PROPOSED PARADISE 100MW SOLAR PHOTOVOLTAIC & 40MW BATTERY ENERGY STORAGE SYSTEMS PROJECT SOUTH OF BLOEMFONTEIN, FREE STATE PROVINCE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DFFE REFERENCE NO.: 14/12/16/3/3/2/2186

DRAFT

JANUARY 2023

APPLICANT: ENERGYTEAM (PTY) LTD

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TITLE AND APPROVAL PAGE

Project Name:	Proposed Paradise 100MW Solar Photovoltaic & 40MW Battery Energy Storage Systems Project South of Bloemfontein, Free State Province
Report Title:	Environmental Impact Assessment Report
Authority Reference:	14/12/16/3/3/2/2186
Report Status:	Draft

Applicant:	energyTEAM (Pty) Ltd

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EXECUTIVE SUMMARY

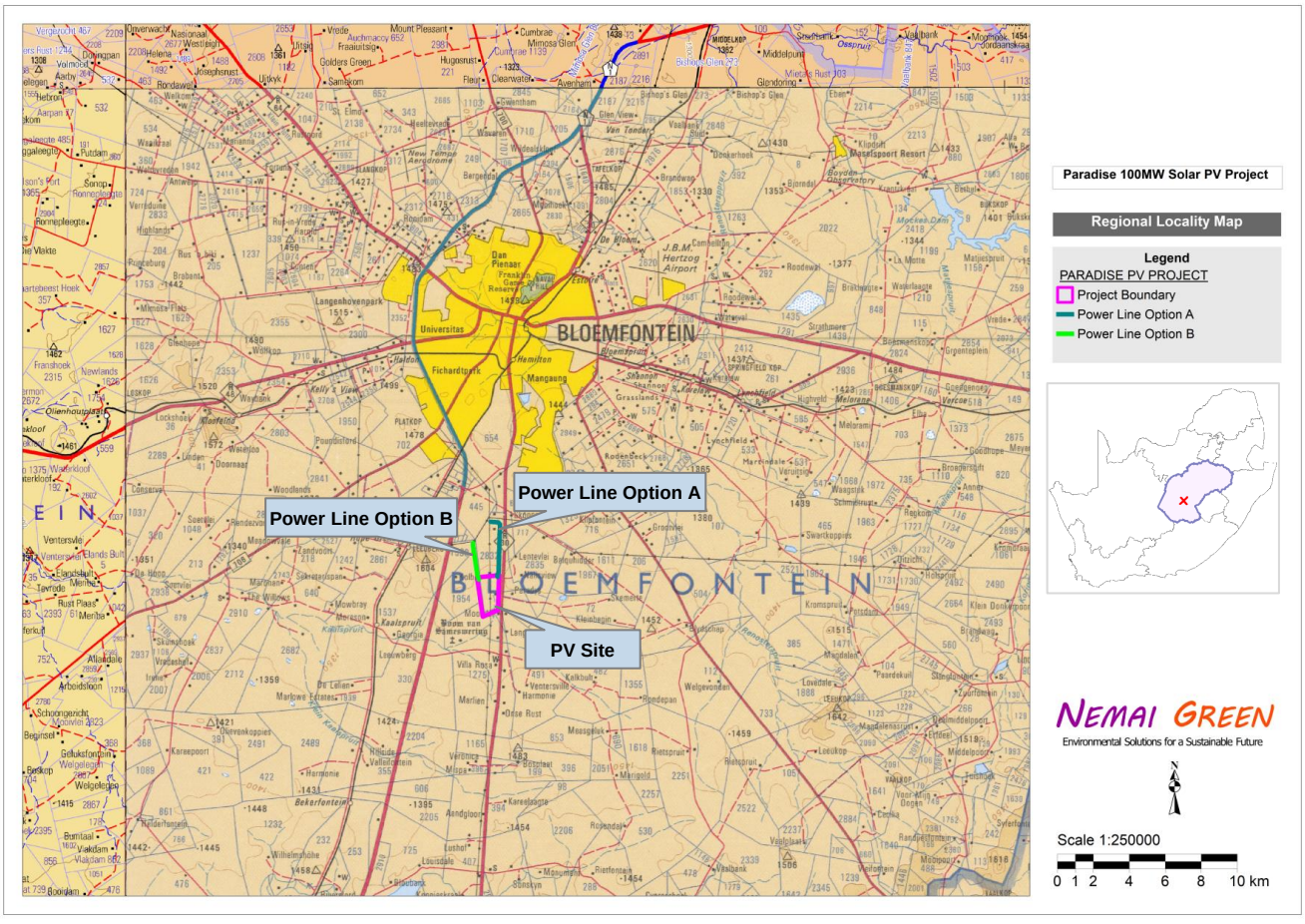
A. PROJECT BACKGROUND AND MOTIVATION

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. Genesis Eco-Energy Developments (Pty) Ltd (the "Applicant") has proposed the development of the Paradise 100MW Solar Photovoltaic (PV) and 40MW Battery Energy Storage Systems (BESS) Project south of Bloemfontein, in the Free State Province (the "Project"). The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system. 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 is located approximately 14km to the south of Bloemfontein's central business district (CBD) and falls within Ward 51 of the Mangaung Metropolitan Municipality (MMM), in the Free State Province. The N6 runs along the eastern boundary of the site.



Regional locality map

The property earmarked for the Project covers a combined area of approximately 212ha, of which the buildable area determined by the engineering team is approximately 186ha. The length of the alternative alignments for the proposed 132 kV power line is approximately 3.5km and 2km for Route Option A and Option B, respectively.

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:

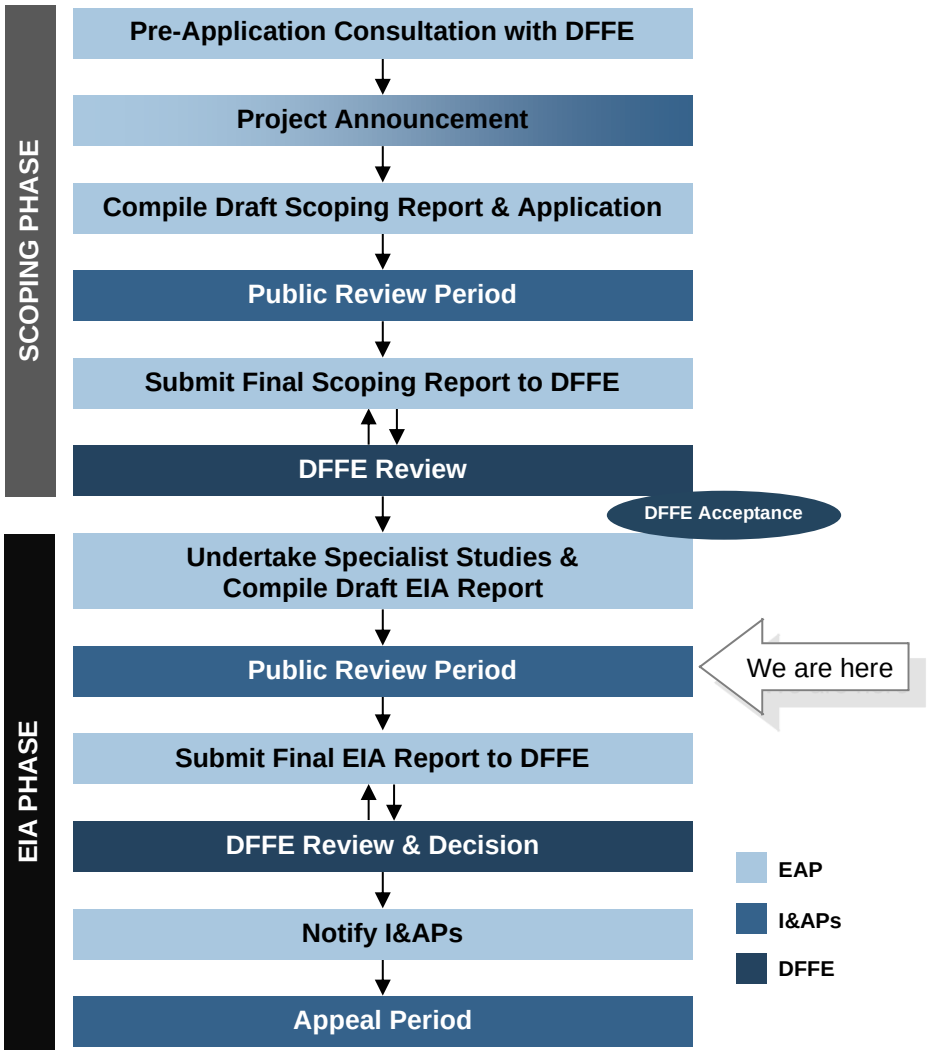
- National Environmental Management Act (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Water Act (Act No. 36 of 1998);
- National Environmental Management Air Quality Act (Act No. 39 of 2004);
- National Environmental Management: Biodiversity 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 Green 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 20 October 2022, 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
1.	Height of PV panels	± 2m
2.	Area of PV Array	± 152 ha
3.	Number of inverters required	Approximately 40
4.	Area occupied by inverter / transformer stations / substations	▪ Inverter stations (19 inverter stations) = 0.1 x 19 = ± 1.9 ha ▪ Control room = Up to 1 ha ▪ Facility (step-up) substation = ± 1 ha
5.	Capacity of on-site substation	100MW, 132 kV/33 kV & 132 kV/22 kV
6.	Area occupied by both permanent and construction laydown areas	Up to 1 ha
7.	Area occupied by buildings	▪ Area occupied by Control room = Up to 1 ha ▪ Area occupied by BESS = Up to 1.1 ha

No.	Component	Description / Dimensions
8.	Length of internal roads	± 15km
9.	Width of internal roads	The internal roads will vary from 4m to 7m wide and will be gravel.
10.	Proximity to grid connection	Length of proposed 132 kV power line between on-site substation and grid connection point is ± 3.5km and 2km for Route Option A and Option B, respectively.
11.	Height of fencing	1.8m - 2.4m
12.	Type of 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
- ❑ Hydrogeology
- ❑ Soils
- ❑ Topography
- ❑ Surface Water
- ❑ Terrestrial Ecology
- ❑ Socio-Economic Environment
- ❑ Agriculture
- ❑ Air quality
- ❑ Noise
- ❑ Cultural Heritage & Palaeontological Features
- ❑ Planning
- ❑ Existing Structures and Infrastructure
- ❑ Transportation
- ❑ Health

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. Wetland Delineation and Risk Assessment;
2. Terrestrial Biodiversity Compliance Statement;
3. Avifaunal Assessment;
4. Agricultural Impact Assessment;

5. Phase 1 Cultural Heritage Impact Assessment;
6. Paleontological Impact Assessment;
7. Visual Impact Assessment; and
8. Social 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.

From a cumulative impact perspective, there are four (4) known approved renewable energy applications within a 30km radius of the Project’s PV Site. 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.

Other aspects identified in terms of cumulative impacts included:

- Traffic-related impacts in terms of the local road network;
- The cumulative area of indigenous vegetation to be cleared;
- The clearance of vegetative cover for the Project’s development footprint will exacerbate erosion, which is already encountered in the greater area as a result of other land use disturbances;
- Increase in the dust levels during the construction phase;
- 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;
- The proposed Project is expected to increase the cumulative visual impact experienced by the identified sensitive receptors;
- Problems associated with the influx of employment seekers; and
- Positive cumulative economic effects from the construction of multiple developments in the area.

I. ANALYSIS OF ALTERNATIVES

Based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts, PV Layout Option B and Power Line Route Option A were 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
- Commenting 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. Key environmental features that contributed toward the sensitive areas shown in the map included wetlands and their associated buffer zones, as well as avifaunal habitats, as determined by the relevant specialist studies.

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
Jan 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
DESTEA	Department of Economic, Small Business Development, Tourism and Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DC	Direct Current
DD	Data Deficient
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
DPRT	Department of Police, Roads and Transport
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EHS	Environmental, Health, and Safety
EMF	Electromagnetic Field
EMPr	Environmental Management Programme
EMS	Environmental Management System
EN	Endangered
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
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
GVA	Gross Value Added
H	High
HGM	Hydrogeomorphic
HIA	Heritage Impact Assessment
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
L	Low
LC	Least Concern
LO	Likelihood of Occurrence
LSU	Large Livestock Unit
M	Moderate
MMM	Mangaung Metropolitan Municipality
MOSS	Metropolitan Open Space System
MP	Moderately Protected
Na	Sodium
NA	Not Assessed
NaS	Sodium-Sulphur
NEMA	National Environmental Management 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)
NP	Not Protected
NPAES	National Protected Area Expansion Strategy
NT	Near Threatened
NWA	National Water Act (Act No. 36 of 1998)
NWCS	National Wetland Classification System
OG	Ordinary Game
OHS	Occupational Health and Safety
ONA	Other Natural Area
PES	Present Ecological State
PG	Protected Game
POSA	Plants of Southern Africa

PP	Poorly Protected
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
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
SARAO	South African Radio Astronomy Observatory
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SOTER	Soil and Terrain
Spp.	Species
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
ToR	Terms of Reference
UFS	University of the Free State
VAC	Visual Absorption Capacity
VU	Vulnerable
WMA	Water Management Area
WP	Well Protected

UNITS OF MEASUREMENT

%	Percentage
°C	Degrees Celsius
ha	Hectare
hz	Hertz
km	Kilometre
kV	Kilovolt
l/s	Litres per second
m	Metre
m^2	Square metre
mm	Millimetre
MVA	Megavolt Amperes
MW	Megawatt
MWh	Megawatt hour
V	Volt

1 PURPOSE OF THIS DOCUMENT

Nemai Green was appointed by energyTEAM (Pty) Ltd (the "Applicant") to conduct the Environmental Impact Assessment (EIA) for the **proposed Paradise 100MW Solar Photovoltaic (PV) and 40MW Battery Energy Storage Systems (BESS) Project south of Bloemfontein, 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 20 October 2022. 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 **20 January until 20 February 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 K	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 Paradise 100MW Solar PV and 40MW BESS Project south of Bloemfontein, in the Free State Province. The electricity generated by the Project will be injected into the existing Eskom 132 kV distribution system.

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.

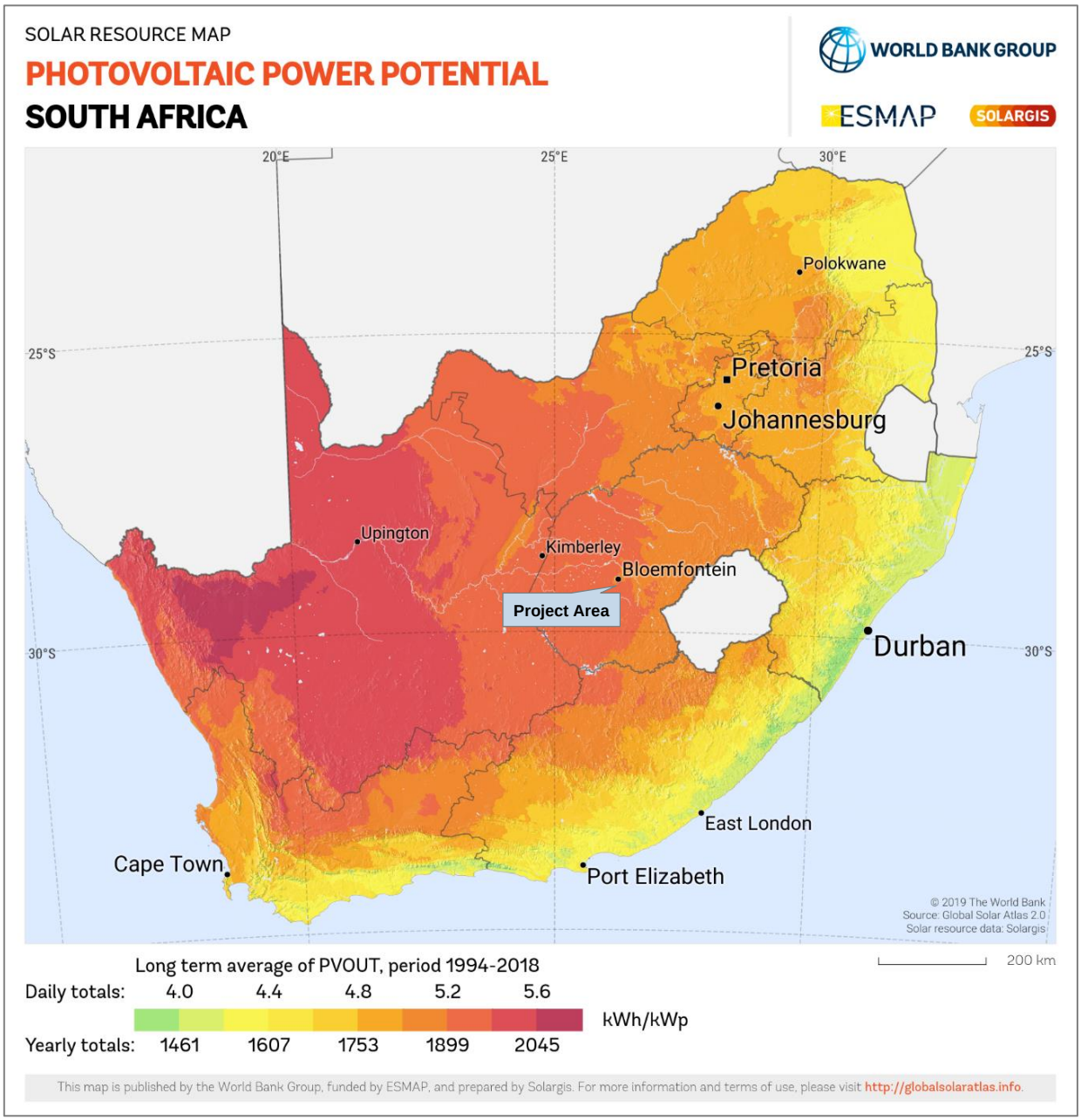


Figure 1: Location of the Project relative to PV Power Potential
(© 2019 The World Bank, Source: Global Solar Atlas 2.0, Solar resource data: Solargis)

4.2 Geographical Context

The Project is located approximately 14km to the south of Bloemfontein's central business district (CBD) and falls within Ward 51 of the Mangaung Metropolitan Municipality (MMM), in the Free State Province. The N6 runs along the eastern boundary of the site. The locality maps are provided in **Figure 2** and **Figure 3** (PV Layout Option A) below, and are also contained in **Appendix A**.

The property earmarked for the Project covers a combined area of approximately 212ha, of which the buildable area determined by the engineering team is approximately 186ha. The length of the alternative alignments for the proposed 132 kV power line is approximately 3.5km and 2km for Route Option A and Option B, respectively.

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

Table 2: Details of the affected properties

Farm Details	21-digit Surveyor General No.
PV Site	
Portion 0 of the Farm Paradys 2832	F00300000000283200000
Power Line Route	
Portion 0 of the Farm Paradys 2832	F00300000000283200000
Portion 7 of the Farm Paradys 2832	F00300000000283200007
Portion 1 of the Farm Paradys 2832	F00300000000283200001
Portion 8 of the Farm Paradys 2832	F00300000000283200008

The Project's coordinates are as follows (shown in **Figure 4** below):

- **PV Site property** –
  1. 29°14'36.9834"S; 26°12'00.85"E (north-western corner);
  2. 29°15'47.6683"S; 26°12'12.6688"E (south-western corner);
  3. 29°15'36.981"S; 26°12'43.4297"E (south-eastern corner); and
  4. 29°14'32.8412"S; 26°12'45.7114"E (north-eastern corner).
- **Power line route options** (from PV substation to Eskom Substation) –

Route Option A:

A1. 29°14'35.9682"S; 26°12'42.7691"E;
A2. 29°14'31.1752"S; 26°12'42.8504"E;
A3. 29°14'28.0154"S; 26°12'44.7786"E;
A4. 29°13'19.416"S; 26°12'47.0401"E;
A5. 29°13'2.0226"S; 26°12'47.7508"E;
A6. 29°12'58.0849"S; 26°12'43.8437"E;
A7. 29°12'57.0391"S; 26°12'28.5149"E.

Route Option B:

B1. 29°14'40.466"S; 26°12'4.0475"E;
B2. 29°14'36.7552"S; 26°12'3.3235"E;
B3. 29°14'34.2784"S; 26°12'1.5034"E;
B4. 29°13'38.2451"S; 26°11'52.1311"E;
B5. 29°12'57.0391"S; 26°11'52.6348"E.

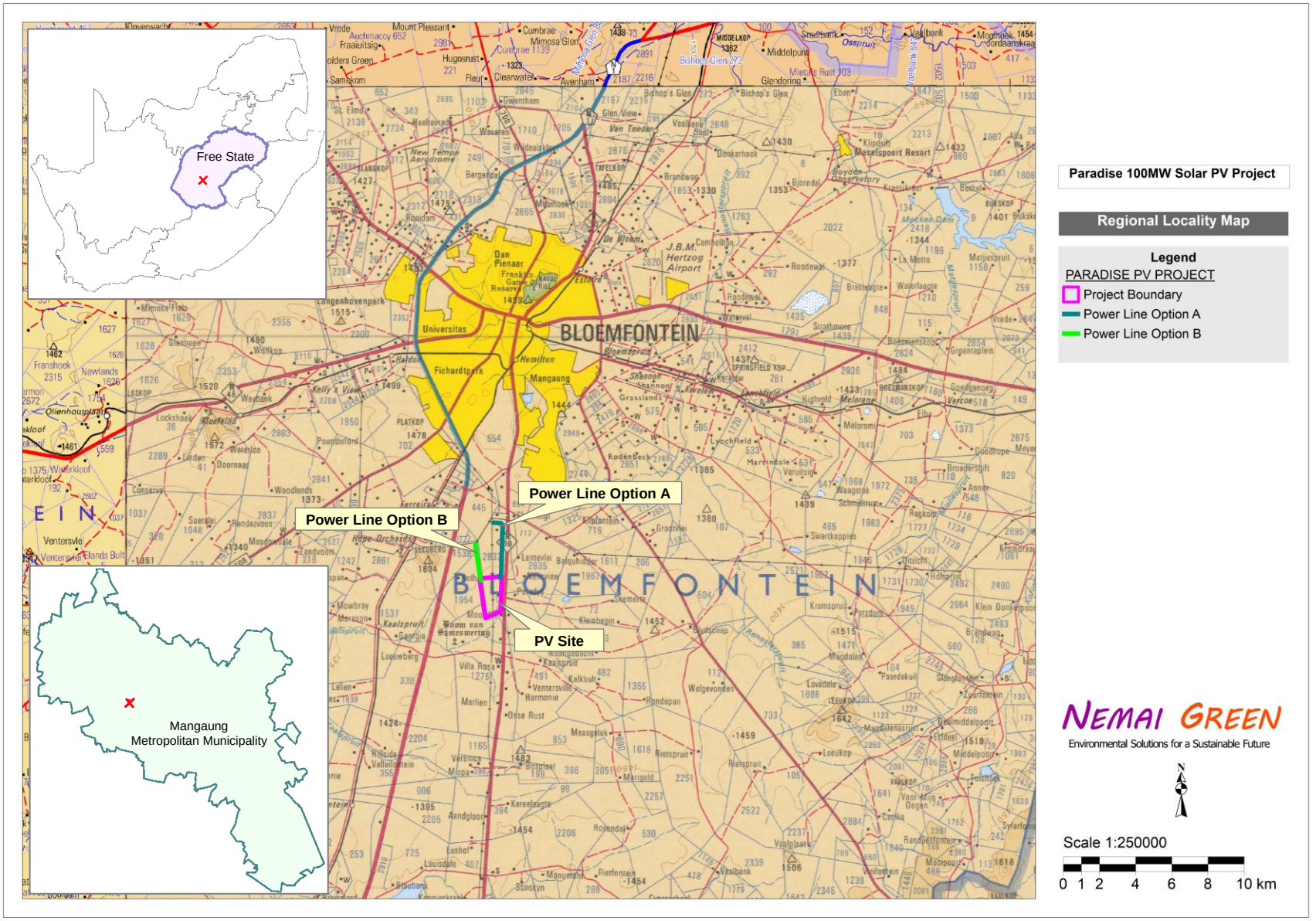


Figure 2: **Regional locality map** *(Note: not all Project components are shown due to scale)*

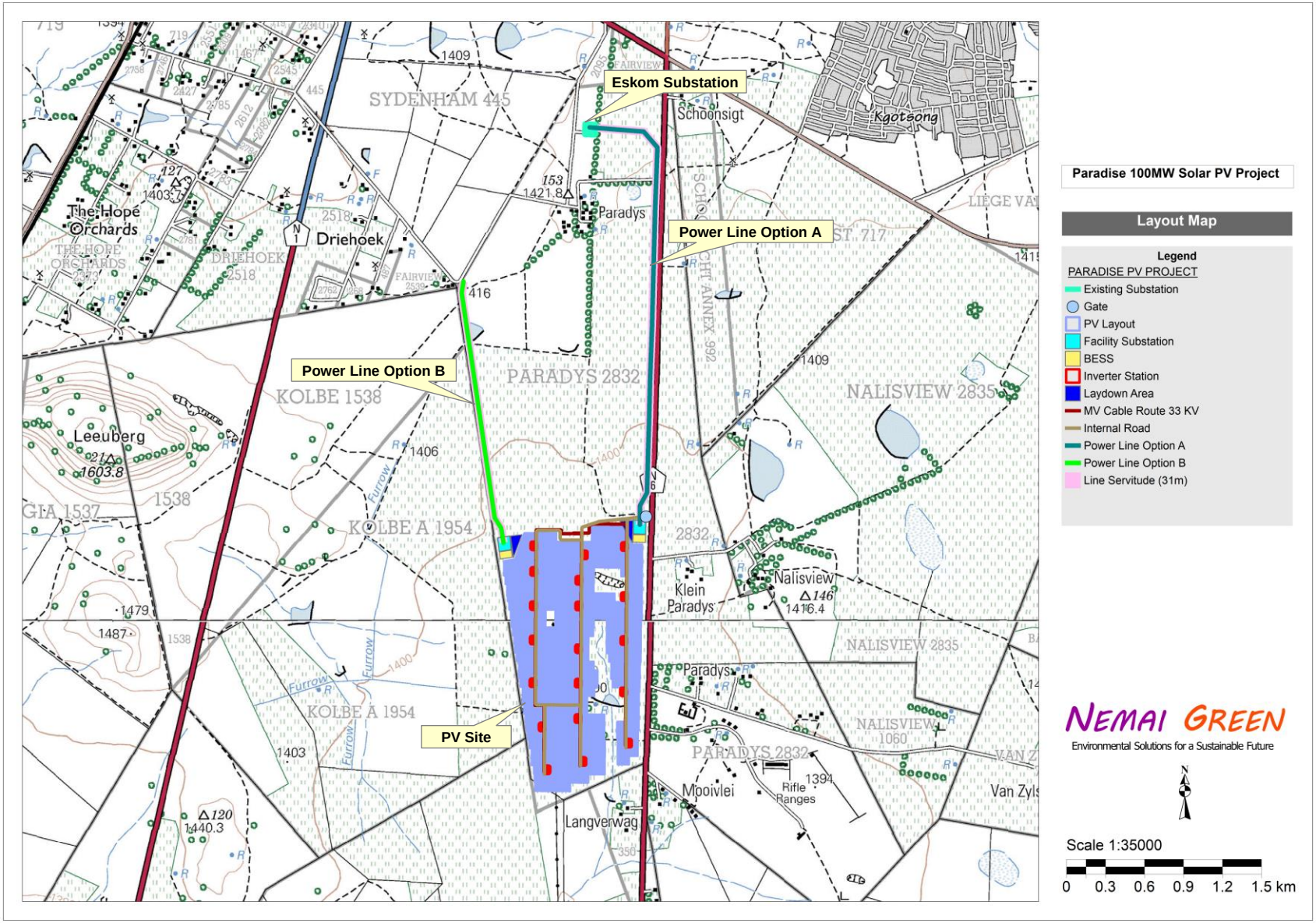


Figure 3: **Locality map (note that PV Layout Option A and Power Line Route Options A and B are shown)**

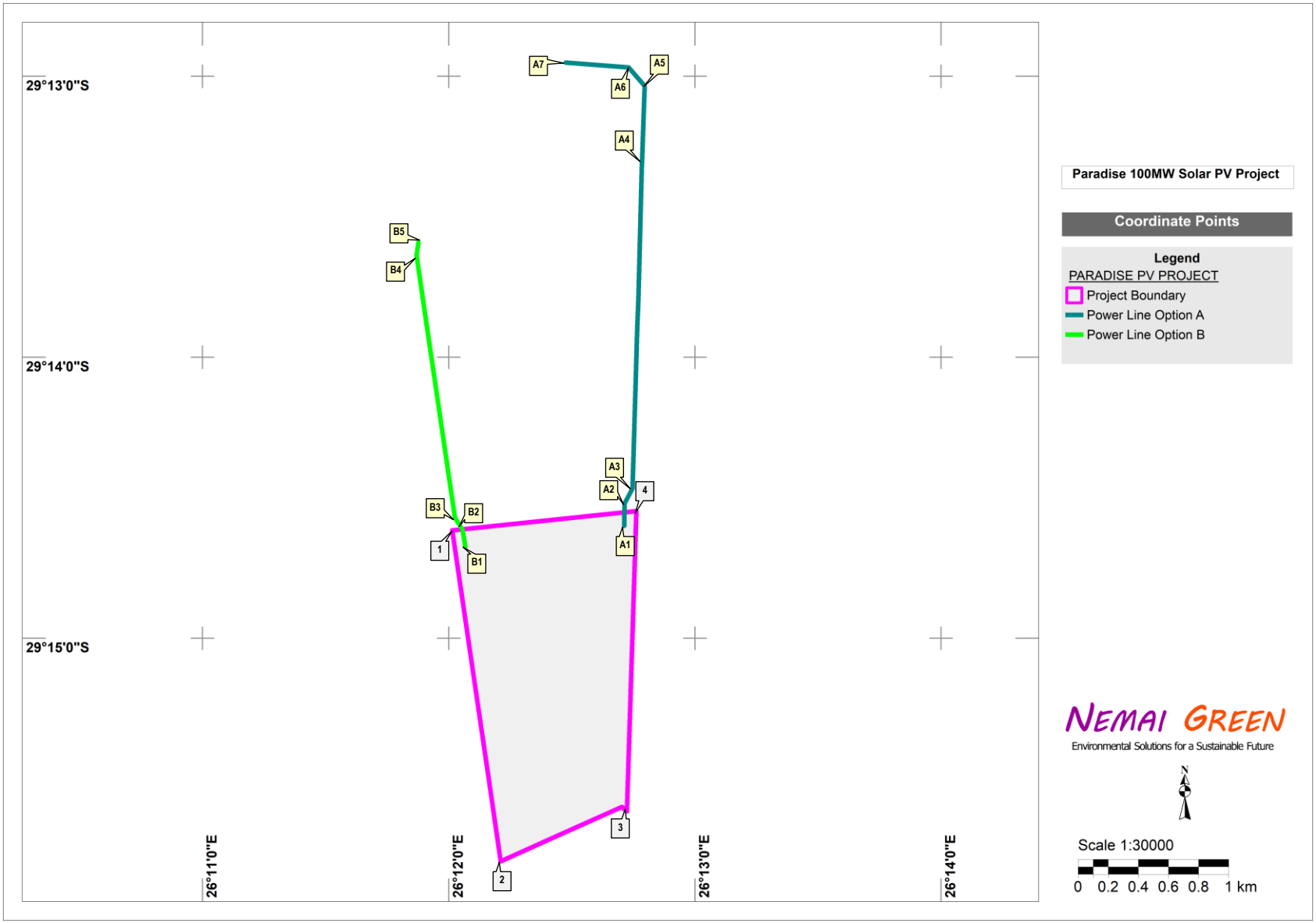


Figure 4: **Project's coordinate points**

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 3** 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 3: 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): ○ 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">

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>Proposed 132 kV overhead power line outside an urban area, of approximately 4km in length, linking the proposed solar facility to the existing Eskom Substation. The capacity of proposed on-site substation is 132 kV/33 kV or 132 kV/22 kV (100MW).</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) 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;</td><td>Crossing of watercourses by infrastructure (access road, power line, medium voltage AC cabling, and boundary fence) associated with the Project, as well as Solar PV infrastructure within 32m of a watercourse and drainage lines.</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.*	*Crossing of watercourses by infrastructure (access road, power line, medium voltage AC cabling, and boundary fence) associated with the Project, as well as Solar PV infrastructure within 32m of a watercourse and drainage lines.*
	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 required for the Project (construction and operational phases). Internal roads will vary from 4m to 7m wide and will be gravel.* *The entrance road to the project site from the regional road will be tarred and this width will exceed 7m and most likely be 7.4m.*
	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. 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:	*The proposed Project involves the development of a PV facility*

Legislation	Description and Relevance	
	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.*	*with a total generation capacity of 100MW renewable solar energy and 40MW BESS.*
	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 of off indigenous vegetation 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. ▪ The following activities under Listing Notice 3 are relevant to this Project:	
	GN No. R.985 – Activity 4 - (b)(i)(ee): *The development of a road wider than 4 metres with a reserve less than 13,5 metres.*	*Access road along power line within Critical Biodiversity Area (CBA) 1 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.*	*Clearance of areas of indigenous vegetation as part of the development footprint within the following sensitive areas:* ▪ *Areas consisting of threatened ecosystems;* ▪ *CBA 1; and* ▪ *100m from the edge of a watercourse or wetland.*
	GN No. R.985 – Activity 14(ii)(a) & (c) - (b)(i)(ff): *The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) <u>infrastructure or structures with a physical footprint of 10 square metres or more</u>;* *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.*	*Development footprint within watercourse(s) / within 32 m from watercourse(s) within CBA 1.*
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. ▪ Authority – Department of Water and Sanitation (DWS).	

Legislation	Description and Relevance
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).
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. ▪ No protected areas are directly affected by the Project.
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 3** above and **Table 4** below.

Table 4: Listed Activities Triggered by the Project

Project Components	Relevant Listed Activities	Description of relevance
Solar PV Plant	***GN No. R.983 (as amended)***	
	Activity no. 12(ii)(a) & (c)	Infrastructure and structures associated with the proposed Solar PV Plant with a physical footprint of 100 square metres or more within 32 m from watercourses and crossing of watercourses by the proposed access roads, medium voltage AC cabling and boundary fence).
	Activity no. 19	Construction activities associated with the proposed Solar PV Plant within 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 100 MW with 40MW BESS.
	Activity no. 15	The area of indigenous vegetation in the Project Area is approximately 170 Ha.
	GN No. R.985 (as amended)	
	Activity no. 12 - (b)(i)(ii) & (iv)	Clearance of indigenous vegetation as part of the development footprint within areas consisting of threatened ecosystems, CBA 1 and within 100m from the edge of a watercourse or wetland.
Power Line & Facility Substation	***GN No. R.983 (as amended)***	
	Activity no. 11(i)	Proposed 132 kV overhead power line outside an urban area, of approximately 4km in length, linking the proposed solar facility to the existing Eskom Substation. The capacity of the proposed on-site substation is 132 kV/33 kV or 132 kV/22 kV (100MW).
	Activity no. 12(ii)(a) & (c)	Crossing of watercourses by proposed power line route options.
	Activity no. 19	Construction activities associated with proposed power line within a watercourse.

Project Components	Relevant Listed Activities	Description of relevance
	GN No. R.985 (as amended)	
	Activity no. 12 - (b)(i)(ii) & (iv)	Clearance of indigenous vegetation as part of the development footprint within areas consisting of threatened ecosystems, CBA 1 and within 100m from the edge of a watercourse or wetland.
	Activity no. 14(ii)(a) & (c) - (b)(i)(ff)	Development footprint within watercourse(s) / within 32 m from watercourse(s) within CBA 1.
Roads	***GN No. R.983 (as amended)***	
	Activity no. 12(ii)(a - c)	Access roads with a physical footprint of 100 square metres or more within 32 m from watercourses, as well as crossing of watercourses by proposed access roads.
	Activity no. 19	Construction activities associated with proposed access roads within a watercourse.
	Activity no. 24(ii)	New roads required for the Project (construction and operational phases). The internal roads will vary from 4m to 7m wide and will be gravel. The entrance road to the project site from the regional road will be tarred and this width will exceed 7m and most likely be 7.4m.
	GN No. R.985 (as amended)	
	Activity no. 4 - (b)(i)(ee)	The internal roads will vary from 4m to 7m wide and will be gravel. Certain sections of the access roads will encroach into CBA 1 in terms of the Free State Biodiversity Plan.
	Activity no. 12 - (b)(i)(ii) & (iv)	Clearance of indigenous vegetation as part of the development footprint within areas consisting of threatened ecosystems, CBA 1 and within 100m from the edge of a watercourse or wetland.
	Activity no. 14(ii)(a) & (c) - (b)(i)(ff)	Development footprint within watercourse(s) / within 32 m from watercourse(s) within CBA 1.

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. Based on the comments received from DFFE on the draft Scoping Report, the proposed BESS does not trigger the storage of dangerous goods in terms of the EIA Listing Notices. Hence, and amended Application Form was compiled and submitted to DFFE with the final Scoping 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 South Africa'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 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.

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.

This Act 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 Wetland Delineation and Risk Assessment and Terrestrial Biodiversity Compliance Statement are included in **Section 12.3** and **Section 12.4** 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 Phase 1 Cultural Heritage Impact Assessment and Palaeontological Impact Assessment that were undertaken for the Project are included in **Section 12.7** and **Section 12.8** 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 were considered during the execution of the Scoping Phase (amongst others):

- MMM's Spatial Development Framework (SDF);
- MMM's Integrated Development Plan (IDP);
- Mangaung Metropolitan Open Space System (MOSS);
- 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 are shown in **Figure 5** below.

As shown in **Figure 5** below, 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.

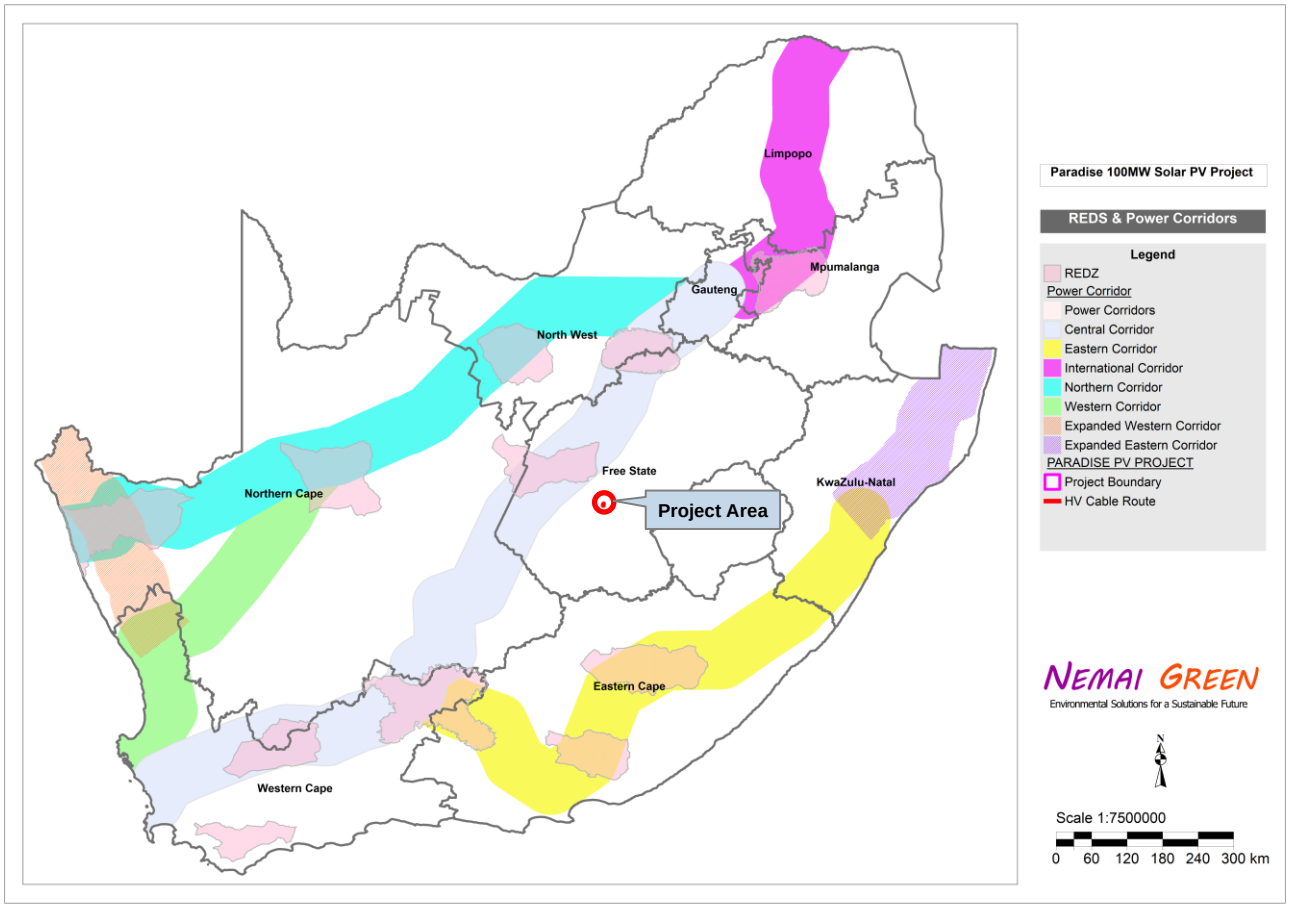


Figure 5: The Project in relation to REDZs

6 SCOPING AND EIA PROCESS

6.1 Environmental Assessment Authorities

In terms of NEMA the lead decision-making authority for the environmental assessment is DFFE, as the competent authority for renewable energy related applications. Due to the geographic location of the Project, 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 Green 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 Green 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 Green 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 Green that are involved with the S&EIR process for the Project are captured in **Table 5** below, and their respective Curricula Vitae are contained in **Appendix D**. The oath of the EAP is contained in **Appendix K**.

Table 5: Scoping and EIA Core Team Members

Name	Qualifications	Selected Experience - Renewable Energy & Bulk Power Projects
D. Henning (21 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. ▪ 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.

Name	Qualifications	Selected Experience - Renewable Energy & Bulk Power Projects
		▪ uMkhomazi Water Project Phase 1 with hydropower facilities, KwaZulu-Natal, 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.

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 respective Screening Reports for the proposed PV Site and power line were appended to the Application Form and were also included in the Scoping Report.

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 6** below. The objectives of the EIA process, based on the EIA Regulations, are captured in **Section 1** above.

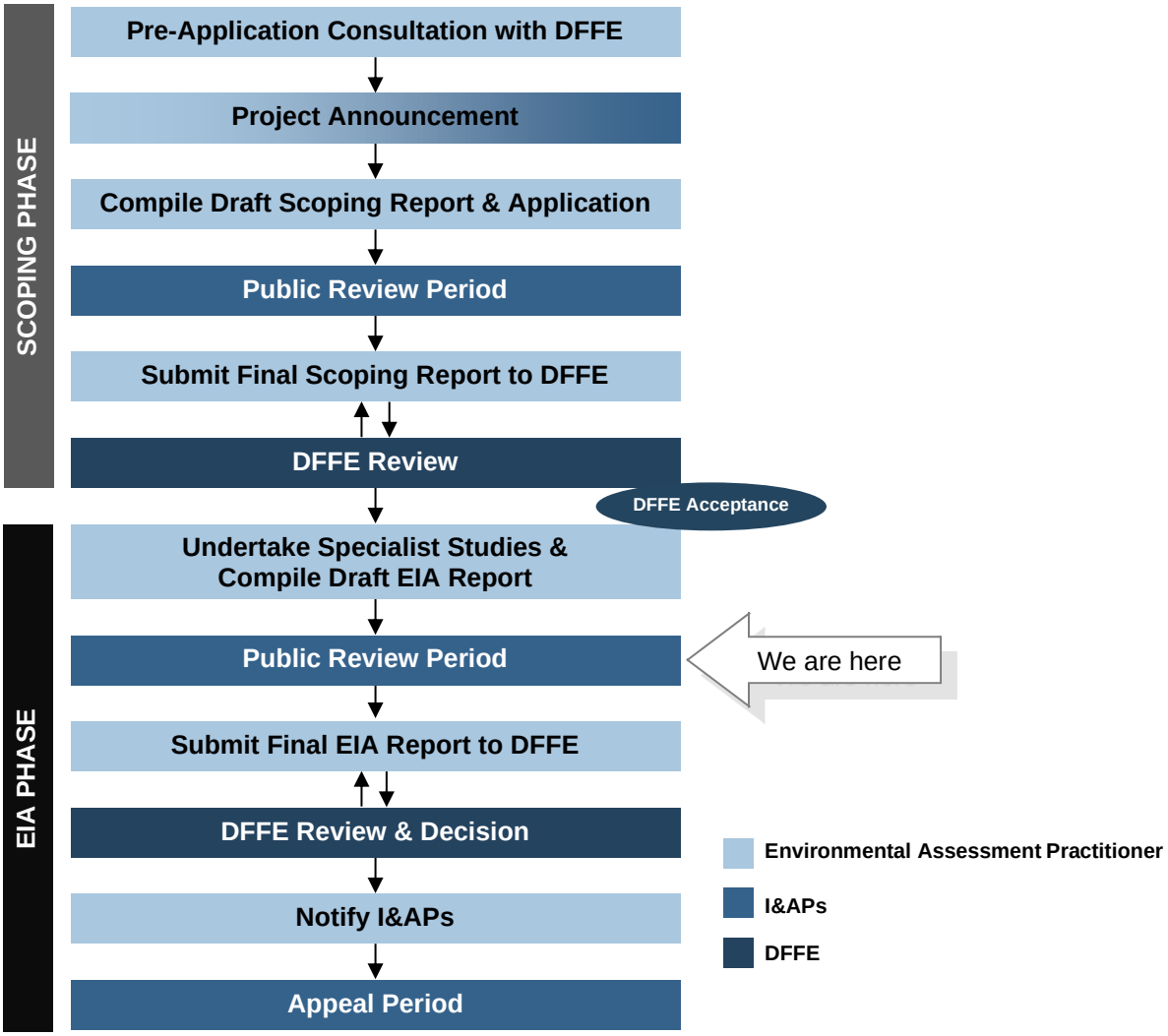


Figure 6: S&EIR process outline

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 18 November 2021.
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 10 August 2022.
4. The draft Scoping Report was lodged for public review from 11 August until 12 September 2022.
5. The final Scoping Report was submitted to DFFE on 16 September 2022.
6. DFFE accepted the Scoping Report and Plan of Study for the EIA on 20 October 2022 (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 the following changes:

- ❑ Details of the new Applicant; and
- ❑ Refinement of listed activities triggered by the Project.

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 EIA for the proposed Project. The manner in which the EIA Report addresses the requirements of the Plan of Study is shown in **Table 6** below.

Table 6: 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. • Allow for the review of the draft EIA Report. • Convene a public meeting. • Compile and maintain a Comments and Responses Report (CRR). • Notification of DFFE's decision.	**Section 15**
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 7** below.

Table 7: DFFE's Specific Requirements - Acceptance of the Scoping Report

DFFE's Requirements	Response/Status
(i) Listed Activities	
(a) It is noted that certain activities may be no longer relevant or necessary after the outcome of specialist studies. Please ensure that only listed activities that are triggered by this development are applied for in the EIAR for the proposed project.	The listed activities triggered are explained in the context of the Project in **Table 3** and **Table 4** above. The findings of the specialist studies were considered in confirming the listed activities triggered.
(b) The EIAR must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Refer to **Section 13** below for the assessment of the listed activities and the identified mitigation measures.
(c) The listed activities represented in the EIAR and the application form must be the same and correct. Ensure to include the facility substation in the listed activities table.	The listed activities contained in **Table 3** and **Table 4** above are the same as those contained in the amended Application Form (**Appendix C**). The proposed facility substation is included in description of the listed activities.
(d) The EIAR must assess the correct sub-listed activity for each listed activity applied for. The onus is on the EAP and applicant to ensure that no other activities are triggered, and the correct activities are applied for.	Refer to **Table 3** and **Table 4** above for the sub-listed activity for each listed activity triggered by the Project.
(ii) Public Participation	
(a) Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAR. This includes but is not limited to the provincial Department of Agriculture, the local and district Municipality, the Department of Water and Sanitation (DWS), the South African Heritage Resources Agency (SAHRA), BirdLife SA, the Department of Mineral Resources and Energy, the Department of Rural Development and Land Reform, and the Department of Environment, Forestry and Fisheries: Directorate Biodiversity and Conservation.	Copies of the draft EIA Report were 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.
(b) Please ensure that all issues raised and comments received during the circulation of the FSR 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 final EIA Report.
(c) 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 in chronological order. 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**.
(d) 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.

DFFE's Requirements	Response/Status
(e) 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.
(iii) Alternatives	
(a) Provide a description of each of the alternatives and provide detailed motivation for the preferred alternative.	Refer to **Section 14** below.
(iv) Layout & Sensitivity Maps	
(a) The EIAr must provide the following: ▪ Clear indication of the envisioned area for the solar PV facility, i.e., location of solar PV, Battery Energy Storage System (BESS); powerlines, supporting Infrastructure: main sub-station, operation and maintenance office, weather station, internal roads, parking, offices, staff ablutions and all associated infrastructure should be mapped at an appropriate scale. ▪ Clear description of all associated infrastructure. This description must include, but is not limited to the following: o Power lines; o Internal roads infrastructure; and: o All supporting onsite infrastructure such as laydown area, guard house and control room etc.	Refer to layouts shown in **Figure 8** (Layout Option A), **Figure 9** (Layout Option B) and **Figure 19** (Power Line Route Options A and B) below.
(b) A copy of the final preferred route layout map. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g., roads. The layout map must indicate the following: ▪ Permanent laydown area footprint; ▪ Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible); ▪ Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used; ▪ The location of sensitive environmental features on site e.g., CBAs, heritage sites, wetlands, drainage lines etc. that will be affected by the facility and its associated infrastructure; ▪ Substation(s) and/or transformer(s) sites including their entire footprint; ▪ Location of access and service roads; ▪ All existing infrastructure on the site, especially railway lines and roads; ▪ Buffer areas; ▪ Buildings, including accommodation; and ▪ All "no-go" areas.	The combined sensitivity map overlaid with the Project's preferred layout is provided in **Figure 79** below. Key environmental features that contributed toward the sensitive areas shown in the map included wetlands and their associated buffer zones, as well as avifaunal habitats, as determined by the relevant specialist studies.
(c) An environmental sensitivity map indicating environmental sensitive areas and features identified during the assessment process.	The combined sensitivity map overlaid with the Project's preferred layout is provided in **Figure 79** below.
(d) A map combining the final layout map superimposed (overlain) on the environmental sensitivity map.	
(v) Specialist assessments	
(a) 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.	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. The specialists did not provide contradicting recommendations.

DFFE's Requirements	Response/Status
▪ Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is 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.	
(b) The following Specialist Assessments will form part of the EIAr: ▪ Terrestrial Ecological Impact Assessment; ▪ Aquatic Impact Assessment & Delineation ▪ Avifaunal Impact Assessment; ▪ Heritage Impact Assessment; ▪ Agricultural Impact Assessment; ▪ Social Impact Assessment; ▪ Visual Impact Assessment; and ▪ Desktop Palaeontological Impact Assessment.	Refer to the findings from these specialist studies contained in **Section 12** below. It is noted that the Desktop Palaeontological Impact Assessment was expanded to include a field survey due to the Very High rating of the Palaeontological Sensitivity of Adelaide Subgroup (Beaufort Group, Karoo Supergroup) according to the PalaeoMap of the South African Heritage Resources Information System (SAHRIS).
(c) 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. Please note that specialist assessments must be conducted in accordance with these protocols.	The relevant specialist studies complied with the requirements of these Protocols.
(d) 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	The verification of site sensitivity, based on the Screening Tool, was undertaken by the relevant specialists. Refer to **Section 12** below for the findings from the specialists in this regard.

DFFE's Requirements	Response/Status
confirm or dispute the findings and sensitivity ratings of the screening tool. ▪ The screening tool (Appendix 11) identifies thirteen (13) Specialist reports. It is the responsibility of the EAP to confirm this list and to motivate in the assessment report, the reason for not including any of the identified specialist study 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.	**Section 12.2** below provide the reasons for excluding certain specialist studies that were identified during Environmental Screening.
(e) 'An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified on the screening tool as being of "very high sensitivity" for terrestrial biodiversity, must submit a Terrestrial Biodiversity Specialist Assessment.'' If the findings of the site verification differed from the screening tool and was found to be of a different sensitivity level, then a compliance statement would be accepted.	The findings of the Terrestrial Biodiversity Compliance Statement are provided in **Section 12.5** below. The Screening Tool classified the animal species theme sensitivity as being of a 'Medium' sensitivity and the plant species theme as 'Low' sensitivity. Following the findings of the field survey, both the animal and plant species themes may be classified as having 'Low' sensitivities. This is due to the fact that there is very little suitable habitat available to support the occurrence of any SCC within the Project Area (Jacobs & Burger, 2022).
(f) Site sensitivity verifications for all the identified specialist studies (according to the screening tool) must be provided.	The verification of site sensitivity, based on the Screening Tool, was undertaken by the relevant specialists. Refer to **Section 12** below for the findings from the specialists in this regard.
(g) 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 prepared by a specialist registered with SACNASP, with expertise in the field of aquatics sciences.	**Section 12** below provides the SACNASP registration details of the relevant specialists.
(h) 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.
(i) Please include a table that shows the proposed studies and the relevant specialists carrying out the study. In addition, a summary should be included of the specialist's recommendations in terms of the alternatives that are preferred based on the findings of their study.	The details of the respective specialists are included in **Section 12** below. The preferred alternatives identified by the specialists are discussed in **Section 14** below.
(vi) General	
(a) The EIAr must provide the technical details for the proposed facility in a table format as well as their description and/or dimensions. A sample for the minimum information required is listed under Annexure 2 below.	Refer to **Section 9.3.1** below.
(b) 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 solar PV facility will have an estimated lifespan of 25 years. It is at this time impossible to accurately predict the exact nature of the surrounding environment in 25 years' time or whether the area would have developed to the point where the solar PV facility will be upgraded to continue providing electricity, or decommissioned. 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

DFFE's Requirements	Response/Status
	the facility will eventually be decommissioned, and the site rehabilitated.
(c) A construction and operational phase EMPr that includes mitigation and monitoring measures must be submitted with the final EIAR.	The EMPr's, which make provision for the construction and operational phase of the Project, are contained in **Appendix H**.
(d) Please take note of the requirements of a generic EMPr.	The following EMPr's were developed for the Project: ▪ Normal EMPr for the Solar PV Plant (contained in **Appendix H1**). ▪ 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**).

6.9 Other Applications in Project Area

DFFE has 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 other renewable energy applications within a 30 km radius of the PV Site. According to the REEA Database, renewable energy applications have been made for properties to the east and north-west of the Project.

Potential cumulative impacts associated with the Project and these other renewable energy applications are discussed in **Section 13.28** below.

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:
  - Wetland Delineation and Risk Assessment (Clark, 2022a) –
    - Fieldwork and consequently the results of this assessment were limited to the area for which access was made possible;
    - The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side; and
    - All information provided by the client was taken as both truthful and correct.
  - Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022) –
    - 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 site visit and therefore, this assessment does not consider temporal trends, however sufficient to derive meaningful baseline;
    - Only a single season survey was conducted for the respective studies, this would constitute a dry season survey. However, owing to the low sensitivity of the terrestrial habitat this is not considered to be a notable limitation, with limit benefit being achieved from a wet season survey in comparison;
    - Flora identification is limited due to the lack of aboveground plant parts used to determine species, especially in regard to bulbous plants, the vegetation was dry, and most plants had already lost the green flush;
    - A separate avifauna assessment has been compiled; and
    - Whilst every effort is made to cover as much of the site as possible, representative sampling is completed and by its nature, it is possible that some plant and animal species that are present on site were not recorded during the field investigations.
  - Avifaunal Baseline and Impact Assessment (Clark, 2022b) –
    - Based on the species accumulation curve their remains notable scope for additional species detections which is to be expected for studies of this nature. However, the duration and seasonality (dual season surveys conducted in late summer / autumn and in late spring-early summer) of the surveys are considered adequate to gain a

sufficient understanding of the resident avifaunal assemblages and the suitability of the habitat for supporting species of conservation concern).

- Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2022) –
  - It is assumed that the description of the proposed project, provided by the client, is accurate;
  - It is assumed that the public consultation process is sufficient and that it does not have to be repeated as part of the HIA;
  - It is assumed that the information contained in existing databases, reports and publications is correct;
  - The unpredictability of buried archaeological remains;
  - No subsurface investigation (i.e. excavations or sampling) were undertaken, since a permit from SAHRA is required for such activities; and
  - The vegetation cover encountered during a site visit can have serious limitations on ground visibility, obscuring features (artefacts, structures) that might be an indication of human settlement.
- Palaeontological Impact Assessment (Butler, 2022) –
  - 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.
  - Areas with similar 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 and thus this study has been commissioned.
- Visual Impact Assessment (Naidoo, 2022) –
  - The core study area for the visual assessment can be defined as an area with a radius of not more than 10 km from the structures and a total study area with a radius of 15 km from the structures. This is because the visual impact of structures beyond a distance of 10 km would be so reduced that it can be considered negligible even if there is direct line of sight.
  - The assessment was undertaken during the planning stage of the project and is based on the information available at that time.
  - The heights were assumed for the proposed infrastructure for which heights were not available at the time of the study.
  - Only the infrastructure expected to cause the most visual impact was included in the visual analysis.

- Visual perception is by nature a subjective experience, as it is influenced largely by personal values. For instance, what one viewer experiences 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. In order to limit such subjectivity, a combination of quantitative and qualitative assessment methods were used. A high degree of reliance has been placed on GIS-based analysis viewsheds, visibility analyses and on making transparent assumptions and value judgements, where such assumptions or judgements are necessary.
- The results generated in GIS cannot be guaranteed as 100% accurate. Some viewpoints, which are indicated on the viewshed as being inside of the viewshed, can be outside of the viewshed. This is due to the change of the natural environment by surrounding activities as well as natural vegetation that play a significant role and can have a positive or negative influence on the viewshed.
- The modelling of visibility is merely conceptual. Being based on the ALOS DSM and land cover data, it does not fully take into account the real-world effect of buildings, trees etc. that could shield the structures from being visible or could have changed over time. The viewshed analysis therefore signifies a worst-case scenario.
- Only the major infrastructure (in terms of height and area) were included in the visual analysis and not the proposed ancillary infrastructure. The expected visual impact of the ancillary infrastructure is generally less significant than the expected visual impact of the proposed PV Panels, substations and powerlines. However, the ancillary infrastructure may contribute to the cumulative expected visual of the proposed project therefore, the expected visual impacts of the proposed ancillary infrastructure is addressed in the Impact Assessment.
- A Glint and Glare Impact Assessment did not form part of the scope of work.

- Social Impact Assessment (Tanhuke & Myeni, 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; and
  - No relocation of families will take place for this project.

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 8** below.

Table 8: 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 were undertaken to assess the impacts of the Project on the ecological integrity of the area: ▪ Wetland Delineation and Risk Assessment (contained in **Appendix E1**); ▪ Terrestrial Biodiversity Compliance Statement (contained in **Appendix E2**); ▪ Avifaunal Baseline and Impact Assessment (contained in **Appendix E3**). The following findings of the Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022) are noted: ▪ According to the Ecosystem Threat Status spatial dataset, the proposed Project Area overlaps with a Near Threatened ecosystem. ▪ According to the Free State Conservation Plan, the Project Area overlaps with a Degraded area as well as an Other Natural Area, while Grid Option B overlaps with a CBA 1. ▪ The majority of the Project Area has historically been modified to accommodate agricultural practices and as such remain in a transformed state. The Project Area does, however, contain unique habitat features such as the unchanneled valley bottom wetland in the central portion of the site and the secondary grassland habitat associated with Route Option B. Thus, it is very important that the management outcomes presented in this study are adhered to, in order to mitigate the negative expected environmental impacts that will stem from the development activities. The initial Wetland Delineation and Risk Assessment advocated that the proposed development avoid the unchanneled valley-bottom that flows from north to south across the site, as well as its associated buffer. This was also recommended in the Terrestrial Biodiversity Compliance Statement Avifaunal Baseline and Impact Assessment. In response, PV Layout Option A was revised to minimise encroachment into the wetland and its buffer area. This new layout is referred to as PV Layout Option B and includes the associated changes to the various components of the Solar PV Plant. The Wetland Specialist (Clark, 2022a) noted that although PV Layout Option B avoids most of the wetland, some solar panels still encroach into small portions of the wetland and its associated buffer. Consequently, the Wetland Specialist (Clark, 2022a) recommended that a basic wetland offset strategy (consisting of on-site rehabilitation) be developed. The Project falls within an area that is designated for crop farming in terms of the SDF (MMM, 2020). According to the

Question No.	Response
	Agricultural Impact Assessment (Gouws, 2022), the land at the PV site has no high or very high potential land and the sensitivity is medium. Management objectives are included in the EIA Report and EMPr's to safeguard the above-mentioned sensitive habitats. One of the goals identified in the municipal IDP (MMM, 2022) to domesticate the Sustainable Development Goals is to promote developments in renewable energy. This IDP further states that the MMM uses large amounts of energy and will face increased energy demand as a result of climate change over and above increases in population growth. The IDP notes that the energy sector is already embattled as it is and despite the increased focus on greener energy, the country is still very dependent on fossil fuels. 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 (RE) 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 (amongst others): ▪ Clearance of large areas of indigenous vegetation associated with the construction footprint of the PV and BESS Site 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. Mitigation measures are included in the EIA Report and EMPr's to manage the above impacts, according to the mitigation hierarchy. The layout of the PV Site was adjusted to minimise encroachment into the wetland and its buffer area. The EMPr for the PV Plant (contained in **Appendix H1**) makes provision for the following related management measures: ▪ A pre-construction survey must be undertaken by a suitably qualified Ecologist to identify fauna and flora SCC. ▪ Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further. ▪ Reinstating and rehabilitating areas disturbed by construction activities, as well as for the ongoing eradication of alien invasive plants and noxious weeds during the operational phase.
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. Mitigation measures were identified and included in the EIA Report and EMPr to manage these impacts. Refer to the following related sections in the EIA Report: ▪ Section 13.10 - impact assessment for soils; ▪ Section 13.11 - impact assessment for groundwater; ▪ Section 13.12 - impact assessment for surface water;

Question No.	Response
	▪ Section 13.13 - impact assessment for terrestrial ecology; ▪ Section 13.19 - impact assessment for air quality; ▪ Section 13.20 - impact assessment for noise; and ▪ Section 13.21 - impact assessment for hazardous substances and waste.
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, water used for washing purposes and drainage over contaminated areas. ▪ 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's contained in **Appendix H**.
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 The following findings from the Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2022) are noted: ▪ No sites, features or objects of cultural significance dating to the Stone Age were identified in the project area; ▪ No sites, features or objects of cultural significance dating to the Iron Age were identified in the project area; and ▪ No sites, features or objects of cultural significance dating to the historic period were identified in the project area. According to the Visual Impact Assessment (Naidoo, 2022), the proposed infrastructure would create a moderate negative visual impact on the surrounding areas during each phase of the activity. These impacts can be reduced after the recommended mitigation measures are implemented. However, the overall visual impact will remain as a moderate negative impact during the operational phase of the Project. This is mainly due to permanent nature of the structures and to the alteration of the area's current sense of place.

Question No.	Response
	Mitigation measures are included in the EMPr to safeguard cultural heritage and palaeontological features, as well as to manage visual impacts.
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	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 electricity will be derived from a renewable energy source, namely, the sun. During the operational phase 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.
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. Impacts to the receiving environment were assessed through various specialist studies that are summarised in **Section 12** below. The results of the impact assessment are contained in **Section 13** below. Opportunity costs are associated with the net benefits forgone for the development alternative. The Project Area is considered to have favourable solar radiation levels, making it suitable for the production of solar power via PV Panels (refer to **Section 4.1** above). The Project's PV Site is located outside the urban edge, and is also vacant and was historically used for agricultural purposes. The Project's power line route options primarily follow property boundaries and traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing.
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 layout of the PV Site was adjusted to minimise encroachment into the wetland and its buffer area, based on the findings of the Wetland Delineation and Risk Assessment, Terrestrial Biodiversity Compliance Statement Avifaunal Baseline and Impact Assessment. The preferred power line route was also determined based on the recommendations of the aforementioned specialist studies (amongst others). The assumptions and limitations that accompany the EIA (including the specialist studies) are captured in **Section 7** above.

Question No.	Response
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 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?*	These impacts were evaluated as part of the Social Impact Assessment and the findings are provided in **Section 13.26** below. 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.)?	Refer to response to question no. 1.7 above. The areas affected by the proposed Project footprint are rural in nature. The Project is located approximately 14km to the south of Bloemfontein's CBD. The Project's PV Site is vacant and was historically used for agricultural purposes. The Project's power line route options primarily follow property boundaries and traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing. According to the Agricultural Impact Assessment (Gouws, 2022), the land at the PV site has no high or very high potential land and the sensitivity is medium.
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. 1.1 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 of the PV Site was adjusted to minimise encroachment into the wetland and its buffer area, based on the findings of the Wetland Delineation and Risk Assessment, Terrestrial Biodiversity Compliance Statement Avifaunal Baseline and Impact Assessment. The preferred power line route was also determined based on the recommendations of the aforementioned specialist studies (amongst others). The Best Practicable Environmental Option (BPEO) is presented in **Section 14** below, which was identified based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts.
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?	The cumulative impacts of other renewable energy projects that are located within a 30km radius of the proposed PV Site are discussed in **Section 13.28** below. Cumulative impacts in relation to the Project were assessed individually in **Section 13.9** to **Section 13.26** below and mitigation measures were developed for each of the impact categories.
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,*	The socio-economic environment is discussed in **Section 11.9** below. The following is noted from a planning perspective: ▪ The Project's power line route options mostly follow property boundaries. Route Option A and Route Option B run along the eastern and western parts of the UFS Paradys Experimental Farm, respectively.

Question No.	Response
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 proposed PV Site and power line are located outside of the urban edge and should not impact on future urban expansion. ▪ The Project falls within an area that is designated for crop farming in terms of the SDF (MMM, 2020a). The SDF notes that commercial mixed crop farming and cattle farming dominates the landscape surrounding the Bloemfontein urban complex. The findings from the Agricultural Impact Assessment that was undertaken for the Project are contained in **Section 12.7** below. ▪ One of the goals identified in the municipal IDP (MMM, 2022) to domesticate the Sustainable Development Goals is to promote developments in renewable energy. ▪ 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. ▪ 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. ▪ The proposed PV Site is located approximately 18km to the south-west of the Bram Fischer International Airport in Bloemfontein. According to the findings from the 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? *2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?*	Refer to the response to question no. 1.9 above.
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*	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. Not deemed to be relevant, due to the nature of the development. 2.5.4. Impacts on surrounding land uses were assessed in **Section 13.9** below and as part of the Agricultural Impact Assessment, Social Impact Assessment and Visual Impact Assessment (amongst others). 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, based on the SDF. 2.5.7. The resources and services required for construction and operation are discussed in **Section 9.8** below.

Question No.	Response
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?*	2.5.8. 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's 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 Social Impact Assessment (contained in **Appendix E7**) identified the socio-economic benefits associated with the Project. 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 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?*	The assumptions, gaps and limitations that accompany the Social Impact Assessment are captured in **Section 7** above. The findings of the assessment of the social impacts are contained in **Section 13.26** below. None of the adverse social impacts that were assessed had a high residual risk after mitigation.
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. These impacts will be assessed as part of the Agricultural Impact Assessment, Social Impact Assessment and Visual Impact Assessment (amongst others).
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 findings of the following related specialist studies: ▪ Agricultural Impact Assessment (refer to **Section 12.7** and **Section 13.15** below); ▪ Visual Impact Assessment (refer to **Section 12.10** and **Section 13.18** below); and ▪ Social Impact Assessment (refer to **Section 12.11** and **Section 13.26** below). Also refer to the response to question no. 1.9 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 is presented in **Section 14** below, which was identified based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts.
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,	

Question No.	Response
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. Consent has been provided by the landowner for the proposed development in terms of the Option to Lease Agreement.
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 assessment of the social impacts are contained in **Section 13.26** below. Mitigation measures to manage these impacts are included in the EMPr's. 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 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?*	**Section 15** below provides an overview of the public participation process to date, 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. The Comments and Responses Report (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.
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 assessment of the social impacts are contained in **Section 13.26** below. Mitigation measures to manage these impacts are included in the EMPr's. 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 **Section 13.25** below. These risks are addressed through mitigation measures identified under other environmental features, such as social environment, surface water, air quality, noise, as well as best practices 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),*	The Project will have a beneficial impact on local employment during the construction and operational phases.

Question No.	Response
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.).*	
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 (DoE) (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 RE generation in SA.
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 100MW renewable solar energy with 160 MWh BESS. Some of the electricity generated from the renewable energy source will be stored in the BESS which will 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 summarised in **Section 12** below. The results of the impact assessment are contained in **Section 13** below.
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The mitigation measures included in the EIA Report and EMPr's are considered to be realistic. The mitigation measures proposed reduce the residual risks to an acceptable level. The solar PV facility will have an estimated lifespan of 25 years. It is at this time impossible to accurately predict the exact nature of the surrounding environment in 25 years' time or whether the area would have developed to the point where the solar PV facility will be upgraded to continue providing electricity, or decommissioned. 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
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?	

Question No.	Response
	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 is presented in **Section 14** below, which was identified based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts. The initial Wetland Delineation and Risk Assessment advocated that the proposed development avoid the unchanneled valley-bottom that flows from north to south across the site, as well as its associated buffer. This was also recommended in the Terrestrial Biodiversity Compliance Statement Avifaunal Baseline and Impact Assessment. In response, PV Layout Option A was revised to minimise encroachment into the wetland and its buffer area. This new layout is referred to as PV Layout Option B and includes the associated changes to the various components of the Solar PV Plant.
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?	The cumulative impacts of other renewable energy projects that are located within a 30km radius of the proposed PV Site are discussed in **Section 13.28** below. Cumulative impacts in relation to the Project were assessed individually in **Section 13.9** to **Section 13.26** below and mitigation measures were developed for each of the impact categories.

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 7** below provides an overview of a typical Solar PV Power Plant.

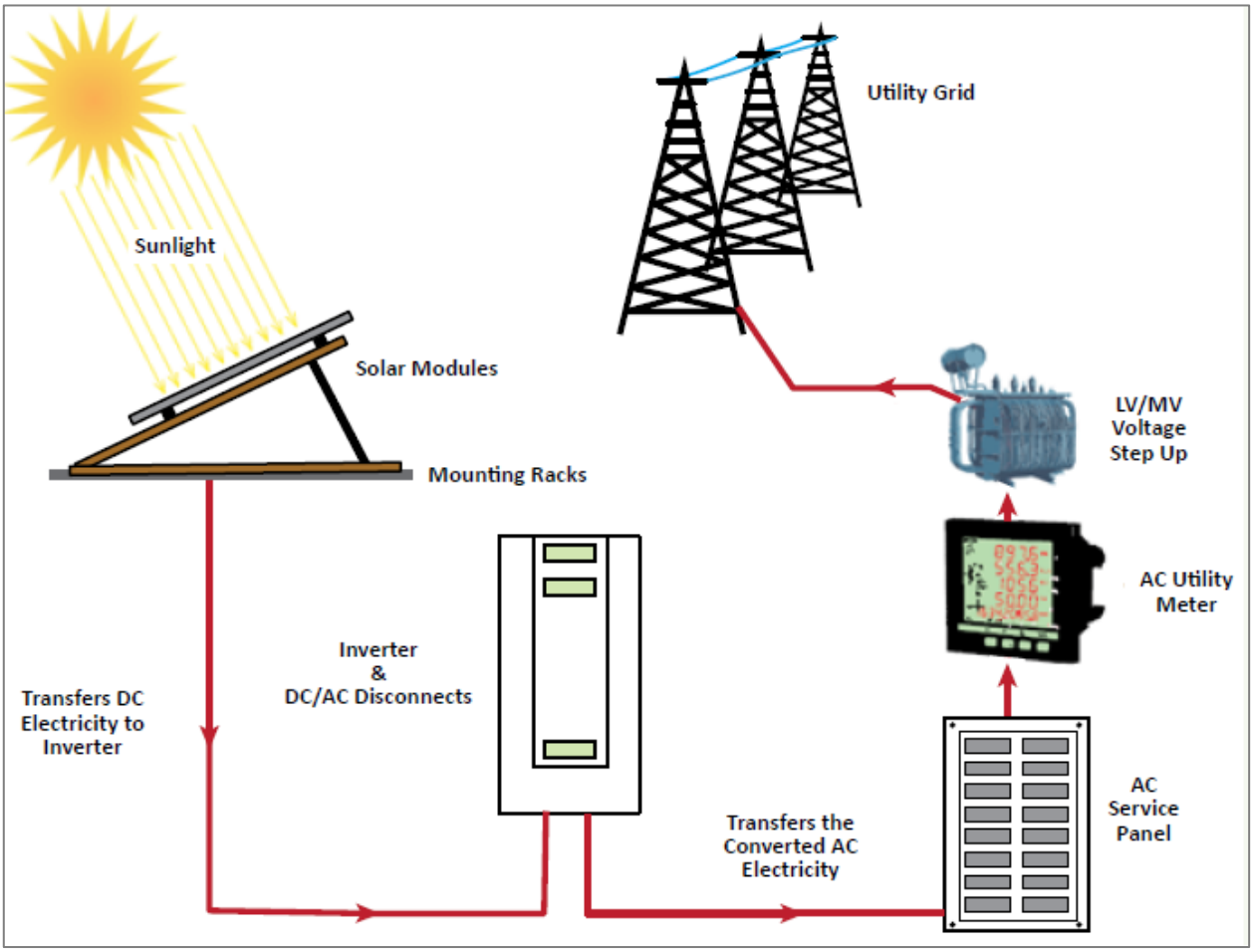


Figure 7: Overview of Solar PV Power Plant (IFC, 2015)

9.3 Project Overview

9.3.1 Overview of Technical Details

The technical details of the proposed Solar PV Plant are captured in **Table 9** below.

Table 9: Technical details of the proposed PV Plant

No.	Component	Description / Dimensions
13.	Height of PV panels	± 2m
14.	Area of PV Array	± 152 ha
15.	Number of inverters required	Approximately 40
16.	Area occupied by inverter / transformer stations / substations	▪ Inverter stations (19 inverter stations) = 0.1 x 19 = ± 1.9 ha ▪ Control room = Up to 1 ha ▪ Facility (step-up) substation = ± 1 ha
17.	Capacity of on-site substation	100MW, 132 kV/33 kV & 132 kV/22 kV
18.	Area occupied by both permanent and construction laydown areas	Up to 1 ha
19.	Area occupied by buildings	▪ Area occupied by Control room = Up to 1 ha ▪ Area occupied by BESS = Up to 1.1 ha
20.	Length of internal roads	± 15km
21.	Width of internal roads	The internal roads will vary from 4m to 7m wide and will be gravel.
22.	Proximity to grid connection	Length of proposed 132 kV power line between on-site substation and grid connection point is ± 3.5km and 2km for Route Option A and Option B, respectively.
23.	Height of fencing	1.8m - 2.4m
24.	Type of fencing	Type will vary around the site, welded mesh, palisade and electric fencing

9.3.2 Project Layout

The layout options of the PV Plant are shown in **Figure 8** and **Figure 9** below. The desirability of the earmarked site for the proposed Solar PV Plant is due to the following key characteristics:

- **Solar Irradiation**: The feasibility of a solar facility, especially a Solar Park of this magnitude, 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 Solar PV Plant will be injected into the existing Eskom 132 kV distribution system (refer to **Section 9.5** below). The PV Site is located close to the Eskom grid.
- **Extent of site**: The overall extent of the site is sufficient for the installation of the PV facility.
- **Site access**: The site can be accessed via the N6, which runs along the eastern boundary of the site.

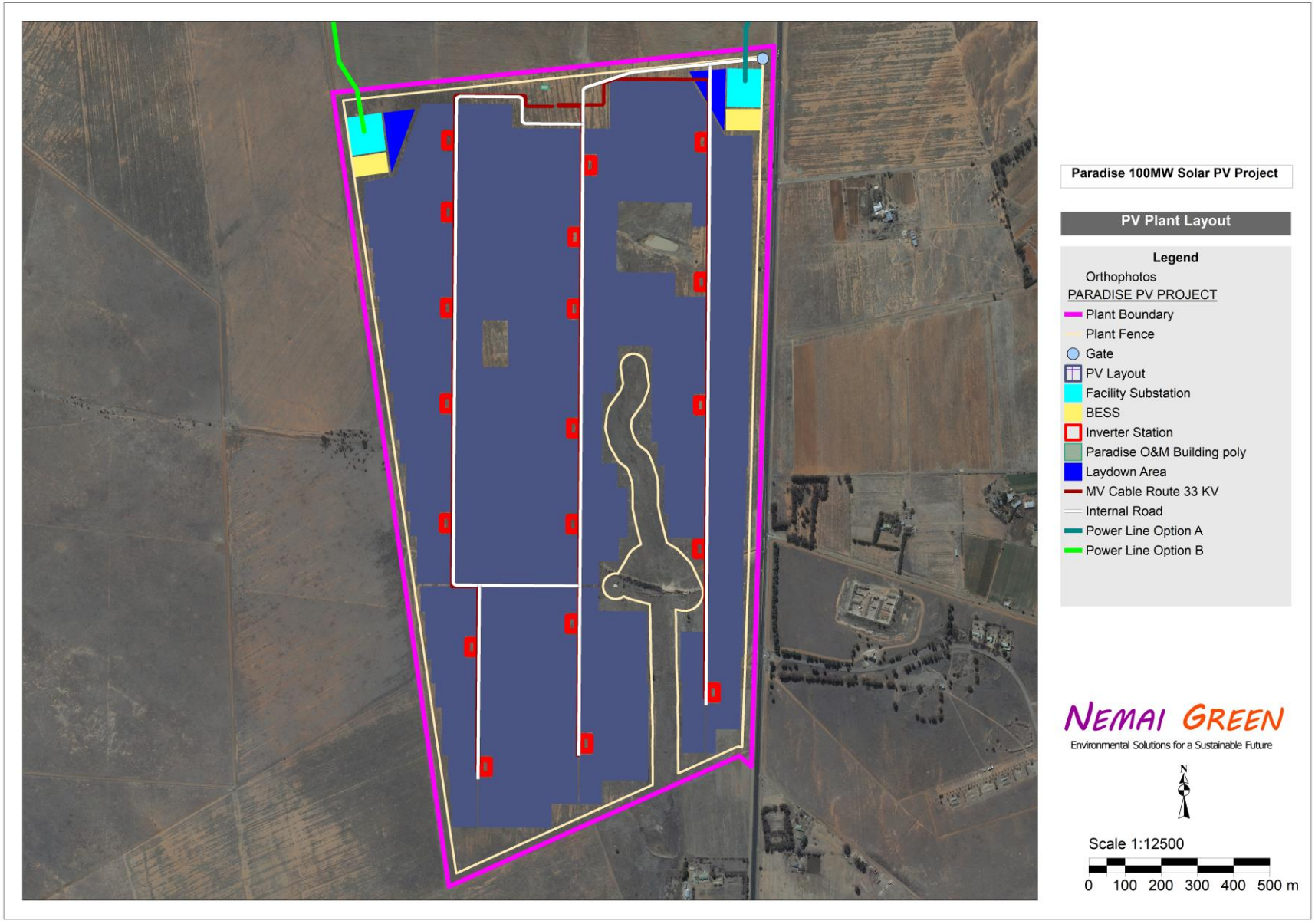


Figure 8: **Proposed Layout of the Solar PV Plant - PV Layout Option A**

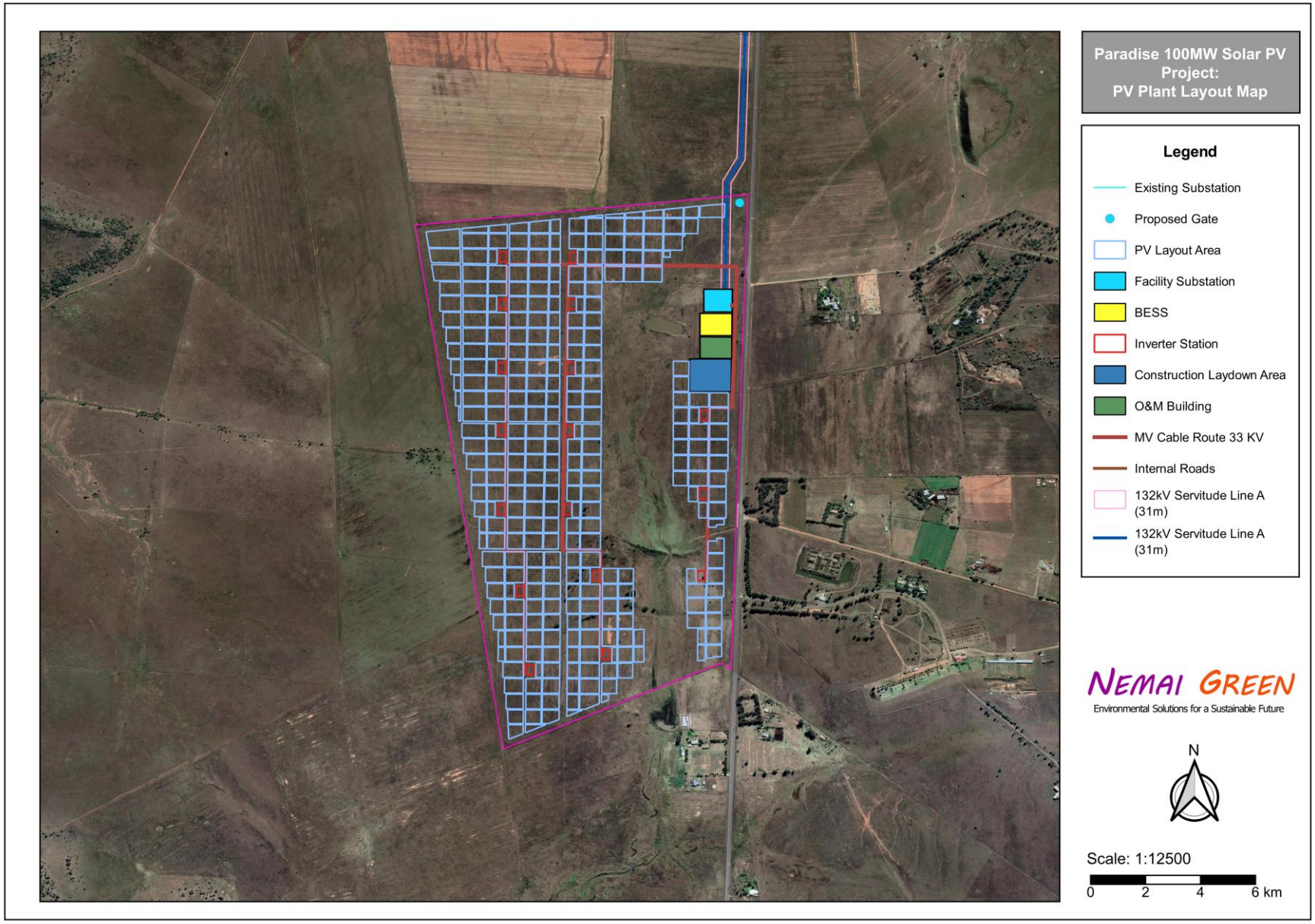


Figure 9: **Proposed Layout of the Solar PV Plant - PV Layout Option B (preferred)**

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 Plant

The Project consists of the following systems, sub-systems or components (amongst others):

- PV panel arrays, which are the subsystems which convert incoming sunlight into electrical energy;
- Mounting structures to support the PV panels;
- On-site inverters to convert DC to facilitate AC connection between the solar energy facility and electricity grid;
- Lithium Ion BESS;
- New 132 kV power lines between the on-site substation and the grid connection point;
- Cabling between the Project's components, to be laid underground (where practical);
- Administration buildings (offices);
- Workshop areas for maintenance and storage;
- Temporary laydown areas;
- Internal access roads and perimeter fencing of the footprint;
- High Voltage (HV) Transformers; and
- Security Infrastructure.

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 0.5V and 6Amp. And it is equivalent to 3W 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 SA is 50Hz, 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 1000V).

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 2.5MVA 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. Existing access from main roads will remain as is. The internal roads will vary from 4m to

7m 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 exceed 7m, most likely 7.4m 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 1500V) 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. The Electrochemical/battery storage system was selected as the preferred solution to meet the requirements of the Project.

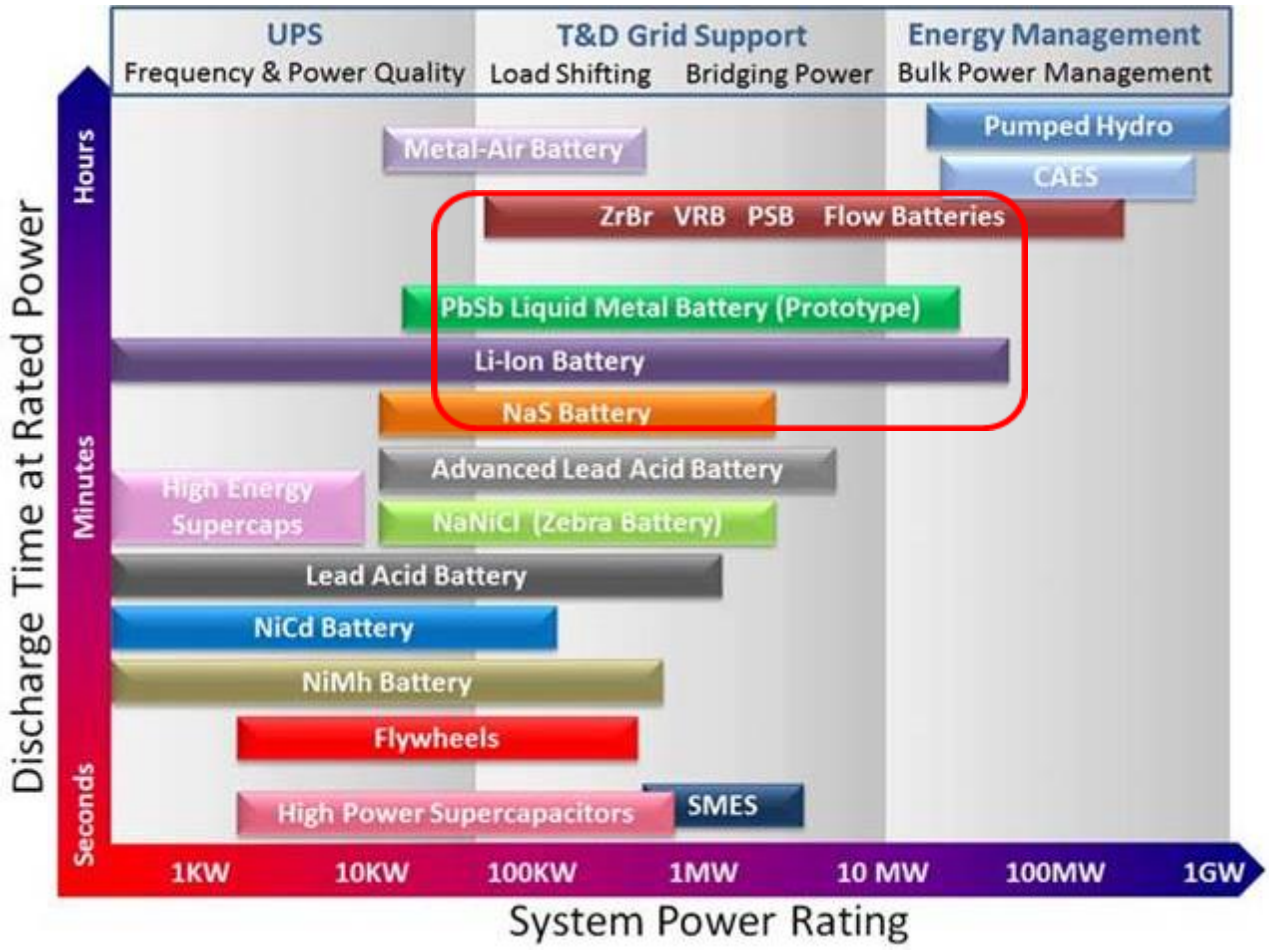


Figure 15: Grid Energy Storage Technologies and Applications
(Adapted from Climate Policy Initiative for the Energy Transitions Committee)

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 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 capacity of the BESS is up to a maximum of 40 MW (160 MWh) of BESS. The technology will be the commercially proven solid state battery systems comprising of the 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 will be contained in shipping containers.

There will be up to a maximum of 40 shipping containers, each with a battery storage capacity of 1MW. The approximate dimensions of the containers will be up to a maximum of 8m long, 3m wide and 3m high. Level and fenced off platforms would be created for the battery storage areas of approximately 3 000m². 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. Two power line route options are under consideration (see **Figure 19** below). Route Option A connects to the existing Eskom Paradys 132/22 kV Substation located to the north of the site through a ±3.5km single circuit twin conductor 132 kV line. Route Option B connects to an existing 132 kV line located ±2.0m to the north of the site. The voltage of the energy generated by the Project will be transformed on site at a step-up substation that will be constructed by the Applicant. The Project's proposed overhead power line will be aligned alongside property boundaries and existing power lines as far as possible.

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

Figure 19: Proposed Power Line Route Options with PV Layout Option A

9.6 Implementation Programme

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

- ❑ Preferred Bidder Status: April 2023;
- ❑ Financial Close: October 2023;
- ❑ Notice to proceed (commencement of construction):November 2023; and
- ❑ Commercial Operation Date (COD): November 2024.

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 MMM or landowners to obtain water from approved sources.

Operation

Water use requirements for a Solar PV Plant during the operational phase depend 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 MMM, 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 (MMM, 2022), there are seven operational landfill sites in the municipality with enough airspace for some years to come, except for the Northern Landfill site that has limited airspace. The Bloemfontein Southern Landfill Site (licence mo. B33/2/350/2/P162) is located nearest to the Project site.

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 Project site is accessible by the N6 which runs along the eastern boundary of the site.

9.8.6 Stormwater

Construction

Best environmental practices will be implemented during construction to manage stormwater. These measures are 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 laydown area of up to 1 ha will be located next to the on-site substation.

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. The changes made to the layout to avoid the wetland on the site are discussed in **Section 14** below.

As explained in **Section 9.5** above, two power line route options are under consideration (see **Figure 19** above). Route Option A connects to the existing Eskom Paradys 132/22 kV Substation located to the north of the site through a ±3.5km single circuit twin conductor 132 kV line. Route Options B connects to an existing 132 kV line located ±2.0m to the north of the site. The locations of the facility substation, BESS and laydown area are reliant on the preferred power line route.

The preferred layout is identified in **Section 14** below.

10.4 Technology Alternatives

10.4.1 PV Technology

Solar PV technology consists of either monofacial or bifacial solar panels used on either a fixed mounting system or tracking mounting system. The following is noted in this regard:

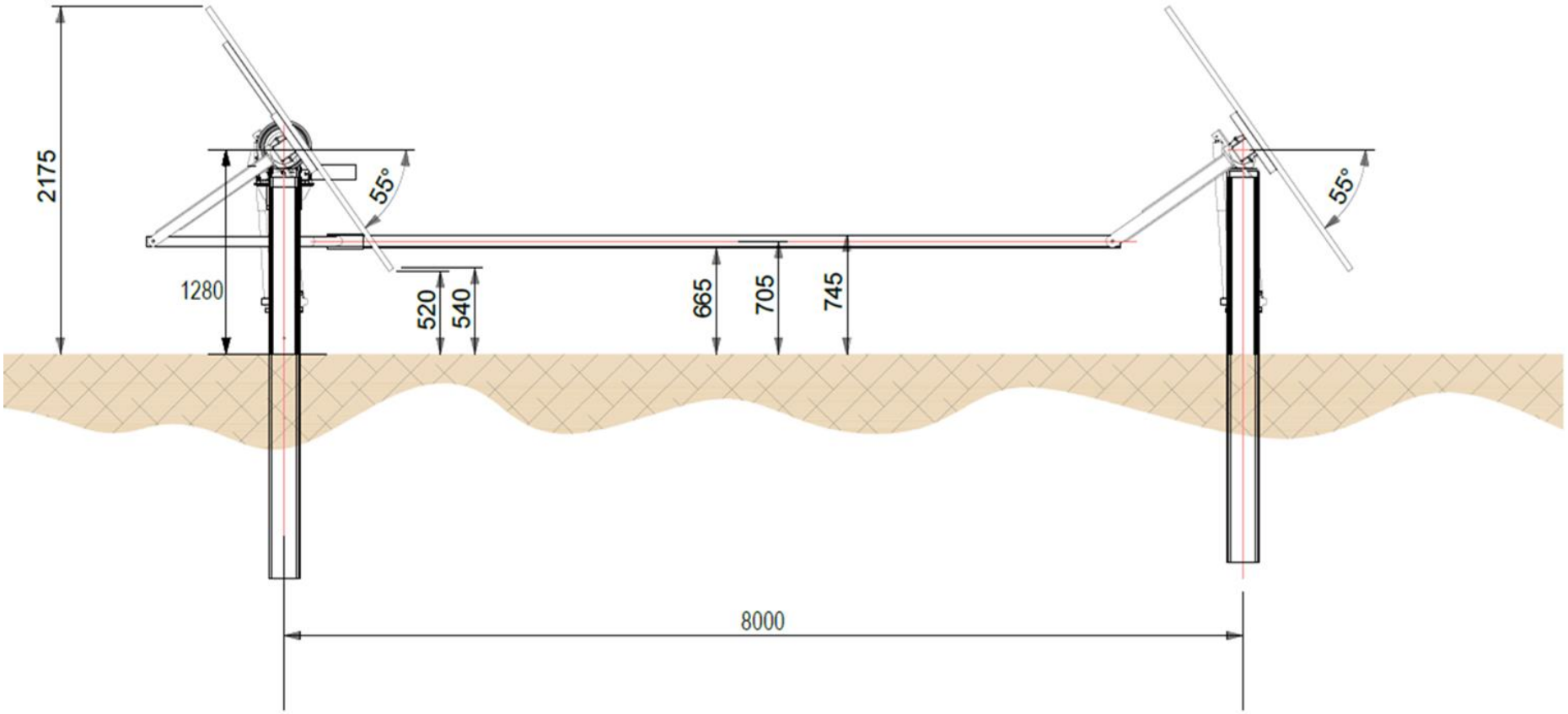
- Single axis tracker system – this is preferred as it optimises the yield output and is the standard for utility scale solar PV installation. Some additional benefits associated with this

technology include its robustness, long lifetime, the equipment prices have drastically decreased the past 10 years, it is easy to maintain, it does not cause any emissions and no waste is generated. The selected tracker type is the single axis E-W tracker system which specifically has its collector move from east to west tracking the suns movement throughout the day. A side view of proposed tracker mounting structure is provided in **Figure 21** below.

- Fixed mounted system – This is not preferred in utility scale solar PV plants as it is not able to generate as much energy as a solar PV system using a tracker system. This option will not be considered further.

A bifacial solar panel receives irradiation on both sides of the panel, which increases the yield. This is preferred over 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/)



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, or a combination of two or more technology alternatives, may 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 13.26** 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.

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 explanations of the specialist studies and their findings for specific environmental features.

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.

11.2 Land Use and Land Cover

The Project is located approximately 14km to the south of Bloemfontein's CBD. The areas affected by the proposed Project footprint are rural in nature. The Project's PV Site is vacant and was historically used for agricultural purposes. Historical Google Earth photos indicate that the farm has not been cultivated for the past two decades (Gouws, 2022).

The Project's power line route options mostly follow property boundaries. Route Option A and Route Option B run along the eastern and western parts of the University of the Free State (UFS) Paradys Experimental Farm, respectively. Both power line alignment options traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing.

Agriculture is the dominant land use in the Project Area. The following land uses are encountered around the Project's PV Site:

- The Paradys Small Holdings, Bloemfontein Shooting Centre and Maccauw Clay Target Club (amongst others) are located to the east, opposite the N6.
- The UFS Paradys Experimental Farm lies to the immediate north. The land to the west also belongs to the UFS;
- The Drina Engelbrecht Academy lies to the immediate south. This land is owned by the same party that owns the land on which the PV Site is proposed. The purpose of the Academy is to equip young people with practical skills on establishing eco-gardens

(https://www.findglocal.com/US/Silver-Spring/212020462264498/One-Year-in-Mission); and

- The Onze Rust Estate lies to the south-west.

According to Naidoo (2022), the land cover type within 15 km of the proposed Project site is dominated by cultivated land and natural grassland, with patches of fallow land and old fields. Formal residential areas are located north of the Project Area and areas of smallholdings are located northwest, northeast and directly east of the site. Refer to land cover map contained in **Figure 24** below.

Views of the Project's PV Site are provided in **Figure 22** and **Figure 23** below.

Figure 22: North-western view of PV Site from N6 (from the site's south-eastern corner)

Figure 23: South-western view of PV Site from N6 (from the site's north-eastern corner)

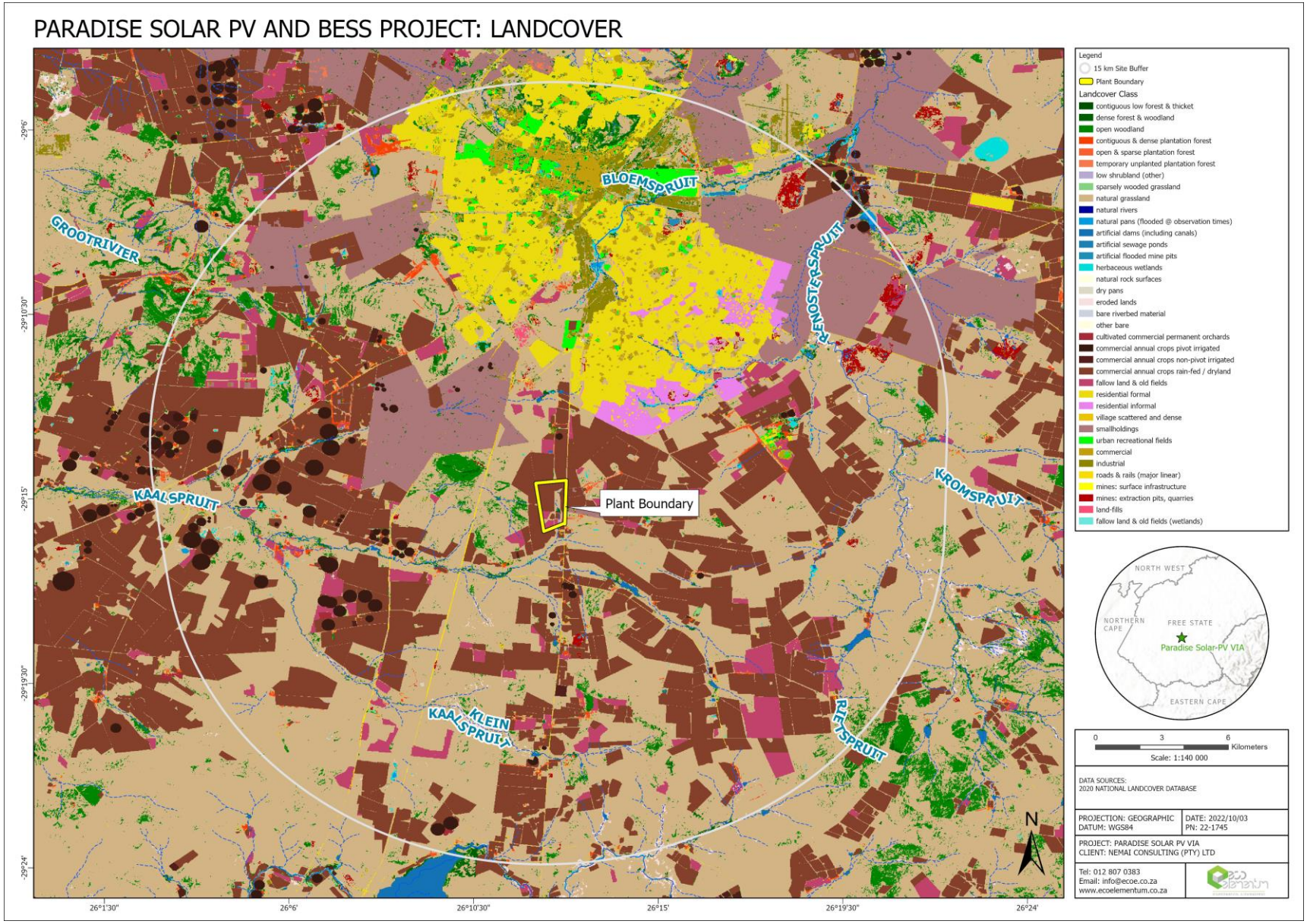


Figure 24: Land cover (Naidoo, 2022)

11.3 Climate

The climate in Bloemfontein, which is influenced by the local steppe climate, is classified as “BSk” by the Köppen-Geiger system. This defines the region as a semi-arid cold climate.

The mean minimum and maximum temperatures over the year are shown in **Figure 25** below. The average annual temperature is 16.7°C. The warmest month, on average, is January with an average temperature of 23.9°C. The coolest month on average is June, with an average temperature of 8.3°C. The average annual precipitation 558.8 mm.

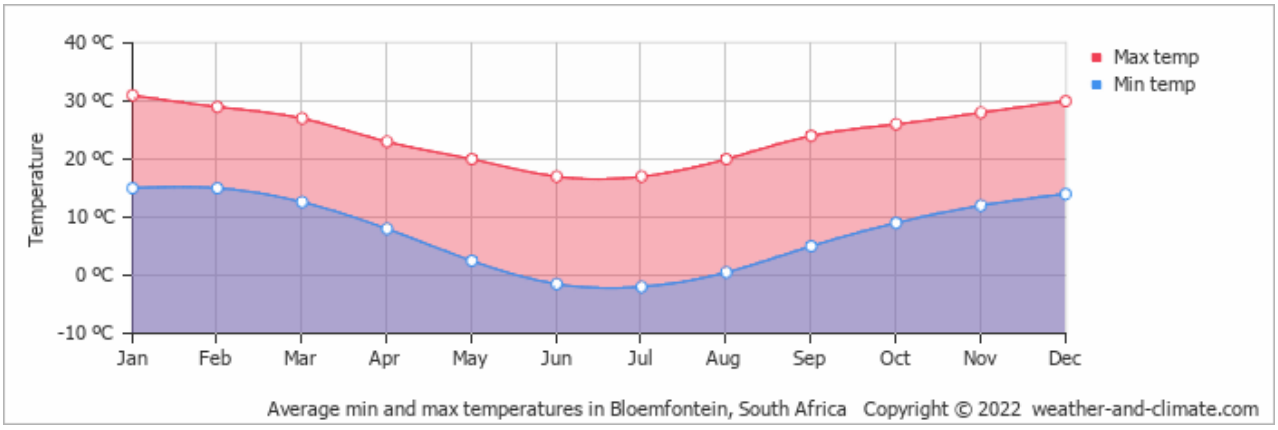


Figure 25: **Average minimum and maximum temperatures in Bloemfontein**
(Copyright © 2022 www.weather-and-climate.com)

The mean monthly precipitation over the year is shown in **Figure 26** below. The average annual precipitation 558.8 mm.

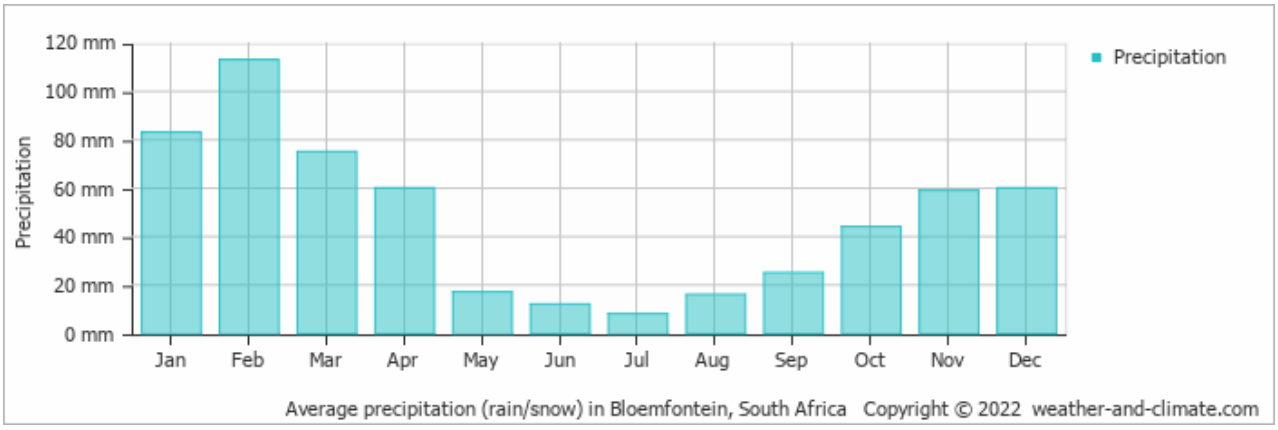


Figure 26: **Average minimum and maximum temperatures in Bloemfontein**
(Copyright © 2022 www.weather-and-climate.com)

11.4 Geology and Soil

The Project Area is underlain by the Adelaide Subgroup that forms part of the Beaufort Group (Karoo Supergroup). The Beaufort group overlays the Ecca Group and consists essentially of sandstones and shales, deposited in the Karoo Basin from the Middle Permian to the early part of the Middle Triassic periods. These sediments were deposited on land through alluvial processes. The Adelaide Subgroup contains alternating greyish-red, bluish-grey, or greenish grey mudrocks in the southern and central parts of the Karoo Basin with very fine to medium-grained, grey lithofeldspathic sandstones.

As shown in **Figure 27** below, most of the PV Site and power line route is characterised by soils with a pedocutanic horizon (S7). This soil type has high natural fertility. Limitations associated with this soil include restricted effective depth and slow infiltration. Freely drained, structureless soils are encountered in the southern part of the PV Site. This soil type may have restricted soil depth, excessive drainage, high erodibility, and low natural fertility.

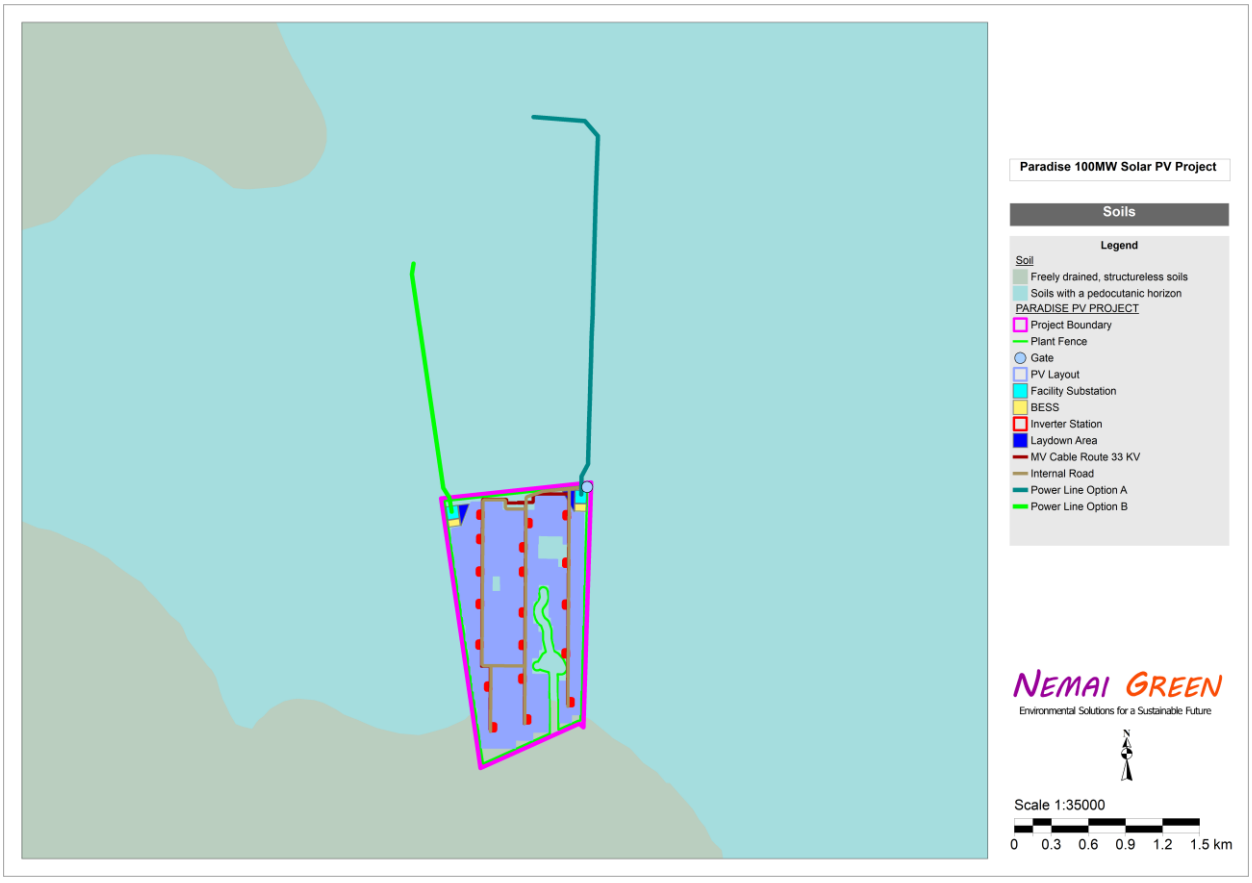


Figure 27: Soil description (PV Layout Option A)

The following is noted in the Agricultural Impact Assessment (Gouws, 2022) in terms of the properties of the soil encountered at the site (see **Figure 28** below):

- The underlying rock is arenite and mudstone of the Beaufort Formation of the Karoo System;

- Over time clay washed form the topsoil into the subsoil and formed highly developed blocky structure with cutanic features. These are expansive clays and on the lower lying area formed Duplex soils like Escourt, Sepane and Valsrivier;
- The topsoil is very compressible in the wet condition as is evident from the many deep tyre tracks, even on the soils where the water drains freely. However, the affect is more pronounced where the lithocutanic structure is close to the surface; and
- The structured subsoil varies in depth, and where more than 400 – 500 mm, was classified as Clovelly.

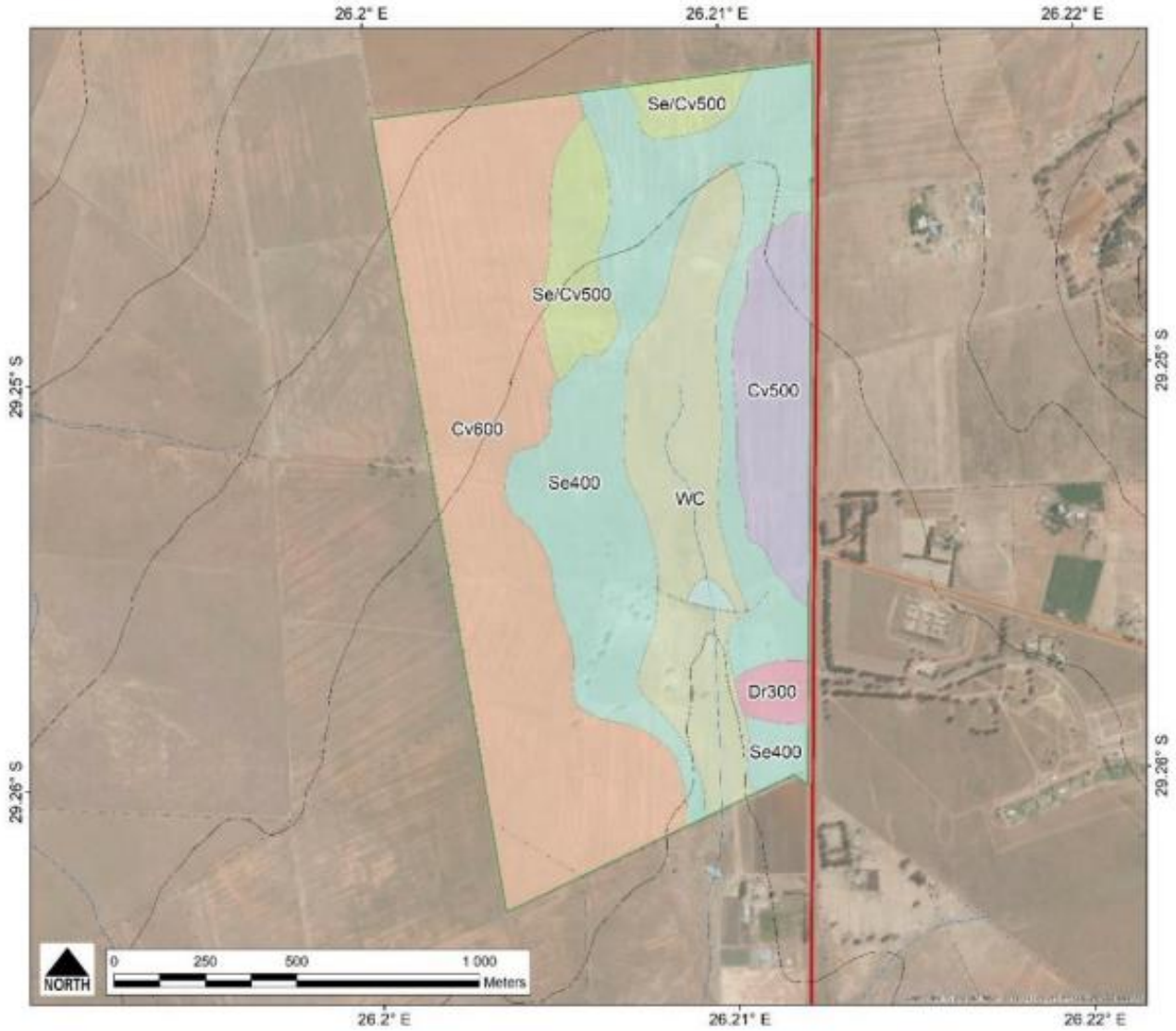


Figure 28: Soil map (Gouws, 2022)

11.5 Hydrogeology

Groundwater is an important source of rural water supply within the MMM and in the drier parts of the municipal area groundwater constitutes the main source of water for rural domestic supplies

and stock watering (MMM, 2020). Based on the appraisal of the site to date, there are no production boreholes located on the proposed PV Site.

The regional aquifer underlying the site was classified by the Department of Water Affairs and Forestry (DWAF) (2002) as D2: intergranular and fractured aquifers with borehole yields between 0.1 - 0.5 l/s.

11.6 Topography

In terms of the terrain morphology, the PV Site is characterised by plains with low relief. 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 level. The landform in the southern area of the PV Site is described as a valley at a medium level.

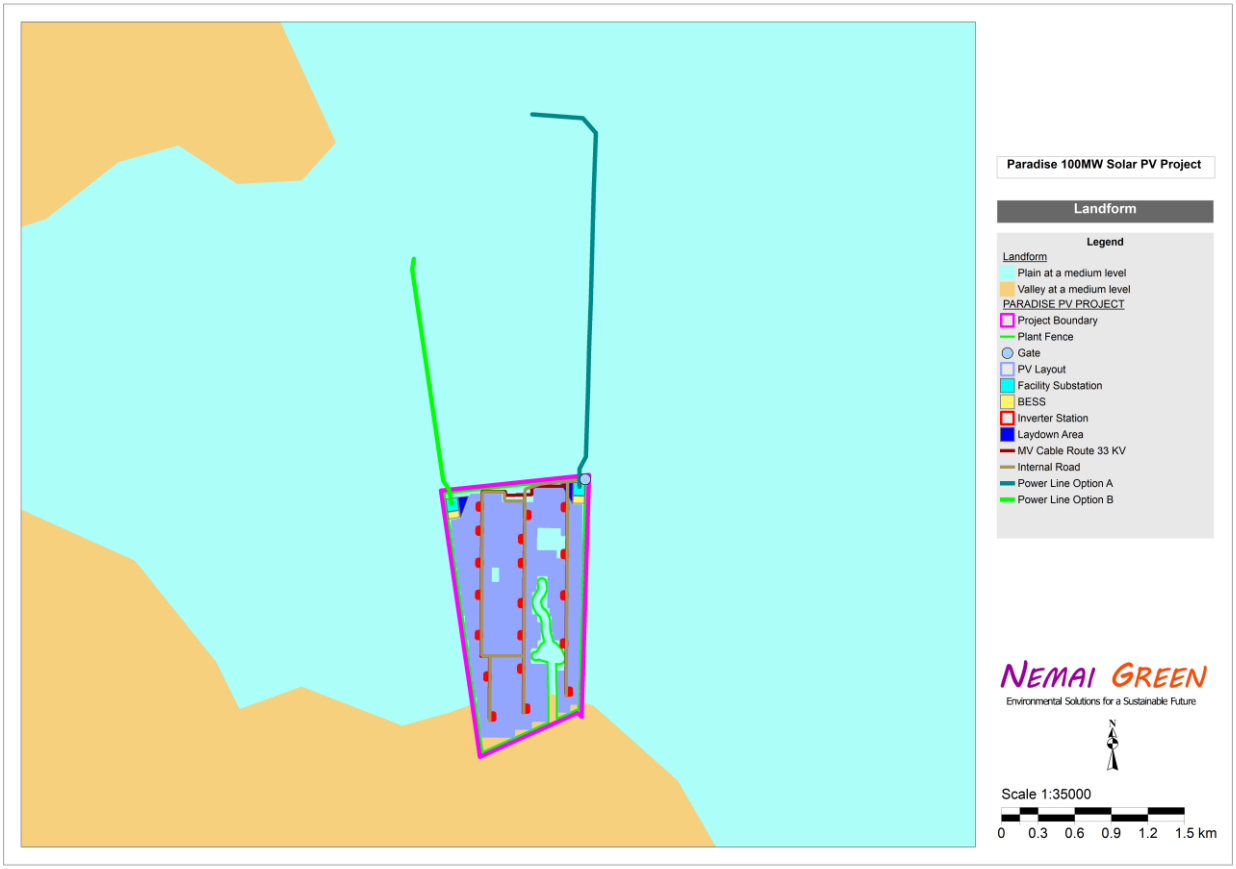


Figure 29: SOTER Landforms (PV Layout Option A)

The elevation profiles of the PV Site are as follows:

- From north to south the elevation drops from 1394m to 1385m above sea level over a distance of approximately 2km; and
- From west to east the elevation drops from 1391m to 1389m above sea level over a distance of approximately 1km.

According to the findings from the Screening Tool, areas of very high and high sensitivity in terms of the relative landscape (solar) theme occur in central part of the PV Site (see **Figure 30** below). This sensitivity relates to the Paradys Small Holdings that are located to the east, opposite the N6.

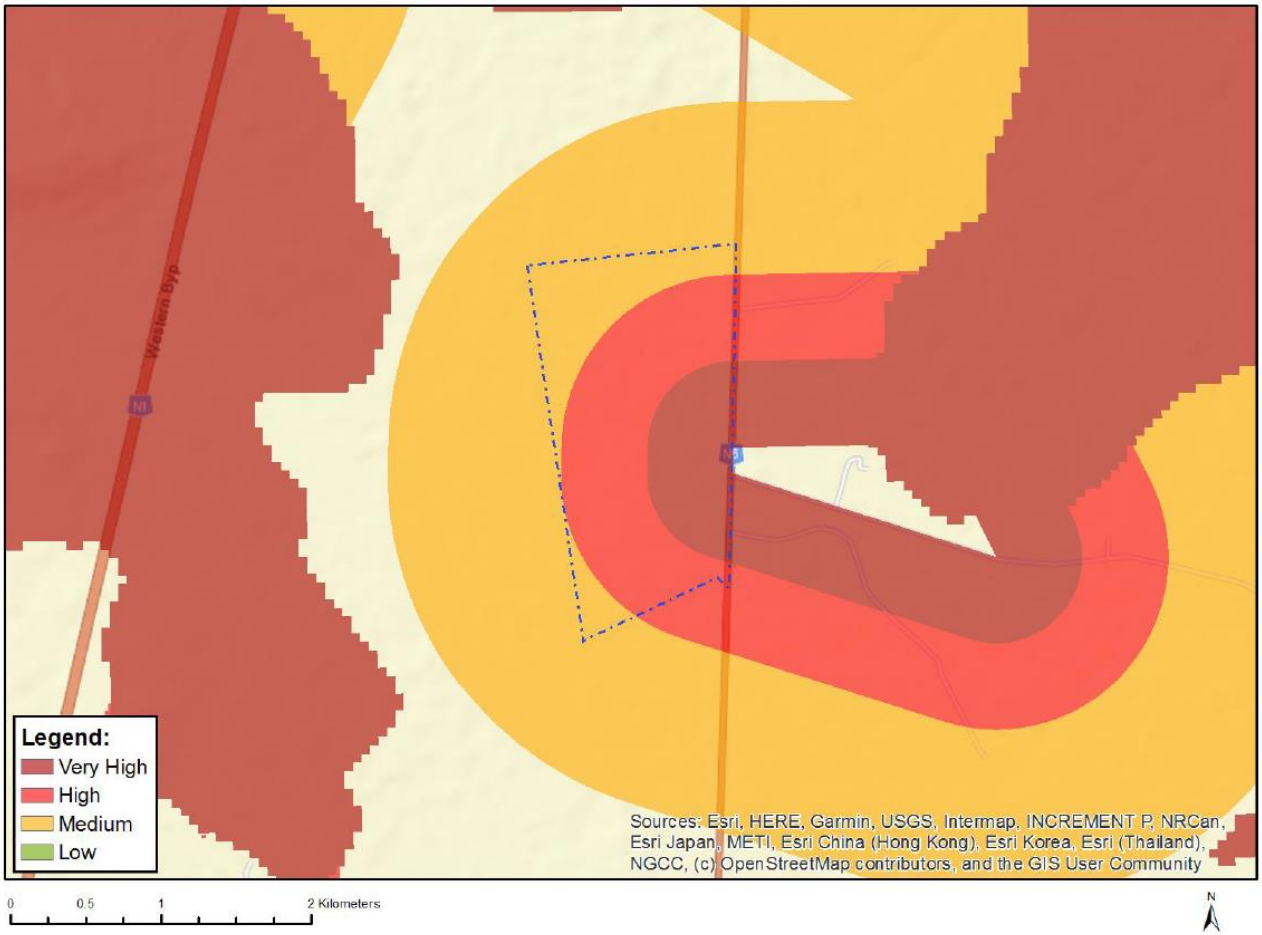


Figure 30: **Map of relative landscape (solar) theme sensitivity**

The findings of the Visual Impact Assessment that was undertaken for the Project are contained in **Section x** below. From a desktop study of satellite imagery and available national data, potential sensitive receptors were identified within 15 km of the proposed development and are presented in **Figure 31** below. Homesteads, schools, recreational facilities and tourist destinations were identified as potential sensitive receptors to the proposed Project. Areas of smallholdings (residential areas) were also identified. These areas are mostly located within the northern section of the 15 km radius, with a few smaller scattered areas along the south of the proposed site. The smallholdings of main interest is the Paradys Small Holdings located directly east of the proposed plant site. Residents within this area are expected to experience high levels of visual exposure from the proposed development.

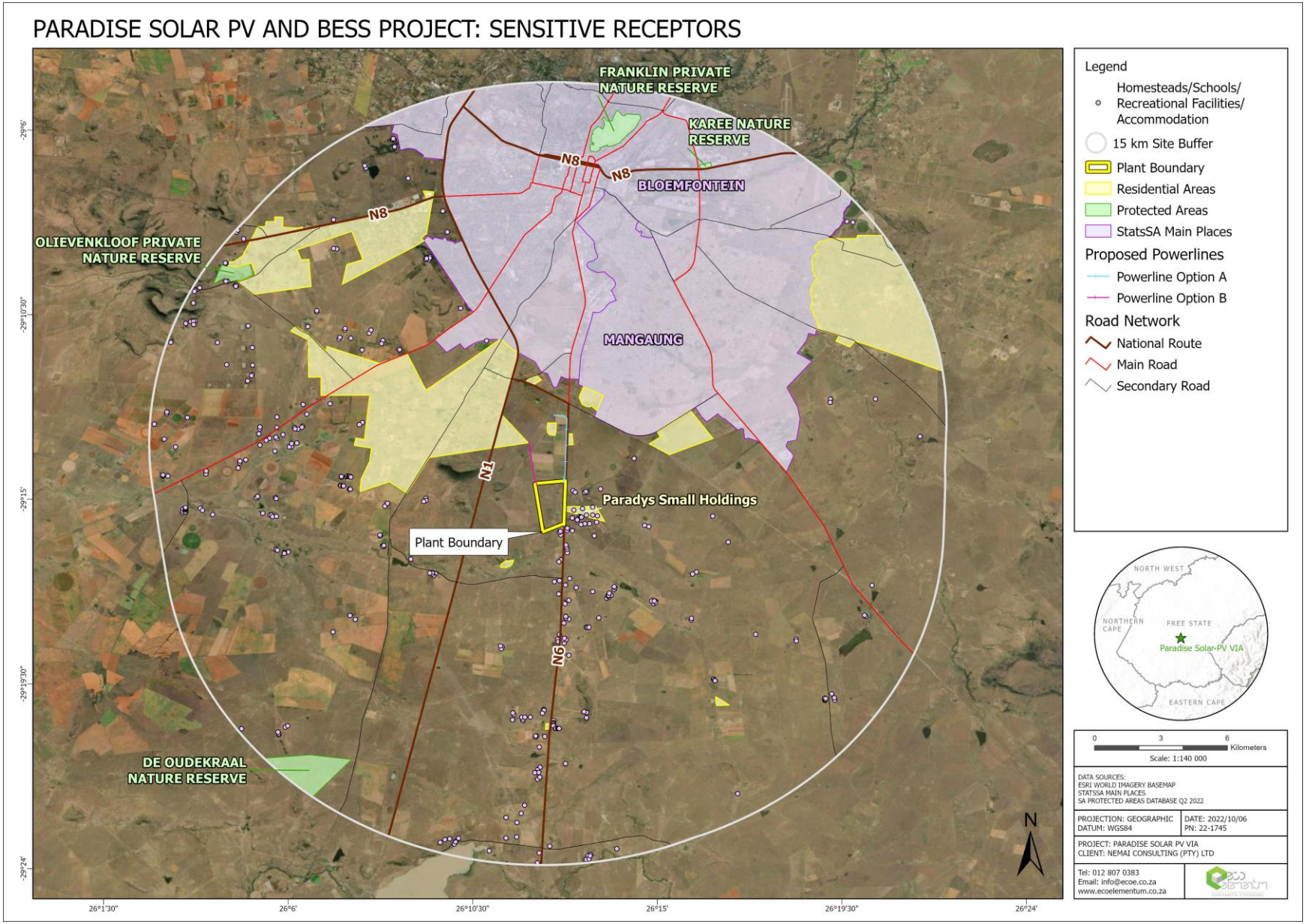


Figure 31: Sensitive receptors (Naidoo, 2022)

11.7 Surface Water

The information contained in the sub-sections to follow was extracted from the Wetland Delineation and Risk Assessment (Clark, 2022a). Refer to **Sections 12.4** and **13.12.2** below for a synopsis of the study and related impact assessment, respectively. The specialist report is contained in **Appendix E1**.

11.7.1 Quaternary Catchments and Water Management Areas

The Project Area is situated in the Middle Vaal Water Management Area (WMA) and more specifically the Quaternary Catchment C52J (see **Figure 32** below). Within this Quaternary Catchment the Kaalspruit has been assigned a desktop ecological importance and sensitivity of Moderate and a present ecological state of Moderately Modified. The main impacts listed for this system centre on dams, weirs, crop cultivation and sand roads.

11.7.2 National Freshwater Ecosystem Priority Area Status

To better conserve aquatic ecosystems, SA has categorised its river and wetland systems according to set ecological criteria to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the NEM:BA biodiversity goals (Nel *et al*., 2011).

Figure 33 below shows the location of the Project Area in relation to wetland FEPAs. Based on this information, the Project Area does not overlap with any class 1 FEPA Rivers or wetlands. The unchanneled valley-bottom wetland on the site ultimately drains into the Kaalspruit located approximately 1.2km to the south, which is not classified as a FEPA river.

11.7.3 National Wetland Map 5

The National Wetland Map 5 spatial data was published in October 2019 (van Deventer *et al*., 2018) in collaboration with the South African National Biodiversity Institute (SANBI) with the specific aim of spatially representing the location, type and extent of wetlands in SA. The data represents a synthesis of a wide number of official watercourse data including rivers, inland wetlands and estuaries. This database does not recognise the presence of any wetlands in the Project Area, the nearest being a Dry Highveld Bioregion Pan 2.3 km east of the Project Area (see **Figure 34** below).

11.7.4 Free State Biodiversity Conservation Plan

The Free State Conservation Plan classified areas within the province on the basis of its contribution to reach the conservation targets. These areas are classified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) to ensure sustainability in the long term. The CBAs are classified as either ‘Irreplaceable’ (must be conserved), or ‘Important’.

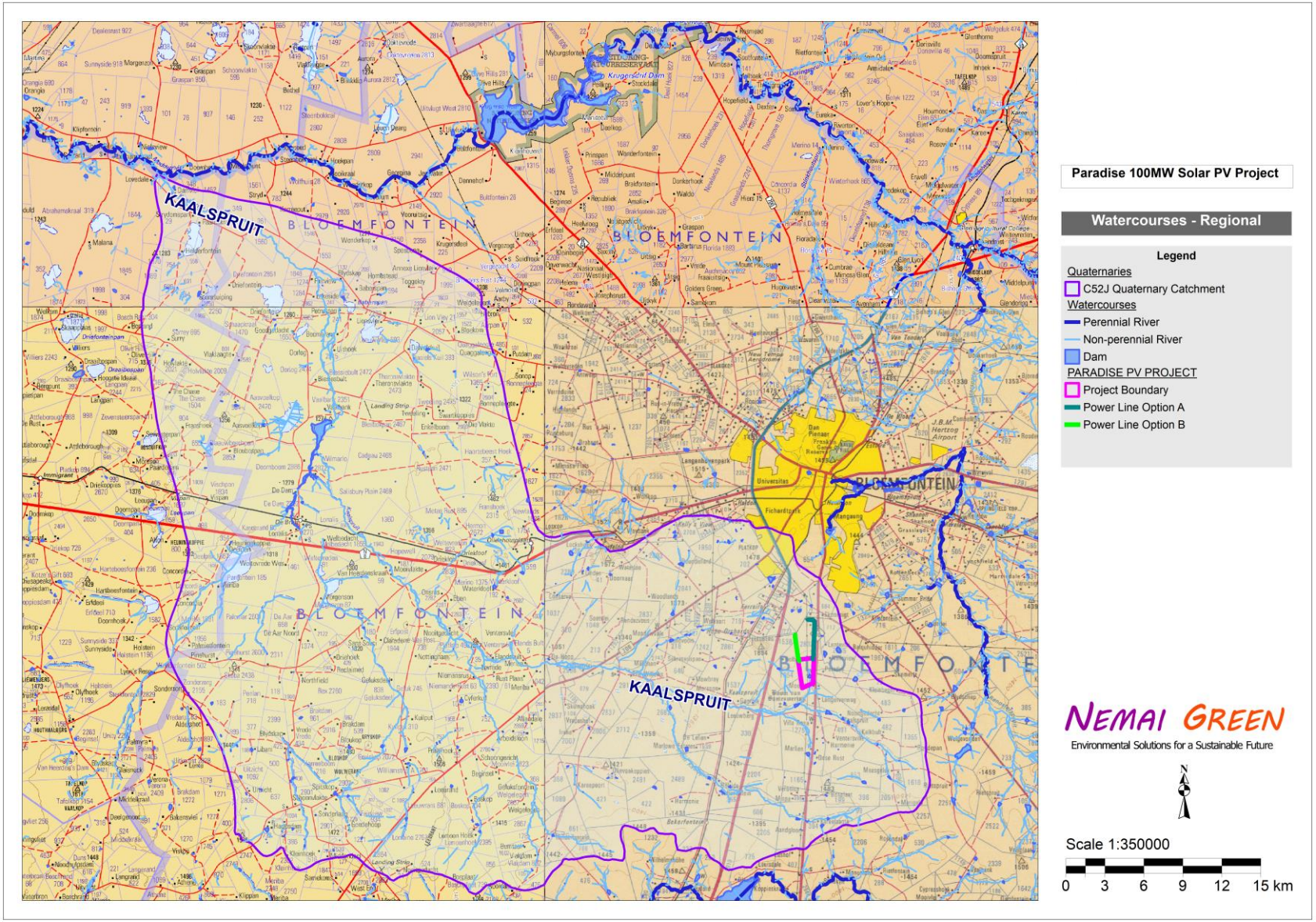


Figure 32: **Quaternary catchment and watercourses – regional map**

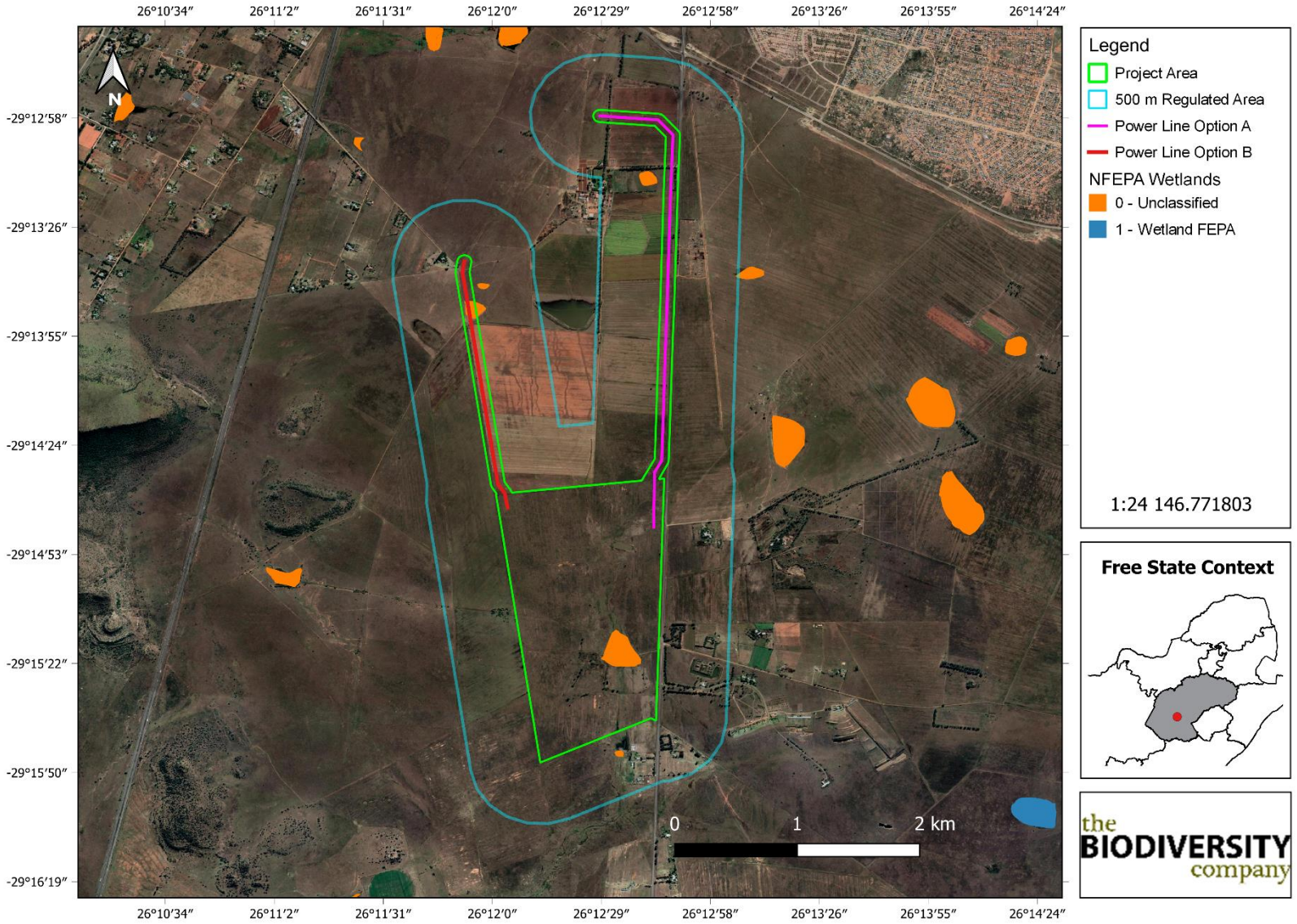


Figure 33: NFEPA Rivers and Wetlands in relation to Project Area (Clark, 2022a)

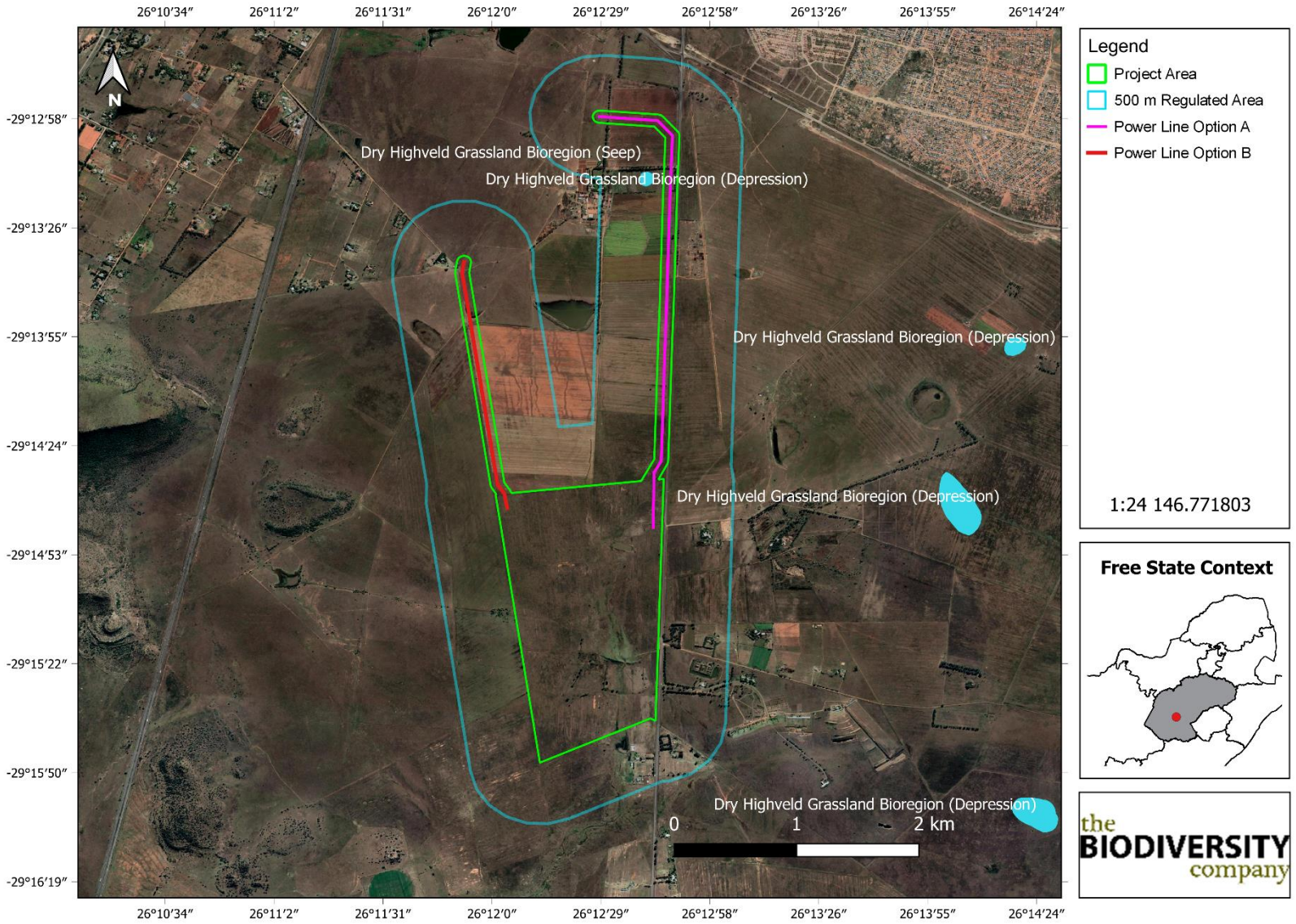


Figure 34: National Wetland Map 5 in relation to the Project Area (Clark, 2022a)

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. According to this spatial dataset, areas associated with the unchanneled valley-bottom wetland are classified as Other Natural Areas (ONAs) while all other portions of the Project Area are classified as Degraded (see **Figure 38** below).

11.8 Terrestrial Ecology

The information contained in the sub-sections to follow was extracted from the Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022). Refer to **Sections 12.5** and **13.13** below for a synopsis of the study and related impact assessment, respectively. The specialist report is contained in **Appendix E2**.

11.8.1 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). According to the spatial dataset, the proposed Project Area overlaps with a NT ecosystem (see **Figure 35** below).

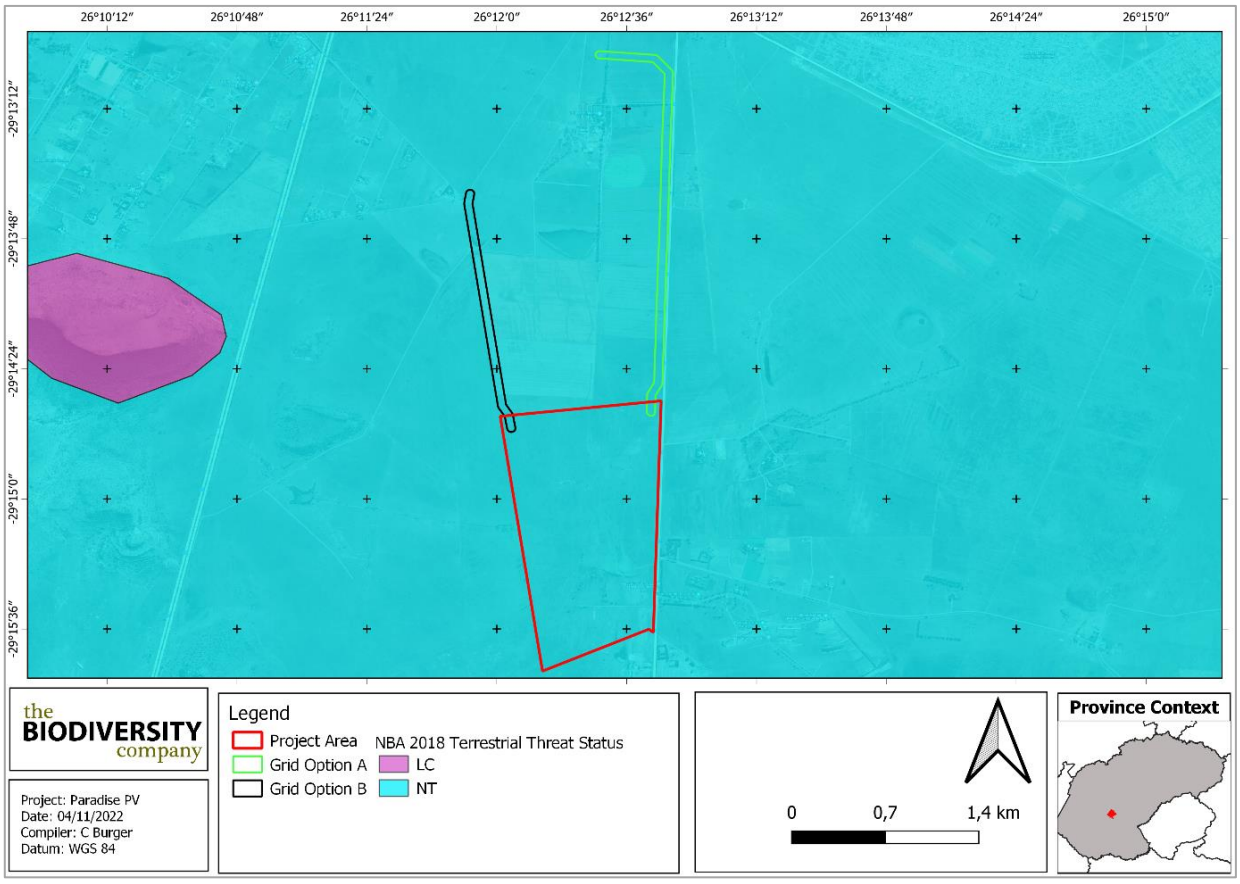


Figure 35: Ecosystem threat status associated with the Project Area (Jacobs & Burger, 2022)

11.8.2 Ecosystem Protection Level

Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed Project overlaps with a Poorly Protected ecosystem (see **Figure 36** below).

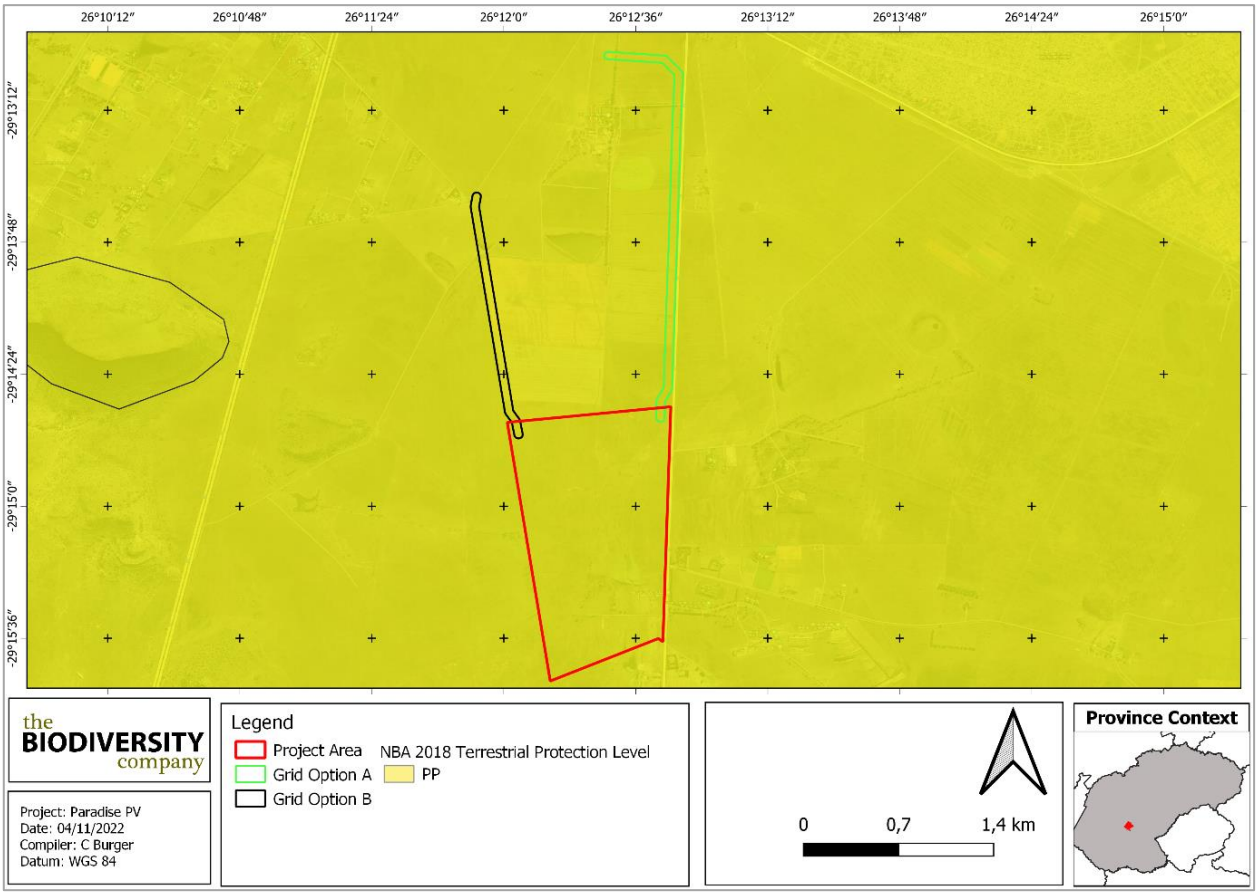


Figure 36: Ecosystem protection level associated with the Project Area (Jacobs & Burger, 2022)

11.8.3 Protected Areas

According to the South Africa Protected Areas Database (SAPAD) (2021) and the South Africa Conservation Areas Database (SACAD) (2021), the Project Area does not overlap with any protected areas or conservation areas. The Project Area also does not occur within the 5 km Protected Area Buffer Zone of any protected areas (see **Figure 37** below).

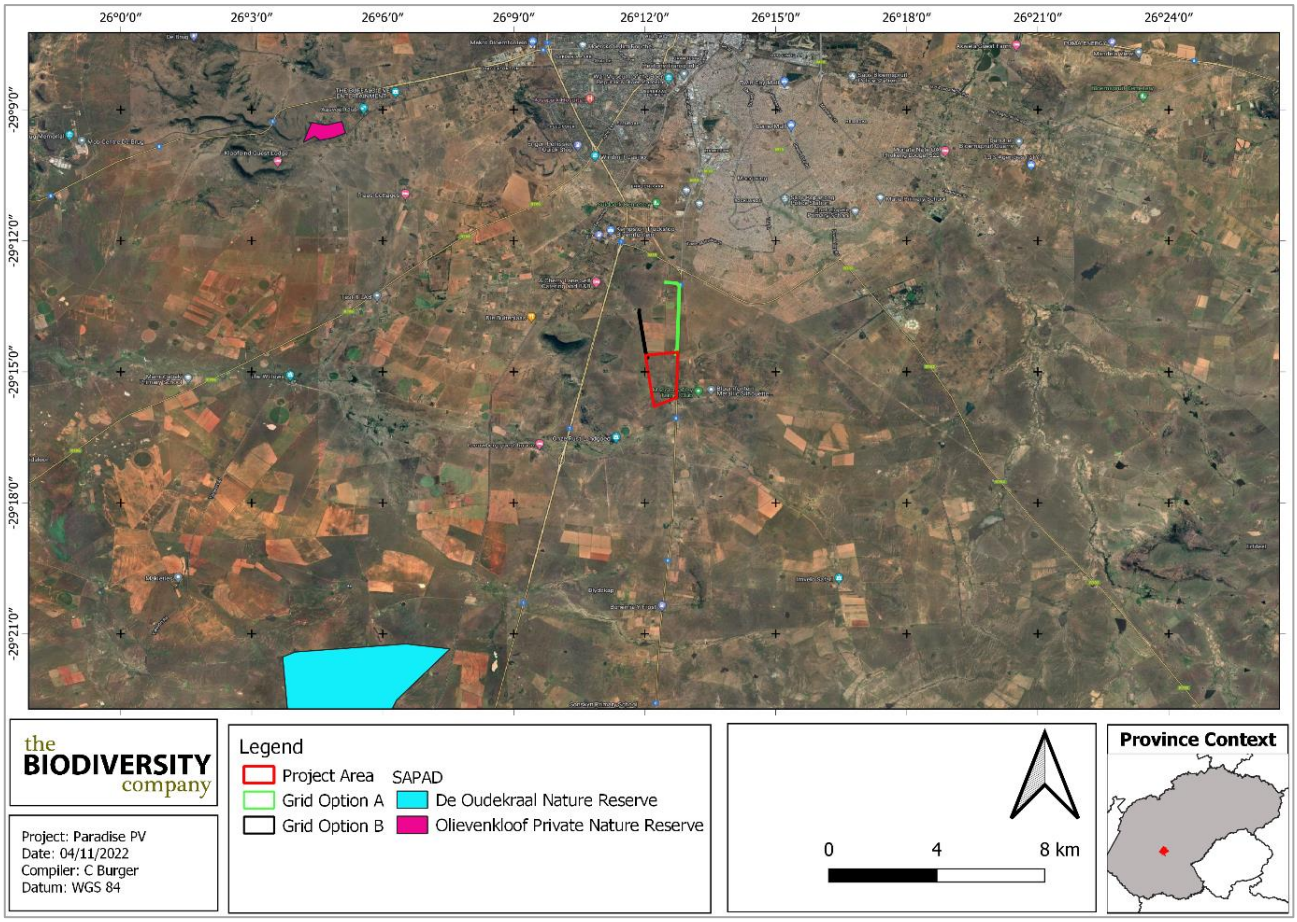


Figure 37: Project Area in relation to the nearest protected areas (Jacobs & Burger, 2022)

11.8.4 Critical Biodiversity Areas and Ecological Support Areas

The key output of a systematic biodiversity plan is a map of biodiversity priority areas. The CBA map delineates CBAs, ESAs, ONAs, Protected Areas, and areas that have been irreversibly modified from their natural state.

Figure 38 below shows the Project Area superimposed on the Terrestrial CBA map. The Project Area overlaps with a Degraded area as well as an ONA, while Grid Option B overlaps with a CBA 1.

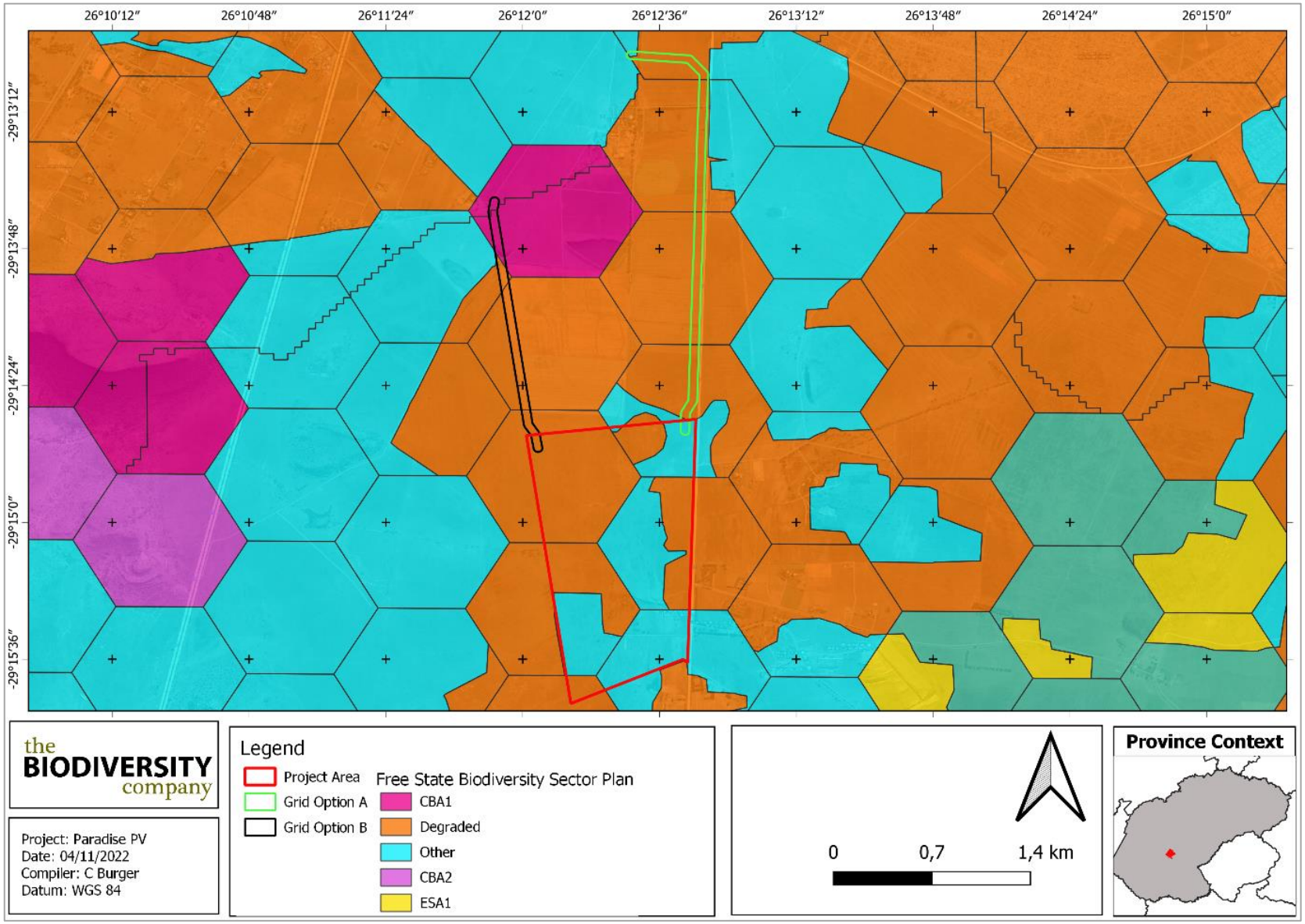


Figure 38: **Project Area in relation to CBAs (Jacobs & Burger, 2022)**

11.8.5 National Protected Area Expansion Strategy

The National Protected Area Expansion Strategy 2017 (NPAES) presents the best opportunities for meeting the ecosystem-specific protected area targets and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. The Project Area does not overlap with any Priority Focus Areas, as per the NPAES (see **Figure 39** below).

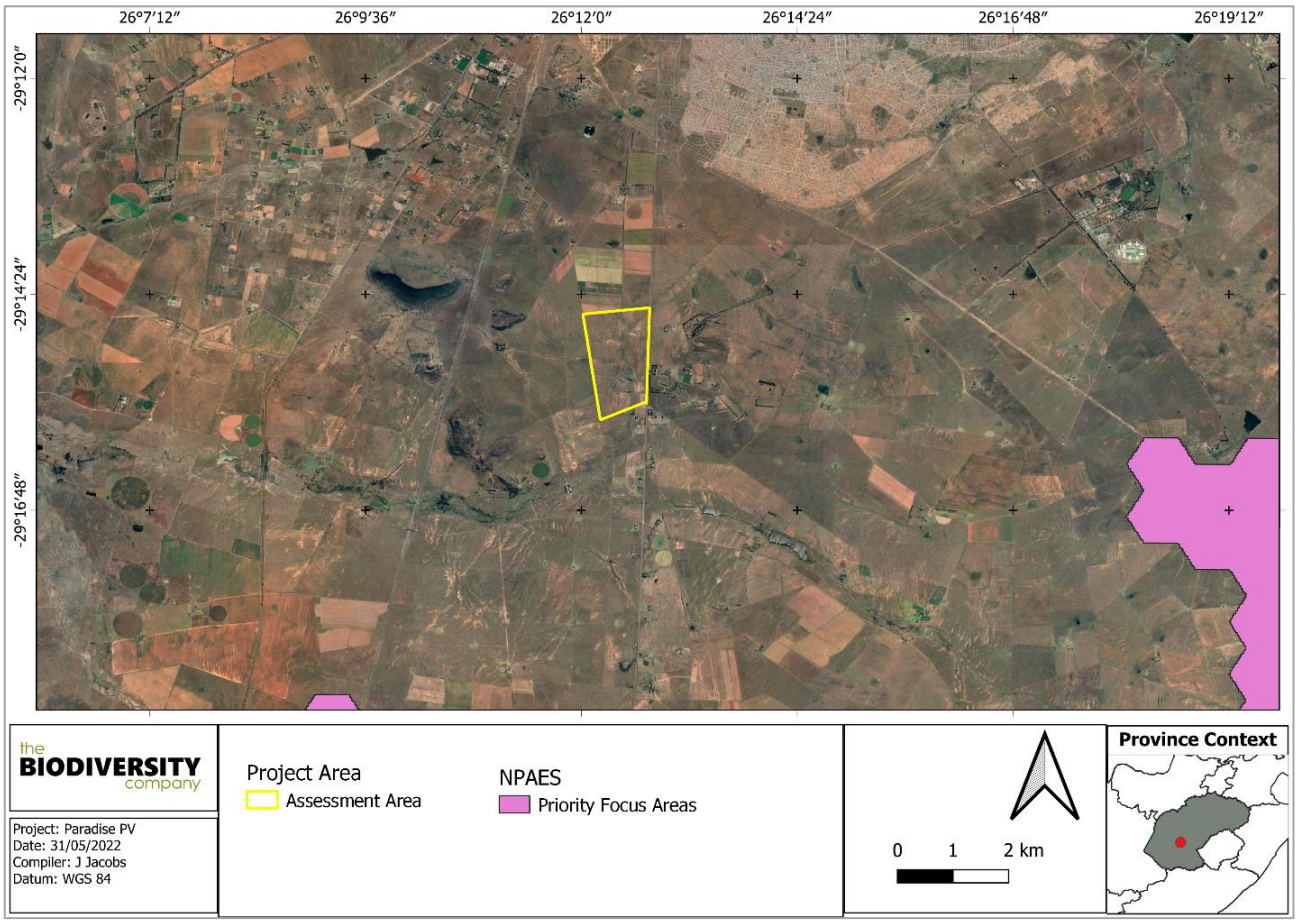


Figure 39: Project Area in relation to NPAES (Jacobs & Burger, 2022)

11.8.6 Flora Assessment

This section is divided into a description of the vegetation type expected under natural conditions and the expected flora species in the Project Area.

11.8.6.1 Vegetation Type

The Project Area is situated within the Grassland biome. On a fine-scale vegetation type, the Project Area overlaps with the Bloemfontein Dry Grassland (see **Figure 40** below).

Figure 40: Vegetation type associated with the Project Area (Jacobs & Burger, 2022)

The Bloemfontein Dry Grassland is characterised as a slightly undulating bottomland landscape covered with tall, dense grassland alternating with patches of karroid scrub, especially over calcrete (Mucina & Rutherford, 2006). It occurs only in the South-central part of the Free State Province, with Bloemfontein located more or less centrally in this vegetation type, hence the name (Mucina & Rutherford, 2006).

Important Taxa (d = dominant):

- Graminoids: *Anthephora pubescens* (d), *Aristida congesta* (d), *A. diffusa* (d), *Cynodon dactylon* (d), *Digitaria argyrograpta* (d), *Elionurus muticus* (d), *Eragrostis chloromelas* (d), *E. lehmanniana* (d), *E. obtusa* (d), *E. plana* (d), *E. superba* (d), *E. trichophora* (d), *Heteropogon contortus* (d), *Panicum stapfianum* (d), *Setaria sphacelata* (d), *Themeda triandra* (d), *Tragus koelerioides* (d), *Aristida stipitata* subsp. *graciliflora*, *Chloris virgata*, *Cymbopogon pospischilii*, *Pogonarthria squarrosa*, *Sporobolus fimbriatus*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*.
- Herbs: *Selago densiflora* (d), *Berkheya onopordifolia* var. *onopordifolia*, *Blepharis integrifolia* var. *clarkei*, *Chamaesyce inaequilatera*, *Commelina africana*, *Dicoma macrocephala*, *Gazania krebsiana* subsp. *krebsiana*, *Geigeria ornativa*, *Harpagophytum procumbens*, *Helichrysum caespititium*, *Heliotropium ciliatum*,

Hermannia comosa, *H*. *tomentosa*, *Indigofera alternans*, *Lactuca dregeana*, *Lotononis listii*, *Monsonia burkeana*, *Nolletia ciliaris*, *Pollichia campestris*.

- Geophytic Herbs: *Oxalis depressa* (d), *Haemanthus humilis* subsp. *humilis*.
- Succulent Herb: *Tripteris aghillana* var. *integrifolia*.
- Low Shrubs: *Chrysocoma ciliata* (d), *Felicia filifolia* subsp. *filifolia* (d), *Pentzia globosa* (d), *P*. *incana* (d), *Amphiglossa triflora*, *Anthospermum rigidum* subsp. *pumilum*, *Asparagus striatus*, *Felicia muricata*, *Gnidia polycephala*, *Helichrysum dregeanum*, *Nenax microphylla*, *Osteospermum leptolobum*, *Polygala hottentotta*, *Selago saxatilis*.
- Succulent Shrub: *Hertia pallens*.

The Bloemfontein Dry Grassland vegetation is classified as EN, with a conservation target of 24% (Mucina & Rutherford, 2006).

11.8.6.2 Expected Flora Species

Based on the Plants of Southern Africa (POSA) database, 590 species of indigenous plants are expected to occur within the Project Area. No floral Species of Conservation Concern (SCC) are expected to occur.

11.8.6.3 Field Survey

During the field assessment four habitat units have been identified and included wetland habitat in the central portion of the site, degraded grassland habitat that encompasses the majority of the Project Area, transformed areas located along the grid connections and secondary grassland found along the northern portion of Route Option B of the proposed power line.

These habitat units encountered on site are discussed further below.

Degraded Grassland Habitat (see **Figure 41** below)

The vegetation associated with the degraded grassland habitat comprised predominantly of graminoid species commonly associated with disturbed areas such as the pioneer grass *Aristida congesta* and the sub-climax grass *Eragrostis superba*. The state of the degraded grassland remains in a modified condition, which is supported by the fact that various alien and invasive species such as *Tagetes minuta*, *Verbena bonariensis*, *Eucalyptus camaldulensis* and *Bidens Pilosa* were observed throughout the area.

Figure 41: Degraded grassland habitat found across most of the Project Area (Jacobs & Burger, 2022)

Wetland (see **Figure 42** below)

The central portion of the Project Area is traversed by an unchanneled valley bottom wetland, which provided habitat to various hydrophytic plant species such as *Cyperus congestus*, *Schoenoplectus brachyceras*, and *Mariscus macrocarpus.* Additionally, a range of larger mature trees and smaller shrubs species were observed along this habitat unit and included species such as *Grewia occidentalis, Olea europaea, Asparagus laricinus* and *Searsia lancea. Olea europaea* is listed as protected under Schedule 6 (Section 30) of the Free State Nature Conservation Ordinance 8 of 1969.

Figure 42: Wetland habitat in the Project Area (Jacobs & Burger, 2022)

Secondary Grassland Habitat (see **Figure 43** below)

This grassland habitat has been exposed to modifications due to land use and mismanagement but differs from the degraded grassland in the extent of disturbance that has taken place, with the degraded grassland being exposed to more severe disturbance.

This habitat unit can be regarded as important, not only within the local landscape, but also regionally. The unit functions as remaining greenlands, which supports viable indigenous plant species populations and is also used for foraging. The unit also serves as a movement corridor for fauna within a landscape mainly fragmented by anthropogenic activities.

Figure 43: Secondary grassland habitat in the Project Area (Jacobs & Burger, 2022)

Transformed (see **Figure 44** below)

The transformed habitat is associated with existing agricultural fields. As such the area has little to no remaining natural vegetation due to land transformation to accommodate agricultural activities. This habitat exists in a constant disturbed state as it cannot recover to a more natural state unless through human intervention.

Figure 44: Representative photograph of transformed habitat in the Project Area (Jacobs & Burger, 2022)

11.8.7 Faunal Assessment

11.8.7.1 Amphibians

Based on the International Union for Conservation of Nature (IUCN) Red List Spatial Data and AmphibianMap, 13 amphibian species are expected to occur within the area. None are regarded as threatened.

11.8.7.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 46 reptile species are expected to occur within the area. None are regarded as threatened.

11.8.7.3 Mammals

The IUCN Red List Spatial Data lists 66 mammal species that could be expected to occur within the area. This list excludes large mammal species that are limited to protected areas. Twelve of these expected species are regarded as threatened (see **Table 10** below), and nine of these have a low likelihood of occurrence based on the lack of suitable habitat and the level of disturbance nearby to the Project Area.

Aonyx capensis (Cape Clawless Otter) is predominantly aquatic, and it is seldom found far from water. Based on the presence of a nearby wetland area and seasonal stream, the likelihood of occurrence of this species occurring in the Project Area is considered to be moderate.

Table 10: Threatened mammal species expected to occur within the Project Area (Jacobs & Burger, 2022)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Aonyx capensis	Cape Clawless Otter	NT	NT	Moderate
Atelerix frontalis	South African Hedgehog	NT	LC	Low
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Moderate
Leptailurus serval	Serval	NT	LC	Moderate
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	LC	Low
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	NT	LC	Low

Hydrictis maculicollis (Spotted-necked Otter) inhabits freshwater habitats where water is un-silted, unpolluted, and rich in small to medium sized fishes. Suitable habitat may be available across the Project Area and therefore the likelihood of occurrence is moderate.

Leptailurus serval (Serval) are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Grasslands are present in the Project Area and as such the likelihood of occurrence is rated as moderate.

11.8.7.4 Field Survey

Mammal activity was low as only evidence of *Atilax paludinosus* (Marsh Mongoose) was observed during the assessment. There is the possibility of additional common mammal species being present across the Project Area. One amphibian species, *Xenopus laevis* (Common Platanna) was observed within the wetland habitat. No reptile species were observed. However, there is the possibility of at least several species being present, as certain reptile and amphibian species are secretive and longer-term surveys are required in order to ensure adequate sampling. Due to the close proximity of the site to the town and the limited in-tact and suitable habitat found within the Project Area, it is unlikely that any mammal or herpetofauna SCC will occur nearby.

11.8.8 Avifaunal Assessment

A separate Avifaunal Baseline and Impact Assessment (Clark, 2022b) was undertaken for the Project. The information to follow was extracted from this study. Refer to **Sections 12.6** and **13.14** below for a synopsis of the study and related impact assessment, respectively. The specialist report is contained in **Appendix E3**.

The Project Area is not situated within any national or global Important Bird and Biodiversity Area (IBA) as designated by Birdlife. The closest IBA is the Soetdoring Nature Reserve (see **Figure 45** below).

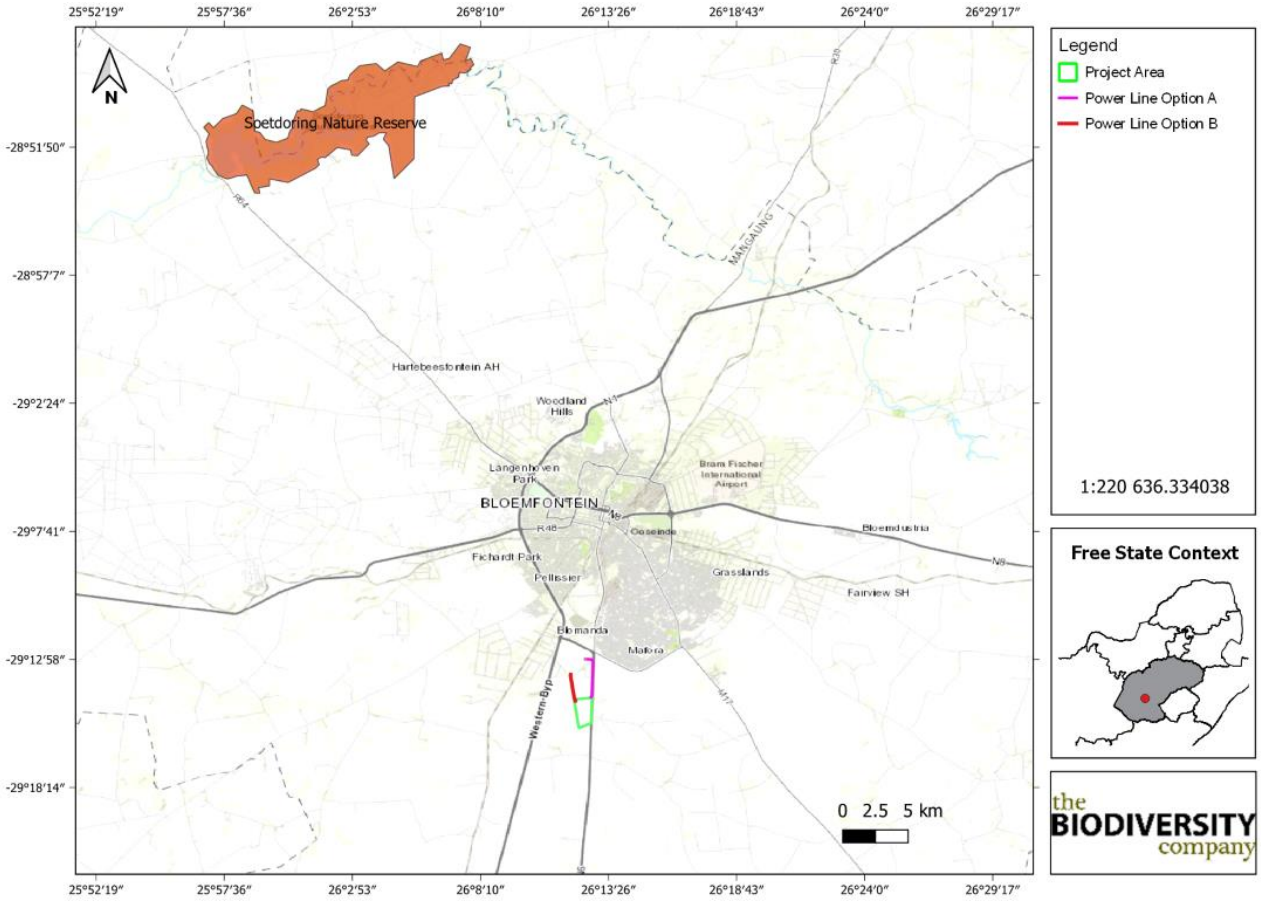


Figure 45: Project Area in relation to the nearest IBA (Clark, 2022b)

A total of 191 bird species have been recorded during South African Bird Atlas Project 2 (SABAP2) surveys within the two pentads (2910_2610 and 2915_2610) covering the Project Area. This inventory is considered to be a slightly under representative, portrayal of the regional diversity. Consequently, this list was supplemented with additional species known to occur and expert knowledge of avifauna from the region. This integrated inventory (including some 260 regionally occurring species) was used as the basis for the project's species probability list.

11.9 Socio-Economic Environment

The following information was sourced from the municipal SDF (MMM, 2020).

- **Demographic Profile –**
  - The MMM represents approximately 28% of the provincial population.
  - During the period 2011 to 2019, the Mangaung population increased from 775,028 to 878,834 – an increment of about 104,749 people which translates to around 13,000 people per annum.

- This population growth rate (1,6% per annum) is significantly higher than that of the Free State Province.
- The population represents an estimated 285,385 households at an average household size of 3,1 people per household.
- About 65% of all households reside in Mangaung/Bloemfontein; 31% in Botshabelo-Thaba Nchu, 3% in the other small towns and 2% in the farm areas.
- The household increment during the period 2011 to 2019 is approximately 4,4750 which translates to approximately 5,594 households per annum.
- The male:female ratio in the MMM is about 48:52.
- The age group 0-14 represents 30% of the population in 2016 compared to 28% in 2011, and the age group 15-29 years represents about 28% in 2016. This implies that about 58% of the population is younger than 30 years.
- 14% of the population had no schooling in 2016 and from the 2011 figures, it is evident that the rural areas (farm areas) represent the larger portion of people with no schooling.
- Only about 9% of the population had a tertiary qualification which shows limited post school training/ skills development which is a concern.
- Approximately 61% of all households earn less than R 3,500 per month (which is the threshold for government subsidized housing).
- About 76% of all dwelling units are formal houses while informal dwellings (backyard and informal settlements) represent about 11% of all housing stock in the municipality. In Mangaung/Bloemfontein this figure is higher at about 14% and even higher (16%) in Botshabelo/Thaba Nchu and 18% in the other small towns.

❑ **Economic and Employment Profile –**

- The MMM recorded a GVA amounting to R 85,5 billion in 2018 which represents about 40,5% of the Free State Provincial GVA (R 218,7 billion) and 2% of the National GVA (R 4,341,3 billion).
- In line with National and Provincial trends, the economic growth rate of MMM has been declining since 2012 when it was around 4,2%, compared to the 0,9% recorded in 2018.
- The primary sector contributes a mere 3% to the economy of the MMM while the secondary sector represents 12% of the GVA. The tertiary sector dominates the municipality's economy by contributing about 85% of the GVA.
- Community services (33%) and Finance (21%) are the largest contributors followed by Trade (17%) and Transport (13%).
- Manufacturing (6%) is the largest contributor in the Secondary Sector while Agriculture contributes about 2% and Mining only 1% to the GVA.
- In terms of employment, the MMM holds an estimated 270,389 workers (job opportunities) of which about 13,051 (5%) are in the Primary Sector, 36,511 (14%) in the Secondary Sector and 220,826 (82%) in the Tertiary Sector.
- Community Services (29%) and Trade (22%) are the largest contributors to employment, followed by Finance (14%) and Households (12%). Construction (7%) and Manufacturing

(6%) are the largest contributors in the Secondary Sector while Agriculture contributes about 3% of all job opportunities in the municipality.

- The estimated unemployment rate (2018) stands at approximately 27,1% which is about 1,8 percentage points higher than the 25,3% recorded in 2011.
- The MMM unemployment rate is in line with the national average but slightly less than the average for Free State Province.

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

11.10 Agriculture

General land uses within 5km of the site are livestock grazing (see **Figure 46** below). Large tracts that are now fallow with only small portions that are cultivated. Directly north of the proposed PV site is the cultivated land of the UFS Paradys Experimental Farm. Water to irrigate the small portion of land on the research farm is pumped form boreholes.

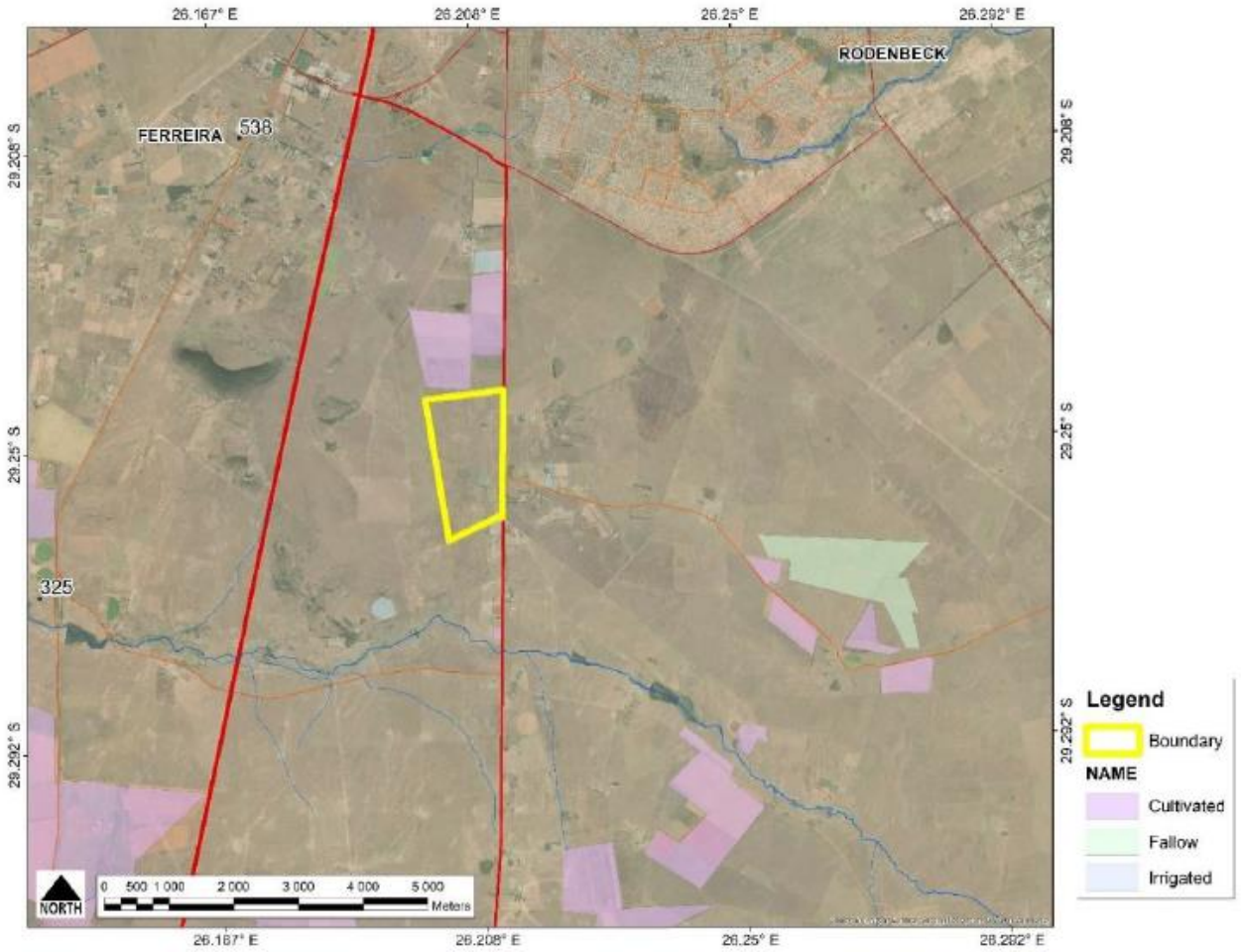


Figure 46: Regional land use (Gouws, 2022)

The Project's PV Site is vacant and was historically used for agricultural purposes. The Project's power line route options primarily follow property boundaries and traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing. Route Option A and Route Option B run along the eastern and western parts of the UFS Paradys Experimental Farm, respectively. Both power line alignment options traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing (see **Figure 47** below).

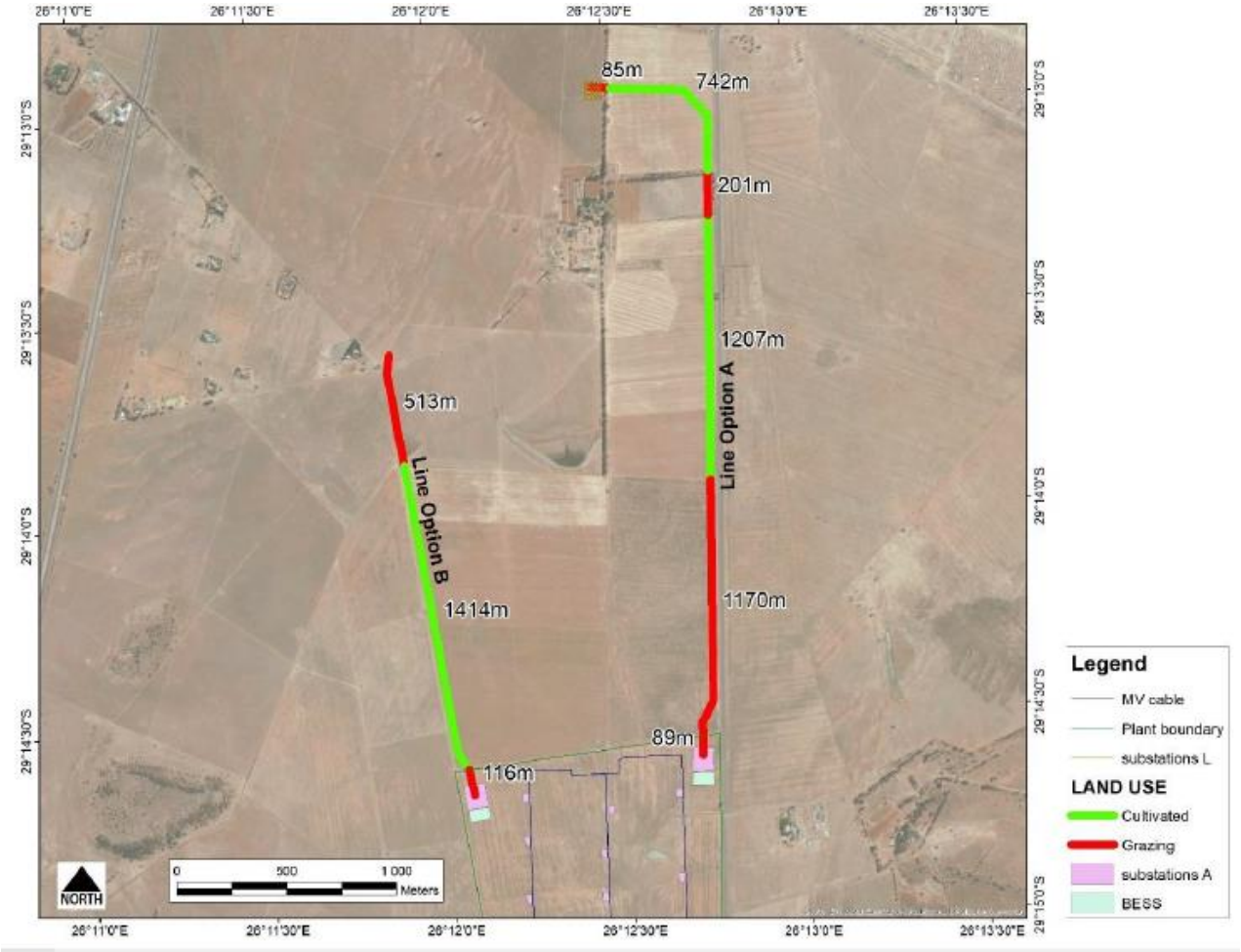


Figure 47: Land uses along the proposed power line route options (Gouws, 2022)

The findings from the Agricultural Impact Assessment that was undertaken for the Project are contained in **Section 12.7** below.

11.11 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 the N6, N1 and other surrounding roads as well as on roads inside Bloemfontein;
- 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.

11.12 Noise

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

11.13 Cultural Heritage & Palaeontological Features

11.13.1 Cultural Heritage

The information to follow was obtained from the Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2022) (contained in **Appendix E5**). Refer to **Sections 12.8** and **13.16** below for a synopsis of the study and a related impact assessment, respectively.

The cultural landscape qualities of the region are made up of a pre-colonial element consisting of very limited Stone Age and Iron Age occupation, as well as a much later colonial (farmer) component, which eventually gave rise to an urban component.

From a review of the available old maps and aerial photographs (see **Figure 48** below) it can be seen that the Project Area has always been open space, with the main activity being agricultural fields. The only built structure development visible are two dams. Neither of these dams are operational as both have been breached some years ago during heavy flooding brought on by stormwater management systems implemented to the northeast of the Project Area. A small rectangular structure of brick was identified in close proximity of the southern dam. Its function is unknown, but it is assumed that it might have served as a pumpstation for the dam.

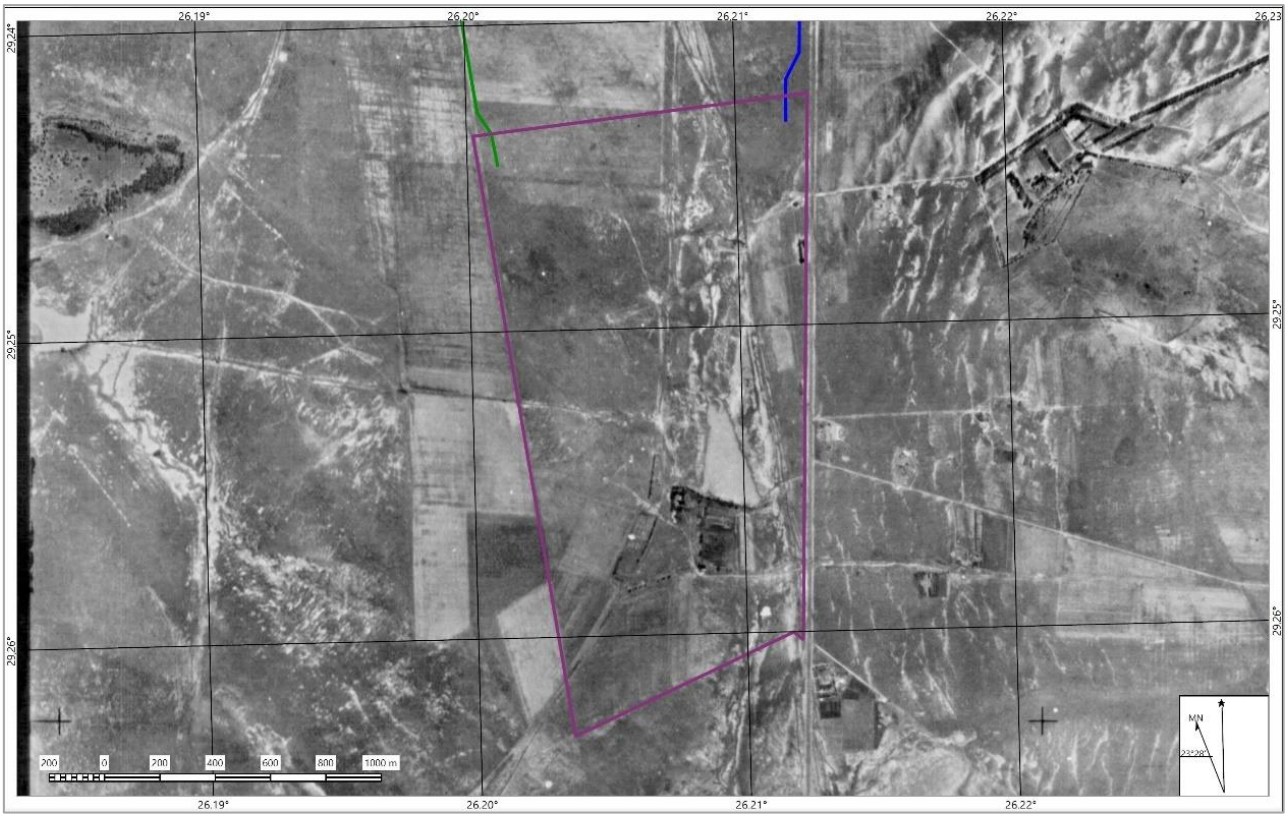


Figure 48: Aerial view of the project area dating to 1950 (NGI photographs: 246_008_00103) (van Schalkwyk, 2022)

11.13.2 Palaeontological Features

The information to follow was obtained from Palaeontological Impact Assessment (Butler, 2022) (contained in **Appendix E6**). Refer to **Sections 12.9** and **13.17** below for a synopsis of the study and a related impact assessment, respectively

The proposed site is underlain by Permian aged sandstone and shale of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). Updated geology indicates that the development is underlain by the Balfour Formation of the Adelaide Subgroup. According to the PalaeoMap of SAHRIS, the Palaeontological Sensitivity of Adelaide Subgroup (Beaufort Group, Karoo Supergroup) is Very High (see **Figure 49** below).

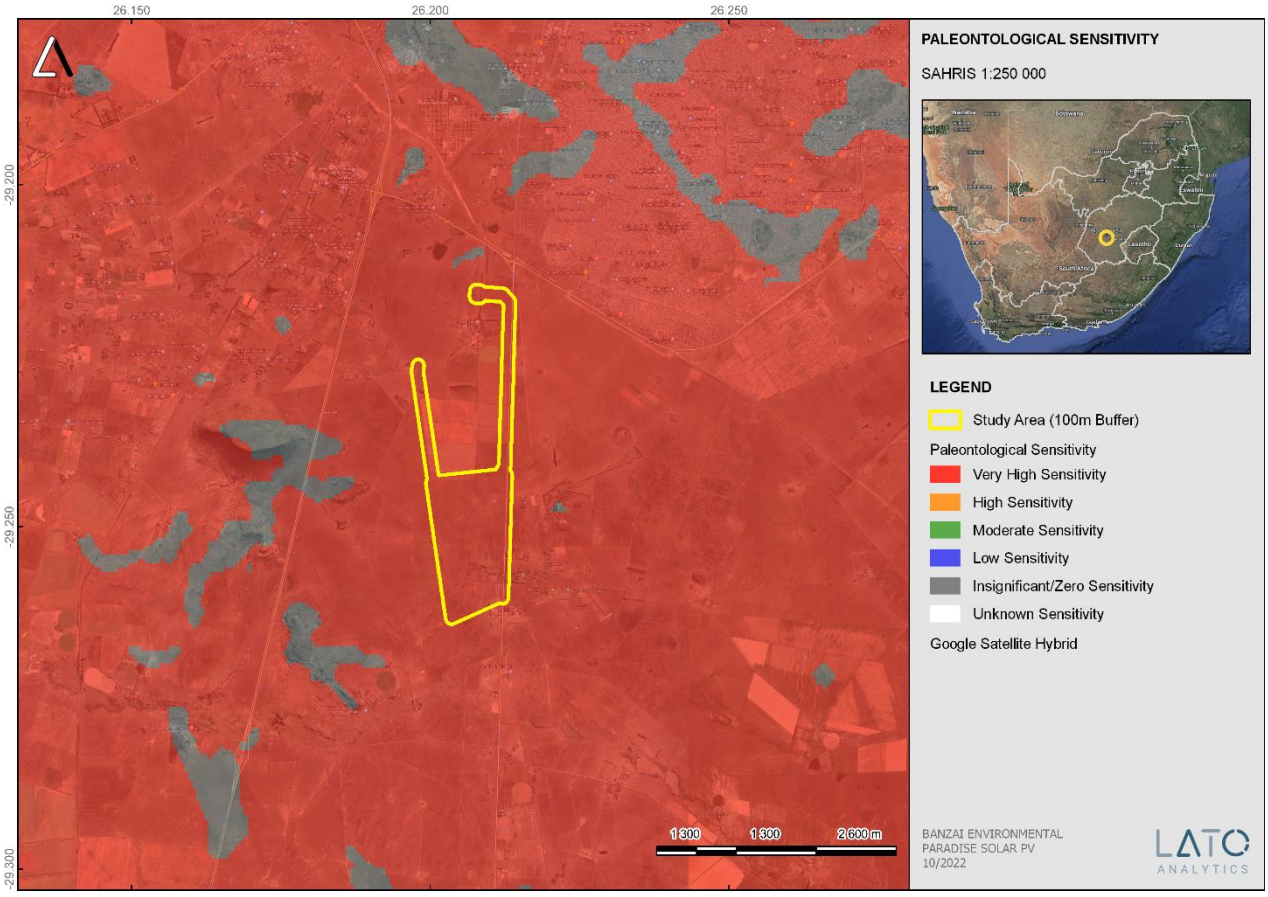


Figure 49: **Extract of the 1 in 250 000 SAHRIS PalaeoMap map (Council of Geosciences) indicating the development in yellow (Butler, 2022)**

11.14 Planning

The following is noted from a planning perspective:

- The Project's power line route options mostly follow property boundaries. Route Option A and Route Option B run along the eastern and western parts of the UFS Paradys Experimental Farm, respectively.
- The proposed PV Site and power line are located outside of the urban edge and should not impact on future urban expansion.
- The Composite Metropolitan SDF for MMM, based on the spatial vision, spatial concept and spatial strategies, is presented in **Figure 50** below. The Project falls within an area that is designated for crop farming in terms of the SDF (MMM, 2020). The SDF notes that commercial mixed crop farming and cattle farming dominates the landscape surrounding the Bloemfontein urban complex. The findings from the Agricultural Impact Assessment that was undertaken for the Project are contained in **Section 12.7** below.
- 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.

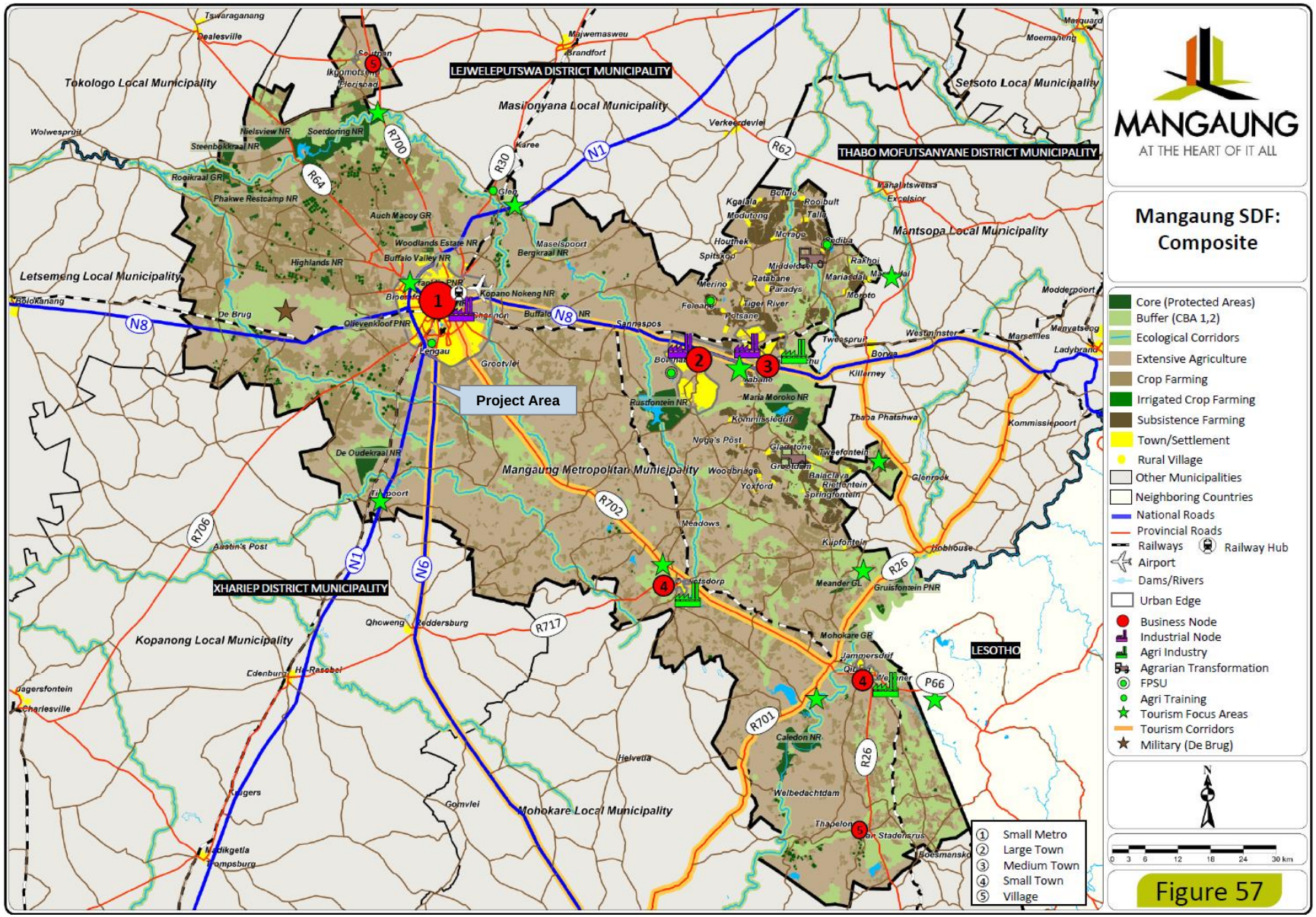


Figure 50: Composite Metropolitan SDF (MMM, 2020)

- 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 6.9** above). The nearest approved PV plant is located approximately 8km to the east of the Project Area.
- The proposed PV Site is located approximately 18km to the south-west of the Bram Fischer International Airport in Bloemfontein. According to the findings from the Screening Tool, the PV Site has low sensitivity in terms of the relative civil aviation theme.

11.15 Existing Structures and Infrastructure

An existing overhead power line traverses the PV Site (see **Figure 51** below) and the N6 runs along the eastern boundary of the site (see **Figure 52** below). The setbacks / conditions required by the custodians of infrastructure on the PV Site and along the power line route will need to be adhered to.

Figure 51: Western view of the PV Site showing existing power line

Figure 52: Northern view along the N6 (PV Site on left-hand side)

11.16 Transportation

The municipality has a comprehensive road network comprising a number of national, provincial and secondary roads, several railway lines, the Bram Fischer International Airport and several smaller airfields (MMM, 2020).

The transportation network in the Project Area is shown in **Figure 54** below. The N6 runs along the eastern boundary of the PV Site.

According to the Free State Department of Police, Roads and Transport (FSDPRT) (Maree pers. comm., 2022), the Provincial Tertiary Road T4267 traverses the site (refer to yellow line in the map contained in **Figure 53** below). From the site investigations, it appears as if this road is not readily used. A meeting was held with the FSDPRT on 12 October 2022 to discuss the Project in relation to this road (refer to minutes contained in **Appendix J**), where the following was noted by the departmental representative (Maree pers. comm., 2022):

- The building restrictions of the T4267 road could be relaxed; and
- Tertiary roads may become abandoned if they are unused, and this road could be closed through proclamation. However, it first needs to be established how the adjacent farm gains access to the N6 and consent from this landowner would be required to close the T4267 road.

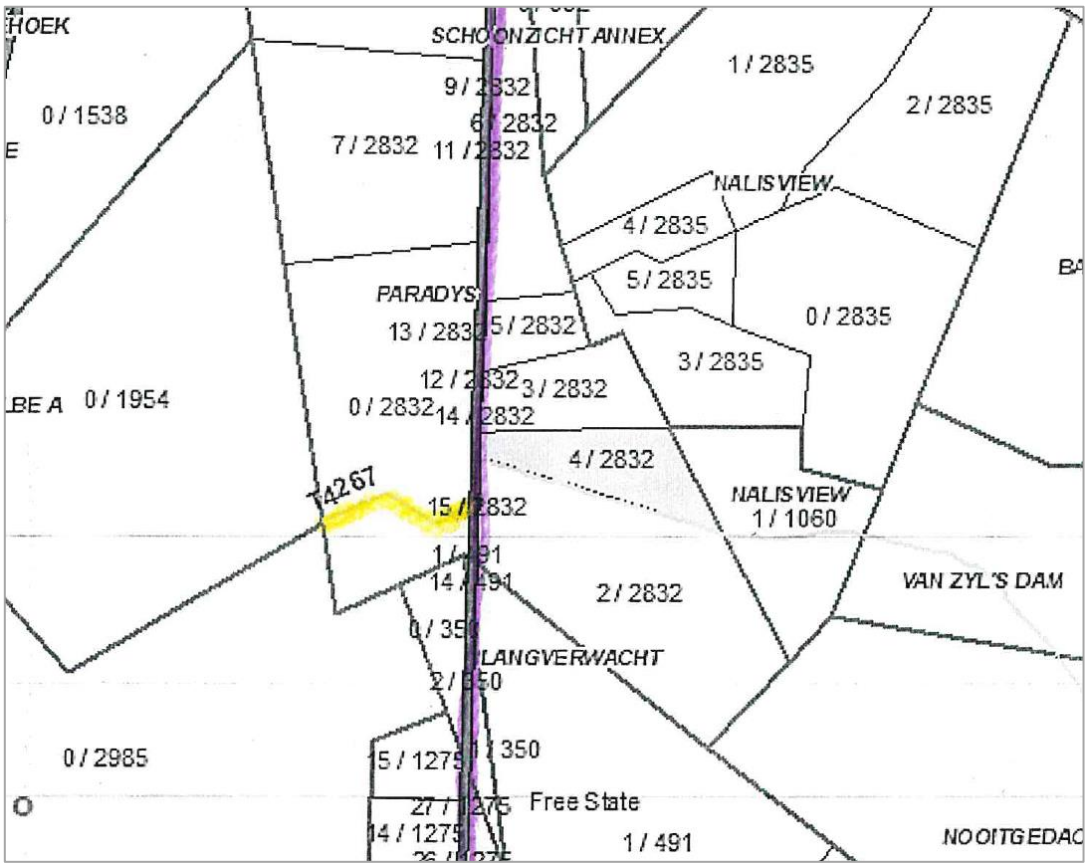


Figure 53: Provincial Tertiary Road T4267 in relation to the site (Maree pers. comm., 2022)

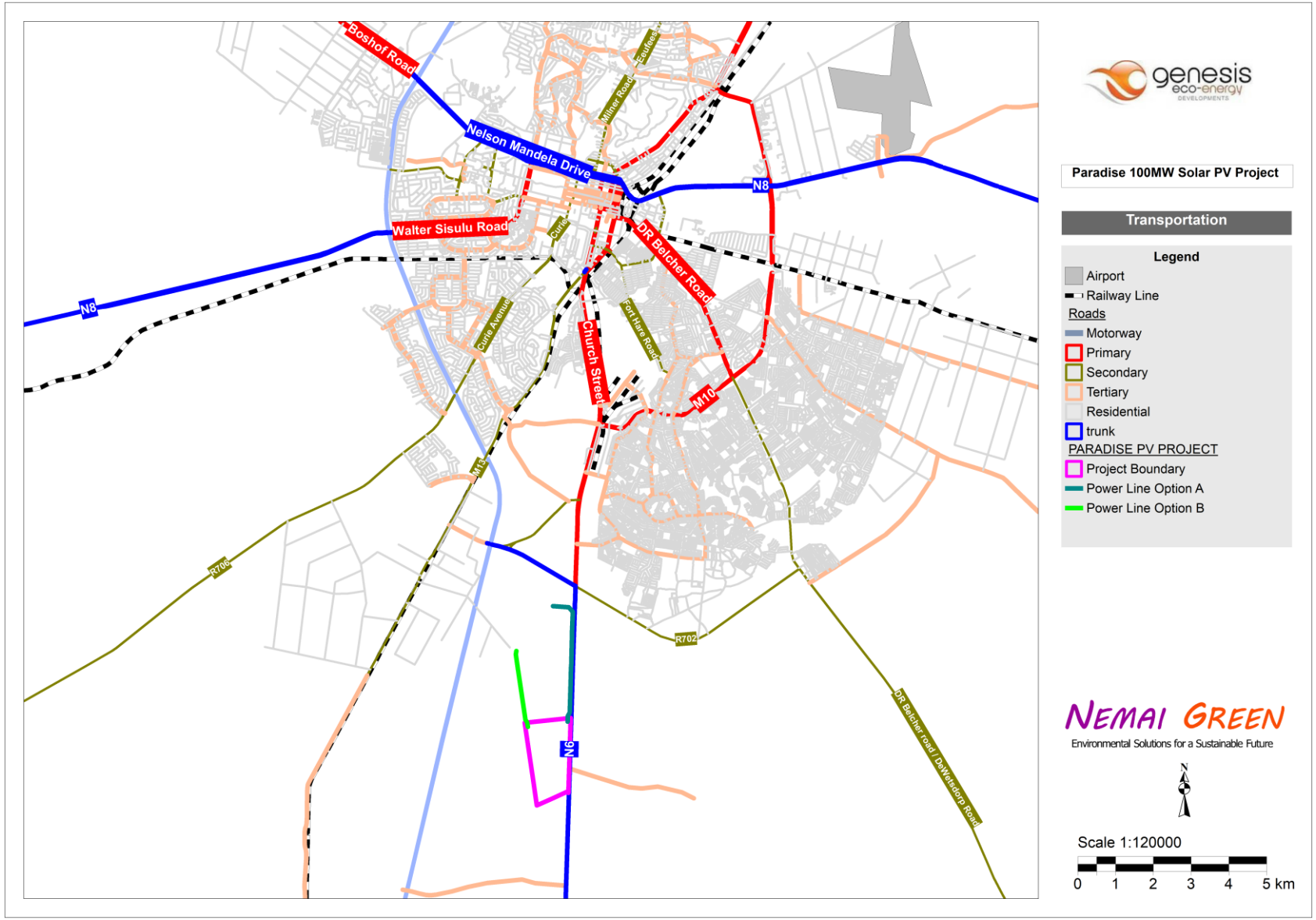


Figure 54: Transportation network

11.17 Health

According to the SDF (MMM, 2020), almost all the hospitals, clinics and health care services are located within the municipal urban nodes. Various hospitals are located in Bloemfontein, north of the Project Area.

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. Wetland Delineation and Risk Assessment;
2. Terrestrial Biodiversity Compliance Statement;
3. Avifaunal Assessment;
4. Agricultural Impact Assessment;
5. Phase 1 Cultural Heritage Impact Assessment;
6. Paleontological Impact Assessment;
7. Visual Impact Assessment; and
8. Social Impact Assessment.

12.2 Excluded Specialist Studies identified during Environmental Screening

As mentioned in **Section 6.3** above, Screening Reports for the proposed PV Site and power line were compiled by means of the Screening Tool, which were appended to the Application Form. **Table 11** below lists the specialist studies that were identified in the Screening Report, but which were not deemed to be necessary.

Table 11: 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 and medium civil aviation sensitivity in terms of the PV Site and power line, respectively. The Project Area is located approximately 18km to the south-west of the Bram Fischer International Airport in Bloemfontein. It was thus not deemed necessary to undertake this study.
Defence Assessment	The map that was created by the Screening Tool showed that the Project Area has medium sensitivity in terms of the relative defence theme. The related defence site is located at the Bram Fischer International Airport in Bloemfontein, which is located approximately 18km to the north-east of the PV site. It was thus not deemed necessary to undertake this study.

Specialist Study identified in Screening Report	Reason for not undertaking the Specialist Study
Radio Frequency Interference (RFI) Assessment	The map that was created by the Screening Tool showed that the Project Area has high to very high sensitivity in terms of the relative RFI theme. The reason for the high sensitivity is that the PV Site is located less than 18 km from a Weather Radar installation. The database of I&APs includes representatives from the South African Radio Astronomy Observatory (SARAO) and SENTECH and these parties were notified of the Project during the announcement phase. They will further be afforded the opportunity to review the draft EIA Report and to provide comments.

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 12.3 – 12.12** 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 Wetland Delineation and Risk Assessment

A summary of the Wetland Delineation and Risk Assessment (Clark, 2022a) 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:	The Biodiversity Company &	Meraki Consulting
Name:	A. Husted	T. Clark
Qualifications:	MSc Aquatic Health	MSc Zoological Science
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 400213/11)	SACNASP Professional Natural Scientist (Registration No.: 121338)

12.4.2 Objectives of the Study

The objectives of this study included the following:

- To identify, delineate and classify wetlands within the Project Area;
- To assess the Present Ecological State (PES) of the identified wetlands;
- To assess the Wetland Ecosystem Services provided by the identified wetlands;
- To assess the Ecological Importance and Sensitivity (EIS) of the identified wetlands;
- To undertake a risk assessment for the proposed development; and
- To provide mitigation measures and recommendations for the identified risks.

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 guideline: A practical field procedure for identification and delineation of wetlands and riparian areas (DWAF, 2005).
- Determining the PES;
- Determining the EIS;
- Determining buffer requirements; and
- Undertaking a risk-based impact assessment.

12.4.4 Key Findings of the Study

A description of the surface water features in the Project Area is contained in **Section 11.7** above.

Key findings from the study follow.

12.4.4.1 Wetland Classification

Three hydrogeomorphic (HGM) wetland units were identified within the Project Area and surrounding 500m regulated area. These included an unchanneled valley-bottom (HGM1), a small wetland flat (HGM2) and several small pans (HGM3).

Figure 55: View northwards along the unchanneled valley-bottom (Clark, 2022a)

The only wetland within the PV site is HGM1 (see **Figure 55** above). The remaining two wetlands (HGM2 and HGM3) were discovered within the 500m regulated area surrounding the two grid connection route options. The unchanneled valley-bottom (HGM1) is a moderately-sized, north-south flowing wetland which bisects the PV site longitudinally. It has a very shallow cross-sectional profile and is an upper catchment wetland. The flow is unchanneled and diffuse but earthen dams are present. The wetland is a tributary of the nearby Kaalspruit. The flat (HGM2) along Route Option B is a small isolated wetland that connects two small depressions (HGM3) and a dam. Two small depressions (HGM3) also occur within a 500m radius of Route Option A.

The classification for these wetlands, as per the NWCS, is presented in **Table 12** below. A map showing the extent of these wetlands is shown in **Figure 56** below.

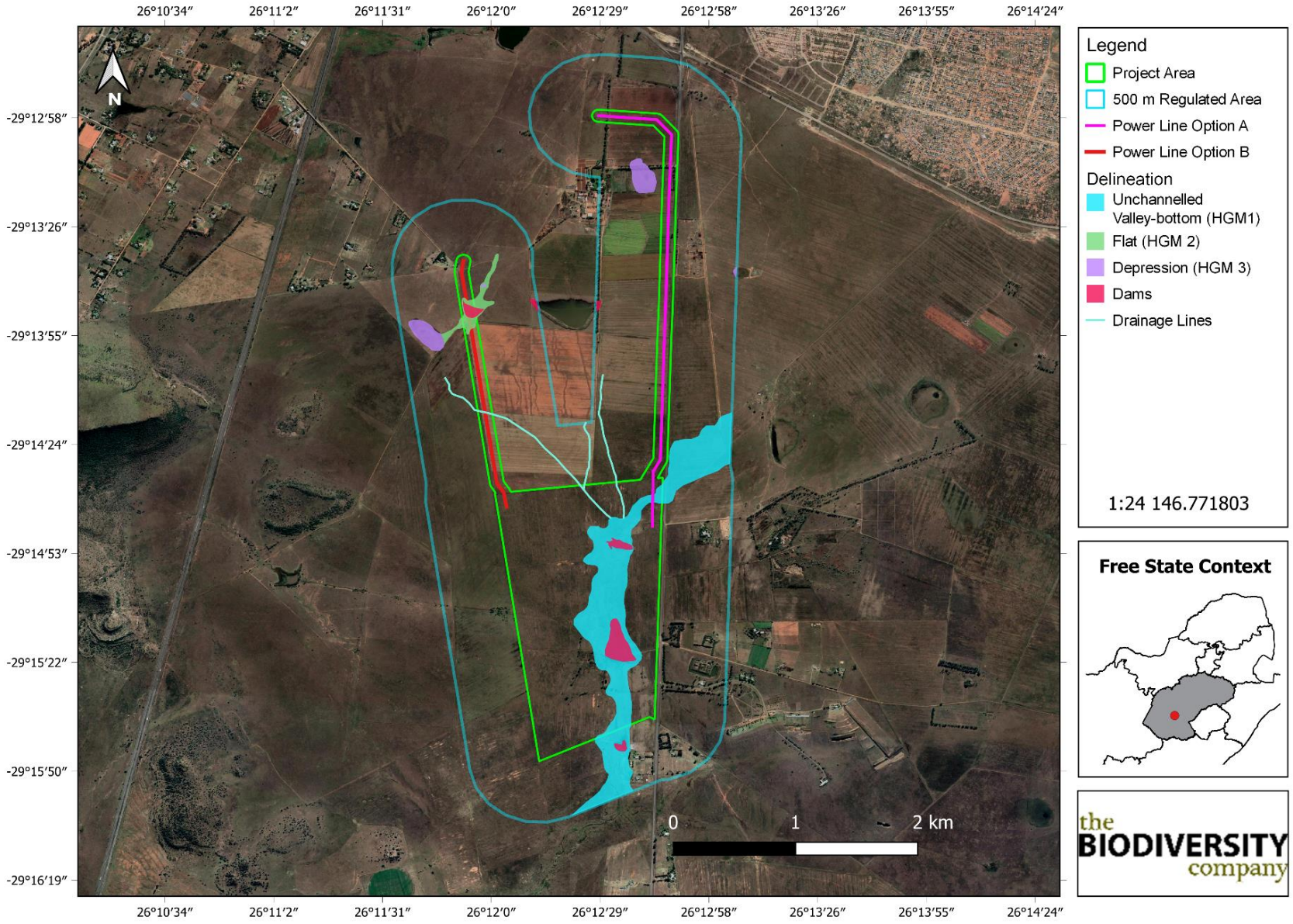


Figure 56: **Wetlands delineated within 500m of the Project Area (Clark, 2022a)**

Table 12: Wetland classification as per SANBI guideline (Clark, 2022a)

Wetland System	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Highveld	Dry Highveld Grasslands Group 3	Valley Floor	Unchanneled valley-bottom	NA	N/A
HGM 2	Inland	Highveld	Dry Highveld Grasslands Group 3	Plain	Flat	NA	N/A
HGM 3	Inland	Highveld	Dry Highveld Grasslands Group 3	Plain	Depression	Endorheic	Without channelled inflow

A summary of the extent (ha) of the wetland area within the PV Site, as well as the extent of its buffers and terrestrial (non-wetland) habitat, is given in **Table 13** below for both the PV Site and the broader 500m regulated area surrounding it. From this table it is evident that the HGM1 wetland and its associated 41m buffer occupy approximately 30% of the Project Area leaving a large proportion (70%) available for development (from a wetland perspective).

Table 13: Summary of extent of wetland resources within PV Site (HGM1) (Clark, 2022a)

Feature	HGM type	Area (ha) 500m	Area (ha) Site	Proportion (%)
HGM1 & Dams	Unchanneled valley-bottom	63.25	45.43	21.46
Wetland Buffer	-	30.18	20.02	9.46
Terrestrial	-	509.25	146.26	69.08
Total		**602.682**	**211.707**	**100.00**
Summary				
Terrestrial		**509.25**	**146.26**	**69.08**
Wetlands & Buffers		**93.43**	**65.45**	**30.92**

12.4.4.2 Wetland Ecosystem Services

The ecosystem services provided by the three wetland types identified were assessed and rated using the latest WET-EcoServices Version 2 system and associated spreadsheets. The summarised results of this assessment are shown in **Table 14** below.

Overall, HGM1 is not considered particularly important in terms of ecosystem services provision. At best, the wetland scores Moderate for three service namely streamflow regulation, biodiversity maintenance, water for human use and food for livestock. This is because although the wetland still supports a largely natural vegetation, it is predominantly seasonally inundated with a sparse, low diversity cover. The wetland is relatively wide and flows are diffuse which makes it effective at trapping sediments and assimilating toxicants but as the catchment remains relatively intact there is very little opportunity to do so. Consequently, in its current state, the wetland mainly functions to provide grazing for livestock (as it has is grass dominated), purify water, support biodiversity (mainly as wildlife

corridor and foraging for transiting threatened avifauna) as well as to capture, store and release water to the Kaalspruit which becomes particularly important during the drier winter months. The wetland provides very little in the way of regulating and cultural benefits.

HGM2 and HGM3 do not have channelled outflows that connect them hydrologically to other wetlands and therefore are rated in the ecosystem services tool as hydrologically isolated and thus have no scores for regulating and supporting services other than erosion control. However, HGM2 is considered Highly valuable in terms of food for livestock as it consists primarily of dense hydromorphic grasses of good palatability. Both HGM2 and HGM3 are Moderately Important in terms of biodiversity maintenance due to their small size and limited vegetation diversity. None of the wetland units identified are considered important from a cultural or educational perspective due to their small, impacted nature and low aesthetic and tourism potential.

Table 14: Summary of the ecosystem services scores (Clark, 2022a)

Ecosystem Service		Score		
		HGM1	HGM2	HGM3
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.2	0.0	0.0
	Stream flow regulation	1.7	0.0	0.0
	Sediment trapping	1.1	0.0	0.0
	Erosion control	0.5	0.0	0.3
	Phosphate assimilation	0.6	0.0	0.0
	Nitrate assimilation	0.9	0.0	0.0
	Toxicant assimilation	1	0.0	0.0
	Carbon storage	1.4	0.9	1.6
	Biodiversity maintenance	1.7	1.4	1.3
PROVISIONING SERVICES	Water for human use	2	2.0	2.0
	Harvestable resources	0.7	1.2	1.7
	Food for livestock	2.2	2.8	0.8
	Cultivated foods	0.8	1.2	1.2
CULTURAL SERVICES	Tourism and Recreation	1.3	1.3	1.5
	Education and Research	0.6	0.0	0.4
	Cultural and Spiritual	1.5	0.5	0.5

Importance Categories					
		Very Low	0-0.79	High	2.7 – 3.19
Low	0.8 – 1.29	Mod-Low	1.3 – 1.69	Very High	3.2 - 4.0
Moderate	1.7 – 2.29	Mod-High	2.3 – 2.69		

12.4.4.3 Wetland Health

The PES of the wetlands identified within the Project Area is provided in **Table 15** below. Overall, the unchanneled valley-bottom (HGM1) was rated as Moderately Modified (Class C). The wetland remains fairly intact but has been impacted slightly by the creation of two

fairly large earthen dams and the past ploughing. The dams appear to have had only a small to negligible effect on the geomorphology of the wetland which remains unchanneled even at the dam outlets. No signs of erosion are evident. This is likely due to the shallow cross-sectional and longitudinal slope of the wetland (0.6 %) and the gradual slopes of the catchment (<1.5%) which promote a low energy sediment depositing hydrological regime. The historical ploughing appears to have had only a minor impact on the distribution and retention time of water in the wetland.

The wetland vegetation remains a largely intact and natural state, albeit sparse and of low species diversity and habitat structure. A few alien bushclumps (*Eucalyptus* sp.) occur in the immediate catchment but are small and likely have a negligible effect on water inputs.

The wetland flat (HGM2) and the depressions (HGM3) were also rated with an overall PES of Moderately Modified. These wetlands have been impacted by cultivation. Ploughing has reduced the overall size of these wetlands and decreased water distribution to and retention time within them. The hydrology of the flat wetland has been impacted through excavation and the creation of several dams which impedes flow and has notably altered their geomorphology creating a more depositional sediment regime upstream of the dams. The depressions, in contrast, maintain a largely natural geomorphology but are still impacted hydrologically by ploughing practices in the catchment.

Table 15: Summary of the scores for the wetland PES (Clark, 2022a)

Wetland	Hydrology	Geomorphology	Vegetation	Overall
HGM1	C: Moderately Modified (2.5)	C: Moderately Modified (2.0)	B: Largely Natural (1.4)	C: Moderately Modified (2.1)
HGM2	C: Moderately Modified (3)	C: Moderately Modified (2.2)	C: Largely Natural (2)	C: Moderately Modified (2.5)
HGM3	C: Moderately Modified (2)	B: Largely Natural (1.9)	C: Largely Natural (2)	C: Moderately Modified (2)

12.4.4.4 The Ecological Importance

The results of the ecological importance (EI) assessment are shown in **Table 16** below. At a regional scale the NFEPA Wetveg database recognises Dry Highveld Grassland Group 3 unchanneled valley-bottoms (HGM1) and seeps (HGM2) as Least Threatened while flats (HGM3) are rated as Endangered. None of the wetlands within the Project Area or the 500m regulated area surrounding it are recognised as NFEPA rivers nor is the wetland recognised on the National Wetland Map 5. Overall, the wetland is not considered particularly important in terms of meeting provincial conservation targets (as it is not Threatened, nor is it a CBA or ESA).

Table 16: Ecological Importance results for the wetland area (Clark, 2022a)

Aspect	HGM1	HGM2	HGM3
Ecological Importance	M (2)	H (2.5)	M (1.8)

At a more local scale, except for HGM2, the wetlands are rated as having a Moderate EI on account of predominantly seasonal saturation levels, intermediate size and moderate habitat diversity and importance for general biodiversity maintenance. The wetlands serve mainly as corridors for wildlife movement. Although they provide suitable foraging habitat for some wide-ranging species of conservation concern (e.g. Cape Clawless Otter and Secretarybird), they are not anticipated to support any viable, resident or breeding populations of Threatened species. However, HGM2 is rated as having a High EI on account of its Endangered status.

12.4.4.5 Sensitivity and Buffer Analysis

The Aquatic Biodiversity Theme of the Screening Tool (see **Figure 57** below) does not recognise the presence wetlands within the Project Area in this national-scale sensitivity map. However, it does classify the far north-eastern corner of the PV Site as falling within a strategic water course are which is rated as Very High.

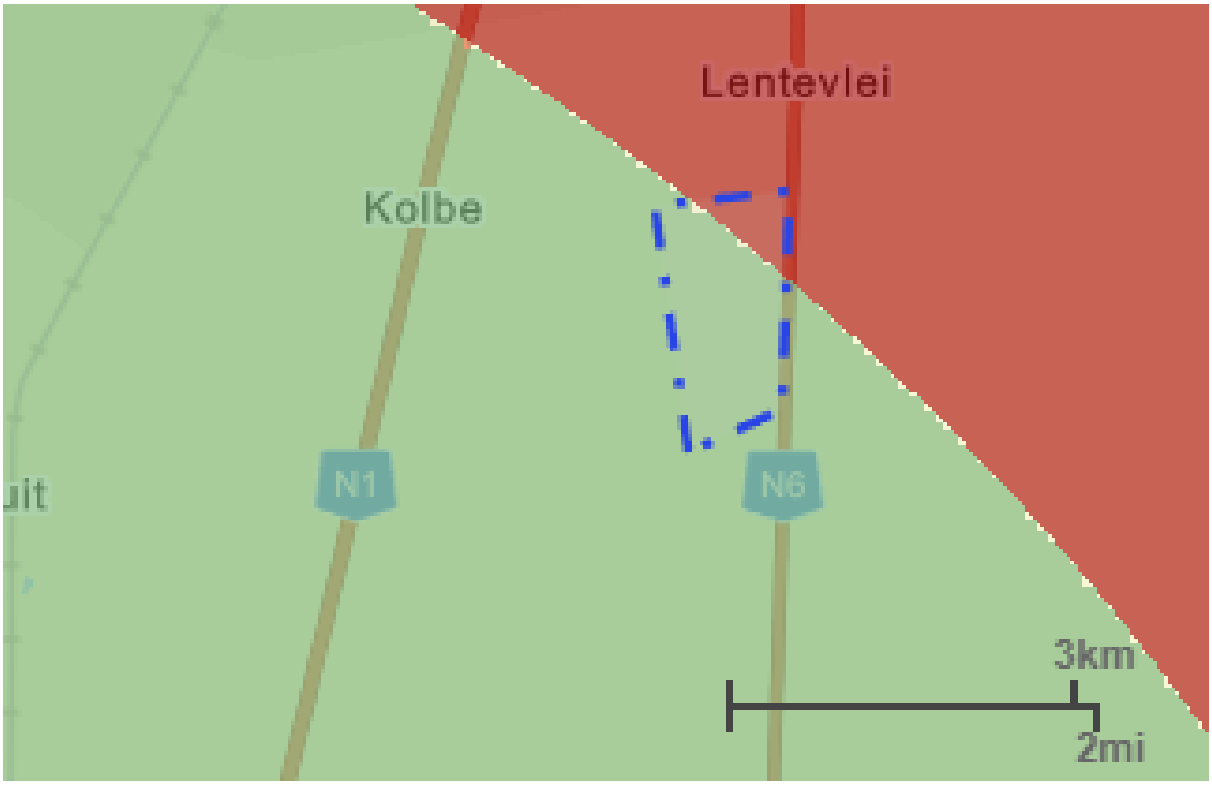


Figure 57: **Aquatic Biodiversity Sensitivity Theme of the Screening Tool (red= Very High sensitivity) (Clark, 2022a)**

A map was produced to visually represent the sensitivity of the wetlands based on the findings of the wetland assessment (see **Figure 58** below). The wetlands (HGM1, HGM2 and HGM3) are classified as having a High sensitivity. Their prescribed buffers are assigned a Moderate sensitivity. All other non-wetland areas including excavations within the 500m regulated area were assigned a Low sensitivity from a wetland perspective.

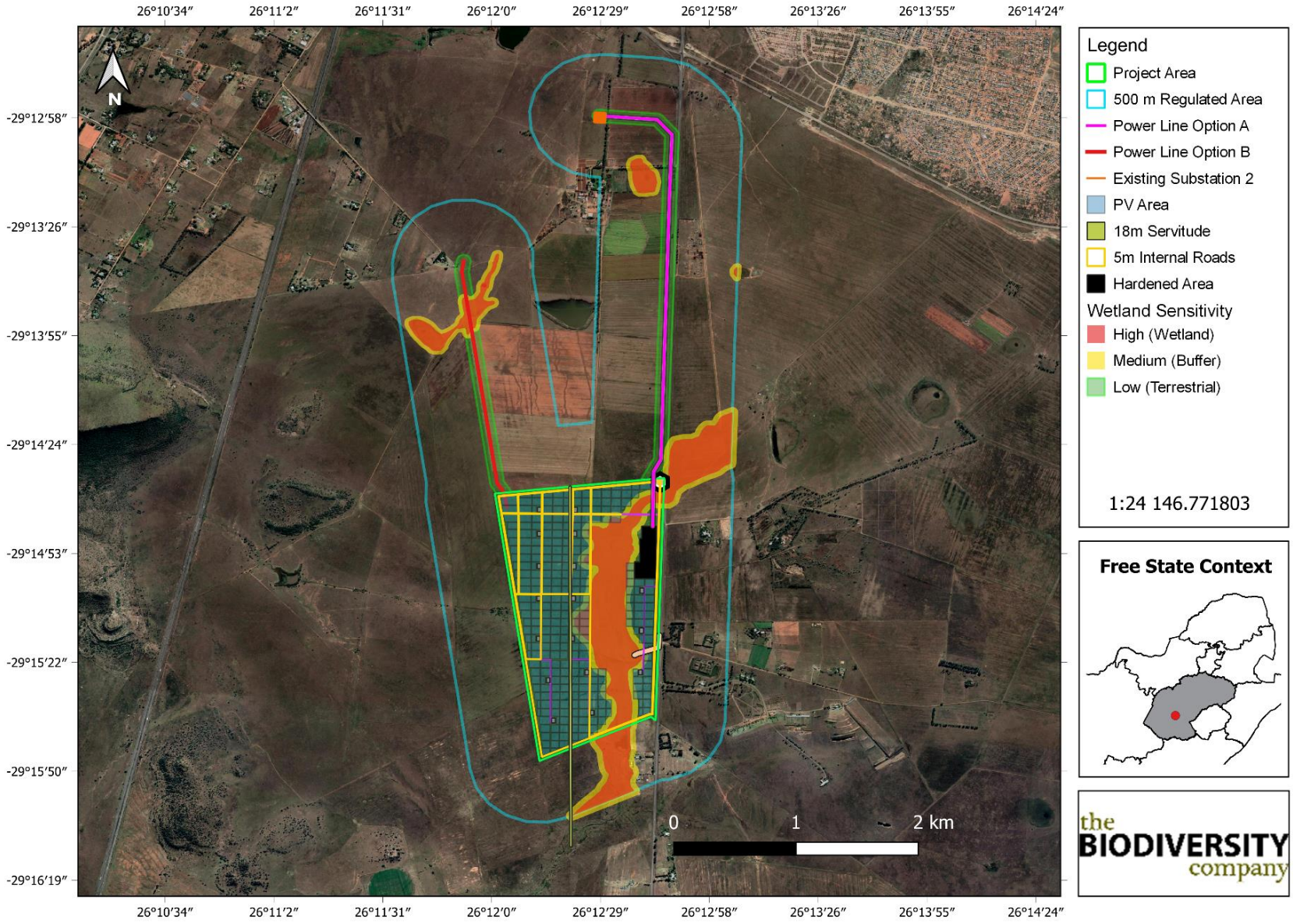


Figure 58: **Wetland sensitivity map (Clark, 2022a) (revised layout with minimised encroachment into wetland)**

The unchanneled valley-bottom (HGM1) was assigned a minimum development buffer of 41m. This was based primarily on the Moderately Modified PES and Moderate EIS combined with the potential for increased sediments and turbidity as a result of the construction of the PV farm. The flat (HGM2) and depression (HGM3) wetlands were prescribed a buffer of 30m each on account of their Moderately Modified PES and the less impactful nature of the development faced by them, namely overhead electrical transmission infrastructure.

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

Three HGM wetland units were identified within the Project Area and surrounding 500m regulated area. These included an unchanneled valley-bottom (HGM1), a small wetland flat (HGM2) and several small pans (HGM3). Only one wetland occurs on the PV Site, which is a north-south flowing seasonally inundated unchanneled valley-bottom wetland (HGM1). The wetland ultimately drains into the Kaalspruit 1.2 km south. The wetland is not recognised on national conservation planning databases such as National Wetland Map 5 or the NFEPA rivers and wetlands. In terms of ecosystem services, the wetland is not particularly significant scoring at best Moderate for streamflow regulation, water quality enhancement, biodiversity maintenance and food for livestock. Overall, the wetland remains fairly intact but has been impacted slightly by the creation of two fairly large earthen dams and past ploughing. Consequently, the wetland is rated as having a PES of Moderately Modified (Class: C). The wetland flat (HGM2) and depressions (HGM3) occur outside the PV area but within the 500m regulated area surrounding the two grid connection powerline routes. These wetlands were rated as having a PES of Moderately Modified (Class: C). They are small wetlands which have also been impacted by cultivation and are not considered to provide any significant ecosystem services, except for grazing in the case of HGM2. In terms of ecological importance HGM2 scores High on account of its Endangered status while HGM1 and HGM3 score Moderate due to their impacted nature and modest ecosystem services.

Given the relatively large amount of non-wetland land in the Project Area (146.26 ha or roughly 70 %), avoidance of the wetland and its buffer was strongly advocated in first draft of the Wetland Delineation and Risk Assessment Report. The wetland delineation was sent to the Applicant who revised the design layout based on the spatial data provided. Upon receipt of the revised layout, it is apparent that great efforts have been made to align the infrastructure, particularly all hardened areas, to avoid the identified wetland. Although the majority of the wetland has been avoided some solar panels still do overlap on small portions of the wetland and its associated buffer. This necessitates a residual risk rating of Medium for wetland habitat loss. This is because development within a wetland triggers a mandatory risk rating of 5 for both Severity and Legal risk criteria. Consequently, the compilation, approval (by DWS) and implementation of a very basic wetland offset strategy (through on-site rehabilitation) is advised.

After wetland loss / degradation, the main risks centre on increased floodpeaks, sedimentation and erosion especially to HGM1. The key objective in this regard should be to, as far as possible, avoid vegetation clearing and facilitate the permeability and drainage of the soil beneath the solar panels while reducing the loss of sediments from this area during rainfall.

In terms of grid connection infrastructure, powerline route Option B traverses the wetland flat (HGM 2) with two depressions on either side. Therefore Option A is considered the most favourable route from a wetland perspective as it does not traverse any wetlands and runs along the N6 Highway while paralleling existing electrical transmission infrastructure. This is the preferred route option that has been incorporated into the development's layout plans

Overall, the development is considered unlikely to degrade the integrity of the wetland (which currently provides no highly important ecosystem services other than grazing for livestock) and downstream water resources, to any appreciable level. This is provided that powerline route Option A is developed and the prescribed mitigation (to promote infiltration below solar PVs and to control run-off, sedimentation and erosion) and offset recommendations are effectively implemented. These assertions are based primarily on the small wetland extent to be directly impacted and the small consequence or magnitude of the actual residual impact therein (PV infrastructure on plinths with minimal to no removal of natural vegetation). It is also important to consider that the small portions of wetland that are overlapped by PV panels likely represent previously terrestrial areas that were artificially inundated through the creation of dams. In light of the above, the proposed Project should be considered viable from a wetland perspective and complication of the water use licensing and offsetting processes for this development is unlikely to add significant value.

12.5 Terrestrial Biodiversity Compliance Statement

A summary of the Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022) 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 Compliance Statement follow.

Organisation:	The Biodiversity Company		
Name:	A. Husted	J. Jacobs	C. Burger
Qualifications:	MSc Aquatic Health	MAppSc Nature Conservation	BSc Hons Ecological Interactions & Ecosystem Resilience
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 400213/11)	-	-

12.5.2 Objectives of the Study

The principal aim of this study was to adequately assess the current state of the terrestrial biodiversity in order to identify any significant and/or sensitive ecological receptors that may be impacted upon by the proposed Project.

The following tasks were completed in fulfilment of the terms of reference for this study:

- Description of the baseline receiving environment specific to the field of expertise (including the general surrounding area as well as the site-specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (i.e., terrestrial biodiversity) that occur in the Project Area, and the manner in which these sensitive receptors may be affected by the activity;
- Identification of significant ecological, botanical and faunal features within the proposed Project Area;
- Identification of conservation significant habitats around the Project Area which might be impacted;
- Screening to identify any critical issues (potential fatal flaws) that may result in a rejection of the application;
- Provide a map to identify sensitive receptors in the Project Area, based on available maps and database information; and
- Presentation of recommend mitigation measures (outcomes to be included in the EMPr) that should be used to mitigate or minimise impacts from the activity, either on terrestrial habitat or ecology directly.

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 field work 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:
    - Compilation of expected species lists;
    - Identification of any Red Data or SCC potentially occurring in the area; and
    - 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 -

- Visual observations;
- Active hand-searches, used for species that shelter in or under particular micro-habitats;
- Identification of tracks and signs; and
- Utilisation of local knowledge.

- Various field guides and texts were consulted for identification purposes in the field during the survey.

The dry season fieldwork was completed during May 2022. Owing to the low sensitivity of the terrestrial habitat this is not considered to be a notable limitation, with limited benefit being achieved from a wet season survey in comparison.

12.5.4 Key Findings of the Study

A description of the terrestrial ecological features in the Project Area is contained in **Section 11.8** above. Key findings from the study follow.

12.5.4.1 Habitat Survey and Site Ecological Importance

The main habitat types identified across the Project Area were initially identified and pre-delineated largely based on aerial imagery from early 2022. These habitat types were then refined based on the field coverage and data collected during the survey. Four habitat units are delineated for the Project Area, namely secondary grassland, degraded grassland, transformed and wetland habitat.

The four delineated habitat types were allocated a sensitivity category, or Site Ecological Importance (SEI), which is shown in **Table 17** and **Figure 59** below.

Table 17: SEI assessment summary of the habitat types delineated within the Project Area (Jacobs & Burger, 2022)

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	SEI
Degraded Grassland	Low	Medium	Low	Medium	Low
Transformed	Low	Low	Low	Medium	Low
Secondary Grassland	Medium	High	Medium	Medium	Medium
Wetland	Medium	High	Medium	Medium	Medium

The secondary grassland is associated with grassland habitat that has been exposed to modifications due to land use and mismanagement but differs from the degraded grassland in the extent of disturbance that has taken place, with the degraded grassland being exposed to more severe disturbance.

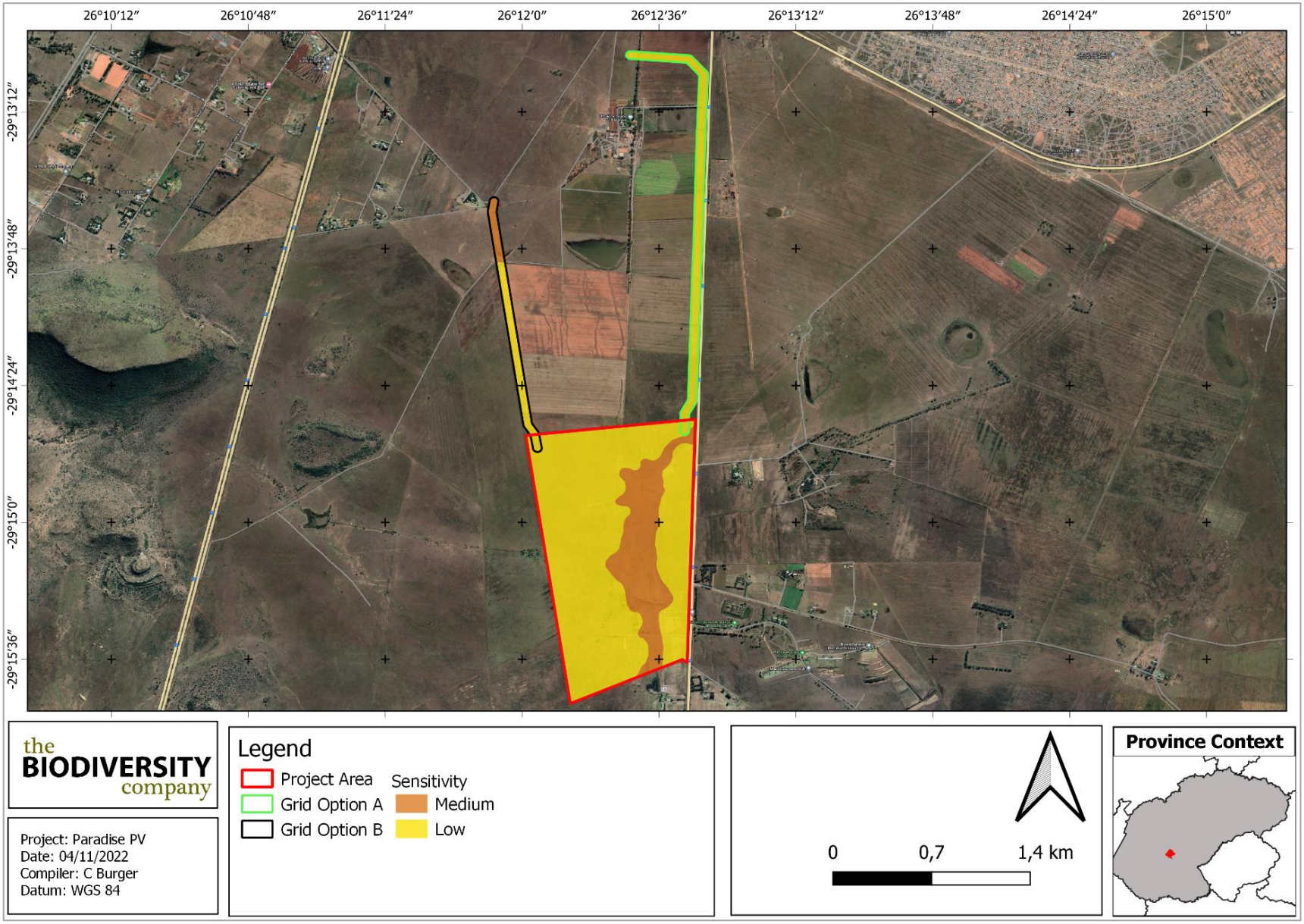


Figure 59: **Biodiversity SEI delineation relevant to the Project Area (Jacobs & Burger, 2022)**

The degraded grassland habitat represents the largest portion of habitat encountered on site. The vegetation consists of pioneer and sub-climax grass species with various alien and invasive species spread across the area. Since the area was previously utilised for cultivation purposes, the state of the degraded grassland remains in a modified condition. Impacts recorded across this habitat include the transformation of the entire habitat in preceding years to accommodate agricultural practises and large stands of the alien and invasive tree species *Eucalyptus camaldulensis* as well as the presence of secondary roads.

The wetland habitat unit was found to traverse the central portion of the site and is considered to be in a moderately modified condition. Previous agricultural practices that occurred throughout the degraded grassland immediately adjacent to this habitat has resulted in edge effects such as the spread of alien and invasive species into the wetland area as well as possible infringement into the outer edges of the wetland. The area does, however, provide habitat to hydrophytic vegetation and common faunal species.

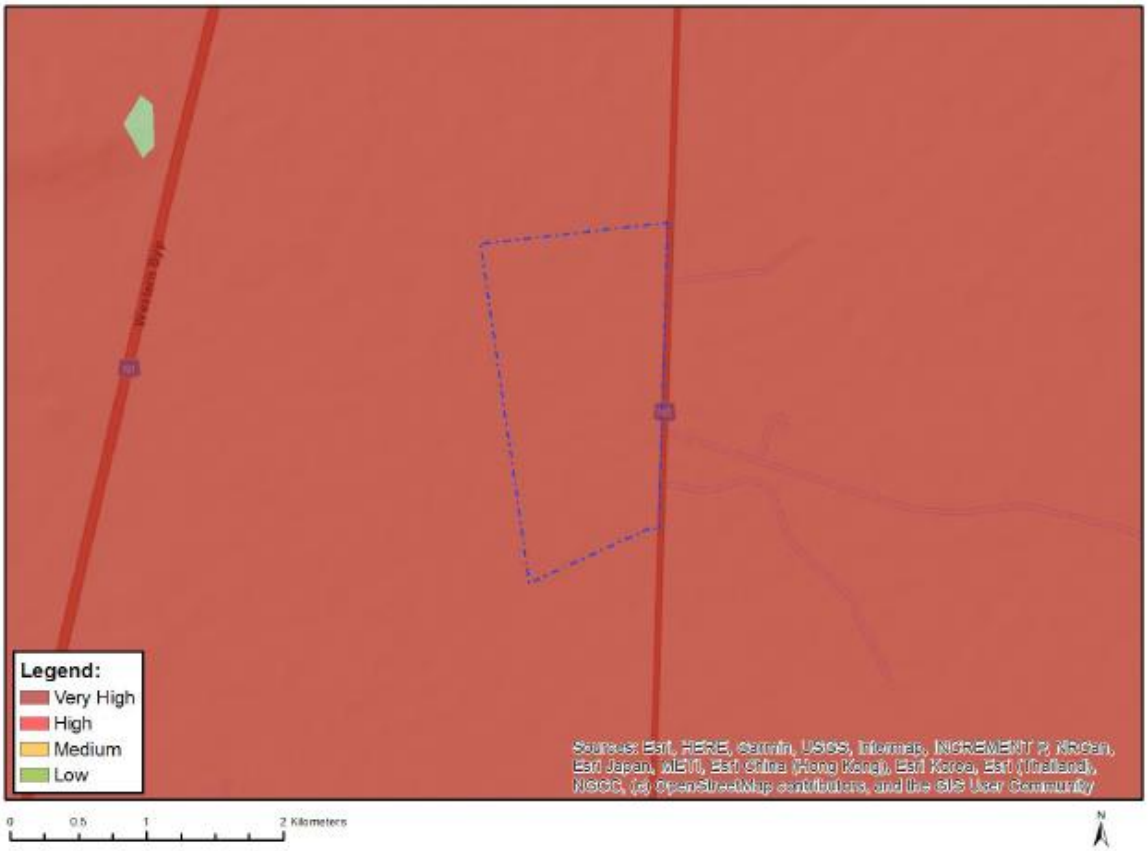
The transformed habitat is associated with existing agricultural fields. As such the area has little to no remaining natural vegetation due to land transformation to accommodate the agricultural activities. This habitat exists in a constant disturbed state as it cannot recover to a more natural state unless through human intervention.

The following guidelines apply when interpreting the SEI:

- Low: Minimisation and restoration mitigation - Development activities of medium to high impact acceptable followed by appropriate restoration activities; and
- Medium: Minimisation and restoration mitigation - Development activities of medium impact acceptable followed by appropriate restoration activities.

The terrestrial biodiversity theme sensitivity as indicated in the screening report (compiled by the Screening Tool) was derived to be ‘Very High’ (see **Figure 60** below), mainly due to the fact that the project area lies within a VU ecosystem. The completion of the terrestrial desktop and field studies disputes the ‘Very High’ sensitivity presented by the screening report. As discussed above, the project area is largely degraded and as such is assigned a sensitivity rating of ‘Low’ (with minor exceptions).

The Screening Tool classified the animal species theme sensitivity as being of a ‘Medium’ sensitivity and the plant species theme as ‘Low’ sensitivity. Following the findings of the field survey, both the animal and plant species themes may be classified as having ‘Low’ sensitivities. This is due to the fact that there is very little suitable habitat available to support the occurrence of any SCC within the Project Area.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Vulnerable ecosystem

Figure 60: Biodiversity sensitivity according to Screening Tool (Jacobs & Burger, 2022)

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

The Project area has been altered both currently and historically. However, the degraded Grassland can be regarded as important, not only within the local landscape, but also regionally; as they are used for habitat, foraging and movement corridors for fauna within a fragmented landscape to more natural areas where they may reproduce. The degraded Grassland was rated with a moderate sensitivity.

The majority of the Project Area has historically been modified to accommodate agricultural practices and as such remain in a transformed state. The Project Area does, however, contain unique habitat features such as the unchanneled valley bottom wetland in the central portion of the site and the secondary grassland habitat associated with Route Option B. Thus, it is very important that the management outcomes presented in this study are adhered to, in order to mitigate the negative expected environmental impacts that will stem from the development activities. These include:

- The loss and fragmentation of vegetation communities;
- The safe movement of faunal species; and
- The direct and indirect loss and disturbance of floral and faunal species and communities.

Completion of the Terrestrial Biodiversity Assessment led to a disputing of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the Screening Tool. The majority of the Project Area has instead been assigned a 'Low' sensitivity, because of the significant levels of environmental disturbance that have taken place and the fact that no SCC were observed, or are very likely to occur. It is noted that an area has been assigned a higher sensitivity, with the wetland allocated a 'Medium' sensitivity and the secondary grassland which has also been allocated a 'Medium' sensitivity. The wetland area and secondary grassland remain in a moderately natural condition as these areas have been predominantly excluded from direct historic anthropogenic activities and as such still provides habitat to support indigenous vegetation and common faunal species.

The areas classified as having a sensitivity rating of 'Low', namely the degraded grassland and transformed habitat, are likely to face minimal further impacts from any development activities, and as such the proposed activities may proceed within these areas. The wetland area, which has been assigned with a 'Medium' sensitivity, must be avoided together with its associated buffer area as mentioned in the Wetland Assessment. *Note that the need for an offset strategy was identified by the Wetland Specialist for small portions of wetland and buffer zone encroachment (associated with PV Layout Option B). In addition, it is further noted that the earthen dam on the PV Site may have caused an unnatural expansion of the wetland. There is a breach in this dam wall, which may reduce the wetland footprint over time. The Applicant may seek to update the delineation of the wetland by a Wetland Specialist prior to the implementation of the Project to determine whether the wetland boundary has been reduced, which may influence the mitigation measures linked to the wetland and its buffer area.*

Route Option A for the grid connection is the preferred alignment. The secondary grassland associated with Route Option B, which has been assigned with a 'Medium' sensitivity, should also be avoided. Should the development avoid the wetland area and its associated buffer area (*apart from areas of minor encroachment that are linked to the offset strategy*), as well as the secondary grassland, then there are no fatal flaws for this Project from a terrestrial biodiversity perspective and the proposed activities may commence, with the implementation of the mitigation measures put forward.

12.6 Avifaunal Baseline and Impact Assessment

A summary of the Avifaunal Baseline and Impact Assessment (Clark, 2022b) follows. The specialist report is contained in **Appendix E3**.

12.6.1 Details of the Specialist

The details of the specialists that undertook the Avifaunal Baseline and Impact Assessment follow.

Organisation:	The Biodiversity Company &	
Name:	A. Husted	T. Clark
Qualifications:	MSc Aquatic Health	MSc Zoological Science
Affiliation (if applicable):	SACNASP Professional Natural Scientist (Registration No.: 400213/11)	SACNASP Professional Natural Scientist (Registration No.: 121338)

12.6.2 Objectives of the Study

The objectives of this study include the following:

- Describe the baseline avifaunal community;
- Identify present or potentially occurring SCC;
- Undertake an avifaunal sensitivity assessment and prepare an avifaunal sensitivity map; and
- Assess impacts to avifauna associated with the Project and recommend suitable mitigation measures.

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
- Fieldwork involved two, two-day field trips conducted in different seasons, the first being 24-25 March 2022 which constituted a late summer / autumn survey and the second being 26-27 October 2022 constituting a late spring-early summer survey. Both involved sampling of the broader study area but the focus of trip 1 was the PV area while the focus of trip 2 was the two proposed grid connection powerline route alternatives. In total 25 standardised point counts were sampled.

12.6.4 Key Findings of the Study

12.6.4.1 Habitat Types

Five main avifaunal habitat types were identified namely Wetlands, Grasslands, Intact Grasslands, Croplands and Alien Bushclumps (see **Figure 61** below).

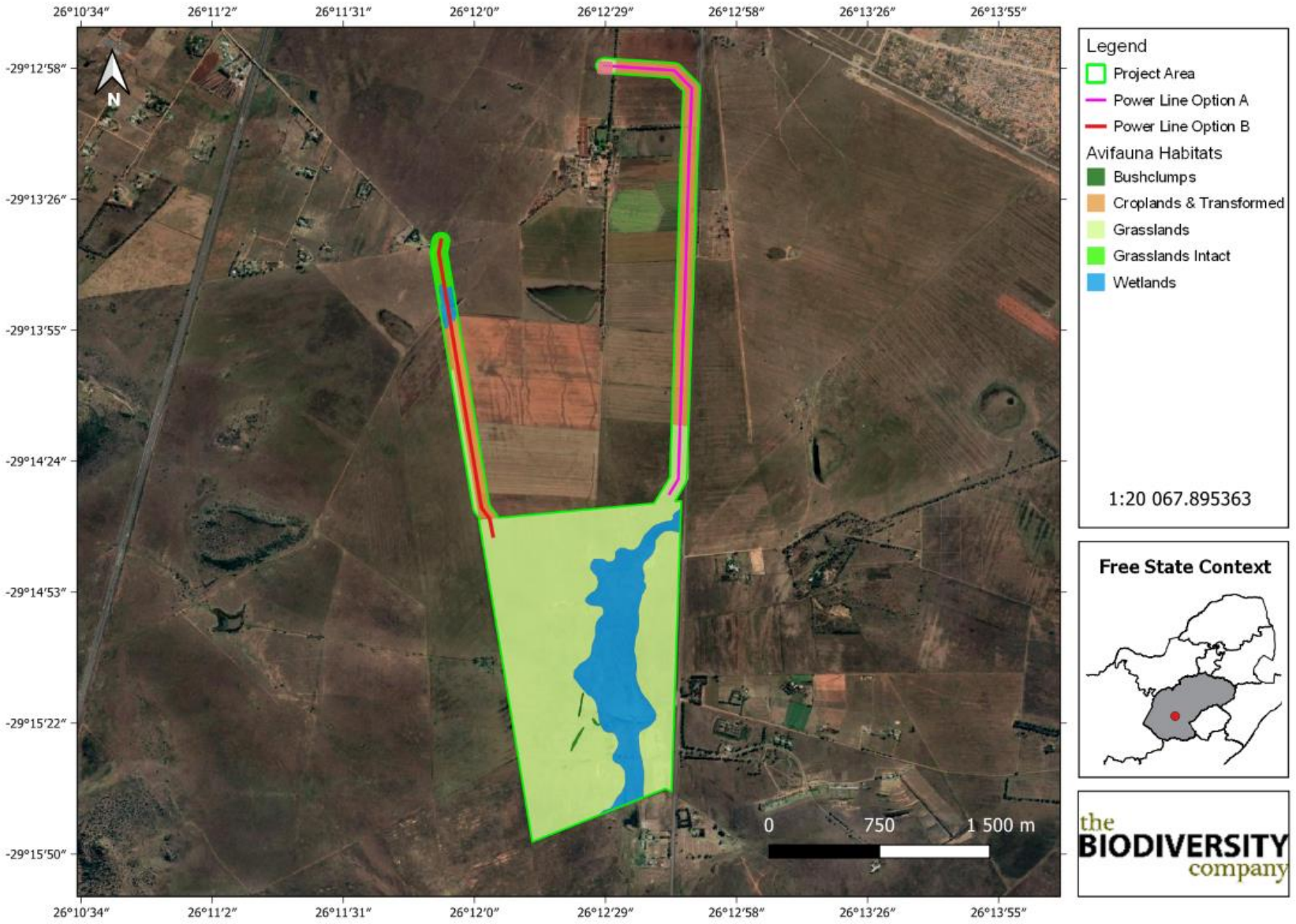


Figure 61: **Avifauna habitats identified in the Project Area (Clark, 2022b)**

From an avifaunal perspective, the Wetland habitat includes the north-south flowing valley-bottom wetland and the flat wetland along proposed power line Option B. The scattered stands of *Eucalyptus camaldulensis* was distinguished on account of its different habitat structure which provides roosting and nesting habitat for numerous species, most notably for small raptors. A small patch of Intact Grassland occurs towards the northern terminus of powerline Option B. Croplands dominate the habitat along both powerline route alternatives. All remaining areas between these habitats that are in a state of advance re-vegetation but still show signs of historical cultivation represent the Grasslands habitat. This habitat shows signs of having been completely transformed in the past ploughing and is relatively homogenous. However. it has recovered such that it retains much of its ecosystem functionality.

12.6.4.2 Site Diversity

Of the approximately 261 regionally occurring species that are predicted to occur based on distribution, only some 175 species are considered highly likely to occur on a regular basis. A further 61 species are likely to occur sporadically while the remaining species are only likely to occur very rarely or not at all. However, when considering seasonal variation in species assemblages and local movements the actual number of species likely to be encountered on any one day in the project area is likely to be < 100 species. This represents moderate to low diversity in the South African context.

During the site visit, a total of 57 bird species were recorded from sampling within both the PV area (43 spp.) and along the two proposed powerline route alternatives (37 spp.). Of these, 46 were recorded during the standardised point counts while the remaining species were detected incidentally (while moving between point counts).

12.6.4.3 Species of Conservation Concern

Red-listed Species

The distribution ranges of 27 SCC overlap the Project Area, as listed in **Table 18** below. Of these, nine have been recorded during SABAP2 surveys within the two pentads relevant to the Project Area, namely Black Harrier (*Circus maurus*), Yellow-billed Stork (*Mycteria ibis*), Lanner Falcon (*Falco biarmicus*), Secretarybird (*Sagittarius serpentarius*), Blue Korhaan (*Eupodotis caerulescens*), Melodious Lark (*Mirafra cheniana*), Maccoa Duck (*Oxyura maccoa*), Greater Flamingo (*Phoenicopterus roseus*) and Lesser Flamingo (*Phoeniconaias minor*).

Table 18: List of present and potentially occurring SCC avifauna (Clark, 2022b)

Common Name	Scientific Name	Status				LO	Atlas
		Global	Regional	NEMBA	FS		
Ludwig's Bustard	*Neotis ludwigii*	EN	EN	EN	PG	3	
Martial Eagle	*Polemaetus bellicosus*	VU	EN	EN	PG	3	
Tawny Eagle	*Aquila rapax*	LC	EN	EN	PG	3	

Common Name	Scientific Name	Status				LO	Atlas
		Global	Regional	NEMBA	FS		
African Marsh Harrier	*Circus ranivorus*	LC	EN		PG	3	
Black Harrier	*Circus maurus*	VU	EN		PG	3	x
Yellow-billed Stork	*Mycteria ibis*	LC	EN		PG	3	x
Blue Crane	*Anthropoides paradiseus*	VU	NT	PS	OG	3	
Lanner Falcon	*Falco biarmicus*	LC	VU		PG	2	x
Verreauxs' Eagle	*Aquila verreauxii*	LC	VU		PG	3	
African Grass Owl	*Tyto capensis*	LC	VU		PG	3	
Secretarybird	*Sagittarius serpentarius*	VU	VU		PG	1	x
Caspian Tern	*Sterna caspia*	LC	VU		PG	3	
Burchell's Courser	*Cursorius rufus*	LC	VU		PG	4	
Black Stork	*Ciconia nigra*	LC	VU		PG	4	
Blue Korhaan	*Eupodotis caerulescens*	NT	LC		PG	3	x
Melodious Lark	*Mirafra cheniana*	NT	LC		PG	3	x
Curlew Sandpiper	*Calidris ferruginea*	NT	LC		PG	4	
Abdim's Stork	*Ciconia abdimii*	LC	NT		PG	2	
Maccoa Duck	*Oxyura maccoa*	NT	NT		PG	3	x
Greater Flamingo	*Phoenicopterus roseus*	LC	NT		PG	3	x
Lesser Flamingo	*Phoeniconaias minor*	NT	NT		PG	3	x
Karoo Korhaan	*Eupodotis vigorsii*	LC	NT		PG	3	
Chestnut-banded Plover	*Charadrius pallidus*	NT	NT		PG	3	
Black-winged Pratincole	*Glareola nordmanni*	NT	NT		PG	3	
Kori Bustard	*Ardeotis kori*	NT	NT	PS	PG	4	
African Rock Pipit	*Anthus crenatus*	LC	NT		PG	4	
Marabou Stork	*Leptoptilos crumeniferus*	LC	NT		PG	4	

Key: Status: CR = Critically Endangered; DD = Data Deficient; EN = Endangered; LC = Least Concern; NA = Not Assessed; NT = Near Threatened; OG = Ordinary Game; PG = Protected Game; PS = Protected Species; VU = Vulnerable. Likelihood of Occurrence (LO): 1 = Present; 2 = High; 3 = Moderate. Sources: Taylor et al. (2015); BirdLife South Africa (2016); SABAP 2 (2022).

In the Free State all birds are protected except for generalist species; Mousebirds, Bulbuls, Red-winged Starling, Pied Starling, Common Myna, Cape and House Sparrow, Crows, weavers, Queleas, Widowbirds, Bishops, Speckled Pigeon, Cape Turtle Dove, Ostrich, Laughing Dove, Reed Cormorant, and White-breasted Cormorant (Nature Conservation Ordinance 8 of 1969).

No SCC were detected within the Project Area during the site visit. However, Secretarybird (*Sagittarius serpentarius*) was recorded during surveys along Powerline Option B but the bird was seen about 2 km east well away from the Project Area. Still, this lends further decreases the favourability of Option B. Based on distribution and habitat suitability, 21 SCC are considered Moderately likely to occur within the Project Area. However, the small size of the Project Area, together with its limited diversity of sub-optimal and degraded habitat, means that all of these species are only likely to occur sporadically and none are considered likely to breed or support resident populations on site. Of these, the most Threatened regionally occurring species known to be particularly prone to collision and electrocution include Ludwig's Bustard (*Neotis ludwigii*), Verreauxs' Eagle (*Aquila*

verreauxii), Martial Eagle (*Polemaetus bellicosus*), Black Harrier (*Circus maurus*), Blue Crane (*Anthropoides paradiseus*) and Lanner Falcon (*Falco biarmicus*). However, the Project Area is on the very edge of the distribution of Ludwig's Bustard and habitat is suboptimal with no SABAP2 records for the pentads covering the Project Area and very low reporting rates in other pentads in the area. As such its occurrence (if present) is likely to be highly sporadic and fleeting at best. Verreauxs' Eagle are likely to occupy some of the larger koppies in the region. One Koppie situated 2.6 km west is flagged as being sensitive on the National Environmental Screening Tool for the species, but its presence here remains unconfirmed and suitable breeding habitat for this cliff-nesting species appears highly limited to absent. Black Harrier are only likely to make very infrequent fleeting visits if anything to the Project Area. Blue Crane may occasionally visit the Project Area but are also only likely to occur very occasionally and will likely occur mainly at the small dams along the valley-bottom wetland.

Species Congregations and Flyways

The Project Area was not found to support any globally significant congregations of water birds or other birdlife. The two dams are too small. The Project Area is not situated in any globally recognised avifaunal flyway.

Collision Prone Species

Six species were identified with a high probability of collision having been seen on more 50% of the time during SABAP surveys include Blacksmith Lapwing (*Vanellus armatus*), Western Cattle Egret (*Bubulcus ibis*), Hadeda Ibis (*Bostrychia hagedash*), Yellow-billed Duck (*Anas undulata*), Helmeted Guineafowl (*Numida meleagris*), Northern Black Korhaan (*Afrotis afraoides*), Black-shouldered Kite (*Elanus caeruleus*), Egyptian Goose (*Alopochen aegyptiaca*) and Black-headed Heron (*Ardea melanocephala*).

Species considered particularly prone and likely to collision based on in-field count data, and flight patterns include Western Cattle Egret (*Bubulcus ibis*), Spur-winged Goose (*Plectropterus gambensis*), Amur Falcon (*Falco amurensis*), Black-shouldered Kite (*Elanus caeruleus*), Yellow-billed Egret (*Egretta intermedia*), Egyptian Goose (*Alopochen aegyptiaca*) and Yellow-billed Duck (*Anas undulata*)

12.6.4.4 Sensitivity Assessment

Desktop-based Sensitivity: Screening Tool

The Screening Tool (see **Figure 62** below) flags the pans and dams to the north (>3 km) of the Project Area as being of High Sensitivity for Yellow-billed Stork and Caspian Tern, while the koppie 2.6 km to the west is highlighted as being of High Sensitivity for Lanner Falcon (*Falco biarmicus*) and Verreauxs' Eagle (*Aquila verreauxii*). A portion of the wetland in the Project Area is highlighted as being of Medium Sensitivity for Ludwig's Bustard (*Neotis ludwigii*). The Avifauna Theme shows that the Project Area is situated in an area of Low sensitivity from an avifauna and solar perspective.

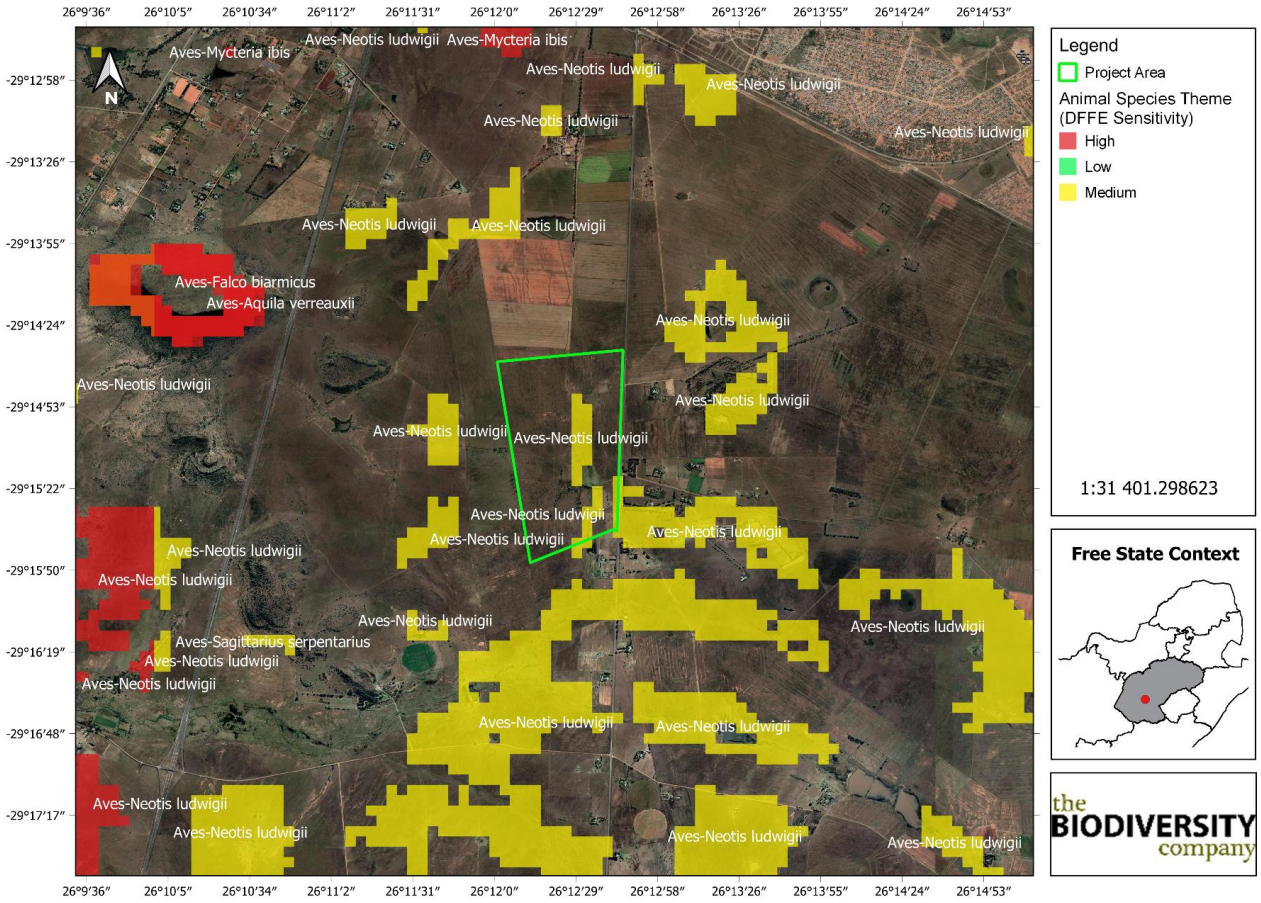


Figure 62: **Screening Tool Animal Species Theme sensitivity map (Clark, 2022b)**

Site-based Sensitivity Assessment

Areas of avifaunal sensitivity within the Project Area are shown in **Figure 63** below. Overall, the Project Area is not considered to be of High Avifaunal significance as it is unlikely to support any breeding or resident populations of SCC.

The large valley-bottom wetland was designated Medium sensitivity on account of its ability to support a moderate diversity and abundance of mostly widespread and adaptable waterfowl. All of the surrounding grassland was afforded a Low sensitivity as it is degraded by past crop cultivation and as such supports a very low abundance and diversity of avifauna. The small scattered Alien Bushclumps were assigned a High sensitivity on account of their suitability for providing ideal nesting habitat for small-bodied raptors.

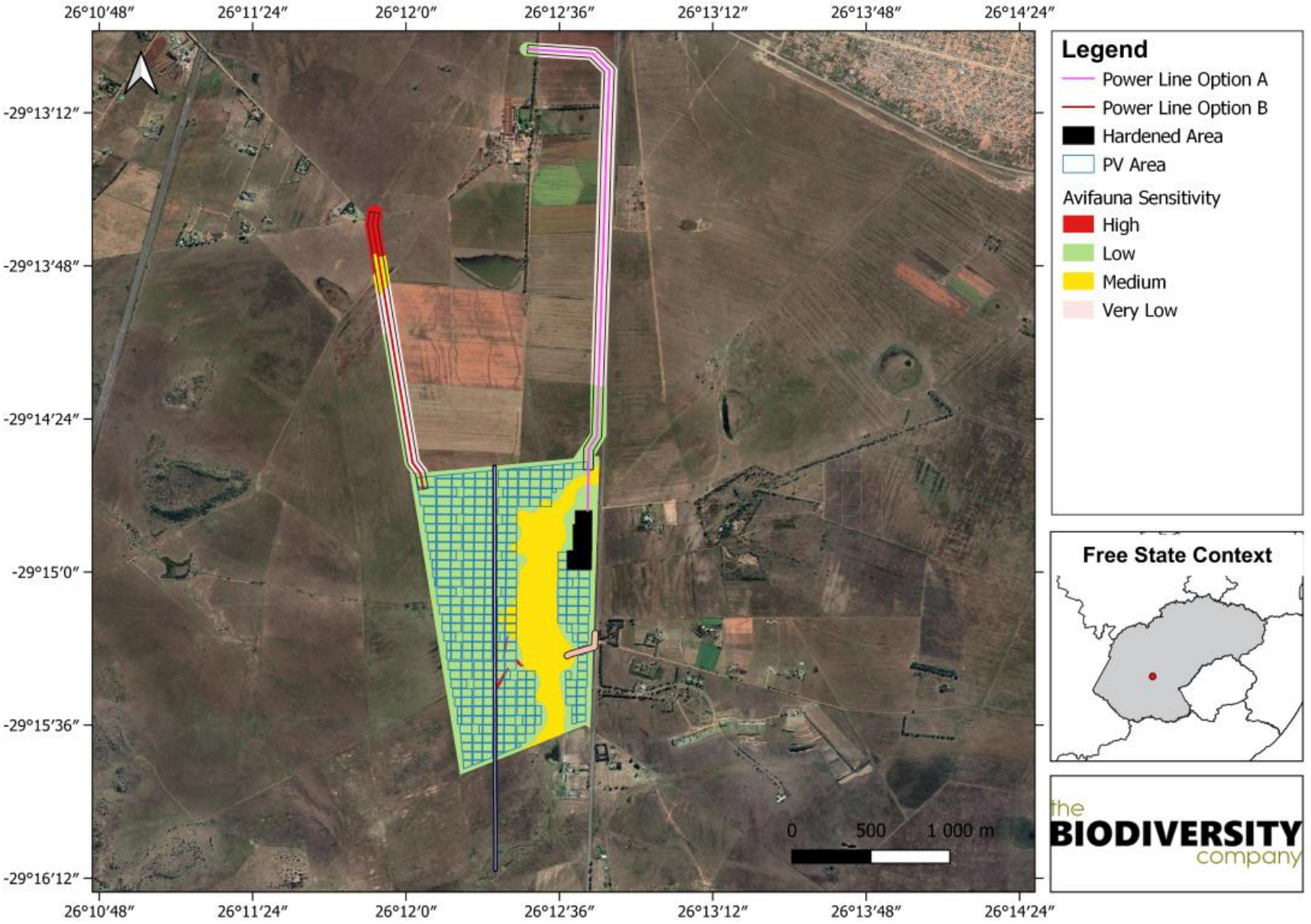


Figure 63: Site-based avifaunal sensitivity map (Clark, 2022b) ((PV Layout Option B)

12.6.5 Impact Assessment

Refer to **Section 13.14** below for the results from the impact assessment from this study.

12.6.6 Conclusions

The Project Area supports a low abundance and diversity of avifauna. This is a reflection of the homogenous nature of the grassland habitat which has been degraded from past cultivation. Although some sensitive habitat features were identified, namely a narrow north-south flowing valley-bottom wetland (Medium sensitivity situated in the PV area), the wetland flat and (medium sensitivity along Powerline Option B), the intact grassland (High sensitivity situated near northern terminus of Powerline Option B) and small scattered stands of Alien Bushclumps (High sensitivity, situated in the PV area), the majority of the site is covered by Low avifauna sensitivity degraded grassland. The wetlands were assigned a Medium Sensitivity on account of their capacity to support a moderate diversity and abundance of mainly widespread and adaptable waterfowl. The Alien Bushclumps were assigned a High sensitivity on account of their suitability for small raptor nesting. The Intact Grasslands were assigned a High sensitivity on account of their capacity to support large-bodied, collision prone SCC.

No SCC were detected during the field survey within the Project Area but Secretarybird was recorded 2 km east of Powerline Option B. Although just over 20 SCC occur regionally, all are only likely to occur sporadically and none are likely to breed in the Project Area. Although some impacts (e.g., habitat loss, collision and electrocution and loss of important nests) have the potential to have a high impact significance, all impacts can be reduced to a low residual impact significance by avoiding the areas identified as High and Medium sensitivity as much as possible. *It is noted that the layout was revised by the Applicant to minimise encroachment into the wetland area*.

Two grid connection route alternatives have been provided namely Powerline Option A and B. Powerline Option A is situated to the east and is the preferred and likely option to be developed. Although it is just under a third longer than Option B it is the preferred option from an avifaunal perspective as it parallels existing powerline infrastructure and the N6 highway and traverses mainly croplands. Whereas powerline Option B traverses several wetlands which attract a high diversity and abundance of waterfowl, Powerline Option A traverses only one medium-sized valley-bottom wetland near its crossing point along the N6 (near the road verge. Option B also borders on an extensive swathe of intact grassland to the west which is likely to support a number of SCC grassland species.

Overall, it is the opinion of the specialist that the project should be considered favourably from an avifaunal perspective, provided the suggested avoidance and mitigation are effectively applied.

12.7 Agricultural Impact Assessment

A summary of the Agricultural Impact Assessment (Gouws, 2022) (contained in **Appendix E4**) follows.

12.7.1 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
Affiliation (if applicable):	▪ Council of Natural Sciences.No:400036/93, Category: Agricultural sciences. ▪ Member of the Soil Science Society of South Africa

12.7.2 Objectives of the Study

The objectives of the Agricultural Impact Assessment include the following:

- ❑ Check the agricultural sensitivity of the overall site;
- ❑ Assess agricultural impacts of the proposed layout (development footprint);
- ❑ Assist with responding to any study-related comments that may be raised during the environmental assessment;
- ❑ Identify the preferred alternative in terms of the two power line route options; and
- ❑ Adhere to the Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Section 24(5) (a) and (h) and 44 of NEMA ("the Protocols") promulgated in GN No. 320 of 20 March 2020.

12.7.3 Methodology

The results of this study followed a site visit on 7 October 2022. Satellite images were used as backdrop and the present land uses digitised. A number of soil profiles were assessed by using a soil augur or soil probe.

Vegetation was simultaneously logged to determine veld condition. Grazing capacity was determined based on information from the Department of Agriculture, Land reform and Rural Development, (DALRRD) and then adapted to present veld conditions. Capability classification is calculated according to the guidelines published on the AGIS website.

Climate data was obtained from SA Weather and other on-line sources available on the internet.

12.7.4 Key Findings of the Study

12.7.4.1 Land Use Capability

The soil on the property is arable but no water is available for irrigation. The climate is the deciding factor to determine land capability (sensitivity). The soil capability for the deep Clovelly soil is high. Once the climate is incorporated into the land capability calculation, then the capability is medium. The conclusion is that the land has no high or very high potential land. The soil capability, as well as the land use capability and sensitivity, are reflected in **Figure 64** below.

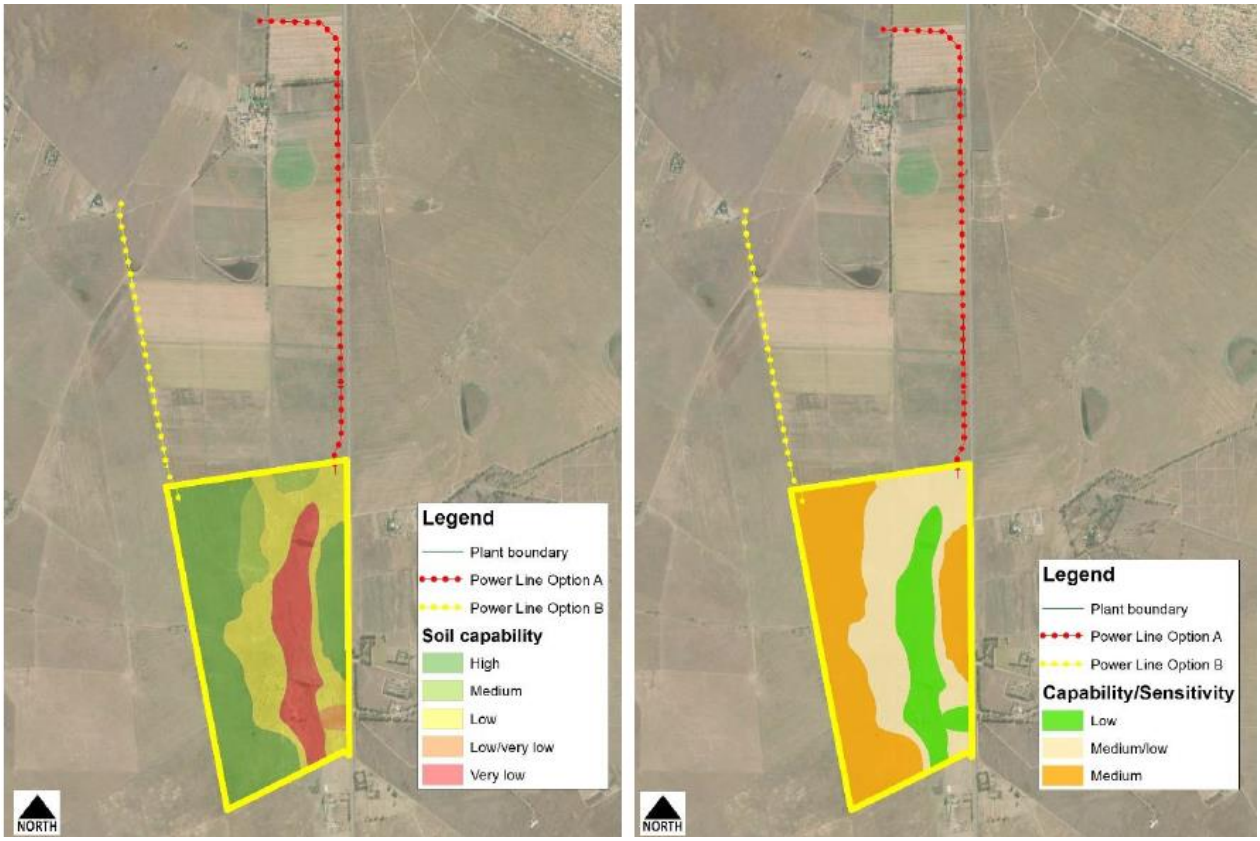


Figure 64: Soil capability (left) and land use capability and sensitivity (right) (Gouws, 2022)

12.7.4.2 Grazing Capacity

According to the Department of Agriculture the grazing capacity is estimated at 6 hectare per large livestock unit (LSU). The property will, therefore, only be capable to sustain around 75 animals, provided that additional fodder be provided in winter. Refer to the addenda for photos of the veld condition.

12.7.4.3 Agricultural Sensitivity – Screening Tool

According to the Screening Tool, the site in general has high sensitivity (see **Figure 65** below). This grading applies to all land that was previously cultivated, regardless of the land use potential. Grazing land is indicated as medium sensitivity.

Figure 65: Agricultural sensitivity of Project Area according to Screening Tool (Gouws, 2022)

The following was found during the site analysis:

- The development is on medium and low sensitive land, which is a variation to the findings of the Screening Tool.
- A detailed assessment found that the sensitivity is low or medium and not high, as found with the tool.

The land use capability was used as guideline to determine sensitivity. This is also the guideline used in the Screening Tool. The Screening Tool indicated all irrigated land as very highly sensitive, and all cultivated or fallow land as highly sensitive. The latter off course is not necessarily true.

Land use capability is a function of soil properties, land characteristics and climate. Whichever is the more limiting will determine the land use capability and hence, the sensitivity. The fact that the land is fallow and the reason why the land is no longer cultivated or that it was planted to pastures, may indicate that the land is not high sensitivity

land. Profits from farming has declined in recent decades, this is especially true on medium potential lands. Livestock production often surpasses crops in feasibility.

The climate is the deciding factor to determine land capability (sensitivity). The soil capability for the deep Clovelly soil is high. Once the climate is incorporated into the land capability calculation, then the capability is medium.

12.7.5 Impact Assessment

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

12.7.6 Conclusions

The land at the PV site has no high or very high potential land and the sensitivity is medium. The Screening Tool did not consider the watercourse, the soil properties or the variable rainfall. Having taken these into consideration, it is concluded that the sensitivity of the site is low to moderate for farming.

The following is noted in terms of the placement of infrastructure:

- Placement of the PV plant - The footprint where infrastructure will be placed is all on moderate to low sensitive land.
- Placement of power line - Both the lines are on the edge of the fields where disturbance during construction is low. Power line option A is not only shorter but construction vehicles can be restricted to the western side of the alignment, whereby there is little or no impact on the crop farming on the Paradys Research Farm. The farm owner (UFS), however, indicated that their preference is Route Option B.

12.8 Phase 1 Cultural Heritage Impact Assessment

A summary of the Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2022) (contained in **Appendix E5**) follows.

12.8.1 Details of the Specialist

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

Name:	J. van Schalkwyk
Qualifications:	D Litt et Phil
Affiliation (if applicable):	Heritage Consultant: ASAPA Registration No.: 164 - Principal Investigator: Iron Age, Colonial Period, Industrial Heritage.

12.8.2 Objectives of the Study

The objectives of this study included the following:

- Evaluate the potential impacts of construction, operation and maintenance of the proposed development on archaeological, cultural and historical resources;
- Recommend mitigation measures to ameliorate any negative impacts on areas of archaeological, cultural or historical importance; and
- Provide guideline measures to manage any impacts that might occur during the proposed project's construction and implementation phases.

12.8.3 Methodology

The methodology employed during this study consisted of the following:

- A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological and historical sources were consulted;
- A survey of Heritage Impact Assessments for projects in the region by various heritage consultants was conducted with the aim of determining the heritage potential of the area;
- The Heritage Atlas Database, various SAHRA databases, the Environmental Potential Atlas, the Chief Surveyor General and the National Archives of SA were consulted. Database surveys produced a number of sites located in the larger region of the proposed development; and
- Aerial photographs, topocadastral and other maps were also studied.

12.8.4 Key Findings of the Study

12.8.4.1 Archaeological and Cultural Heritage Sensitivity - Screening Tool

According to the Screening Tool, the Project Area has a low sensitivity for archaeological and cultural heritage themes, as indicated in the map in **Figure 66** below.

The low sensitivity of the Project Area in terms of archaeological and cultural heritage was confirmed during this study.

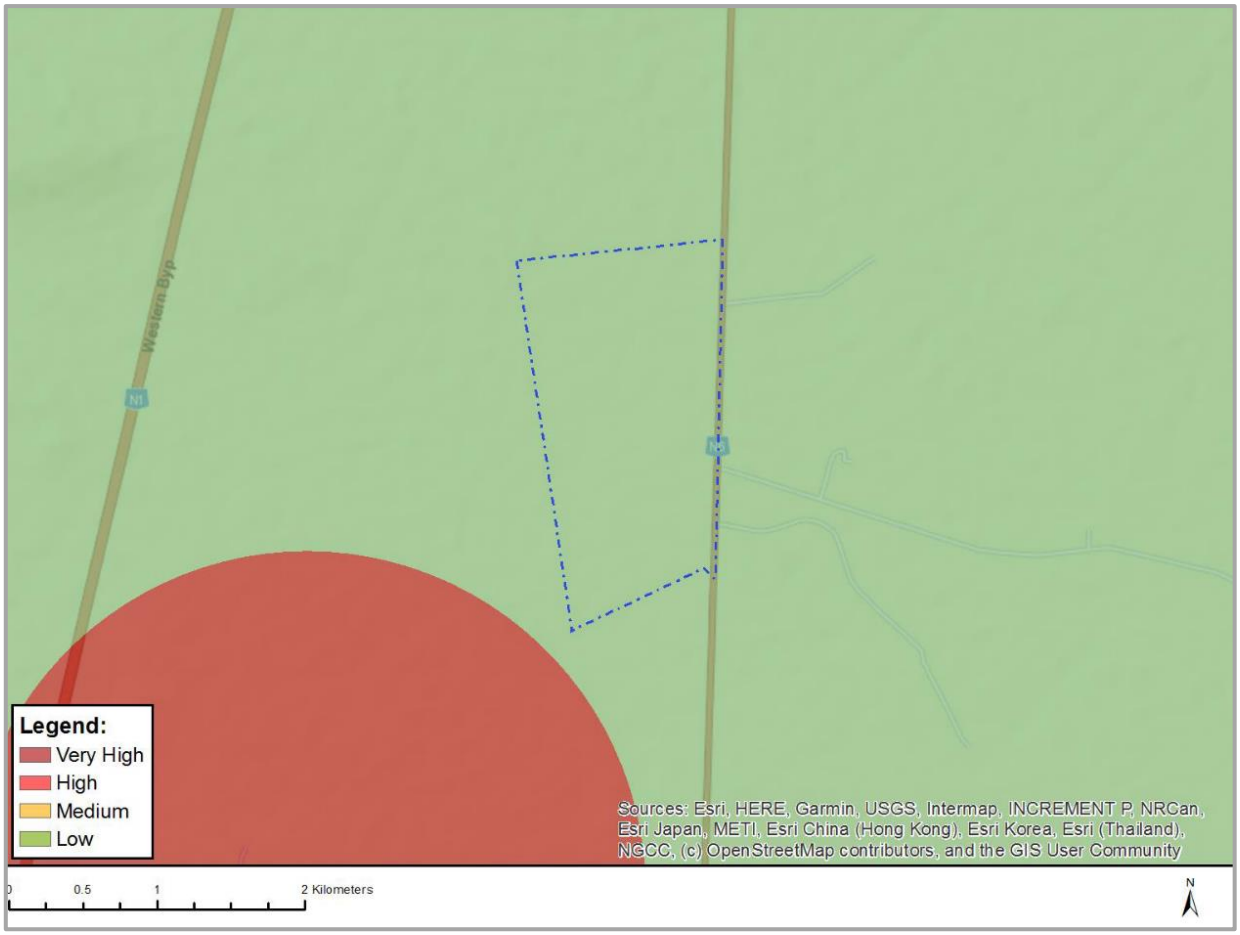


Figure 66: Sensitivity for archaeological and cultural heritage themes in the Project Area according to Screening Tool (van Schalkwyk, 2022)

12.8.4.2 Survey Results

The results from the survey are as follows:

- No sites, features or objects of cultural significance dating to the Stone Age were identified in the project area;
- No sites, features or objects of cultural significance dating to the Iron Age were identified in the project area; and
- No sites, features or objects of cultural significance dating to the historic period were identified in the project area.

12.8.5 Impact Assessment

Refer to **Section 13.16** below for the results from the impact assessment from this study.

12.8.6 Conclusions

From a heritage point of view, it is recommended that the proposed Project be allowed to continue on acceptance of the mitigation measures and conditions that emanated from the study.

It is noted that this study recommended that a palaeontological assessment be undertaken and a protocol for finds be implemented. Refer to **Section 12.9** below for the findings of the Palaeontological Impact Assessment.

12.9 Palaeontological Impact Assessment

A summary of the Palaeontological Impact Assessment (Butler, 2022) (contained in **Appendix E6**) follows.

12.9.1 Details of the Specialist

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

Organisation:	Banzai Environmental
Name:	E. Butler
Qualifications:	MSc Zoology (specializing in Palaeontology)
Affiliation (if applicable):	Member of the Palaeontological Society of South Africa (PSSA)

12.9.2 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.

12.9.3 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 Bloemfontein 2926 Geological map (1966) (Council of Geoscience, Pretoria);
- Updated geology produced by the Council of Geosciences, Pretoria; and
- Palaeontological Impact Assessment undertaken in the Bloemfontein area.

A site-specific field survey of the development footprint was conducted on 16 November 2022.

12.9.4 Key Findings of the Study

The proposed site is underlain by Permian aged sandstone and shale of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). Updated geology indicates that the development is underlain by the Balfour Formation of the Adelaide Subgroup. According to the PalaeoMap of the SAHRIS,

the Palaeontological Sensitivity of Adelaide Subgroup (Beaufort Group, Karoo Supergroup) is Very High. A site investigation was thus triggered for the Project.

A site-specific field survey of the development footprint was conducted on foot and by motor vehicle. No fossiliferous outcrop was detected in the proposed development. The apparent rarity of fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in palaeontological terms. It is therefore considered that the proposed development will not lead to damaging impacts on the palaeontological resources of the area.

12.9.5 Impact Assessment

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

12.9.6 Conclusions

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.

12.10 Visual Impact Assessment

A summary of the Visual Impact Assessment (Naidoo, 2022) (contained in **Appendix E8**) follows.

12.10.1 Details of the Specialist

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

Organisation:	Eco Elementum (Pty) Ltd	
Name:	N. Breitenbach	N. Naidoo
Qualifications:	B.Sc. Geography	B.Sc. Hons. Environmental Science
Affiliation (if applicable):	-	SACNASP (Cand. Sci. Nat.)

12.10.2 Objectives of the Study

The scope of work for the Visual Impact Assessment included the following:

- Describing the existing visual characteristics of the proposed site and its environment;
- Viewshed and viewing distance determination using Geographic Information System (GIS) analysis up to 15 km from the proposed structures;
- Visual Exposure Analysis, comprising the following aspects;
- Identifying the preferred alternative in terms of the two powerline route options;
- Impact identification and ratings; and
- Mitigation of identified visual impacts.

12.10.3 Methodology

The methodology employed for this study included the following:

1. Viewshed and viewing distance was modelled using GIS analysis up to 15 km from the proposed structures utilizing ArcGIS Pro 2.9.3 and Spatial Analyst Extension.
2. In order to model the decreasing visual impact of the structures, concentric radii zones of 1 km to 15 km from the proposed development were superimposed on the viewshed to determine the level of visual exposure. The closest zone to the proposed structures indicates the area of most significant impact, and the zone further than 10 km from the structures indicates the area of least impact. The visual ratings of the zones have been defined as follows –
   a. < 1 km (very high);
   b. 1 - 2 km (high);
   c. 2 - 5 km (moderate);
   d. 5 - 10 km (low);
   e. 10 - 15 km (very low); and
   f. > 15 km (insignificant).
3. A visual exposure analysis was conducted which included the following parameters –
   a. Terrain Slope;
   b. Aspect of structure location;
   c. Landforms;
   d. Slope position of structure;
   e. Relative elevation of structure;
   f. Terrain ruggedness;
   g. Visual Absorption Capacity (VAC); and
   h. Overall visual impact.

12.10.4 Key Findings of the Study

12.10.4.1 Landcover VAC

Figure 67 below shows the possible VAC of the study area calculated using the surrounding landcover. Taking into account the vegetation and landcover, the results reiterate that the study area has a moderate VAC. This suggests that the proposed infrastructure will be partially screened by the surrounding areas vegetation and landcover.

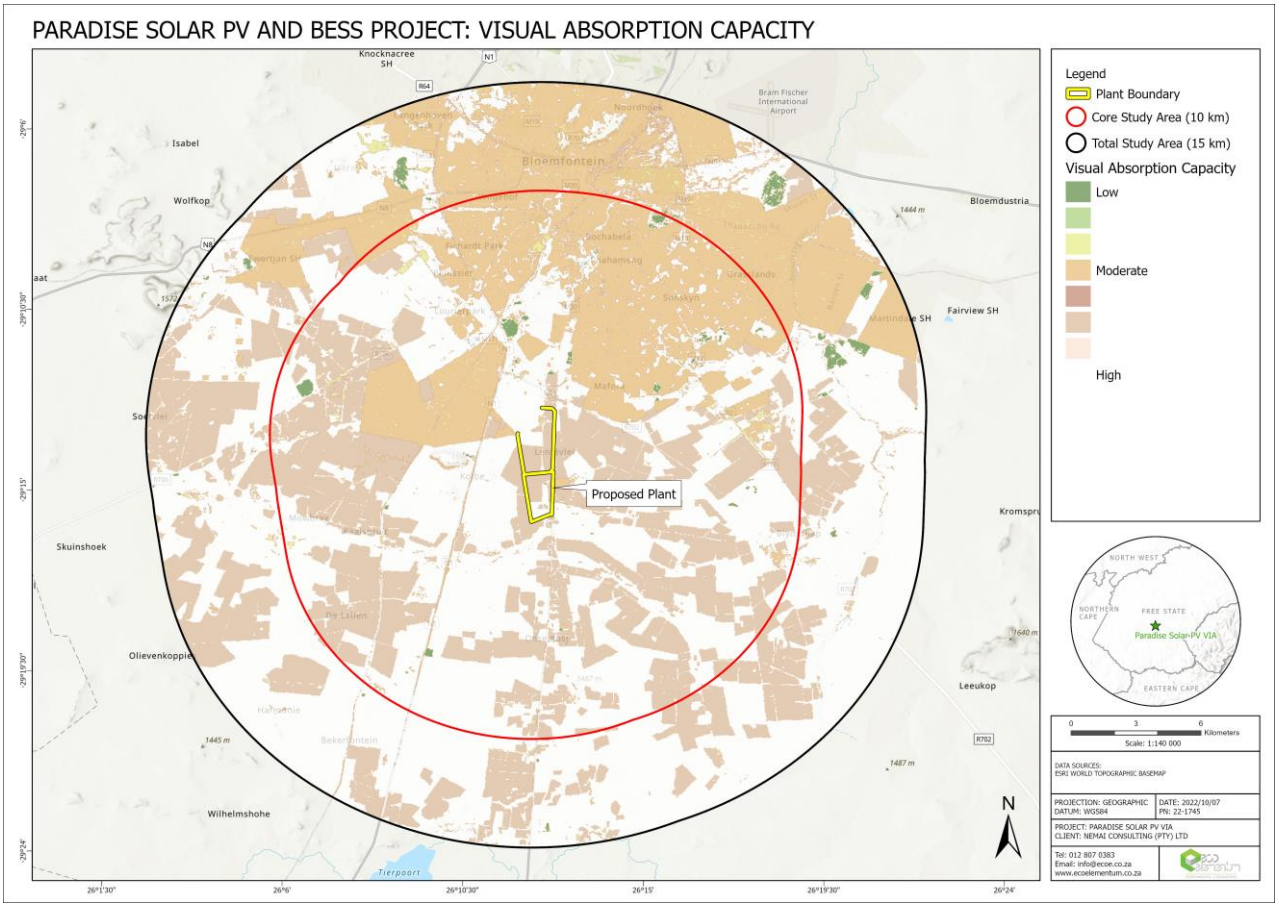


Figure 67: Potential VAC (Naidoo, 2022)

12.10.4.2 Viewshed Visibility – Distance Ranking

The results from the viewshed visibility were ranked based on the distance from the centre of the proposed site. The distances are ranked according to **Table 19** below.

Table 19: Visibility rating (Naidoo, 2022)

12 – 15 km	Very Low
9 – 12 km	Low
6 – 9 km	Medium
3 – 6 km	High
0 – 3 km	Very High

Figure 68 and **Figure 69** below show that the visibility of the proposed infrastructure will be highest towards the northeast of the site boundary. This may be attributed to the high vertical height of the proposed powerlines. The visibility impact decreases as the distance from the site increases, for both Option A and Option B.

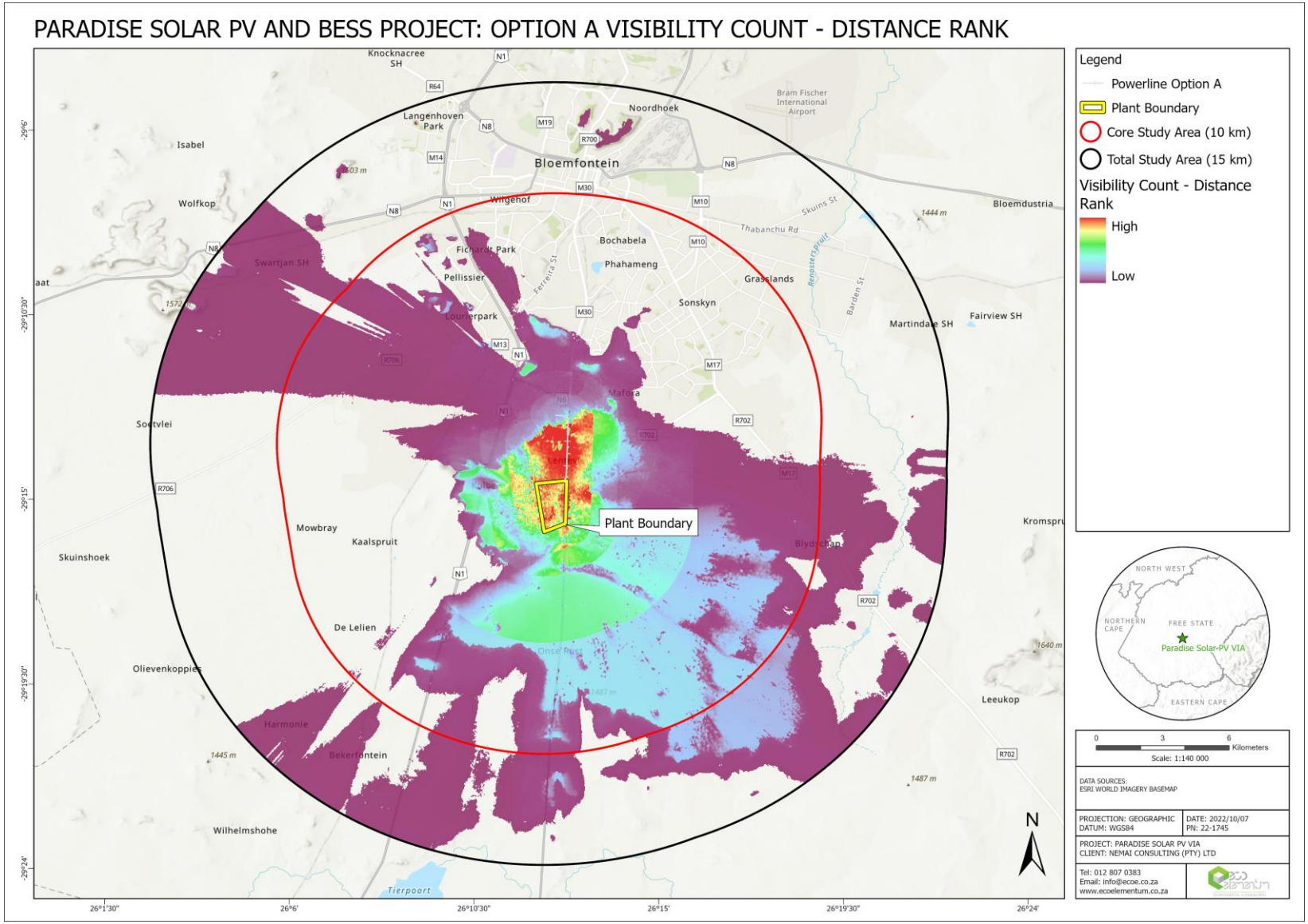


Figure 68: **Option A Visibility Count Distance Rank – showing the number of observer points that may be visible from within 15 km of the proposed site (Naidoo, 2022)**

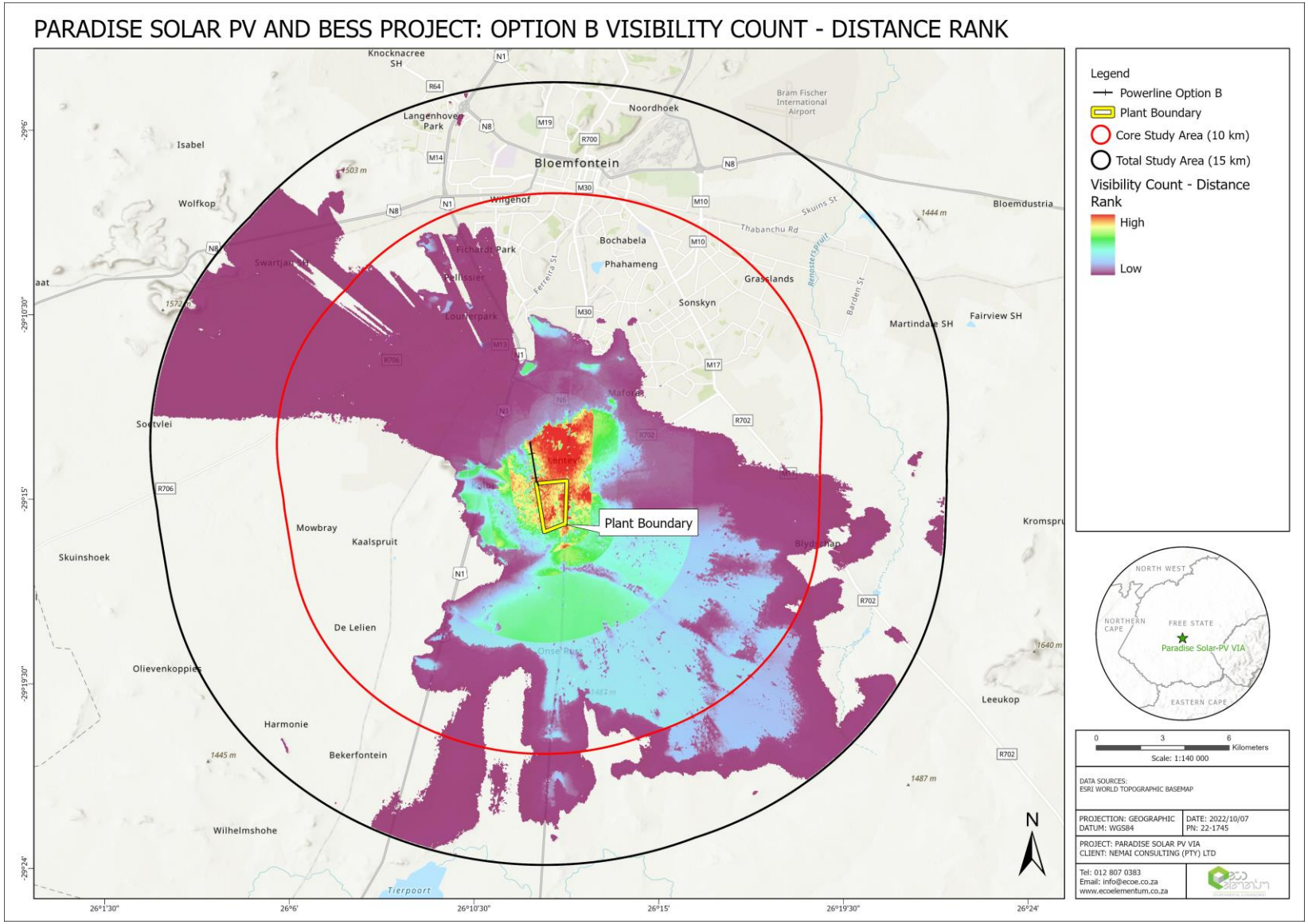


Figure 69: **Option B Visibility Count Distance Rank – showing the number of observer points that may be visible from within 15 km of the proposed site (Naidoo, 2022)**

12.10.4.3 Visual Exposure Ranking

The viewshed visibility and distance ranking is combined with the slope angle, slope aspect, slope position, ruggedness, relative elevation, landforms and landcover VAC to obtain a quantitative visual exposure ranking of all areas where the proposed infrastructure may potentially be visible from. **Table 20** below indicates the visual exposure ranking.

Table 20: Visual exposure ranking (Naidoo, 2022)

- 2	Very Low
3 - 4	Low
5 - 6	Medium
7 - 8	High
9 - 10	Very High

Figure 70 and **Figure 71** below show the visual exposure expected from both Route Option A and Route Option B layouts. The results for both options are similar in that the highest level of visual exposure is expected from the mountain tops/high ridges located west of the proposed site. Low to medium levels of visual exposure is expected from the areas immediately surrounding the study area and from the mountain tops/high ridges located north of the site, within the core study area. The areas south, southeast and northwest of the proposed site are expected to experience low levels of visual exposure. The areas further northeast and southwest are expected to experience no levels of visual exposure from the proposed Project.

When comparing the extent of visual exposure of the power line alignment options, the visual exposure results indicate that the visual exposure of Route Option A covers approximately 43% of the total study area and Route Option B covers approximately 41% of the total study area. This 2% difference occurs mostly outside of the core study area, i.e., the extent of visual exposure from Route Option A covers additional areas southwest, east and north of the site, outside of the core study area. These areas are, however, expected to experience low levels of visual exposure from the proposed Route Option A layout.

Overall, the figures indicate that low levels of visual exposure from the proposed Project are expected for both option layouts.

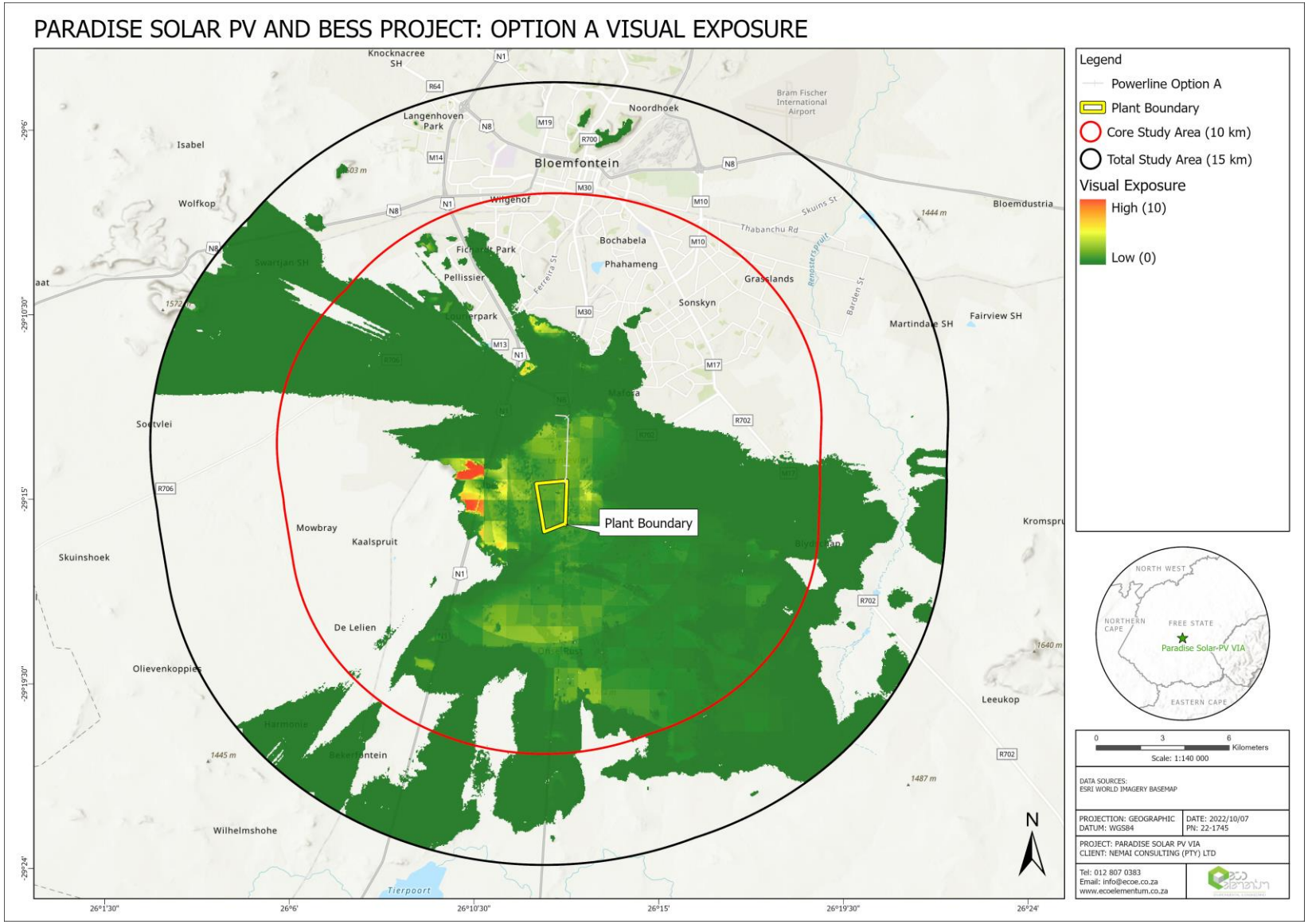


Figure 70: **Option A Visual Exposure – showing the level of visual exposure which may be experienced within 15 km of the proposed site (Naidoo, 2022)**

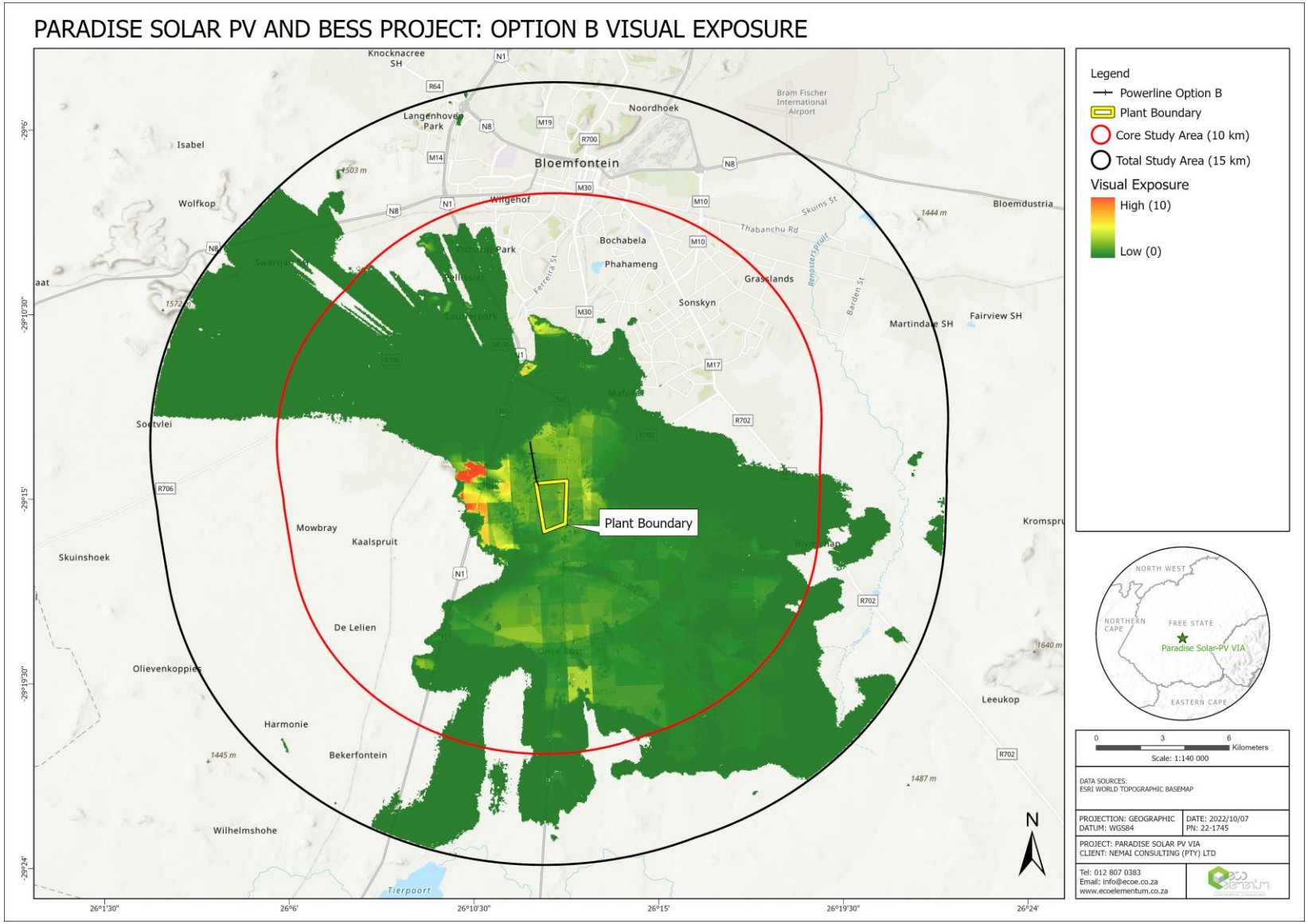


Figure 71: **Option B Visual Exposure – showing the level of visual exposure which may be experienced within 15 km of the proposed site (Naidoo, 2022)**

12.10.4.4 Viewpoints

Figure 72 and **Figure 73** below show the level of visual exposure expected to be experienced by the identified sensitive receptors for both Route Option A and Route Option B layouts.

The results indicate that for both options, the identified homesteads/schools/recreational facilities/accommodation and residential areas are expected to experience low to no levels of visual exposure. The formal residential areas of Bloemfontein and Mangaung are expected to experience low to medium levels of visual exposure along the southern boundaries of these areas. The southwestern boundary of Bloemfontein is expected to experience lower extents of visual exposure from Route Option A than from Route Option B. The sensitive receptors within the Paradys Small Holdings are expected to experience low levels of visual exposure from both option layouts.

Regarding the identified nature reserves, the Olievenkloof Private Nature Reserve and Karee Nature Reserve are expected to experience the same low to no levels of visual exposure, respectively, for both option layouts. The De Oudekraal Nature Reserve and Franklin Private Nature Reserve are expected to experience low levels of visual exposure from Route Option A and no levels of visual exposure from Route Option B. However, it is important to note that tourists may still be able to view the proposed development due to the use of optical instruments used for viewing distant objects.

Lastly, the identified road networks are also expected to experience low levels of visual exposure from both option layouts.

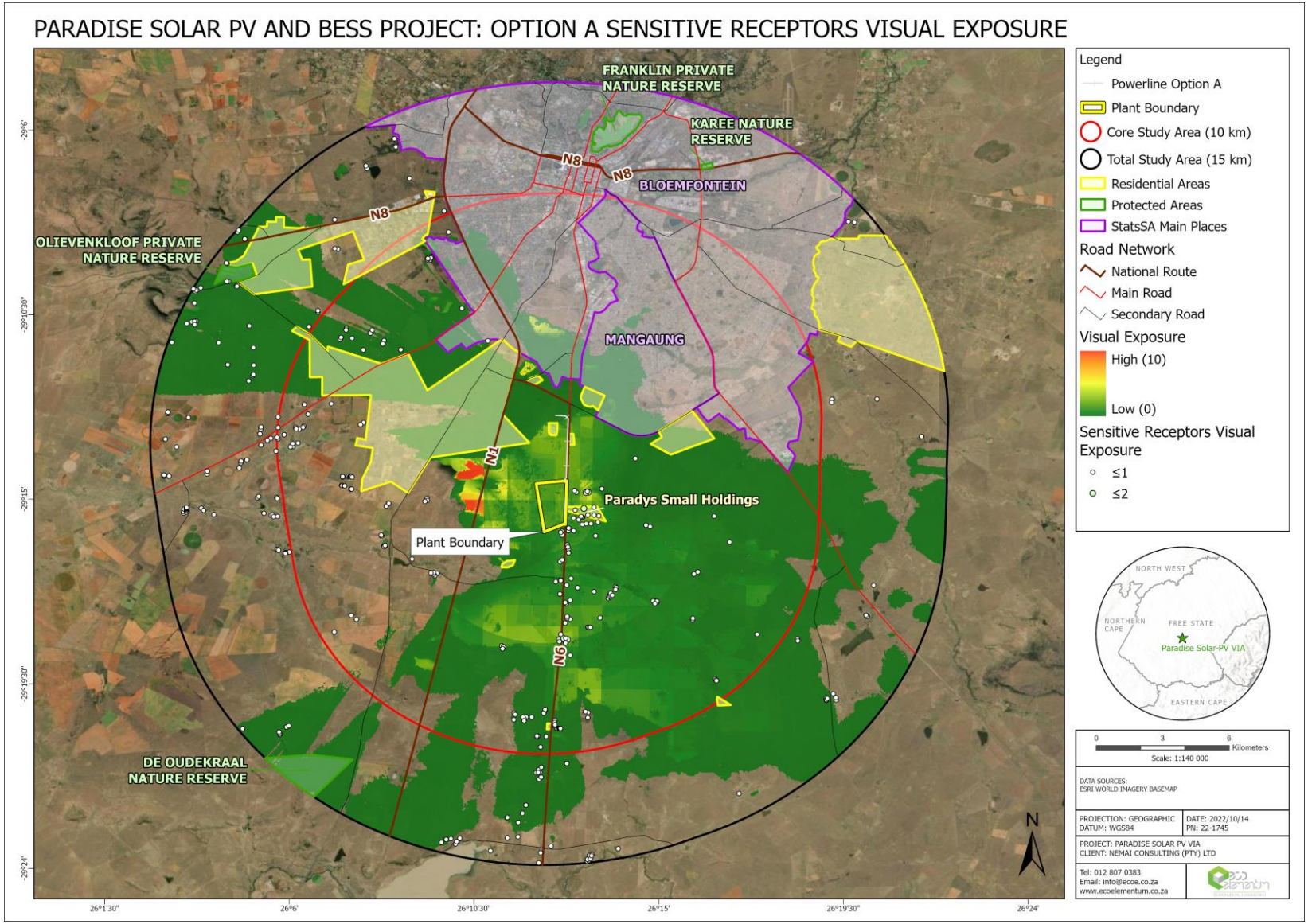


Figure 72: **Option A Visual exposure and sensitive receptors – showing the level of visual exposure potentially experienced by identified sensitive receptors (Naidoo, 2022)**

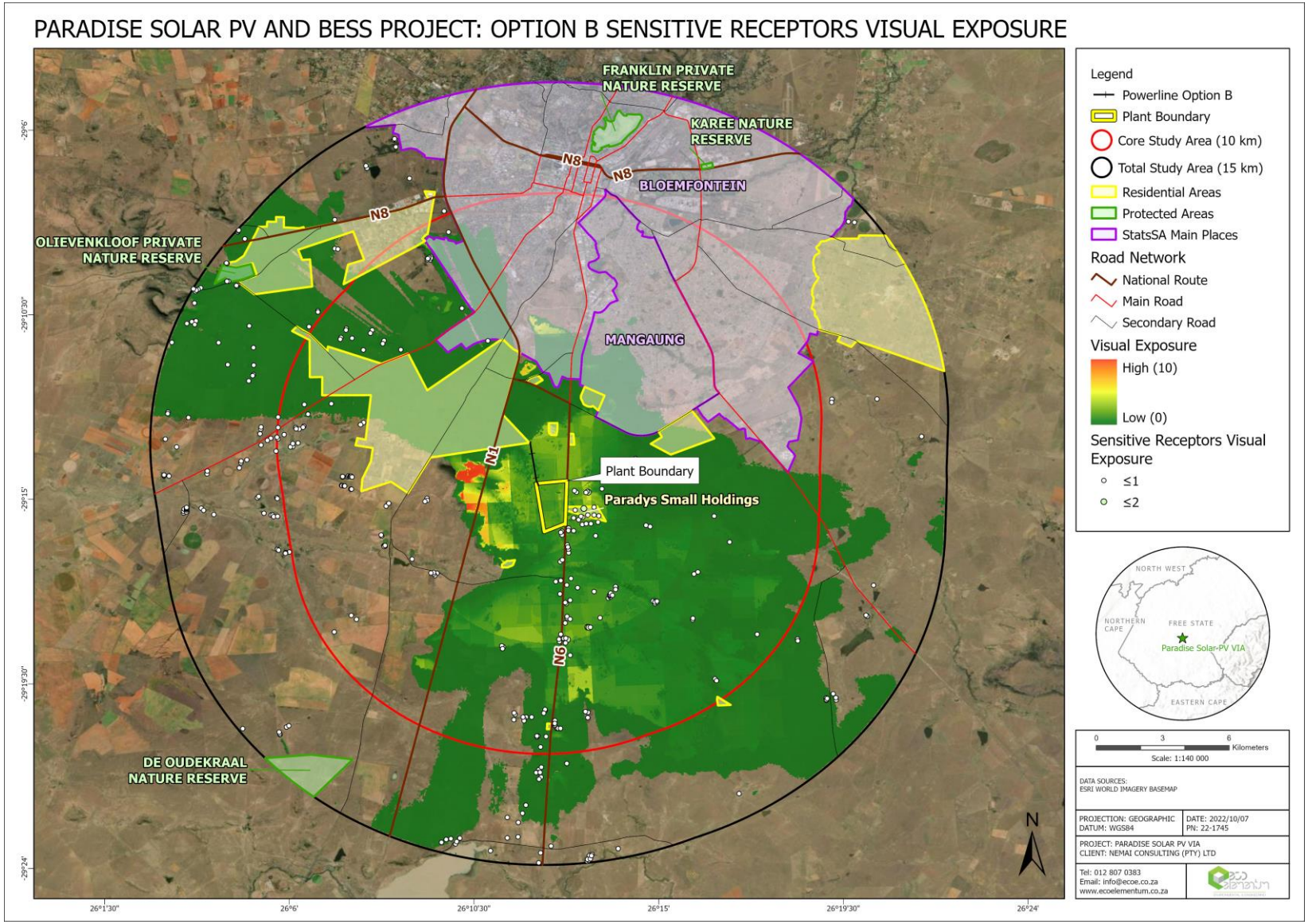


Figure 73: **Option B Visual exposure and sensitive receptors – showing the level of visual exposure potentially experienced by identified sensitive receptors (Naidoo, 2022)**

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

Overall, considering the viewshed and visual exposure results, the difference in the level and extent of visual exposure expected to be experienced by the identified sensitive receptors for both option layouts, can be considered minor as both layout options create an overall low level of visual exposure. Therefore, from a visual perspective, either Route Option A or Route Option B can be selected as the preferred option.

The impact assessment indicated that the proposed infrastructure would create a moderate negative visual impact on the surrounding areas during each phase of the activity. These impacts can be reduced after the recommended mitigation measures are implemented. However, the overall visual impact will remain as a moderate negative impact during the operational phase of the Project. This is mainly due to permanent nature of the structures and to the alteration of the area's current sense of place.

Given the presence of existing powerlines, an Eskom substation and agricultural/farming activities within the study area, along with the two approved solar PV facilities, the proposed Project is expected to increase the cumulative visual impact experienced by the identified sensitive receptors. The proposed solar plant is also expected to alter the sense of place of the study area and may set a precedent for additional renewable energy plants. Therefore, the proposed solar plant, in conjunction with any further renewable energy plants, will have a negative visual impact on the surrounding study area's sense of place. Consequently, it is recommended that the environmental authorities consider the overall cumulative impact on the character and the areas sense of place before a final decision is taken with regard to the optimal number of renewable energy activities in the area.

Mitigation measures were recommended for the proposed Project and should be adhered to in order to lessen the visual impact as far as possible. These mitigation measures should be applied regardless of which option layout is selected.

Considering the viewshed, visual exposure results and the visual impact assessment, the recommended Solar PV and BESS Project can proceed from a visual perspective, provided that the recommended mitigation measures are adhered to. Furthermore, given that the proposed development is expected to alter the area's current sense of place, it must be carefully managed.

12.11 Social Impact Assessment

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

12.11.1 Details of the Specialist

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

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

12.11.2 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.

12.11.3 Methodology

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 South African 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.

Further primary data was collected for the purposes of the study; these were collected using the following approaches:

- Rapid Rural Assessment: A survey was conducted to capture visual observations on the social dynamics, community proceedings, community resources and infrastructure.
- Stakeholder Consultations: Consultations with the affected communities carried out by members of the project team along each project component to discuss the proposed project and to gather their concerns and feedback on the project; and
- Key Informant Interviews: Informal discussions with the I&APs to help inform the baseline were conducted during site visits and as well as during the scoping phase. These included community members and authority members.

Secondary data was collected using different sources, these included Statistics South Africa Census data as well as a review of relevant municipal, district and other literature.

A GIS was used to conduct an analysis of the area. The use of GIS brings together the demographic and socio-economic data to enable a thorough analysis of the project area.

12.11.4 Key Findings of the Study

The regional study area is a rural economy with a narrow base. The Project Site 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 mainly 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 management rules and practises. It is therefore found 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.

12.11.5 Impact Assessment

Refer to **Section 13.26** below for the results from the impact assessment from this study.

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.

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 21** below.

Table 21: 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, cultivated land) along the proposed power lines • Visual impact associated with the proposed power line. • Impacts to agricultural land use at UFS Paradys Experimental Farm. • Cumulative impacts associated with aligning the proposed power line alongside linear developments (including existing roads and power lines).

Listed Activities	Potential Impact Overview
GN No. R.983 – Activity no. 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 in-stream and alongside watercourses. • Loss of wetland vegetation within construction domain. • 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 (including bulk earthworks) to be undertaken 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 no. 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, power line, medium voltage AC cabling, and boundary fence). • Impacts associated with obtaining access from the N6.
GN No. R.983 – Activity no. 28(ii): Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game	• Clearance of large areas associated with the construction footprint of the PV Site and associated infrastructure. • Loss of agricultural land.

Listed Activities	Potential Impact Overview
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.	• Socio-economic impacts associated with construction activities.
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. • 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 no. 4 - (b)(i)(ee): The development of a road wider than 4 metres with a reserve less than 13,5 metres. b. Free State i. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	Impacts associated with building an access road along a power line (Route Option B) within CBA 1, including loss of biodiversity.
GN No. R.985 – Activity no. 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.	The clearance of large tracts of indigenous vegetation and potential loss of sensitive fauna and flora species within areas consisting of threatened ecosystems, CBA 1 and within 100 m from the edge of a watercourse or wetland.

Listed Activities	Potential Impact Overview
GN No. R.985 – Activity no. 14(ii)(a) & (c) - (b)(i)(ff): 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: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	• Impacts to biodiversity within CBA 1 as a result of the development of infrastructure within 32 m from watercourses, including access roads, stormwater system, transformer blocks and associated infrastructure and structures. • 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 watercourses within CBA 1.

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 Comments and Response Report for a comprehensive and accurate representation of the issues raised*):

- ❑ Land use –
  - Impacts to existing agricultural land use.
  - Servitude restrictions.
  - Cumulative impacts of existing linear infrastructure on UFS properties.
- ❑ Water use –
  - Application in terms of the NWA for water uses.
- ❑ Construction –
  - Sourcing of construction material.
  - Water conservation during construction.
- ❑ Socio-economic impacts –
  - Safety of the Agricultural Community.
  - Risk of fire hazards.
  - Safety and security risks.
- ❑ Ecology –
  - Ground-thruthing of ecological sensitivity.
  - Compliance with BirdLife SA Guideline.
- ❑ Agriculture –

- Loss of high potential agricultural land.
- Route Option B traverses planted pastures and livestock camps on the UFS Paradys Experimental Farm.
- Preference of UFS for Route Option A.

- Existing infrastructure –
  - Impacts to existing infrastructure (power lines, telephone lines, roads, railway lines, pipelines, etc.).
  - Access to site from N6.
- Cultural Heritage & Palaeontological Features –
  - Impacts to cultural heritage and palaeontological features.
- Civil Aviation –
  - Compliance with the procedures of the South African Civil Aviation Authority (SACAA).
- BESS –
  - Management of associated risks.
- Technical information –
  - Technical details for the proposed facility.
  - Details of the future plans for the site and infrastructure after decommissioning.
- EIA Process –
  - Confirm listed activities triggered and assess related impacts.
  - Details of project components.
  - Sufficiently detailed layout and sensitivity maps.
  - Need for amended application form.
  - Specialist studies –
    - Requirements for terms of reference.
    - Include limitations and methodologies.
    - 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.
    - Include a Geohydrological Study.
  - Cumulative impact assessment to consider other similar projects within a 30km radius of the proposed development site.
  - Assessment of alternatives.
  - Requirements for the EMPr.
- Public participation –
  - Written consent from landowner.
  - Agreement from nearby shooting range owner.
  - Compliance with regulated requirements.
  - Recording and addressing comments from registered I&APs and organs of state.

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 22** below.

Table 22: 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 PV Site
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 (air quality, water quality, noise, traffic, social)
• Barricading of sensitive environmental features (e.g. wetland buffer)
• 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 23** below.

Table 23: 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 transmission lines
• 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 (air quality, water quality, noise, traffic, social)
• 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 24** below.

Table 24: Simplified List of Activities associated with Operational Phase

Project Phase: Operation
Project Activities
• Testing and commissioning the facility's components
• Cleaning of PV modules

Project Phase: Operation
• Servitude access arrangements and requirements
• Routine maintenance inspections of power lines and servitudes
• 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 25** below. Note that only high level aspects are provided.

Table 25: Environmental Aspects associated with Project Life-Cycle

Project Phase: Pre-construction
Environmental Aspects
• Inadequate consultation with landowner and other relevant stakeholders
• Inadequate rehabilitation of current eroded areas
• 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 trees, heritage resources)
• Lack of barricading of sensitive environmental features (e.g., wetland buffer)
• 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

Project Phase: Construction
• Disruptions to traffic
• Poor transportation practices
• Poor fencing arrangements
• 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)
• Impact to resource quality of wetland in central part of PV site
• Inadequate stormwater management
• Disruptions to agricultural activities at UFS Paradys Experimental Farm
• 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 26** below, were identified through an appraisal of the following:

- Project-related components and infrastructure (see **Section 9**);
- Operation of the PV Plant and power line;
- 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 26** were evaluated as part of the specialist studies and suitable mitigation measures were identified where it was found that these impacts could possible occur. These impacts are assessed in **Sections 13.9 – 13.28** below.

Table 26: 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.	▪ Sterilisation of land for other land use types up to the decommissioning of the Project (if applicable). ▪ Servitude restrictions associated with proposed power line (grid connection).
Geology	▪ Suitability of geological conditions to support the Solar PV Plant.	▪ Suitability of geological conditions to support the Solar PV Plant.
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).	▪ Crossing topographic features (watercourses). ▪ Visual impact caused by proposed Project infrastructure and landscape transformation. ▪ 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.	▪ 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.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Impacts where access roads and ancillary infrastructure cross / are in close proximity to watercourses (e.g., sedimentation, loss of vegetation, destabilisation of watercourse structure).	▪ 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. ▪ Pollution of the biophysical environment from poor construction practices. ▪ Proliferation of invasive alien species in disturbed areas.	▪ 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.
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.	▪ Loss of possible future agricultural land use due to direct occupation by the development footprint. ▪ Soil erosion due to inadequate stormwater management.
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.	▪ 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. ▪ Sun glare off PV panels.

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts
	▪ Use of oversized vehicles/abnormal loads, as required. ▪ Risks to other road users.	
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.
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 13.26** 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 27** 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 27** below. However, the quantitative basis for these specialist evaluations of the impacts to specific environmental features still satisfied the intention of the EIA.

Table 27: 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 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 was historically used for agricultural purposes. The landowner has signed an Option to Lease Agreement with the Applicant. 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.

To minimise impacts to the receiving environment and current land uses, the Project's power line route options mostly follow property boundaries. Route Option A and Route Option B run along the eastern and western parts of the UFS Paradys Experimental Farm, respectively. Both power line alignment options traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing. A meeting was held with the UFS on 12 September 2022 (refer to minutes contained in **Appendix I**). During this meeting the representatives from the UFS stated that Route Option A for the proposed power line is preferred, however, they expressed concern for related impacts to agricultural activities on their property. Agricultural activities at the UFS Paradys

Experimental Farm will be disturbed during the construction phase, however, will be permitted within the power line's servitude during the operational phase. The power line's towers will create a permanent disturbance to the cultivated areas.

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.	• Technical team to investigate locating the towers of the proposed power line outside of the area where the new pivot is planned on the UFS Paradys Experimental Farm, as well as spanning cultivated areas as much as possible to minimise disruptions to agricultural activities (refer to **Section 13.15.1** below).

	+/- 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

According to Gouws (2022), the soil at the PV Site is highly erodible. 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.	• Consider findings from geotechnical investigations during Project design phase and incorporate mitigation measures (as relevant). • 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;
- ❑ 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.	• Consider findings from geotechnical investigations during Project design phase and incorporate mitigation measures (as relevant). • 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). • The intention is for water to be supplied by the MMM, with a water connection to the PV Site. 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

With regards to hydrological features associated with the PV Site, a north-south flowing seasonally inundated unchanneled valley-bottom wetland (HGM1) traverses the site and drains into the Kaalspruit located approximately 1.2km to the south.

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 associated with the PV facility are to be developed outside of the 1:100 year floodline of any watercourse. • 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 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 Wetlands

13.12.2.1 Impact Description

The findings from the Wetland Delineation and Risk Assessment (Clark, 2022a) follow. The specialist report is contained in **Appendix E1**.

Given the relatively large amount of non-wetland land in the Project Area (146.26 ha or roughly 70 %), avoidance of the wetland and its buffer was strongly advocated in first drafts of this report. The wetland delineation was sent to the Applicant who revised the layout based on the spatial data provided. Upon receipt of the revised layout, it is apparent that great efforts have been made to align the infrastructure, particularly all hardened areas, to avoid the identified wetland. Although the majority of the wetland has been avoided some solar panels still do overlap on small portions of the wetland and its associated buffer. This necessitates a residual risk rating of Medium for wetland habitat loss. This is because development within a wetland triggers a mandatory risk rating of 5 for both Severity and Legal risk criteria. Consequently, the compilation, approval (by DWS) and implementation of a very basic wetland offset strategy (through on-site rehabilitation) is advised. Overall, however, the development is considered unlikely to degrade the integrity of the wetland (which currently provides no highly important ecosystem services other than food for livestock) and downstream water resources, to any appreciable level. This is based primarily on the small wetland extent to be impacted and the small consequence or magnitude of the actual residual impact expected within those areas (PV infrastructure on plinths with minimal to no removal of natural vegetation). However, it is also important to consider that these overlap areas likely represent previously terrestrial land which has been artificially inundated through the creation of dams in any event.

The main risks relate to increased floodpeaks, sedimentation and erosion to the unchanneled valley-bottom wetland (HGM1) associated with PV development. This risk is likely to stem from the exposed soil surfaces created during clearing in the construction phase but also during operation from maintaining cleared surfaces beneath the bifacial solar panels. The key objective should be to as far as possible increase the permeability and drainage of the soil beneath the solar panels while reducing the loss of sediments from this area during rainfall.

13.12.2.2 Impact Assessment

This risk-based impact assessment was conducted in line with Section 21(c) and (i) of the NWA to investigate the level of risk posed by the construction and operation of the proposed solar PV farm. **Table 28** below lists the potential risks posed by the development to the identified wetlands (HGMs 1-3). Significance ratings for each identified risk are given for scenarios with and without mitigation.

Table 28: Risk and impact assessment matrix (Clark, 2022a)

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
Construction																			
Clearing and preparation of PV footprint, access roads and powerline route.	Disturbance of wetland habitat.	Loss or degradation of wetland vegetation.	Without	4	4	4	5	4.3	2	5	11	4	4	5	3	16	180	**H**	▪ Use the wetland shapefiles provided by TBC to clearly demarcate (on the ground) the edge of the buffer on the unchanneled valley-bottom wetland (41 m buffer). For the areas where the development infringes on the wetland zone demarcate the edge of the PV footprint and signpost wetland areas beyond that as environmentally sensitive "no-go" areas and apply an appropriately designed, on-site wetland rehabilitation plan to offset the residual impacts to these wetland areas. The rehabilitation plan needn't be large, complex or costly given the small wetland extent to be impacted and the low consequence or magnitude of the residual impact within those areas (PV infrastructure on plinths with minimal to no removal of natural vegetation. The rehabilitation offset plan should be approved by DWS prior to licence application. ▪ Opt for powerline route Option A. ▪ All activities (including driving and equipment storage) must remain outside of the wetland. ▪ Use existing access roads and only create new roads in non-wetland areas.
			With	2	2	2	2	5	2	5	12	2	2	5	1	10	120	**M**	
		Increased bare surfaces, floodpeaks and potential for erosion	Without	5	5	5	4	4.8	2	5	12	4	4	5	3	16	188	**H**	▪ Hold off on the clearing of vegetation as long as possible, ensuring that all environmental and water use authorisations are in place, the site construction materials are in place and the PV infrastructure is sourced and ready prior to clearing. ▪ Take every measure to ensure that the bulk of the site clearing and earth moving activities take place in winter when rainfall is lowest (and the grass sward is thinnest) to minimize environmental damage, erosion, sedimentation and contamination. (*Insert: based on technical viability*).
			With	2	3	3	3	2.8	2	2	6.8	3	3	1	1	8	54	**L**	

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											▪ Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. ▪ Scrape the area where mixing and storage of sand and concrete occurred to clean and re-grass once finished. ▪ Revegetate all denuded areas beyond the buildings as soon as possible
		Introduction and spread of alien and invasive vegetation	Without	2	2	4	4	3	2	5	10	3	3	5	1	12	120	M	▪ Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs). ▪ Appropriately stockpile topsoil cleared from the site. ▪ Minimize unnecessary clearing of vegetation beyond the infrastructure footprints. ▪ Lightly till any disturbed soil around the development to avoid compaction.
			With	1	1	1	1	1	1	2	4	2	1	5	1	9	36	L	
Excavation and installation of PV infrastructure.	Alteration of Hydrological Regime	Decreased flow inputs to the Kaalspruit	Without	2	2	4	4	3	2	5	10	3	3	5	1	12	120	H	▪ Develop a sound stormwater management plan that is engineered to promote rainfall infiltration, maintain diffuse subsurface flows in seep areas, minimise the development of preferential flow paths. The stormwater plan would also benefit from Lidar based topography maps and / or site-specific contours that allow for the identification of flow paths. ▪ Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). ▪ Minimise the extent of concreted / paved / gravel areas. ▪ Avoid excessively compacting the ground beneath the solar panels. ▪ Introduce coarse, preferably washed, gravel beneath PV arrays.
			With	1	1	1	1	1	2	1	4	1	1	1	1	4	16	L	
	Soil disturbance	Increased sediment loads	Without	4	5	4	4	4.3	2	5	11	4	4	5	1	14	158	M	▪ See mitigation for increased bare surfaces, runoff and potential for erosion.

Activity	Aspect	Impact	Wetland Type	Severity					Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Water Quality	Habitat	Biota	Severity											
		to downstream reaches	With	2	2	2	3	2.3	2	2	6.3	2	2	1	1	6	38	L	▪ Introduce coarse, preferably washed, gravel beneath PV arrays.
Operation																			
Routine operation and maintenance	Residual vegetation disturbance	Proliferation of alien and invasive species	Without	1	1	2	2	5	2	5	12	2	2	5	1	10	120	M	▪ Continue to remove all alien and invasive plant species as they arise (i.e. weedy annuals and other alien forbs). ▪ Attempt to plant only locally indigenous plant species within the gardens.
			With	1	1	1	1	1	2	5	8	2	2	1	1	6	48	L	
	Increased contamination	Nutrient enrichment of wetlands	Without	1	2	2	2	2	2	5	9	4	4	5	2	15	135	M	▪ Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. ▪ Do not store any construction materials or equipment within any of the identified wetlands or their buffers. ▪ Mixing of concrete must under no circumstances take place within any wetland. ▪ Release only clean water into the environment.
			With	1	1	1	1	1	1	2	4	2	1	5	1	9	36	L	
	Altered sediment regime	Increased sedimentation from cleared ground beneath solar PV areas	Without	1	1	4	4	2.5	2	5	9.5	3	3	5	1	12	114	M	▪ Develop a sound stormwater management plan that is engineered to promote rainfall infiltration, maintain diffuse subsurface flows in seep areas, minimise the development of preferential flow paths. ▪ Consider the use of a coarse heavy metal-free gravel beneath the solar panels to promote infiltration and minimize surface run-off and erosion during high rainfall events. The gravel should be free of heavy metal contaminants.
			With	1	1	1	1	1	1	2	4	2	1	5	1	9	36	L	

The following mitigation measures are proposed in light of the above risk assessment (Clark, 2022a):

- Use the wetland shapefiles provided by TBC to clearly demarcate (on the ground) the edge of the buffer on valley-bottom (41 m buffer) wetland. Regard the wetland and its buffer as a strict no-go areas and sign post as environmentally sensitive. [Insert: *Note that the need for an offset strategy was identified by the Wetland Specialist for small portions of wetland and buffer zone encroachment*. *In addition, it is further noted that the earthen dam on the PV Site may have caused an unnatural expansion of the wetland. There is a breach in this dam wall, which may reduce the wetland footprint over time. The Applicant may seek to update the delineation of the wetland by a Wetland Specialist prior to the implementation of the Project to determine whether the wetland boundary has been reduced, which may influence the mitigation measures linked to the wetland and its buffer area.*]
- Opt for preferred powerline route Option A and generally avoid traversing wetlands with the powerline route.
- Use existing farmers access road and crossing point across the unchannelled valley-bottom wetland (HGM 1). All new roads and activities (including driving and equipment storage) must remain outside of the wetlands identified. Avoid constructing any new crossings by accessing other PV areas via new gates along the main regional sand road. [Insert: *It is noted that the existing Provincial Tertiary Road T4267 traverses the site (see* ***Section 11.16*** *above), which can be used for access purposes. Any upgrading of this road to allow for the implementation of the Project will need to be assessed by the Wetland Specialist.*]
- Hold off on the clearing of vegetation as long as possible, ensuring that all environmental authorisations are in place, the site construction materials are in place and the PV infrastructure is sourced and ready prior to clearing.
- Take every measure to ensure that the bulk of the site clearing and earth moving activities take place in winter when rainfall is lowest (and the grass sward is thinnest) to minimize environmental damage, erosion, sedimentation and contamination. [Insert: *This is reliant on the project schedule*.]
- Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area.
- Develop a sound stormwater management plan that is engineered to promote rainfall infiltration, maintain diffuse subsurface flows in seep areas, minimise the development of preferential flow paths. The stormwater plan would also benefit from Lidar based topography maps and / or site-specific contours that allow for the identification of flow paths.
- Stormwater leaving the PV areas should not be concentrated in a single exit drain but spread across multiple exit drains, each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in).
- Avoid the clearing of vegetation beneath the solar panels.
- Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the overall master plan.

- Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed.
- Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.

13.13 Terrestrial Ecology

The findings from the Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022) follow. The specialist report is contained in **Appendix E2**.

13.13.1 Impact Description

The majority of the Project Area has historically been modified to accommodate agricultural practices and as such remain in a transformed state. The Project Area does, however, contain unique habitat features such as the unchanneled valley bottom wetland in the central part of the Solar PV Site and the secondary grassland habitat associated with Route Option B.

The focus of the mitigation measures is to reduce the significance of the expected impacts associated with the development and thereby to:

- Prevent the further loss and fragmentation of vegetation communities within the natural areas in the vicinity of the project area;
- Reduce the negative fragmentation effects of the development and enable the safe movement of faunal species; and
- Prevent the direct and indirect loss and disturbance of floral and faunal species and communities (including any potential SCC).

13.13.2 Impact Assessment

According to the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial biodiversity (GN No. 320 of 20 March 2020), a Terrestrial Biodiversity Compliance Statement was prepared for the Project as the desktop assessment and field survey confirmed that the Project Area is mostly of a ‘Low’ sensitivity. This compliance statement does not include a quantitative assessment of the potential impacts to terrestrial biodiversity, however, it provides impact management actions that are contained in **Table 29** below.

Table 29: Mitigation measures from Terrestrial Biodiversity Compliance Statement (Jacobs & Burger, 2022)

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
All planned activities should be realigned to prioritise development within the 'Low' sensitivity area. It is recommended that areas to be developed/disturbed be specifically demarcated so that during the construction/activity phase, only the demarcated areas be impacted upon.	Planning Phase, Construction Phase	Project manager, Environmental Officer	Construction footprint	During phase
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
All vehicles and personnel must make use of existing roads and walking paths, especially construction/operational vehicles.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	During phase
All laydown, chemical toilets etc. should be restricted to '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/closure phase has been concluded.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement	During phase
Areas that are denuded during construction that are not within the proposed footprint area need to be re-vegetated with indigenous vegetation to prevent erosion during flood events and strong winds and to support the adjacent habitat. This will also reduce the likelihood of encroachment by alien invasive plant species.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
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.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
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.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
• 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 is to take place on site unless necessary. • All contaminated soil shall be treated in situ or removed and be placed in containers. • It is important to appropriately contain any diesel storage tanks and/or machinery spills (e.g., accidental spills of hydrocarbons, oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.				
Consult a fire expert and compile and implement a fire management plan to minimise the risk of veld fires around the project site.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
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. Hi visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.	Life of operation	Project manager, Environmental Officer	Protected Tree species	Ongoing
Management outcome: Fauna				
No trapping, killing, or poisoning of any wildlife is to be allowed. Signs must be put up to enforce this. These actions are illegal in terms of provincial environmental legislation.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
A qualified Environmental Control Officer must be on site when clearing begins. The area must be walked though prior to construction to ensure that no faunal species remain in the habitat and get killed. 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.	Pre-Construction, Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal species	During phase
Any holes/deep excavations must be dug in a progressive manner in order to allow burrowing animals time to move off and to prevent trapping. Should the holes remain open overnight they must be covered temporarily to ensure no fauna species fall in.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
The proposed area to be developed must be disturbed by walking the area, prior to clearing of the area. This will allow fauna to move off from the area.	Life of Operation	Environmental Officer, Contractor, and estate manager	Fauna	Construction phase
The areas to be developed (or activity areas) must be specifically demarcated to prevent the movement of staff or equipment/vehicles into the surrounding environments. Signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into surrounding areas	During phase
The duration of the construction should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction timeframe	During phase
Outside lighting should be designed and limited to minimize impacts on fauna. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (yellow) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light	During phase
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 must be enforced to ensure that road killings and erosion is limited. Speed bumps should be built to force slow speeds.	Construction Phase	Health and Safety Officer	Compliance to the training	During phase
Noise must be kept to a minimum during the evenings/ at night to minimize all possible disturbances to amphibian species and nocturnal mammals.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
Signs must be put up in order to show the importance and sensitivity of surrounding areas and their functions. This especially pertains to the wetland areas.	Life of operation	Environmental Officer	Presence and condition of signs	Ongoing
Only use environmentally friendly dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Management outcome: Alien Vegetation and Fauna				
The implementation of an Alien Invasive Plant management plan is very important, especially because of the invasive species identified on site which, if left unchecked, will continue to grow and spread prolifically leading to further and more significant deterioration to the health of the natural environment within the project area.	Life of operation	Project manager, Environmental Officer & Contractor	Assess and control presence and encroachment of alien vegetation	Quarterly monitoring

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
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.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	During phase
Management outcome: Dust				
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, particularly for all dirt roads and any earth dumps. This includes the wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated. Only environmentally friendly suppressants may be used to avoid the pollution of water sources. Speed limits must be put in place to reduce erosion, and speed bumps should also be constructed.	Construction Phase and Life of operation	Contractor	Dustfall	Ongoing, as per a dust monitoring program
Management outcome: Waste Management				
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. • Refuse bins must be emptied and secured; • Temporary storage of domestic waste shall be in covered waste skips; and • Maximum domestic waste storage period must be 10 days.	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
Any litter, spills, fuels, chemical and human waste in and around the project area must be removed and disposed of timeously and responsibly.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
It must be made an offence to litter or dump any material outside of specially demarcated and managed zones. Signs and protocols must be established to explain and enforce this.	Life of operation	Contractor, Environmental Officer & Health and Safety Officer	Presence of Waste and Dumping	Daily, Ongoing
A minimum of one toilet must be provided per 10 persons. Portable toilets must be regularly pumped dry to ensure that the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
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.	Life of operation	Environmental Officer & Health and Safety Officer, Contractor	Availability of bins and the collection of waste	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Where a registered disposal facility is not available close to the project area, the Contractor/property owner shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site. Waste may never be stored in an open pit where it is susceptible to the elements such as wind and rain.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of waste	Ongoing
Management outcome: Environmental Awareness Training				
All personnel are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on all sensitive environmental receptors within the project area to inform contractors and site staff of the presence of sensitive habitat features such as wetlands, and management requirements in line with the Environmental Authorisation and within the EMPr.	Life of operation	Environmental Officer, Health and Safety Officer	Compliance to the training	Ongoing
Contractors and employees must all undergo a strict environmental induction and be made aware of the sensitive habitats within the project area.	Life of operation	Environmental Officer, Health and Safety Officer	Compliance to the training	Ongoing

13.14 Avifauna

A separate Avifaunal Baseline and Impact Assessment (Clark, 2022b) was undertaken and the findings from this study follow. The specialist report is contained in **Appendix E3**.

13.14.1 Impact Description

Development of the PV plant within the Project Area and its associated infrastructure will invariably result in a loss of habitat which has the potential to be of Moderate significance for avifauna (without avoidance or mitigation). However, provided the Wetland and Alien Bushclumps are excluded from the PV infrastructure footprint and the suggested mitigation is effectively applied the loss of habitat is only considered to have a low residual impact. *It is noted that the layout was revised by the Applicant to minimise encroachment into the wetland area. In response (refer to Section 12.3.6 above), the Wetland Specialist indicated that although the majority of the wetland has been avoided some solar panels still do overlap on small portions of the wetland and its associated buffer and advised that a wetland offset strategy (through on-site rehabilitation) be developed.*

Two grid connection route alternatives have been provided namely Powerline Option A and B. Powerline Option A is situated to the east and is the likely option to be developed. Although it is just under a third longer than Option B it is the preferred option from an avifaunal perspective as it parallels existing powerline infrastructure and the N6 highway and traverses mainly croplands and does not cross as many wetlands. Whereas Powerline Option B traverse several wetlands Powerline Option A traverses only one medium-sized valley-bottom wetland near its crossing point along the N6. Powerline Option B, in contrast, crosses several small depressions and dams which attract a high diversity and abundance of waterfowl. Option B also borders on an extensive swathe of intact grassland to the west which is likely to support a number of SCC grassland species. Indeed, Secretarybird was observed in the grassland during the survey. Option B thus has the potential to pose a High collision and electrocution risk to regionally occurring avifauna including several large-bodied SCC. Additionally, this route may pose a risk to Blue Crane as well and is thus not the preferred option from an avifaunal perspective. This impact assessment assumes that the preferred Powerline Option A will be opted for in which case the residual risk will be Low (with mitigation).

No suitable breeding habitat for SCC was identified in the Project Area. However, attempts should be made to conserve (in-situ) the few scattered Alien Bushclumps as these provide highly suitable nesting habitat for small raptors. Assuming the Alien Bushclumps are avoided this impact is considered to have a Low residual significance.

Sensory disturbances to avifauna are inevitable, but are unlikely to negatively impact upon nesting SCC or large flocks of roosting birds. In any event, although dust, noise and human activity during construction is unavoidable, much can be done to reduce the effect of these sensory disturbance impacts on avifauna by adopting temporal avoidance strategies by simply avoiding or lowering the

intensity of construction activities during spring and summer. During operation, the residual impacts associated with sensory disturbance is considered to be of Low significance.

13.14.2 Impact Assessment

Table 30: Loss, degradation and fragmentation of sensitive avifaunal habitat (Clark, 2022b)

Criteria	Without mitigation	With mitigation
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation	▪ Continue to use the sensitivity spatial layers provided by TBC to appropriately position all surface infrastructure so as to avoid placing solar panels and associated infrastructure within the areas demarcated as being of High and Medium avifaunal sensitivity. *Note that the need for an offset strategy was identified by the Wetland Specialist for small portions of wetland and buffer zone encroachment.* ▪ Demarcate these areas on the ground during construction and sign post them as environmentally sensitive areas keep out. ▪ Rehabilitate all areas that may have been redundantly disturbed immediately after construction. ▪ Develop and implement an Alien and Invasive Plant Control Plan. ▪ Continue to avoid all areas of High avifaunal sensitivity, this must be enforced through on-ground demarcation and education of staff and contractors through inductions and signage.	

Table 31: Collision, electrocution and entrapment with PV infrastructure (Clark, 2022b)

Criteria	Without mitigation	With mitigation
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Low (4)
Probability	Definite (5)	Improbable (2)
Significance	**High**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Mitigation	▪ The valley-bottom wetland which would be crossed by powerline Option A is narrow enough to allow for pylon towers to be placed outside the wetland and its buffer, this is strongly recommended to decrease impacts on the wetland and associated avifauna. ▪ It is recommended that the client install Eskom-approved flappers or coils, particularly at the crossing point over the valley-bottom wetland immediately north of the hardened areas. If feasible it would also be preferable to install flappers along the entire grid connection route. These should be placed 1 m apart when crossing wetlands and can be further apart in non-wetland areas (Eskom guidelines specify five metres apart). Flight diverter structures should ideally alternate between light and dark shades to maximise visibility and contrast against background as seen from powerline level. The structures	

	must be installed as the powerlines are being spanned. This will drastically help to increase the visibility of transmission lines especially the thinner earth line with which most collisions tend to be associated. ▪ All power cables within the project area should be thoroughly insulated and preferably buried in demarcated corridors. ▪ White strips placed along the edges of the panels appear to help to increase visibility and deter birds and are recommended as far as practically feasible. ▪ Install bird deterrent devices around panels and on transmission line poles, pylons and / or monopoles. ▪ The BESS must be covered in non-reflective surfaces and protected against thermal discharge and the risk of veld fires as a result.

Table 32: Direct loss of SCC nests or suitable nesting habitat (Clark, 2022b)

Criteria	Without mitigation	With mitigation
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Low (4)
Probability	Definite (5)	Improbable (2)
Significance	**High**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	Yes	No
Mitigation	▪ Continue to avoid all areas of High avifaunal sensitivity (Alien Bushclumps) and Wetlands, this must be enforced through on-ground demarcation and education of staff and contractors through inductions and signage. *Note that the need for an offset strategy was identified by the Wetland Specialist for small portions of wetland and buffer zone encroachment*	

Table 33: Sensory disturbance and extirpation of SCC or large roosting flocks (Clark, 2022b)

Criteria	Without mitigation	With mitigation
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation	▪ Attempt as far as possible to conduct the majority of the high intensity construction activities during winter to minimize disturbance of avifauna during sensitive life stages such as lekking, courting, nesting and fledging. ▪ Keep lighting to a minimum and fit external lighting with downward facing hoods. ▪ Demarcate natural areas beyond the surface infrastructure footprint and restrict access of personnel into these areas through education and signposting. ▪ All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (40km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	

13.15 Agricultural

The findings from the Agricultural Impact Assessment (Gouws, 2022) follow. The specialist report is contained in **Appendix E4**.

13.15.1 Impact Description

The present land use at the proposed PV site is animal grazing. No farming infrastructure was observed. Most of the surrounding lands are fallow or no longer cultivated. It was concluded that the sensitivity of the land is medium.

Both power line alignment options traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing. Approximate distances that can be spanned by the power line (between towers) is around 150 m – 300 m, depending on the line. Areas to be cleared for each tower during construction is accepted as a radius of 20 m. Only the footprint will be lost to grazing after rehabilitation while the total disturbed area will be lost on cultivated land. The land below the lines can still be cultivated or used as grazing as is the case now. There will be a temporary disturbance of the land while the line is erected. The implication is that the impacted areas include a path of about 20 m below the line will temporary be disturbed by movement of construction vehicles, and approximately 1 256 m^2 for the towers.

The following was noted by the Agricultural Specialist in terms of the potential impacts:

- Loss of high potential land - There is no high potential land on the PV site.
- Loss of grazing land - The loss on regional scale is low. Some grazing on a local scale will be lost, but the significance is low.
- Loss of agricultural production - The land at the PV site is not grazed at present nor has it been cultivated for decades.
- Loss of agricultural resources - The soil is highly erodible if it's vegetation cover is removed. Mitigation can be achieved by installing drains and structures to reduce the flow speed of stormwater. Preferably, ensure that vegetation remains or is planted below the panels. The watercourse augments groundwater and supplements the river south of the PV site. It is recommended that the whole drainage system of the site be incorporated into a stormwater management plan.
- Loss of agricultural infrastructure - There is now no agricultural infrastructure on the PV site.
- Loss of job opportunities - The land on the PV site is not used at present. Implementing the PV project will not change the status quo.

13.15.2 Impact Assessment

The impact ratings shown in **Table 34** below were applied in determining the agricultural impacts (see **Table 35** below).

Table 34: Impact ratings used to evaluate agricultural impacts (Gouws, 2022)

Score	Significance	Description of Rating
2 – 10	Low Significance	No specific management action required
10 – 20	Medium-low significance	Administrative management actions required
20 – 40	Medium significance	Management and monitoring action plans required
40 – 60	Medium-high significance	Specific management and monitoring plans required
>60	High significance	Detailed plans required, potential red flag impact

Table 35: Assessment of agricultural impacts (Gouws, 2022)

IMPACT	Before Mitigation								Mitigation	Significance after mitigation
	Extent	Probability	Reversibility	Irreplaceable	Duration	Magnitude	TOTAL (SP)	Significance		
LOSS OF HIGH POTENTIAL LAND										
Loss of land	0	0	0	0	0	0	0	**L**	There is no high potential land on the property. No mitigation possible.	**L**
LOSS OF GRAZING LAND										
Loss of land	1	4	2	2	3	1	36	**M**	Grazing land is not protected in terms of HUAL policy. The loss on regional scale is moderate. Some grazing on a local scale will be lost, but the land is only sufficient to carry 75 LSU. The loss of grazing land of due to the transmission line is insignificant. The only land that will be lost is where the pylon legs are.	**ML**
LOSS OF AGRICULTURAL PRODUCTION										
Loss of crop production	0	0	0	0	0	0	0	**L**	The land is not cultivated and has not been for decades. Therefore, no loss of production will occur. The land is virgin and may not be cultivated without permission of the Minister of DALRRD. Approximately 1,1ha and 1,5ha of cultivated land will be lost due to the placement of the transmission line pylons.	**L**
Loss of animal production	1	4	2	2	3	1	36	**M**	The land is not used for grazing at present. A loss of cattle production can occur. Sheep, however, can still graze below the panels, whereby there will be no loss of grazing. Mitigation is by shifting to produce sheep in favour of cattle.	**L**
LOSS OF AGRICULTURAL RESOURCES (soil and water)										
Soil loss due to erosion	1	2	2	0	3	2	16	**ML**	The soil is highly erodible if its vegetation cover is removed. Mitigation can be achieved by installing drains and structures that can reduce the flow speed of stormwater. Alternatively, ensure that vegetation remains or is planted below the panels. If the latter is the case, then erosion is unlikely and full mitigation is possible.	**L**
Loss of water resources	1	2	2	0	3	2	16	**ML**	The watercourse augments groundwater and the river south of the property. Stormwater should be controlled and regulated in order to ensure groundwater recharge. Furrows at present channels wate towards the dam. With the dam wall that was broken, it further concentrates the water. It is recommended that the whole drainage system of the site be incorporated into a stormwater management plan.	**L**

IMPACT	Before Mitigation								Mitigation	Significance after mitigation
	Extent	Probability	Reversibility	Irreplaceable	Duration	Magnitude	TOTAL (SP)	Significance		
LOSS OF AGRICULTURAL INFRASTRUCTURE										
Direct loss	0	0	0	0	0	0	0	**L**	There is no agricultural infrastructure. Handling facilities will be required to manage animals.	**L**
LOSS OF JOB OPPORTUNITIES										
Direct loss	1	1	1	1	1	1	5	**L**	The land is not used at present. Implementing the PV project will not change the status quo. No mitigation possible and none is required.	**L**

13.16 Cultural Heritage

The findings from the Phase 1 Cultural Heritage Impact Assessment (van Schalkwyk, 2022) follow. The specialist report is contained in **Appendix E5**.

13.16.1 Impact Description

Potential heritage impacts include the following:

- Direct or physical impacts, implying alteration or destruction of heritage features within the project boundaries;
- Indirect impacts, e.g. restriction of access or visual intrusion concerning the broader environment; and
- Cumulative impacts that are combinations of the above.

From a review of available databases, publications, as well as available heritage impact assessments done for the purpose of developments in the region, it was determined that the Project is located in an area with a low presence of heritage sites and features.

Heritage resources are sparsely distributed on the wider landscape with highly significant (Grade 1) sites being rare. Because of the low likelihood of finding further significant heritage resources in the area of the proposed for development and the generally low density of sites in the wider landscape the overall impacts to heritage are expected to be of generally low significance before mitigation.

For the Project Area, the impacts to heritage sites are expected to be of medium significance. However, this can be managed by implementing mitigation measures, include isolating sites, relocating sites (e.g. burials) and excavating or sampling any significant archaeological material found to occur within the Project Area. The chances of further such material being found, however, are negligible. After mitigation, the overall impact significance would therefore be low.

Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

13.16.2 Impact Assessment

The assessment of the Project's cultural heritage impacts is provided in **Table 36** below.

Table 36: Assessment of cultural heritage impacts – construction and operational phases (van Schalkwyk, 2022)

Impact assessment		
As no sites, features or objects of cultural heritage significance were identified on the project area, there would be no impact as a result of the proposed development.		
	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Permanent (5)	Permanent (5)
Intensity	Minor (2)	Minor (2)
Probability	Very improbable (1)	Very improbable (1)
Significance	Low (8)	Low (8)
Status (positive or negative)	Neutral	Neutral
Reversibility	n/a	n/a
Irreplaceable loss of resources?	No	No
Can impacts be mitigated	n/a	
Mitigation: None		
Cumulative impact: None		

13.17 Palaeontology

The findings from the Palaeontological Impact Assessment (Butler, 2022) follow. The specialist report is contained in **Appendix E6**.

13.17.1 Impact Description

The apparent rarity of fossil heritage in the proposed development footprint suggests that the impact of the development will be of a Low significance in palaeontological terms. It is therefore 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.

If palaeontological heritage is uncovered during surface clearing and excavations the Chance Find Protocol contained in the EMPr should be implemented immediately.

13.17.2 Impact Assessment

The impact significance ratings shown in **Table 37** below were applied in determining the Project's impacts on fossil heritage (see **Table 38** below).

Table 37: Impact significance ratings used to evaluate impacts on fossil heritage (Butler, 2022)

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

Table 38: Assessment of impacts on fossil heritage (Butler, 2022)

Impacts	Extent	Duration	Magnitude	Reversibility	Irreplaceable loss	Cumulative effect	Impact
Pre-mitigation	1	4	4	4	4	2	Negative High 60
Post mitigation	1	4	1	4	4	2	Negative Low 15

13.18 Visual Quality

The findings from the Visual Impact Assessment (Naidoo, 2022) follow. The specialist report is contained in **Appendix E8**.

13.18.1 Impact Description

The following potential visual impacts were identified for the Project:

- Construction phase –
  - Visual intrusion due to the removal of vegetation, movement of construction vehicles and heavy machinery, presence of laydown areas and site clearance;
  - Light pollution due to night lighting; and
  - Dust pollution due to site clearance and movement of construction vehicles and heavy machinery.
- Operational phase –
  - Change in visual/landscape character and sense of place due to the presence of the PV Panels and ancillary infrastructure;
  - Light pollution due to night lighting, security lighting and navigational lighting; and
  - Visual impact on the identified sensitive receptors.

The proposed infrastructure will create a moderate negative visual impact on the surrounding areas during the construction and operational phases of the development. These impacts can be reduced after the recommended mitigation measures are implemented. However, the overall visual impact will remain as a moderate negative impact during the operational phase of the Project.

The construction phase of the proposed Project is expected to be visible from the surrounding areas however, the time of exposure to these activities will be short. Therefore, the impacts on the sensitive receptors are expected to be lower after the mitigation measures have been implemented. For the operational phase, the visual impact of the infrastructure can be reduced after the recommended mitigation measures are implemented however, the visual impact will remain as moderate. This is mainly due to permanent nature of the structures and to the alteration of the areas current sense of place. During the closure phase of the Project, all moderate visual impacts can be lowered to a low negative impact.

13.18.2 Impact Assessment

The following impact ratings were applied in the Visual Impact Assessment:

- Rating of 1-55 = (L) Low Risk;
- Rating of 56-169 = (M) Moderate Risk; and
- Rating of 170-300 = (H) High Risk.

Table 39: Construction phase visual impact assessment (Naidoo, 2022)

Construction Phase		Unmitigated	Mitigated
Assessment Criteria	**Severity** [Insignificant / non-harmful (1); Small / potentially harmful (2); Significant / slightly harmful (3); Great / harmful (4); Disastrous / extremely harmful / within a regulated sensitive area (5)]	**3**	**2**
	Spatial Scale [Area specific (at impact site) (1); Whole site (entire surface right) (2); Local (within 5km) (3); Regional / neighbouring areas (5 km to 50 km) (4); National (5)]	**2**	**1**
	Duration [One day to one month (immediate) (1); One month to one year (Short term) (2); One year to 10 years (medium term) (3); Life of the activity (long term) (4); Beyond life of the activity (permanent) (5)]	**2**	**2**
	Frequency of Activity [Annually or less (1); 6 monthly (2); Monthly (3); Weekly (4); Daily (5)]	**5**	**5**
	Frequency of Incident/Impact [Almost never / almost impossible / >20% (1); Very seldom / highly unlikely / >40% (2); Infrequent / unlikely / seldom / >60% (3); Often / regularly / likely / possible / >80% (4); Daily / highly likely / definitely / >100% (5)	**3**	**2**
	Legal Issues [No legislation(1); Fully covered by legislation (5)]	**1**	**1**
	Detection [Immediately(1); Without much effort (2); Need some effort (3); Remote and difficult to observe (4); Covered (5)]	**3**	**3**
Consequence	Severity + Spatial Scale + Duration	**7**	**5**

Construction Phase		Unmitigated	Mitigated
Likelihood	Frequency of Activity + Frequency of impact + Legal issues + Detection	**12**	**11**
Risk	Consequence * Likelihood	**MODERATE (84)**	**LOW (55)**
Mitigation	- Limit the construction footprint to only the development area. - Carefully plan to minimize the construction duration. - Regulate the speed of vehicles on site. - Implement dust suppression activities. - Plant indigenous vegetation surrounding the site, specifically along the eastern boundary of the site. - Choose lighting types that reduce spill light and glare. - Only focus light where it is needed.		

Table 40: Operational phase visual impact assessment (Naidoo, 2022)

Operational Phase		Unmitigated	Mitigated
Assessment Criteria	**Severity** [Insignificant / non-harmful (1); Small / potentially harmful (2); Significant / slightly harmful (3); Great / harmful (4); Disastrous / extremely harmful / within a regulated sensitive area (5)]	**3**	**2**
	Spatial Scale [Area specific (at impact site) (1); Whole site (entire surface right) (2); Local (within 5km) (3); Regional / neighbouring areas (5 km to 50 km) (4); National (5)]	**4**	**3**
	Duration [One day to one month (immediate) (1); One month to one year (Short term) (2); One year to 10 years (medium term) (3); Life of the activity (long term) (4); Beyond life of the activity (permanent) (5)]	**4**	**4**
	Frequency of Activity [Annually or less (1); 6 monthly (2); Monthly (3); Weekly (4); Daily (5)]	**5**	**5**
	Frequency of Incident/Impact [Almost never / almost impossible / >20% (1); Very seldom / highly unlikely / >40% (2); Infrequent / unlikely / seldom / >60% (3); Often / regularly / likely / possible / >80% (4); Daily / highly likely / definitely / >100% (5)	**4**	**3**
	Legal Issues [No legislation(1); Fully covered by legislation (5)]	**1**	**1**
	Detection [Immediately(1); Without much effort (2); Need some effort (3); Remote and difficult to observe (4); Covered (5)]	**3**	**3**
Consequence	Severity + Spatial Scale + Duration	**11**	**9**
Likelihood	Frequency of Activity + Frequency of impact + Legal issues + Detection	**13**	**12**
Risk	Consequence * Likelihood	**MODERATE (143)**	**LOW (108)**
Mitigation	- Retain/maintain natural vegetation within and around the development footprint where possible. - Plant indigenous vegetation specifically along the eastern and southern boundary of the site to provide visual screening of the PV plant to road users on the N6 and residents of and surrounding the Paradys Small Holdings settlement. - Natural colours should be used on ancillary infrastructure so that they blend into the surrounding landscape. - Implement dust suppression activities. - All infrastructure should be always kept in a presentable condition. - Choose lighting types that reduce spill light and glare. - Only focus light where it is needed.		

13.19 Air Quality

13.19.1 Impact Description

Sensitive receptors to dust and other air quality impacts in the study area include people residing in the surrounding rural areas (including the Paradys Small Holdings to the east and Drina Engelbrecht Academy to the immediate south), agricultural activities (including the UFS Paradys Experimental Farm to the immediate north), and ecological features (fauna and flora).

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.

13.19.2 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, including construction area and access roads. Note that 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. • Air quality to be monitored (baseline and during construction) for dust fallout and particulate matter. Sampling locations to consider major sources of dust and sensitive receptors. • All vehicles and machinery used at the site are to be in good working condition and fitted with appropriate emission controls • 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	3
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-high	long-term	likely	3
After Mitigation	-	local	low	long-term	unlikely	1

13.20 Noise

13.20.1 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 issues 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.

13.20.2 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

13.21 Hazardous Substances & Waste

13.21.1 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.

13.21.2 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 41** 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 incorporated into the Operational EMPr.

Table 41: 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
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

13.22 Traffic

13.22.1 Impact Description

The main trip generation will be during the construction period and will depend on the tempo of construction and the types of vehicles to be used to transport materials and construction staff. Construction vehicles accessing and leaving the PV site via the N6 may pose risks to other road users. The traffic generated by the Project during the operational phase is expected to be limited.

The Provincial Tertiary Road T4267 traverses the site. From the site investigations, it appears as if this road is not readily used. A meeting was held with the FSDPRT on 12 October 2022 to discuss the Project in relation to this road (refer to minutes contained in **Appendix J**), where the following was noted by the departmental representative (Maree pers. comm., 2022):

- The building restrictions of the T4267 road could be relaxed; and
- Tertiary roads may become abandoned if they are unused, and this road could be closed through proclamation. However, it first needs to be established how the adjacent farm gains access to the N6 and consent from this landowner would be required to close the T4267 road.

13.22.2 Impact Assessment

Environmental Feature	**Traffic and Access**
Relevant Alternatives & Activities	**All construction activities that may affect existing road networks**
Project life-cycle	**Construction**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruptions to existing road users. • Safety risks. • Access to N6, which is a high-speed environment, during construction. • Increase in dust levels. • Use of road network by construction vehicles.	• Obtain approval from the South African National Roads Agency (SANRAL) for gaining access to the Solar PV Plant from the N6. • Follow legal process to closing the Provincial Tertiary Road T4267 that traverses the site, with consent from the FSDPRT. • Clearly demarcate all construction access roads. • Proper access control is to be maintained to prevent livestock from accessing construction areas, as well as for any other unauthorised access. • Strict adherence to speed limits by construction vehicles on public roads and access roads. Appropriate speed limits need to be posted on all access roads according to the geometric design and limitations of heavy vehicles. • The access roads need to provide sufficient width for heavy vehicles to navigate around curves in the road. • Ensure adequate maintenance of construction vehicles. • Implement appropriate safety and traffic calming measures for vehicles leaving and accessing the N6. This will include flag men, speed reductions and warning signage (as relevant). • Limit internal service roads to a minimum. • Implement measures to manage dust caused by site traffic.

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

Project life-cycle	**Operation**
Potential Aspects & Impacts	**Proposed Management Objectives / Mitigation Measures**
• Disruptions to existing road users. • Safety risks. • Accessing the Solar PV Plant from the N6. • Dust generated from use of internal gravel roads.	• Maintain internal roads. • Maintain proper access control to the Solar PV Plant. • Strict adherence to speed limits by operational vehicles on public roads and access roads. • Ensure adequate maintenance of operational vehicles. • Implement measures to manage dust through use of internal gravel roads.

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

13.23 Civil Aviation

13.23.1 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.

The proposed PV Site is located approximately 18km to the south-west of the Bram Fischer International Airport in Bloemfontein. According to the findings from the Screening Tool, the PV Site has low sensitivity in terms of the relative civil aviation theme (see **Figure 74** below). Accordingly, no Glint and Glare Impact Assessment in terms of Obstacle Notice 4/2017, was undertaken, as there are “no major or other types of civil aviation aerodromes” in proximity to the site.

It is noted that the Screening Tool showed medium sensitivity in terms of the relative civil aviation theme for the proposed power line route options(see **Figure 75** below), as these alignments are “between 15 and 35 km from a civil aviation radar”. The SACAA was engaged with as part of the EIA and the Applicant will adhere to the requirements of this authority.

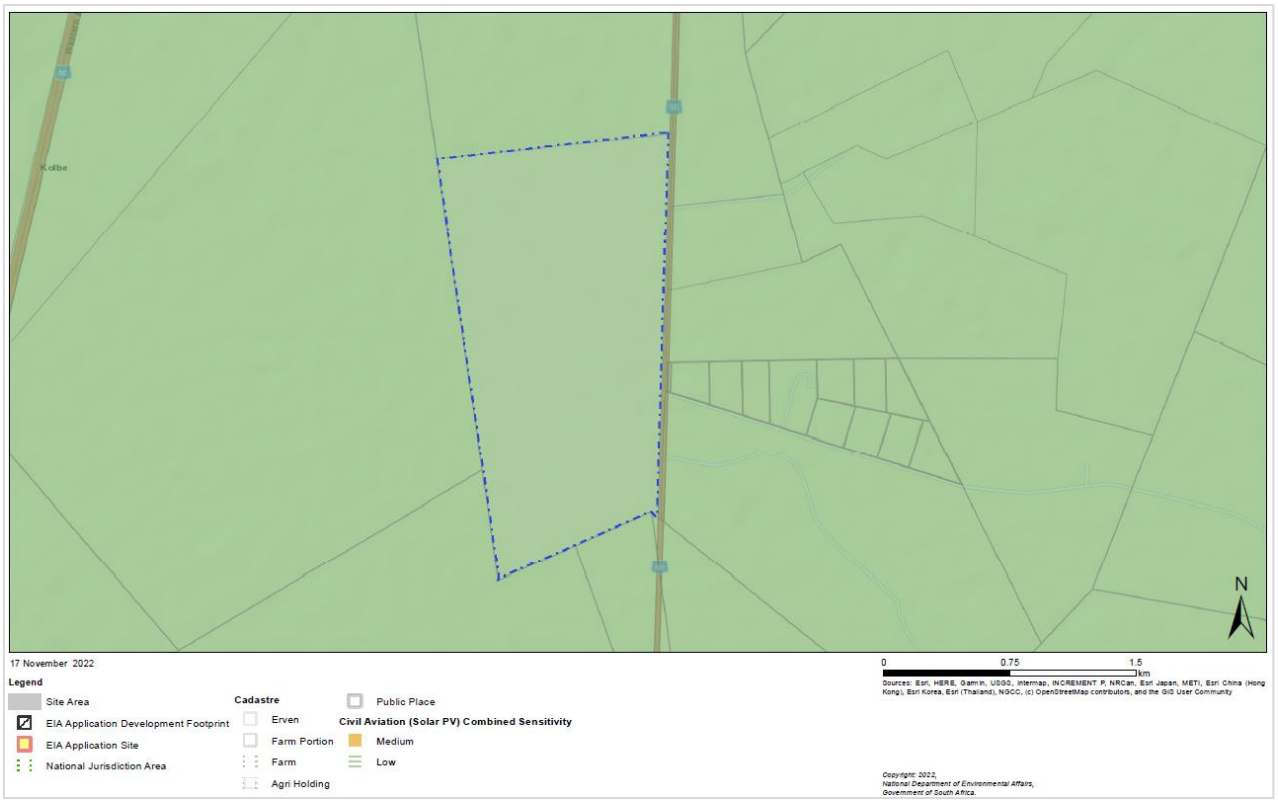


Figure 74: Map of relative civil aviation theme sensitivity for Solar PV Site

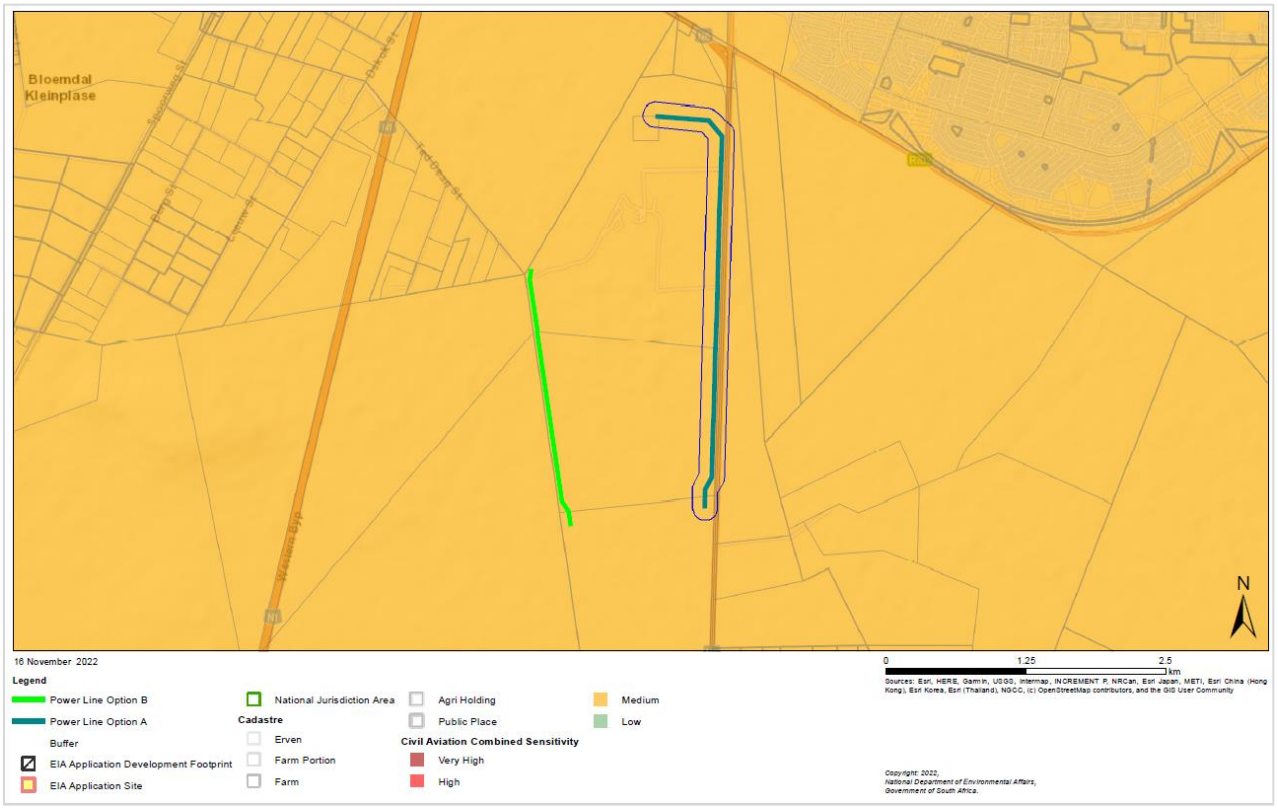


Figure 75: Map of relative civil aviation theme sensitivity for power line route options

13.23.2 Impact Assessment

A quantitative impact assessment was not undertaken from a civil aviation perspective, due to the reasons provided in **Section 13.23.1** above.

13.24 Existing Structures and Infrastructure

13.24.1 Impact Description

An existing overhead power line traverses the PV Site and the N6 runs along the eastern boundary of the site. The setbacks / conditions required by the custodians of infrastructure on the PV Site and along the power line route will need to be adhered to.

Potential impacts of the Project to existing structures and infrastructure include:

- Disruptions to services or damage caused as a result of construction activities;
- Disruptions to traffic on N6 during construction (see **Section 13.19** above);
- Closure of Provincial Tertiary Road T4267 (see **Section 13.19** above); and
- Construction-related disturbances (e.g. noise, dust).

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. Where avoidance is not possible, suitable compensation measures need to be established, as necessary.

During the public participation process conducted to date, various infrastructure owners and custodians (including Eskom Distribution and OPENSERVE) provided wayleave requirements and conditions when working near or closer to existing services.

13.24.2 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, SANRAL, 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

13.25 Health and Safety

13.25.1 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, surface water, air quality, noise, 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.) and;
- ❑ Emergency fire hazards; and
- ❑ Electrocution of workers.

13.25.2 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

13.26 Social Environment

The findings from the Social Impact Assessment (Tanhuke & Myeni, 2023) follow. The specialist report is contained in **Appendix E7**.

13.26.1 Impact Description

The activities, aspects and impacts associated with the social environment are captured in **Table 42** below.

Table 42: Activities, aspects and impacts related to the social environment (Tanhuke & Myeni, 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
	Servitude Rights	-	Some restrictions on use of productive land
Construction Phase	Access into properties	-	Security Concerns
		Employment of people locally	-

Activity	Aspect	Potential Impact – Positive	Potential Impact – Negative
	Solar Park Construction – piling, frame erection and solar panel mounting, electrical installation and rehabilitation	Sourcing of equipment, machinery, and services locally	-
		-	Noise
		-	Dust
		-	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	-
	Transport of goods to site and employment of staff	-	Increased traffic
			Noise
	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
Operational Phase	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	

13.26.2 Impact Assessment

Table 43: Institutional, Legal, Political and Equity Impact/Mitigation Table (Tanhuke & Myeni, 2023)

Environmental Feature	Institutional, Legal, Political and Equity
Project life cycle	All Phases
Potential Impact	Proposed Management Objectives / Mitigation Measures
Attitude formation towards project	Promptly deal with any raised expectations amongst communities regarding perceived benefits associated with the project, through a process of communication and consultation.
Project information queries and raised concerns	Promptly address any concerns raised by the public in a transparent manner.
	Where necessary always provide prompt and clear feedback to communities.
	Include all relevant community members in decisions affecting them.

Compliance with municipal by-laws	Ensure that all municipal by-laws are complied with.					
	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 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 impact on project alternatives.					

Table 44: Gender Relations Impact/Mitigation Table (Tanhuke & Myeni, 2023)

Environmental Feature	Gender Relations					
Project life-cycle	Construction Phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
Cultural resistance towards women	• Sensitise staff in respect of gender sensitive issues that are pertinent to the workplace.					
Division of labour	• 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 policy and implementation of policy. The impact has no impact on alternative route selection.					

Table 45: Construction Phase Impact/Mitigation Table (Tanhuke & Myeni, 2023)

Environmental Feature	Economic opportunities arising from the construction phase					
Project life-cycle	Construction phase					
Potential Impact	Proposed Management Objectives / Mitigation Measures					
SMME Participation	• Local SMMEs should be given an opportunity to participate in the construction of the project through the supply of services, material or equipment.					
Job Creation and Skills Development	• The main contractor should employ non-core labour from the regional study area as far as possible during the construction phase.					
Indirect Employment Impacts	• Spaza/informal trader shops may open next to the site because of construction. These should be controlled by the contractor to limit their footprint and to ensure that the MMM 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 power line routing alternative is preferred.					

Environmental Feature	Disturbance arising from the construction phase
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.
Influx of workers	• All employment of locally sourced labour should be controlled on a contractual basis. If possible, and if the relevant Ward Councillors deem it necessary, the employment process should include the affected Ward Councillors. • People in search of work may move into the area, however, the project will create a limited number of job opportunities. Locally based people should be given opportunities and preferences over others; • No staff accommodation should be allowed on site; • Influx of workers could may lead to increased diseases and HIV/AIDSs & STI as well as STD infections, therefore awareness programmes should be implemented through the local educational institutions and for the workers as well.
Worker Health and Safety	• 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.
Security	• 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.
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.
Damage to property	• If a risk existing 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	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 46: Operational Phase Economic Impacts (Positive) Impact/Mitigation Table (Tanhuke & Myeni, 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 47: Operational Phase Economic Well Being (Negative) Impact/Mitigation Table (Tanhuke & Myeni, 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.					
	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.					

13.27 "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 13.26** 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 an alternative future desired use of the land where the Solar PV Plant is proposed. It is noted that the site was historically used for agricultural purposes, but it is currently vacant. 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. The "no go option" is thus not preferred.

13.28 Cumulative Impacts

13.28.1 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.

13.28.2 Other Renewable Energy Projects in Proximity to the Proposed PV Site

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.

According to the REEA Database (quarter 2, 2022), the following renewable energy applications have been made for properties that are located within a 30km radius of the PV Site (refer to **Figure 76** below):

- Status: **approved** –
  - Proposed Serurubele PV Solar Energy Facility (application 14/12/16/3/3/2/675), which is located approximately 9km to the east of the Project.
  - Proposed Sonneblom PV Solar Energy Facility (application 14/12/16/3/3/2/673), which is located approximately 8km to the east of the Project.
  - Proposed 15MW PV Solar Energy Facility on the Farm Mara No. 2571, Near Woodland Hills Estate (application 14/12/16/3/3/1/564), which is located approximately 22km to the north-west of the Project.

- Proposed SSS1 5MW Solar PV Power Plant on Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 (application 14/12/16/3/3/1/1093), which is located approximately 18km to the north-west of the Project (status: Approved).

❑ Status: **withdrawn/lapsed** –

- Proposed Keren Holdings Spes Bona Solar PV Plant on Farm 2355 Portion 5 (application 14/12/16/3/3/2/435), which is located approximately 16km to the north-west of the Project.

❑ Status: **in process** –

- Proposed PV Solar Facility on Portion 1 and 9 of Spes Bona (application 14/12/16/3/3/2/641), which is located approximately 17km to the north-west of the Project.

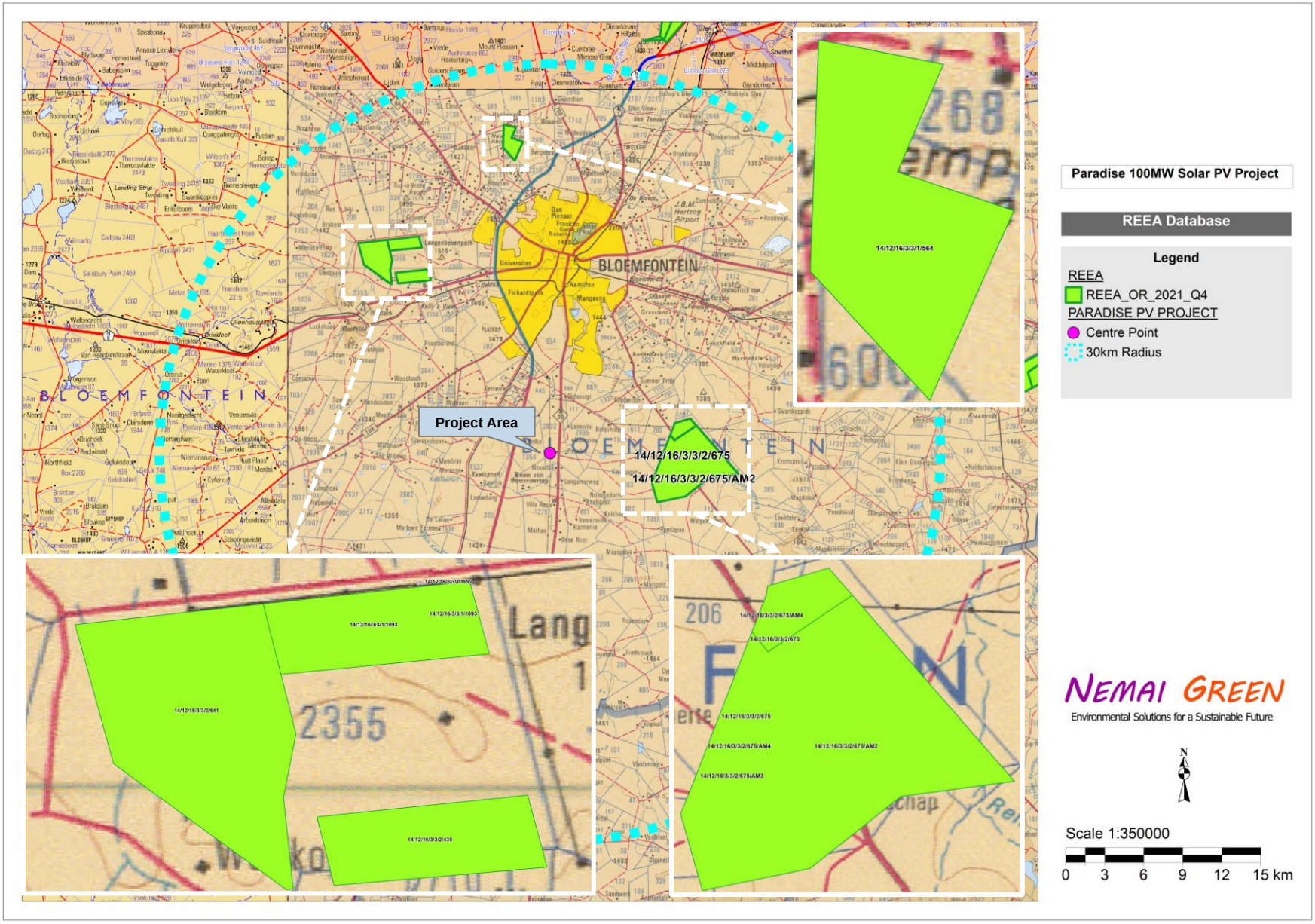


Figure 76: **Renewable energy applications in relation to the Project (within a 30km radius)**

The following is noted in terms of the cumulative impacts of the Project and the **approved** renewable energy applications for properties that are located within a 30km radius of the PV Site (assuming that these developments will proceed):

- There will be a cumulative loss of indigenous vegetation for these renewable energy developments. The total footprint area of the proposed Project's Solar PV Plant prior to the reduction of the layout to minimise wetland encroachment equated to approximately 0.35% per hectare, with a loss of approximately 60 Ha of indigenous vegetation. It is noted that the Terrestrial Biodiversity Compliance Statement confirmed that the Project Area is mostly of a 'Low' sensitivity. The total areas to be cleared for the other renewable energy applications could not be conclusively established. Some of these sites are located in areas where threatened ecosystems occur. From a desktop scan it can be seen that parts of the areas proposed for the approved applications (i.e., 14/12/16/3/3/2/675, 14/12/16/3/3/2/673, 14/12/16/3/3/1/564 and 14/12/16/3/3/1/1093) have been affected by agricultural activities.
- The Project is not located in the same quaternary catchment as the other renewable energy developments. Cumulative impacts to freshwater resources through sedimentation (silt-laden runoff) caused by inadequate stormwater management, as well as contaminated through inadequate storage and handling of hazardous materials and poor management of waste and wastewater, would thus not affect the same catchment. Provision is made in the Project's EMPr to manage stormwater and to prevent pollution of water resources.
- The renewable energy developments will require water for construction and operational purposes. As explained in **Section 9.8.2** above, water for the Project will be supplied from approved sources such as the MMM. Provision is made in the Project's EMPr to manage the consumptive use of water.
- Localised impacts in terms of noise, reduction in air quality (dust) and traffic disruptions will be managed by the provisions of the EMPr for the respective renewable energy developments.

13.28.3 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. 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 will exacerbate erosion, which is already encountered in the greater area as a result of other land use disturbances. 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 13.19.1** 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 13.20.1** 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.
- Given the presence of existing powerlines, an Eskom substation and agricultural/farming activities within the study area, along with the approved solar PV facilities, the proposed Project is expected to increase the cumulative visual impact experienced by the identified sensitive receptors (Naidoo, 2022). The Project may also establish a precedent for similar developments within the area.
- 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.

13.28.4 Cumulative Environmental Impact Statement

From a cumulative impact perspective, there are four (4) known approved renewable energy applications within a 30km radius of the Project's PV Site (refer to **Section 13.28.2** above) according to the REEA Database (quarter 2, 2022). Cumulative impacts in relation to the Project were assessed individually in **Section 13.9** to **Section 13.26** above 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 13.27** 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

14.3.1 Solar PV Plant

The original layout of the Solar PV Plant, referred to as PV Layout Option A (shown in **Figure 3** and **Figure 8** above), was assessed by the specialists (refer to **Section 12.4** to **Section 12.11** above).

The initial Wetland Delineation and Risk Assessment advocated that the proposed development avoid the unchanneled valley-bottom (HGM1) that flows from north to south across the site, as well as its associated buffer. This was also recommended in the Terrestrial Biodiversity Compliance Statement Avifaunal Baseline and Impact Assessment. In response, PV Layout Option A was revised to minimise encroachment into the wetland and its buffer area. This new layout is referred to as PV Layout Option B (see **Figure 77** below) and includes the associated changes to the various components of the Solar PV Plant. The Wetland Specialist (Clark, 2022a) noted that although PV Layout Option B avoids most of the wetland, some solar panels still encroach into small portions of the wetland and its associated buffer. Consequently, the Wetland Specialist (Clark, 2022a) recommended that a basic wetland offset strategy (consisting of on-site rehabilitation) be developed.

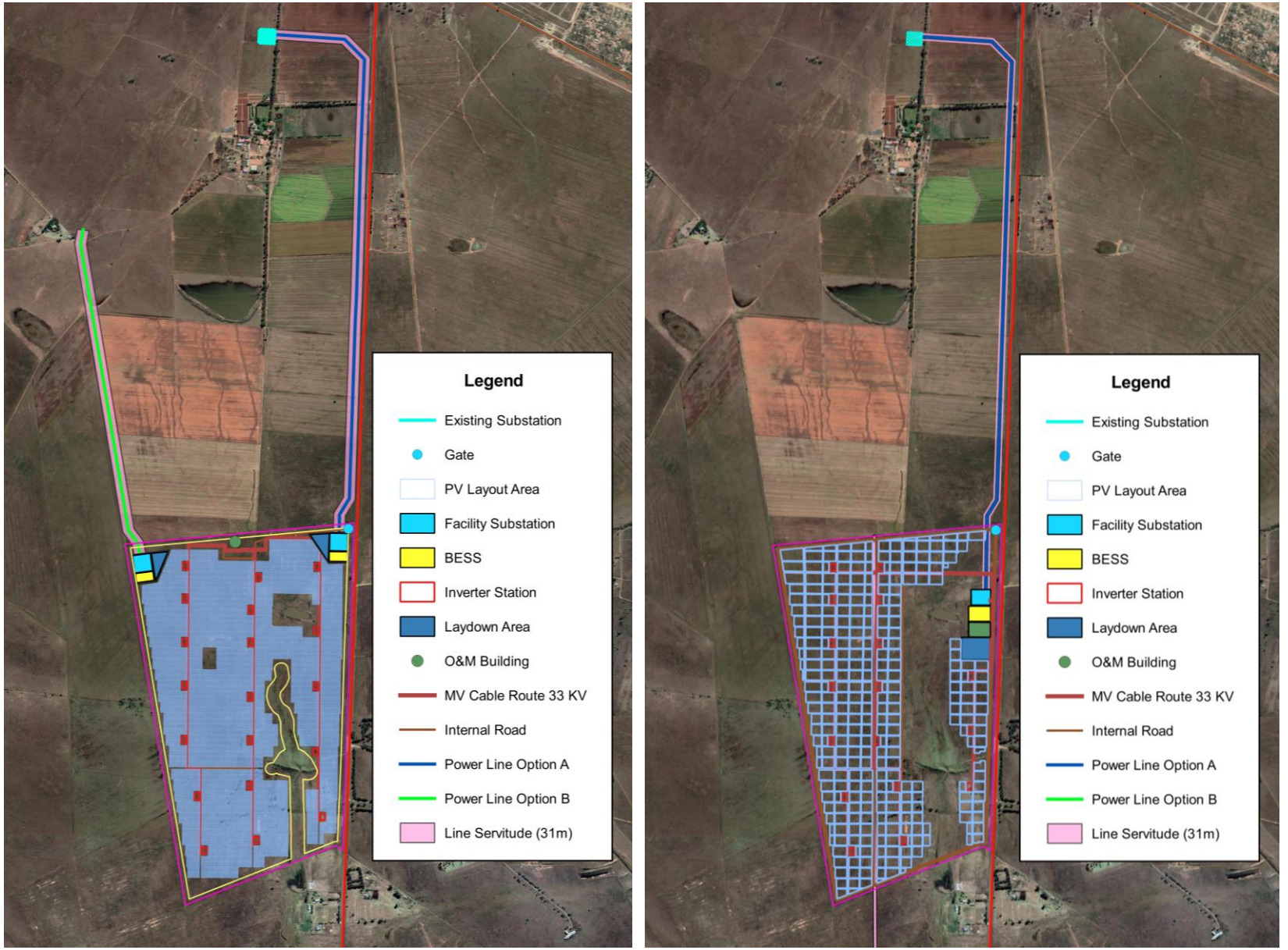


Figure 77: **Comparison of PV Layout Option A (left) and Option B (right), showing revised footprint to minimise wetland encroachment**

Based on the recommendations of the specialists, PV Layout Option B was identified as the BPEO.

14.3.2 Power Line

As explained in **Section 9.5** above, two power line route options were assessed for the Project (see **Figure 19** above). Route Option A connects to the existing Eskom Paradys 132/22 kV Substation located to the north of the site through a ±3.5km single circuit twin conductor 132 kV line. Route Options B connects to an existing 132 kV line located ±2.0m to the north of the site. The locations of the facility substation, BESS and laydown area are reliant on the preferred power line route.

The following factors were considered in comparing the power line route options:

1. Route Option A and Route Option B run along the eastern and western parts of the UFS Paradys Experimental Farm, respectively. Both power line alignment options traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing. A meeting was held with the UFS on 12 September 2022 (refer to minutes contained in **Appendix I**). During this meeting the representatives from the UFS stated that Route Option A for the proposed power line is preferred, however, they indicated that it still poses risks to their agricultural activities. These impacts are assessed in **Section 13.9.2** above.
2. Findings from specialist studies –
    a. **Wetland Delineation and Risk Assessment** – Although Option B is shorter, it traverses a wetland flat with two depressions on either side. Option A is thus the favourable route (Clark, 2022a).
    b. **Terrestrial Biodiversity Compliance Statement** – Based on the desktop information as well as the site visit it is clear that Route Option A is the preferred alternative from a terrestrial ecological perspective as it is located directly adjacent to the N6 which has exposed the area to more modifications due to edge effects and it will avoid crossing an area classified as CBA 1 that occurs along Route Option B (Jacobs & Burger, 2022).
    c. **Avifaunal Assessment** – Option A is preferred as it poses a low residual risk to local birdlife provided measures are taken to install bird flappers (Clark, 2022b).
    d. **Agricultural Impact Assessment** – There is no clear preference between the two power line options (Gouws, 2022).
    e. **Visual Impact Assessment** – The viewshed and visual exposure results indicated that the difference in the level and extent of visual exposure anticipated to be experienced by the identified sensitive receptors for the power line route options, can be considered minor as both options create an overall low level of visual exposure. Therefore, either Route Option A or Route Option B can be selected as the preferred option (Naidoo, 2022).
    f. **Social Impact Assessment** – Option A follows the N6, and would not disturb the rural nature of the route for Option B (Tanhuke & Myeni, 2023)

Based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts, Route Option A was identified as the BPEO.

14.4 Technology Alternatives

14.4.1 PV Technology

The preferred option in terms of solar PV technology, as explained in **Section 10.4.1** above, includes a single axis tracker system and bifacial solar panels. This technology will optimise the Project's yield output.

14.4.2 BESS Technology

The BESS can be broken into solid state and flow battery systems. A single battery technology, or a combination of two or more technology alternatives, may be implemented for the Project.

15 PUBLIC PARTICIPATION

15.1 Introduction

The purpose of public participation includes the following:

1. To provide I&APs with an opportunity to obtain information about the Project;
2. To allow I&APs to express their views, issues, and concerns with regard to the Project;
3. To grant I&APs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the Project; and
4. 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).

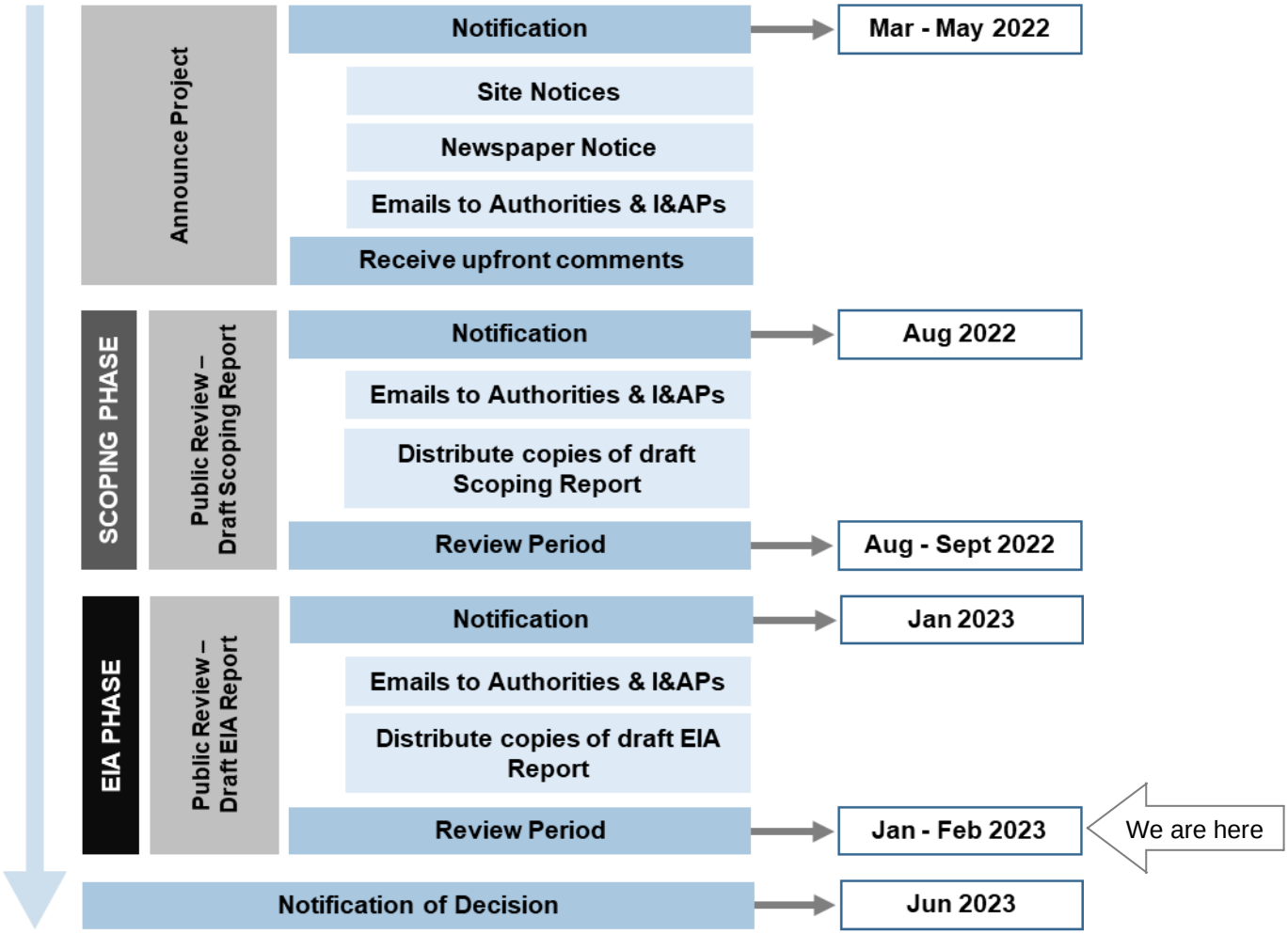


Figure 78: **Outline of Public Participation Process (*note: dates are subject to change*)**

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 **20 January until 20 February 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 Mangaung 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: Free State Region;
- DMRE;
- FSDPRT; and

- MMM.

A Comment Sheet is provided in **Appendix L**, 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 27 January 2023. 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 and significant environmental features and aspects that are associated with the Project and its receiving environment are highlighted, for which mitigation measures are included in the EIA Report and EMPr:

- A north-south flowing seasonally inundated unchanneled valley-bottom wetland (HGM1) traverses the site and drains into the Kaalspruit located approximately 1.2km to the south.
- In terms of the Free State Conservation Plan, the Power Line Route Option B overlaps with a CBA 1. The PV site falls within areas classified as Degraded as well as an ONA.
- Secondary grassland is found along the northern portion of the Power Line Route Option B. This habitat unit can be regarded as important, not only within the local landscape, but also regionally. The unit functions as remaining greenlands, which supports viable indigenous plant species populations and is also used for foraging. The unit also serves as a movement corridor for fauna within a landscape mainly fragmented by anthropogenic activities.
- Based on distribution and habitat suitability, 21 avifaunal SCC are considered moderately likely to occur within the Project Area. However, the small size of the Project Area, together with its limited diversity of sub-optimal and degraded habitat, means that all of these species are only likely to occur sporadically and none are considered likely to breed or support resident populations on site. The unchanneled valley-bottom wetland was designated Medium avifaunal sensitivity on account of its ability to support a moderate diversity and abundance of mostly widespread and adaptable waterfowl. The small scattered Alien Bushclumps were assigned a High avifaunal sensitivity on account of their suitability for

providing ideal nesting habitat for small-bodied raptors. The Intact Grasslands along the northern portion of the Power Line Route Option B were assigned a High avifaunal sensitivity on account of their capacity to support large-bodied, collision prone SCC.

- The Power Line Route Option A and Option B run along the eastern and western parts of the UFS Paradys Experimental Farm, respectively. Both power line alignment options traverse cultivated land for most of their routes, with some sections crossing land used for animal grazing.
- The Paradys Small Holdings, Bloemfontein Shooting Centre and Maccauw Clay Target Club (amongst others) are located to the east, opposite the N6. The Drina Engelbrecht Academy and UFS Paradys Experimental Farm are located to the immediate south and north of the PV Site, respectively. The Onze Rust Estate lies to the south-west.
- The N6 runs along the eastern boundary of the PV Site and the Provincial Tertiary Road T4267 traverses the PV Site.

The combined sensitivity map overlaid with the Project's BPEO is provided in **Figure 79** below. Key environmental features that contributed toward the sensitive areas shown in the map included wetlands and their associated buffer zones, as well as avifaunal habitats, as determined by the relevant specialist studies.

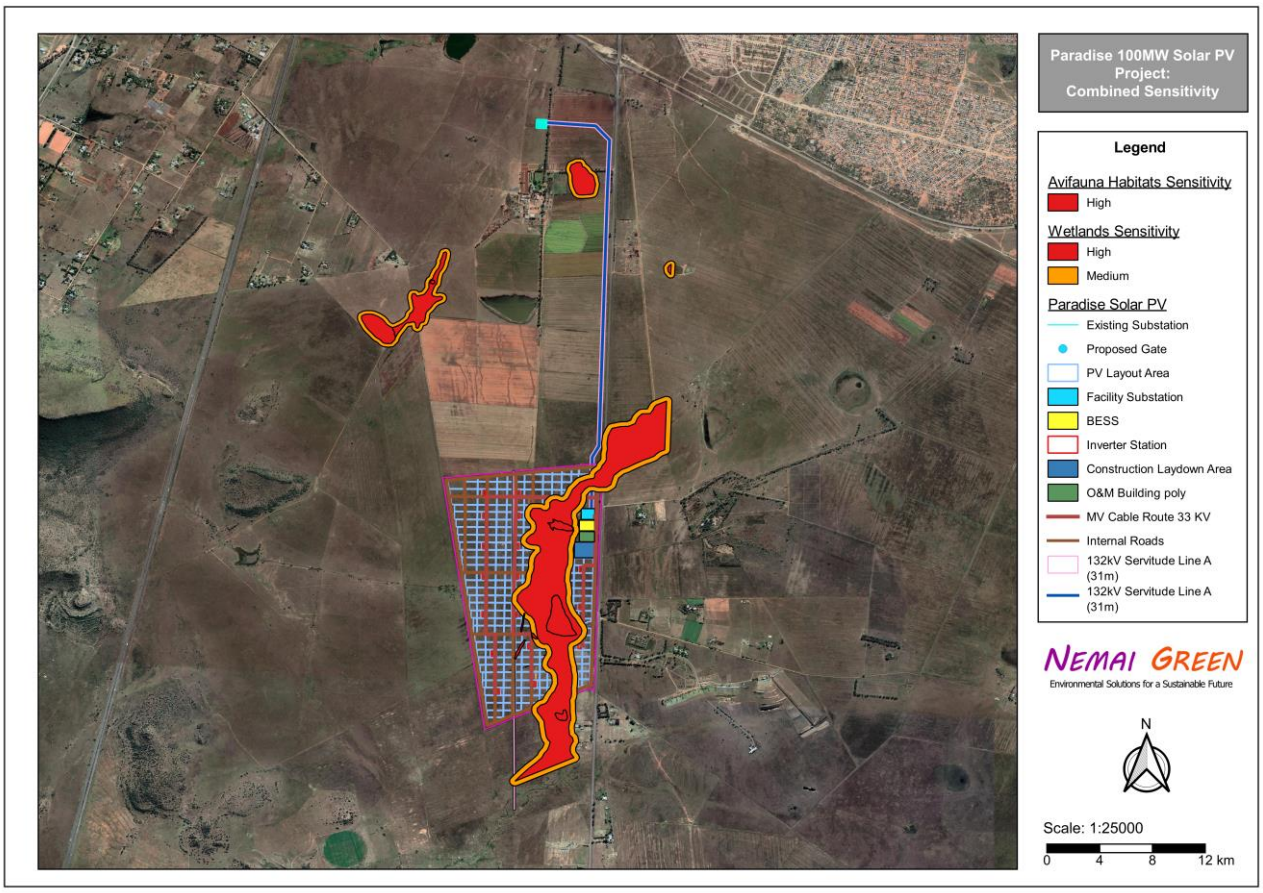


Figure 79: Combined sensitivity map of BPEO

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. The initial PV Layout was revised to minimise encroachment into the wetland and its buffer area. The Project's proposed overhead Power Line Route Option A is aligned alongside property boundaries and existing linear developments as far as possible.

Based on the recommendations of the specialists, technical considerations, feedback from I&APs and the comparison of the impacts, PV Layout Option B and Route Option A were 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:

- Avifaunal Baseline and Impact Assessment –
  - Avoid small stands of *Eucalyptus camaldulensis* considered important for small raptor nesting.
- Wetland Delineation and Risk Assessment –
  - For the areas where the development infringes on the wetland zone demarcate the edge of the PV footprint and signpost wetland areas beyond that as environmentally sensitive "no-go" areas. Develop and apply an appropriately designed, on-site wetland rehabilitation plan to offset the residual impacts to these wetland areas. *It is noted that the earthen dam on the PV Site may have caused an unnatural expansion of the wetland. There is a breach in this dam wall, which may reduce the wetland footprint over time. The Applicant may seek to update the delineation of the wetland by a Wetland Specialist prior to the implementation of the Project to determine whether the wetland boundary has been reduced, which may influence the mitigation measures linked to the wetland and its buffer area.*
  - Use existing access roads and only create new roads in non-wetland areas. *It is noted that the existing Provincial Tertiary Road T4267 traverses the site (see **Section 11.16** above), which can be used for access purposes. Any upgrading of this road to allow for the implementation of the Project will need to be assessed by the Wetland Specialist.*
- Power Line Route Option A is to span the wetland on the PV Site. No towers are to be located within the delineated wetland and it associated buffer.

- Undertake a walkdown survey of the power line route to confirm the most suitable locations of the towers. An Aquatic Ecologist and Avifaunal Specialist are to be involved in the walkdown survey.
- Engage further with the UFS Paradys Experimental Farm to plan the locations of towers along the power line route that traverses their land, taking into consideration all technical requirements.
- The final layout must avoid the 1:100 year floodline.
- Prepare a stormwater management plan for the PV Site.
- Adhere to the requirements of the FSDPRT for the Provincial Tertiary Road T4267 that traverses the PV Site.
- 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 incorporated into the Operational EMPr.

The Project is considered to be compatible with existing land uses encountered in the area. The impacts and risks 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.

17 REFERENCES

Arup, 2018. Darlington Point Solar Farm Preliminary Hazard Assessment. Arup Pty Ltd, Australia.

Brownlie, S., 2005. Guideline for involving biodiversity specialists in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 C. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Butler, R., 2013. Managing the lithium (ion) battery fire risk, accessed online from http://www.hemmingfire.com/news/fullstory.php/aid/1790/Managing_the_lithium__ion__battery_fire_risk.html.

Butler, E., 2022. Palaeontological Impact Assessment: Paradise 100MW Solar Photovoltaic & 40MW Battery Energy Storage Systems Project, Free State Province. Banzai Environmental, Bloemfontein, South Africa.

Chang, G.J., & Jennings, C., 1994. Magnetic Field Survey at PG&E Photovoltaic Sites, accessed October 2017, from http://www.osti.gov/bridge/servlets/purl/82309-WOEtJb/webviewable/82309.pdf.

Clark, T., 2022a. Wetland Delineation and Risk Assessment for the Proposed Paradise Solar PV, Free State. The Biodiversity Company (TBC), Johannesburg, South Africa.

Clark, T., 2022b. Proposed Paradise PV Site– Avifaunal Baseline & Impact Assessment, Free State. The Biodiversity Company (TBC), Johannesburg, South Africa.

Collins, N.B., 2016. Free State Province Biodiversity Plan: Technical Report v1.0. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs. Internal Report. Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs, Bloemfontein, South Africa.

DEA, 2010. Public Participation 2010. Integrated Environmental Management Guideline Series 7. Department of Environmental Affairs (DEA), Pretoria, South Africa.

DEA, 2015. EIA Guideline for Renewable Energy Projects. Department of Environmental Affairs (DEA), Pretoria, South Africa.

DEA, 2017. Guideline on Need and Desirability. Department of Environmental Affairs (DEA), Pretoria, South Africa.

DEA&DP, 2010. Guideline on Alternatives, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning (DEA&DP), Cape Town, South Africa.

DEAT, 2006. Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations, 2006. Integrated Environmental Management Guideline Series, Department of Environmental Affairs and Tourism (DEAT), Pretoria, South Africa.

DoE, 2017. State of Renewable Energy in South Africa. Department of Energy (DoE), Pretoria, South Africa.

DWAF, 2005. A practical field procedure for identification and delineation of wetlands and riparian areas. Department of Water Affairs and Forestry (DWAF), Pretoria, South Africa.

Energy Storage Council, 2016, Battery storage systems: what are their chemical hazards?, accessed 22 November 2017 from https://energystoragealliance.com.au/category/safety/.

Gouws, A., 2022. Agricultural Assessment: Paradise 100MW Solar PV & 40MW Battery Energy Storage Systems Project, Bloemfontein, Free State Province. Index, Pretoria, South Africa.

IUCN, 2021. The IUCN Red List of Threatened Species. Version 2021-3. https://www.iucnredlist.org. Accessed: May 2022. International Union for Conservation of Nature (IUCN).

Jacobs, J. & Burger, C., 2022. Terrestrial Biodiversity Compliance Statement for the Proposed Paradise Solar Development. The Biodiversity Company (TBC), Johannesburg, South Africa.

Keatimilwe, K. & Ashton, P.J., 2005. Guideline for the Review of Specialist Input into the EIA. Process: Edition 1. CSIR Report No ENV-S-C 2005 053 B. Provincial. Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

Lochner, P., 2005. Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Maree, J.P.W., 2022. Personal communication. the Free State Department of Police, Roads and Transport (FSDPRT), Bloemfontein, South Africa.

MMM, 2020. Spatial Development Framework. Mangaung Metropolitan Municipality (MMM), Bloemfontein, South Africa.

MMM, 2022. Draft Integrated Development Plan 2022/2027. Mangaung Metropolitan Municipality (MMM), Bloemfontein, South Africa.

Mucina, L. & Rutherford, M.C., (eds.) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria, South Africa.

Münster, F., 2005. Guideline for determining the scope of specialist involvement in EIA processes: Edition 1. CSIR Report No ENV-S-C 2005 053 A. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town, South Africa.

Naidoo, N., 2022. Visual Impact Assessment: Paradise 100 MW Solar PV & 40 MW Battery Energy Storage Systems Project - Free State Province. Eco Elementum (Pty) Ltd, Pretoria, South Africa.

Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. & Nienaber, S., 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Parsons Brinckerhoff, 2013. Review of Environmental Factors Pursuant to Section 111 of the Environmental Planning and Assessment Act 1979. Cooma 132/66kV Substation Rebuild and Associated Works. Parsons Brinckerhoff Australia Pty Limited, Australia.

SANBI, 2016. Red List of South African Plants version 2020. Redlist.sanbi.org (Accessed: Feb 2022). South African National Biodiversity Institute (SANBI), Pretoria, South Africa.

Tanhuke, C. & Myeni, N., 2023. Social Impact Assessment. Proposed Paradise 100MW Solar Photovoltaic & 40MW Battery Energy Storage Systems Project South of Mangaung, Free State Province. Nemai Consulting (PTY) Ltd, Johannesburg, South Africa.

Van Deventer, H., Smith-Adao, L., Mbona, N., Petersen, C., Skowno, A., Collins, N.B., Grenfell, M., Job, N., Lötter, M., Ollis, D., Scherman, P., Sieben, E. & Snaddon, K., 2018. South African National Biodiversity Assessment 2018: Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI), Pretoria, South Africa.

van Schalkwyk, J.A., 2022. Phase 1 Cultural Heritage Impact Assessment: Proposed Paradise 100MW Solar Photovoltaic (PV) & 40MW Battery Energy Storage Systems (BESS) Project South of Bloemfontein, Free State Province.

Visser, D.J.L. (ed), 1984. Geological Map of South Africa 1:100 000. South African Committee for Stratigraphy, Council for Geoscience, Pretoria, South Africa.

Wolhuter, R. & Holtzhausen, J.P., 2015. Environmental Impact Assessment for the Proposed Isundu 765/400 kV Sub-Station and Turn-In Transmission Lines. Electromagnetic Fields (EMF) Specialist Report.

Websites

http://www.energy.gov.za/files/renewables_frame.html

APPENDICES