, it is recommended to undertake a “dry-run” with the largest abnormal load vehicle, prior to the transportation of any components, to ensure that delivery will occur without disruptions. This process is to be undertaken by the haulage company transporting the components and the contractor, who will modify the road and intersections to accommodate abnormal vehicles. The “dry-run” should be undertaken within the same month components are expected to arrive. The haulage company is to provide evidence that the route has been surveyed and deemed acceptable for the transportation of the abnormal load.
- The Contractor needs to ensure that the gravel sections of the haulage routes (i.e., the site access road and the main access road to the site) remain in good condition and will need to be maintained during the additional loading of the construction phase and reinstated after construction is completed.
- Design and maintenance of internal roads. The internal gravel roads will require grading with a grader to obtain a camber of between 3% and 4% (to facilitate drainage) and regular maintenance blading will also be required. The geometric design of these gravel roads needs to be confirmed at detailed design stage. This process is to be undertaken by a civil engineering consultant or a geometric design professional.

13.24 Civil Aviation

13.24.1 Impact Description

Possible impacts that may be caused by a Solar PV Plant to civil aviation include potential glare and glint from *inter alia* PV panels, steel array mounting, glass windows and rooftops that might cause temporary loss of vision to pilots on arrival or departure. Towers and transmission lines can disrupt airplane flight paths in and near airports and endanger low-flying airplanes, especially those used in agricultural management activities.

Glint and glare are caused by many reflective materials, whereby light from the sun is reflected off such materials with a potential to cause hazard, nuisance or unwanted visual impact. It is noted that solar panels are designed to absorb, not reflect, irradiation.

As verified, based on the Screening Report (refer to **Section 12.2** above), the Project Area has low sensitivity in terms of civil aviation as there are no major or other types of civil aviation aerodromes in proximity to the site. Accordingly, no Glint and Glare Impact Assessment in terms of Obstacle Notice 4/2017 was undertaken.

The SACAA was engaged with as part of the EIA and the Applicant will adhere to the requirements of this authority.

13.24.2 Impact Assessment

A quantitative impact assessment was not undertaken from a civil aviation perspective, due to the reasons provided in **Section 13.24.1** above.

13.25 Existing Structures and Infrastructure

13.25.1 Impact Description

The Project may cause disruptions to services or damage existing infrastructure as a result of construction activities.

A detailed survey will be conducted to identify all physical features that are located within the final project footprint. Optimisation of the layout during the design phase will seek to avoid existing structures and infrastructure, where possible. The setbacks / conditions required by the custodians of infrastructure in proximity to the PV Site and along the power line route will need to be adhered to.

During the public participation process conducted to date, certain infrastructure owners and custodians provided wayleave requirements and conditions when working near to existing services.

13.25.2 Impact Assessment

Environmental Feature	Existing Structures and Infrastructure
Relevant Alternatives & Activities	**All activities that affect existing structures and infrastructure**
Project life-cycle	**Construction & operational phases**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruption of existing services. • Damage to existing structures and infrastructure.	• Identify and record existing services and infrastructure. • Conform to requirements of relevant service providers and infrastructure custodians (e.g., Eskom. Transnet, Telkom, FSDPRT, etc.). • Ensure access to infrastructure is available to service providers at all times. • Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site. • Adequate reinstatement and rehabilitation of affected environment.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	medium-high	short-term to permanent	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

13.26 Health and Safety

13.26.1 Impact Description

Construction Phase

Health and safety related risks associated with the Project during the construction phase include the following:

- ❑ Hazards related to construction work;
- ❑ Increased levels of dust and particulate matter, as well as noise;
- ❑ Water (surface and ground) contamination;
- ❑ Poor water and sanitation services for construction workers;
- ❑ Communicable diseases;
- ❑ Psychosocial disorder (e.g. social disruptions);
- ❑ Safety and security to the local community; and
- ❑ Lack of suitable health services.

These risks are addressed through mitigation measures identified under other environmental features, such as socio-economic environment, air quality, noise, traffic, hazardous substances and waste as well as best practices included in the EMPr. Additional management requirements will be included in the Project's Occupational Health and Safety system.

Operational Phase

The predominant types of hazards associated with battery systems include electric shock, stored energy, chemical, flammable emission, thermal runaway, transportation, kinetic energy and manual handling (Energy Storage Council, 2016). A lithium-ion based BESS must be designed with proper disconnects, relays, thermal management, enclosures, layout, monitoring and controls to mitigate risks to the required level of safety. Operating strategies spanning proper planning, risk assessment, storage methods, maintenance protocols, and response protocols are the other important factors in mitigating lithium-ion safety risks (Butler, 2013).

Electromagnetic fields (EMFs) are produced whenever electricity is used. Research into electric and magnetic fields undertaken at utility scale PV installations in California by Chang and Jennings (1994), indicated that magnetic fields were significantly less for solar arrays than for household applications. Chang and Jennings (1994) found magnetic fields from solar arrays were not distinguishable from background levels at the site boundary, suggesting the health risk of EMFs from solar arrays is minimal.

For a transmission line, the strength of the electric field varies generally with the operating voltage of the line (measured in volts) while the magnetic field strength is related to the current flowing in the line (measured in amps) (Parsons Brinckerhoff, 2013). EMF strengths dependent on *inter alia* the height of the electrical wires above the ground and their geometric arrangements, which are supported by the transmission structures.

Even though the EMF inside a substation is high (but less than occupational limits), the fields outside the substation decrease with distance, as is the case with power lines (Wolhuter & Holtzhausen, 2015). It is documented in literature that EMF levels reduce rapidly with distance from the source. The Project's proposed substation, which contains high voltage transformers, will be enclosed by security fencing to prevent unauthorised access and the exposure to high voltage electricity. This will also provide safe distance between electrical equipment and the general public.

Other health and safety risks associated with the Project during the operational phase include the following:

- Leaching of materials from broken or fire damaged PV modules;
- Injuries to workers from operation and maintenance activities (vehicle accidents, replacement of components/parts, etc.);
- Emergency fire hazards; and
- Electrocution of workers.

13.26.2 Impact Assessment

Environmental Feature	Health and Safety
Relevant Alternatives & Activities	Construction activities
Project life-cycle	Construction phase

Potential Aspects & Impacts	Proposed Management Objectives / Mitigation Measures
• Health and safety risks during construction.	• Dedicated Occupational Health and Safety system to be implemented by the Contractor. • Undertake a hazard identification and risk assessment and identify preventive and protective measures. • Conduct basic safety awareness training with construction workers. • Provide all workers with the necessary Personal Protective Equipment (PPE). • Prevent environmental contamination. • Provide potable water and sanitation services to workers. • All workers shall be clearly identifiable and shall remain within the construction domain during working hours. • Prepare an Emergency Response Plan. • Ensure adequate control of communicable diseases. • Maintain access control to construction domain.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	short-term	likely	3
After Mitigation	-	local	low	short-term	unlikely	1

Relevant Alternatives & Activities	Operation and maintenance activities
Project life-cycle	**Operational phase**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Health and safety risks posed by operation and maintenance activities.	• Dedicated Occupational Health and Safety system to be implemented by the Operator of the PV Plant. • Conduct basic safety awareness training with all operational staff. • Temporary Contractors to adhere to Occupational Health and Safety requirements. • Provide potable water and sanitation services to operational staff. • Prepare an Emergency Response Plan. • Measures at the battery storage area to manage fire risks will include a non-flammable buffer area to prevent the spread of fire, battery temperature monitoring, circuit breakers, fire detection and fire suppression as per fire and electrical regulatory requirements. • Provide adequate access/egress for installation and maintenance at the BESS. • Maintain servitude. • Ensure EMF remain less that occupational limits within substation. • Control access to the substation.

	+/- Impacts	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	-	local	high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.27 Social Environment

The findings from the Social Impact Assessment (Tanhuke & Chidley, 2023) follow. The specialist report is contained in **Appendix E7**.

13.27.1 Impact Description

The activities, aspects and impacts associated with the social environment are captured in **Table 44** below.

Table 44: Activities, aspects and impacts related to the social environment (Tanhuke & Chidley, 2023)

Activity	Aspect	Potential Impact – Positive	Potential Impact – Negative
Land and Servitude Rights Acquisition	Land Acquisition	-	▪ Loss of agricultural production ▪ Loss of land (including, structures and cultivated areas) through project infrastructure ▪ Community dissatisfaction
	Servitude Rights	-	▪ Some restrictions on use of productive land
Scheme Operations	Electricity generation	▪ Economic growth and induced impacts.	-
	Supply of goods and services to the project	▪ Opportunity for local business	-
	-	▪ Opportunity for local labour force	-
	Administration and Technical Input	▪ Employment of staff locally ▪ Skills development	-
Construction Phase	Access into properties	-	▪ Security concern ▪ Risk of intrusion
	Solar Park Construction – piling, frame erection and solar panel mounting, electrical installation and rehabilitation	▪ Employment of people locally ▪ Sourcing of equipment, machinery, and services locally	-
			▪ Noise ▪ Dust ▪ Injuries on site ▪ Increased community conflicts due to employment of outsiders ▪ Influx of people seeking employment and associated impacts ▪ (e.g., cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS)
		▪ Sourcing of equipment, machinery, and services locally	

Activity	Aspect	Potential Impact – Positive	Potential Impact – Negative
			▪ Livestock and game animal safety
	Transport of goods to site and employment of staff		▪ Increased traffic
	Transmission Line	▪ Employment of people locally	
			▪ Security concerns when contractor's access private property
		▪ Sourcing of equipment, machinery, and services locally	
	Rehabilitation	-	▪ Damage or wear to access roads
			▪ Security Concerns
			▪ Damage to property or equipment

Taking the above impacts into account and based on the project description as well as the applicable legislation and policy and planning issues, the following socio-economic impact variables have been identified as being associated with the project:

- ❑ Health and Well-Being Impacts
  - Risk of intrusion
  - Injuries
  - Health risks
  - Social pathologies
- ❑ Quality and the Living Environment Impacts
  - Risk of intrusion
  - Dust
  - Noise
- ❑ Economic and Material Well-Being Impacts
  - Loss of land
  - Restrictions on land
  - Economic and social stimuli
  - Informal settlements
  - Damage to property
- ❑ Cultural Impacts
  - Cultural resistance
  - Influx of job seekers
  - Community conflict over non-local employment
- ❑ Gender Relations Impacts
  - Cultural resistance

- Risk to the vulnerable

These categories are not exclusive, nor fully inclusive of the project specific impacts, and at times tend to overlap as certain processes may have an impact within more than one category.

13.27.2 Impact Assessment

The tables to follow were obtained from the Social Impact Assessment (Tanhuke & Chidley, 2023).

Construction Phase

Table 45: Institutional, Legal, Political and Equity (Tanhuke & Chidley, 2023)

Environmental Feature	Institutional, Legal, Political and Equity					
Project life cycle	All Phases					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Loss of land through project infrastructure	• Where the construction takes place will result in the land being acquisitioned and so adequate steps must be taken to ensure that the owner is not treated unfairly in the process.					
	• Promptly address any concerns raised by the public in a transparent manner.					
	• Include all relevant community members in decisions affecting them.					
Some restrictions on use of productive land	• Once the project is operational, the land will be dedicated exclusively to the project and so its prior productivity will no longer apply. This must be clearly communicated and the owner should be adequately compensated.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Long Term	High	2
After Mitigation	Negative	Site	Low	Long Term	High	1
Significance of Impact and Preferred Alternatives	The impact on project progress could be significant if grievances are not addressed. This can be effectively mitigated through the establishment of a grievance procedure and adherence to local by-laws. The impact has no consequence for project alternatives.					

Table 46: Construction Phase Impacts - Economic Opportunities (Tanhuke & Chidley, 2023)

Environmental Feature	Economic Opportunities
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Economic and social stimuli arising from the developmental initiative of the project.	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.
	• Youth development should be considered as an initiative so that there is a benefit of transferring skills to the community. This can be achieved through the assistance of the local municipality.

	• The main contractor should employ non-core labour from the regional study area as far as possible during the construction phase.
Informal trading being established at the site boundaries	• Spaza/informal trader shops may open next to the site to cater for construction workers. These should be controlled by the contractor to limit their footprint and to ensure that the MLM By-laws are complied with.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	Medium	Short Term	Likely	1
After Mitigation	Positive	Regional	Large	Short Term	Likely	3
Significance of Impact and Preferred Alternatives	Individuals who will benefit during the construction are limited to those who actively participate in the construction activity through employment, sub-contracting or other economic opportunities. Active participation should be encouraged. The benefits on such a construction will take place irrespective of which site alternative is preferred.					

Table 47: Construction Phase Impacts - Gender Relations (Tanhuke & Chidley, 2023)

Environmental Feature	Gender Relations
Project life-cycle	All phases
Potential Impact	Proposed Management Objectives / Mitigation Measures
Cultural resistance towards women because of increased gender representation in the workforce	• Sensitise staff in respect of gender sensitive issues that are pertinent to the workplace.
	• Ensure gender inclusivity and equity with respect to all compensation.
	• Prioritise gender inclusivity and equity in access to resources, goods, services and decision making with the aim of empowering women.
	• Promote equal job opportunities for women and men during the construction and operational processes.
	• Prioritise and articulate gender inclusivity and equity in the project documents by including specific strategies and guidelines for implementation.
	• The project documents should also include clear mechanisms through which the actual implementation of the activities and the impact on the ground can be monitored and evaluated.
	• Develop a grievance procedure to specifically address gender matters.
	• Factors such as culture should be considered when planning for gender activities since they play a great role in influencing gender relations.

	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	High	1

Significance of Impact and Preferred Alternatives	The impact on project equity promotion would be moderate if this impact were not addressed. This can be effectively mitigated through the design of a specific gender-focused. The impact has no impact on alternative project layouts.

Table 48: Construction Phase Impacts - Property and Production (Tanhuke & Chidley, 2023)

Environmental Feature	Property and Production					
Project life-cycle	Construction phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Risk of intrusion	• The project proponent should ensure entrance management and control.					
Livestock & game animals Safety	• There should be clear demarcation of the area in development so that livestock and game animals are prevented from wandering nearby.					
Loss of agricultural production	• The project proponent should ensure that the schedule for construction is made available to the local community so that they can suitably prepare.					
Damage to property	• If a risk exists of damage taking place on a property as a result of construction, a condition survey should be undertaken prior to construction; • The contractor is to make good and acknowledge any damage that occurs on any property as a result of construction work; • Where crops and agricultural machinery are damaged, compensation is to be paid to the farmer for the proven loss of these crops; • The farmer should be compensated for any loss of income experienced at the account of the contractor.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	1
After Mitigation	Positive	Local	Minor	Short Term	Likely	3
Significance of Impact and Preferred Alternatives	Costs related to damage and theft should be borne by the developer. There are no alternatives suggested.					

Table 49: Construction Phase Impacts - Disturbances Arising from Construction (Tanhuke & Chidley, 2023)

Environmental Feature	Disturbances Arising from Construction
Project life-cycle	Construction phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Increase in Dust	• Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms.

	• Adherence to road signage can be added as an advantage and a measure to manage the increase in dust levels; • Mitigation measures management should be adhered to according to the relevant specialist studies.					
Noise impacts	• Prior notice should be given to surrounding communities of noisy event such as blasting. • Construction work should take place during working hours – defined as 07h00 to 17h00 on weekdays and 07h00 to 14h00 on Saturdays. Should overtime work be required, that will generate noise, consultation with the affected community or landowner should take place.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction is to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase. Negative impacts owing to the construction will unfortunately be experienced irrespective of the site and routing alternative that is most preferred and chosen.					

Table 50: Construction Phase Impacts – Worker Health and Safety (Tanhuke & Chidley, 2023)

Environmental Feature	Worker Health and Safety					
Project life cycle	Construction Phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Injuries on Site	• The provisions of the OHS Act 85 of 1993 and the Construction Regulations of 2014 should be implemented on all sites; • Account should be taken of the safety impacts on the local community when carrying out the longitudinal aspects of the project, such as the powerline; • Contractors should establish HIV/AIDS awareness programmes at their site camps. • Gender sensitive work place practises should be planned for and adopted on site. Employment practises should be demonstrated free of coercion or harassment.					
Protecting the Vulnerable	• There should be a policy on harassment that is well understood by all. • There should be separate changing facilities for men and women, and they should be clearly marked as such. • There should separate toilet facilities for men and women, and they should be clearly marked as such.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	The significance of the impact is high as community attitudes can be altered. The implementation of the overall mitigation measures is essential and necessary to minimise the impact from workers' health and safety and community impacts.					

Table 51: Construction Phase Impacts – Influx of Job Seekers (Tanhuke & Chidley, 2023)

Environmental Feature	Influx of Job Seekers					
Project life cycle	Construction Phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Job seekers influx into the community.	• All employment of locally sourced labour should be controlled and formalised. No employment should take place from the project gate and contracts of employment should be entered into taking into account the Labour Relations Act; • If possible, and if the relevant Ward Councillors deems it necessary, the employment process should include the affected Ward Councillors and their ward committee. • To limit the growth of informal settlements in the project area, labour should be sourced from existing labour sending areas, from people who resided in the area prior to appointment. This process should include the Ward Councillor to ensure that only local residents are employed, rather than labour migrants. • No staff accommodation should be allowed on site; • To limit the growth of settlements near the project site the project proponent should provide worker transport to and from the work site for the duration of construction.					
Increased community conflicts due to employment of local and non-local labourers	• Programmes should be developed to boost the local economy. These can be in the form of Corporate Social Responsibility (CSR) that will favour local empowerment.					
Increase health risk	• Measures should be taken to provide condoms and, where necessary, access to counselling to address any risks to health.					
Increased social pathologies such as crime, drug abuse and sexual behaviours.	• The mitigation method will require a change in community values and attitudes; This can be done through creating social awareness, and educating the workforce with regards crime awareness and social pathology prevention					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Site	Moderate	Short term	High	2
After Mitigation	Negative	Site	Low	Short term	High	1
Significance of Impact and Preferred Alternatives	The significance of the impact is high as community attitudes can be altered. The implementation of the overall mitigation measures is essential and necessary to minimise the impact from job-seekers influx and community impacts.					

Table 52: Construction Phase Impacts – Security (Tanhuke & Chidley, 2023)

Environmental Feature	Security
Project life cycle	Construction Phase
Potential Impact	Proposed Management Objectives / Mitigation Measures
Ensuring the security of the project site	• The camp site for the project and the longitudinal construction sub-site laid down areas should be fenced for the duration of construction; • All contractors' staff should be easily identifiable through their respective uniforms;

	• A project policy on management of workers should be developed. This would include education and awareness to be conducted with regards crime, trespassing and not gathering outside the site could be conducted. • Security staff should only be allowed to reside at contractor camps and no other employees.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Medium	Short Term	Likely	2
After Mitigation	Negative	Local	Low	Short Term	Moderate	1
Significance of Impact and Preferred Alternatives	Disturbances and irritation during construction are to be expected. These can then be successfully mitigated through contractor specifications that are issued at a tender stage and through the continuous monitoring of contractor proceedings and performance during construction phase.					

Operational Phase

Table 53: Operational Phase Impacts – Economic Impacts (Tanhuke & Chidley, 2023)

Environmental Feature	Economic Impacts (positive)					
Project life-cycle	Operational Phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Economic	• The solar park will stimulate the local economy through the provision of jobs and through local procurement. • It will contribute to the improvement of the national electricity supply at a price that has been set by a competitive bidding process					
Local Procurement	• Local SMMEs should be given an opportunity to participate in the operation of the project through the supply of services, material or equipment.					
	• A procurement policy promoting the use of local business where possible, should be put in place and applied throughout the operational phases of the project.					
Job Creation and Skills Development	• Women should be given equal employment opportunities and encouraged to apply for positions.					
	• A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills whilst in employment.					
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Positive	Regional	High	Long Term	Likely	3
After Mitigation	Positive	Regional	High	Long Term	Likely	3
Significance of Impact and Preferred Alternatives	The solar park in the regional study area will provide economic stimulus to the regional study area for the long-term. The solar park should adopt policies that are supportive of local procurement and support for local enterprises. Economic impact considerations require that the most cost-effective transmission power line route be adopted to service the project.					

Table 54: Operational Phase Impacts – Economic and material well-being (Tanhuke & Chidley, 2023)

Environmental Feature		Economic and material well-being (negative)				
Project life-cycle		Operational Phase				
Potential Impact		Proposed Management Objectives / Mitigation Measures				
Loss of productive land		• A very low impact that does not require mitigation.				
Loss of grazing land		• A very low impact that does not require mitigation.				
	Nature	Extent	Magnitude	Duration	Probability	Significance
Before Mitigation	Negative	Local	Low	Short Term	Low	1
After Mitigation	Negative	Local	Low	Short Term	Low	1
Significance of Impact and Preferred Alternatives	This impact is not considered significant. It should be noted that this study defers to the agricultural specialists with regards the impact of the project on regional production.					

13.28 "No-Go" Impacts

The "no-go option" is the alternative of not implementing the activity / development. The "no-go option" also provides the baseline against which the impacts of other alternatives are compared.

The "no go option" needs to be considered in light of the motivation (see **Section 3** above) as well as the need and desirability of the Project (see **Section 8** above).

SA has identified the need to supply diversified power generation that includes renewable energy technologies, such as proposed by the Project. This is in light of the country's endeavour and commitment to reduce the carbon footprint created by the current heavy reliance on coal to produce electricity. In this regard, the Applicant intends to bid for the current and future REIPPPP bid windows and/or other renewable energy markets within SA.

In contrast, should the proposed Project not go ahead, any potentially significant environmental issues associated with the Project (refer to **Section 13.9** to **Section 13.27** above) would be irrelevant and the status quo of the local receiving environment would not be affected by the Project-related activities. The prerogative will lie with the landowner to determine whether to proceed with the current land use or an alternative future desired use where the Solar PV Plant is proposed. It is noted that the site is currently used for grazing.

With the "no-go option" the objectives of the Project would not be met. This will *inter alia* mean that the Project's intended benefits will not materialise. From a social perspective, the "no-go option" will present the following implications:

- There will be no contribution to employment and skills development to the local community.

- The local economy will remain unchanged as the area and will not attract new economic investment.
- The opportunity to improve the overall supply of electricity in the regional will be missed; and
- The economic stimulus presented by the Project will be foregone.

Taking the above into consideration, the “no go option” is not preferred.

13.29 Cumulative Impacts

13.29.1 Introduction

A 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.

13.29.2 Other Renewable Energy Projects in Proximity to the Proposed PV Site

13.29.2.1 Introduction

Cumulative impacts can be identified by combining the potential environmental implications of the Project with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the Project Area. It is noted that the accurate characterisation of the future state of the Project area is inherently speculative to an extent, due to the dynamic nature of future decisions related to land use and growth, protection of terrestrial and aquatic biological resources, water use (consumptive, waste-related and encroachments), etc.

13.29.2.2 REEA Database

According to the REEA Database (quarter 1, 2023), the following renewable energy applications have been made for properties that are located within a 30km radius of the PV Site (refer to **Figure 74** below):

- Status: **approved** –
  - The construction and operation of the EGI to the proposed 100Mac Vrede Solar Energy facility, BESS and associated infrastructure near Kroonstad (14/12/16/3/3/1/2406), which is located approximately 11.5km to the north-west of the Project; and
  - The construction and operation of the grid connection infrastructure for 100Mac Rondavel solar energy facility near Kroonstad (14/12/16/3/3/1/2405), which is located approximately 12.5km to the north-west of the Project.
  - The proposed construction and operation of Teshe 100MW Rondavel photovoltaic solar energy facility, BESS and associated infrastructure located near Kroonstad, Free State Province (14/12/16/3/3/2/2039), which is located approximately 14 km to the north-west of the Project.

- Proposed construction of Hennenman 5 mw Solar Energy Facility, near Hennenman, Free State Province (14/12/16/3/3/1/1322), which is located approximately 26.5km to the south-west of the Project.
- Proposed Everest solar energy facility near Hennenman, Free State Province (14/12/16/3/3/2/512), which is located approximately 30km to the south-west of the Project.

❑ Status: **in process** –

- Proposed Steynrus solar facility PV1 near Kroonstad (14/12/16/3/3/1/798/1), which is located approximately 25km to the south-east of the Project.

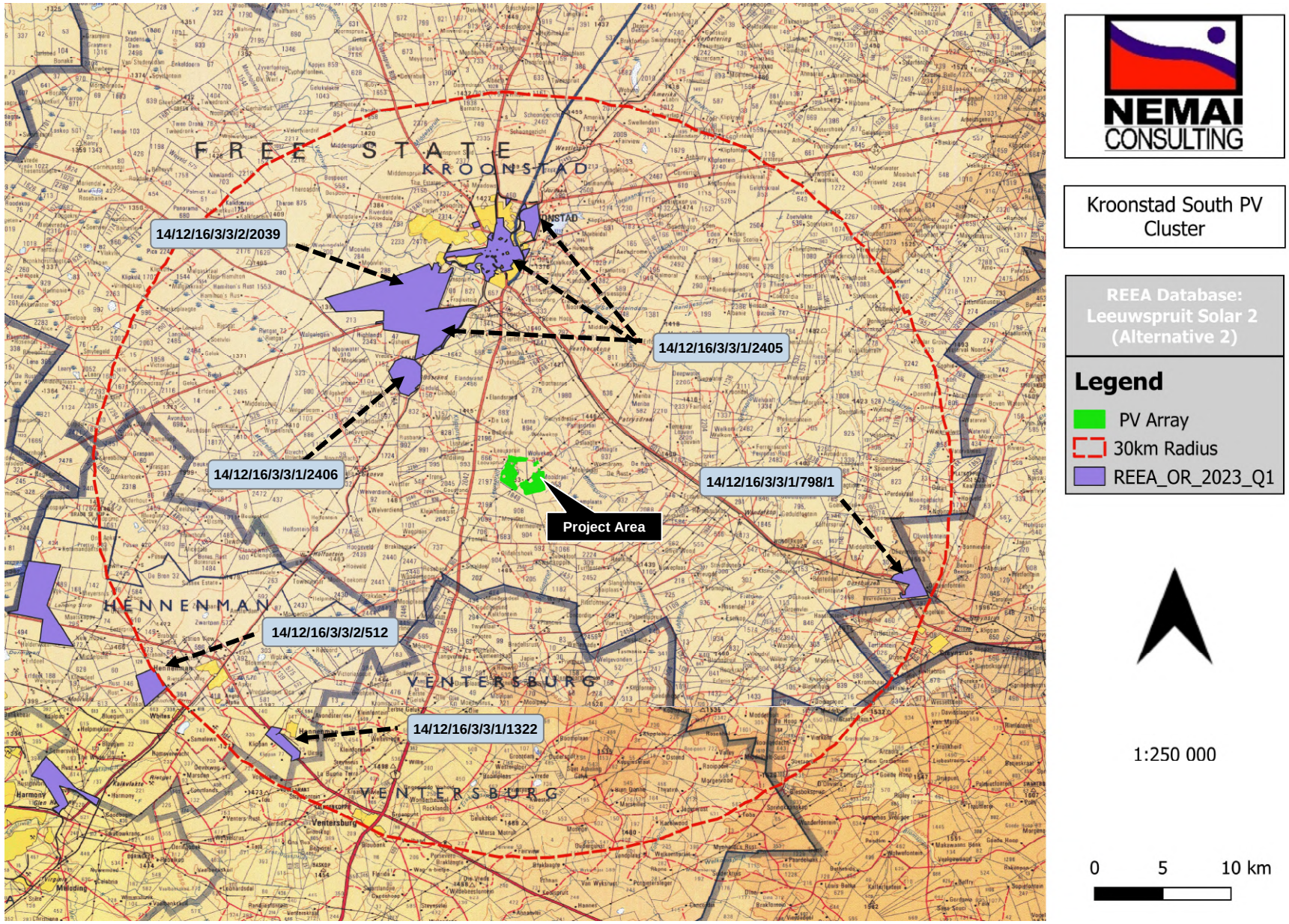


Figure 74: Renewable energy applications in relation to the Project (within a 30km radius) (Layout Alternative 2)

13.29.2.3 Kroonstad Cluster

In addition, there is a cluster of renewable energy developments in the area south of Kroonstad that consist of the following projects (shown in **Figure 75** below):

- Leeuwspruit Solar 1 (located less than 400m to the east of the Project);
- Leeuwspruit Solar 2 (this Project);
- Oslaagte Solar 1 (located approximately 2.9km to the north-east of the Project);
- Oslaagte Solar 2 (located approximately 1.6km to the north-east of the Project); and
- Oslaagte Solar 3 (located approximately 2km to the east of the Project).

The EIA processes for the above projects are running concurrently.

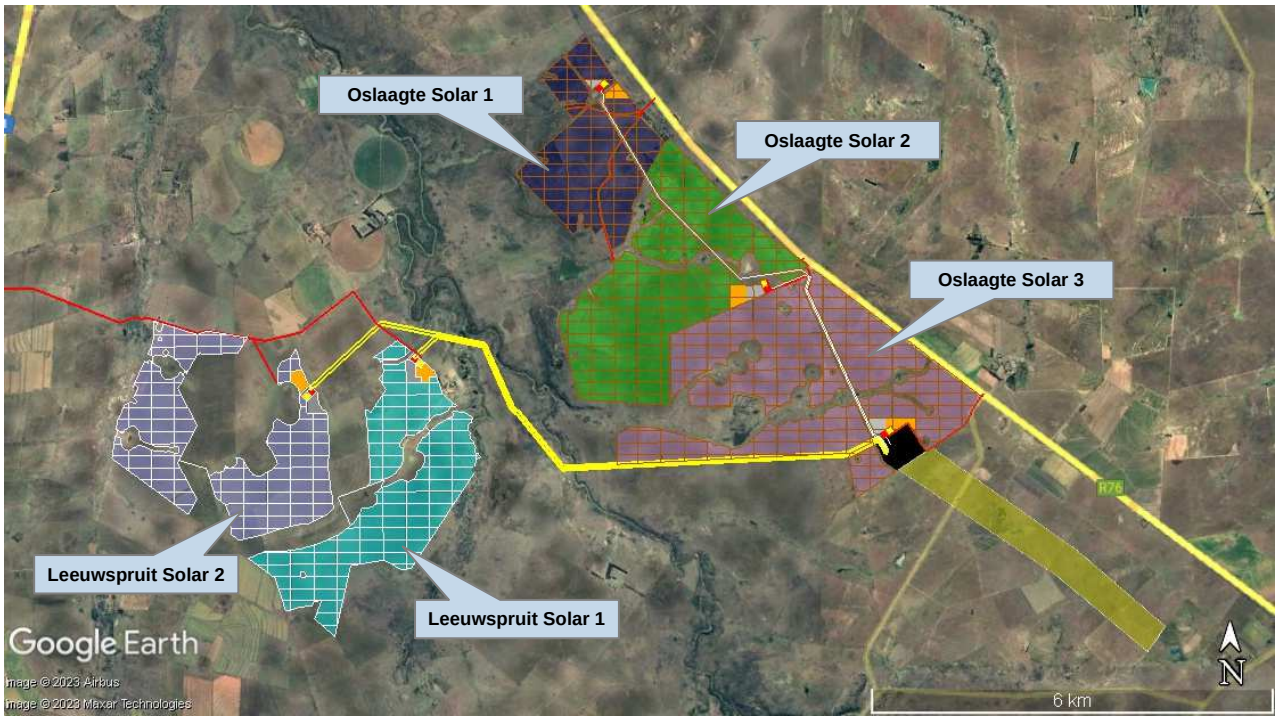


Figure 75: Proximity of the Project Area to other proposed renewable energy developments south of Kroonstad (Layout Alternative 2 shown)

13.29.3 The Proposed Project's contribution towards Cumulative Impacts

The following is noted in terms of the Project's contribution towards cumulative impacts:

- The construction period may cause traffic-related impacts in terms of the local road network, which will be associated with heavy vehicle construction traffic for the delivery of material, transportation of construction workers and general construction-related traffic. This may compound traffic impacts if other large-scale projects are planned during the same period, such as the other solar PV projects in the Kroonstad cluster. The EMPr includes mitigation measures to manage traffic-related impacts.
- The clearance of the vegetative cover over large areas associated with the Project's development footprint may cause erosion. According to Gouws (2023), the soil in the Project

Area is very erodible because of the strongly developed structure in the subsoil.. Mitigation measures to control erosion are included in the EMPr.

- There will be an increase in the dust levels during the construction phase, as a result of earthworks, use of haul roads and other gravel roads, stockpiles, material crushing, etc. Sensitive receptors to dust and other air quality impacts in the study area are discussed in **Section 13.20.1** above. Measures to manage dust are included in the EMPr.
- Construction of the proposed facilities along with construction activities of other developments in the Project Area could potentially increase noise impacts on surrounding land uses. This impact will be temporary in nature. It is further noted that noise is a localised issue that diminishes in intensity with distance from the source. Sensitive receptors to noise in the study area are discussed in **Section 13.21.1** above. The Project's contribution to cumulative noise impacts is thus not anticipated to be significant. Measures are included in the EMPr to manage noise impacts that may be caused by the Project.
- Changes in demographics in the region due to the influx of employment seekers may cause problems such as crime, STDs, conflicts with local communities, etc. This was assessed as part of the Social Impact Assessment and mitigation measures are included in the EMPr.
- There is a potential for positive cumulative economic effects from the construction of multiple developments in the area. The increased creation of jobs and economic input into local businesses would provide a benefit to local communities.
- Specialists' assessment of cumulative impacts –
  - Freshwater Assessment (van Rooyen, 2023) –
    - Hydrological function – cumulative impacts are rated as low to moderate and could possibly include edge effects to remaining natural vegetation as the footprint activities may result in vegetation clearing. This could lead to increase in sedimentation as well as introduction of alien and invasive species.
    - Introduction and spread of alien and invasive species – limited alien and invasive plant species were observed on site. Related cumulative impacts are regarded as low to moderate.
    - Activities causing pollution – cumulative impacts to water quality will not only affect local water quality but regional water quality as well. This is considered as a significant cumulative impact.
  - Terrestrial Biodiversity Assessment (Human, 2023) –
    - The cumulative impacts associated with the proposed Project as well as other project in the area are moderately high. Cumulatively these developments will be responsible for the destruction of a low portion of Grassland in the area. In isolation this project will only affect 0.03% of the total area for the remaining extant of Central Free State Grassland and 0.07% for the Central free State Grassland vegetation bioregions; but cumulatively it will affect 0.33% of the total reaming area for the Central Free State Grassland.
  - Avifauna Impact Assessment (Steyn, 2023) –
    - 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.

- A total area of 30 km surrounding the PAOI was used to assess the total habitat loss in the area and subsequently the cumulative impact. To determine the intact remnant habitat the NBA (2018) remnant spatial data was utilised. The future renewable energy projects were also considered by utilising the REEA Q4 (2022) spatial dataset. In order to remove any duplication, only the areas that overlap with the remanence areas were considered. The total cumulative loss was found to be 41.97%, a visual representation of this is shown in **Figure 77**.
- The proposed Solar PV facility in isolation has a Negative Low impact significance. In consideration of the aforementioned information, the cumulative impact was determined to be of a Negative Medium significance.

- Heritage Impact Assessment (Kitto, 2023) –
  - The baseline impacts are considered to be moderate for Heritage resources, and additional project impacts (if no mitigation measures are implemented) will increase the significance of the existing baseline impacts, where the cumulative unmitigated impact will probably be of a moderate to high significance. The impact is going to happen and will be long-term in nature, therefore the impact risk class will be Moderate to High. However, with the implementation of the recommended management and mitigation measures this risk class can be minimized to a Low rating.
- Palaeontological Desktop Assessment (Butler, 2023) –
  - Solar facilities have been identified in a 30 km radius of the proposed development. However, it is important to note that the quality of preservation of different sites will most probably vary and it is thus difficult to allocate a Cumulative Sensitivity to projects. If all the mitigation measures are carried out, a conservative estimate of the Cumulative impacts on fossil Heritage will vary between Low and Medium.
- Visual Impact Assessment (Viljoen, 2023) –
  - In terms of the potential cumulative impacts, the proposed site is surrounded by various commercial and agricultural activities. In addition, according to the REEA Database, three renewable energy applications have been made for properties located within a 30km radius of the site. The majority of the proposed site currently consists of grassland vegetation and land previously used for agricultural purposes. The clearance and subsequent development of the site will result in the alteration of this space. Consequently, the development of this site will add cumulatively to the loss of sense of place. While the result in a change in the sense of place for those areas that look onto the project site, the magnitude of the impact is likely to be low as the majority of the sensitive receptors are located more than 5km from the Project site.

- Agricultural Compliance Statement (Gouws, 2023) –
  - Because of land ownership and individual land use or farming enterprise preference, the impact of any development rarely transcend farm boundaries. The Project site forms part of a cluster of renewable energy development which can introduce increased runoff and erosion if the stormwater management is not carefully designed. Rivers and streams may silt up or due to increased runoff speed which may damage wetlands and dam structures, which will affect irrigation water sources.
  - The proposed development will not have impacts on farming land due to fragmentation or subdivisions of land that can lead to unsustainable farming units. There is no subdivision proposed and the land will be returned to farming after the life of the Project.
- Transport Impact Assessment (Patandin, 2023) -
  - Potential cumulative impacts include traffic congestion/delays on the surrounding road network, as well as noise and dust pollution.
  - The cumulative impact assumes that all proposed and authorized renewable energy projects within 50 km be constructed at the same time. This is a precautionary approach, as in reality these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom, and construction is likely to be staggered depending on project-specific issues.
  - The construction and decommissioning phases are the only significant traffic generators for renewable energy projects. The duration of these phases is short term (i.e., the impact of the generated traffic on the surrounding road network is temporary and renewable energy facilities, when operational, do not add any significant traffic to the road network). Even if all renewable energy projects within the area are constructed at the same time, the roads authority will consider all applications for abnormal loads and work with all project companies to ensure that loads on the public roads are staggered and staged to ensure that the impact will be acceptable.
- Visual Impact Assessment (Buys, 2023):
  - In terms of the potential cumulative impacts, the proposed site is surrounded by various commercial and agricultural activities. Most of the proposed site is currently grassland vegetation and the clearance and subsequent development of the site will result in the alteration of this space. Consequently, the development of this site will add cumulatively to the loss of sense of place. While the result in a change in the sense of place for those areas that look onto the project site, the magnitude of the impact is likely to be low as most of the sensitive receptors are located more than 5km from the project site.

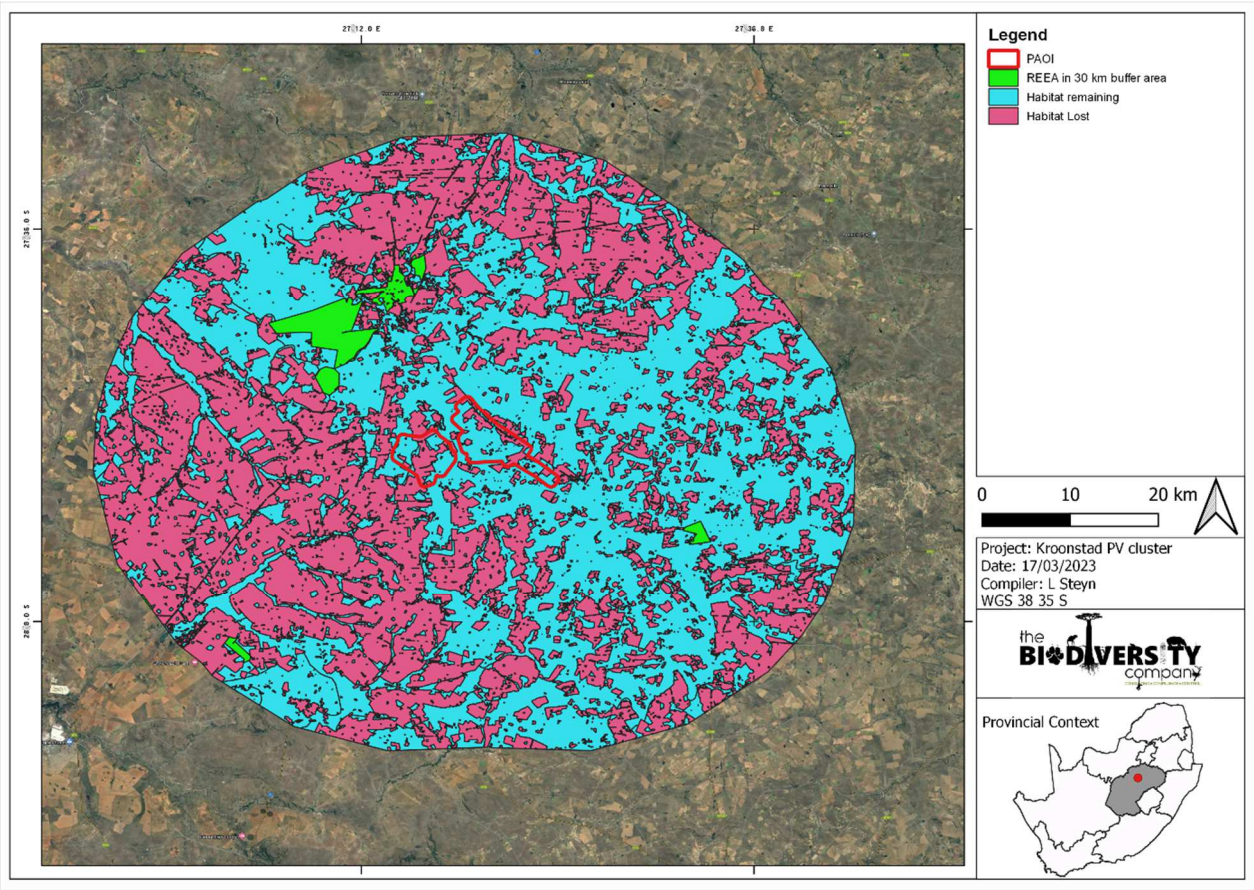


Figure 76: **Map illustrating the additional renewable energy developments within the landscape overlaid onto the remnant vegetation types (Steyn, 2023)**

13.29.4 Cumulative Environmental Impact Statement

From a cumulative impact perspective, there are five known renewable energy applications within a 30km radius of the Project's PV Site (refer to **Section 13.29.2.2** above) according to the REEA Database (quarter 1, 2023) which have been approved. The Project is also located within a cluster of proposed renewable energy developments to the south of Kroonstad.

Cumulative impacts in relation to the Project were assessed individually in **Section 13.9** to **Section 13.27** above, as well as through the specialist studies (see **Section 13.29.3** above for key findings), and mitigation measures were developed for each of the impact categories.

14 ANALYSIS OF ALTERNATIVES

14.1 General

Alternatives are the different ways in which a project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project.

By conducting the comparative analysis, the Best Practicable Environmental Option (BPEO) can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "*provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*".

14.2 "No-Go" Option

The implications of the "no-go" option are discussed in **Section 13.28** above. The "no go option" is not preferred, as the objectives of the Project will not be met, and the associated benefits will not materialise. Although not proceeding with the Project would avoid the adverse environmental impacts, these impacts are considered to be manageable through the provisions contained in the EIA Report and EMPr.

14.3 Layout Alternatives

The extent of the site allows for the identification of layout/design alternatives to manage impacts to environmental sensitivity. Layout Alternative 1 (shown in **Figure 3**) constitutes the initial layout contemplated during the Scoping Phase. During the course of the EIA process, the layout was revised to avoid sensitive terrestrial (including CBA1, healthy remnants of an endangered ecosystem, and habitat for girdled lizards) and aquatic (wetlands and non-perennial rivers) ecological features. The resultant Layout Alternative 2 is shown in **Figure 4** above.

Table 55 below indicates the preference expressed by the Specialists between Layout Alternative 1 and 2.

Table 55: Preference expressed by the Specialists between Layout Alternative 1 and 2

Specialist Studies	Layout Alternative 1	Layout Alternative 2	No Preference
Freshwater Assessment		✕	
Terrestrial Biodiversity Assessment		✕	
Avifauna Impact Assessment		✕	
Giant Girdled Lizard Study		✕	
Agricultural Compliance Statement		✕	

Specialist Studies	Layout Alternative 1	Layout Alternative 2	No Preference
Heritage Impact Assessment		✕	
Paleontological Impact Assessment			✕
Visual Impact Assessment		✕	
Social Impact Assessment			✕
Transport Impact Assessment			✕

Based on the environmental considerations, Layout Alternative 2 was identified as the BPEO (shown in **Figure 77** below).

14.4 Technology Alternatives

14.4.1 PV Technology

The different solar PV technologies, as explained in **Section 10.4.1** above, include a single axis tracker system and bifacial solar panels. These technology options do not constitute alternatives as the choice of technology will be determined during detailed design.

14.4.2 BESS Technology

The BESS can be broken into solid state and flow battery systems. A single battery technology, namely solid state, will be implemented for the Project.

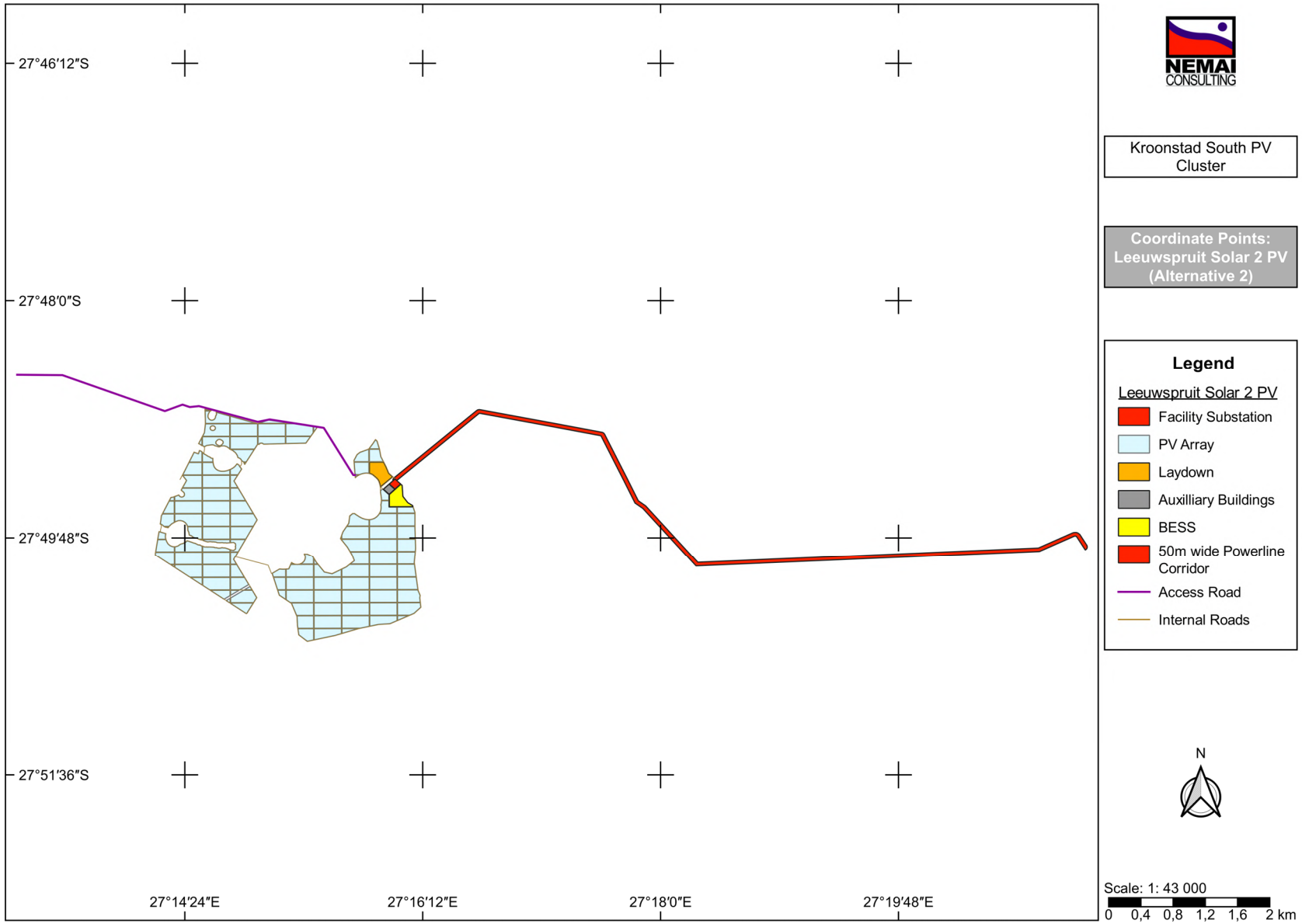


Figure 77: BPEO - Layout Alternative 2

15 PUBLIC PARTICIPATION

15.1 Introduction

The purpose of public participation includes the following:

- To provide I&APs with an opportunity to obtain information about the Project;
- To allow I&APs to express their views, issues, and concerns with regard to the Project;
- To grant I&APs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the Project; and
- To enable the Applicant to incorporate the needs, concerns, and recommendations of I&APs into the Project, where feasible.

The public participation process that is being undertaken is governed by NEMA and the EIA Regulations. **Figure 78** below outlines the public participation process for the upfront Announcement Phase (completed), Scoping Phase (completed) and EIA Phase (current).

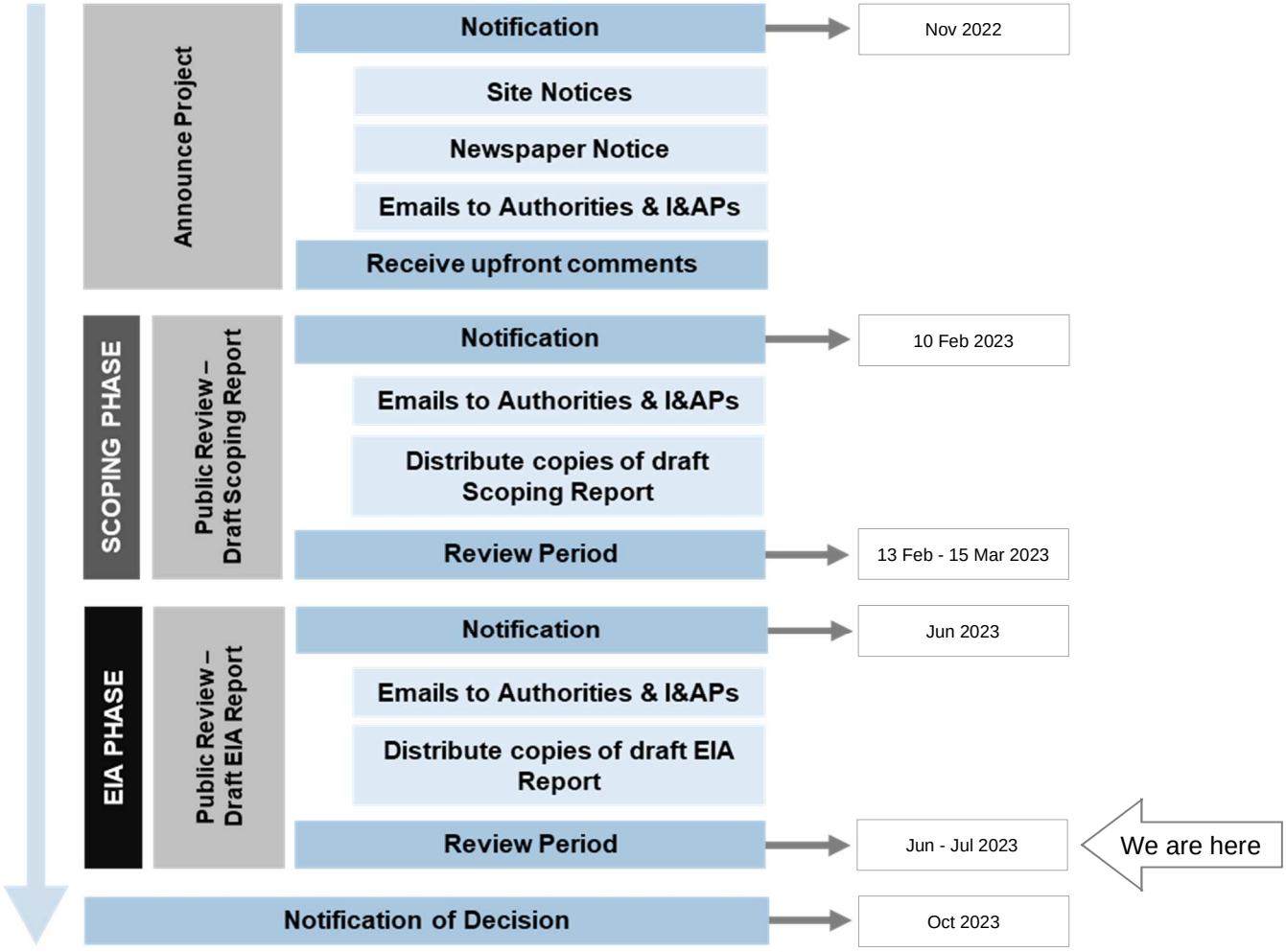


Figure 78: **Outline of Public Participation Process (*note: dates are subject to change*)**

15.2 Public Participation during the Announcement & Scoping Phases

The primary tasks undertaken as part of public participation during the Announcement and Scoping Phases included the following (details provided in the Scoping Report):

1. Compiling a database of organs of state and I&APs;
2. Announcing the Project by placing notices in newspapers, erecting site notices and circulating a Background Information Document and Reply Form to organs of state and I&APs;
3. Lodging the draft Scoping Report for public review and notifying organs of state and I&APs; and
4. Compiling and maintaining a CRR (contained in **Appendix G**).

15.3 Public Participation during the EIA Phase

15.3.1 Maintenance of the Stakeholders' Database

The database of stakeholders (contained in **Appendix F**), which includes authorities, different spheres of government (national, provincial and local), parastatals, stakeholders, landowners, interest groups, members of the general public and I&APs, was maintained during the EIA phase.

15.3.2 Period to Review the Draft EIA Report

In accordance with Regulation 43(1) of the EIA Regulations, organs of state and I&APs are granted an opportunity to review and comment on the draft EIA Report from **03 July until 1 August 2023**.

15.3.3 Notification of Review of Draft EIA Report

Organs of state and I&APs contained in the database (refer to **Appendix F**) were notified of the review of the draft EIA Report. Proof of notification will be included in the final EIA Report.

15.3.4 I&APs' Access to the Draft EIA Report

The draft EIA Report can be accessed as follows:

- A hardcopy of the draft EIA Report was placed at the Kroonstad Public Library; and
- An electronic copy was uploaded to the following website, for downloading purposes: https://nemai.co.za/downloads/.

The draft EIA Report was provided to the following parties, which include key regulatory and commenting authorities with jurisdiction over the receiving environment:

- DFFE (including Biodiversity Conservation Unit);
- DESTEA;
- DWS;
- DMRE;
- FSDPRT;
- FSHRA; and

- MLM and FDDM.

A Comment Sheet is provided in **Appendix J**, which can be used to provide comments on the draft EIA Report.

15.3.5 Public Meeting to Present the Draft EIA Report

Anyone that has an interest in attending a public meeting will need to inform Nemai Consulting in writing by 10 July 2023. Should a public meeting be requested, a suitable date will be confirmed. Only preregistered parties that confirmed interest will receive an invitation to the public meeting.

15.3.6 Comments Received on the Draft EIA Report

The CRR will be updated with all comments received from organs of state and I&APs during the review period of the draft EIA Report. The updated CRR will be appended to the final EIA Report that will be submitted to DFFE.

15.4 Notification of DFFE Decision

Registered I&APs will be notified after having received written notice from DFFE (in terms of NEMA) on the final decision for the Project. The notification will include the appeal procedure to the decision and key reasons for the decision.

16 EIA CONCLUSIONS

16.1 Outcomes of the EIA Phase

The following key tasks were undertaken during the EIA phase for the proposed Project:

- The specialist studies identified in the Plan of Study for the EIA were undertaken and the findings were incorporated into the EIA Report in terms of understanding the environmental status quo and sensitive features, assessing the potential impacts and establishing concomitant mitigation measures, as well as identifying the preferred alternatives;
- Potentially significant impacts pertaining to the pre-construction, construction and operational phases of the Project were identified and assessed, and mitigation measures were provided; and
- Alternatives for achieving the objectives of the proposed activity were considered, and the BPEO was identified. The “no-go” option is not supported when considering the implications of not implementing the Project.

The outcomes of these tasks are captured below.

16.2 Sensitive Environmental Features

The following sensitive environmental features associated with the Project’s receiving environment are highlighted, for which mitigation measures are included in the EIA Report and EMPr:

- The perennial Enslinspruit flows to the immediate east of the site. The confluence of the Enslinspruit with the Blomspruit is to the east of Layout Alternative 2. Non-perennial rivers also flow across the Project Area and drain into the Enslinspruit and Blomspruit. Two HGM units (Dep and CVB) were identified within the Layout Alternative 1. Layout Alternative 2 presents a revised layout that attempts to avoid all direct encroachment into watercourses and their associated buffer zones (apart from the roads and power line crossings). The access road (existing gravel road) and power line route traverse watercourses.
- The Project Area encroaches into CBA1, CBA 2, ESA1, ESA2, NPAES and an Endangered Ecosystem (i.e., Vaal-Vet Sandy Grassland). The layout was revised to avoid areas of high sensitivity that were delineated as part of the Terrestrial Biodiversity Assessment.
- Habitat for the Giant Girdled Lizard (*Smaug giganteus*), which is categorised as a vulnerable species, is encountered in the Layout Alternative 1 footprint. Layout Alternative 2 avoids this habitat.
- SCC recorded during the avifaunal survey included Black-winged Pratincoles (water resources habitat) as well as Secretarybird and Blue Korhaan (grasslands habitat). Various priority species were also recorded, which are those avifauna that are particularly susceptible to energy developments.

- Three habitats were delineated as part of Avifauna Impact Assessment namely, Grassland, Degraded-transformed grassland and Water Resources. All these habitats support a number of avifauna species with the grasslands being the most species rich. The Water Resources were given a high SEI rating based on the SCC that are dependent on this habitat for both water and habitation.
- Four heritage resource sites were identified in total, three within the general project area and one outside. One is an informal graveyard (Leeuw-04), two contain the remains of demolished structures (Leeuw 05 and Leeuw-03), and the site located just outside the project area comprises an extant historical farmhouse and outbuildings (Leeuw 02). The Alternative 2 layout has been designed to avoid the identified heritage resources.
- Tertiary roads T410, T411, T413 and T416 (statutory road reserve width of 16 meters) will be affected by the proposed Project.

The combined sensitivity maps overlaid with Layout Alternative 1 and Layout Alternative 2 (BPEO) are provided in **Figure 79** and **Figure 80** below, respectively. The combined sensitivity map overlaid with the eastern section of the power line route is provided in **Figure 81** below.

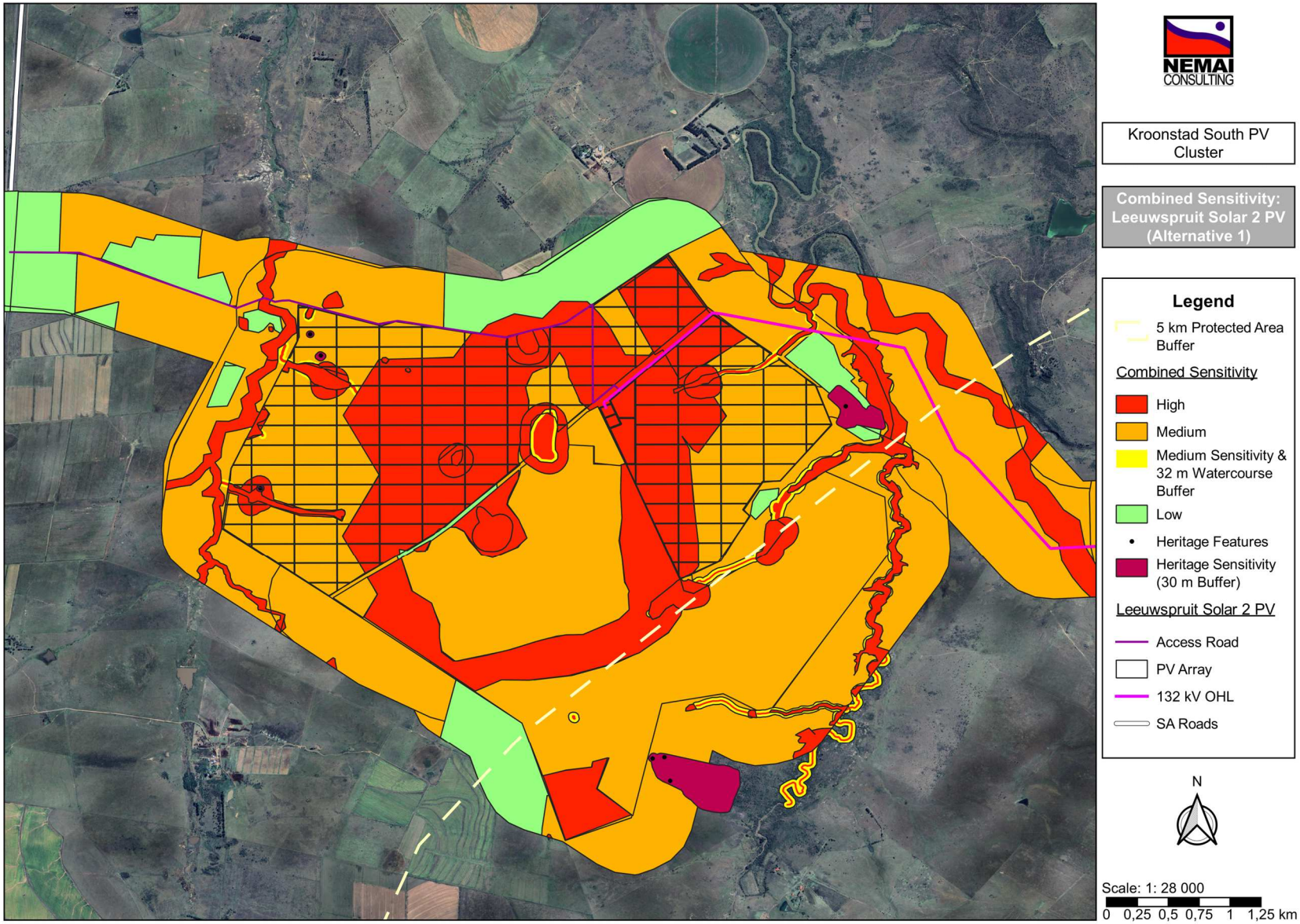


Figure 79: **Combined sensitivity map of Layout Alternative 1**

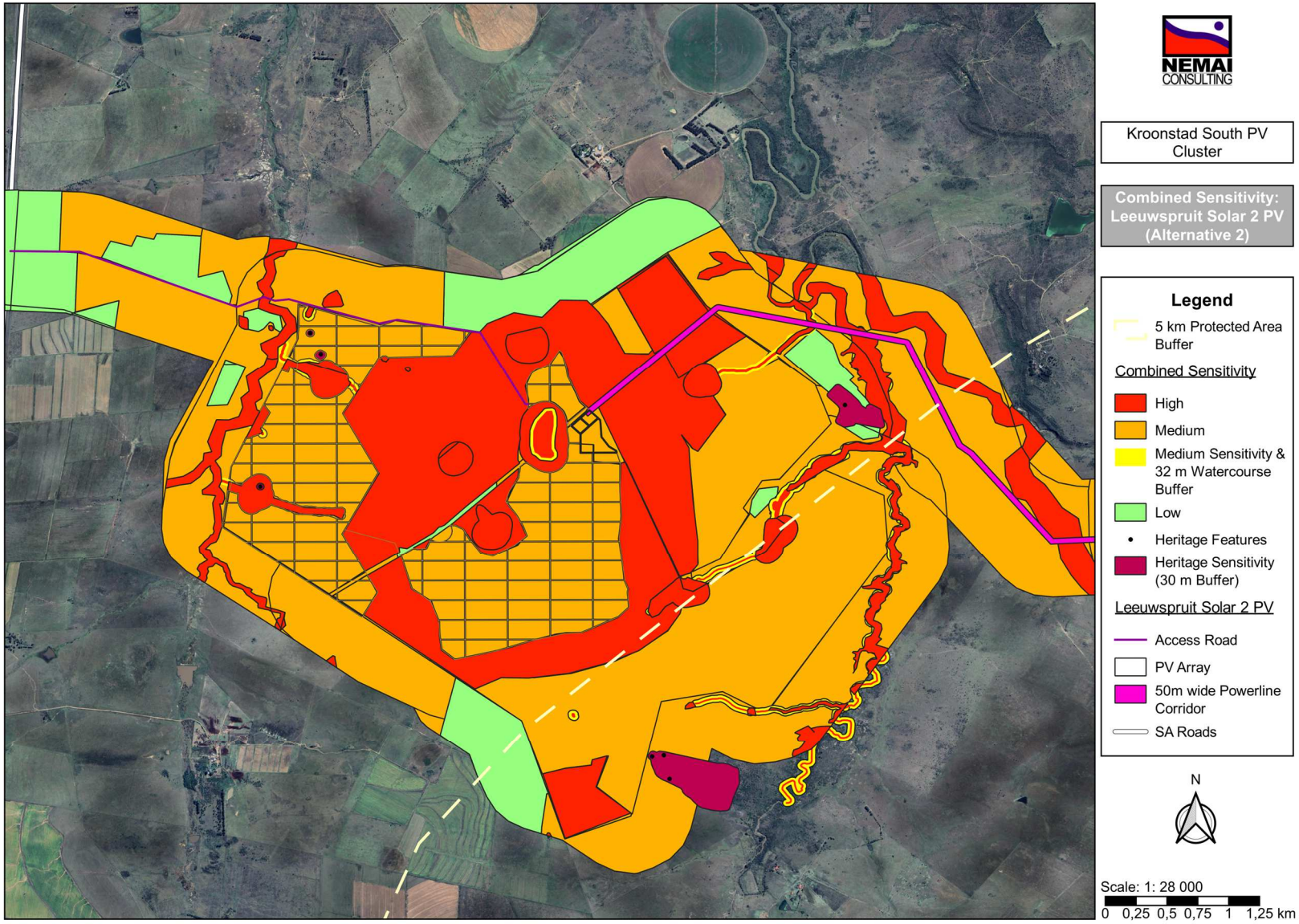


Figure 80: **Combined sensitivity map of Layout Alternative 2 (identified as BPEO)**

Figure 81: **Combined sensitivity map of eastern section of Power Line Route**

16.3 Environmental Impact Statement

The Project's strategic intent is linked to the SA Government's pursuit of promoting the country's renewable energy development imperatives, which encourages the role of Independent Power Producers (IPPs) to feed into the national grid. In this regard, the Applicant intends to bid for the current and future REIPPPP bid windows and/or other renewable energy markets within SA.

The rationale for the siting of the Project is based on its suitable geographic location, including the area's favourable solar irradiation levels, short distance to grid connection point, flat topography, suitable site access and availability of land. During the course of the EIA process, the layout was revised to avoid sensitive terrestrial (including CBA1, healthy remnants of an endangered ecosystem, and habitat for girdled lizards) and aquatic (wetlands and non-perennial rivers) ecological features. The new layout is known as Layout Alternative 2.

Based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts, Layout Alternative 2 was identified as the BPEO.

The potentially significant environmental impacts were investigated through the relevant specialist studies. Key findings from the EIA, apart from the sensitive environmental features and aspects listed in **Section 16.2** above, which may also influence the conditions of the Environmental Authorisation (if granted), include the following:

- The proposed power line traverses watercourses along its route. No towers are to be located within the delineated wetlands and riparian zones, as well as their associated buffers.
- Adhere to the requirements of the FSDPRT for gaining access from the Tertiary Roads leading to the site and for upgrading the access road.
- The proposed access point is located too close to a curve, which would affect the shoulder sight distance requirements. It is recommended to move the proposed access point to approximately 400m to the west from the curve during detailed design.
- The proposed Project could impact on heritage resources identified within and adjacent to the general project footprint. Four heritage resource sites were identified in total, three within the general project area and one outside. One is an informal graveyard (Leeuw-04), two contain the remains of demolished structures (Leeuw 05 and Leeuw-03), and the site located just outside the project area comprises an extant historical farmhouse and outbuildings (Leeuw 02). The Alternative 2 layout has been designed to avoid the identified heritage resources. However, there is still a risk of indirect impact during both construction and operation related activities. The following is recommended to safeguard these heritage resources:
  - All three heritage sites identified within and adjacent to the general project footprint must be demarcated clearly at the at the 30m buffer;
  - The informal graves at site Leeuw 04 are protected by section 36 of the NHRA and must be demarcated clearly as A "no go" area. There is also a possibility that potential infant burials

could be located at site Leeuw 05. The mitigation measures set out in Table 10, above, are required to be implemented;

- The Historical structures at Leeuw 02 (and homestead remains at Leeuw 05) are protected by section 34 of the NHRA and if any impact is anticipated, a permit is required from the FSPHRA before any of the structures or structure remains can be altered or demolished.

- ❑ Indigenous vegetation is to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion.
- ❑ Nests of seven species were observed of which five are priority species. A 100 m buffer were placed around the priority species nests. If the nests are in the development footprint then these nests must be regarded as no go buffers for the duration of the breeding season (January-April), if the nests can be found just outside of the development areas then these nests and their buffers must be treated as long term (for the lifetime of the development) no go areas.
- ❑ All areas to be developed must be walked through prior to construction by a suitably qualified Ecologist. Should any SCC be found, the correct actions need to be determined by the Ecologist to protect these species.

The Project is considered to be compatible with existing land uses encountered in the area. The risks and impacts assessed as part of the EIA process that was undertaken for the Project are considered manageable with the effective implementation of the measures stipulated in this EIA Report and EMPr.

With the selection of the BPEO, the adoption of the mitigation measures included in the EIA Report and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this Project can be suitably mitigated. With the aforementioned in mind, it can be concluded that there are no fatal flaws associated with the Project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

It is further the opinion of the EAP and EIA team that the EIA was executed in an objective manner and that the process and EIA Report conform to the requirements stipulated in the EIA Regulations. The period for which the EA is required is 10 years.

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APPENDICES