DRAFT BASIC ASSESSMENT REPORT

for

DUNEVELD PV

On

RE Farm Geel Kop Farm No 456.

In terms of the

National Environmental Management Act (Act No. 107 of 1998, as amended) & 2014 Environmental Impact Regulations

Prepared for Applicant: Duneveld PV (Pty) Ltd.

Date: 06 July 2020

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Report Reference: KAI632/10

Department Reference: To be allocated

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DOCUMENT TRACKING

DOCUMENT HISTORY

REVISION	DATE	AUTHOR
Draft Basic Assessment Report	06 July 2020	Dale Holder
Final Basic Assessment Report	Pending	Dale Holder
Draft Environmental Management Programme	06 July 2020	Dale Holder
Final Environmental Management Programme	Pending	Dale Holder

APPROVAL FOR RELEASE

NAME	TITLE	SIGNATURE
Dale Holder	Senior Environmental Practitioner	

DISTRIBUTION

DISTRIBUTION LIST
Department of Environmental Affairs
Duneveld PV (Pty) Ltd
Registered and Potential I&AP's

SUBMISSION AND CORRESPONDENCE

SUBMISSION / CORRESPONDENCE	DATE
Application form Submitted	06 July 2020
Application form Acknowledged	Pending
Draft Basic Assessment Report Submitted	06 July 2020
Draft Basic Assessment Report Acknowledged	Pending
Comment on Draft Basic Assessment Report	Pending
Final Basic Assessment Report Submitted	Pending

APPOINTED ENVIRONMENTAL ASSESSMENT PRACTITIONER:
Cape EAPrac Environmental Assessment Practitioners PO Box 2070 George 6530 Tel: 044-874 0365 Fax: 044-874 0432 **Report written & compiled by:** Dale Holder (Ndip Nature Conservation), who has over 15 years' experience as an environmental practitioner. **Registrations:** Director, Louise-Mari van Zyl (MA Geography & Environmental Science [US]; Registered Environmental Assessment Practitioner with the Interim Certification Board for Environmental Assessment Practitioners of South Africa, EAPSA). Ms van Zyl has over fifteen years' experience as an environmental practitioner.

PURPOSE OF THIS REPORT:
I&AP Review and Comment

APPLICANT:
Duneveld PV (Pty) Ltd

CAPE EAPRAC REFERENCE NO:
KAI632/10

DEPARTMENT REFERENCE:
Pending

SUBMISSION DATE:
06 July 2020

DRAFT BASIC ASSESSMENT REPORT

in terms of the

National Environmental Management Act, 1998 (Act No. 107 of 1998 as amended) & Environmental Impact Regulations2014 (as amended)

Duneveld PV

RE Farm Geel kop No. 456

Submitted for:

Stakeholder Review & Comment

Report Issued by:

Cape Environmental Assessment Practitioners

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REPORT DETAILS

Title:	Draft Basic Assessment Report for Duneveld PV
Purpose of this report:	This Draft Basic Assessment Report is made available to all registered and potential Interested and Affected Parties (I&APs) for review and comment and all comments received will be incorporated into the Final Basic Assessment Report that will be submitted to the competent authority for decision making. This BAR forms part of a series of reports and information sources that are being provided during the Basic Assessment Process for the proposed Duneveld PV near Keimoes in the Northern Cape Province. Registered I&APs will be given an opportunity to comment on the following reports as part of this environmental process: - Draft Basic Assessment Report, - All Specialist Studies, and - Draft Environmental Management Programme. In accordance with the regulations, the objectives of an environmental process are to, through a consultative process: (a)identify the relevant policies and legislation relevant to the activity; (b) motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location; (c) identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process; (d) identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment; (e) identify the key issues to be addressed in the assessment phase; (f) agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and (g) identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored. <u>The Draft Basic Assessment Report is available to all registered and potential interested and affected parties for a 30 day review and comment period extending from 06 July 2020 – 06 August 2020</u> All comments received during this comment period will be incorporated into the Final BAR that will be submitted to the DEA for Decision making.
Prepared for:	Duneveld PV (Pty) Ltd
Published by:	Cape Environmental Assessment Practitioners (Pty) Ltd. (Cape EAPrac)
Authors:	Mr Dale Holder
Reviewed by:	Ms Melissa Mackay
Cape EAPrac Ref:	KAI632/10
DEA Case officer & Ref. No:	To be allocated
Date:	06 July 2020
To be cited as:	*Cape EAPrac,* 2020. Draft Basic Assessment Report for Duneveld PV. Report Reference: KAI632.10. George.

TECHNICAL CHECKLIST

The following technical checklist is included as a quick reference roadmap for the proposed project.

Applicant Details	Applicant Name:	Duneveld PV (Pty) Ltd
	Company Registration Number:	2020/156269/07
	BBBEE Status:	n/a
	Project Name:	Duneveld PV
Size of the study area	Size in ha of initial study area.	212ha

Development Footprint	This includes the total footprint of PV panels, auxiliary buildings, battery energy storage system, onsite substation, inverter stations and internal roads.	Approximately 212ha
Capacity of the facility	Capacity of facility (in MW) Capacity of energy storage (in MWh)	Net generating capacity of 100MW_{AC} Storage Capacity 400MWh
Solar Technology selection	Type of technology	Solar photovoltaic (PV) with either of fixed-tilt, single-axis tracking- or dual-axis tracking-mounting structures.
	Structure height	Solar panels a maximum of ± 3.5m from ground level
	Surface area to be covered (including associated infrastructure such as roads)	Approximately 212ha
	Structure orientation	Fixed-tilt: north-facing at a defined angle of tilt Single-axis: horizontal axis tracking from east to west
	Laydown area dimensions	Approximately 2-5ha of temporary laydown area will be required (the laydown areas will not exceed 5ha and will be situated within the assessed footprint). Permanent laydown area not exceeding 1ha.

The PV energy facility is to consist of solar photovoltaic (PV) technology, fixed-tilt-, single-axis tracking- or dual-axis tracking- mounting structures, with a net generating capacity of 100 MW as well as associated infrastructure, which will include:

- On-site switching-station / substation;
- Auxiliary buildings (gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
- Battery Energy Storage System;
- Inverter-stations, transformers and internal electrical reticulation (underground cabling);
- Access and internal road network;
- Laydown area;
- The projects intend to connect from the onsite sub-stations to the Upington MTS (400/132 kV), via the 132kV Geel Kop Collector Substation (this basic assessment process only includes the IPP portion of the onsite sub-station, while the remainder of the grid connection is being assessed in a separate BAR process);
- Rainwater tanks; and
- Electrified Perimeter fencing and security infrastructure.

COMPONENT DETAILS

Component	Description/ Dimensions
Location of the site	Approximately 27km Southwest of Upington along the N14
PV Panel area	A maximum of 200 ha within a total project footprint of approximately 212ha
SG Codes	C02800000000045600000
Preferred Site access	The site will be accessed directly from the N14 via Access Point 1 (an existing farm access) as described in the Transport study undertaken by JG Afrika.
Export capacity	100 MW
Proposed technology	PV with fixed-tilt-, single-axis tracking- or dual-axis tracking- mounting structures.

Height of installed panels from ground level	Solar panels a maximum of ± 3.5m from ground level
Width and length of internal roads	Roads - width: up to 8m, length: up to 15km

LOCATION OF PREFFERED ALTERNATIVE

The co-ordinates of the preferred alternative are reflected in the table below.[1]

Layout Alternative 1 (Preferred)	Latitude	Longitude
North-West Corner	28°37'35.23"S	21° 1'02.50"E
North-East Corner	28°37'35.76"S	21° 01'51.06"E
South-West Corner	28°38'33.3"S	21°01'36.18"E
South-East Corner	28°38'37.4"S	21°02'24.33"E

CONTENTS OF A BASIC ASSESSMENT REPORT.

Appendix 1 of Regulation 326 of the 2014 EIA Regulations (as amended) contains the required contents of a Basic Assessment Report. The checklist below serves as a summary of how these requirements were incorporated into this Basic Assessment Report.

Requirement	Details
(1) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include -	
(a) Details of - The EAP who prepared the report; and The expertise of the EAP, including, a curriculum vitae.	The report was compiled by Dale Holder of Cape EAPrac. The author has thirteen years' experience as an EAP and holds a ND Nature Conservation qualification. The CV of the EAP and Company Profile is included as Annexure J4 of this report.
(b) The location of the activity, including – The 21 digit Surveyor General code of each cadastral land parcel; Where available, the physical address and farm name; Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.	C02800000000045600000 ±27km Southwest of Upington in the Northern Cape <u>Corner co-ordinates:</u> North-West Corner 28°37'35.23"S 21° 1'02.50"E North-East Corner 28°37'35.76"S 21° 01'51.06"E South-West Corner 28°38'33.3"S 21°01'36.18"E South-East Corner 28°38'37.4"S 21°02'24.33"E
(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 A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Refer to Appendix A and B of this report.
(d) a description of the scope of the proposed activity, including - All listed and specified activities triggered and being applied for; and A description of the activities to be undertaken including associated structures and infrastructure.	The relevant listed activities are captured in Section 3.1.2 The description of the activity is provided in Section 2 of this report with graphic representation provided in Appendix B.
(e) A description of the policy and legislative context within which the development is proposed, including – An identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and	Please refer to Section 3 of this document.

[1] This Basic Assessment Process includes the IPP portion of the on-site substation only. The powerline and remainder of infrastructure needed to connect this facility to the national grid is being considered as part of a separate basic assessment process.

Requirement	Details
instruments that are applicable to this activity and have been considered in the preparation of the report; and .How the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks and instruments.	
(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 location.	Please refer to Section 2.2 of this document.
(g) A motivation for the preferred site, activity and technology alternative.	The preferred alternative has been identified as the best practicable option and is discussed in detail in section 2.4 of this report.
(h) A full description of the process followed to reach the proposed preferred alternative within the site, including - • Details of all alternatives considered; • Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; • A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; • The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; • The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts - (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated. • The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; • Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; • The possible mitigation measures that could be applied and level of residual risk; • The outcome of the site selection matrix; • If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and • A concluding statement indicating the preferred alternatives, including preferred location of the activity.	Section 2.4 addresses feasible and reasonable alternatives which were identified for facility. Site, layout and technological alternatives were considered. Details of Public Participation are included in section 8 of the report. A summary of all issues raised by I&APs as well as the responses thereto are included in Appendix F. The environmental attributres of the study site are included in section 5 of the report. The identification and assessment of Impacts are included in section 6 of the report. The summary of proposed mitigation measures are included in section 7 of the report. The outcome of the site selection matrix is attached in Annexure E7 and is summarised in section 2.3 of the report. The concluding statement is contained in section 6.14 of the report.
(i) A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including - A description of all environmental issues and risks that were identified during the basic assessment process; and 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.	Please see Summary and Section 6 of the report and Appendix E for the specialist reports.
(j) An assessment of each identified potentially significant impact and risk, including - Cumulative impacts; The nature, significance and consequences of the impact and risk;	Please see Section F of the report and Appendix E for the specialist reports.

Requirement	Details
The extent and duration of the impact and risk; The probability of the impact and risk occurring; The degree to which the impact and risk can be reversed; The degree to which the impact and risk may cause irreplaceable loss of resources; and The degree to which the impact and risk can be mitigated.	
(k) Where applicable, a summary of the findings and impact management measures identified in 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.	Please see Section 6 of the report and Appendix E for the specialist reports.
(l) An environmental impact statement which contains – • A summary of the key findings of the environmental impact assessment; • A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and • A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 6.23 and 6.14 of this report. See Appendix D Section 6.13 of this report.
(m) Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr.	See section 7 report.
(n) 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.	See section 7 of this report.
(o) A description of assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	See 3.4 of this report.
(p) 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.	See section 9 of this report.
(q) Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded and the post construction monitoring requirements finalised.	The proposed activity does include operational aspects.
(r) An undertaking under oath or affirmation by the EAP in relation to: The correctness of the information provided in the reports; The inclusion of comments and inputs rom stakeholders and I&APs; The inclusion of inputs and recommendations from the specialist reports where relevant; and Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	The declaration of the EAP is attached in Appendix G.
(s) Where applicable, details of any financial provisions for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts.	This environmental assessment does not include application for decomissioning and closure of activities
(t) Any specific information that may be required by the competent authority.	Currently not applicable but will be included if such a request is made.
(u) Any other matters required in terms of section 24(4)(a) and (b) of the Act.	This section will be updated on reciept of the mandatory comment from the competant authority.

DEA COMMENT ON DRAFT BASIC ASSESSMENT REPORT

This section will be updated once the DEA provide comment on the Draft Basic Assessment Report.

ORDER OF REPORT

Report Summary

Draft Basic Assessment Report – Main Report

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Appendix B	:	Biodiversity Overlays
Appendix C	:	Site Photographs
Appendix D	:	Solar Facility Layout Plans
Appendix D1	:	Cluster Map showing proximity of Duneveld PV to other projects on the property.
Appendix D2	:	Cumulative impacts Map
Appendix E	:	Supplementary Reports (Specialist Reports and Technical Reports)
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Annexure E2	:	Avifaunal Impact Assessment (Van Rooyen, 2020)
Annexure E3	:	Freshwater Ecological Impact Assessment (Colloty, 2020)
Annexure E4	:	Agricultural Impact Assessment Report (Lubbe, 2020)
Annexure E5	:	Heritage Impact Assessment Report (van der Walt, 2020)
Annexure E6	:	Palaeontology Desktop Study (Bamford, 2020)
Annexure E7	:	Visual Impact Assessment (Marshall, 2020)
Annexure E8	:	Social Impact Assessment (Barbour, 2020)
Annexure E9	:	Technical Design Report (Duneveld PV (Pty) Ltd, 2020)
Annexure E9b	:	Battery Storage Technical Document (Duneveld PV (Pty) Ltd, 2020)
Annexure E10	:	Water Consumption Study (Duneveld PV (Pty) Ltd, 2020)
Annexure E11	:	Site Selection Matrix (Duneveld PV (Pty) Ltd, 2020)
Annexure E12	:	Traffic and Transportation Assessment (JG Africa, 2020)
Annexure E13	:	Stormwater Management Plan (SRK, 2020)
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Appendix F	:	Public Participation Process
Annexure F1	:	I&AP Register
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Annexure F3	:	Adverts & Site Notices
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EXECUTIVE SUMMARY

I. INTRODUCTION

Cape EAPrac has been appointed by Duneveld PV (Pty) Ltd, hereafter referred to as the Applicant, as the independent Environmental Assessment Practitioner (EAP), to facilitate the Basic Assessment process[2] required in terms of the National Environmental Management Act (NEMA, Act 107 of 1998) for the proposed development of the Duneveld PV facility near Upington and Keimoes in the Northern Cape Province of South Africa.

The total generation capacity of the solar facility will not exceed 100MW_{AC} for input into the national Eskom grid. The project will feed into the National Grid via the existing Eskom Upington Major Transmission Substation (MTS). The grid connection to connect this project to the National Grid is being assessed as part of a separate environmental application process. This current BAR process only includes the IPP portion of the on-site substation.

The purpose of this **Draft Basic Assessment Report** (BAR) is to describe the environment to be affected, the proposed project, to present the site constraints identified by the various specialist during their site assessments, and identify & assess the impacts of this development on the receiving environment. This information is herewith presented to all registered and potential Interested and Affected Parties (I&AP's), including the competent authority for review and comment.

The Draft BAR is available for a 30-Day period extending from **06 July 2020 – 06 August 2020.**

All comments received on the Draft BAR will be incorporated into the Final BAR that will be submitted to the DEA for consideration and decision making. After the department has taken a decision on the application, this decision will be communicated to all I&AP's along with details of the appeal process.

RECOMMENDATION OF THIS EIA

None of the participating specialists identified any impacts that remain high after mitigation. Because of the risk adverse approach followed for the development of the preferred layout, all the main sensitive features, (most notably significant Water Courses, Pans, Rocky outcrops Archaeology Features, Avifaunal buffers, and visually sensitive areas) were avoided.

The affected area is considered suitable for development and there are no impacts associated with Duneveld PV that cannot be mitigated to a medium level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Duneveld PV can be supported from a terrestrial ecology, avifaunal, freshwater, visual, social, heritage and agricultural point of view.

It is thus Cape EAPrac's considered opinion that the preferred alternative (Layout Alternative 1 and the Eastern Access Road Alternative – Site Access 1) can be considered for approval.

NEED AND DESIRABILITY

Need and desirability for this project has been considered in detail in this environmental process. The overall need and desirability in terms of developing renewable energy generation in South Africa and globally is considered in section 1, while the project specific need and desirability is considered in section 5.

[2] The environmental process follows a basic assessment process, as it is located within the Upington Renewable Energy Development Zone, which was formally gazetted in 2018 in GN 113 and GN114.

ENVIRONMENTAL LEGISLATIVE REQUIREMENTS

The current assessment is being undertaken in terms of the **National Environmental Management Act** (NEMA, Act 107 of 1998). This Act makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the competent authority (in this case, the National Department of Environmental Affairs, DEA) based on the findings of an Environmental Assessment.

The proposed development entails several listed activities, which require a Basic Assessment Process, which must be conducted by an independent EAP. Cape EAPrac has been appointed to undertake this process.

Table 1: NEMA 2014 (As amended in April 2017) listed activities applicable to Duneveld PV.

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Description
11	The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	Construction of the IPP portion of the on-site substation outside of an urban area[3]. The facilities and Infrastructure associated with Duneveld PV will have a maximum capacity of 132 kilovolts.
12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse;	Construction of internal, perimeter and acess roads as well as PV mounting structures across the ephemeral washes identified on farm Geel Kop Farm 456 RE. These roads and structures will have a physical footprint exceeding 100 square metres
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;	Construction of internal, perimeter and acess roads as well as PV mounting structures across the ephemeral washes identified on the property. The excavation and infilling associated with these roads and structures will exceed 10 cubic metres.
24	The development of a road— ((ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	Construction of the main access road to the proposed Duneveld PV facility. The access road will have a width of 8m but with the inclusion of side drains will exceed a total width of more than 8m.
28	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: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	The Duneveld PV facility is considered as commercial use, being proposed on an area used for agricultural purposes. Duneveld PV will have a total footprint of approximately 212 ha
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (ii) where no reserve exists, where the existing road is wider than 8 metres;	The existing access track will be widened by more than 6m in certain sections.
Activity No(s):	**Basic Assessment Activity(ies) as set out in Listing Notice 3 (GN R985)**	**Description**
4	The development of a road wider than 4 metres with a reserve less than 13 metres. g. Northern Cape iii. Outside urban areas:	The access road to the project crosses a CBA in the South of the Property. This road will be 8m in width.

[3] Duneveld PV will connect from the on-site substation to the Upington MTS via the Geelkop Collector Substation (this Basic Assessment process only includes the IPP portion of the on-site substation, while the remainder of the grid connection is being assessed as part of a separate Basic Assessment process).

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Description
	(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	
12	The clearance of an area of 300 square metres or more of indigenous vegetation. g. Northern Cape 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;	The access road and portions of the project fall within a CBA in the South of the Property. The construction of this section of road and PV infrastructure will require the removal of more than 300 square metres of vegetation within this CBA.
14	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more. g. Northern Cape ii. 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;	The access road and portions of the PV development is proposed within CBA in the South of the Property. This section of road and PV infrastructure within the CBA will have a footprint exceeding 10 square metres.
Activity No(s):	**Scoping and EIR Activity(ies) as set out in Listing Notice 2 (GN R984)**	**Description**
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,	The proposed Duneveld PV comprises a renewable energy generation facility, which will utilise PV technology and will have a net generation capacity of up to 100MW.
15	The clearance of an area of 20 hectares or more of indigenous vegetation	Duneveld PV will have a total footprint of approximately 212ha.

NOTE: Basic Assessment as well as S&EIR Activities are being triggered by the proposed development, but since the project is contained in a legislated REDZ, the EIA Process will follow a Basic Assessment process.

Before any of the above-mentioned listed activities can be undertaken, authorisation must be obtained from the relevant authority, in this case the DEA. Should the Department approve the proposed activity, the Environmental Authorisation does not exclude the need for obtaining relevant approvals from other Authorities who has a legal mandate in respect of the activity.

II. DEVELOPMENT PROPOSAL

Duneveld PV will have a net generating capacity of 100 MW with an estimated maximum footprint of ± 212 ha.

The technology under consideration is PV modules mounted on either single or double axis tracking structures. Other infrastructure includes battery energy storage systems, inverter stations, internal electrical reticulation, access road, internal roads, an on-site switching station / substation (the grid connection to the Upington MTS via the Geelkop Collector Substation is being assessed as part of a separate basic assessment process), auxiliary buildings, construction laydown areas and perimeter fencing and security infrastructure.

The on-site switching station / substation will locate the main power transformer/s that will step up the generated electricity to a suitable voltage level for distribution into the national electricity grid. Auxiliary buildings include, *inter alia*, a control building, offices, warehouses, a canteen and visitors centre, staff lockers and ablution facilities, a gate house and security offices.

III. PROFFESIONAL INPUT

The following professionals[4] have provided input into this environmental process:

1.	Terrestrial Ecology	-	David Hoare Consulting (Pty) Ltd
2.	Avifaunal	-	Chris van Rooyen Consulting
3.	Archaeology	-	Heritage Contracts and Archaeological Consulting (HCAC)
4.	Palaeontology	-	Professor Marion Bamford
5.	Heritage	-	Heritage Contracts and Archaeological Consulting (HCAC)
6.	Agricultural Potential	-	Mr Christo Lubbe
7.	Visual	-	Environmental Planning and Design
8.	Freshwater	-	Dr Brian Colloty
9.	Social	-	Tony Barbour
10.	Engineering aspects	-	Duneveld PV (Pty) Ltd
11.	Stormwater	-	SRK Consulting
12.	Traffic and Transportation	-	JG Afrika
13.	Water Consumption	-	Duneveld PV (Pty) Ltd
14.	Planning	-	Macroplan.
15.	Geological	-	GCS

IV. PLANNING CONTEXT

A Planning specialist will be appointed in order to consider the planning implications of the proposed Duneveld PV and submit the required applications as follows:

- Application for land use change in terms of the Spatial Planning and Land Use Management Act, Act 16 of 2013, submitted to the Kai !Garib Municipality in terms of their Land Use Management Scheme and relevant and approved SPLUMA by-laws.
- Notification of the intended process of land use change submitted to the Department of Agriculture Forestry and Fisheries (DAFF) in terms of the Subdivision of Agricultural Land Act, Act 70 of 1970.

V. ASSESSMENT OF IMPACTS

The potential key impacts identified and assessed by the various specialists (more details on the significance and ratings of these impacts are provided in section 6 below and in the attached specialist reports).

Ecological Impacts Assessed

Construction Phase Impacts

Direct impacts

- Loss and/or fragmentation of indigenous natural vegetation due to clearing;
- Loss of individuals of plant species of conservation concern and/or protected plants;
- Loss of faunal habitat and refugia;
- Direct mortality of fauna due to machinery, construction, and increased traffic;
- Displacement and/or disturbance of fauna due to increased activity and noise levels;

[4] Note that not all of these professionals are considered specialists as contemplated in chapter 3 of Regulation 326. Studies such as Engineering, Stormwater, Traffic, water consumption and planning constitute "technical" studies, rather than specialist studies and as such, the requirements in appendix 6 of R326 do not apply to all these professionals

- Effects on physiological functioning of vegetation due to dust deposition;
- Increased poaching and/or illegal collecting due to increased access to the area.

Indirect impacts

- Indirect impacts during the construction phase include the following:
- Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation;
- Changes to behavioural patterns of animals, including possible migration away or towards the project area;
- Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas.

Operational Phase Impacts

Direct impacts

- Ongoing direct impacts will include the following:
- Continued disturbance to natural habitats due to general operational activities and maintenance;
- Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure;

Indirect impacts

- These will include the following:
- Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
- Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;
- Changes to behavioural patterns of animals, including possible migration away or towards the project area;
- Positive potential impact on climate change due to generation of electricity without the need for coal mining or burning of coal, currently the main form of power generation in South Africa.

Decommissioning Phase Impacts

Direct impacts

- These will include the following:
- Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites;
- Direct mortality of fauna due to machinery, construction and increased traffic;
- Displacement and/or disturbance of fauna due to increased activity and noise levels;
- Effects on physiological functioning of vegetation due to dust deposition;

Indirect impacts

- These will occur due to renewed disturbance due to decommissioning activities, as follows:
- Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
- Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;
- Changes to behavioural patterns of animals, including possible migration away or towards the project area;

Cumulative impacts

- Loss and/or fragmentation of indigenous natural vegetation due to clearing;
- Loss of individuals of plant species of conservation concern and/or protected plants;
- Changes to ecological processes at a landscape level;
- Mortality, displacement and/or disturbance of fauna;
- General increase in the spread and invasion of new habitats by alien invasive plant species;

- Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape;
- Loss of the wilderness character of the area;
- Positive cumulative impact on climate change.

Avifaunal Impacts Assessed

- Displacement due to disturbance associated with the construction of the Duneveld PV plant and associated infrastructure.
- Displacement due to habitat transformation associated with the construction of the Duneveld PV plant and associated infrastructure
- Collisions with the solar panels
- Entrapment in perimeter fences
- Electrocutions in the onsite substation and inverter station
- Displacement due to disturbance associated with the decommissioning of the Duneveld PV plant and associated infrastructure

Freshwater Impacts Assessed

- Loss of Very High Sensitivity systems, namely the mainstem alluvial water course and a pan through physical disturbance although the proposed layout will avoid any of these systems
- Impact on secondary alluvial water courses (Moderate Sensitivity), through physical disturbance
- Impact on all riparian and wetland systems through the possible increase in surface water runoff on riparian form and function through hydrological changes
- Increase in sedimentation and erosion
- Risks on the aquatic environment due to water quality impacts
- Cumulative impacts

Heritage Impacts Assessed

Construction Phase

- Impact on scenic routes during construction

Operational Phase

- Impacts on the heritage resources.
- Impact on scenic routes.
- Impact of new structures on cultural landscape and character.

Cumulative impacts

- Change to the rural character.
- Socio-economic upliftment.

Archaeological Impacts Assessed

Construction Phase

- Disturbance to surface and sub-surface sediments

Operational Phase

- None

Cumulative Impacts

- No cumulative impacts will arise

Visual Impacts Assessed

Construction Phase

- Visual scarring as a result of new development, clearing vegetation and construction works.

Operational Phase

- Change in the rural visual character of the site.
- Visual impact on key visual receptors and secondary visual receptors.
- Potential visual.
- Visibility from sensitive receptors.
- Visual intrusion of lighting at night.

Socio-Economic Impacts Assessed

Construction Phase

- Creation of business and employment opportunities
- Impacts associated with the presence of construction workers on site;
- Security and safety impacts associated with the presence of construction workers;
- Noise, dust and safety impacts associated with construction related activities and the movement of heavy vehicles.

Operational Phase

- Creation of employment and business opportunities;
- Impact on rural sense of place and character of the area;
- Crime levels and pressure on local services.

Traffic Impacts Assessed

- Traffic Congestion
- Noise pollution due to increased traffic.
- Air quality affected by dust pollution
-

Impact Summary

The table below summarises the significance (with mitigation) of all impacts assessed in the sections above[5].

Table 2: Summary of the significance of impacts associated with Duneveld PV[6].

Impact	Significance (with mitigation)
Social Impacts during the construction Phase	
Creation of employment and business opportunities	Medium positive
Presence of construction workers and potential impacts on family structures and social networks.	Low negative
Influx of job seekers.	Low negative
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers.	Low negative
Increased risk of veld fires	Low negative
Impact of heavy vehicles and construction activities.	Low negative
Loss of farmland.	Low negative
Social Impacts during the operational phase	
Promotion of renewable energy projects	High positive
Creation of employment and business opportunities	Medium positive
Establishment of Community Trust	High positive
Generate income for affected landowner/s	Medium positive
Visual impact and impact on sense of place	Low negative
Impact on tourism	Low positive and negative
Visual Impacts during construction and operation phase	

[5] In order to attain these outcomes, the mitigation measures reflected in section 7 of the report need to be implemented.

[6] This includes cumulative impacts associated with the facility

Impact	Significance (with mitigation)
Change of local and surrounds visual resources due to the construction and operation of the proposed (3.5m high) PV structures, and buildings.	Low negative
Change of local and surrounds visual resources due to the construction and operation of the proposed road access.	Low negative
Palaeontological Impacts	
Impact on potential palaeontological resources	Low negative
Agricultural Impacts	
Soil pollution with contaminants during the construction phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the construction of all facets of the facility: laydown area, concrete foundations of the auxiliary buildings, inverter stations subterranean cabling, main access and internal service roads.	Low negative
The establishment of the PV Solar facility will be done at the expense of agricultural land. The area to be lost for agricultural development would be 212ha in size. This includes the area under PV panels, internal service roads and temporary laydown area	Low negative
The construction of a PV Solar facility will cause impairment of the land capability with the potential risk of erosion	Low negative
The establishment of the PV Solar facility may alter drainage patterns with construction and cause erosion	Low negative
Soil pollution with contaminants during the operational phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the maintenance of the facility.	Low negative
The establishment of Duneveld PV will be done at the expense of agricultural land. Area to be lost for agricultural development would be 212 ha in size. This includes the area under PV panels, internal service roads and temporary laydown area.	Low negative
The quantity of available soil for agricultural production decreases as result of the footprints of these facilities. The quality of soil decreases in the way the construction of these structures alters the workability of the soil. This includes the physical deformation in the soil profile (Cumulative)	Medium negative
Clearing of vegetation increases flow speed and a lower infiltration tempo increases silt transport (Cumulative)	Medium negative
Chemicals, hazardous substances and waste used or generated during live span of the facility accumulate and pollute soil will become contaminated (Cumulative)	Medium negative
Freshwater Ecology Impacts	
Loss of Very High Sensitivity systems, namely the mainstem alluvial water course and a pan through physical disturbance although the proposed layout will avoid any of these systems.	Low negative
Impact on secondary alluvial water courses (Moderate Sensitivity), through physical disturbance	Low negative
Impact on all riparian and wetland systems through the possible increase in surface water runoff on riparian form and function through hydrological changes	Low negative
Increase in sedimentation and erosion	Low negative
Risks on the aquatic environment due to water quality impacts	Low negative
Cumulative impacts	Medium Negative
Terrestrial Fauna Impacts	
Loss and/or fragmentation of indigenous natural vegetation due to clearing;	Medium negative
Loss of individuals of plant species of conservation concern and/or protected plants	Low negative
Loss of faunal habitat and refugia	Low negative
Direct mortality of fauna due to machinery, construction and increased traffic	Low negative
Displacement and/or disturbance of fauna due to increased activity and noise levels	Low negative
Effects on physiological functioning of vegetation due to dust deposition	Low negative
Increased poaching and/or illegal collecting due to increased access to the area.	Low negative
Indirect impacts during the construction phase include the following	Low negative
Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation	Low negative
Changes to behavioural patterns of animals, including possible migration away or towards the project area	Low negative

Impact	Significance (with mitigation)
Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas.	Low negative
Cumulative Impacts	Medium negative
Avifaunal Impacts	
Construction of the solar PV plant and associated infrastructure	Low negative
Displacement due to habitat transformation	Medium negative
Collisions	Low negative
Entrapment	Low negative
Electrocution	Low negative
Decomissioning Impacts	Low negative
Cumulative Impacts	Low negative
Traffic Impacts	
Traffic Congestion	Low negative
Noise pollution due to increased traffic.	Low negative
Air quality affected by dust pollution	Low negative

As can be seen from the table above, there are a number of positive impact associated with Duneveld PV. The majority of the negative impacts are either low or medium/ There are no high or very high impacts associated with Duneveld PV.

Impact Statement

None of the participating specialists identified any impacts that remain high after mitigation. Because of the risk adverse approach followed for the development of the preferred layout, all the main sensitive features, (most notably significant Water Courses, Pans, Rocky outcrops Archaeology Features, Avifaunal buffers and visually sensitive areas) were avoided.

The affected area is considered suitable for development and there are no impacts associated with Duneveld PV that cannot be mitigated to a medium level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Duneveld PV can be supported from a terrestrial ecology, avifaunal, freshwater visual, social, heritage and agricultural point of view.

A map showing the proposed activity in relation to the key sensitive features is in attached in **Appendix D**. All sensitive features along with their appropriate buffers are shown in this plan. As required by the EMPr, all areas outside of the proposed development footprint are to be demarcated as no go areas.

VI. CONCLUSIONS & RECOMMENDATIONS

This environmental process is currently being undertaken to present proposals to the public and potential I&APs and to identify and assess environmental impacts, issues and concerns raised because of the proposed development alternatives.

Cape EAPrac is of the opinion that the information contained in this Basic Assessment Report and the documentation attached hereto is sufficient to allow the I&APs to apply their minds to the potential negative and/or positive impacts associated with the development, in respect of the activities applied for. This environmental process has not identified any fatal flaws with the proposal and as such it is our reasoned view that the project should proceed to the next phase of the environmental process. All specialists concur that the development as proposed (Layout Alternative 1 and Eastern Access Road Alternative – Site Access 1) can be considered for approval and that there are no reasons why the development should not be implemented. All impacts range from high positive to medium negative and all high and medium - high negative impacts have been avoided by the risk adverse approach to the development of this facility.

All stakeholders will have the opportunity to review the Draft BAR and the associated appendices (including all specialist studies), and provide comment, or raise issues of concern, directly to Cape EAPrac within the specified 30-day comment period. All comments received during this comment period will be included in the Final BAR submitted to DEA for decision making.

It is the EAP's considered recommendation that the development proposal, Layout Alternative 1 and Eastern Access Road Alternative (Site Access 1) be considered for approval by the competent Authority on condition that all other legislative approvals be obtained, and that the final EMPr be adhered to.

DRAFT BASIC ASSESSENT REPORT

1 INTRODUCTION

Cape EAPrac has been appointed by Duneveld PV (Pty) Ltd, hereafter referred to as the Applicant, as the independent Environmental Assessment Practitioner (EAP), to facilitate the Basic Assessment process[7] required in terms of the National Environmental Management Act (NEMA, Act 107 of 1998) for the proposed development of the Duneveld PV facility near Upington and Keimoes in the Northern Cape Province of South Africa.

The total generation capacity of the solar facility will not exceed 100MW$_{AC}$ for input into the national Eskom grid.

The project will feed into the National Grid via the proposed Geelkop Collector Substation to the existing Eskom Upington MTS. (The grid connection, excluding the IPP portion of the on-site substation is being assessed as part of a separate environmental application process).

The purpose of this **Draft Basic Assessment Report** (BAR) is to describe the environment to be affected, as a result of the proposed project, to present the site constraints identified by the various specialist during their site assessments, and identify and assess the impacts of the Duneveld PV development on the receiving environment. This information will be provided to all potential and registered interested and affected parties (I&AP's) for review and comment.

The Draft BAR is available for a 30-Day period extending from **06 July 2020 – 06 August 2020.**

All comments received on the Draft BAR will be incorporated into the Final BAR that will be submitted to the DEA for consideration and decision making.

1.1 RECOMMENDATION OF THIS EIA

The proposal by the Applicant is to develop a renewable energy generation facility on Geel Kop Farm 456 RE. The project has received general support throughout the ongoing environmental application, with no major issues identified by any of the participating stakeholders nor specialists.

The Basic Assessment process, through various investigations, has found that the proposal can be conditionally supported and that the potential negative impacts that may arise from this development can be effectively mitigated.

It is thus Cape EAPrac's considered opinion that the preferred alternative (Layout Alternative 1 and the Eastern Access Road Alternative – Site Access 1) can be considered for approval.

1.2 OVERVIEW OF ALTERNATIVE ENERGY IN SOUTH AFRICA AND THE NORTHERN CAPE

South Africa's generation capacity is dominated by coal-fired generation stations with a net output of 35.6 GWp, which represents over 85% of the country's total installed capacity of over 44 GW.

Globally, renewable energy has gained momentum, with a significant rise in the uptake of various RE technologies such as solar PV, wind energy, biogas and other biofuels, hydroelectricity, landfill gas, geothermal energy, and concentrated solar power (CSP).

Ministerial determinations by the South African government to procure RE — such as the Integrated Resource Plan (IRP) for Electricity 2010-2030, which lays out the country's electricity future — have given growth in the renewable energy sector a significant boost.

[7] The environmental process follows a basic assessment process, as it is located within the Upington Renewable Energy Development Zone, which was formally gazetted in 2018 in GN 113 and GN114.

South Africa's green economy, partly driven by the country's utility-scale Renewable Energy Independent Power Production Procurement Programme (REIPPPP), reflects these trends and is leading the way in some areas. According to Moody's, South Africa had the fastest growing green economy in the world in 2015. The REIPPPP, a key factor in this growth, is in its sixth year and has achieved remarkable successes. To date, the programme has:

- Procured over 6 300 MWp of RE generation capacity, of which over 2 500 MWp was connected and has been feeding electricity into the national grid since June 2016.
- Selected 102 preferred bidders to develop utility-scale projects across the country – with projects in every province across South Africa.
- Received a ministerial determination to procure a further 6 300 MWp of generation capacity. This is the second time capacity to the programme has been doubled – a testimony to its success.
- Attracted over R195 billion of investment into South Africa, with over 25% from foreign investors. In doing so, the programme, through local content requirements, has successfully stimulated the development of a local RE technology components manufacturing sector. Given the additional 6 300 MWp still to be procured, this sector is set to grow further.
- Achieved significant technology price reductions, with South Africa boasting some of the world's lowest clean energy costs.

Beyond these successes, the programme and, consequently, the utility-scale RE industry, is well positioned to continue contributing to South Africa's national development, as enshrined in the government's Strategic Infrastructure Projects (SIP) and the National Development Plan (NDP). The programme's socio-economic development (SED) and enterprise development (ED) mechanisms give successful project developers a unique opportunity to be competitive in their bidding strategy, while contributing meaningfully to the local and national economy. Project developers have fully embraced the SED/ED component of the REIPPPP, resulting in numerous inspiring contributions to priority areas on the government's developmental agenda. Among other areas, these contributions span community development, local economic development, skills development, and early childhood development.

The recent uncertainties involving the state-owned utility, Eskom, highlight the need for reforms in an evolving energy sector, where electricity generation, transmission and distribution systems require unbundling. The interest from local municipalities in procuring RE generation capacity from independent power producers (IPPs) contributes further to the shift in the structure of the country's power sector.

Regionally, the Northern Cape is suggested by many to be the ideal location for various forms of alternative energy; this has resulted in a number of feasibility studies being conducted, not least of which, an investigation by the Industrial Development Corporation in 2010 into potential for photovoltaic, thermal, solar and wind power (Northern Cape Business website, 2010).

The northern area of the Northern Cape and Namibia boasts the highest solar radiation intensity anywhere in Southern Africa. Solar energy is therefore likely to be the most viable alternative energy source for the Northern Cape, although wind-power potential is generally good along the coast (State of the Environment, S.A, 2014)

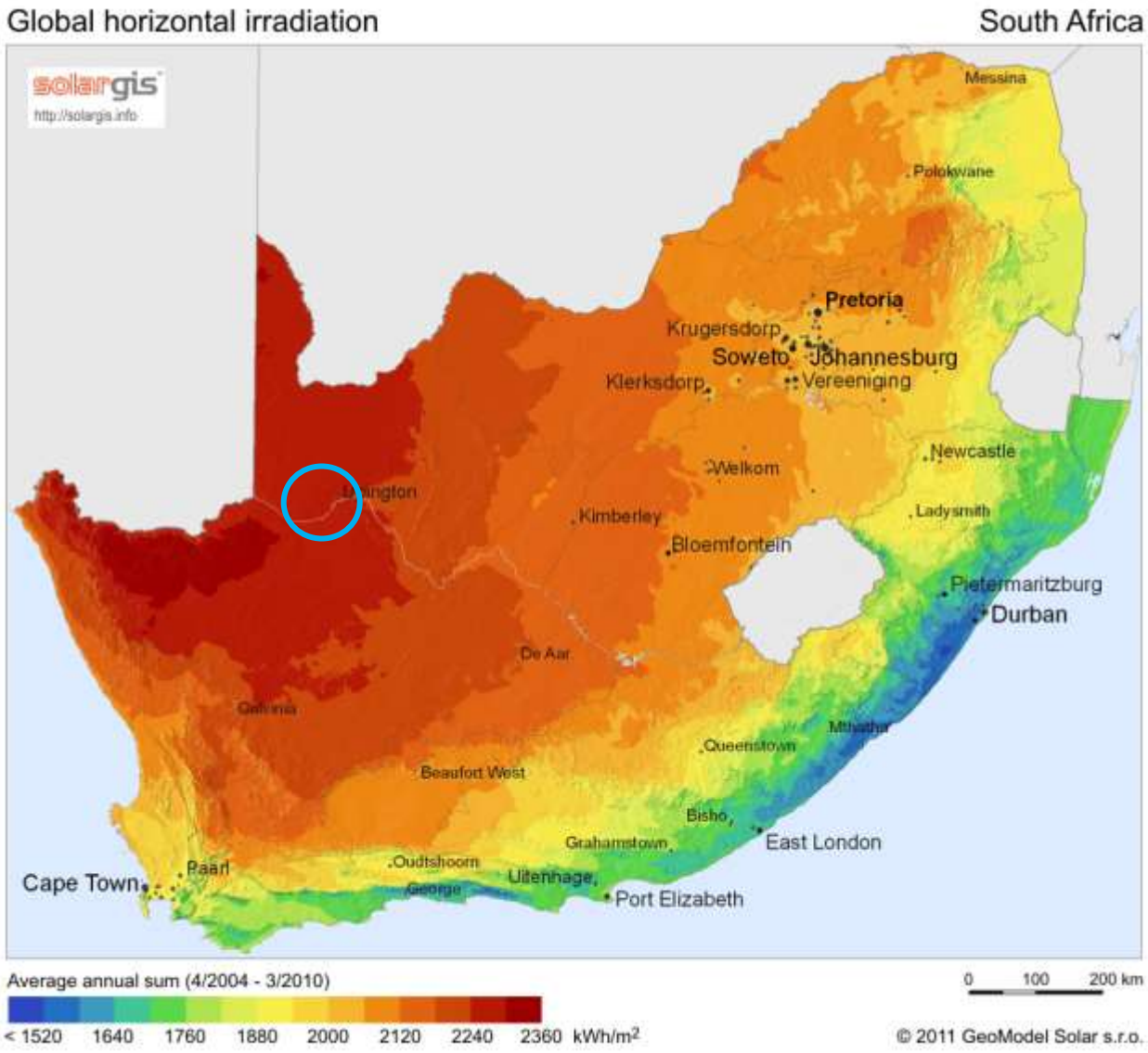

Figure 1: Global Horizontal radiation map for South Africa (Source: http://solargis.info, 2015) showing the approximate area proposed for Duneveld PV.

The Northern Cape area is considered to have extremely favourable solar radiation levels over the majority of the year, making it ideal for the production of solar-power via photovoltaic (fixed and tracking panels) and concentrated (solar thermal) solar technology systems. Several solar irradiation maps have been produced for South Africa, all of which indicate that the Northern Cape area has high solar irradiation.

The Northern Cape is not too dusty, the land is flat and sparsely populated, and there are little to no geological or climate risks, meaning that the sun can be used year-round (BuaNews online, 2014). An advantage that the Northern Cape has over the Sahara Desert is the relatively wind-free environment that prevails in large portions of the province. A Clinton Climate Initiative (CCI) pre-feasibility study has found that South Africa has one of the best solar resources on the planet (Northern Cape Business website – solar power, 2015).

The introduction of private sector generation offers multiple benefits; it will contribute greatly to the diversification of both the supply and nature of energy production, assist in the introduction of new skills and in new investment into the industry, and enable the benchmarking of performance and pricing. The Department of Energy (DoE), National Treasury (NT) and the Development Bank of Southern Africa (DBSA) established the IPP Office for the specific purpose of delivering on the IPP procurement

objectives. The REIPPPP is a competitive bidding process used by national government to procure RE generation capacity in line with the national IRP for Electricity 2010-2030.

NOTE: It is the intention that Duneveld PV will submit a bid under this REIPPPP.

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2013) identified eight (8) Renewable Development Zones (REDZs). The REDZs identified areas where large scale renewable energy facilities can be developed in in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country.

Duneveld PV is located within the Upington REDZ, which was formally gazetted in 2018. The area has therefore been identified as suitable for the establishment of renewable energy facilities, specifically large-scale solar farms.

1.3 ASSUMPTIONS & LIMITATIONS

This section provides a brief overview of *specific assumptions and limitations* having an impact on this environmental application process:

- It is assumed that the information on which this report is based (specialist studies and project information, as well as existing information) is **correct, factual and truthful.**
- The proposed development is **in line** with the statutory planning vision for the area (namely the local Spatial Development Plan) as well as the Upington REDZ, and thus it is assumed that issues such as the cumulative impact of development in terms of character of the area and its resources, have been taken into account during the strategic planning for the area.
- It is assumed that all the relevant **mitigation and management measures** and agreements specified in this report will be implemented to ensure minimal negative impacts and maximum environmental benefits.
- It is assumed that due consideration will be given to the **discrepancies in the digital mapping** (PV panel array layouts against possible constraints), caused by differing software programs, and that it is understood that the ultimate/final positioning of solar array will only be confirmed on-site with the relevant specialist/s.
- The Department of Water and Sanitation **will consider the submission of a water use application** necessary for allowing the use of water from any water resource on site. The assumption is made that water provision is to be obtained from the local municipality.
- It is assumed that Stakeholders and Interested and Affected Parties notified of the availability of this will submit all relevant **comments within the designated 30-days** review and comment period, so that these can included in the Final BAR to be timeously submitted to the competent authority, the Department Environmental Affairs, for consideration.

The assumptions and limitations of the various specialist studies are included in their respective reports attached in Appendix E.

2. PROPOSED ACTIVITY

The Applicant is proposing the establishment of a commercial PV facility, called Duneveld PV, on Geel Kop Farm No 456 RE. The proposed site is located approximately 35 km south west of Upington and 12 km north east of Keimoes in the Kai !Garib Local Municipality (ZF Mgcawu District Municipality) in the Northern Cape.

The technology under consideration is PV modules mounted on either fixed-tilt or tracking structures. Other infrastructure includes inverter stations, internal electrical reticulation, internal roads, an on-site switching station / substation (the powerline from on-site substation to the Upington MTS via the Geelkop Collector Substation / switching station is being assessed as part of a separate basic assessment process), auxiliary buildings, construction laydown areas and perimeter fencing and security

infrastructure. Auxiliary buildings include, inter alia, a control building, offices, warehouses, a canteen and visitors centre, staff lockers and ablution facilities, a gate house, and security offices.

Table 3: Component Areas and % of Total Project Area (Duneveld PV (Pty) Ltd, 2020).

SEF Component	Estimated Area	% of Total Area (± 212 ha)	% of Farm Area (4117.3628 ha)
PV array	± 205ha	95.30 %	5.0 %
Permanent and construction laydown areas	± 3 ha	1.5%	0.07 %
Auxiliary buildings	± 1 ha	0.45 %	0.02 %
Internal roads	± 6ha	2.93 %	0.15 %
Substation	± 0.5 ha	0.27%	0.012 %

The sections below depict the typical components associated with the Duneveld PV.

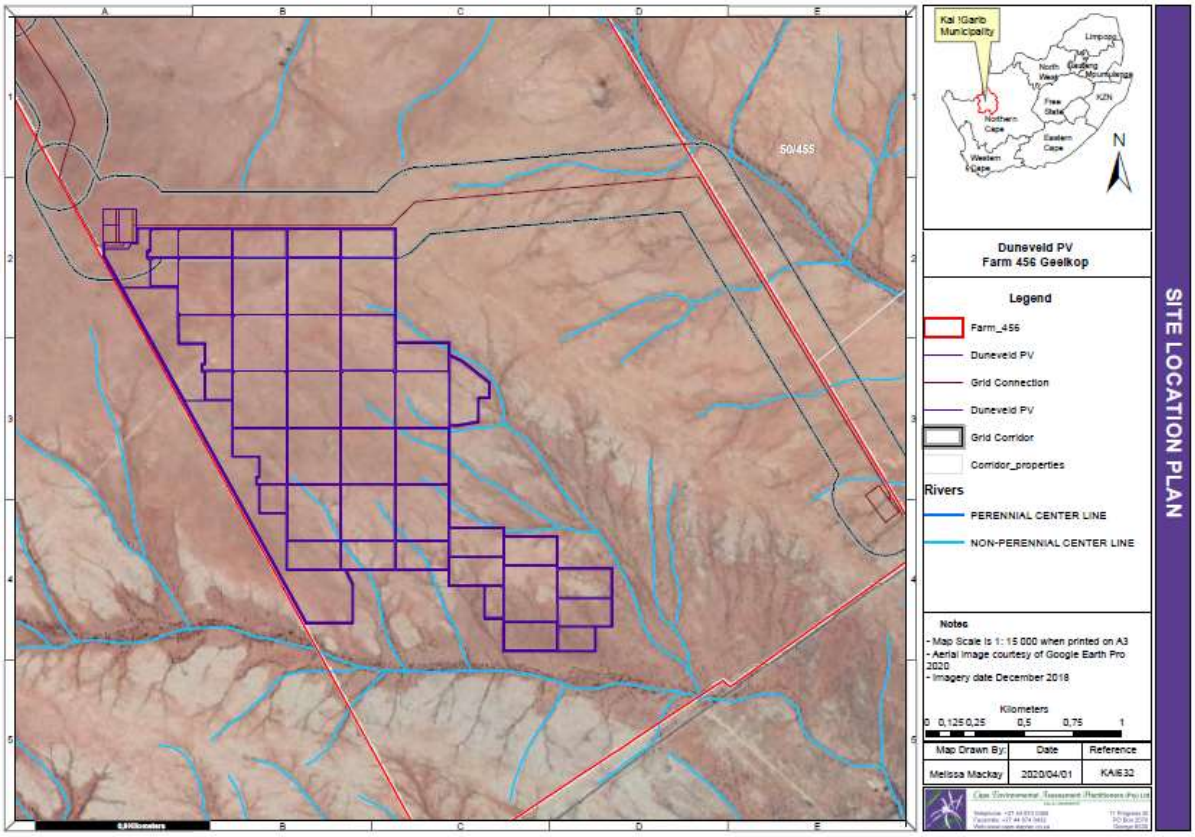

Figure 2: Simplified layout of Duneveld PV. Please refer to the detailed site layout plan in Appendix D.

2.1 SOLAR ARRAY

Solar PV modules are connected in series to form a string. A number of strings are then wired in parallel to form an array of modules. PV modules are mounted on structures that are either fixed, north-facing at a defined angle, or mounted to a single or double axis tracker to optimise electricity yield.

2.2 MOUNTING STRUCTURES

Various options exist for mounting structure foundations, which include cast/pre-cast concrete, driven/rammed piles, or ground/earth screws mounting systems. Due to the presence of ephemeral washes within the PV footprint, driven/rammed piles and earth screws are the preferred mounting technology.

Figure 3: Cast Concrete Foundation (alternative mounting)

Figure 4: Driven/ Rammed Steel Pile (left) and Ground Screw (right) are the preferred mounting technology.

The impact on agricultural resources and production of these options are considered to be the same, however concrete is least preferred due the effort required at a decommissioning phase in order to remove the concrete from the soil, and therefore its impact on the environment. The Duneveld PV energy facility will therefore aim to make the most use of either driven/rammed piles, or ground/earth screws mounting systems, and only in certain instances resort to concrete foundations should geotechnical studies necessitate this. This BAR also proposes that no concrete mounting structures be used for sections of PV infrastructure crossing secondary water courses.

2.3 BATTERY ENERGY STORAGE SYSTEM

The proposal includes the installation of a 400Mwh Battery storage component situated adjacent to the on-site substation.

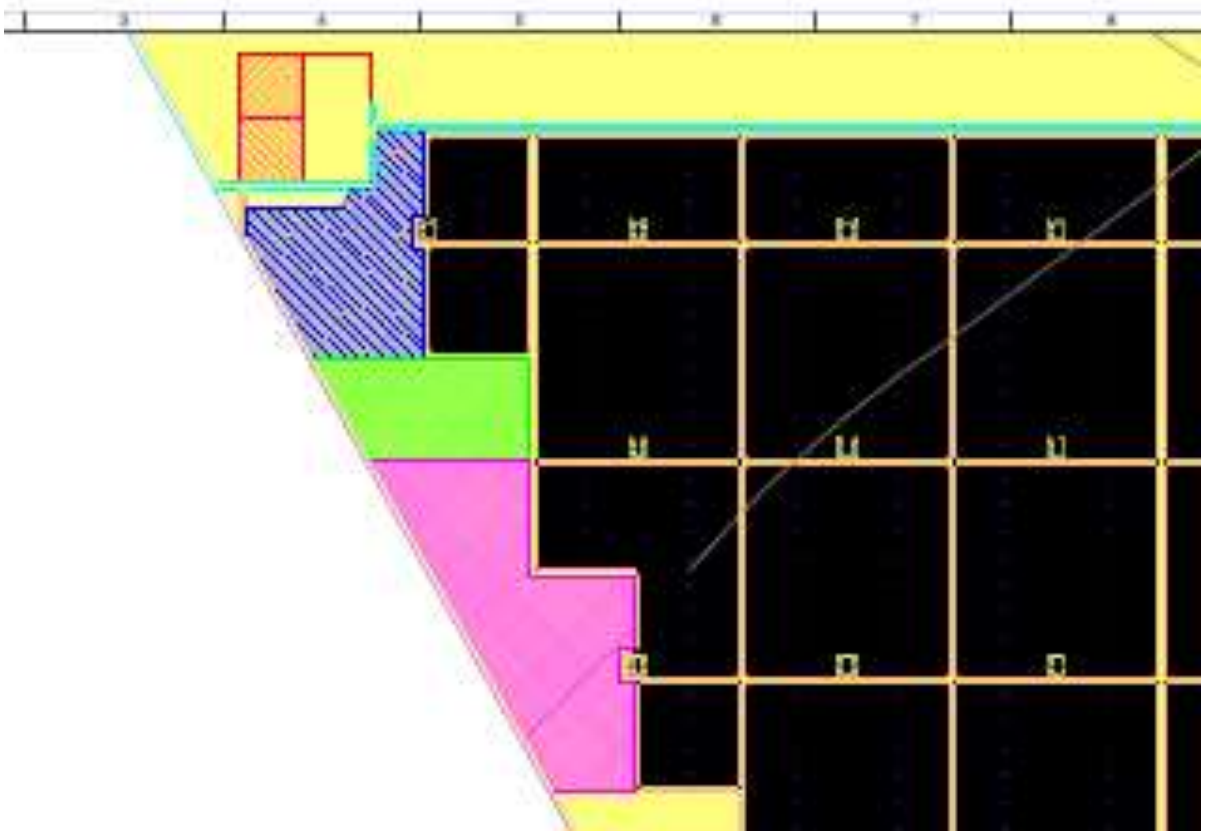

Figure 5: Showing location of battery energy storage system (blue polygon) in relation to the remaining components.

Different battery storage technologies, such as lithium-ion (Li-ion), zinc hybrid cathode, sodium ion, flow (e.g. zinc iron or zinc bromine), sodium sulphur (NaS), zinc air and lead acid batteries, were considered for this project. Compared to other battery options, Li-ion batteries are highly efficient, have a high energy density are lightweight and have a lower environmental risk. As a result of the declining costs, Li-ion technology now accounts for more than 90% of battery storage additions globally.

Therefore, in line with the above, it is proposed that Lithium Battery Technologies be considered as the preferred technology.

The design aims to provide two hours of stored energy during the morning and evening demand peaks (i.e. four hours of stored energy per day). The size of the battery depends on the net output (MWAC) of the facility. For example, assuming a 100 MWAC PV plant as with the proposed project, the battery storage could export 400 MWh (100MWAC x 4 hours) per day.

The size of the battery storage area required will depend on the specific manufacturer. The area required typically ranges from 12kWh/m^2 to approximately 120kWh/m^2. These calculations include all additional support equipment and any necessary clearances between Battery Modules/Containers.

At this stage the exact supplier/manufacturer has not yet been identified. However, for the purpose of this BAR the assessment includes the maximum possible footprint of 12kWh/m^2.

Traditional utility-scale Li-ion battery storage facilities include the following main components:

- Battery cells → modules → packs → racking system (DC).
- Storage container (HVAC system, thermal management, monitors and controls, fire suppression, switchgear, and energy management system).
- Power conversion system (bidirectional inverter to convert AC to DC for battery charging and DC to AC for discharging).
- Transformer (to step up 480-V inverter output to 12–66 kV).

The figure below illustrates the components that generally make up the primary battery system, Figure 7 is a typical flow diagram of a PV plant with battery storage and Figure 8 is a conceptual example of a typical battery storage facility.

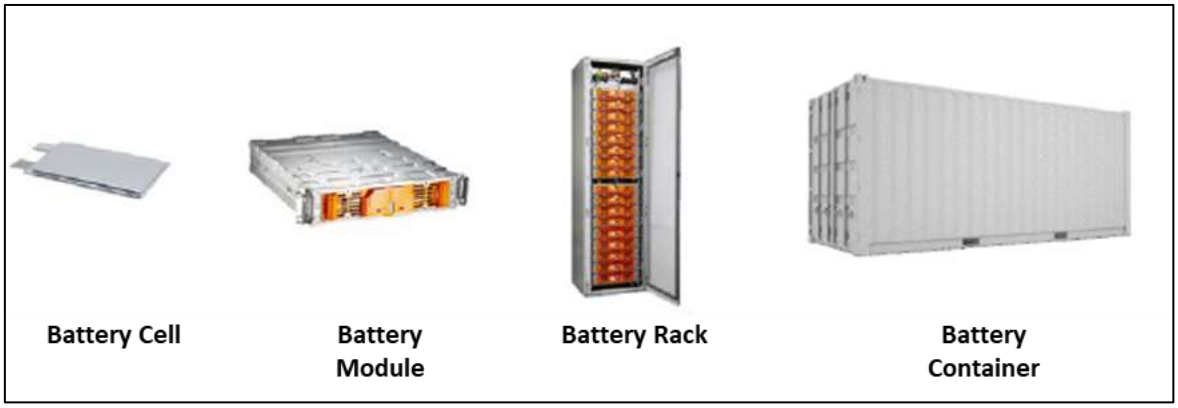

Figure 6: Typical Battery System Components.

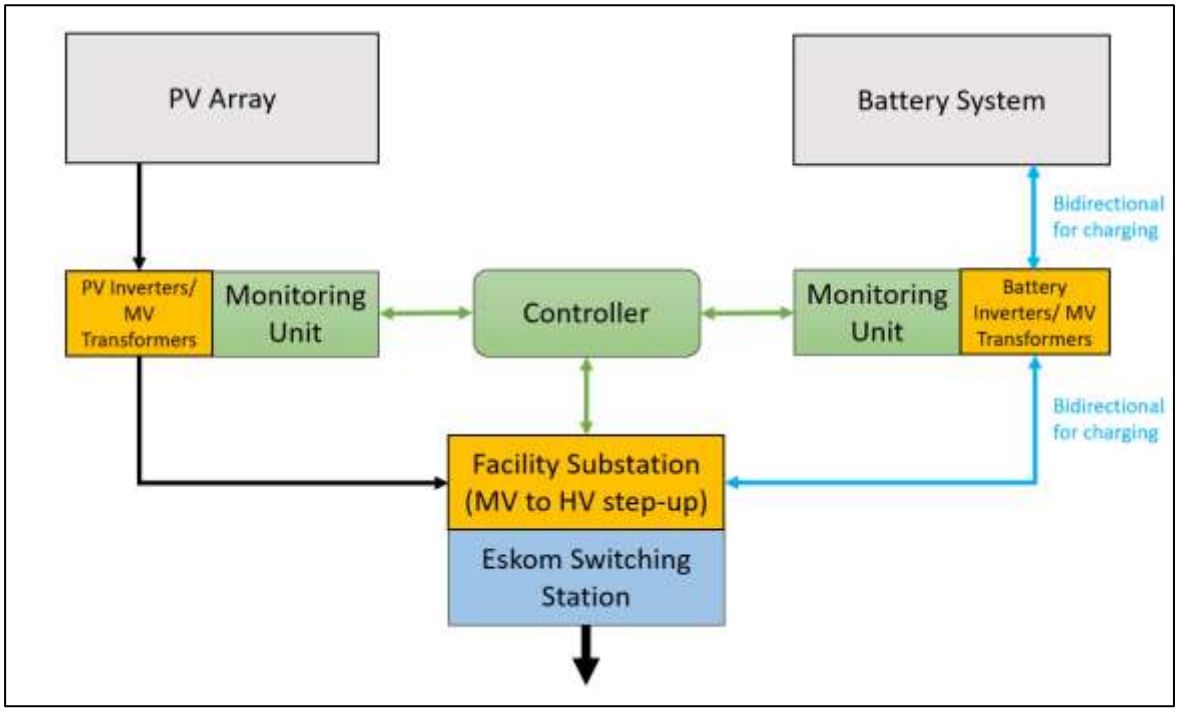

Figure 7: Typical flow diagram of PV plant with battery storage

Figure 8: Pivot Power's proposed 50MW lithium-ion battery in Kemsley, Kent.

The battery storage facility will be constructed adjacent to the on-site substation as shown on the site layout plan in the Appendix D.

2.4 AUXILIARY BUILDINGS

The auxiliary buildings will comprise of the following as a minimum:

- Control Building / Centre;
- Office;
- Warehouses;
- Canteen and Visitors Centre;
- Staff Lockers and Ablution; and
- Gate house / security offices.

The total area occupied by auxiliary buildings is approximately 1 ha (this area excludes the on-site substation, which is discussed separately).

2.5 WASTE MANAGEMENT

A summary of the waste management actions associated with Duneveld PV are provided below. The waste management during construction and operation is discussed in more detail in the EMPr and Waste Management plan appended.

2.5.1 Solid waste

Solid waste during the construction phase will mainly be in the form of construction material, excavated substrate and domestic solid waste. All waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by the contractor. Any other waste will be removed once construction is complete and disposed of at a registered waste facility. Excess excavation material will either be spoiled offsite at a registered facility or used for landscaping berms within the overall PV footprint.

2.5.2 Sewerage

During the construction phase, chemical ablution facilities will be utilised. These ablution facilities will be maintained, serviced and emptied by an appointed contractor, who will dispose of the effluent at a licensed facility off site. Once construction is complete, the chemical ablution facilities will be removed from the study area. A conservancy tank which will be regularly emptied by a registered service provider will be installed at the Operations and Maintenance building.

2.6 HAZARDOUS SUBSTANCES

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

- Cement powder associated with the batching plant;
- Petrol/diesel for trucks/ cranes/ bulldozers;
- Limited amounts of lubricants and transformer oils;
- Damaged PV Modules;
- Damaged Battery Units;

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

2.7 GRID CONNECTION AND CABLING[8]

Duneveld PV intends to connect to the Upington MTS (400/132 kV) located ± 14km to the east of Duneveld PV, via the 132kV Geelkop Collector Substation located between Duneveld PV and Gordonia Solar PV Developments. The proposed Duneveld PV substation will be approximately 75m x 75m in size (Facility component) and feature a step-up transformer/s to transmit electricity via a 132 kV OHL from the Geelkop Collector Substation onto the Upington MTS. The OHL is envisaged to be ± 16km in length, a maximum height of 32m and occupy a servitude width of between 31 - 52m. Alternatively, Duneveld PV will connect to Upington MTS (400/132 kV), via a loop in loop out (LILO) into the McTaggart's/Oasis 132kV powerline adjacent to the Duneveld PV Substation.

A 100MW_{AC} installation will require specific electrical components to meet the national grid code requirements in order to generate and supply electricity into the national grid.

The conversion from DC (modules) to AC is achieved by means of inverter stations. A single inverter station is connected to a number of solar arrays, are will be placed along the internal service roads for ease of access. A number of inverter stations will be installed for the SEF (up to maximum of ± 60 centralised inverters, or a maximum of ± 840 string inverters), each of which is connected to the on-site / facility substation.

Final placement of the inverter stations and on-site/facility substation will need to take ground conditions into consideration. Interconnecting electrical cabling will be trenched where practical and follow internal access roads to the greatest extent. Sensitive areas will consequently be avoided as far as possible, or alternatively, cables will be fastened above- ground to the mounting structures so as to avoid excessive excavation works and clearing of vegetation.

2.8 ACCESS ROUTES AND INTERNAL ROADS

Access to the development will be via the N14 National Road. The Main access road will be 8m wide, while internal roads will be a maximum of 5m wide. Please refer to section 2.10.3 of this report for a

[8] The Grid connection to the Upington MTS via the Geelkop Collector Substation is being assessed as part of a separate Basic Assessment process, but is described here for context. This Basic Assessment Process includes the IPP portion of the on site substation only.

detailed description of the various access road alternatives that were considered as part of this assessment.

2.9 PROJECT NEED AND DESIRABILITY

In keeping with the requirements of an integrated Environmental Impact process, the DEA&DP [9] *Guidelines on Need and Desirability (2010 & 2011)* were referenced to provide the following estimation of the activity in relation to the broader societal needs. The concept of need and desirability can be explained in terms of its two components, where *need* refers to *time* and *desirability* refers to *place*. Questions pertaining to these components are answered in the Sections below.

The section above considers the overall need for alternative, so-called 'green energy' in light of the known environmental burdens associated with the impact of coal power generation through which most of our country's electricity is currently being generated. Associated aspects such as air pollution, water use and carbon tax are discussed in order to further explain the need and desirability for 'green energy' projects in general.

2.9.1 Feasibility consideration

The commercial feasibility for the proposed 100MW_{AC} Duneveld PV to be built on private land between Upington and Keimoes, has been informed by its contextual location, and economic, social and environmental impacts and influence (with due consideration to the project falling within a REDZ). The project has gathered sufficient information and conducted studies of the site and the region to make qualified and reliable assumptions on the project's various impacts.

2.9.2 Solar Resource & Energy Production

The arid climate experienced in the Northern Cape lends itself to the availability of high levels of solar energy. Considering the steady nature of the solar radiation at the Duneveld PV site, the resource is sufficient to guarantee a positive return on investment.

2.9.3 Solar Farm & Grid Connection

Among the outstanding characteristics of the Duneveld PV site is its exceptionally flat nature, sufficient medium-low sensitivity environments (the proposed layout plan was able to avoid all areas with a high sensitivity and very high sensitivity) and accessible location, facilitating the delivery of bulky PV panel infrastructure, and the construction and assembly process. The proximity of the site to the N14 decreases the impact on secondary roads and natural habitat from the traffic going to and from Duneveld PV during construction and operations. The close proximity of the existing Eskom Upington MTS also allows for connection via a relatively short distribution line. As the site is not used for intensive agricultural purposes, Duneveld PV will not significantly interfere with the agricultural productivity of the area.

2.9.4 Social impact

Please refer to the Social Impact Assessment Report in Annexure E7 for a detailed description of the social environment. The Northern Cape region is economically challenged due to its arid climate, challenging agricultural conditions, lack of water and limited natural resources (away from the Orange

[9] The Western Cape Provincial guidelines on Need and Desirability were considered in the absence of National and Northern Cape Guidelines.

River). The local economy, mainly supported by limited agriculture, simply isn't enough to accommodate the high level of unemployment.

Private sector development is seen to offer opportunities to access Enterprise Development funds of the main mining groups. This can contribute to entrepreneurial activities linked to their supply chain. The same applies to the investment, in terms of employment opportunities and entrepreneurial activities, associated with renewable energy projects.

Power generation is one of the rare growth opportunities for the Northern Cape (and even more so within the REDZ such as where Duneveld PV is proposed) due to the high solar irradiation levels and its strategic position relative to the National Transmission Network. This setup creates unprecedented growth opportunities for the area and the establishment of a renewable energy project is considered important to diversify and complement the economic development of the region.

2.9.5 Employment & Skills Transfer

The benefits of renewable energy facilities to local regions are not confined to the initial investment in the project. They also provide a reliable and on-going income for landowners and municipality, creating direct employment opportunities for locals, as well as flow-on employment for local businesses through provision of products and services to the project and its employees.

Duneveld PV will have a positive impact on local employment. During the estimated 18 month construction phase, the project will employ approximately 300 – 400 individuals of various qualifications. The majority will be provided by the local labour market. During operations, Duneveld PV is expected to have up to 60 employment opportunities ranging from security staff to administration and artisans. Due to the fact that there is limited local skilled labour in the field of renewable energy, the employment structure will likely consist of local and outside capacity. To guarantee successful operations over the lifetime of the investment, Duneveld PV will likely use the skills of outside labour to cross-train local specialists. This cross training and skills development will take place especially in the area of technical maintenance and administration.

2.9.6 Need (time)

Is the land use considered within the timeframe intended by the existing approved Spatial Development Framework (SDF)? (I.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP?

Yes, the employment of renewable energy technology' / development has a spatial strategic place in the Kai !Garib Municipality SDF while the need for a policy on the development of sustainable solar energy facilities has been identified as Key Development Priority / Project.

Should the development occur here at this point in time?

Yes, the proposed Duneveld PV energy facility is to be located outside the Upington and Keimoes Urban Edges urban edge, but within a legislated REDZ, and would promote diversification to the local economy as well as serve as a catalyst for further expansion in the stream of sustainable renewable energy development within these REDZ (identified as a priority development strategy IDP & SDF). There are currently 4 operational renewable energy developments in very close proximity to the proposed Duneveld PV.

Does the community / area need the activity and the associated land use concerned?

The Kai Garib Municipality identified the opportunity for a renewable energy project through their SDF and IDP processes, which include public participation. The proposed Duneveld PV development will allow for a diversification of employment, skills and contribute to the potential development of small business associated with its construction, operation and maintenance activities.

The proposed Duneveld PV development will contribute electricity to the constrained Northern Cape and National electrical network, contributing to a provincial and national need. Duneveld PV has been designed in such a way so as to avoid or minimise potential negative impacts of the local environment while enhancing potential positive impacts, locally and regionally. The social specialist undertook interviews with various municipal officials as part of the Social Impact Assessment. The proposed development was strongly supported by Mr McKay and Mr Clarke, the Director of Planning and Head of Engineering Services respectively at the Kai !Garib Municipality.

Are the necessary services with adequate capacity currently available?

Some existing, some new. Duneveld PV requires the installation of an overhead power line to connect to the existing Eskom MTS Upington Substation via the Geelkop Collector Substation (feed into the national grid system), as well as an access road to the development site from the N14 (following existing farm tracks for most part). The cost of supplying the new infrastructure will be covered by the Applicant, and the impacts thereof have been assessed in this environmental process.

The water required for the construction and operation of Duneveld PV will be sourced from the Kai !Garib Municipality and will be supplemented by stored rainwater (proof of confirmation of availability included in Annexure G6). The applicant may at a later stage consider the utilisation of groundwater to supplement this supply, this will however be subject to approval in terms of the National Water Act.

Construction waste (general waste) will be disposed of at the existing landfill sites - confirmation of capacity of the municipal landfill site to accept the estimated volumes of general waste is included in in Annexure G6. Defunct and damaged panels identified during construction will be returned to the supplier for recycling and/or disposal.

Is this development provided for in the infrastructure planning of the municipality?

Yes. Attracting private investment and the employment opportunities associated with renewable energy development are identified as priority strategies to create sustainable urban and rural settlements.

Is this project part of a national programme to address an issue of national concern or importance?

Yes. In order to meet the increasing power demand within South Africa, Eskom has set a target of 30% of all new power generation to be derived from independent power producers (IPPs). The Applicant is one such IPP which intends to generate up to 100MW of electricity from the proposed Duneveld PV, for input into the national grid (via the Geelkop Collector Substation to the existing Upington MTS Substation). The proposed Duneveld PV is also situated within a legislated REDZ.

2.9.7 Desirability (place)

Is the development the best practicable environmental option for this land / site?

The target property is outside the Upington and Keimoes Urban Edge, within a legislated REDZ and as such will unlikely be considered for an alternative land use such as urban development. The property has a poor agricultural potential due to the arid climate and other limiting factors. These factors have rendered the property vacant with limited land use option alternatives.

Would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?

No. According to the IDP, attracting Renewable Energy Investment is seen as an IDP Strategy and economic driver to alleviate unemployment and poverty and “to ensure sustainable economic and social transformation in the District”. The performance of which would be reflected in the development of a Renewable Energy Strategy and Policy for the District (IDP, 2012-2018). The IDP furthermore specifically promotes socio-economic development, SMME’s, job creation and private sector investment and identifies solar energy as a growth opportunity within the local economy.

Would the approval of this application compromise the integrity of the existing approved environmental management priorities for the area?

Unlikely. According to the national vegetation map (Mucina & Rutherford 2012, the solar development site lies entirely within a vegetation type that is classified as Least Threatened, namely Bushmanland Arid Grassland (ecosystems that cover most of their original extent and which are mostly undamaged, healthy and functioning). Portions of the site are situated in a CBA 2 area – the reasoning for this is as an aquatic support area to the Orange River (which is considered an important fish habitat). The freshwater specialist has however confirmed the impact of Duneveld PV on these systems will be minimal. Considering the extent of this relatively intact ecosystem type, and the fact that the site is not highly sensitive (there are no unique, threatened or otherwise unique habitats present which are not widely available in the wider landscape), it can withstand some loss of natural area through development.

Do location factors favour this land use at this place?

Yes. The region has been identified as being one of the most viable areas for solar energy generation due to the following factors:

- Excellent solar radiation (compared to other regions);
- Close to existing main transport routes and access points;
- Close to connection points to the local and national electrical grid; and
- Outside Critical Biodiversity 1 Areas.

The proposed site is furthermore situated within a legislated REDZ and as such has been subjected to a detailed SEA in which highly sensitive landscapes were already excluded from these areas.

The ecological sensitive areas on and surrounding the solar site have informed the optimal location and layout for the proposed solar project, with minimal impact to the receiving environment, subject to implementation of mitigation measures.

How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas?

The alternatives considered for the solar development have been iteratively designed and informed by various investigations and assessments that considered both the natural and cultural landscapes. The natural and culturally sensitive areas have been identified and where possible, avoided to prevent negative impacts on such areas.

How will the development impact on people's health and wellbeing?

The site is located outside of the Upington and Keimoes Urban Edge and as a result is unlikely to impact negatively on the community's health and wellbeing. The closest populated settlement is situated on Kanoneiland, situated more than 8km from the site.

Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?

Unlikely. The next best land use alternative to the solar facility is limited agriculture (the status-quo). However, the proposed solar development site does not have any significant agricultural value and has not been utilised for any intensive agricultural purposes. The carrying capacity of the site is too low to generate noteworthy financial benefit from agricultural activities. The development of the proposed solar facility would constitute the loss of less than 212ha of the overall property. The economic benefits and opportunities that the proposed solar development holds for the landowner and the local economy of the municipal area cannot be recovered from the current or potential agricultural activities.

The opportunity costs in terms of the water-use requirements of Duneveld PV are within acceptable bounds if one considers the minimal demand on the resources.

Will the proposed land use result in unacceptable cumulative impacts?

Unlikely. Due to the fact that the Northern Cape, and specifically sites within the legislated REDZ have been identified as an area with high potential for renewable energy generation: solar irradiation and

availability of vast tracts of land with low sensitivity; there are a number of on-going applications in the region already. The potential for further, future solar developments in the area cannot be discounted (as many have already been approved or are in progress). However these will have synergistic benefits for the economy and growth of the area, while the contribution to cumulative habitat loss in the area associated with this and potential future solar development would be relatively small in relation to the land resources available, with low impacts restricted to the local area.

2.10 SITE SELECTION PROCESS

The site selection process followed a two-stage approach; firstly, to select the property for the proposed development (Geel Kop Farm No 456 RE), and secondly, to select the footprint of the proposed development within the farm portion. A site selection matrix supplied by the applicant is attached in Annexure E11.

2.10.1 Property Selection

2.10.1.1 Proximity to towns with a need for socio-economic upliftment

The Duneveld PV site is situated approximately 30 km south west of Upington in the Northern Cape Province. The Kai! Garib Local Municipality is typically masked with high rates of unemployment and poverty, which is largely the case throughout the Northern Cape Province. To this extent, Duneveld PV is situated near the towns of Upington, Keimoes and Kakamas. Consequently, local labour would be easy to source, which fits in well with the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) economic development criteria for socio-economic upliftment. Currently, a large proportion of local labour is used in the mining and agricultural industry. There are several negatives related to agricultural employment however; that it is very seasonal and it is not always in close proximity to the homes of farm workers, forcing workers to travel large distances on a daily basis to reach their place of employment. Over the years, employment in the mining sector has shown to be very volatile. The Northern Cape has been identified as a node for the development and construction of solar PV within South Africa and the locality of the Duneveld PV site would therefore present new opportunities for local skilled labour through previous work experience on surrounding preferred bidder plants.

2.10.1.2 Access to grid

The new Upington MTS is in close proximity to the Site. There are two options proposed to connect Duneveld PV to the Upington MTS:

- Option 1: direct powerline to Upington MTS (400/132 kV), via the 132kV Geelkop Collector Substation located between Duneveld PV and Gordonia Solar PV Developments.
- Option 2: connect to Upington MTS (400/132 kV), via a loop in loop out (LILO) into the McTaggerts/Oasis 132kV powerline. The proposed location of the Geelkop Collector Substation is on the south east portion of the Bushmanland PV.

Ease of access into the Eskom electricity grid is vital to the viability of a solar PV facility. Projects which are near a connection point and/or demand centre are favourable, and reduce the losses associated with power transmission. In addition, Eskom's '2040 Transmission Network Study' has drawn on various scenarios to determine the grid's development requirements, as well as to identify critical power corridors for future strategic development, of which the Northern corridor is one of these. The national power corridors consisting of five transmission power corridors of 100 km in width have been gazetted by the Department of Environmental Affairs (DEA) following the outcome of the strategic environmental assessment (SEA) which aimed to identify environmentally acceptable routes over which long-term environmental impact assessment (EIA) approvals can be secured. Duneveld PV falls into the Northern corridor as shown in the figure below.

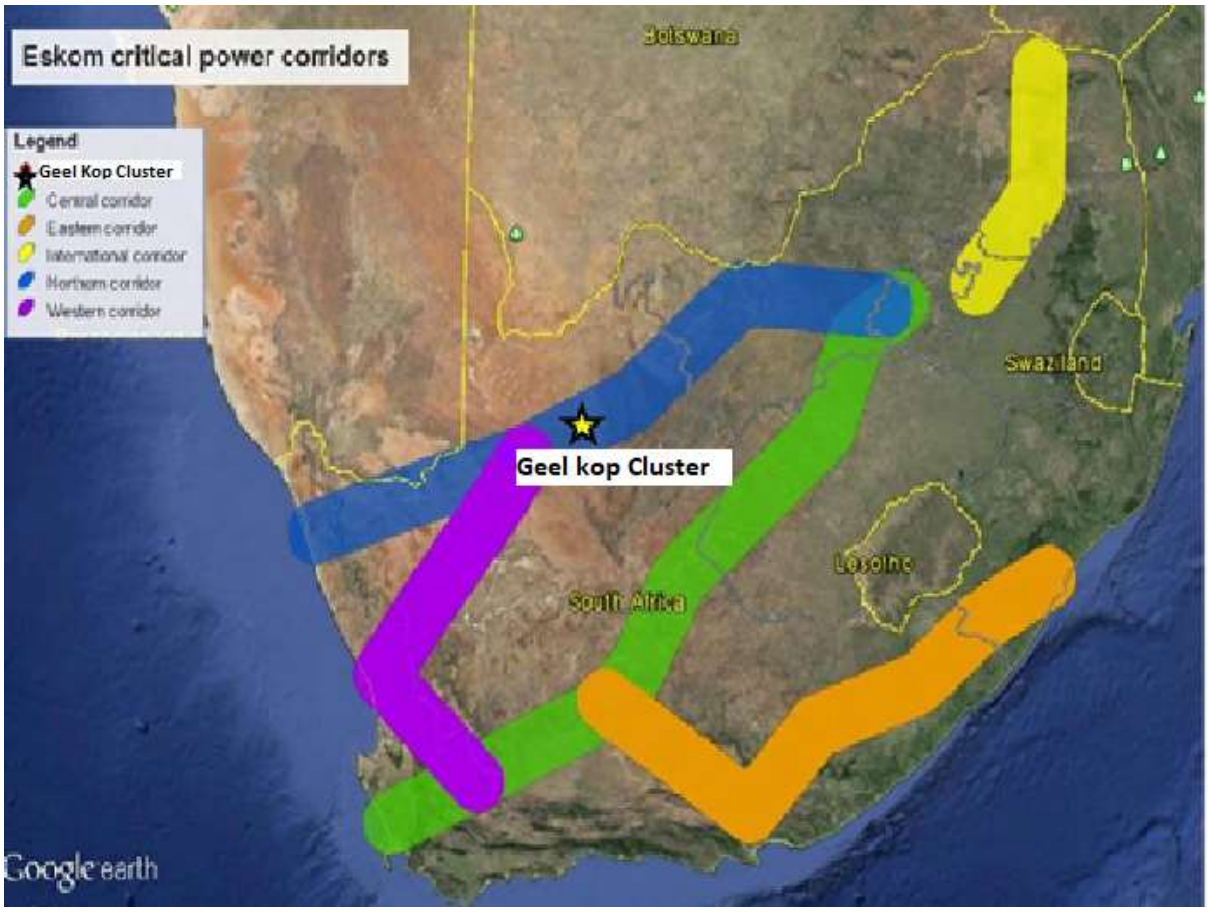

Figure 9: Eskom "Critical Power" Corridors. The Duneveld PV site is within the northern corridor as depicted by the blue polygon.

2.10.1.3 Need and Desirability of the Development at the preferred site location

The Upington area has been ear-marked as a hub for the development of solar energy projects due to the viability of the solar resource for the area, and this area is included in the solar corridor which has been identified by the Northern Cape Spatial Development Framework. The overarching objective for the solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is preferred for solar energy development by virtue of its annual solar irradiation values. From a local perspective, the Duneveld PV site has specifically been identified as being highly desirable for the development of a solar PV facility due to its suitable topography (i.e. in terms of slope and local topography), site access (i.e. to facilitate the movement of machinery during the construction phase), land availability, the extent of the site, and enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints, as well as the consolidation of renewable projects within an already identified node.

2.10.1.4 REDZ

The proposed Duneveld PV site falls within the gazetted geographical areas / focus area most suitable for the rollout of the development of solar energy projects (called "Upington Solar priority area") within the Northern Cape Province.

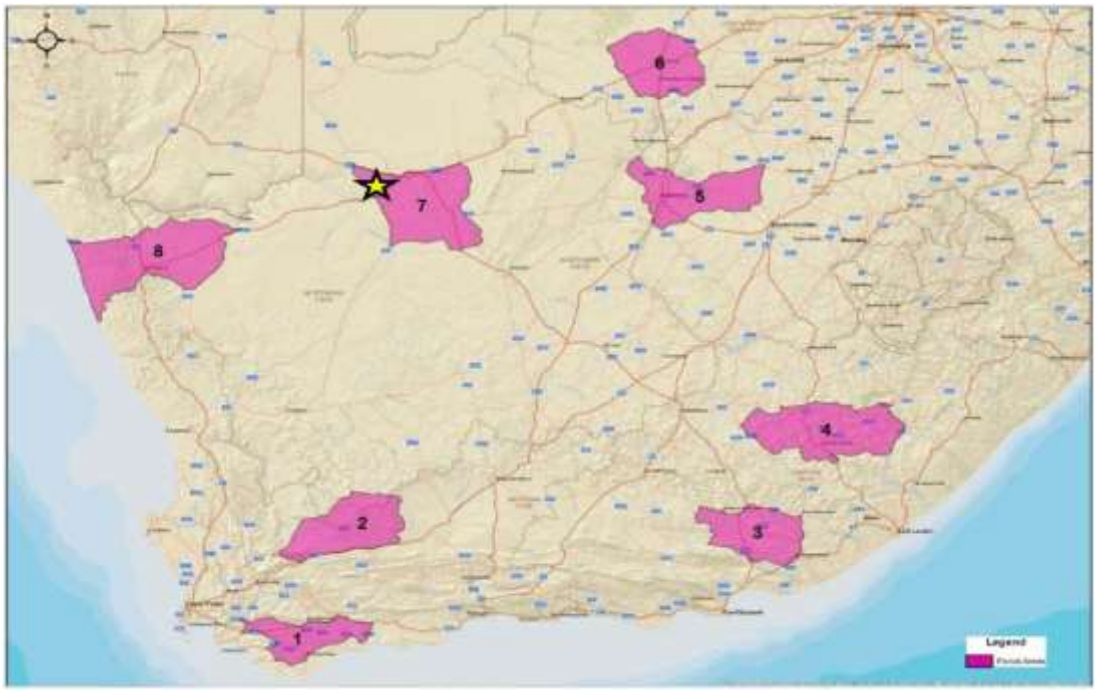

Figure 10: Renewable Energy Development Zones (CSIR 2014); Duneveld PV is shown by the yellow star and falls within REDZ 7.

2.10.1.5 Agricultural Potential

The unfavourable climate of the Kalahari environment greatly decreases agricultural potential. The area is known to be an agricultural hub but the Geel Kop Farm No. 456 RE is located too far from the Orange River and its fertile banks to ever be considered for high intensity grazing and/or cultivation practices. The development does not encroach on land that is currently being used for grape production which is crucial for the economy of South Africa and the Upington area.

2.10.1.6 The Solar Irradiation

The economic viability of a solar facility is directly dependent on the annual direct solar irradiation values. The Northern Cape receives the highest average daily direct normal irradiation (DNI) in South Africa. In addition, Upington exhibits some of the best solar irradiation in South Africa, and the world. Global horizontal irradiation (GHI) for the Upington region varies between 2250 and 2300 kWh/m^2/annum. The GHI for the Duneveld PV site is in the region of approximately 2278 kWh/m^2/annum. The high irradiation level is an important factor in a highly competitive bidding environment under REIPPPP, the economic viability of a project is a critical success factor.

2.10.1.7 Proximity to access road for transportation of material and components

The proximity of the site to the N14 decreases the impact on secondary roads from traffic during the construction and operation phases. As material and components would need to be transported to the Duneveld PV site during the construction phase of the project, the accessibility of the Duneveld PV site was a key factor in determining the viability of the project, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on project economics and therefore the ability to submit a competitive bid under the Department of Energy's (DoE) REIPPPP.

2.10.1.8 Upington airport

The Upington airport is located approximately 34km to the south-west of the Dunevelt PV site, and therefore will not pose any threat to the aviation industry.

2.10.1.9 Landowner Support

The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The landowner does not view the development as a conflict with their current land use practices. The support from the landowner for the development to be undertaken on the affected property has been solidified by the provision of the consent for the project to proceed on the property through the signing of a land lease agreement with the developer. The applicant Duneveld PV (Pty) Ltd has an established relationship with the landowner of Geel Kop Farm No. 456 RE due to developing several PV projects on surrounding landowners' land. Based on the above list of findings it was decided that the proposed Site would be suitable for such a development. Based on the extent of Geel Kop Farm No.456 RE, it is believed that the site could accommodate 100 MW of contracted capacity permitted under the DoE's RFP, and furthermore, that all this power would be able to be absorbed into the national grid via the Upington MTS.

2.10.2 Footprint selection

The selection of the proposed study area within the RE Farm Geel Kop No 456 followed a risk adverse, bottom up approach to ensure that the impacts of the proposed developments can be avoided as far as possible. This avoidance approach reduces the degree of mitigation required in order ensure that potential environmental impacts are within acceptable levels.

This approach was achieved by means of appointing the ecology, avifaunal, heritage (archaeology[10]) and aquatic experts to undertake a site sensitivity analysis of the entire property prior to the design of the layout. The following sensitive features were identified by the participating specialists during the site sensitivity investigations. Please refer to the discussion in section 5 of the report, where site sensitivities are discussed in further detail.

- Watercourses (including both, major, secondary and ephemeral washes);
- Pans;
- Koppies;
- Dunes;
- Protected plant species;
- Avifaunal sensitive areas and buffers; and
- WULA regulated zones.

[10] The Archaeology specialist did not identify any specific features that need to be incorporated into the layout design. The areas avoided from other specialist disciplines (pans, koppies, main water courses) are the same landscape features likely to be of archaeological significance.

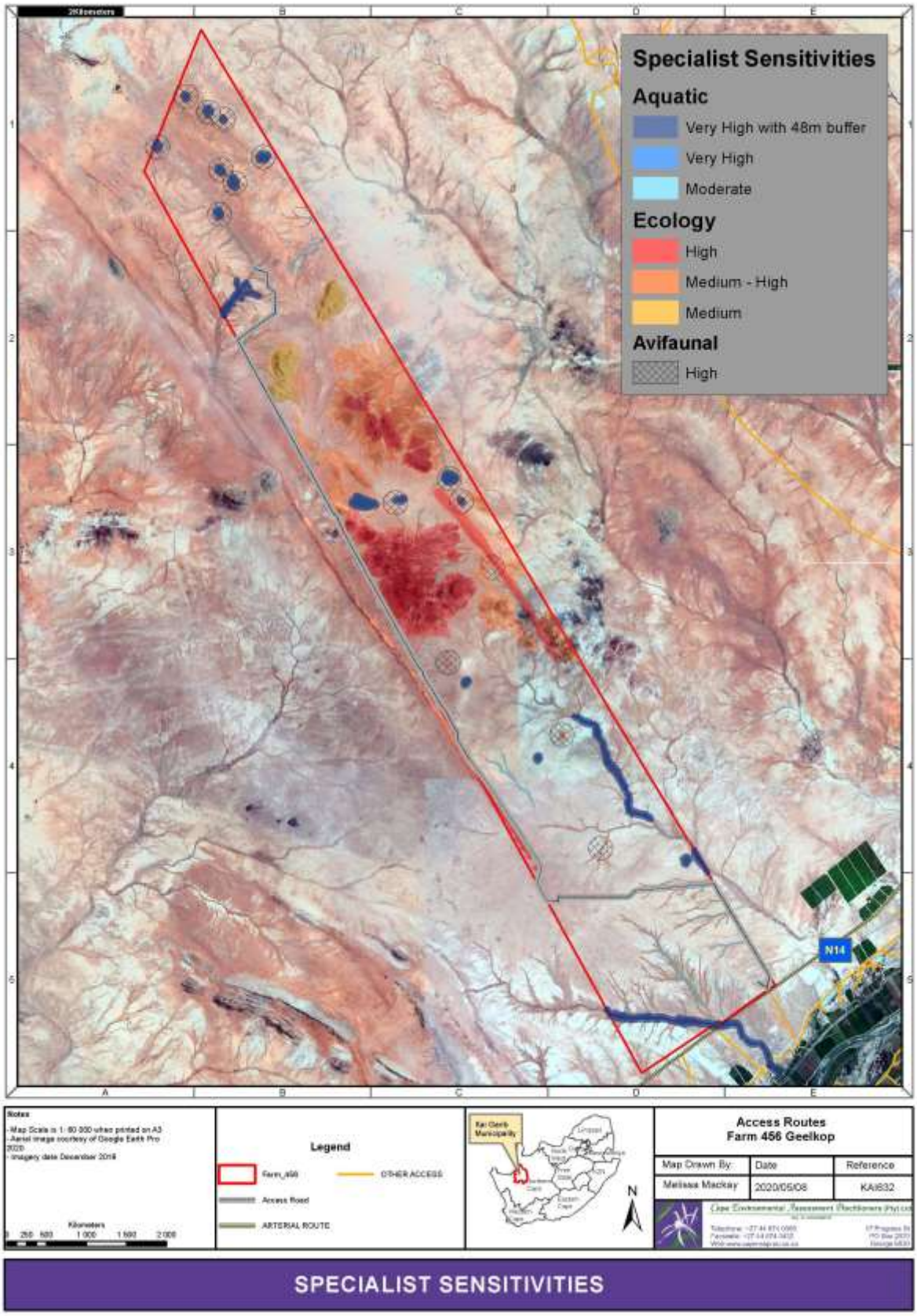

Figure 11: Sensitive features on Geel Kop Farm No 456 RE as identified by the participating specialists. These include low, medium, and high sensitivity features. Please refer to the full-scale sensitivity plans attached in Appendix B.

The initial study area (including alternative footprints) was then developed to utilise areas where the least sensitive features occurred. The specialists were then engaged in detail throughout the layout development phase to ensure that the preferred alternative resulted in the lowest overall impact. See the section below for a discussion on this process.

2.11 CONSIDERATION OF ALTERNATIVES

Duneveld PV will consist of solar PV technology with fixed, single, or double axis tracking mounting structures, with a net generation (contracted) capacity of 100MW_{AC} as well as associated infrastructure, which will include:

- On-site switching-station / substation;
- Auxiliary buildings (gatehouse and security, control centre, office, warehouse, canteen and visitors centre, staff lockers etc.);
- Inverter-stations, transformers, and internal electrical reticulation (underground cabling);
- Access and internal road network;
- Laydown area;
- Duneveld PV will connect from the onsite sub-stations to the Upington MTS (400/132 kV), via the 132kV Geel Kop Collector Substation (this basic assessment process only includes the IPP portion of the onsite sub-station, while the remainder of the grid connection is being assessed in a separate BAR process.
- Rainwater tanks; and
- Electrified Perimeter fencing and security infrastructure.

As mentioned earlier in this report, the total Geel Kop Farm No. 456 RE was analysed by relevant specialists to determine the property sensitivity. The layout design took these sensitivities into account and numerous iterations the layout occurred through a consultative design process in conjunction with the specialists. The preferred layout proposed in this report has thus gone through multiple stages of refinement until its current stage that has been accepted by all specialists as being the best practicable environmental option. For the purposes of this assessment, we will provide chronological details on the alternatives considered throughout this design phase and will provide a detailed assessment of the preferred alternative and the no-go alternative.

2.11.1 Layout Alternatives

According the preliminary design report (Appendix E9, Duneveld PV (Pty) Ltd, 2020), it is customary to develop the final/detailed construction layout of the facility only once an Independent Power Producer (IPP) is awarded a successful bid under the REIPPPP, after which major contracts are negotiated and final equipment suppliers identified. However, for the purpose of this Basic Assessment Report in accordance with the minimum requirements prescribed by the DEA, two alternative layouts are discussed, which include the initial footprint area and the preferred alternative.

2.11.1.1 Initial Assessment Area

An initial/ conceptual area of ± 340 ha was identified during the planning phase of the Basic Assessment for Duneveld PV. The area is located in the southern portion of Geel Kop Farm No. 456 RE. The Figure below depicts the 340 ha initial/ conceptual area outlined in Red.

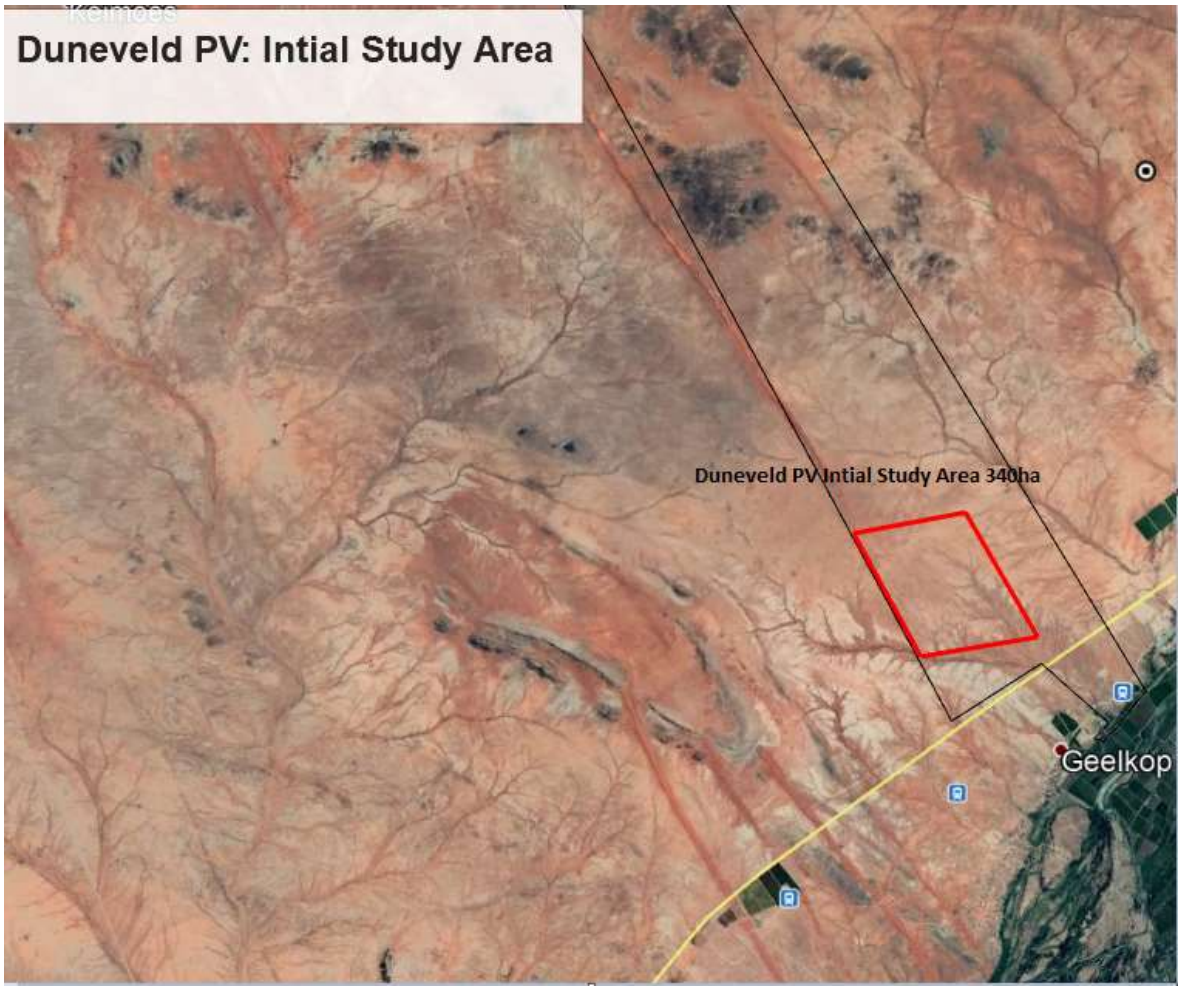

Figure 12: Initial/ Conceptual Area

This initial/ conceptual area did not consider any environmentally sensitive areas (which at that stage were still to be identified by the various specialist studies). This initial/conceptual area was driven primarily by its proximity to the N14 access road as well as reduced OHL distance to connect into the Upington MTS, located ± 14km to the east of the site.

2.11.1.2 Site sensitivity screening

As discussed above, following the identification of the initial/conceptual area, various specialists namely ecological, aquatic, avifaunal and archaeological were appointed to assist in the site selection process in the form of mapping the sensitive areas of the initial/ conceptual area following a site visit. These sensitivity files were then used to determine the location of the preferred layout alternative during the planning and design phase, which aimed to avoid all areas with a high and very high sensitivity as indicated in the figure below.

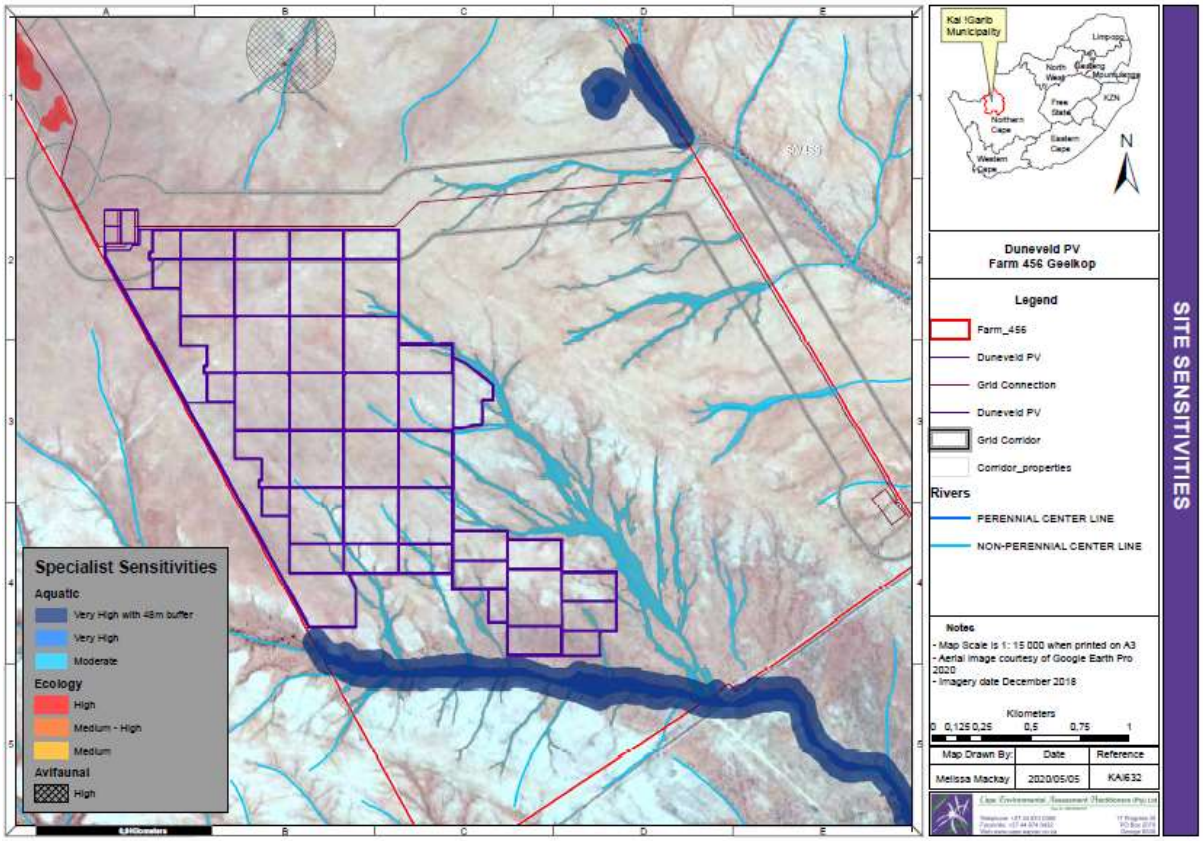

Figure 13: Sensitive features[11] identified for Duneveld PV (This map includes Very High, High, and Medium to High features)

2.11.1.3 Layout alternative 1 (preferred)

Extensive upfront consultation with the various specialists mitigated many of the impacts associated with the planning and design phase. Therefore, the preferred layout alternative within the initial/ conceptual area was the only layout alternative assessed for Duneveld PV as it predominantly occupies Low/Medium sensitivity areas. In terms of the minimum assessment requirements, this preferred layout alternative will be comparatively assessed with the no-go alternative.

[11] The moderate sensitivity aquatic features are on the exact same positions as the medium-high terrestrial ecology features. As such, the medium – high ecological features are are not visible on this map, due to them covering the same spatial extent of the aquatic features.

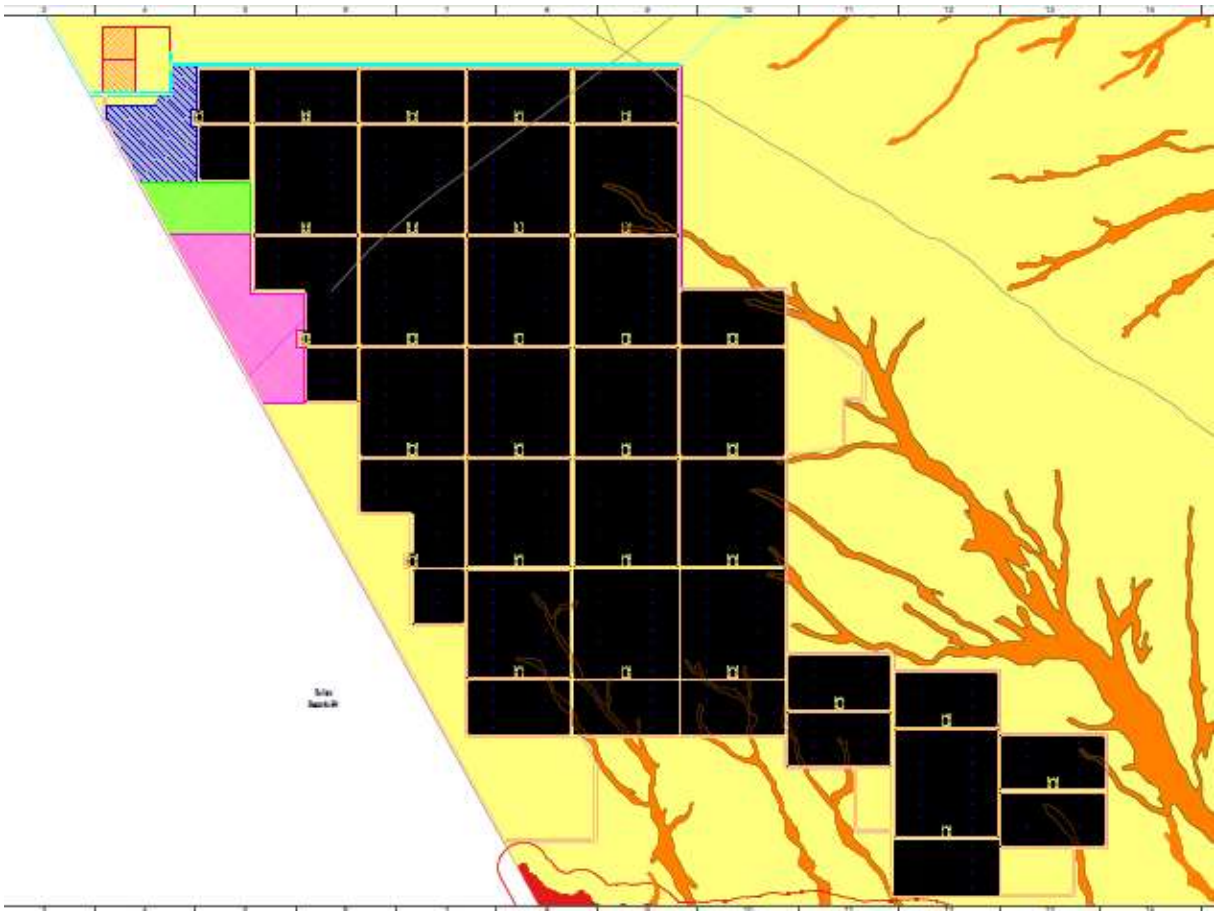

Figure 14: Duneveld PV Layout Alternative 1 (Preferred). Please refer to the full scale site layout plans attached in Appendix D.[12]

2.11.2 Grid Connection Alternatives

The grid connection for Duneveld PV is being assessed as part of a separate environmental process, this separate environmental process will consider and assess two alternatives to connect the project to the Upington MTS, namely:

- Option 1: direct powerline to Upington MTS (400/132 kV), via the 132kV Geel Kop Collector Substation located between Duneveld PV and Gordonia Solar PV Developments.
- Option 2: connect to Upington MTS (400/132 kV), via a loop in loop out (LILO) into the McTaggart's/Oasis 132kV powerline. Geel Kop Collector Substation to be located on the south east portion of the Bushmanland PV

This Basic Assessment Process only considers and assesses the facility (IPP) portion of the on-site sub station, which in this instance is 75m x 75m and is situated in the northwest of the development footprint.

2.11.3 Access Road Alternatives

The proposed project site is accessible via the major national road found in the broader study area, the N14, which connects Upington and Keimoes in a south-west direction. The Transport Study undertaken by JG Afrika (attached in Appendix E12) identified and assessed 6 alternative access points from the N14 as described below.

[12] The orange polygons depict the medium and medium – high sensitivities, while the red polygons depict the high and very-high sensitivities.

Figure 15: Potential Access Points for the proposed Duneveld PV (JG Afrika, 2020)

Access point 1 is an existing farm access. It is proposed that the Duneveld PV site be accessed via an approximate 4.67km road, shown in the figures below. The alignment of the new road follows an existing gravel track.

Figure 16: Access point 1 - preferred access (JG Afrika, 2020)

Access points 2 to 4, although also in close proximity to the site boundary, would require the construction of a bridge structure over the existing watercourse and as such are deemed to be least preferred.

Figure 17: Access Point 2 (JG Afrika, 2020)

Figure 18: Access Point 3 (JG Afrika, 2020)

Figure 19: Access Point 4 (JG Africa, 2020)

Access point 1 is deemed the preferred access route as it allows direct access to the proposed site and does not require additional structures crossing the watercourse (i.e. will have a lower impact on Aquatic Ecology)

In summary, the preferred access point of access will be the eastern access (Access Point 1) as depicted in the image below. This access is the most technically and environmentally preferred access road. This route of 4.67km in length connects the site via the N14 national road along the southern boundary of Geel Kop Farm 456 RE. The proposed access road utilizes an existing farm track to minimise the environmental impact associated with access to the project.

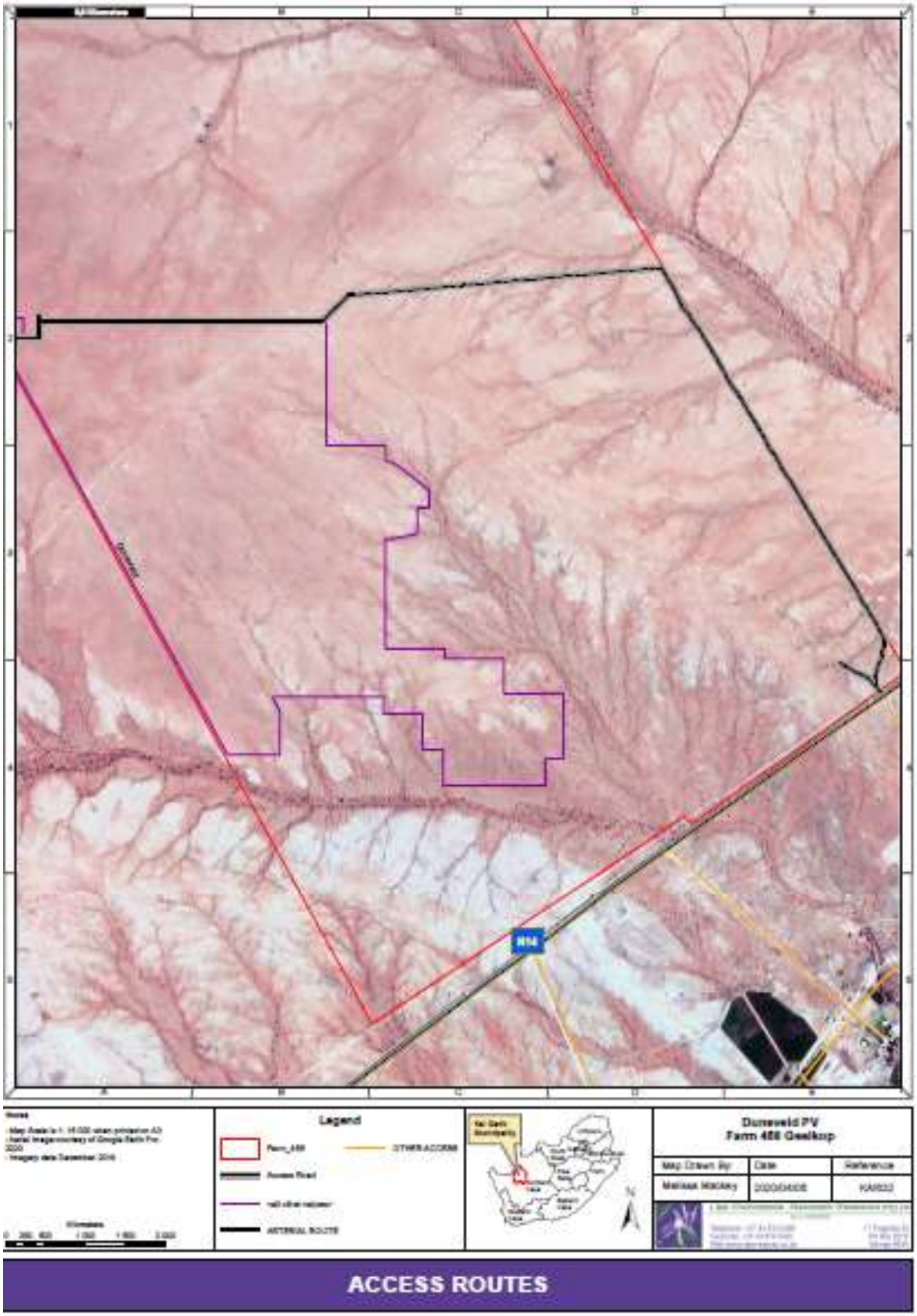

Figure 20: Preferred Access (Access Point 1) to Duneveld PV

The internal road network of the SEF will be gravelled roads, approximately 5m in width, around the solar array periphery. Roads located in-between the solar modules will be un-surfaced tracks to be used for maintenance and cleaning of solar PV panels.

A detailed transport and traffic plan compiled by JG Afrika is attached in Appendix E12. This plan concluded that the access point in the map above is deemed the preferred access route as it allows direct access to the proposed site and does not require additional structures.

The access point proposed for Duneveld PV will need to be upgraded to cater for the construction vehicles navigating the road to the laydown areas on site. Generally, the road width at the access point needs to be a minimum of 8m and the access roads on site a minimum of 5m. The radius at the access point from the N14 needs to be large enough to allow for all construction vehicles to turn safely. It is recommended that the access point shall be surfaced and the internal access roads on site can remain gravel.

The traffic impact study furthermore recommended that the site access be controlled via a boom and gatehouse and that security staff be stationed on site at the access booms during construction and that an electronic number plate reader will be implemented once the solar farm is in operation. It furthermore recommends to allow for at least 25m stacking distance at the boom access to the site.

Precautionary measures will be taken to mitigate the risk of ground disturbances where access roads will be constructed. Special attention will be given to drainage, water flow and erosion by applying appropriate building methods listed in the aquatic specialist report and the stormwater management plan .

2.11.4 The no-go alternative

The no-go Alternative (or status quo) proposes that Duneveld PV not go ahead and that the area in proximity to the Eskom Upington MTS and within a Renewable Energy Development Zone remain undeveloped as it is currently. The land on which the Duneveld PV is proposed is currently vacant. It is currently used for limited game grazing activities, however due to a combination of water scarcity and extreme climatic conditions, it has no potential for irrigated crop cultivation (this has been confirmed by the Agricultural Specialist in his report attached in **Appendix E4**). The area in question is also considered too small to generate noteworthy financial benefit from agricultural activities due to its low carrying capacity.

The solar-power generation potential of the Northern Cape area, particularly in proximity to the existing and proposed substations, is significant and will persist should the no-go alternative occur.

The no-go alternative will limit the potential associated with the land and the area as a whole for ensuring energy security locally, as well as the meeting of renewable energy targets on a provincial and national scale. Should the no-go alternative be considered, the positive impacts associated with Duneveld PV (increased revenue for the farmer, economic investment, local employment and generation of electricity from a renewable resource) will not be realised.

The no-go alternative is thus not considered a favourable option in light of the benefits associated with the proposed Duneveld PV, however it will be used as a baseline from which to determine the level and significance of potential impacts associated with the proposed Duneveld PV.

2.11.5 Comparison of alternatives

The table below reflects the key environmental advantages and disadvantages of the two layouts (i.e. the preferred and initial assessment area and the 4 access road alternatives including the identification of the preferred alternatives in each case[13].

Table 4: Comparison of Advantages and Disadvantages of Layout and Access Road Alternatives.

Alternative	Preference	Reasons (incl. potential issues)
PV LAYOUT ALTERNATIVES		
Alternative 1	Preferred	- This is seen as the preferred alternative as the footprint is in closer proximity to roads and existing PV projects where existing disturbance would decrease the value of the affected habitat. - The landscape fragmentation of this alternative is lower than that of the initial conceptual area. - Avoids all high and very high ecologically sensitive areas. - Avoids all high and very high hydrologically sensitive areas. - Avoids all Avifaunal sensitive areas.
Initial Conceptual Area	Less Preferred, eliminated from further assessment	- The Initial Conceptual area is significantly less preferred due to its impact on areas of high and very high environmental sensitivity. Due to these significant impacts, it has been eliminated from further assessment as part of this environmental process. - Traverses high and very high ecologically sensitive areas. - Traverses high and very high hydrologically sensitive areas.
Access Road Alternatives		
Eastern Alternative (Access Point 1)	Preferred	- Does not cross the high sensitivity major watercourse - Does not require the construction of bridge structures within the high sensitivity major watercourse.
Access Alternatives 2,3 & 4	Least Preferred	- Crosses the high sensitivity major watercourse - Requires the construction of bridge structures within the high sensitivity major watercourse.

As can be seen in the table above, there is an environmental preference for Layout Alternative 1 due to its lower impact on sensitive features. The preferred access road option is the Eastern Alternative (access point 1) due to its lower overall impact on watercourses.

2.12 PROJECT PROGRAMME AND TIMELINES

As mentioned previously Duneveld PV is intended to be bid into the REIPPPP. The programme has definite and stringent timelines that the project needs to meet. Note that the DoE has not yet released the exact dates of the bidding schedules, so the implementation schedule below is based on the best available information we have at this time and is subject to change.

Table 5: Preliminary implementation schedule.

	Description	Timeline
1	Expected REIPPPP submission date (5th round)	Third Quarter of 2020
2	Preferred bidders selected	First Quarter 2021
3	Finalisation of agreements	First Quarter 2022
4	Procurement of infrastructure	Second Quarter 2022

[13] The comparative assessment of the to grid connection alternatives is not included in this report, as these are being assessed as part of a separate Basic Assessment Process.

5	Construction	2022 - 2023
6	Commissioning	2023

The table above clearly depicts the dependence of the project on the REIPPPP's timelines. Any delay or acceleration within the REIPPPP will have a corresponding effect on the timelines of the projects. Also, as mentioned, no official public submission date for Round 5 has been communicated by the DoE.

NOTE: Duneveld PV intends submitting their bid during the 5th bidding window or thereafter if unsuccessful in immediate bidding rounds. Due to the uncertainty regarding the timing of these bidding windows, the Department is herewith requested that the validity period of the environmental authorisation, if authorised, be for the full 10 years allowable in terms of the regulations.

3. LEGISLATIVE AND POLICY FRAMEWORK

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

3.1 NATIONAL LEGISLATION

This section deals with nationally promulgated or nationally applicable legislation associated with the proposed Duneveld PV.

3.1.1 The Constitution of the Republic of South Africa

The Constitution of the Republic of South Africa (Act 108 of 1996) states that everyone has a right to a non-threatening environment and that reasonable measures are applied to protect the environment. This includes preventing pollution and promoting conservation and environmentally sustainable development, while promoting justifiable social and economic development.

The Constitution and Bill of Rights provides that:

Everyone has the right:

- to an environment that is not harmful to their health or well-being; and
- to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures:
    - prevent pollution and ecological degradation
    - promote conservation; and
    - secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.

NEMA (discussed below) is the enabling legislation to ensure this primary right is achieved.

3.1.2 National Environmental Management Act (NEMA)

The current assessment is being undertaken in terms of the **National Environmental Management Act** (NEMA, Act 107 of 1998)[14]. This Act makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the competent authority (in this case, the national Department of Environmental Affairs, DEA) based on the findings of an Environmental Assessment.

[14] The Minister of Water and Environmental Affairs promulgated new regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA, Act 107 of 1998), viz, the Environmental Impact Assessment (EIA) Regulations 2014 (as amended in April 2017). These regulations came into effect on 08 December 2014 (amended on 07 April 2017) and replace the EIA regulations promulgated in 2006 and 2010.

The proposed development entails a number of listed activities, which would normally require a Scoping & Environmental Impact Reporting process, but due to the project falling within a legislated REDZ, only requires a Basic Assessment Process. Such a process must be conducted by an independent EAP. Cape EAPrac has been appointed to undertake this process. The figure below depicts a summary of the Basic Assessment process.

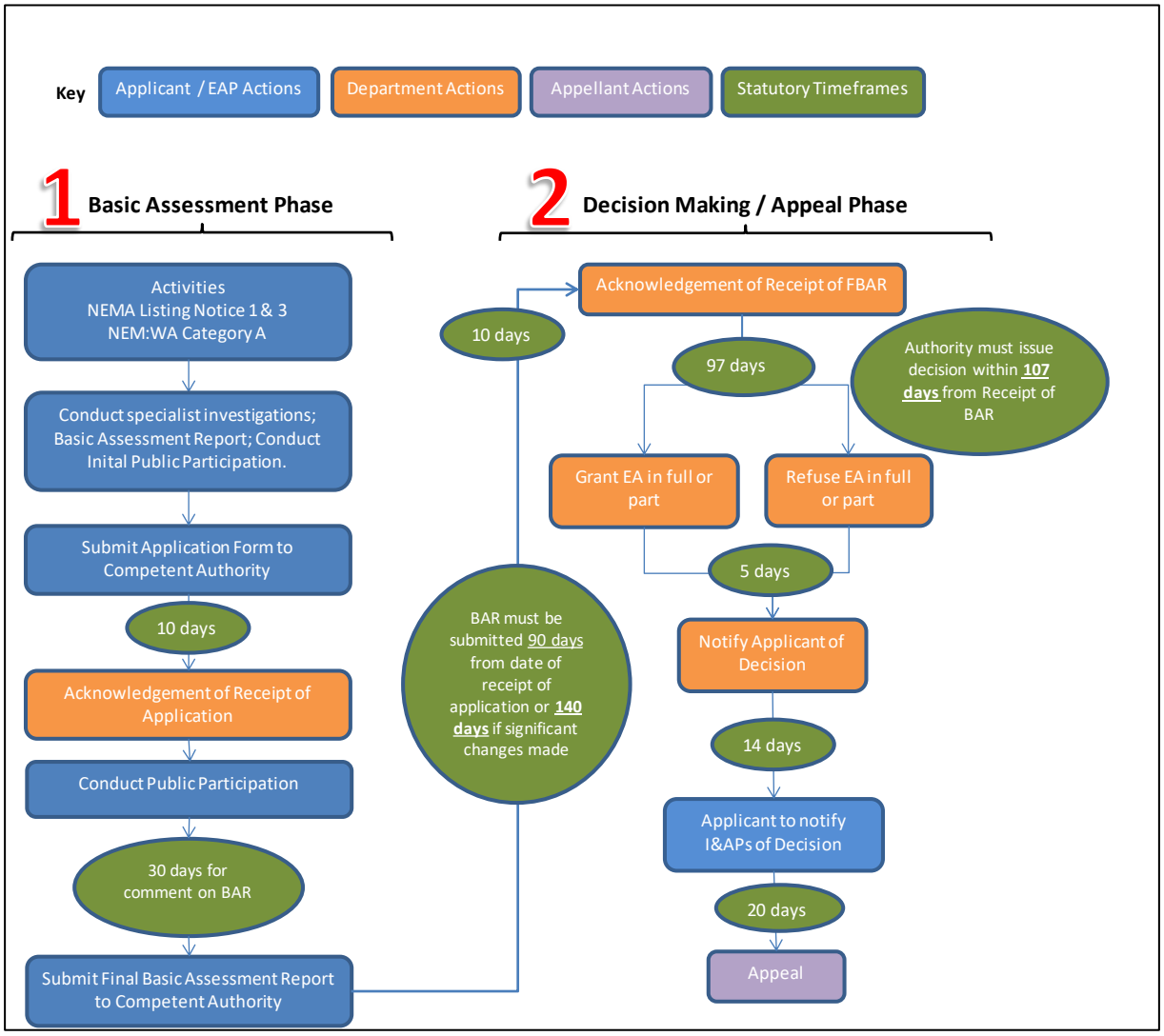

Figure 21: Summary of Basic Assessment Process in terms of the 2014 Regulations(as amended).

The listed activities associated with the proposed development, as stipulation under 2014 Regulations **327, 325 and 324** are as follows:

Table 6: NEMA 2014 (As amended in April 2017) listed activities applicable to Duneveld PV.

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Description
11	The development of facilities or infrastructure for the transmission and distribution of electricity—	Construction of the IPP portion of the on-site substation outside of an urban area[15]. The

[15] Duneveld PV will connect from the on-site substation to the Upington MTS via the Geelkop Collector s

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Description
	(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	facilities and Infrastructure associated with Duneveld PV will have a maximum capacity of 132 kilovolts.
12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse;	Construction of internal and perimeter roads as well as PV mounting structures across the ephemeral washes identified on Geel Kop Farm No. 456 RE. These roads and structures will have a physical footprint exceeding 100 square metres
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;	Construction of internal and perimeter roads as well as PV mounting structures across the ephemeral washes identified on the property. The excavation and infilling associated with these roads and structures will exceed 10 cubic metres.
24	The development of a road— ((ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	Construction of the main access road to the proposed Duneveld PV facility. The access road will have a width of 8m but with the inclusion of side drains will exceed a total width of more than 8m.
28	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: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	The Duneveld PV facility is considered as commercial use, being proposed on an area used for agricultural purposes. Duneveld PV will have a total footprint of approximately 212 ha
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (ii) where no reserve exists, where the existing road is wider than 8 metres;	The existing access track will be widened by more than 6m in certain sections.
Activity No(s):	**Basic Assessment Activity(ies) as set out in Listing Notice 3 (GN R985)**	**Description**
4	The development of a road wider than 4 metres with a reserve less than 13 metres. g. Northern Cape iii. Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The access road to the project crosses a CBA in the South of the Property. This road will be 8m in width.
12	The clearance of an area of 300 square metres or more of indigenous vegetation. g. Northern Cape 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;	The access road and portions of the project fall within a CBA in the South of the Property. The construction of this section of road and PV infrastructure will require the removal of more than 300 square metres of vegetation within this CBA.

Substation (this Basic Assessment process only includes the IPP portion of the on-site substation, while the remainder of the grid connection is being assessed as part of a separate Basic Assessment process).

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Description
14	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more. g. Northern Cape ii. 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;	The access road and portions of the PV development is proposed within CBA in the South of the Property. This section of road and PV infrastructure within the CBA will have a footprint exceeding 10 square metres.
Activity No(s):	**Scoping and EIR Activity(ies) as set out in Listing Notice 2 (GN R984)**	**Description**
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,	The proposed Duneveld PV comprises a renewable energy generation facility, which will utilise PV technology and will have a net generation capacity of up to 100MW.
15	The clearance of an area of 20 hectares or more of indigenous vegetation	Duneveld PV will have a total footprint of approximately 212ha.

Table 7: Activities applied for and their applicability to the components in the project description.

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Applicable Aspects of Project Description
11	The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts;	On-site switching-station / substation; Inverter-stations, transformers and internal electrical reticulation (underground cabling);
12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse;	Access and internal road network; Perimeter fencing and security infrastructure.
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;	Access and internal road network; Perimeter fencing and security infrastructure.
24	The development of a road— ((ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	Access road
28	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: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	Solar photovoltaic (PV) technology, fixed-tilt-, single-axis tracking- or dual-axis tracking-mounting structures, with a net generating capacity of 100 MW as well as all associated infrastructure.
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (ii) where no reserve exists, where the existing road is wider than 8 metres;	Access Road
Activity No(s):	**Basic Assessment Activity(ies) as set out in Listing Notice 3 (GN R985)**	**Description**
4	The development of a road wider than 4 metres with a reserve less than 13 metres. g. Northern Cape iii. Outside urban areas:	Access and internal road network;

Activity No(s):	Basic Assessment Activity(ies) as set out in Listing Notice 1 (GN R983)	Applicable Aspects of Project Description
	(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	
12	The clearance of an area of 300 square metres or more of indigenous vegetation. g. Northern Cape 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;	Access Road and PV infrastructure
14	The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more. g. Northern Cape ii. 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;	Access Road and PV infrastructure
Activity No(s):	**Scoping and EIR Activity(ies) as set out in Listing Notice 2 (GN R984)**	**Description**
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,	Solar photovoltaic (PV) technology, fixed-tilt-, single-axis tracking- or dual-axis tracking-mounting structures, with a net generating capacity of 100 MW.
15	The clearance of an area of 20 hectares or more of indigenous vegetation	Solar photovoltaic (PV) technology, fixed-tilt-, single-axis tracking- or dual-axis tracking-mounting structures, with a net generating capacity of 100 MW as well as all associated infrastructure, which will include: - On-site switching-station / substation; - Auxiliary buildings (gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.); - Inverter-stations, transformers and internal electrical reticulation (underground cabling); - Access and internal road network; - Laydown area; - IPP portion of the on-site substation, - Rainwater tanks; and - Perimeter fencing and security infrastructure.

NOTE: Basic Assessment as well as S&EIR Activities are being triggered by the proposed development, but since the project is contained in a legislated REDZ, the EIA Process will follow a Basic Assessment process.

Before any of the above mentioned listed activities can be undertaken, authorisation must be obtained from the relevant authority, in this case the DEA. Should the Department approve the proposed activity, the Environmental Authorisation does not exclude the need for obtaining relevant approvals from other Authorities who have a legal mandate in respect of the activity.

3.1.3 National Environmental Management: Biodiversity (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment.

The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. **However, the vegetation types on the preferred footpring are classified as Least Threatened.**

NEMBA also deals with endangered, threatened and otherwise controlled species. The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered**: any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered**: any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable**: any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species**: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Certain activities, known as Restricted Activities, are regulated by a set of permit regulations published under the Act. These activities may not proceed without environmental authorization.

The study area is located in the Kalahari Karroid Shrubland (Least threatened) Bushmanland Arid Grassland (Least threatened) and Gordonia Duneveld (Least Threatened) vegetation types. The study area is not located in a threatened ecosystem the Lower Gariep Alluvial Vegetation threatened ecosystem is located south of the study area[16].

Kalahari Karroid Shrubland vegetation type is endemic to the Northern Cape Province. The vegetation type is characteristic of forming belts alternating with belts of Gordonia Duneveld on plains northwest of Upington through Lutzputs and Noenieput to the Rietfontein/Mier area in the north. Other patches occur around Kakamas and north of Groblershoop. The unit is also found in the neighbouring Namibia. The vegetation can be described as low karroid shrubland on flat, gravel plains. Karoo-related and northern floristic elements such as shrubs meet here, indicating a transition to the Kalahari region and sandy soils. Altitude varies mostly from 700 - 1100 m.

The conservation target is set at 21% with very little statutorily conserved in the Augrabies Falls National Park. Although only a small area has been transformed many of the belts of this type were preferred routes for early roads, thus promoting the introduction of alien plants (about a quarter of the unit has scattered *Prosopis* species). Erosion is very low (94%) (Mucina & Rutherford, 2010).

The Bushmanland Arid Grassland vegetation type occurs only in the Northern Cape Province. It spans about one degree of latitude from around Aggeneys in the west to Prieska in the east. The southern border of the unit is formed by edges of the Bushmanland Basin while in the northwest this vegetation unit borders on desert vegetation (northwest of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often

[16] Duneveld PV is predominantly situated in Bushmanland Arid Thiscket, with a very small portion of the Northwestern corner extending into Gordonia Duneveld.

intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. Most of the western border is formed by the edge of the Namaqualand hills. Altitude varies mostly from 600–1 200 m. The conservation target is set at 21% with only small patches statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed. Erosion is very low (60%) and low (33%) (Mucina & Rutherford, 2010).

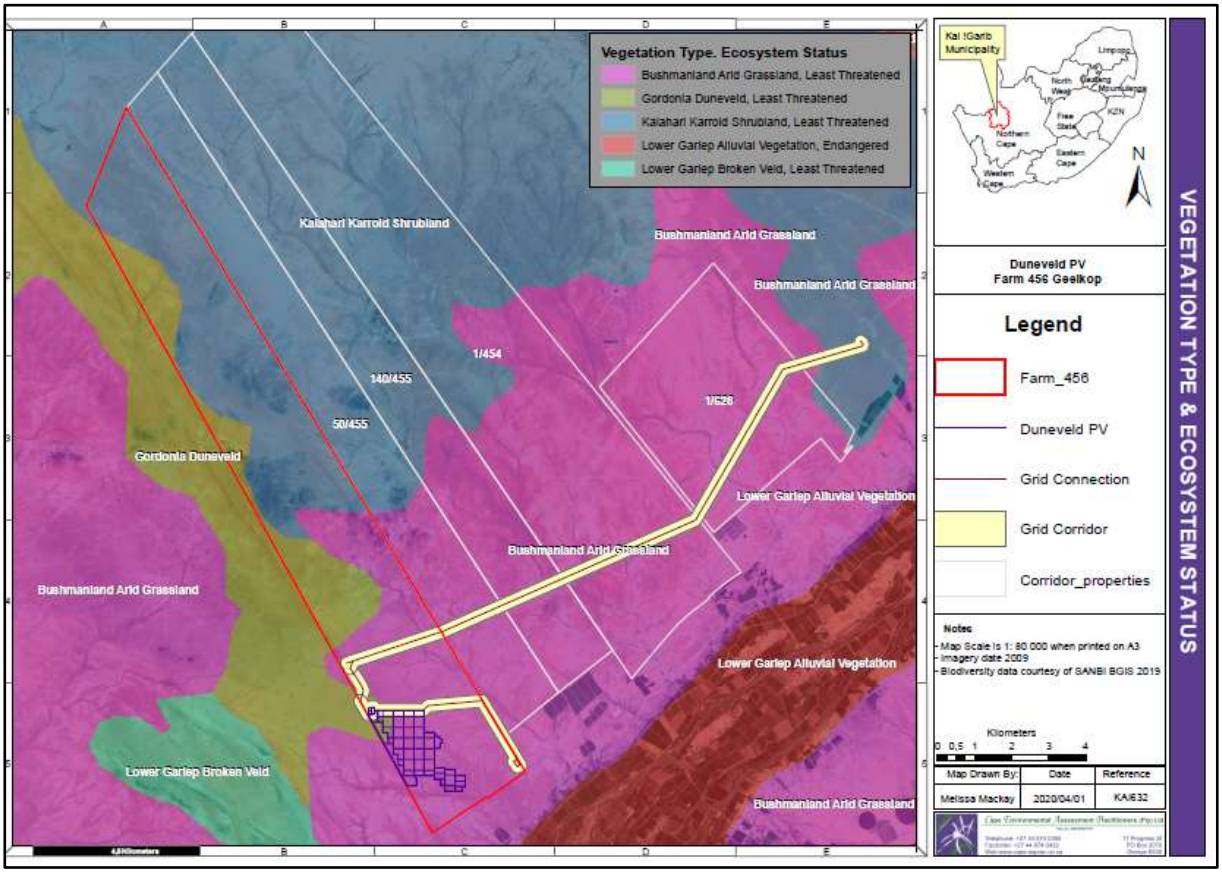

Figure 22: The study area for Duneveld PV in relation to threatened ecosystems, namely the Lower Gariep Alluvial Vegetation situated to the south of the site.

3.1.4 Conservation of Agricultural Resources Act – CARA (Act 43 of 1983):

The Conservation of Agricultural Resources Act (CARA) provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. CARA defines different categories of alien plants:

- Category 1 - prohibited and must be controlled;
- Category 2 – must be grown within a demarcated area under permit; and
- Category 3 - ornamental plants that may no longer be planted, but existing plants may remain provided that all reasonable steps are taken to prevent the spreading thereof, except within the flood lines of water courses and wetlands.

The abundance of alien plant species on the Duneveld PV site is very low, which can be ascribed mainly to the aridity of the site.

The Department of Agriculture, Land Reform and Rural Development is guided by Act 43 of 1983.

In order to comply with their mandate in terms of this legislation, the applicant is required to take note of the following:

Article 7.(3)b of Regulation 9238: CONSERVATION OF AGRICULTURE RESOURCES, 1983 (Act 43 of 1983)

Utilisation and protection of vleis, marshes, water sponges and water courses

- 7.(1) “no land user shall utilize the vegetation in a vlei, marsh or water sponge or within the flood area of a water course or within 10 meters horizontally outside such flood area in a manner that causes or may cause the deterioration of or damage to the natural agriculture resources.”
- (3)(b) “cultivate any land on his farm unit within the flood area of a water course or within 10 meters horizontally outside the flood area of a water course”.

Kindly refer to the Freshwater Ecological Impact Assessment in Appendix E3 for a discussion of potential impacts on the freshwater resources on site. As confirmed in this specialist report, all the main drainage lines have been completely avoided by the proposed Duneveld PV.

3.1.5 The Subdivision of Agricultural Land, Act 70 Of 1970

The Subdivision of Agricultural Land Act 70 of 1970 (SALA”) came into operation on 2 January 1971. The Department of Agriculture, Forestry and Fisheries (DAFF) administers the Subdivision of Agricultural Land Act No. 70 of 1970. Subdivision of agricultural land, therefore, requires DAFF’s consent.

DAFF is considered a commenting authority on this environmental process, but will be a decision making authority on the SALA application which will take place after the project receives an EA. Please refer to the Planning Statement attached in Appendix E14.

3.1.6 National Water Act, No 36 of 1998

Section 21c & i of the National Water Act (NWA) requires the Applicant to apply for authorisation from the Department of Water and Sanitation for an activity in, or in proximity to any watercourse. Such an application would be required for any access road or PV infrastructure that crosses any watercourse.

Section 21(a) of the National Water Act is related to the abstraction of water from a water resource (including abstraction of groundwater); a Water Use Licence (WUL) would be required for such abstraction.

Water required for the construction and operation of Duneveld PV is to be sourced from the Kai !Garib Local Municipality (Please refer to Appendix G6 for Written confirmation of availability). Should the applicant in the future, wish to utilise groundwater for the purposes of construction or operation of the facility, such use will require a licence in terms of Section 21(a) of the NWA.

The freshwater specialist has identified a number of drainage lines and alluvial washes which occur on plains as well as slopes within the broader study area. The preferred layout has avoided all the main drainage lines, pans as well as the high sensitivity alluvial washes. Certain aspects of the development (mainly the perimeter tracks and some of the modules to a lesser degree) do however encroach on some of the low and medium sensitivity alluvial washes. Such encroachments will require authorisation in terms of the National Water Act.

The Department of Water and Sanitation have been registered as a key stakeholder in this environmental process.

3.1.7 National Forests Act (No. 84 of 1998):

The National Forests Act (NFA) provides for the protection of forests as well as specific tree species, quoting directly from the Act: “*no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a licence*

or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".

The ecological specialist, Dr David Hoare, identified the following species on site which are protected in terms of the National Forest Act.

Table 8: Species present on site that are protected in terms of the National Forest Act.

Species	Common Name	SANBI National Red List[17]	Northern Cape Protected[18]	National Forest Act (1998)[19]	Habitat Description
Boscia albitrunca	Shepherd's tree	Least Concern	Yes	Yes	Terrestrial – including seven provinces excluding Western and Eastern Cape
Vachellia erioloba	Camel thorn	Least Concern	Yes	Yes	Widespread in the arid northern provinces of South Africa, also Namibia, Botswana, Zimbabwe, southern Angola and south-western Zambia

Notwithstanding, the significance associated with the removal of protected trees for the proposed development, the applicant will be required to submit an application in terms of the NFA for a licence to remove individuals of these two species.

The Department of Agriculture, Forestry and Fisheries (DAFF) (now the department of Environment, Forestry and Fisheries) have been registered as a key stakeholder in this environmental process and will be requested to provide comment in this regard.

3.1.8 National Heritage Resources Act, 25 of 1998

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999). South African National Heritage Resources Agency (SAHRA) is the enforcing authority in the Northern Cape, and is registered as a Stakeholder for this environmental process.

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

The National Heritage Resources Act requires relevant authorities to be notified regarding this proposed development, as the following activities are relevant:

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

[17] http://redlist.sanbi.org/

[18] Northern Cape Nature Conservation Act (Act No 9 of 2009)

[19] Notice of the list of protected tree species under the National Forests Act 84 of 1998 published in GN 182 in GG 41100 of 8 September 2017

- the re-zoning of a site exceeding 10 000m^2 in extent.

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

- In terms of Section 36 (3), no person may destroy, damage, alter, exhume or remove from its original position, or otherwise disturb, any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority, without a permit issued by the SAHRA, or a provincial heritage authority.
- In terms of Section 35 (4), no person may destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object, without a permit issued by the SAHRA, or the responsible resources authority.

Mr Jaco van der Walt of HCAC heritage consultants, has undertaken a heritage impact assessment for the proposed Duneveld PV. This heritage study has included a Paleontological Desktop Assessment undertaken by Dr Marion Bamford.

Please refer to the Heritage Impact Report, Paleontological Desktop Assessment attached in Appendix E5 and E6 respectively.

The application in terms of the NHA will be lodged with SAHRA via their SAHRIS system.

3.1.9 National Energy Act (No. 34 of 2008)

The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation; while taking environmental management requirements into account. In addition, the Act also provides for energy planning, and increased generation and consumption of Renewable Energies.

The objectives of the Act, are to amongst other things, to:

- Ensure uninterrupted supply of energy to the Republic.
- Promote diversity of supply of energy and its sources.
- Facilitate energy access for improvement of the quality of life of the people of the Republic.
- Contribute to the sustainable development of South Africa's economy.

The National Energy Act therefore recognises the significant role which electricity plays growing the economy while improving citizens' quality of life. The Act provides the legal framework which supports the development of Renewable Energy facilities for the greater environmental and social good, and provides the backdrop against which South Africa's strategic planning regarding future electricity provision and supply takes place.

3.2 PROVINCIAL LEGISLATION

This section deals with provincially promulgated or provincially applicable legislation associated with the proposed Duneveld PV.

3.2.1 Northern Cape Nature Conservation Act, No. 9 of 2009

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the solar development may require.

Manipulation of boundary fences: 19. No Person may –

(a) erect, alter, remove or partly remove or cause to be erected, altered, removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom.

It is recommended that the perimeter fencing around the solar development site will be constructed in a manner which allows for the passage of small and medium sized mammals:

The ecology specialist identified the following species protected in terms of this Act.

- Aloidendron dichotomum (Asphodolaceae),
- Aloe claviflora (Asphodolaceae),
- Aloe gariepensis (Asphodolaceae),
- Avonia albissima (Anacampserotaceae),
- Boscia foetida,
- Boscia albitrunca
- Mesembryanthemum sp. (Aizoaceae),
- Ruschia sp. (Aizoaceae),
- Euphorbia braunsii, and
- Nerine laticoma (Amaryllidaceae).

Despite not being threatened, any impacts on these species will require a permit from the relevant authorities. There is a possibility that additional protected species occur on site that were not detected during the field survey.

The specialist noted that many of these species are widespread and not of any conservation concern, but protected due to the fact that the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009) protects entire families of flowering plants irrespective of whether some members are rare or common.

The implication is that a comprehensive list of species occurring within the footprint of the proposed infrastructure is required and a permit application submitted for any of those listed as protected.

Please also refer to the Ecological Impact Report attached in Appendix E1 for further information on protected species present on site.

3.2.2 Nature and Environmental Conservation Ordinance, No 19 of 1974

This legislation was developed to protect both animal and plant species within the various provinces of the country which warrant protection. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for implementing the provisions of this legislation, which includes the issuing of permits etc. In the Northern Cape, the Department of Environment and Nature Conservation fulfils this mandate as per the Northern Cape Nature Conservation Act as described above.

3.2.3 Astronomy Geographic Advantage Act, 2007 (Act No 21 Of 2007)

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

Chapter 2 of the act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following:

- Restrictions on use of radio frequency spectrum in astronomy advantage areas;
- Declared activities in core or central astronomy advantage area;
- Identified activities in coordinated astronomy advantage area; and
- Authorisation to undertake identified activities.

The South African SKA Project Office have been registered as a key stakeholder on this environmental process and have been requested to provide input in terms of the Astronomy Geographic Advantage Act and potential impact to SKA. The potential Impact of Duneveld PV is likely to be low, due to the considerable distance to the nearest SKA infrastructure.

3.2.4 Northern Cape Provincial Spatial Development Framework (PSDF) 2012

The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the Province is to enable sustainability through sustainable development. The Province considers social and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty.

The PSDF considers the release of greenhouse gas (GHG) emissions created by human activity as the key cause of global warming, which in turn could result in major negative effects and disasters in the short- and medium-term. This effect would increasingly undermine human development gains. Innovative strategies would have to be implemented to reduce the impact of global deterioration.

The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the Province's energy generation capacity by 2020.

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the Province through appropriate financial and fiscal instruments.

Considering the need for the development of renewable energy facilities in order to achieve the objective of sustainability the development of the proposed SEF within the Northern Cape and within the study area is considered to be aligned with the Northern Cape PSDF.

3.2.5 Northern Cape Province Provincial Growth and Development Strategy

The Northern Cape Provincial Growth and Development Strategy (NCPGDS) identifies poverty reduction as the most significant challenge facing the government and its partners. All other societal challenges that the province faces emanate predominantly from the effects of poverty. The NCPGDS notes that the only effective way to reduce poverty is through long-term sustainable economic growth and development. The sectors where economic growth and development can be promoted include:

- Agriculture and Agro-processing;
- Fishing and Mariculture;
- Mining and mineral processing;
- Transport;
- Manufacturing;
- Tourism.

However, the NCPGDS also notes that economic development in these sectors also requires:

- Creating opportunities for lifelong learning;
- Improving the skills of the labour force to increase productivity;
- Increasing accessibility to knowledge and information.

The achievement of these primary development objectives depends on the achievement of a number of related objectives that, at a macro-level, describe necessary conditions for growth and development. These are:

- Developing requisite levels of human and social capital;
- Improving the efficiency and effectiveness of governance and other development institutions;
- Enhancing infrastructure for economic growth and social development.

Of specific relevance to this EIA and more specifically, the SIA is that the NCPGDS make reference to the need to ensure the availability of inexpensive energy. The section notes that in order to promote economic growth in the Northern Cape the availability of electricity to key industrial users at critical localities at rates that enhance the competitiveness of their industries must be ensured. At the same time, the development of new sources of energy through the promotion of the adoption of energy applications that display a synergy with the province's natural resource endowments must be encouraged. In this regard the NCPGDS notes "the development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NCPGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The NCPGDS also highlights the importance of enterprise development, and notes that the current levels of private sector development and investment in the Northern Cape are low. In addition, the province also lags in the key policy priority areas of SMME Development and Black Economic Empowerment. The proposed solar energy facility therefore has the potential to create opportunities to promote private sector investment and the development of SMMEs in the Northern Cape Province.

In this regard care will need to be taken to ensure that the proposed STPs and other renewable energy facilities do not negatively impact on the regions natural environment. In this regard the NCPGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the provinces exceptional natural and cultural attributes, it has the potential to become the preferred adventure and ecotourism destination in South Africa. Care therefore needs to be taken to ensure that the development of large renewable energy projects, such as the proposed solar energy facility, do not affect the tourism potential of the province.

3.2.6 Northern Cape Climate Change Response Strategy

The key aspects of the PCCRS Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the water, agriculture and human health sectors as the 3 key adaptation sectors, the industry and transport alongside the energy sector as the 3 key mitigation sectors with the disaster management, natural resources and Human society, livelihoods and services sectors as 3 remaining key sectors to ensure proactive long term responses to the frequency and intensity of extreme weather events such as flooding and wild fire, with heightened requirements for effective disaster management".

Key points from MEC's address include the NCPG's commitment to develop and implement policy in accord with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is indented as an important provincial intervention in addressing climate change. The

renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy. The MEC also indicated that the NCP was involved in the processing a number of wind and solar energy facility EIA applications.

3.3 REGIONAL AND MUNICIPAL LEGISLATION

This section deals with regionally and municipally promulgated or regionally or municipally applicable legislation associated with the proposed Duneveld PV[20].

3.3.1 ZF Mcgawu District Municipality Integrated Development Plan

The vision set out in the ZFMDM is “Quality support to deliver quality services”. The mission is a “Centre of excellence in providing quality basic services through support to local municipalities”.

In terms of the National Spatial Development Perspective, The ZF Mgcawu District area has been classified as a “medium” importance area which means that no significant investment is concentrated in the region. In terms of the National Spatial Development Perspective, The ZF Mgcawu District area has been classified as a “medium” importance area which means that no significant investment is concentrated in the region.

The IDP lists a number of strategic objectives and development objectives. The relevant objectives include:

Strategic objective
To Facilitate the Development of Sustainable regional land use, economic, spatial and environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable district economy. The associated development objective is to:

- Establish a vehicle to ensure all businesses are co-operating (i.e. District LED Forum);
- Create investment opportunities in sectoral development (i.e. investment activities; Entrepreneurial business support programme);
- Enable an environment for business establishment and support initiatives (i.e. Increase the number of businesses; entrepreneurial support)

Strategic objective
To market, develop and co-ordinate tourism in the ZFMDM. The associated development objective is to:

- Promote the Green Kalahari tourism brand in the ZF Mgcawu district

The IDP identifies a number of key challenges. The following are relevant to the proposed development:

- High rate of unemployment;
- Inadequate human capital;
- Youth development;
- Access to health care facilities.

In terms of the Kai Garib Municipality, the priority issues include:

- Lack of Basic Services;
- Lack of proper housing / existing informal settlements/ Lack of Land Ownership;

[20] This section includes legislation applicable to both the District (Category C) and Local (Category B) municipalities.

- Poverty & unemployment, lack of youth development and social issues contributing thereto (Local Economic Development) / Lack of farming land/ commonage;
- Lack of sport and recreational facilities and services;
- Lack of sufficient and proper health services (HIV/AIDS).

The IDP also notes that the ZF Mgcawu District Municipality acknowledges that climate change poses a threat to the environment, its residents, and future development. Actions are required to reduce carbon emissions (mitigation), and prepare for the changes that are projected to take place (adaptation) in the District. ZF Mgcawu District Municipality has therefore prioritised the development of a Climate Change Vulnerability Assessment and Climate Change Response Plan.

3.3.2 Kai! Garib Local Municipality Integrated Development Plan

The vision for the Kai! Garib LM is "Creating an economically viable and fully developed municipality, which enhances the standard of living of all the inhabitants / community of Kai! Garib through good governance, excellent service delivery and sustainable development." The mission is the "Provision of transparent, accountable and sustainable service delivery".

The IDP notes that that the activities of the KGLM are guided by a number of values, of which the following are relevant to the proposed development:

- Transparency in planning and management;
- Proper understanding of the needs of communities;
- The implementation of a development orientated approach to Local Government;
- Building capacity among the staff and Community wherever possible in order to enable them to play an effective role in Local Government.

The IDP is aligned with the National Government identified Key Performance Areas (KPA's) which are:

- KPA 1: Service Delivery and Infrastructure Development;
- KPA 2: Local Economic Development;
- KPA 3: Municipal Financial Viability and Management;
- KPA 4: Institutional Development and Transformation;
- KPA 5: Public Participation and Good Governance.

KPA 2, Local Economic Development, is the most relevance KPA for the proposed development.

3.4 GUIDELINES, POLICIES AND AUTHORITATIVE REPORTS

This section includes relevant Guidelines, Policies and Authoritative reports applicable to the proposed Duneveld PV.

3.4.1 National Protected Area Expansion Strategy (NPAES) for S.A. 2008 (2010)

Considering that South Africa's protected area network currently falls far short of sustaining biodiversity and ecological processes, the NPEAS aims to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to Climate Change. Protected areas, recognised by the National Environmental Management: Protected Areas Act (Act 57 of 2003), are considered formal protected areas in the NPAES. The NPAES sets targets for expansion of these protected areas, provides maps of the most important protected area expansion, and makes recommendations on mechanisms for protected area expansion.

The NPAES identifies 42 focus areas for land-based protected area expansion in South Africa. These are large intact and un-fragmented areas suitable for the creation or expansion of large protected areas. The closest focus area is the Eastern Kalahari Bushveld Focus Area ; the proposed Duneveld PV will not affect this or any other NPAES focus area as it is situated considerable distance from the Eastern Kalahari Bushveld Focus Area.

3.4.2 Critical Biodiversity Area Planning

A Critical Biodiversity Areas (CBA) Map is a spatial plan for ecological sustainability. It identifies a set of biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

CBA Maps can be given formal legal status through the National Environmental Management: Biodiversity Act (Act 10 of 2004),

The Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province.

According to the CBA Map, the proposed Duneveld PV falls within a CBA category 2 as well as an ecological support area.

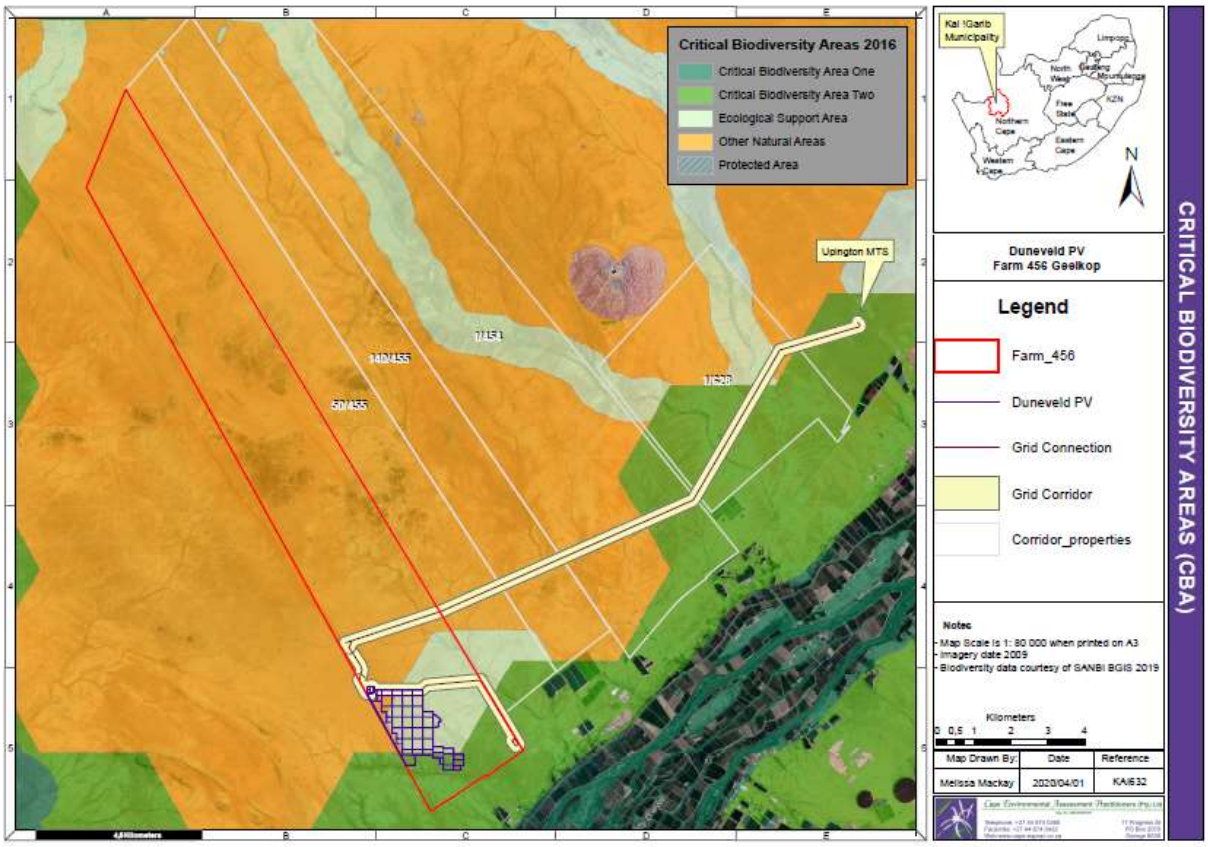

Figure 23: The proposed Duneveld PV in relation to the Northern Cape Critical Biodiversity Areas (2016).

The ecological specialist, Dr David Hoare, concluded the following in regards significance and potential impact of the CBA 2 within the study site (Please also refer to the Ecological Impact Assessment attached in Appendix E1) The Northern Cape Critical Biodiversity Area (CBA) Map was published in 2016 and updates, revises and replaces all older systematic biodiversity plans and associated products for the province.

This includes the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2008), from which the Northern Cape CBA Map derived identified CBA1 and CBA2 areas (and added additional CBA1 and CBA2 areas). This is important, since the rationale for defining the recent (2016) CBA areas is derived from the earlier (2008) product. CBA1 and CBA2 areas in the 2016 map include the following areas:

- Important Bird Areas;

- SKEP expert identified areas;
- Threatened species locations;
- Features from previous conservation plans (including CBA1 and CBA2 areas from the Namakwa District Biodiversity Sector Plan);
- Areas supporting climate change resilience, e.g. areas of high diversity, topographic diversity, strong biophysical gradients, climate refugia, including kloofs, south-facing slopes and river corridors;
- Conservation Plans from adjacent provinces; and
- Landscape structural elements, e.g. rocky outcrops, koppies, dolerite dykes, boulder fields, woody vegetation on outwash plains.

The Northern Cape CBA map classifies the natural vegetation of the province according to conservation value in decreasing value, as follows:

1. Protected;
2. Critical Biodiversity Area One (Irreplaceable Areas);
3. Critical Biodiversity Area Two (Important Areas);
4. Ecological Support Area; and
5. Other Natural Area

This shows features within the study area within three of these classes, as follows:

1. Critical Biodiversity Areas: The southern half of the site is mostly within a CBA2 area. There are patches of CBA1 within the floodplain of the Orange River to the south of the site.
2. Ecological Support Areas: The northern half of the study area is within ECAs.
3. Other Natural Areas: All areas to the north of the site are indicated as being in a natural state.

The presence of CBA areas 2 in the southern half of the site indicate that these areas are considered important for biodiversity conservation. Additionally, the ESAs in the northern half indicate that the site has importance in a wider ecological context for supporting biodiversity patterns. CBA2 areas in the Northern Cape are assigned on the basis of one of the following five categories:

1. PA Domains & Buffers
2. SKEP Expert Areas
3. Namakwa CBA 2s
4. PUs <65% irreplaceability
5. NFEPA Wetland Clusters

The following is of pertinence to the site under investigation:

1. Protected Areas (PA Domains & Buffers): The closest protected area to the site is the Augrabies Falls National Park, over 50 km away, therefore PA Domains & Buffers do not apply. Note that there are also no areas close to the site that are within National Park Area Expansion Strategy focus areas.
2. SKEP Expert Areas: The site is outside of the SKEP planning domain area, therefore SKEP expert areas do not apply.
3. Namakwa CBA2s: The site is outside the Namakwa District, therefore Namakwa CBAs do not apply.
4. PU irreplaceability: Irreplaceability of Planning Units is based on a variety of factors, for example, conservation targets for vegetation types, habitat for threatened species, rare habitats in the Province, and threatened ecosystem processes. For those specific locations, processes or targets listed in the Technical Report (Holness & Oosthuysen 2016), none are applicable to the current general area.
5. NFEPA Wetland Clusters: The site falls within a NFEPA Wetland Cluster. It is associated with the Orange River and, according to “Atlas of Freshwater Ecosystem Priority Areas in South Africa”, WRC Report No TT500/11”, the site is within an area designated as “Fish Support Area and associated sub-quaternary catchment” with the river at this location designated as “Fish

Sanctuary: other threatened" (as opposed to "Fish Sanctuary: critically endangered & endangered". The site is within a FEPA Sub-quaternary Catchment.

An interpretation of the above information is (1) that the CBA is moderately irreplaceable, and (2) the function of the sub-quaternary catchment requires protection.

In addition, a regional view of the CBA2 area on site shows the following:

1. The CBA2 area on site is part of a broader CBA2 network associated with the Orange River across its entire length through the Northern Cape. The CBA2 area on site is therefore a very small part of a much larger network. The intention therefore appears to be to preserve representative areas of various ecosystems, as well as preserve aquatic functioning of key ecosystems.
2. The Planning Units are hexagons with an individual area of 1600 ha, which provides little local resolution. On-site observation indicates that there is little difference between the CBA2 areas on site and other areas on site that are outside the CBA2 area. It should therefore be possible to preserve similar habitat nearby with the same overall outcome, even with some loss of habitat on site.

The most important objective in considering the CBA2 area on site is to ensure that aquatic function in the landscape is not compromised. In addition to the Ecology Impact Report, please also refer to the Freshwater Impact Report in Appendix E3, where is confirmed that the aquatic function of the landscape will not likely be compromised by Duneveld PV.

3.4.3 White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)

The White Paper on Renewable Energy Policy of 2003 supplements Government's predominant policy on energy as set out in the White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The policy recognises the potential of RE, and aims to create the necessary conditions for the development and commercial implementation of RE technologies. The position of the White Paper on RE Policy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

The White Paper on Renewable Energy Policy sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing Renewable Energy in South Africa. The country relies heavily on coal to meet its energy needs due to its abundant, and fairly accessible and affordable coal resources. However, massive RE resources that can be sustainable alternatives to fossil fuels, have so far remained largely untapped. The White Paper on Renewable Energy Policy fosters the uptake of Renewable Energy in the economy and has a number of objectives that include: ensuring equitable resources are invested in renewable technologies; directing public resources for implementation of Renewable Energy technologies; introducing suitable fiscal incentives for Renewable Energy and; creating an investment climate for the development of the RE sector.

The White Paper on Renewable Energy Policy set a target of 10 000GWh to be generated from RE by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The target was subsequently reviewed in 2009 during the RE summit of 2009. The objectives of the White Paper on Renewable Energy Policy are considered in six focal areas, namely; financial instruments, legal instruments, technology development, awareness raising, capacity building and education, and market based and regulatory instruments. The policy supports the investment in Renewable Energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of Renewable Energy sources.

3.4.4 White Paper on the Energy Policy of the Republic of South Africa (1998)

The White Paper on Energy Policy places emphasis on the expansion of energy supply options to enhance South Africa's energy security. This can be achieved through increased use of renewable energy and encouraging new entries into the generation market. South Africa has an attractive range of cost effective renewable resources, taking into consideration social and environmental costs. Government policy on renewable energy is thus concerned with meeting the following challenges:

- Ensuring that economically feasible technologies and applications are implemented.
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
- Addressing constraints on the development of the renewable industry.

The policy states that the advantages of Renewable Energy include; minimal environmental impacts during operation in comparison with traditional supply technologies, generally lower running costs, and high labour intensities. Disadvantages include; higher capital costs in some cases; lower energy densities; and lower levels of availability, depending on specific conditions, especially with sun and wind based systems. Nonetheless, renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future. The White Paper on Energy Policy therefore supports the advancement of Renewable Energy sources and ensuring energy security through the diversification of supply.

3.4.5 Integrated Energy Plan (IEP), 2016

The development of a National Integrated Energy Plan (IEP) was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act, 2008 (Act No. 34 of 2008), the Minister of Energy is mandated to develop and, on an annual basis, review and publish the IEP in the Government Gazette. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development.

The IEP notes that South Africa needs to grow its energy supply to support economi**c expansion and** in so doing, alleviate supply bottlenecks and supply-demand deficits. In addition, it is essential that all citizens are provided with clean and modern forms of energy at an affordable price. As part of the Integrated Energy Planning process, eight key objectives were identified, namely:

- Objective 1: Ensure security of supply;
- Objective 2: Minimise the cost of energy;
- Objective 3: Promote the creation of jobs and localisation;
- Objective 4: Minimise negative environmental impacts from the energy sector;
- Objective 5: Promote the conservation of water;
- Objective 6: Diversify supply sources and primary sources of energy;
- Objective 7: Promote energy efficiency in the economy; and
- Objective 8: Increase access to modern energy.

The IEP provides an assessment of current energy consumption trends within different sectors of the economy (i.e. agriculture, commerce, industry, residential and transport) and uses this information to identify future energy requirements, based on different scenarios. The scenarios are informed by different assumptions on economic development and the structure of the economy and also take into account the impact of key policies such as environmental policies, energy efficiency policies, transport policies and industrial policies, amongst others.

Based on this information the IEP then determines the optimal mix of energy sources and technologies to meet those energy needs in the most cost-effective manner for each of the scenarios. The associated environmental impacts, socio-economic benefits and macroeconomic impacts are also analysed. The

IEP is therefore focused on determining the long-term energy pathway for South Africa, taking into account a multitude of factors which are embedded in the eight objectives.

As part of the analysis four key scenarios were developed, namely the Base Case, Environmental Awareness, Resource Constrained and Green Shoots scenarios:

- The Base Case Scenario assumes that existing policies are implemented and will continue to shape the energy sector landscape going forward. It assumes moderate economic growth in the medium to long term;
- The Environmental Awareness Scenario is characterised by more stringent emission limits and a more environmentally aware society, where a higher cost is placed on externalities caused by the supply of energy;
- The Resource Constrained Scenario in which global energy commodity prices (i.e. coal, crude oil and natural gas) are high due to limited supply;
- The Green Shoots Scenario describes an economy in which the targets for high economic growth and structural changes to the economy, as set out in the National Development Plan (NDP), are met.

The IEP notes that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources. In terms of renewable energy the document refers to wind and solar energy. The document does however appear to support solar over wind noting that solar PV and CSP with storage present excellent opportunities to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Solar technologies also present the greatest potential for job creation and localisation. Incentive programmes and special focused programmes to promote further development in the technology, as well as solar roll-out programmes should be pursued.

3.4.6 Integrated Resource Plan for Electricity (2010-2030)

The Integrated Resource Plan (IRP) for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's national electricity plan. The primary objective of the IRP is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.

The current iteration of the IRP, led to the Revised Balanced Scenario (RBS) that was published in October 2010. Following a round of public participation which was conducted in November / December 2010, several changes were made to the IRP model assumptions. The document outlines the proposed generation new-build fleet for South Africa for the period 2010 to 2030. This scenario was derived based on a cost-optimal solution for new-build options (considering the direct costs of new build power plants), which was then "balanced" in accordance with qualitative measures such as local job creation.

The Policy-Adjusted IRP reflects recent developments with respect to prices for renewables. In addition to all existing and committed power plants, the plan includes 9.6GW of nuclear; 6.25GW of coal; 17.8GW of renewables; and approximately 8.9GW of other generation sources such as hydro, and gas.

3.4.7 National Development Plan 2030 (2012)

The National Development Plan (NDP) 2030 is a plan prepared by the National Planning Commission in consultation with the South African public which is aimed at eliminating poverty and reducing inequality by 2030. The NDP aims to achieve this by drawing on the energies of its people, growing and inclusive economy, building capabilities, enhancing the capacity of the state and promoting leaderships and partnerships throughout society. While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

- Raising employment through faster economic growth.
- Improving the quality of education, skills development and innovation.

- Building the capability of the state to play a developmental, transformative role.

In terms of the Energy Sectors role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes:

- Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.
- Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
- Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The proposed project will assist in reducing carbon emissions targets and creating jobs in the local area as well as assist in creating a competitive infrastructure based on terms of energy contribution to the national grid.

3.4.8 The New Growth Path Framework

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

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

3.4.9 National Infrastructure Plan

The South African Government adopted a National Infrastructure Plan in 2012. The aim of the plan is to transform the economic landscape while simultaneously creating significant numbers of new jobs and strengthen the delivery of basic services. The plan also supports the integration of African economies. In terms of the plan Government will invest R827 billion over the next three years to build new and upgrade existing infrastructure. The aim of the investments is to improve access by South Africans to healthcare facilities, schools, water, sanitation, housing and electrification. The plan also notes that investment in the construction of ports, roads, railway systems, electricity plants, hospitals, schools and dams will contribute to improved economic growth.

As part of the National Infrastructure Plan, Cabinet established the Presidential Infrastructure Coordinating Committee (PICC). The Committee identified and developed 18 strategic integrated projects (SIPS). The SIPs cover social and economic infrastructure across all nine provinces (with an emphasis on lagging regions) and consist of:

- Five geographically-focussed SIPs;
- Three spatial SIPs;
- Three energy SIPs;
- Three social infrastructure SIPs;
- Two knowledge SIPs;
- One regional integration SIP;
- One water and sanitation SIP.

The three energy SIPS that are related to Duneveld PV are SIP 8, 9 and 10.

Table 9: Strategic Infrastructure applicable to Duneveld PV

SIP 8: Green energy in support of the South African economy
Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010); Support bio-fuel production facilities.
SIP 9: Electricity generation to support socio-economic development
Accelerate the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances; Monitor implementation of major projects such as new power stations: Medupi, Kusile and Ingula.
SIP 10: Electricity transmission and distribution for all
Expand the transmission and distribution network to address historical imbalances, provide access to electricity for all and support economic development. Align the 10-year transmission plan, the services backlog, the national broadband roll-out and the freight rail line development to leverage off regulatory approvals, supply chain and project development capacity.

3.4.10 Strategic Environmental Assessment (SEA) for Wind and Solar PV energy in South Africa

The Strategic Environmental Assessment (SEA) for wind and solar PV energy in South Africa (CSIR, 2013) identified eight (8) Renewable Development Zones (REDZs). The REDZs identified areas where large scale renewable energy facilities can be developed in in a manner that limits significant negative impacts on the environment while yielding the highest possible socio-economic benefits to the country. The Duneveld PV site is located within the Upington REDZ, which was formally gazetted in 2018 . The area has therefore been identified as suitable for the establishment of renewable energy facilities, specifically large scale solar farms.

3.4.11 Conservation of Migratory Species of Wild Animals

Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is the most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impact associated with man-made infrastructure. CMS requires that parties (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species i.e. power lines (Art 111, par. 4b and 4c).

An Avifaunal Specialist has been appointed to consider the impact of the proposed Duneveld PV as well as the powerline connecting the facility to the Eskom Upington MTS (the powerline to the MTS is being assessed as part of as separate basic assessment process). Birdlife Africa South Africa has also been given an opportunity to comment in this regard.

3.4.12 The Agreement on the Convention of African-Eurasian Migratory Water Birds

The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory water birds and their habitat across Africa, Europe, the Middle East Central Asia, Greenland and the Canadian Archipelago. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle and is a legally binding agreement by all contracting parties (South Africa included) to guarantee the conservation of migratory water birds within their national boundaries through species and habitat protection and the management of human activities. As mentioned above, an Avifaunal Specialist has been appointed to consider the impact of the proposed Duneveld PV as well as the powerline connecting the facility to the Eskom Upington MTS (the powerline is being assessed as part of a separate Basic Assessment Process) (Annexure E1). Birdlife Africa South Africa has also been given an opportunity to comment in this regard.

3.4.13 Guidelines to minimise the impacts on birds of Solar Facilities and Associated Infrastructure in South Africa

The "Guidelines to minimise the impact on birds of Solar Facilities and Associated Infrastructure in South Africa" (Smit, 2012) is perhaps the most important (although not legally binding) document from an avifaunal impact perspective currently applicable to solar development in South Africa. The guidelines are published by BirdLife South Africa (BLSA) and detail the recommended procedure for conducting an avifaunal specialist study as well as list all of the potential impacts of interactions between birds and solar facilities and associated infrastructure. We are aware of changes to the BLSA best-practise guidelines recently published at the Birds and Renewable Energy Forum in Johannesburg (2015) and although the revised requirements are still a work in progress and have not yet been ratified, they will inform this assessment where applicable. Please refer to Annexure E1 for a copy of the Avifaunal assessment undertaken for this project.

3.4.14 Environmental Impact Assessment Guideline for Renewable Energy Projects

The Minister of Environmental Affairs published the Environmental Impact Assessment Guideline for Renewable Energy in terms of section 24J of the National Environmental Management Act, 1998 (Act No. 107 of 1998) on 16 October 2016.

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

In order to facilitate the development of the first phase of IPPs in South Africa, these guidelines have been written to assist project planning, financing, permitting, and implementation for both developers and regulators. The guideline is principally intended for use by the following stakeholder groups:

- Public Sector Authorities (as regulator and/or competent authority);
- Joint public sector authorities and project funders, e.g., Eskom, IDC, etc.
- Private Sector Entities (as project funder/developer/consultant);
- Other interested and affected parties (as determined by the project location and/or scope).

This guideline aims to ensure that all potential environmental issues pertaining to renewable energy projects are adequately and timeously assessed and addressed as necessary so as to ensure sustainable roll-out of these technologies by creating a better understanding of the environmental approval process for renewable energy projects.

The guidelines list the following possible environmental impacts associated with the development of solar energy facilities.

Table 10: Potential environmental impacts of solar energy projects (Adapted from DEA, 2015) showing where they have been considered in this report

Impact Description	Relevant Legislation	Applicability to this project
Visual Impact	NEMA	Specialist input attached in Annexure E6.
Noise Impact (CSP)	NEMA	Not applicable, as CSP is not considered as a technology alternative.
Land Use Transformation (fuel growth and production)	NEMA, NEMPAA, NHRA	Not Applicable to PV. Agricultural specialist input however attached in Annexure E3

Impact Description	Relevant Legislation	Applicability to this project
Impacts on Cultural Heritage	NEMA, NHRA	Heritage impact assessment attached in Annexure E4.
Impacts on Biodiversity –	NEMA, NEMBA, NEMPAA, NFA	Biodiversity specialist input attached in Annexure E1 and E2 (Ecology and Freshwater respectively)
Impacts on Water Resources –	NEMA, NEMICMA, NWA, WSA	The project will obtain water directly from the local municipality. A freshwater ecologist has assessed the potential impacts on freshwater resources (Annexure E2).
Hazardous Waste Generation (CSP and PV)	NEMA, NEMWA, HAS	The EMPr makes provision for damaged and defunct PV infrastructure for dismantling and re-use.
Electromagnetic Interference	NEMA	The nearest SKA station has been identified as Rem-Opt-9, at approximately 30km from the proposed Duneveld PV. SKA have been given an opportunity to provide comment in this regard.
Aircraft Interference	NEMA, MSA	The SA CAA have been automatically registered as an interested and affected party on this environmental process. There are no airports nor landing strips in the vicinity of the proposed site.
Loss of Agricultural Land	SALA	Agricultural specialist input is attached in Annexure E3
Sterilisation of mineral resources	MPRDA	The Department of Mineral Resources has been registered as an I&AP on this environmental process.

Assuming an IPP project triggers the need for BA or S&EIR under the EIA regulations, included in the assessment process is the preparation of an environmental management programme (EMPr). Project-specific measures designed to mitigate negative impacts and enhance positive impacts should be informed by good industry practice and are to be included in the EMPr. Potential mitigation measures for solar energy projects include but are not limited to:

- Conduct pre-disturbance surveys as appropriate to assess the presence of sensitive areas, fauna, flora and sensitive habitats;
- Plan visual impact reduction measures such as natural (vegetation and topography) and engineered (berms, fences, and shades, etc.) screens and buffers;
- Utilise existing roads and servitudes as much as possible to minimise project footprint;
- Site projects to avoid construction too near pristine natural areas and communities;

- Locate developments away from important habitat for faunal species, particularly species which are threatened or have restricted ranges, and are collision-prone or vulnerable to disturbance, displacement and/or habitat loss;
- Fence sites as appropriate to ensure safe restricted access;
- Ensure dust abatement measures are in place during and post construction;
- Develop and implement a storm water management plan;
- Develop and implement waste management plan; and
- Re-vegetation with appropriate indigenous species to prevent dust and erosion, as well as establishment of alien species.

The recommendations of these guidelines have been explicitly considered in this Basic Assessment process and where necessary, additional specialist input has been obtained. Please see section 6 of this BAR for a full assessment of impacts.

3.4.15 Sustainability Imperative

The norm implicit to our environmental law is the notion of sustainable development ("SD"). SD and sustainable use and exploitation of natural resources are at the core of the protection of the environment. SD is generally accepted to mean development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. The evolving elements of the concept of SD *inter alia* include the right to develop; the pursuit of equity in the use and allocation of natural resources (the principle of intra-generational equity) and the need to preserve natural resources for the benefit of present and future generations. Economic development, social development and the protection of the environment are considered the pillars of SD (the triple bottom line).

"Man-land relationships require a holistic perspective, an ability to appreciate the many aspects that make up the real problems. Sustainable planning has to confront the physical, social, environmental and economic challenges and conflicting aspirations of local communities. The imperative of sustainable planning translates into notions of striking a balance between the many competing interests in the ecological, economic and social fields in a planned manner. The 'triple bottom line' objectives of sustainable planning and development should be understood in terms of economic efficiency (employment and economic growth), social equity (human needs) and ecological integrity (ecological capital)."

As was pointed out by the Constitutional Court, SD does not require the cessation of socio-economic development but seeks to regulate the manner in which it takes place. The idea that developmental and environmental protection must be reconciled is central to the concept of SD - it implies the accommodation, reconciliation and (in some instances) integration between economic development, social development and environmental protection. It is regarded as providing a "conceptual bridge" between the right to social and economic development, and the need to protect the environment.

Our Constitutional Court has pointed out that the requirement that environmental authorities must place people and their needs at the forefront of their concern so that environmental management can serve their developmental, cultural and social interests, can be achieved if a development is sustainable. "*The very idea of sustainability implies continuity. It reflects the concern for social and developmental equity between generations, a concern that must logically be extended to equity within each generation. This concern is reflected in the principles of inter-generational and intra-generational equity which are embodied in both section 24 of the Constitution and the principles of environmental management contained in NEMA.*" [Emphasis added.]

In terms of NEMA sustainable development requires the integration of the relevant factors, the purpose of which is *to ensure that development serves present and future generations.*[21]

It is believed that the proposed 100MW Duneveld PV supports the notion of sustainable development by presenting a reasonable and feasible alternative to the existing vacant land use type, which has limited agricultural potential due the lack of water and infrastructure.

Furthermore the proposed alternative energy project (reliant on a natural renewable resource – solar energy) is in line with the national and global goal of reducing reliance on fossil fuels, thereby providing long-term benefits to future generations in a sustainable manner.

3.4.16 DEA Screening Tool and Protocols

A screening tool report was generated for the proposed Duneveld PV. The outcomes of the various environmental themes sensitivities as well as the level of study required by the protocols, are summarised in the table below.

Table 11: Sensitivity of the environmental themes and studies undertake in terms of these sensitivities

Environmental Theme	Sensitivity	Required investigation	Discussion / Compliance
Agriculture Theme	Low	Agricultural Compliance Statement	A more detailed agricultural impact statement was undertaken. This is attached as part of the specialist and technical studies in Appendix E.
Animal Species Theme	Low	Animal Species Complianc statement	This forms part of the detailed ecology Impact Assessment
Aquatic Biodiversity Theme	Very High	Aguatic Impact Assessment	This was undertaken and is attached in Appendix E
Archaeological and Cultural Heritage Theme	Medium	Heridtage Impact Assessment	A detailed Heritage Impact Assessment, encompassing an Archaeology Impact Assessment, Palaeontology Desktop Assessment and Visual Impact Assessment has been undertaken.
Bats Theme	Low	Compliance Statement	Forms part of the detailed ecology impact assessment
Civil Aviation (Solar PV) Theme	Low	Complaince Statement	The South African Civil Aviation Authority will be provided an opportunity to comment in this regard.
Landscape (Solar) Theme	Very High	Visual and Landscape Impact Assessment	This was undertaken and is attached to the BAR in Appendix E
Plant Species Theme	Medium	Compliance Statement	A full botanica Impact Assessment was undertaken.
RFI Theme	Medium	Compliance Statement	The South African Square Kilometre Array SKA-SA will be requested to provide proffesional comment in this regard.
Terrestrial Biodiversity Theme	Very High	Terrestrial Biodiversity Impact Assessment	A Terrestrial Biodiversity Impact Assessment was

21 Refer to definition of "sustainable development" in section 1 of NEMA.

Environmental Theme	Sensitivity	Required investigation	Discussion / Compliance
			undertaken and is attached in appendix 4

The table below reflects the specialist studies recommended in the DEA Screening tool and whether they have been included in this BAR.

Table 12: Specialist Studies recommended in the DEA Screening Tool.

Study Reccomended	Discussion
Agricultural Impact Assessment	Completed
Landscape/Visual Impact Assessment	Coimpleted
Archaeological and Cultural Heritage Impact Assessment	Completed
Palaeontology Impact Assessment	Completed
Terrestrial Biodiversity Impact Assessment	Completed
Aquatic Biodiversity Impact Assessment	Completed
Avian Impact Assessment	Completed
Civil Aviation Assessment	Not Completed – the South Avian Civil Aviation Authority will be approached to provide input in this regard.
Defense Assessment	Not Completed – the South African National Defence Force will be approached to provide input in this regard.
RFI Assessment	Not Completed – The South African Square Kilometre Array (SA SKA) will be approached to provide comment in this regard.
Geotechnical Assessment	Completed
Socio-Economic Assessment	Completed
Plant Species Assessment	Completed
Animal Species Assessment	Completed

4. PLANNING CONTEXT

A Planning specialist will be appointed in order to submit application in terms of the relevant planning legislation for the proposed facility. Please refer to the planning statement attached in Appendix E14 for the detailed planning context from which the following key components are drawn.

- A **land use change application** for the rezoning of approximately 212ha, from **Agricultural Zone I to Special Zone**, will be lodged at the Kai !Garib Local Municipality, in accordance with the Northern Cape Planning and Development Act (Act 7 of 1998).
- If there are restrictive Title Deed conditions burdening the proposed development, an application for the removal thereof will be lodged at the Government of the Northern Cape Province, Department: Corporate Governance and Traditional Affairs, in accordance with the Removal of Title Deed Restriction Act (Act 84 of 1967).
- Parallel to the rezoning application, a **long term lease application will be lodged at the National Department of Agriculture**, in accordance with the Subdivision of Agricultural Land Act (Act 70 of 1970).
- Relevant planning documents, on all spheres of Government, will be evaluated before any land use change application is launched. These documents include, but are not limited to the following: **NSDP** (National Spatial Development Perspective); **PGDS NC** (Provincial Growth and Development Strategy), Northern Cape Province; **IDP** (Integrated Development Plan); **SDF** (Spatial Development Framework).

The planning specialist will furthermore likely engage with the following authorities as part of the planning process.

- Kai !Garib Municipality for approval in terms of the relevant Zoning Scheme;

Where relevant, these authorities will also be engaged with as part of the EIA Process and will be given an opportunity to provide input and comment on this

- Northern Cape Department of Agriculture as well as the National Department of Agriculture, Forestry & Fisheries (DAFF) for approval in terms of Act 70 of 70 (SALA) and Act 43 of 83(CARA);
- District Roads Engineer;
- Department of Water and Sanitation (DWS) for comment in terms of the National Water Act;
- Department of Mineral Resources for approval in terms of Section 53 of Act 28 of 2002;
- Department of Transport & Public Works;
- South African Heritage Resource Agency (SAHRA) ;
- Civil Aviation Authority;
- Eskom Northern Cape; and
- Northern Cape Nature Conservation.

5. SITE DESCRIPTION AND ATTRIBUTES

The following sections provide a description of the natural environmental and built environment context of the Geel Kop Farm No 456 RE, with particular focus on the site location for the proposed Duneveld PV.

5.1 LOCATION & BUILT ENVIRONMENT

The target property, Geel Kop Farm No 456 RE, is located in the ZF Mgcawu District (previously Siyanda District) of the Northern Cape Province, within the jurisdiction area of the Kai !Garib Local Municipality. The property is approximately 4117.3628 in size and is located approximately 14km East of Keimoes.

The proposed Duneveld PV is accessed and is situated directly north of the N14 between Upington and Keimoes.

No buildings, ruins or any other structures were noted on or within the direct proximity of the proposed Duneveld PV site.

5.2 GEOLOGY & CLIMATE

The following information relating to geology and climate was obtained from the Agricultural Specialist; please refer to Appendix E4 for a full copy of his report.

5.2.1 Geology & Soils

The area lies in the Kalahari geological group of the Namaqualand metamorphic complex. This is the youngest of the geological groups formed in the past 65 million years. The lithology (mineralogical composition and texture of rocks) of this area consists of:

5.2.1.1 Sand

During a very dry period in Southern Africa some 100 000 years ago sand was transported from the Namib dessert by strong and continuous winds and distributed over the Kalahari.

5.2.1.2 Limestone

Limestone is a sedimentary rock consisting largely of calcium-carbonate, which is usually derived from the shells of minute marine or fresh-water animals. Sand, clay and minerals such as magnesia or iron oxide are also present.

Sedimentary and Volcanic rocks (parent material of soils) found in the area include Migmatite, Schist, Gneiss, Kinzigite and granite.

5.2.1.3 Soil

Calcic soils are prone to develop under the climatic conditions and geology of the area.

Calcic soils originate in arid climates with the accumulation of secondary lime, forming a distinctive horizon consisting chiefly of calcite. In calcic soils either hardpan carbonate or a soft carbonate horizon or (rarely) gypsic horizon dominates the morphology of the sub-soil.

AGIS indicates the typical profile for soils in this region as follows:

- Soils with minimal development, usually shallow, on hard or weathering rock, with or without intermittent diverse soils;
- Lime generally present in part or most of the landscape;
- Red and yellow well drained sandy soil with high base status;
- Freely drained, structure less soils;
- Favourable physical properties; and
- Soils may have restricted soil depth, excessive drainage, high erodibility and low natural fertility.

5.2.2 Climate

The region is classified as an arid zone with desert climate. Specific parameters are shown in the table below.

Table 13: Climatic parameters of associated with Duneveld PV.

Rainfall	
Annual rainfall	0-200mm
Summer rainfall	<62.5mm
Winter rainfall	<62.5mm
Variation in rainfall	<62.5mm40 – 50 %
Temperature	
Mean maximum temperature	>35°C
January Temperature	>27.5°C
Mean Minimum Temperature	2-4°C
July Temperature	<7.5°C
Temperature range	>15°C
First frost expected	21-31 May
Last frost expected	01 – 10 September
Hours of sunshine	>80%
Evaporation	>2400mm
Humidity	<30%

5.3 TOPOGRAPHY

The terrain type is labelled as Rolling or irregular plains with some relief and Level plains with some relief. The Slope is less than 5%.

5.4 BOTANICAL COMPOSITION OF THE SITE

Dr David Hoare of David Hoare Consulting (Pty) Ltd undertook a Botanical Impact Assessment which formed part of larger Ecological Impact Assessment Report. Please refer to the Ecological Impact Assessment attached in **Annexure E1** from which the following has been drawn.

5.4.1 Broad-Scale Vegetation Patterns

The study area is located in the Kalahari Karroid Shrubland (Least threatened) and Bushmanland Arid Grassland[22] (Least threatened) vegetation types. The study area is not located in a threatened

[22] Only the Access road crosses Bushmanland Arid Grassland. The PV facility is situated entirely within Kalahari Karroid Shrubland.

ecosystem. The Lower Gariep Alluvial Vegetation threatened ecosystem is located south of the study area.

Kalahari Karroid Shrubland vegetation type is endemic to the Northern Cape Province. The vegetation type is characteristic of forming belts alternating with belts of Gordonia Duneveld on plains northwest of Upington through Lutzputs and Noenieput to the Rietfontein/Mier area in the north. Other patches occur around Kakamas and north of Groblershoop. The unit is also found in the neighbouring Namibia. The vegetation can be described as low karroid shrubland on flat, gravel plains. Karoo-related and northern floristic elements such as shrubs meet here, indicating a transition to the Kalahari region and sandy soils. Altitude varies mostly from 700 - 1100 m.

The conservation target is set at 21% with very little statutorily conserved in the Augrabies Falls National Park. Although only a small area has been transformed many of the belts of this type were preferred routes for early roads, thus promoting the introduction of alien plants (about a quarter of the unit has scattered *Prosopis* species). Erosion is very low (94%) (Mucina & Rutherford, 2012).

Table 14: Attributes of the Kalahari Karroid Shrubland vegetation type.

Name of vegetation type	Kalahari Karroid Shrubland
Code	NKb5
Conservation Target (percent of area) from NSBA	21%
Protected (percent of area) from NSBA	0.1%
Remaining (percent of area) from NSBA	99.2%
Description of conservation status from NSBA	Least threatened
Description of the Protection Status from NSBA	Hardly protected
Area (km^2) of the full extent of the Vegetation Type	8283.90
Name of the Biome	Nama-Karoo

The Bushmanland Arid Grassland vegetation type occurs only in the Northern Cape Province. It spans about one degree of latitude from around Aggeneys in the west to Prieska in the east. The southern border of the unit is formed by edges of the Bushmanland Basin while in the northwest this vegetation unit borders on desert vegetation (northwest of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. Most of the western border is formed by the edge of the Namaqualand hills. Altitude varies mostly from 600–1200m. The conservation target is set at 21% with only small patches statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed. Erosion is very low (60%) and low (33%) (Mucina & Rutherford, 2012.

Table 15: Attributes of Bushmanland Arid Grassland

Name of vegetation type	Bushmanland Arid Grassland
Code as used in the Book - contains space	NKb3
Conservation Target (percent of area) from NSBA	21%
Protected (percent of area) from NSBA	0.4%
Remaining (percent of area) from NSBA	99.4%
Description of conservation status from NSBA	Least threatened
Description of the Protection Status from NSBA	Hardly protected
Area (km^2) of the full extent of the Vegetation Type	45478.96
Name of the Biome	Nama-Karoo

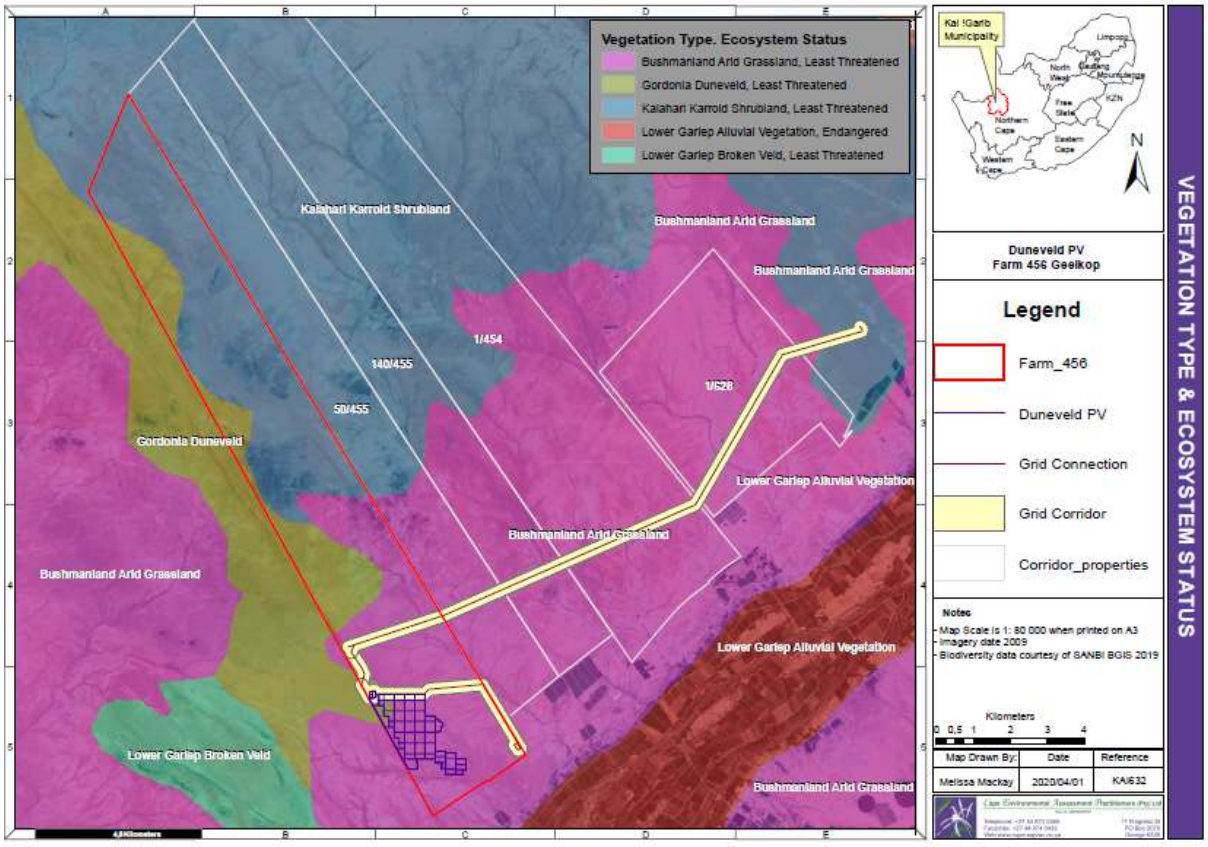

Figure 24: Regional vegetation types and conservation status in relation to Duneveld PV. Only Lower Gariep Alluvial Vegetation is classified as endangered and does not occur within the study site.

5.4.2 Habitats & Plant Communities

The botanical specialist identified the following broad natural habitat units on Geel Kop Farm No 456 RE:

1. Plains vegetation (dwarf karroid shrubland);
2. Dune ridges:
3. Rocky outcrops (high rock cover areas);
4. Hills vegetation (more diverse karoo with high rock cover); and
5. Depressions (temporary pans);
6. Drainage lines;
7. Dry stream beds and associated riparian vegetation.

Of these identified for the entire property, only the following 3 occur within or adjacent to the Duneveld PV development footprint.

1. Plains vegetation (dwarf karroid shrubland);
2. Drainage lines;
3. Dry stream beds and associated riparian vegetation.

The location of these habitat types within Duneveld PV are shown in the Figure below.

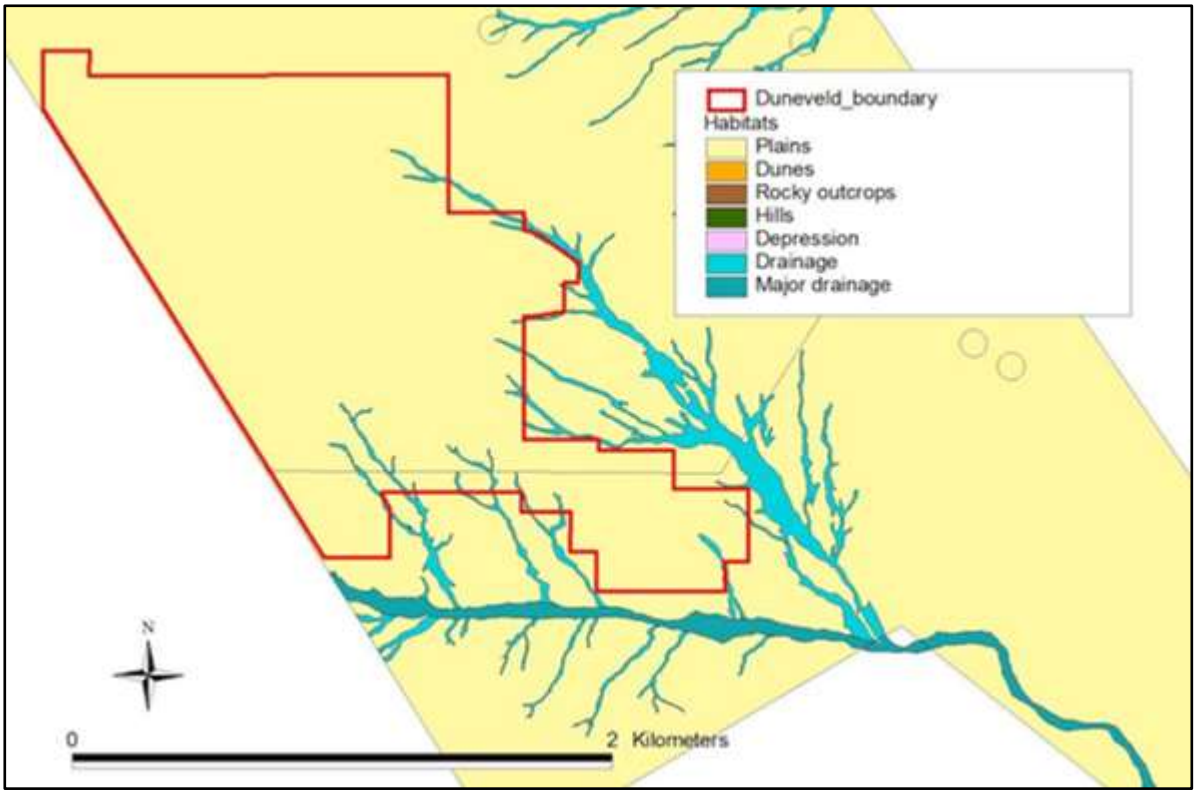

Figure 25: Habitat Types within Duneveld PV (Hoare, 2020)

These three habitat types are described in more detail in the following sub-sections.

5.4.2.1 Plains vegetation

The general study area is characterised by a low karroid dwarf shrubland, typical of one of the two regional vegetation types that converge here, Kalahari Karroid Shrubland, which is described as “Low karroid shrubland on flat, gravel plains.”. A typical view of this vegetation is shown in the figure below.

Figure 26: Typical example of Plains vegetation (Hoare, 2020)

The general floristic character of this vegetation on site is fairly uniform across wide areas, often dominated by the same suite of species, including Rhigosum trichototum, Caroxylon calluna, Justicia australis, Galenia africana, Limeum aethiopicum, Tribulus pterophorus, Indigofera alternans, Enneapogon cenchroides, Tragus berteronianus, Senegalia mellifera, Blepharis mitrata, Aptosimum spinescens, Aptosimum procumbens, Roepera lichtensteiniana, Stiparostis uniplumis and Eriocephalus sp.. However, any local variation in topography can lead to localized increase in richness associated with a more diverse species composition. Localised rock outcrops add habitat diversity.

5.4.2.2 Dry Drainage lines and Riparian vegetation

There is a network of dry stream beds throughout the lower-lying areas of the study area, with smaller streams eventually joining together to form larger systems further downstream. In the hilly areas these start as dry drainage lines, but these are not mapped as part of this unit since they reflect the characteristics of the surrounding vegetation rather than that of being a unique habitat. Where the dry streams occur as a unique habitat, they consist of a sandy or rocky bed, often unvegetated or sparsely vegetated, bordered by a line of shrubs or small trees. The smaller drainage areas are only recognizable by the increased density of more woody shrubs, such as Rhigozum obovatum, Asparagus suaveolens and Lycium cinereum, as well as Senegalia mellifera. As they increase in size, they tend to develop a channel of sand.

Figure 27: Typical Example of Drainage Lines and Riparian Vegetation (Hoare, 2020)

5.4.2.3 Drainage Lines

As the stream beds get larger, the riparian fringe becomes more pronounced, often containing some large trees of Vachellia erioloba, there is a continuum from the smallest streams to the larger “rivers”. Other species typical of these areas are Senegalia mellifera, Asparagus suaveolens, Lycium cinereum, Boscia foetida, and Rhigosum trichotomum.

Figure 28: Typical Habitat within Drainage Lines (Hoare, 2020)

The habitat contains a combination of bare rock and deeper sands, so it is able to support a flora that is adapted to these substrate conditions, in addition to the sporadic flooding and scouring that takes place in these habitats as a result of rare large rainfall events. The thorn trees (and other shrubs) occur here because they are able to root deeply to access underground water, a source that is not available to other terrestrial habitats. Although not necessarily floristically sensitive, the habitat that is derived under these ecological conditions is critically important for fauna, providing food and shelter as well as corridors for undetected movement. In times of drought, riparian areas may offer the only slightly green vegetation as a source of food. The deeper sands are important for burrowing animals and the shrubs and low trees offer shelter and browse.

Riparian habitats are disproportionately important in terms of the proportion of the area that they occupy in the landscape – they probably occupy 5-10% of the landscape in total but provide a unique and important habitat for both flora and fauna. The plant species occurring within these habitats are not necessarily rare in a global sense, but degradation of this interconnected system can cause floristic loss and change in areas far removed from any impact. Maintenance of regional vegetation patterns therefore is dependent on maintaining the health and functionality of this component of the landscape. For this reason, and for the utilitarian importance to fauna, the riparian vegetation is considered to be ecologically sensitive.

5.4.3 Listed and Protected Plant Species

The botanical specialist provided details of red listed plants, plants protected in terms of NEMBA, plants protected in terms of the Northern Cape Nature Conservation Act as well as trees protected in terms of the NFA.

5.4.3.1 Red List plant species of the study area

Lists of plant species previously recorded in the study area were obtained from the South African National Biodiversity Institute (SANBI) website (http://newposa.sanbi.org/). These are listed in Appendix 1 of the Ecology Impact Assessment. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed by the specialist. There are seven species on this list that have a geographical distribution that could include the site.

The species on this list were evaluated to determine the likelihood of any of them occurring on site on the basis of habitat suitability. Of the species that are considered to occur within the geographical area under consideration, there is one threatened species that occurs in the study area, *Aloidendron dichotomum*. According to IUCN Ver. 3.1 (IUCN, 2001) this species is listed as Vulnerable. A total of 5 individuals were found on site within the footprint of proposed infrastructure or in close proximity to the boundary of these areas.

There are also two species listed as Near threatened (*Dinteranthus wilmotianus* and *Hoodia officinalis* subsp. *officinalis*) and two species listed as Declining (*Vachellia erioloba* and *Hoodia gordonii*) that could occur on site. A number of individuals of *Vachellia erioloba* were found on site. The other species were not found on site.

In summary, one Vulnerable plant species, *Aloidendron dichotomum*, and one Declining plant species, *Vachellia erioloba*, were found on site.

5.4.3.2 Protected plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 6 of the Ecology Impact Assessment. None of the species on this list were found on site, although several have a geographical distribution that includes the site.

5.4.3.3 Protected plants (Northern Cape Nature Conservation Act)

Plant species protected under the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009) are listed in Appendix 5 of the Ecology Impact Assessment. One species on this list, *Hoodia gordonii*, is also protected according to the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) and has been discussed above. A number of species were found on site that are protected according to the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009). From the reconnaissance survey, this includes the following: *Aloidendron dichotomum* (Asphodolaceae), *Aloe claviflora* (Asphodolaceae), *Aloe gariepensis* (Asphodolaceae), *Avonia albissima* (Anacampserotaceae), *Boscia foetida*, *Boscia albitrunca* (protected Provincially as well as according to the National Forests Act), *Mesembryanthemum sp.* (Aizoaceae), *Ruschia* sp. (Aizoaceae), *Euphorbia braunsii*, and *Nerine laticoma* (Amaryllidaceae). Despite not being threatened, any impacts on these species will require a permit from the relevant authorities. There is a possibility that additional protected species occur on site that were not detected during the field survey. Note that many of these species are widespread and not of any conservation concern, but protected due to the fact that the Northern Cape Nature Conservation Act, 2009 (Act 9 of 2009) protects entire families of flowering plants irrespective of whether some members are rare or common. The implication is that a comprehensive list of species occurring within the footprint of the proposed infrastructure is required and a permit application submitted for any of those listed as protected.

5.4.3.4 Protected trees

Tree species protected under the National Forest Act are listed in Appendix 2 of the ecology impact assessment. Those that have a geographical distribution that includes the study area are *Vachellia erioloba* (Camel Thorn, Kameeldoring), *Vachellia haematoxylon* (Grey Camel Thorn, Vaalkameeldoring), *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi) and *Euclea pseudebenus (*Ebony Tree, Ebbeboom).

The tree *Vachellia erioloba* occurs in dry woodland along watercourses in arid areas where underground water is present as well as on deep Kalahari sands. Two individuals of this species were found on site within proximity to the proposed footprint area of the solar array. They were associated with drainage areas / watercourses.

Vachellia haematoxylon occurs on deep Kalahari sand between dunes or along dry watercourses. No individuals were found on site or nearby.

Boscia albitrunca occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils. A small number of individuals of this species were found on the property, both within very close proximity to drainage lines, but none were found within the footprint of the solar array.

Euclea pseudobenus occurs in semi-desert and desert areas, usually along watercourses and in depressions. It could occur in hills or on flats. Its main distribution is closer to the Richtersveld and into Namibia. No individuals have been sighted close to Keimoes, but specimens have been recorded in the grid south and west of Kakamas. No individuals were recorded on site.

In summary, two species of protected trees were found on site, namely *Vachellia erioloba* and *Boscia albitrunca*. None of the individuals of these species were within the footprint of the proposed solar array.

5.5 TERRESTRIAL FAUNAL COMPONENT OF THE SITE

Dr David Hoare undertook a Faunal Impact Assessment which formed part of larger Ecological Impact Assessment Report. Please refer to the Ecological Impact Assessment attached in **Annexure E1** from which the following has been drawn.

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix 4 of the Ecology Impact Assessment. All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could potentially occur in the study area and have habitat preference that includes habitats available in the study area, are discussed further below.

5.5.1 Mammals

There are 64 mammal species that have a geographical distribution that includes the study area, of which six (6) are listed in a conservation category of some level (see Appendix 3 of the Ecology Impact assessment), as follows: Black Rhinoceros (CR), Hartmann's Mountain Zebra (EN), Cape Clawless Otter (NT), Leopard (VU), Dent's Horseshoe Bat (NT), and Littledale's Whistling Rat (NT). This is a relatively moderate diversity of mammals compared to other parts of South Africa. Based on the natural state of the study area and surrounding areas, it is considered likely that many of these species could occur on site, especially the smaller species, such as various rodents, insectivores and small predators. Listed species with a geographical range that includes the site are discussed in more detail below to evaluate the potential for them to occur on site.

5.5.1.1 Black Rhinoceros

The Black Rhinoceros (*Diceros bicornis bicornis*), listed as Critically Endangered, has a geographical distribution that includes the study area. The species is confined to formal conservation areas as well as a few individuals held on private land. **Although the habitat on site is suitable for this species, it does not occur there and would not be found there unless deliberately introduced.**

5.5.1.2 Hartmann's Mountain Zebra

Hartmann's Mountain Zebra (*Equus zebra hartmannae*), listed as Endangered in South Africa and Vulnerable regionally, is found in Namibia, southern Angola and the north-west parts of the Northern Cape. Ii inhabits rugges, broken mountainous and escarpment areas up to 2000 m in elevation where there is a diversity of grasses and a perennial water source. It has not been recorded in the grid in which

the site is found or any nearby grids. The habitat on site is only marginally suited to this species. There is therefore a low likelihood of it being found on site. **The proposed development is therefore highly unlikely to have any negative effect on the species.**

5.5.1.3 Cape Clawless Otter

The Cape Clawless Otter (*Aonyx capensis*), listed as Least Concern in South Africa and Near Threatened regionally, is widely but patchily distributed throughout South Africa, and is also the most widely found otter in Africa. It is aquatic and seldom found far from permanent water, which needs to be fresh. They may be found in seasonal rivers in the Karoo, provided suitable-sized pools persist. The site is within the known distribution of this species but there are no historical records for the grid in which the site is found or any nearby grids. There is no suitable habitat for this species on site. **It is therefore considered highly unlikely that it occurs on site.**

5.5.1.4 Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. In montane and rocky areas of the Western and Northern Cape, they prey on dassies and klipspringers. They have large home ranges, but do not migrate easily, males having ranges of about 100 km^2 and females 20 km^2. It has been recorded in the grid in which the site is located, as well as nearby grids. There is a medium to high probability of this species occurring on site, in which case it would be at very low densities. **The proposed project could displace individuals but is unlikely to have a significant effect on overall population densities.**

5.5.1.5 Den't Horseshoe Bat

Dent's Horseshoe Bat (*Rhinolophus dentei*), listed as Near Threatened, is widely but patchily distributed in west and southern Africa. In southern Africa it is found in Namibia, western Botswana and northern parts of South Africa. The global distribution includes the study area, but known siting's in South Africa are restricted to the Ghaap Plateau (between Olifantshoek and Vryburg, down towards Kimberley and De Aar). It is associated with arid savannah habitats where suitable roosting sites occur, which restricts it to broken country with rocky outcrops or suitable caves. Colonies are largely dependent on caves, caverns, crevices in rocky outcrops, abandoned mines and similar habitats. It is were to occur on site, which is not very likely, it would probably only be found in the rocky outcrops to the north of the current site. **It is considered possible but unlikely that it could occur on site and individuals could be affected by activities on site.**

5.5.1.6 Littledale's Whistling Rat

Littledale's Whistling Rat (*Parotomys littledalei*), listed as Near Threatened, has a narrow distribution in the driest parts of southern Africa, from the western regions of South Africa north into Namibia and mostly along a narrow strip of desert. It has been recorded in the grid in which the site is located as well as two surrounding grids and some nearby grids. It is found in Desert and Karoo on sandy or gravel open plains. It tends to excavate burrow beneath a shrub, but will also construct stick nest at the base of a shrub. It is herbivorous, favouring leaves of Zygophullum and Mesembryanthemaceae. **It is considered possible and likely for it to occur in the study area and the proposed development could therefore affect this species**.

5.5.2 Reptiles

A total of 62 reptile species have a geographical distribution that includes the general study area in which the site is found (Alexander & Marais 2007, Bates et al. 2014, Branch 1988, Marais 2004, Tolley & Burger 2007). This is a fairly high potential diversity compared to average diversity in other parts of the country. Of the reptile species that could potentially occur in the study area, none are listed in a threat category.

There are therefore no reptile species of conservation concern that could potentially occur in the study area and that may therefore be affected by the proposed project

5.5.3 Amphibians

A total of only 9 frog species have a geographical distribution that includes the general study area in which the site is found (Du Preez & Carruthers 2009). Some of these species are only marginally present in the study area due to the fact that their distribution range ends close to the study area. Of the frog species that could potentially occur in the study area, none are listed in a threat category. Note that the Giant Bullfrog was previously listed as Near Threatened, but it is currently assessed as Least Concern, although still listed in legislation as protected.

It is concluded that the site contains habitat that is suitable for various frog species, although **no species of conservation concern are likely to occur in the study area**.

5.5.4 Protected animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7*". Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 6 of the Ecology Impact Assessment. This includes the following species: White Rhinoceros (does not occur on site), Black Rhinoceros (does not occur on site), Hartmann's Mountain Zebra (unlikely to occur on site), Cape Clawless Otter (unlikely to occur on site), Leopard, Cape Fox, and Giant Bullfrog .

Due to habitat and forage requirements, and the fact that some species are restricted to game farms and/or conservation areas, only the Leopard, Cape Fox, and Giant Bullfrog have any likelihood of occurring on site. Two of these species are mobile animals (Leopard and Cape Fox) that are likely to move away in the event of any activities on site disturbing them. However, the Giant Bullfrog, if it occurs on site, may be dependent on a small patch of habitat within their range to exist there. They could therefore be affected by the proposed development of the project.

5.6 AVIFAUNAL COMPONENT OF THE STUDY SITE

An Avifaunal Impact Assessment, including pre-construction avifaunal monitoring was undertaken by Chris van Rooyen. Please refer to the Avifaunal Impact Assessment Report attached in Appendix E2 for a full copy of this report. The following details on the avifaunal component of the site are summarised from this specialist report. The section below describes species that could potentially occur on site as well as those physically observed during the pre-construction monitoring.

5.6.1 Southern African Bird Atlas 2

The SABAP 2 data indicate that a total of 203 bird species could potentially occur in the broader area – Appendix 2 in the Avifaunal Impact Assessment provides a comprehensive list of all the species, including those recorded during the pre-construction monitoring. Of the priority species potentially occurring in the broader area, 35 could potentially occur in the study area. Eight (8) of these are South African Red Data species, and 5 are globally Red listed. The probability of a priority species occurring in the study area is indicated in the table below.

Table 16: Priority species which could potentially occur in the study area (Van Rooyen, 2020)

Species	Taxonomic name	Status				Class				Habitat			Impact					
		SABAP2 full protocol reporting rate	Red Data Global	Red Data Regional	Endemic/near endemic - South Africa	Waterbird	Raptor	Probability of occurrence	Recorded during surveys	Arid shrubland and rocky outcrops	Arid grassland	Surface water: Pans	Collision: PV panels	Displacement: Disturbance PV	Displacement: Habitat loss PV	Entrapment in fences	Displacement: Disturbance grid construction	Electrocutions: substations and inverter stations
Abdim's Stork	*Ciconia abdimii*	9.66	LC	NT				Low		x		x		x	x	x	x	
African Sacred Ibis	*Threskiornis aethiopicus*	51.14				x		Low				x		x				
Barn Owl	*Tyto alba*	19.89					x	High		x	x			x			x	x
Black-eared Sparrowlark	*Eremopterix australis*	5.68			Near endemic			High	x	x	x	x	x	x	x			
Black-headed Heron	*Ardea melanocephala*	29.55				x		High			x	x		x	x			
Black-shouldered Kite	*Elanus caeruleus*	28.41					x	High		x	x	x		x	x		x	
Blacksmith Lapwing	*Vanellus armatus*	55.68				x		Medium				x		x				
Booted Eagle	*Aquila pennatus*	6.25					x	High		x	x	x		x	x		x	
Cattle Egret	*Bubulcus ibis*	61.36				x		Low		x	x	x		x				
Common Greenshank	*Tringa nebularia*	3.98				x		Low				x		x				
Common Ostrich	*Struthio camelus*	1.70						High		x	x	x		x	x		x	
Common Sandpiper	*Actitis hypoleucos*	2.27				x		Low				x		x				
Egyptian Goose	*Alopochen aegyptiacus*	59.66				x		High	x			x		x				x
Fiscal Flycatcher	*Sigelus silens*	15.34			Near endemic			High		x	x	x	x	x	x			
Greater Kestrel	*Falco rupicoloides*	3.98					x	High		x	x			x	x		x	x
Hamerkop	*Scopus umbretta*	31.25				x		Medium				x		x				
Karoo Korhaan	*Eupodotis vigorsii*	35.23	LC	NT				Very high	x	x	x			x	x	x	x	
Kori Bustard	*Ardeotis kori*	5.11	NT	NT				High	x	x	x	x		x	x	x	x	

Species	Taxonomic name	SABAP2 full protocol reporting rate	Red Data Global	Red Data Regional	Endemic/near endemic - South Africa	Waterbird	Raptor	Probability of occurrence	Recorded during surveys	Arid shrubland and rocky outcrops	Arid grassland	Surface water: Pans	Collision: PV panels	Displacement: Disturbance PV	Displacement: Habitat loss PV	Entrapment in fences	Displacement: Disturbance grid construction	Electrocutions: substations and inverter stations
Lanner Falcon	*Falco biarmicus*	10.80	LC	VU			x	High		x	x	x	x	x	x		x	x
Ludwig's Bustard	*Neotis ludwigii*	3.41	EN	EN				Medium	x	x				x	x	x	x	
Martial Eagle	*Polemaetus bellicosus*	2.27	VU	EN			x	High		x	x	x		x	x		x	x
Pearl-spotted Owlet	*Glaucidium perlatum*	2.27					x	Medium			x			x	x		x	
Pygmy Falcon	*Polihierax semitorquatus*	7.39					x	High		x	x	x	x	x	x		x	
Rock Kestrel	*Falco rupicolus*	6.82					x	High		x	x			x	x		x	
Secretarybird	*Sagittarius serpentarius*	1.14	VU	VU			x	Medium		x	x	x		x	x	x	x	
South African Shelduck	*Tadorna cana*	22.73				x		Medium				x		x				
Southern Pale Chanting Goshawk	*Melierax canorus*	15.34					x	Very high	x	x	x	x	x	x	x			x
Spotted Eagle-owl	*Bubo africanus*	2.27					x	High		x	x	x	x	x	x		x	x
Spur-winged Goose	*Plectropterus gambensis*	18.18				x		Medium				x		x				
Steppe Buzzard	*Buteo vulpinus*	2.27					x	Low		x	x	x		x	x			x
Tawny Eagle	*Aquila rapax*	0.00	VU	EN			x	High	x	x	x	x		x	x		x	x
Three-banded Plover	*Charadrius tricollaris*	38.07				x		Medium				x		x				
White-faced Duck	*Dendrocygna viduata*	13.64				x		Low				x		x	x			
Wood Sandpiper	*Tringa glareola*	7.95				x		Low				x		x				
Yellow-billed Duck	*Anas undulata*	9.66				x		Low				x		x	x			

5.6.2 Pre-construction surveys

On-site surveys were conducted from 25 - 29 February and again from 02 - 03 March 2020 (7 days in total).

The abundance of species recorded during the walk transects and focal points are displayed in the figures below . A total of 291 individual birds were counted at the 16 focal points in the course of the surveys.

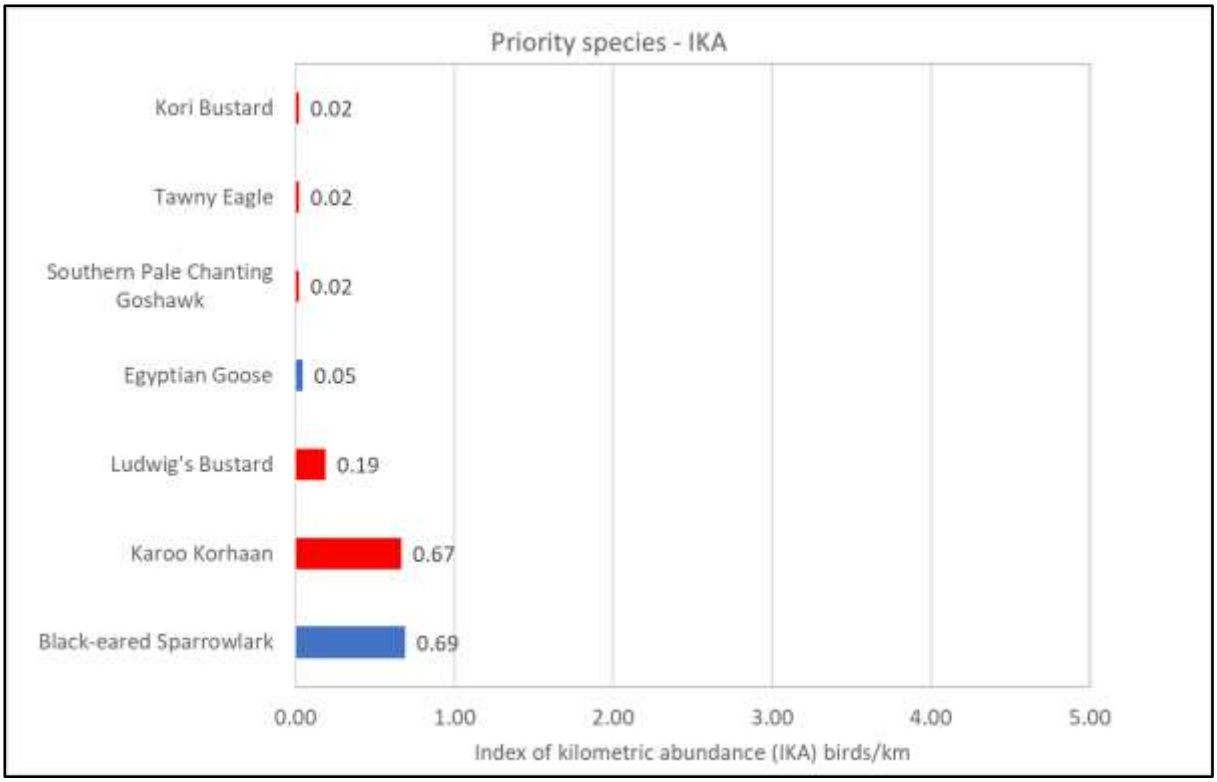

Figure 29: Index of kilometric abundance for all priority species recorded by means of walk transects during the surveys in the study area (van Rooyen, 2020)

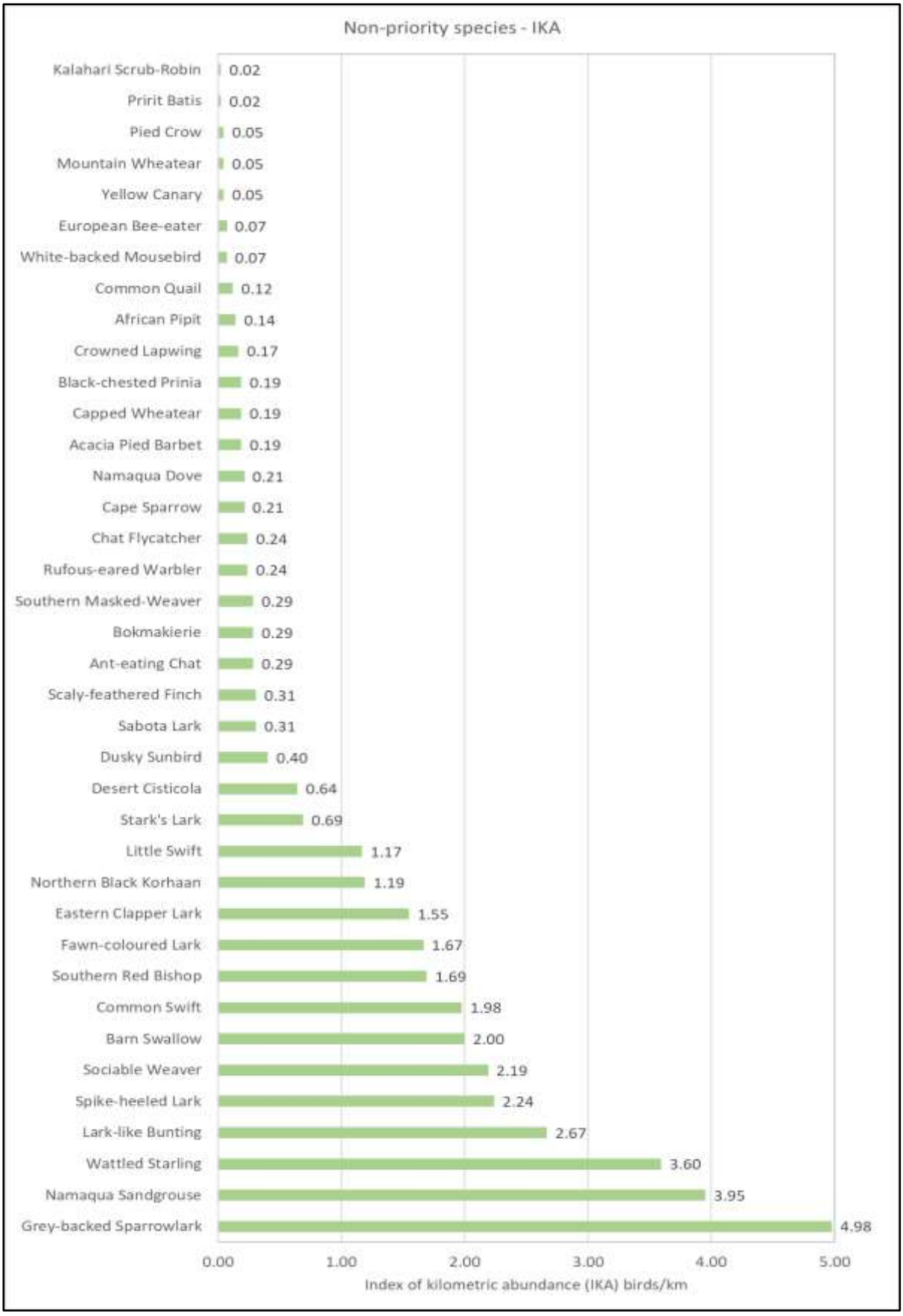

Figure 30: Index of kilometric abundance for all non-priority species recorded by means of walk transects during the surveys (van Rooyen, 2020)

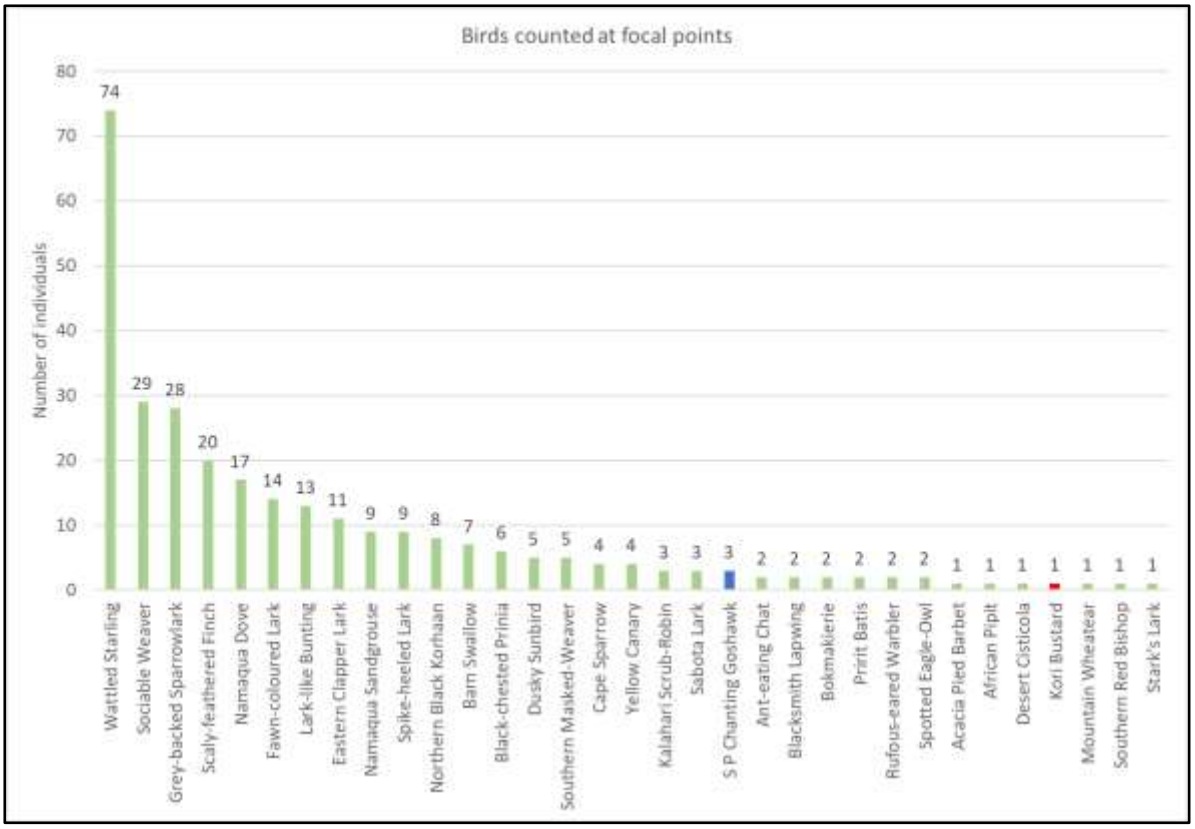

Figure 31: The variety and number of birds counted at focal points in the study area (van Rooyen, 2020)

5.7 AQUATIC COMPOSITION OF THE STUDY SITE

Dr Brian Colloty undertook a freshwater resource assessment for the proposed Duneveld PV. The section below details the aquatic composition of the project area, as determined during his study.

The proposed development occurs within the D73F catchment associated with alluvial systems of the Nama Karoo ecoregion. These mainstem watercourses are short tributaries of the Orange River (ca. 3 km from the development area), which are ephemeral in nature and did not contain any wetland elements within the development footprint. This lack of wetlands is an important consideration, as the study area has been highlighted in the Department of Environment Forestry and Fisheries (DEFF) Screen Tool.

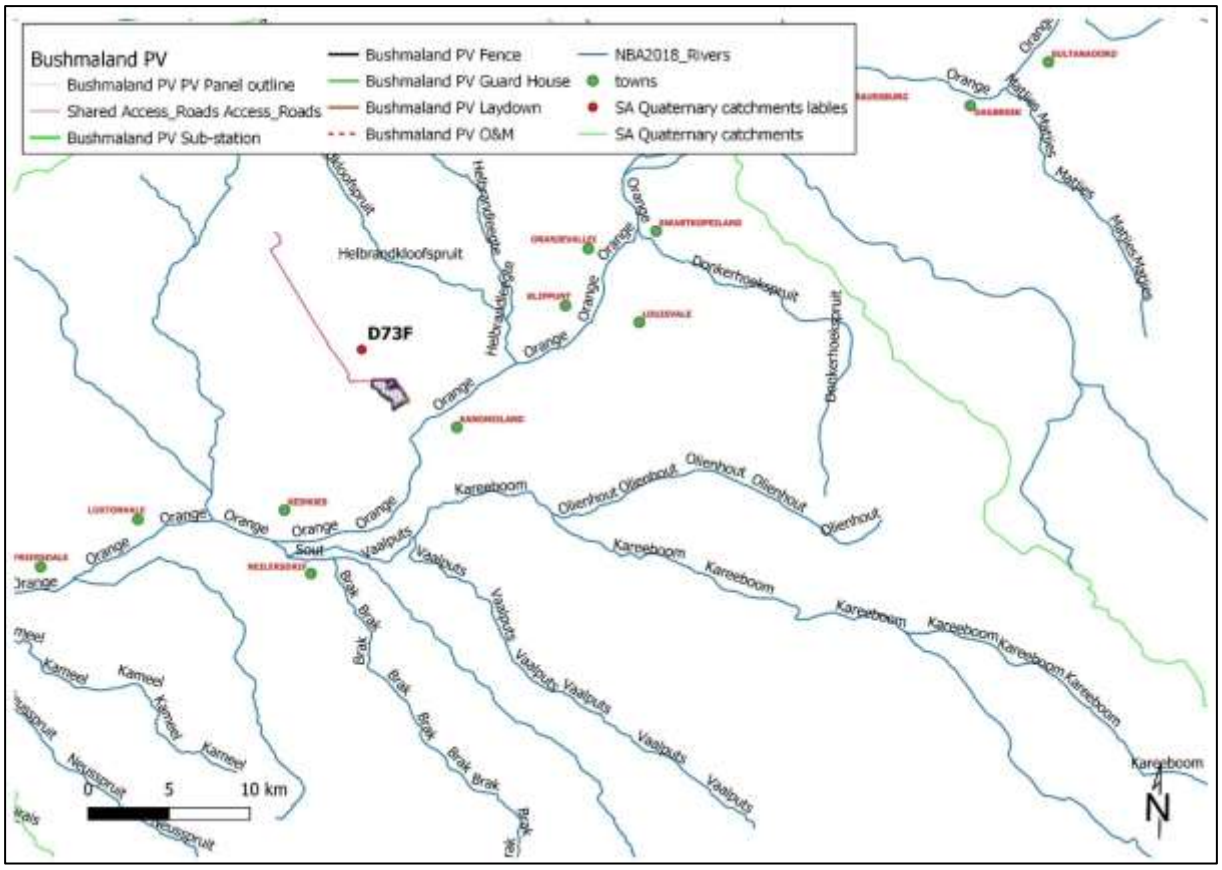

Figure 32: Project locality map indicating the various quaternary catchment boundaries (green line) in relation to the development area

Overall, these watercourses are largely in a natural state, when compared to those associated with the Orange River reach, which has modified floodplains and flows. Current and existing impacts occur in localised areas within the development area and includes existing tracks and evidence of grazing (small livestock).

The only wetland observed, included one depression, located more than 500m from the study site, but not affected by any development activities associated with this project. The National Wetland Inventory v5.2 spatial data (NWI), only indicated riverine floodplains which were confirmed as alluvial channels in that database withing the western boundary of the development area, as well as pans/depressions to the north and to the west of the area. The potential presence of these wetlands and the pans, resulted in the development area, receiving a Very High Aquatic sensitivity rating in the DEFF Screening Tool. It should be noted that several of pans contained in the NWI did not exist and only those delineated in this assessment were actually observed.

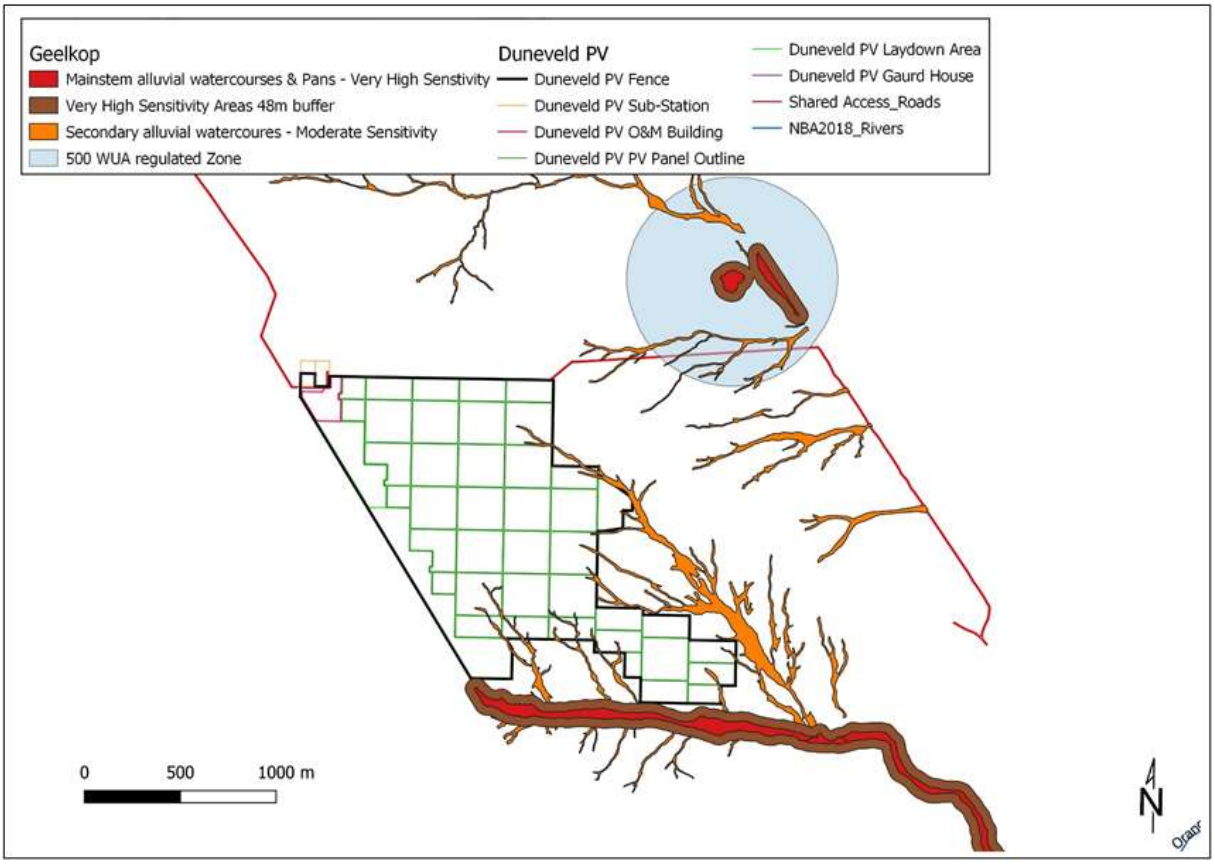

Figure 33: Delineated wetlands (pans) and watercourses in relation to the activities, with buffers, sensitivity ratings and the 500m regulated WULA zone.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all the systems within the development area have been assigned a condition score of AB (Nel et al. 2011), indicating that they are largely intact and perform an ecological function. However, the development area systems are ephemeral and only carried water for a short periods as previously mentioned, thus the observed systems do not support any wide riparian zones and the vegetation associated with these watercourses were between 0.65 m and 16 m wide and contain mostly terrestrial species.

Fourteen woody plant species were found associated with the riparian and pan systems within the development area. Although none of these were obligate or facultative river/wetland species, they do show a preference for areas exposed to runoff. Species within the development area were dominated by *Vachellia erioloba* (Camel Thorn, Kameeldoring), *Vachellia haematoxylon* (Grey Camel Thorn), *Boscia foetida* (Stink Shepard's Tree) and *Euclea pseudebenus* (Ebony Tree), all protected under the National Forest Act.

The few grass or forbs species were successfully identified were all associated with the regional vegetation type, namely Bushmanland Arid Grassland.

The only obligate wetland plants observed were those found along the Orange River itself. Species observed included *Typha capensis, Phragmites australis, Prosopis glandulosa* and *Cyperus marginatus*. Notably the prevalence of *Prosopis*, an alien invasive tree species had increased between 2010 and this survey within the sites that had been visited previously by this report author. However, none of the project components would affect these species or habitats that they occur in, both from a hydrological and physical disturbance standpoint.

The National Freshwater Ecosystems Priority Areas (NFEPA) (Nel *et al*., 2011), also earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the

priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs). The development area falls within a Fish FSA (Fish Support Area or Fish Sanctuary), associated with the Orange River. Although no permanent fish habitat occurs within the proposed development, Fish Sanctuaries are sub-quaternary catchments that are required to meet biodiversity targets for threatened and near threatened fish species indigenous to South Africa. Furthermore, Fish sanctuaries in sub-quaternary catchments associated with a river reach in good condition (A or B Ecological Category) were selected as FEPAs; the remaining fish sanctuaries became Fish Support Areas.

Fish Support Areas also include sub-quaternary catchments that are important for migration of threatened and near threatened fish species. Thus, any river reaches within Fish Support Areas need to be maintained in a condition that supports the associated populations of threatened fish species, which need not necessarily be an A or B ecological category.

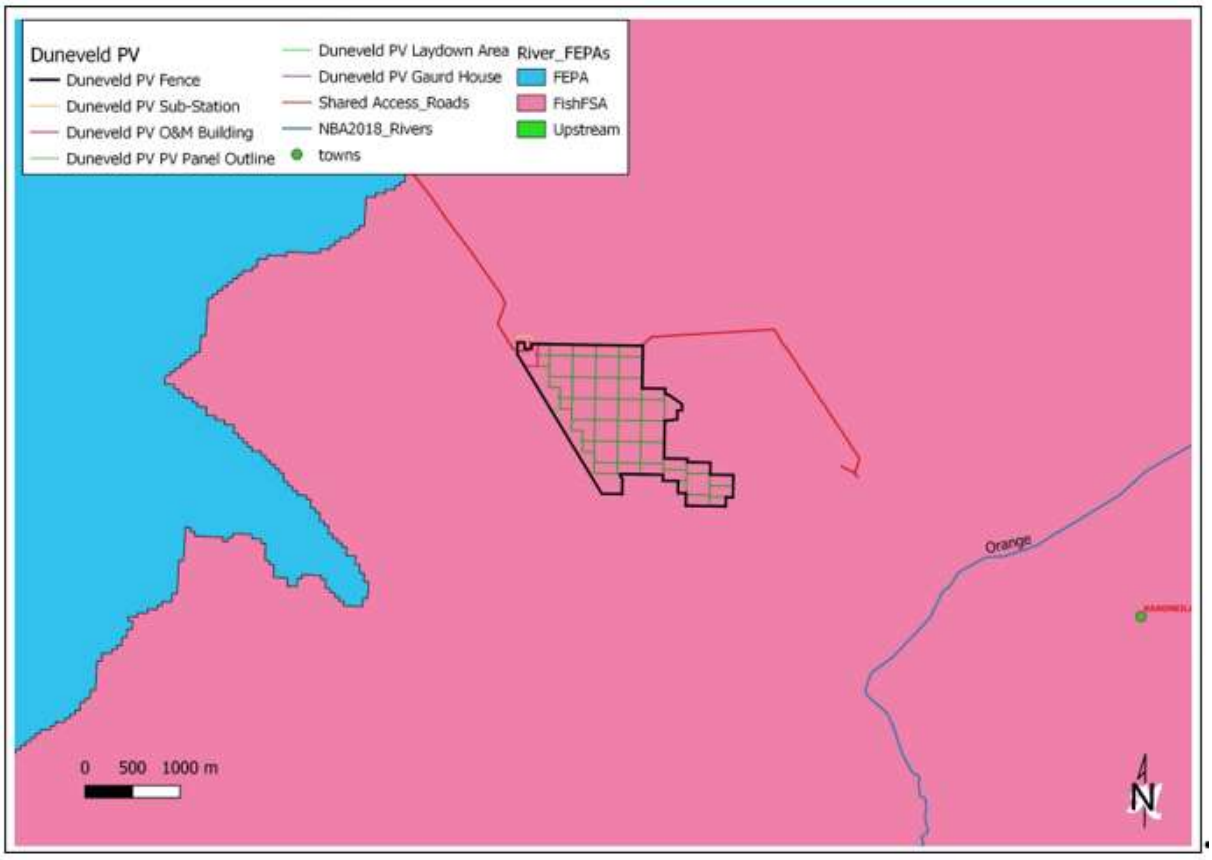

Figure 34: The respective sub quaternary catchments rated in terms of Freshwater Ecosystem Priority Areas (FEPAs) in relation to the development area

5.8 SOCIO ECONOMIC CONTEXT

This section is summarised from the Social Impact Assessment undertaken by Mr Tony Barbour (Appendix E8) and provides an overview of the spatial context of the Province, District Municipality, and Local Municipality within which Duneveld PV is proposed for development, and provides the socio-economic basis against which potential issues can be identified.

5.8.1 Spatial Context of the Northern Cape Province

The Northern Cape Province is located in the north-western extent of South Africa and comprises South Africa's largest province; occupying an area 372 889km² in extent, equivalent to nearly a third (30.5%) of the country's total land mass. It is also South Africa's most sparsely populated province with a

population of 1 145 861, and a population density of 3.1/km². It is bordered by the Provinces of Western Cape, and Eastern Cape Provinces to the south, and south-east; Free State, and North West Provinces to the east; Botswana and Namibia, to the north; and the Atlantic Ocean to the west. The Northern Cape is the only South African province which borders Namibia, and therefore plays an important role in terms of providing linkages between Namibia and the rest of South Africa. The Orange River is a significant feature, and is also the main source of water in the Province, while also constituting the international border between the Northern Cape and Namibia.

The Northern Cape offers unique tourism opportunities including wildlife conservation destinations, natural features, historic sites, festivals, cultural sites, stars gazing, adventure tourism, agricultural tourism, ecotourism, game farms, and hunting areas, etc. The Province is home to the Richtersveld Botanical and Landscape World Heritage Site, which comprises a United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site under the World Heritage Convention. The Northern Cape is also home to 2 Transfrontier National Parks, namely the Kgalagadi Transfrontier Park, and the Richtersveld /Ai-Ais Transfrontier Park, as well as 5 national parks, and 6 provincial reserves.

The Northern Cape also plays a significant role in South Africa's science and technology sector, as it is home to the SKA, the SALT, and the MeerKAT.

The Northern Cape makes the smallest contribution to South Africa's economy (contributing only 2% to South Africa's Gross Domestic Product per region (GDP-R) in 2007). At 26% the mining sector is the largest contributor to the provincial GDP. The Northern Cape's mining industry is of national and international importance, as it produces approximately 37% of South Africa's diamond output, 44% of its zinc, 70% of its silver, 84% of its iron-ore, 93% of its lead and 99% of its manganese.

In 2007 the agricultural sector contributed 5.8% to the Northern Cape GDP per region which was equivalent to approximately R1.3 billion. The agricultural sector also employs approximately 19.5% of the total formally employed individuals (LED Strategy). The sector is experiencing significant growth in value-added activities, including game-farming; while food production and processing for the local and export market is also growing significantly (PGDS, July 2011). Approximately 96% of the land is used for stock farming; including beef cattle and sheep or goats, as well as game farming; while approximately 2% of the province is used for crop farming, mainly under irrigation in the Orange River Valley and Vaalharts Irrigation Scheme (LED Strategy).

5.8.2 Spatial Context of the District[23]

The ZF Mgcawu District Municipality (ZFMDM) consists of six Local Municipalities namely, Dawid Kruiper; Kai !Garib; //Khara Hais; Tsantsabane, !Kheis and Kgatelopele, and covers an area of more than 100 000 km² (almost 30% of the Northern Cape Province). Of this total, 65% (65 000 km²) is made up of the Kalahari Desert, Kgalagadi Transfrontier Park and the former Bushman Land. The largest town in the region is Upington, which also functions as the district municipal capital. Following the municipal elections in 2011, Riemvasmaak (Sending and Vredesvallei) were included within the KGLM. The Riemvasmaak Community is located ~ 60 km west of Kakamas. Based on the Household Community Survey data the population of the ZFMDM was 252 692 in 2016 compared to 236 763 in 2011. The DLKM and KGLM are home to ~ 70 % of the ZFMDM population (Table 3.1).

Table 17: Population of Local Municipalities within the ZFMDM

Local Municipality	Population	Percentage
Dawid Kruiper	107 161	42.4%
Kai !Garib	68 929	27.3%
Tsantsabane	39 345	15.6%
!Kheis	16 566	7.5%
Kgatelopele	20 691	8.2%

[23] ZF Mccawu District Municipality

The Coloured population group make up the dominant group in the ZFMDM, DKLM and KGLM, followed by Black Africans and Whites. In terms of language, Afrikaans, followed by Setswana and IsiXhosa are the three main languages spoken in the area.

The ZFMDM accounts for ~ 30% of the Northern Cape economy. Agriculture plays a key role in the local economy and is strongly linked to irrigation along the Gariep River (Orange River). The Orange River is perennial with a flow which varies between 50 and 1800 cubic meter per second (cum/s) depending on the season. The flow of the river is largely controlled by the releases of the dams upstream, like the Bloemhof, Gariep and Van der Kloof dams. Agriculture in the ZFMDM is dominated by grape production for table grapes, which is mainly exported to Europe, as well as livestock and game farming.

The Orange River over area delivers a major part is that South Africa's table grape production. More than 90% of Africa's total dried vine fruit production is produced in the Northern Cape. The Orange River Wine Cellars Co-op, based in Upington, is the second largest winemaking cooperative in the world and has wine cellars in Groblershoop, Grootdrink, Upington, Keimoes and Kakamas.

Livestock farming occurs mainly on large farms where farming is extensive. The majority of the farms are privately owned. The central parts of the region consist mainly of semi-desert areas and are therefore, with few exceptions, mainly suitable for extensive livestock farming. In terms of employment, the most important economic sectors are Agriculture, followed by Community, Social and Personal, and Private Households.

Tourism represents one of the most important economic sectors in the Northern Cape as well as within the ZFMDM. In this regard the ZFMDM IDP indicates that tourism is the fastest growing component of the economy. Key tourism assets include the world renowned Kgalagadi Transfrontier Park, Augrabies National Park and Pitskop Nature Reserve near Upington.

Minerals and mining also play an important role in the local economy of the ZFMDM. Key mining activities include copper and zinc of Areachap north of Upington. Various small concentrations of calcite, lead, fluorspar, barite, wolfram and amethyst. Salt is also being mined at two pans, namely Groot Witpan, 95 km northwest of Upington and at Witpan, 115km northwest of Upington. In terms of social well-being the ZFMDM's greatest social challenges are illiteracy, poverty and low education levels.

5.8.3 Spatial context of the Local Munigipality[24]

The proposed facility is located in the KGLM, a category-B municipality[25]. The municipality is approximately 7 445 km² in size (~7.2% of the ZFMDM) and is bordered to the north, south and west by a District Management Area (NCDMA08) and in the east by the //Khara Hais and !Kheis Local Municipalities. In terms of land use, the Kai !Garib Local Municipality is largely rural and agricultural with three urban/semi-urban nodes at Kakamas, the designated administrative centre of the municipality, Keimoes and Kenhardt.

The Orange River (Gariep River) plays a key role in the day to day life of most of the inhabitants in the KGLM and is critical to the area's economic well-being. The main towns of Kakamas and Keimoes are situated in the midst of an intensive irrigation farming community stretching from Groblershoop in the east up to Blouputs in the west. Farming includes crops such as vineyards, pecan nut- and citrus plantations. Local areas within the KGLM where intensive irrigation is undertaken include Blouputs, Eksteenskuil, Riemvasmaak and Cannon Island.

The KGLM also has two unique trust communities that in many ways functions differently than other communities. The first is Riemvasmaak which is located ~ 60 km west from Kakamas and falls with

[24] Kai !Garib

[25] A category-B municipality is defined as a municipality that shares executive and legislative authority in its area with a category- C municipality within whose area it falls.

Ward 1 of the municipality. The Riemvasmaak community consists of ~ 250 households and were forcefully removed from their land in 1973 and returned in 1994. The Riemvasmaak Community Trust is divided in two sections namely Vredesvallei and Mission.

Of relevance to the proposed development is the second Trust community, the Blocuso Trust Community, which consists of 3 farms, namely, Bloemsmond, Curriescamp and Soverby. These farms are located in Ward 8, ~ 10 km north east of Keimoes. The community of Bloemsmond is located immediately to the south of the site. The farms were handed over to the three families by Queen Victoria in 1886. However, the properties were forcefully resold to white farmers in 1914 and the previous owners became farm workers. The Independent church of Gordonia under the leadership of Ds Saul Damon bought back the farms between 1914 and 1934. In 2000 the government assisted the 466 families on the three farms to buy the farms from the church. The communities established the Blocuso Trust and used the government subsidies to buy the farms and provide basic services like electricity and clean water. Since the Blocuso Trust was established the government have provided the trust with great assistance in terms of infrastructure projects.

The Municipal Area is divided into 9 wards (Table 3.2). The proposed SEF is located in Ward 8.

Table 18: List of Wards in the KGLM

Ward	Areas
1	Augrabies, Noudonsies, Zeekoeisteek, Blouput Riemvasmaak
2	Cillie, Marchand, Perde-eiland, Omdraai
3	Kakamas Dorp, Alheit, Bloukamp, Truterkamp
4	Kromhout Boerdery, Kakamas Oos (Langverwag), Neus
5	Lennertsville, Koms, Keimoes Dorp, Akasia Park
6	Gardenia, Whalsig, Noodkamp, Vaaldriehoek
7	Lutzburg, Friersdale, Warmsand, Eenduin, Swartbooisberg, Bloemsmond,
8	Eksteenskuil Eilande, Soverby, McTaggerscamp, Curriescamp, Blaauwsekop, Kanoneiland
9	Kenhardt, Southern Farms

5.9 VISUAL CONTEXT

Mr Jon Marshall of Environmental Planning and Design undertook a Visual Impact Assessment of the proposed Duneveld PV. The following visual context was determined from this study.

5.9.1 Landscape character

The topography of the region is relatively homogenous and is described pre-dominantly as lowlands with hills and dune hills to the north. Relatively prominent small hills occur towards the west and south-west of the study area.

The terrain surrounding the farm is predominantly flat with an even south-eastern slope towards the Orange River valley that forms a distinct regional hydrological feature. The surrounding area is generally comprised of fairly flat-lying terrain between Inselbergs or isolated steep rocky outcrops. The inselbergs in the vicinity of the site are concentrated to the north and north-west of the site where they form the upper valley slopes and ridgelines.

There are four minor non-perennial watercourses, that drain the site towards the north, east and south into two more major non-perennial channels. These larger non-perennial water courses drain directly into the Orange River to the south of the site.

Whilst the region surrounding the site is relatively flat, a degree of relief is provided by minor ridgelines that formed by an historic dune field that runs in a general northwest to southeast direction at regular intervals. From the air, these minor ridgelines appear as a series of waves in the arid landscape. These ridgelines rise between three and five metres above the valley floor. Whilst they are minor they are likely to have a visual influence in that they will provide some visual screening for relatively low structures.

The non-perennial water courses that flow into the Orange River at intervals fall from the undulating plain into the Orange River Valley, due to the intermittent quantity of water that flows through the

channels and also due to the slightly steeper gradient as they fall towards the Orange River, they have created larger and slightly deeper valleys than can be found on the plain. This is particularly obvious when driving along the N14 which is located on the edge of the river valley. This section of road passes through valleys that are approximately 15m deep from floor to the crest of the ridgelines. These valley lines are likely to have significant influence over the visibility of the project from the road.

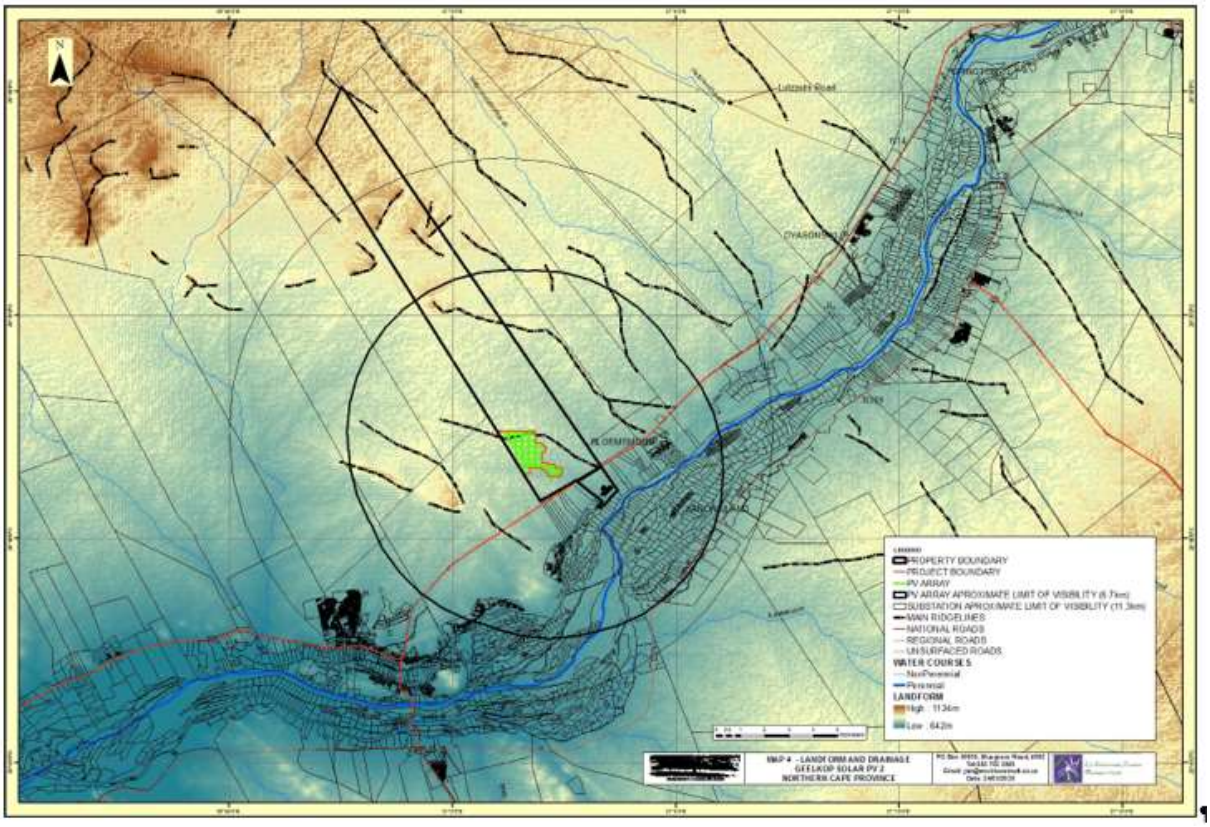

Figure 35: Landform and Drainage in the vicinity of Duneveld PV.

The Orange River has, to a large degree, dictated the settlement pattern in this arid region by providing a source of perennial water for the cultivation of grapes and cotton. This and the associated production of wine and dried fruit (raisins and sultanas) are the primary agricultural activity of this district.

The majority of cultivation and settlement in the region occurs around the Orange River.

Upington is a major regional centre that lies approximately 24km to the northeast of the Project Site. Due to distance and the relatively flat terrain, the proposed project will not have any visual impact on this area.

In the vicinity of the proposed project there are extensive vineyards within the Orange River Valley.

Settlement in the form of small townships and groups of farm buildings are located on the edges of the river valley and within the cultivated areas. This cultivation and settlement generally extends to the N14 which runs along the upper edge of the River Valley. Because the majority of settlement is within the River Valley and at a lower level than the project site, it is likely that the proposed development will be largely screened, particularly from settlement located on the northern side of the Orange River.

Other than areas located around the Orange River, settlement in the region is sparse.

5.9.2 Visual receptors

Visual Receptors are defined as “individuals and / or defined groups of people who have the potential to be affected by the proposal

It is possible that an area might be sensitive due to an existing use. The nature of an outlook is generally more critical to areas that are associated with recreation, tourism and in areas where outlook is critical to land values.

The visual receptors include:

- Area Receptors which include the minor urban settlement areas that are located within the Orange River Corridor LCA. From the site visit it appears that the majority of settlement areas relate to agricultural use of the River Valley. It is likely that the residents of these minor settlements are predominantly focused on agricultural production of the area. As these settlements are located within the River Valley LCA, it is also likely that views of the proposed development particularly from the northern side of the valley will be difficult. However, vegetation within the River Valley will help screen views of the proposed development that may be possible from the valley;
- Linear Receptors or routes through the area that include the N14, the R359, the Lutzputs road and the Upington to Kakamas Spur Railway Line. Both the N14 and the R359 roads have tourism significance, although the N14 is possibly the most important in this regard. The Lutzputs road is an unsurfaced road that runs approximately 15.3km to the north east of the subject property, this road is likely to be mainly used by local people. The Upington to Kakamas Spur Railway Line is used for transporting goods and so is not considered further;
- Point Receptors that include individual homesteads that are located both within the River Valley LCA and the Plateau LCA. From the site visit, it is unlikely that individual homesteads on the northern side of the Orange River will have views over the proposed development. It is however possible that homesteads on the higher sections on the southern side of the valley could have views of the proposed development. These however will be distance views and they are likely to be softened by vegetation on the fringes of the River Valley.

6. IMPACT ASSESSMENT

This section was of the report was completed with input from the following specialists:

- Terrestrial Ecology (David Hoare, 2020)
- Avifauna (Chris van Rooyen, 2020)
- Botany (David Hoare, 2020)
- Freshwater Ecology (Brian Colloty, 2020)
- Agricultural (Christo Lubbe, 2020)
- Palaeontology (Marion Bamford, 2020)
- Archaeology and Heritage (Jaco van der Walt, 2020)
- Visual (Jon Marshall, 2020)
- Socio Economic (Tony Barbour, 2020)
- Traffic Impact Assessment (JG Afrika, 2020).
- Geotechnical Assessment (GCS, 2020)

The impacts will firstly be discussed per specialist discipline and then summarised in the impact summary and statement below[26].

[26] The assessment tables reflected in this section are those of the preferred site alternative. Please see the discussion in section 2.4 above for impacts associated with alternatives.

6.1 ASSESSMENT METHODOLOGY

All possible impacts need to the assessed – the **direct, in-direct as well as cumulative impacts**. Impact criteria should include the following:

- **Nature of the impact:** impacts associated with the proposed Hotazel Solar have been described in terms of whether they are negative or positive and to what extent.
- **Duration of impacts: Impact were assessed in terms of their anticipated duration:**
    - Short term (e.g. during the construction phase)
    - Medium term (e.g. during part or all of the operational phase)
    - Permanent (e.g. where the impact is for all intents and purposes irreversible)
    - Discontinuous or intermittent (e.g. where the impact may only occur during specific climatic conditions or during a particular season of the year)
- **Intensity or magnitude: The size of the impact (if positive) or its severity (if negative):**
    - Low, where the receiving environment (biophysical, social, economic, cultural etc) is negligibly affected or where the impact is so low that the remedial action is not required;
    - Medium, where the receiving environment (biophysical, social, economic, cultural etc) is altered, but not severely affected, and the impact can be remedied successfully; and
    - High, where the receiving environment (biophysical, social, economic, cultural etc) would be substantially (i.e. to a very large degree) affected. If a negative impact, could lead to irreplaceable loss of a resource and/or unacceptable consequences for human wellbeing.
- **Probability: Should describe the likelihood of the impact actually occurring indicated as:**
    - Improbable, where the possibility of the impact is very low either because of design or historic experience;
    - Probable, where there is a distinct possibility that the impact will occur;
    - Highly probable, where it is most likely that the impact will occur; or
    - Definite, where the impact will occur regardless of any prevention measures.
- **Significance: The significance of impacts can be determined through a synthesis of the assessment criteria. Significance can be described as:**
    - Low, where it would have negligible effect on the receiving environment (biophysical, social, economic, cultural etc), and on the decision;
    - Medium, where it would have a moderate effect on the receiving environment (biophysical, social, economic, cultural etc), and should influence the decision;
    - High, where it would have, or there would be a high risk of, a large effect on the receiving environment (biophysical, social, economic, cultural etc). These impacts should have a major influence on the decision;
    - Very high, where it would have, or there would be a high risk of, an irreversible negative impact on the receiving environment (biophysical, social, economic, cultural etc) and irreplaceable loss of natural capital/resources or a major positive effect on human well-being. Impacts of very high significance should be a central factor in decision-making.
    - Provision should be made for with and without mitigation scenarios.
- **Confidence: The level of confidence in predicting the impact can be described as:**

- Low, where there is little confidence in the prediction, due to inherent uncertainty about the likely response of the receiving ecosystem, or inadequate information;
- Medium, where there is a moderate level of confidence in the prediction, or
- High, where the impact can be predicted with a high level of confidence

- **Consequence**: **What will happen if the impact occurs**
  - Insignificant, where the potential consequence of an identified impact will not cause detrimental impact to the receiving environment;
  - Significant, where the potential consequence of an identified impact will cause detrimental impact to the receiving environment.
  - Provision must be made for with and without mitigation scenarios.

The impacts should also be assessed in terms of the following aspects:

- **Status of the impact**

  The specialist should determine whether the impacts are negative, positive or neutral ("cost – benefit" analysis). The impacts are to be assessed in terms of their effect on the project and the environment. For example, an impact that is positive for the proposed development may be negative for the environment. It is important that this distinction is made in the analysis.

- **Cumulative impact**

  Consideration must be given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts must be evaluated with an assessment of similar developments planned and already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.

  Care must be taken to ensure that where cumulative impacts can occur that these impacts are considered and categorised as **additive** (incremental or accumulative); **interactive**, **sequential** or **synergistic**.

Based on a synthesis of the information contained in the above-described procedure, the specialists assessed the potential impacts in terms of the following significance criteria:

- **No significance**: The impacts do not influence the proposed development and/or environment in any way.
- **Low significance**: The impacts will have a minor influence on the proposed development and/or environment. These impacts require some attention to modification of the project design where possible, or alternative mitigation.
- **Moderate significance**: The impacts will have a moderate influence on the proposed development and/or environment. The impact can be ameliorated by a modification in the project design or implementation of effective mitigation measures.
- **High significance**: The impacts will have a major influence on the proposed development and/or environment.

6.2 IDENTIFICATION OF IMPACTS ASSESSED

This section simply lists the potential key impacts identified and assessed by the various specialists (more details on the significance and ratings of these impacts are provided in section 6.4 – 6.11 below and in the specialist reports attached in Appendix E).

6.2.1 Ecological Impacts Assessed

6.2.1.1 Construction Phase Impacts

Direct impacts

- Loss and/or fragmentation of indigenous natural vegetation due to clearing;
- Loss of individuals of plant species of conservation concern and/or protected plants;
- Loss of faunal habitat and refugia;
- Direct mortality of fauna due to machinery, construction and increased traffic;
- Displacement and/or disturbance of fauna due to increased activity and noise levels;
- Effects on physiological functioning of vegetation due to dust deposition;
- Increased poaching and/or illegal collecting due to increased access to the area.

Indirect impacts

- Indirect impacts during the construction phase include the following:
- Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation;
- Changes to behavioural patterns of animals, including possible migration away or towards the project area;
- Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas.

6.2.1.2 Operational Phase Impacts

Direct impacts

- Ongoing direct impacts will include the following:
- Continued disturbance to natural habitats due to general operational activities and maintenance;
- Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure;

Indirect impacts

- These will include the following:
- Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
- Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;
- Changes to behavioural patterns of animals, including possible migration away or towards the project area;
- Positive potential impact on climate change due to generation of electricity without the need for coal mining or burning of coal, currently the main form of power generation in South Africa.

6.2.1.3 Decommissioning Phase Impacts

Direct impacts

- These will include the following:
- Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites;
- Direct mortality of fauna due to machinery, construction and increased traffic;
- Displacement and/or disturbance of fauna due to increased activity and noise levels;
- Effects on physiological functioning of vegetation due to dust deposition;

Indirect impacts

- These will occur due to renewed disturbance due to decommissioning activities, as follows:

- Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors;
- Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape;
- Changes to behavioural patterns of animals, including possible migration away or towards the project area;

Cumulative impacts

- Loss and/or fragmentation of indigenous natural vegetation due to clearing;
- Loss of individuals of plant species of conservation concern and/or protected plants;
- Changes to ecological processes at a landscape level;
- Mortality, displacement and/or disturbance of fauna;
- General increase in the spread and invasion of new habitats by alien invasive plant species;
- Reduction in the opportunity to undertake or plan conservation, including effects on CBAs and ESAs, as well as on the opportunity to conserve any part of the landscape;
- Loss of the wilderness character of the area;
- Positive cumulative impact on climate change.

6.2.2 Avifaunal Impacts Assessed

- Displacement due to disturbance associated with the construction of the Duneveld PV plant and associated infrastructure.
- Displacement due to habitat transformation associated with the construction of the Duneveld PV plant and associated infrastructure
- Collisions with the solar panels
- Entrapment in perimeter fences
- Electrocutions in the onsite substation and inverter station
- Displacement due to disturbance associated with the decommissioning of the Duneveld PV plant and associated infrastructure

6.2.3 Freshwater Impacts Assessed

- Loss of Very High Sensitivity systems, namely the mainstem alluvial water course and a pan through physical disturbance although the proposed layout will avoid any of these systems
- Impact on secondary alluvial water courses (Moderate Sensitivity), through physical disturbance
- Impact on all riparian and wetland systems through the possible increase in surface water runoff on riparian form and function through hydrological changes
- Increase in sedimentation and erosion
- Risks on the aquatic environment due to water quality impacts
- Cumulative impacts

6.2.4 Heritage Impacts Assessed

Construction Phase

- Impact on scenic routes during construction

Operational Phase

- Impacts on the heritage resources.
- Impact on scenic routes.
- Impact of new structures on cultural landscape and character.

Cumulative impacts

- Change to the rural character.

- Socio-economic upliftment.

6.2.5 Archaeological Impacts Assessed

Construction Phase

- Disturbance to surface and sub-surface sediments

Operational Phase

- None

Cumulative Impacts

- No cumulative impacts will arise

6.2.6 Visual Impacts Assessed

Construction Phase

- Visual scarring as a result of new development, clearing vegetation and construction works.

Operational Phase

- Change in the rural visual character of the site.
- Visual impact on key visual receptors and secondary visual receptors.
- Potential visual.
- Visibility from sensitive receptors.
- Visual intrusion of lighting at night.

6.2.7 Socio-Economic Impacts Assessed

Construction Phase

- Creation of business and employment opportunities
- Impacts associated with the presence of construction workers on site;
- Security and safety impacts associated with the presence of construction workers;
- Noise, dust and safety impacts associated with construction related activities and the movement of heavy vehicles.

Operational Phase

- Creation of employment and business opportunities;
- Impact on rural sense of place and character of the area;
- Crime levels and pressure on local services.

6.2.8 Traffic Impacts Assessed

- Traffic Congestion
- Noise pollution due to increased traffic.
- Air quality affected by dust pollution

6.3 SITE SENSITIVITY CONSTRAINTS AND POTENTIAL RISKS & IMPACTS

The following spatial site-specific constraints were identified by various specialists and the EAP during the initial stage of the environmental process.

Table 19: Summary of potential site constraints identified during the initial phase of the BAR Process and which are assessed in the section below.

Specialist Discipline	Site Constraints
Flora:	Sensitive vegetation associated with the koppies, water courses and pans.

Specialist Discipline	Site Constraints
Fauna	Sensitive habitat associated with the koppies, water courses and pans.
Avifauna	Habitat and Avifaunal Flight paths associated with the koppies and pans
Agricultural	No specific spatial constraints identified.
Heritage	None
Visual	Scenic Receptors

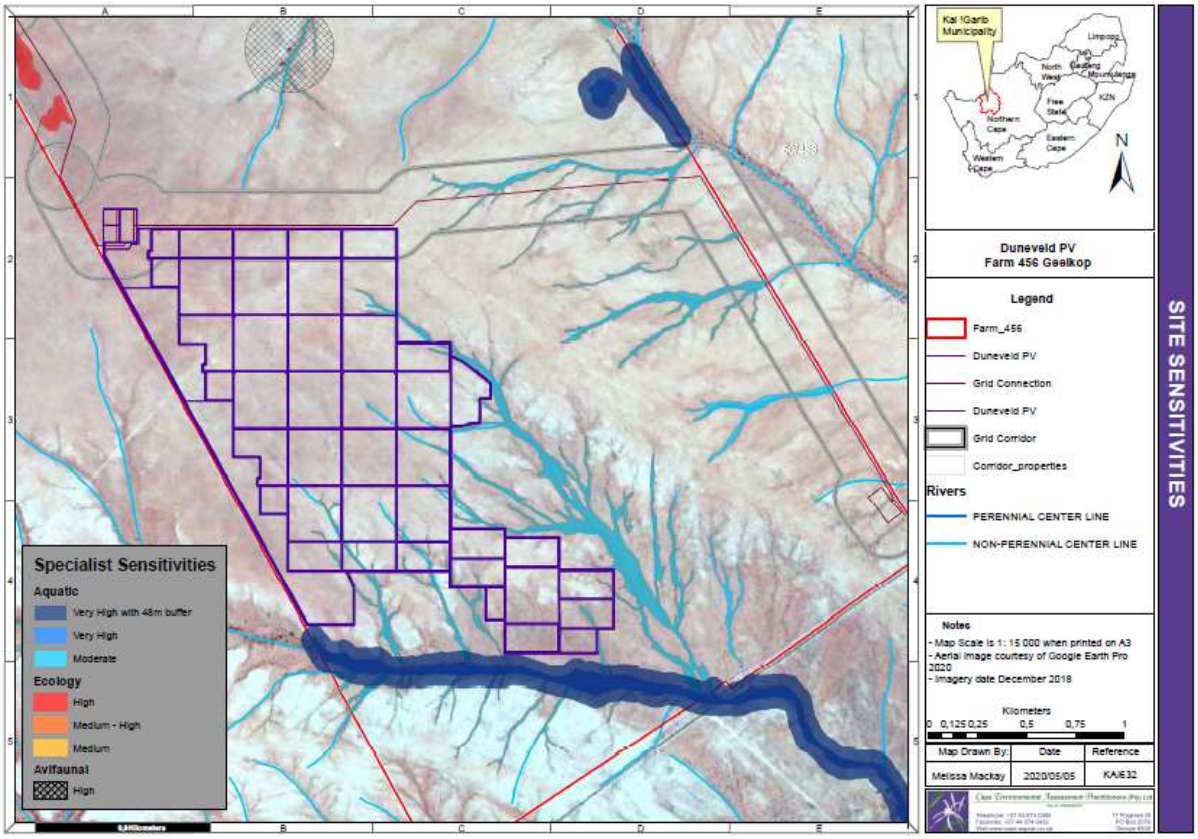

Figure 36: Showing sensitive features and buffer areas identified within and in proximity to the Duneveld PV[27].

Kindly refer to section 2.9 and section 2.10 above and the detailed layout plan in Appendix D for details as to how the preferred alternative incorporated these sensitive features.

All high and very high sensitive features were avoided and excluded from the preferred layout. Impacts on the remainder of the features were able to be effectively mitigated (See section 7 for detailed mitigation measures).

6.4 TERRESTRIAL ECOLOGY IMPACTS

An Ecological Assessment (encompassing Terrestrial Fauna, Avifauna and Botany) was undertaken by Dr David Hoare. A copy of this assessment is attached in **Annexure E1.** The following impact

[27] The moderate sensitivity aquatic features are on the exact same positions as the medium-high terrestrial ecology features. As such, the medium – high ecological features are are not visible on this map, due to them covering the same spatial extent of the aquatic features.

descriptions, tables with assessment of the impacts and concluding statement was provided by the specialist.

6.4.1 Construction Phase Terrestrial Ecology Impacts

- **Loss and/or fragmentation of indigenous natural vegetation due to clearing**

The regional vegetation type in the broad study area is a combination of Bushmanland Arid Grassland, Kalahari Karroid Shrubland and Gordonia Duneveld, classified in the scientific literature as Least Threatened (Mucina *et al*., 2008) and not listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). Any areas of natural habitat within this regional vegetation type are therefore considered to have moderate conservation value. The southern half of the site is included in a Critical Biodiversity Area (CBA2) for the Northern Cape and considered to have moderately high conservation value.

Vegetation on site is within a very arid region and consists of slow-growing dwarf shrubs and ephemeral herbs, some of which are partially succulent. These species are slow to grow and individuals are probably much older than they appear from their size. Disturbed areas are not likely to recover to any natural state and clearing must therefore be kept to an absolute minimum to avoid habitat degradation issues.

Habitat loss refers to physical disturbance of habitats through clearing, grading and other permanent to semi-permanent loss or degradation. Loss of habitat on site could lead to loss of biodiversity as well as habitat important for the survival of populations of various species. Habitat fragmentation will occur primarily through the construction of roads. Edge effects related to roads are difficult to quantify or predict, but anything within 50 m of a road is almost certain to be affected by the changed physical conditions.

All infrastructure components will require some level of clearing of vegetation prior to construction. However, the access roads, internal access roads, construction camps and pv arrays will cause the greatest loss of vegetation. The substations will also require vegetation clearing, but this will be much smaller areas in comparison to the other components. For all infrastructure components, loss of habitat will occur, but this will be relatively insignificant in comparison to the total area of the vegetation types concerned.

Table 20: Loss and/or fragmentation of indigenous natural vegetation.

Loss and/or fragmentation of indigenous natural vegetation	
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss, degradation or fragmentation of vegetation.
Extent	The impact will affect natural vegetation on site.
Probability	If the project is authorized then the impact will definitely happen.
Reversibility	Irreversible in human timeframes, since construction of roads and other hard surfaces completely remove vegetation and modify the substrate upon which it grows. Secondary vegetation in disturbed areas will probably never resemble the original vegetation found on site.
Irreplaceable loss of resources	Significant loss of resources will occur within the footprint of the proposed infrastructure since vegetation clearing is required prior to installation of infrastructure.
Duration	The impact will be permanent (mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient)
Cumulative effect	Medium cumulative impact. Added to existing impacts on natural habitat from activities in the general region as well as the nearby similar RE projects, the current project will cause additional loss of vegetation, the cumulative effect of which will be medium.
Intensity/magnitude	High. The functional integrity of vegetation on site will be compromised to some degree (especially in the sense that the quality, integrity and

	functionality of CBA areas will be affected, which can be limited to some extent by implementation of mitigation measures.	
Significance rating	Medium negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	4 (Definite)	4 (Definite)
Reversibility	4 (Irreversible)	4 (Irreversible)
Irreplaceable loss	3 (Significant loss of resources)	3 (Significant loss of resources)
Duration	4 (Permanent)	4 (Permanent)
Cumulative effect	4 (High)	4 (High)
Intensity/magnitude	3 (High)	2 (Medium)
Significance rating	**-60 (high negative)**	**-40 (medium negative)**
Mitigation measures	It is not possible to completely avoid impacts on indigenous vegetation for this project. The following mitigation measures would help to limit impacts: • Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. • As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores. • Avoid sensitive features and habitats when locating infrastructure. • Cross streams and other linear features at right angles, where possible, and also near their end-points or where there are natural breaks in the feature. • Construct adequate structures at points where roads cross watercourses, either proper stabilized dips in the road or culverts that do not limit the width of natural channels or the natural hydrological function. • No mass clearing of vegetation for the PV arrays should be allowed. Vegetation to be brush cut and only in exceptional circumstances completely cleared. • Compile a Rehabilitation Plan. • Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. • Where possible, access roads should be located along existing farm, access and district roads. • Access to sensitive areas outside of development footprint should not - be permitted during construction. • Undertake monitoring to evaluate whether further measures would be required to manage impacts.	

- **Impacts on listed or protected plant species**

Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat within which metapopulation dynamics occur (dispersal, recruitment, pollination, etc.).

There is one species listed as Vulnerable, *Aloidendron dichotomum*, five of which occur in or near the proposed infrastructure.

There is one species protected according to the National Forests Act, *Vachellia erioloba*, two of which were found on site during the field survey. No additional individuals were found on site during the field survey.

There are a number of species protected according to the Northern Cape Nature Conservation Act that were recorded on site during the walk-through survey. None of these are threatened species, but are protected according to Provincial legislation.

Table 21: Loss of individuals of protected plants.

Loss of individuals of protected plants		
Environmental parameter	Protected plants, as per NEM:BA or NCNCA or listed plants	
Issue/Impact/Environmental Effect/Nature	Loss of individuals occurring within the footprint of construction.	
Extent	The impact will affect local populations or individuals of the affected species.	
Probability	Based on the list of species that are protected or listed, the impact is certain to happen.	
Reversibility	Partly reversible. Where necessary, individuals can be rescued or else cultivated to replace lost specimens.	
Irreplaceable loss of resources	Marginal loss of resources could occur. The species that are likely to occur on site are likely to be relatively common throughout their range and they have very wide geographical ranges.	
Duration	The impact will be medium-term.	
Cumulative effect	Low cumulative impact. Cumulative effects will not be significant.	
Intensity/magnitude	Low. Loss of some individuals will be insignificant compared to the number that probably occur in nearby natural areas.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	4 (Definite)	4 (Definite)
Reversibility	4 (Irreversible)	4 (Irreversible)
Irreplaceable loss	2 (Marginal loss of resources)	1 (No loss of resources)
Duration	4 (Permanent	2 (Medium-term)
Cumulative effect	2 (Low)	1 (Negligible)
Intensity/magnitude	2 (Medium	1 (Low)
Significance rating	**-34 (medium negative)**	**-11 (low negative)**
Mitigation measures	A number of protected species were found on site. The following mitigation measures would help to avoid and limit impacts: • It is a legal requirement to obtain permits for specimens that will be lost. • A detailed pre-construction walk-through survey will be required during a favourable season to locate any additional individuals of protected plants. This survey must cover the footprint of all approved infrastructure, including internal access roads. • If possible, plants should be conserved *in situ*, along with an appropriate buffer zone around them. Consideration should be given to shifting infrastructure to avoid such plants, especially the Vulnerable *Aloidendron dichotomum.* If this is not possible, then the following measures may be implemented: • Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the irreplaceable loss of resources as well as the cumulative effect. • A Plant Rescue Plan must be compiled to be approved by the appropriate authorities.	

- **Loss of faunal habitat and refugia**

Construction activities will lead to direct loss of habitat favourable for various faunal species, including sites where mobile fauna would obtain refuge and sedentary fauna would have permanent homes. This could potentially affect all animal species occurring on site, although threatened and protected species

are of greater concern. There are two animal species of particular concern for this project, namely the Leopard (Vulnerable) and Littledale's Whistling Rat (Near Threatened), neither of which were seen on site, although they have been assessed as having a probability of occurring there. There are also other more mobile species that are protected by legislation, including the Cape Fox.

Table 22: Loss of faunal habitat and refugia.

Loss of faunal habitat and refugia		
Environmental parameter	Fauna of conservation concern (Leopard, Littledale's Whistling Rat)	
Issue/Impact/Environmental Effect/Nature	Displacement of individuals.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	No or low loss of resources will occur.	
Duration	The impact will be short-term (construction phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Low. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	3 (Probable)
Reversibility	3 (Barely reversible)	3 (Barely reversible)
Irreplaceable loss	2 (Marginal)	2 (Marginal)
Duration	4 (Permanent)	4 (Permanent)
Cumulative effect	2 (Low)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Medium)
Significance rating	**-30 (medium negative)**	**-15 (low negative)**
Mitigation measures	• Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. • Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, cliffs and riparian habitats. • All mitigation measures that apply to "Loss and/or fragmentation of indigenous natural vegetation" also apply here.	

- **Direct mortality of fauna due to machinery, construction and increased traffic**

There is a possibility that animals will be killed by machinery during construction, especially sedentary or relatively sedentary species, and those that move too slowly to move out of the path of construction. This will inevitably lead to mortality of individuals of such animals. There is also a possibility of collisions with vehicles due to increased traffic along roads and within the project area. Faunal mortalities may also be caused by electric fences, ingestion of waste material and/or accidental ensnarement.

Table 23: Mortality of fauna.

Mortality of individuals of fauna due to machinery, construction or increased traffic		
Environmental parameter	Fauna	
Issue/Impact/Environmental Effect/Nature	Loss of individuals.	
Extent	The impact will affect individuals on site.	
Probability	The impact will probably happen to some extent.	
Reversibility	Completely reversible. Impact is reversible with mitigation measures.	
Irreplaceable loss of resources	Marginal loss of resources will occur.	
Duration	The impact will be short-term (during construction phase only).	
Cumulative effect	Negligible cumulative impact.	
Intensity/magnitude	Low. Barely perceptible impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)

Probability	3 (Probable))	2 (Possible))
Reversibility	1 (Completely reversible)	1 (Completely reversible)
Irreplaceable loss	2 (Marginal)	2 (Marginal)
Duration	1 (Short-term)	1 (Short-term)
Cumulative effect	1 (Negligible)	1 (Negligible)
Intensity/magnitude	1 (Low)	1 (Low)
Significance rating	-9 (low negative)	-8 (low negative)
Mitigation measures	The following mitigation measures would help to avoid or limit impacts: • Access to sensitive areas outside of development footprint should not be permitted during construction. • Speed limits should be set for all roads on site, as well as access roads to the site. Strict enforcement of speed limits should occur – install speed control measures, such as speed humps, if necessary. • Night driving should be strictly limited and, where absolutely required, lower speed limits should apply for night driving. • Pre-construction walk-through on construction front must be undertaken to move any individual animals, such as tortoises, prior to construction. • No dogs or other pets should be allowed on site. • Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas. • If electric fences are to be constructed, these should be erected according to the standars of Nature Conservation authorities. • Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.	

- **Displacement of mobile terrestrial fauna**

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the site. Mobile species of conservation concern that could potentially be affected by the proposed project are as follows:

1. Leopard,
2. Cape Fox.

These are mobile terrestrial species with a large home range and the ability to travel long distances in short periods of time. Individuals may be locally displaced, but this will have little effect on the overall range of the species nor is it expected that any overall impacts will result from local displacement.

Table 24: Displacement of terrestrial fauna.

Displacement of individuals of mobile terrestrial fauna	
Environmental parameter	Mobile fauna of conservation concern (Honey Badger, Black-footed Cat, Leopard, Cape Fox and Grey Rhebok)
Issue/Impact/Environmental Effect/Nature	Displacement of individuals.
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.
Probability	The impact may possibly happen.
Reversibility	Partly reversible with time.
Irreplaceable loss of resources	No or low loss of resources will occur.
Duration	The impact will be short-term (construction phase).
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.
Intensity/magnitude	Low. May impact on population processes.
Significance rating	Low negative impact expected.

	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	1 (None)	1 (None)
Duration	1 (Short-term)	1 (Short-term)
Cumulative effect	1 (Low)	1 (Low)
Intensity/magnitude	1 (Low)	1 (Low)
Significance rating	**-8 (low negative)**	**-8 (low negative)**
Mitigation measures	• Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. • Access to sensitive areas outside of development footprint should not be permitted during construction. • No speeding on access roads – install speed control measures, such as speed humps, if necessary • No hunting of protected species. • Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. • Report any sitings to conservation authorities.	

- **Increased poaching and/or illegal collecting due to increased access to the area**

The site is in a relatively remote area with moderately low access to the public. More importantly, access to mountainous areas is limited due to it being on private land. There is therefore a relatively low risk of opportunistic or targeted poaching of plants or animals. The construction of roads into the project area and the increased amount of traffic from outside areas will increase the opportunity for poaching or illegal collecting.

From a botanical perspective, there are a number of plants in succulent or geophyte groups that are attractive to collectors. There are also animals, such as lizards and tortoises that may be attractive to collectors or vulnerable to opportunistic collection. Many of these groups are protected under national and/or provincial legislation, but this does not necessarily prevent ill-informed or determined collectors.

Poaching of animals or plants for meat or medicinal purposes is a separate risk that is also more likely to occur where physical access is created.

Table 25: Increased poaching and illegal collecting.

Increased poaching and/or illegal collection of plants and animals		
Environmental parameter	Any plants and/or animals that are attractive to collectors and/or poachers	
Issue/Impact/Environmental Effect/Nature	Loss of individuals / populations.	
Extent	The impact will affect individuals on site.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	Low to marginal loss of resources will occur.	
Duration	The impact will be permanent (duration of the life of the roads).	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Low)	2 (Low)
Duration	4 (Permanent)	4 (Permanent)
Cumulative effect	2 (Low)	1 (Low)
Intensity/magnitude	2 (Low)	1 (Low)
Significance rating	-26 (low negative)	-12 (low negative)

Mitigation measures	• Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species. • Implement strict access control for the site. • No hunting of protected species. • Report any illegal collection to conservation authorities.

- **Effects on physiological functioning of vegetation due to dust deposition**

There is a high risk during construction that dust will be created that will settle on surrounding vegetation. This will be due to earth-moving equipment as well as vehicles moving around on site as well as into and out of the site. There will be a definite increase in the amount of traffic on access roads to the site that will also affect surrounding areas.

Dust deposited on vegetation directly screens incoming radiation as well as affects stomatal gas-exchange. The combined effect is a reduction in fitness of affected vegetation which will lead to reduced potential growth rates , damage to leaves, and possibly reduced ability to resist pathogens.

In addition to direct effects on the vegetation, there is also a possibility that grazing animals will be affected through a reduction in palatability of plants, and increased silica on surfaces of edible plants that will possibly affect dental wear-and-tear.

Table 26: Vegetation damage due to dust deposition.

Impaired physiologivcal functioning of vegetation due to increased dust deposition.		
Environmental parameter	Vegetation	
Issue/Impact/Environmental Effect/Nature	Dust deposition, resulting in reduced physiological fitness of plants / vegetation.	
Extent	The impact will affect vegetation on site and in all areas with access roads leading to site.	
Probability	The impact will almost certainly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	Low to marginal loss of resources will occur.	
Duration	The impact will be permanent (duration of the life of the roads) for access roads (although only subject to high traffic volumes during construction, and short-term for construction areas.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	2 (Local)	2 (Local)
Probability	4 (Definite)	3 (Probable)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Low)	2 (Low)
Duration	1 (Short-term)	1 (Short-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-28 (low negative)**	**-12 (low negative)**
Mitigation measures	• No speeding on access roads – install speed control measures, such as speed humps, if necessary, and penalties for non-compliance. • Undertake dust fall-out monitoring and manage, where necessary.	

- **Establishment and spread of declared weeds and alien invader plants due to the clearing and disturbance of indigenous vegetation**

Major factors contributing to invasion by alien invader plants includes inter alia high disturbance (such as clearing for construction activities) and negative grazing practices (Zachariades et al. 2005). Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins *et al*., 2003). Consequences of this may include:

1. loss of indigenous vegetation;
2. change in vegetation structure leading to change in various habitat characteristics;
3. change in plant species composition;
4. change in soil chemical properties;
5. loss of sensitive habitats;
6. loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
7. fragmentation of sensitive habitats;
8. change in flammability of vegetation, depending on alien species;
9. hydrological impacts due to increased transpiration and runoff; and
10. impairment of wetland function.

Small existing populations of alien plants were seen on site or in nearby areas, the potentially most problematic species of which is *Prosopis glandulosa*. There is a high possibility that alien plants could be introduced to areas within the footprint of the proposed activities from surrounding areas in the absence of control measures. The potential consequences may be of moderate seriousness for affected natural habitats. Control measures could prevent the impact from occurring. These control measures are relatively standard and well-known.

Table 27: Establishment and spread of declared weeds.

Establishment and spread of declared weeds		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Loss of habitat due to invasion by alien plants	
Extent	The impact will affect habitat on site and possibly in immediately surrounding areas.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled invasion can affect all nearby natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. Severe invasion can alter the functioning of natural ecosystems.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	2 (Possible)
Reversibility	2 (Partly)	2 (Partly)
Irreplaceable loss	3 (Significant)	2 (Marginal)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-30 (medium negative)**	**-12 (low negative)**
Mitigation measures	It is possible to avoid impacts due to alien plant invasions by undertaking the following mitigation measures: • Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. This should include any areas within proximity to the project that may be	

	affected by the project, or that could have an influence on invasion by alien invasive plants into the property. • Undertake regular monitoring to detect alien invasions early so that they can be controlled. • Implement control measures.

- Changes to behavioural patterns of animals, including possible migration away or towards the project area

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Some of these changes could possibly increase levels of predation. Territorial species such as steenbok and klipspringer, will be negatively affected as well as species that live or move in the soil. These species might undergo a local reduction in their population size.

Table 28: Changes in behavioural patterns of animals.

Changes in behavioural patterns of fauna		
Environmental parameter	Mobile fauna	
Issue/Impact/Environmental Effect/Nature	Displacement of individuals or changes to community structure.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	No or low loss of resources will occur.	
Duration	The initial impact will be short-term (construction phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Low. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	1 (None)	1 (None)
Duration	1 (Long-term)	1 (Short-term)
Cumulative effect	1 (Low)	1 (Low)
Intensity/magnitude	1 (Low)	1 (Low)
Significance rating	**-8 (low negative)**	**-8 (low negative)**
Mitigation measures	• Avoid development of designated sensitive habitats. • Access to sensitive areas outside of development footprint should not be permitted during construction. • Personnel to be educated about environmental sensitivities and issues on site. • Report any sitings to conservation authorities. • Appropriate lighting should be installed to minimize impacts on nocturnal animals. • Construction activities should not be undertaken at night. • Noise and light pollution should be managed according to guidelines from the noise specialist study.	

- Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas

Increased erosion (water and wind) and water run-off will be caused by the clearing of indigenous vegetation, creation of new hard surfaces and compaction of soil. The internal access roads will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. The construction site, and substation site will furthermore be levelled and compacted causing

additional run-off and erosion. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams.

Table 29: Increased runoff and erosion.

Increased runoff and erosion		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Runoff and erosion	
Extent	The impact will affect habitat on site.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled erosion can affect all downslope natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. Severe erosion can locally alter the functioning of natural ecosystems and cause additional loss of vegetation.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	2 (Possible)
Reversibility	2 (Partly)	2 (Partly)
Irreplaceable loss	3 (Significant)	2 (Marginal)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	-30 (medium negative)	-12 (low negative)
Mitigation measures	It is possible to avoid impacts due to erosion by undertaking the following mitigation measures: • Compile and implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control. • Undertake regular monitoring to detect erosion features early so that they can be controlled. • Implement control measures. • Avoid building on or near steep or unstable slopes. • Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow.	

6.4.2 Operational Phase Terrestrial Ecology impacts

- Continued disturbance to natural habitats due to general operational activities and maintenance

During the operational phase of the project, there will be continuous activity on site, including normal operational activities, maintenance and monitoring. There may also be minor additional construction. Rehabilitation of various sites, such as the construction camps, will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation.

Table 30: Continued disturbance of indigenous natural vegetation.

Loss and/or fragmentation of indigenous natural vegetation	
Environmental parameter	Indigenous natural vegetation
Issue/Impact/Environmental Effect/Nature	Loss or degradation of vegetation.
Extent	The impact will affect natural vegetation on site.
Probability	Continued disturbance will probably happen.
Reversibility	Partly reversible, on condition no additional vegetation clearing takes place.

Irreplaceable loss of resources	Marginal loss of resources will occur adjacent to the footprint of the proposed infrastructure since this is the most likely location of operational activities.	
Duration	The impact will be long-term (will continue or last for the entire operational life of the project)	
Cumulative effect	Medium cumulative impact. Added to existing impacts on natural habitat from activities on site, will cause additional loss of vegetation, the cumulative effect of which will be medium.	
Intensity/magnitude	Medium. The quality, use and integrity of vegetation on site will be compromised to some degree, which can be limited to some extent by implementation of mitigation measures.	
Significance rating	Medium negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	3 (Probable)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Marginal loss of resources)	2 (Marginal loss of resources)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	3 (Medium)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-28 (low negative)**	**-14 (low negative)**
Mitigation measures	The following mitigation measures would help to limit impacts: No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities. If any additional infrastructure needs to be constructed, for example overhead powerlines, communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts. No driving of vehicles off-road. Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. Access to sensitive areas outside of development footprint should not be permitted during operation. Surface runoff and erosion must be properly controlled and any issues addressed as quickly as possible.	

- **Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure**

There are various animal species of particular concern for this project, including the Leopard and Littledale's Whistling Rat. There are also other more mobile species that are protected by legislation, including the Cape Fox. It is possible that individuals of these species may suffer mortality or removal of individuals through road kills, encounters with infrastructure, illegal hunting, illegal collecting (especially for the tortoise and lizard) and possible damage to habitats.

Table 31: Mortality of fauna during operation.

Loss of individuals of animal species of concern	
Environmental parameter	Fauna, including those of conservation concern (Leopard, and Cape Fox)
Issue/Impact/Environmental Effect/Nature	Mortaility of individuals due to secondary effects.
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.
Probability	The impact may possibly happen.
Reversibility	Partly reversible with time.
Irreplaceable loss of resources	Low loss of resources will occur.
Duration	The impact will be long-term (operation phase).
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.
Intensity/magnitude	Medium. May impact on population processes.

Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Marginal)	1 (None)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	2 (Low)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-24 (low negative)**	**-11 (low negative)**
Mitigation measures	• Personnel and vehicles to avoid sensitive habitats. • No speeding on access roads – install speed control measures, such as speed humps, if necessary • No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard. • No hunting of protected species or hunting of any other species without a valid permit. • Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. • Report any sitings to conservation authorities. • Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting.	

- **Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors**

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established.

Table 32: Continued establishment and spread of declared weeds.

Continued establishment and spread of declared weeds		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Loss of habitat due to invasion by alien plants	
Extent	The impact will affect habitat on site and possibly in immediately surrounding areas.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled invasion can affect all nearby natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. Severe invasion can alter the functioning of natural ecosystems.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	2 (Possible)
Reversibility	2 (Partly)	2 (Partly)
Irreplaceable loss	3 (Significant)	2 (Marginal)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-30 (medium negative)**	**-12 (low negative)**

Mitigation measures	It is possible to avoid impacts due to alien plant invasions by undertaking the following mitigation measures: • Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. • Undertake regular monitoring to detect alien invasions early so that they can be controlled. • Implement control measures. • Do NOT use any alien plants during rehabilitation.

- **Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape**

Increased erosion (water and wind) and water run-off will be caused by the clearing of indigenous vegetation, creation of new hard surfaces and compaction of soil. The internal access roads will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. The construction site, substation site laydown areas and access roads will furthermore be levelled and compacted causing additional run-off and erosion. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams.

Table 33: Increased runoff and erosion.

Increased runoff and erosion		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Runoff and erosion	
Extent	The impact will affect habitat on site.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled erosion can affect all downslope natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. Severe erosion can locally alter the functioning of natural ecosystems and cause additional loss of vegetation.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	2 (Possible)
Reversibility	2 (Partly)	2 (Partly)
Irreplaceable loss	3 (Significant)	2 (Marginal)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-30 (medium negative)**	**-12 (low negative)**
Mitigation measures	It is possible to avoid impacts due to erosion by undertaking the following mitigation measures: • Compile and implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control. • Undertake regular monitoring to detect erosion features early so that they can be controlled. • Implement control measures. • Avoid building on or near steep or unstable slopes.	

	• Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow.

- **Changes to behavioural patterns of animals, including possible migration away or towards the project area.**

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of the animal communities. Some of these changes could possibly increase levels of predation. Territorial species such as steenbok and klipspringer will be negatively affected as well as species that live or move in the soil. These species might undergo a local reduction in their population size.

Table 34: Changes in behavioural patterns of animals.

Changes in behavioural patterns of fauna		
Environmental parameter	Mobile fauna	
Issue/Impact/Environmental Effect/Nature	Displacement of individuals or changes to community structure.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	No or low loss of resources will occur.	
Duration	The initial impact will be short-term (construction phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Low. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	1 (None)	1 (None)
Duration	1 (Long-term)	1 (Short-term)
Cumulative effect	1 (Low)	1 (Low)
Intensity/magnitude	1 (Low)	1 (Low)
Significance rating	**-8 (low negative)**	**-8 (low negative)**
Mitigation measures	• Avoid development of designated sensitive habitats. • Access to sensitive areas outside of development footprint should not be permitted during construction. • Personnel to be educated about environmental sensitivities and issues on site. • Report any sitings to conservation authorities. • Appropriate lighting should be installed to minimize impacts on nocturnal animals. • Construction activities should not be undertaken at night. • Noise and light pollution should be managed according to guidelines from the noise specialist study.	

6.4.3 Decommissioning Phase Terrestrial Ecology Impacts

It is expected that the project will operate for a minimum of twenty years or more (a typical planned life-span for a project of this nature. Decommissioning will probably require a series of steps resulting in the removal of equipment from the site and rehabilitation of footprint areas. It is possible that the site could

be returned to a rural nature, but it is unlikely that natural vegetation would become established at disturbed locations on site for a very long time thereafter. The reality is that it is not possible to determine at this stage whether rehabilitation measures will be implemented or not or what the future plans for the site would be nor is it possible at this stage to determine what surrounding land pressures would be. These uncertainties make it difficult to undertake any assessment to determine possible impacts of decommissioning. It is recommended that a closure and rehabilitation plan be compiled near to the stage but in advance of when decommissioning is planned, and that this would be required to be implemented prior to closure of the project. Possible impacts are described below.

- **Loss and disturbance of natural vegetation due to the removal of infrastructure and need for working sites**

During the decommissioning phase of the project, there will be a flurry of activity on site over a period of time, similar to during the construction phase, including dismantling and removal of equipment and rehabilitation. There may also be minor additional construction. Rehabilitation of various sites will also take place. These activities all have the potential to cause additional direct and/or indirect damage to natural habitat and vegetation.

Table 35: Disturbance of indigenous natural vegetation.

Loss and/or fragmentation of indigenous natural vegetation		
Environmental parameter	Indigenous natural vegetation	
Issue/Impact/Environmental Effect/Nature	Loss or degradation of vegetation.	
Extent	The impact will affect natural vegetation on site.	
Probability	Continued disturbance will probably happen.	
Reversibility	Partly reversible, on condition no additional vegetation clearing takes place.	
Irreplaceable loss of resources	Marginal loss of resources will occur adjacent to the footprint of the proposed infrastructure since this is the most likely location of operational activities.	
Duration	The impact will be medium-term (until rehabilitation has succeeded in establishing perennial vegetation cover)	
Cumulative effect	Medium cumulative impact. Added to existing impacts on natural habitat from activities on site, will cause additional loss of vegetation, the cumulative effect of which will be medium.	
Intensity/magnitude	Medium. The quality, use and integrity of vegetation on site will be compromised to some degree, which can be limited to some extent by implementation of mitigation measures.	
Significance rating	Medium negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	3 (Probable)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Marginal loss of resources)	2 (Marginal loss of resources)
Duration	2 (Medium-term)	2 (Medium-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-26 (low negative)**	**-12 (low negative)**
Mitigation measures	The following mitigation measures would help to limit impacts: • No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities. • If any additional infrastructure needs to be constructed, for example overhead powerlines, communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts.	

	• No driving of vehicles off-road. • Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas. • Access to sensitive areas outside of development footprint should not be permitted during operation. • Surface runoff and erosion must be properly controlled and any issues addressed as quickly as possible.

- **Direct mortality of fauna due to machinery, construction and increased traffic**

It is possible that individuals of species of concern, as well as other species, may suffer mortality or removal of individuals through road kills, encounters with infrastructure, illegal hunting, illegal collecting (especially for the tortoise and lizard) and possible damage to habitats.

Table 36: Mortality of fauna during operation.

Loss of individuals of animal species of concern		
Environmental parameter	Fauna, including those of conservation concern (Leopard, and Cape Fox)	
Issue/Impact/Environmental Effect/Nature	Mortaility of individuals due to secondary effects.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	Low loss of resources will occur.	
Duration	The impact will be long-term (operation phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Marginal)	1 (None)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	2 (Low)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-24 (low negative)**	**-11 (low negative)**
Mitigation measures	• Personnel and vehicles to avoid sensitive habitats. • No speeding on access roads – install speed control measures, such as speed humps, if necessary • No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard. • No hunting of protected species or hunting of any other species without a valid permit. • Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. • Report any sitings to conservation authorities. • Prevent unauthorised access to the site – project roads provide access to remote areas that were not previously easily accessible for illegal collecting or hunting.	

- Displacement and/or disturbance of fauna due to increased activity and noise levels

Decommissioning and rehabilitation activities may lead to loss of habitat, noise, dust and general activity that are likely to cause all mobile species to move away from the site.

All these species are mobile terrestrial species with a large home range and the ability to travel long distances in short periods of time. Individuals may be locally displaced, but this will have little effect on the overall range of the species nor is it expected that any overall impacts will result from local displacement.

Table 37: Displacement of terrestrial fauna.

Displacement of individuals of mobile terrestrial fauna		
Environmental parameter	Mobile fauna of conservation concern	
Issue/Impact/Environmental Effect/Nature	Displacement of individuals.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	No or low loss of resources will occur.	
Duration	The impact will be short-term (construction phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Low. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	1 (None)	1 (None)
Duration	1 (Short-term)	1 (Short-term)
Cumulative effect	1 (Low)	1 (Low)
Intensity/magnitude	1 (Low)	1 (Low)
Significance rating	**-8 (low negative)**	**-8 (low negative)**
Mitigation measures	• Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. • Access to sensitive areas outside of infrastructure footprint should not be permitted during construction. • No speeding on access roads – install speed control measures, such as speed humps, if necessary • No hunting of protected species. • Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species. • Report any sitings to conservation authorities.	

- **Effects on physiological functioning of vegetation due to dust deposition**

There is a moderate risk during decommissioning that dust will be created that will settle on surrounding vegetation. This will be due to earth-moving equipment as well as vehicles moving around on site as well as into and out of the site. There will be a definite increase in the amount of traffic on access roads to the site that will also affect surrounding areas.

Table 38: Vegetation damage due to dust deposition.

Impaired physiologivcal functioning of vegetation due to increased dust deposition.	
Environmental parameter	Vegetation
Issue/Impact/Environmental Effect/Nature	Dust deposition, resulting in reduced physiological fitness of plants / vegetation.
Extent	The impact will affect vegetation on site and in all areas with access roads leading to site.
Probability	The impact will almost certainly happen.
Reversibility	Partly reversible with time.
Irreplaceable loss of resources	Low to marginal loss of resources will occur.
Duration	The impact will be of short-term duration for access roads (only subject to high traffic volumes during decommissioning).

Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	2 (Local)	2 (Local)
Probability	4 (Definite)	3 (Probable)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Low)	2 (Low)
Duration	1 (Short-term)	1 (Short-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-28 (low negative)**	**-12 (low negative)**
Mitigation measures	• No speeding on access roads – install speed control measures, such as speed humps, if necessary, and penalties for non-compliance. • Excessive dust can be controlled by spraying water onto areas affected by construction and/or vehicle traffic or using other suitable dust-control measures.	

- Continued establishment and spread of alien invasive plant species due to the presence of migration corridors and disturbance vectors

The presence of disturbed surfaces on site creates ecological edges and corridors along which alien species can travel and become established.

Table 39: Continued establishment and spread of declared weeds.

Continued establishment and spread of declared weeds		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Loss of habitat due to invasion by alien plants	
Extent	The impact will affect habitat on site and possibly in immediately surrounding areas.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled invasion can affect all nearby natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. Severe invasion can alter the functioning of natural ecosystems.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	2 (Possible)
Reversibility	2 (Partly)	2 (Partly)
Irreplaceable loss	3 (Significant)	2 (Marginal)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-30 (medium negative)**	**-12 (low negative)**
Mitigation measures	It is possible to avoid impacts due to alien plant invasions by undertaking the following mitigation measures: • Implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control.	

	• Undertake regular monitoring to detect alien invasions early so that they can be controlled. Post-decommissioning monitoring should continue for an appropriate length of time to ensure that future problems are avoided. • Do NOT use any alien plants during any rehabilitation that may be required.

- Continued runoff and erosion due to the presence of hard surfaces that change the infiltration and runoff properties of the landscape

Increased erosion (water and wind) and water run-off will be caused by the creation of new hard surfaces and compaction of soil. The internal access roads will be the main source of disturbance and erosion if not properly constructed and provided with water run-off structures. Increased run-off and erosion could affect hydrological processes in the area and will change water and silt discharge into drainage lines and streams.

Table 40: Impact table for Impact 22: Increased runoff and erosion.

Increased runoff and erosion		
Environmental parameter	Vegetation and habitat	
Issue/Impact/Environmental Effect/Nature	Runoff and erosion	
Extent	The impact will affect habitat on site.	
Probability	The impact will probably happen in the absence of control measures.	
Reversibility	Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.	
Irreplaceable loss of resources	Marginal to significant loss of resources will occur. Uncontrolled erosion can affect all downslope natural habitats.	
Duration	The impact will be long-term.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Medium. Severe erosion can locally alter the functioning of natural ecosystems and cause additional loss of vegetation.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	3 (Probable)	2 (Possible)
Reversibility	2 (Partly)	2 (Partly)
Irreplaceable loss	3 (Significant)	2 (Marginal)
Duration	3 (Long-term)	3 (Long-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	1 (Low)
Significance rating	**-30 (medium negative)**	**-12 (low negative)**
Mitigation measures	It is possible to avoid impacts due to erosion by undertaking the following mitigation measures: Implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control. Following decommissioning, undertake regular monitoring for an appropriate length of time to detect erosion features early so that they can be controlled. Implement any control measures that may become necessary. Avoid undertaking any activities on or near steep or unstable slopes.	

- Changes to behavioural patterns of animals, including possible migration away or towards the project area

The increased human presence and/or construction operations will increase noise levels as well as light levels at night. The increased human presence, elevated noise and light levels, loss of animal habitat and compaction of soils may alter the behavioural patterns of some animals. Some of these changes may favour certain species and negatively affect others and consequently change the composition of

the animal communities. Some of these changes could possibly increase levels of predation. Territorial species such as steenbok and klipspringer will be negatively affected as well as species that live or move in the soil. These species might undergo a local reduction in their population size.

Table 41: Changes in behavioural patterns of animals.

Changes in behavioural patterns of fauna		
Environmental parameter	Mobile fauna	
Issue/Impact/Environmental Effect/Nature	Displacement of individuals or changes to community structure.	
Extent	The impact will affect individuals on site and possibly in immediately surrounding areas.	
Probability	The impact may possibly happen.	
Reversibility	Partly reversible with time.	
Irreplaceable loss of resources	No or low loss of resources will occur.	
Duration	The initial impact will be short-term (construction phase).	
Cumulative effect	Low cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Low. May impact on population processes.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	1 (Site)	1 (Site)
Probability	2 (Possible)	2 (Possible)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	1 (None)	1 (None)
Duration	1 (Long-term)	1 (Short-term)
Cumulative effect	1 (Low)	1 (Low)
Intensity/magnitude	1 (Low)	1 (Low)
Significance rating	**-8 (low negative)**	**-8 (low negative)**
Mitigation measures	• Avoid disturbance of designated sensitive habitats. • Access to sensitive areas outside of infrastructure footprint should not be permitted during decommissioning. • Personnel to be educated about environmental sensitivities and issues on site. • Appropriate lighting should be installed to minimize impacts on nocturnal animals. • Project activities should not be undertaken at night. • Noise and light pollution should be managed according to guidelines from the noise specialist study. • No dangerous pits, trenches, etc. should remain on site after rehabilitation.	

6.4.4 Cumulative impacts on Terrestrial Ecology

- Cumulative impacts on indigenous natural vegetation

The regional terrestrial vegetation types in the broad study area are listed as Least Threatened and generally have large areas. There are other vegetation types that will be affected, but these are not discussed here. Loss of habitat will definitely occur for each project, each of which will be a small area in comparison to the total area of the vegetation type. The total loss of habitat due to a number of projects together will be greater than for any single project, so a cumulative effect will occur. However, the area lost in total will be small compared to the total area of the vegetation type concerned. Of more concern is the total degree of fragmentation due to the combination of all projects, which will be much more significant than gross loss of habitat, measures in hectares. Direct loss of habitat will not result in a change in the conservation status of the vegetation types, but overall degradation due to fragmentation effects may be cause for concern. The cumulative effect will therefore be low for vegetation loss, but possibly significant for fragmentation. In addition, the current project is located in a rural area with the no existing infrastructure nearby, as is the case with all the other proposed projects. This will fundamentally change the character of this area in terms of its natural state.

Table 42: Cumulative impacts on natural vegetation.

Loss and/or fragmentation of indigenous natural vegetation		
Environmental parameter	Indigenous natural vegetation	
Issue/Impact/Environmental Effect/Nature	Loss, degradation and/or fragmentation of indigenous natural vegetation.	
Extent	The impact will affect natural vegetation on site and in surrounding areas.	
Probability	Loss and/or disturbance of vegetation will definitely happen for all of the projects.	
Reversibility	In all projects, loss of vegetation is effectively irreversible, since construction of roads and other hard surfaces completely removes vegetation and modifies the substrate upon which it grows. For all the projects, the secondary vegetation in disturbed areas will probably never resemble the original vegetation found on site.	
Irreplaceable loss of resources	For each project, there will locally be marginal to significant loss of resources. Assessed over a wider area (the combined footprint of all projects), there will probably only be marginal loss of resources (in relation to all biodiversity resources within the area).	
Duration	The impact will be permanent.	
Cumulative effect	Medium cumulative impact. Added to existing impacts on natural habitat from activities on site, will cause additional loss of vegetation, the cumulative effect of which will be medium.	
Intensity/magnitude	Medium. At the very minimum, the projects together will alter the quality, use and integrity of vegetation in the area , but the system (vegetation) will continue to function in a moderately modified way and maintain general integrity..	
Significance rating	Medium negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	2 (District)	2 (District)
Probability	4 (Definite)	4 (Definite)
Reversibility	4 (Irreversible)	4 (Irreversible)
Irreplaceable loss	2 (Marginal loss of resources)	2 (Marginal loss of resources)
Duration	4 (Permanent)	4 (Permanent)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	2 (Medium)
Significance rating	**-38 (medium negative)**	**-36 (medium negative)**
Mitigation measures	At a regional level, the only possible mitigation is to limit the number of projects, or else limit the scope of individual projects. These decisions are a function of competent authorities and not of the proponent. The following decisions would then apply: • Limit projects to specific zones, for example the Upington REDZ. • Limit development within biodiversity zones, especially CBA1 areas.	

- Cumulative impacts on plant species of concern and protected plant species

There are various plant species of conservation concern and protected plant species that may occur in the study area, all of which are relatively widespread. A distinction is made here between protected species, which are often widespread, and threatened species, which are often rare. Constructing the current project as well as all other renewable energy projects increases the likelihood of individuals being affected, but unless large numbers of individuals are directly affected, there will only be small to moderate cumulative effects. In principle, no development should allow loss of populations of threatened species, so the assessment undertaken below is for protected species (although effects on threatened species are also discussed).

Table 43: Loss of individuals of threatened and protected plants.

Loss of individuals of protected plants	
Environmental parameter	Protected plants, as per NEM:BA or NCNCA or listed plants
Issue/Impact/Environmental Effect/Nature	Loss of individuals occurring within the footprint of construction.

Extent	The impact will affect local populations or individuals of the affected species. The large number of projects taken together make this a regional effect.
Probability	Based on the list of species that are protected or listed, the impact is certain to happen to protected plants and probable for threatened plants.
Reversibility	Partly reversible. Where necessary, individuals can be rescued or else cultivated to replace lost specimens. Unfortunately, this is probably not feasible for threatened plants, which means the impact is barely reversible / irreversible for such species.
Irreplaceable loss of resources	Marginal loss of resources could occur for protected plants and significant loss of resources for threatened plants. The protected species that are likely to occur on site are likely to be relatively common throughout their range and they have very wide geographical ranges. With a number of projects, however, the chances of threatened species being affected increases.
Duration	The impact will be medium-term for protected plants and possibly permanent for threatened plants.
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.
Intensity/magnitude	Possibly medium for protected plants and very high for threatened plants. Loss of some individuals will be insignificant compared to the number that probably occur in nearby natural areas.
Significance rating	Low negative impact expected.

	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	2 (Local)	2 (Local)
Probability	4 (Definite)	4 (Definite)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	2 (Marginal loss of resources)	2 (Marginal loss of resources)
Duration	2 (Medium-term)	2 (Medium-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	2 (Medium)
Significance rating	**-30 (medium negative)**	**-28 (low negative)**
Mitigation measures	The following mitigation measures would help to avoid and limit impacts: It is a legal requirement to obtain permits for specimens that will be lost. • Undertake a detailed pre-construction walk-through survey will be required during a favourable season to locate any additional individuals of protected plants. This survey must cover the footprint of all approved infrastructure, including internal access roads. • Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the irreplaceable loss of resources as well as the cumulative effect. • A Plant Rescue Plan must be compiled to be approved by the appropriate authorities. • Where large populations of affected species of high value are encountered, consideration should be given to shifting infrastructure to avoid such areas. • No authorization should be given that results in the loss of populations of threatened plants. Infrastructure should be relocated and a suitable buffer zone maintained around such populations. An ecological management plan must be compiled for such areas.	

- Cumulative impacts on ecological processes

There are various ecological processes that may be affected at a landscape level by the presence of multiple projects. This includes obvious processes, such as migration, pollination and dispersal, but also more difficult to interpret factors, such as spatial heterogeneity, community composition and environmental gradients, that can become disrupted when landscapes are disturbed at a high level.

Disturbance can alter the pattern of variation in the structure or function of ecosystems. Fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. An important consequence of repeated, random clearing is that contiguous cover can break down into isolated patches. This happens when the area cleared exceed a critical level and landscapes start to become disconnected. Spatially heterogenous patterns can be interpreted as individualistic responses to environmental gradients and lead to natural patterns in the landscape. Disrupting gradients and creating disturbance edges across wide areas is very disruptive of natural processes and will lead to fundamental changes in ecosystem function.

Table 44: Cumulative impacts on ecological processes.

Disruption of landscape-level ecological processes		
Environmental parameter	Landscape-level ecological processes	
Issue/Impact/Environmental Effect/Nature	Disruption, disturbance or alteration of ecological processes	
Extent	The large number of projects taken together make this a regional effect.	
Probability	Based on the number and the nature of the projects (mostly solar-energy projects), the impact may possibly happen.	
Reversibility	Partly reversible, where disruptions to specific processes can be identified and rectified.	
Irreplaceable loss of resources	Significant loss of resources could potentially occur , but it is more likely that marginal loss of resources will happen.	
Duration	The impact will be long-term to permanent, depending on the process and the specific impact.	
Cumulative effect	Medium cumulative impact. Cumulative effects will be minor.	
Intensity/magnitude	Based on the nature and number of projects and the ecological process affected, the impact is most likely to be of medium intensity.	
Significance rating	Low negative impact expected.	
	Pre-mitigation impact rating	**Post-mitigation impact rating**
Extent	2 (Local)	2 (Local)
Probability	2 (Possible)	4 (Definite)
Reversibility	2 (Partly reversible)	2 (Partly reversible)
Irreplaceable loss	3 (Significant loss of resources)	2 (Marginal loss of resources)
Duration	2 (Medium-term)	2 (Medium-term)
Cumulative effect	3 (Medium)	2 (Low)
Intensity/magnitude	2 (Medium)	2 (Medium)
Significance rating	**-30 (medium negative)**	**-28 (low negative)**
Mitigation measures	The following mitigation measures would help to understand impacts: Undertake a landscape-level assessment of the combined fragmentation index of all projects together. For analysis purposes, a fragmentation value can be assigned to individual projects, and to all projects together. This will provide an indication of the relative contribution to landscape disruption of each project relative to others, the effect on specific parts of the landscape, and the effect on specific components of the landscape, e.g. a climate corridor, south-facing slopes, etc. • Limit projects to specific zones, for example the Upington REDZ. • Limit development within biodiversity zones, especially CBA1 areas.	

- **Cumulative impacts on fauna**

Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the area. This effect will be increased if there are a number of projects being constructed at the same time or in quick succession, so the effect is likely to be cumulative. However, the geographical ranges of the species of concern is wide and it is considered that the significance of the effect will be low in the long-term, although probably significant during the combined construction phase of the projects. It is possible that some species will

be more significantly negatively affected than others, especially shy species, territorial species that get displaced, or those with large territories that get shrunk. It is also possible that some species will benefit from the increased presence of humans and will migrate into the area. This will possibly cause additional shifts in other species that are affected by the increase in numbers or new species.

- **Cumulative impacts due to spread of declared weeds and alien invader plants**

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. For the current site, the impact is predicted to be low due to the current absence of invasive species on site and the high ability to control any additional impact. The significance will therefore be low, especially if control measures are implemented. However, the increased overall disturbance of the landscape will create opportunities and, if new invasions are not controlled, can create nodes that spread to new locations due to the heightened disturbance levels.

- **Cumulative impacts due to loss of protected animals**

There are various animal species protected according to National legislation that occur in the geographical area covered by the combined projects. Some of these animals may be vulnerable to secondary impacts, such as hunting, road kill and illegal collecting (the Armadillo Girdled Lizard may be particularly vulnerable to this). The greater the number of projects, the more likely this effect will happen; therefore, the effect is cumulative. However, in all cases, the geographical distribution of each species is much wider than the combined project areas. The significance will therefore be low, especially if control measures are implemented.

- **Cumulative impact on climate change**

One of the primary reasons for promoting renewable energy projects is the desire to make South Africa compliant with international treaties regarding climate-change effects. The combined generation capacity of all the renewable energy projects considered here is just less than 700 MW, which is about a quarter of the average size of one of the 14 coal power stations in South Africa (Eskom's Generation Division has 14 coal-fired power stations with an installed capacity of 38 548 MW, www.eskom.co.za). A reduction in reliance on coal power would improve the air quality of the Mpumalanga Highveld (where many of these power stations are located), reduce the amount of coal-mining that would take place (which has a devastating effect on biodiversity resources and water quality) and would reduce the per capita carbon footprint of our country. Greater uptake of renewable energy would furthermore reduce the global risk of climate change, one of the factors taken into account in designing the conservation network in South Africa. The construction of renewable energy projects can, in fact, be seen as an offset for other carbon-generating technology.

6.4.5 Concluding Statement – Terrestrial Ecology Impacts

At the site-specific scale, some sensitivities have been identified, primarily related to natural habitat, but also to some individual species. Many of these can be minimised or avoided with the application of appropriate mitigation or management measures, including, in some cases, slight shifts of infrastructure positions. There will be residual impacts, primarily on natural habitat. The amount of habitat that will be lost as a result of the proposed Duneveld PV development is insignificant compared to the area in hectares of the regional vegetation type that occurs on site and over the entire geographical range of the vegetation type. In most cases, the exact location of important biodiversity features have been identified in the field and suggestions made to relocate proposed infrastructure to avoid these. The current layout plan has already taken these suggestions into account. From this perspective it is unlikely that the proposed project will have an unacceptable impact on the natural environment. Based on the analysis provided in this report, the conclusion is that the project should be authorised (inclusive of all project alternatives).

6.5 AVIFAUNAL IMPACTS

An Avifaunal Assessment (inclusive of pre-construction monitoring) was undertaken by Chris van Rooyen of Chris van Rooyen Consulting. A copy of this assessment is attached in Annexure E1. The following impact descriptions, tables with assessment of the impacts and concluding statement was determined by the specialist.

6.5.1 Construction Phase Avifaunal Impacts

Table 45: Avifaunal Impacts associated with disturbance during the construction phase

Aspect/Activity	Construction of the solar PV plant and associated infrastructure
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area. Priority species potentially affected are: All priority species
Status	Negative
Mitigation Required	• Activity should as far as possible be restricted to the footprint of the infrastructure. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. • Access to the rest of the property must be restricted. • The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.
Impact Significance (Pre-Mitigation)	Moderate (Level 3)
Impact Significance (Post-Mitigation)	Low (Level 4)
I&AP Concern	No

6.5.2 Operational Phase Avifaunal Impacts

Table 46: Avifaunal Impacts associated with displacement due to Habitat Transformation

Aspect/Activity	The vegetation clearance and presence of the solar arrays and associated infrastructure amounts to habitat transformation in the development footprint
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance and the presence of the solar PV plant and associated infrastructure. Priority species potentially affected are the following: • Lanner Falcon • Spotted Eagle-owl • Martial Eagle • Tawny Eagle • Greater Kestrel • Secretarybird • Abdim's Stork • Karoo Korhaan • Kori Bustard • Ludwig's Bustard

	• Pygmy Falcon • Black-shouldered Kite • Booted Eagle • Common Ostrich • Pearl-spotted Owlet • Rock Kestrel • Southern Pale Chanting Goshawk • Steppe Buzzard • Black-eared Sparrowlark • Fiscal Flycatcher • Black-headed Heron
Status	Negative
Mitigation Required	The recommendations of the botanical specialist must be strictly implemented, especially as far as limiting the vegetation clearance to what is absolutely necessary, and rehabilitation of transformed areas are concerned.
Impact Significance (Pre-Mitigation)	High (Level 2)
Impact Significance (Post-Mitigation)	Moderate (Level 3)
I&AP Concern	No

Table 47: Avifaunal Impacts associated with collisions

Aspect/Activity	The presence of the PV solar arrays will lead to collisions with the reflective solar panels in the PV footprint
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Birds will get killed or injured through collisions with the solar panels. Priority species potentially affected are: • Lanner Falcon • Spotted Eagle-owl • Pygmy Falcon • Southern Pale Chanting Goshawk • Black-eared Sparrowlark • Fiscal Flycatcher
Status	Negative
Mitigation Required	No mitigation is required due to the very low expected magnitude.
Impact Significance (Pre-Mitigation)	Very Low (Level 5)
Impact Significance (Post-Mitigation)	Very Low (Level 5)
I&AP Concern	No

Table 48: Avifaunal Impact associated with entrapment in perimeter fences.

Aspect/Activity	The presence of a double perimeter fence could lead to entrapment of birds between the fences
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Entrapment of medium and large terrestrial birds between the perimeter fences, leading to mortality. Priority species that could potentially be affected are: Secretarybird Abdim's Stork Karoo Korhaan Kori Bustard Ludwig's Bustard

Status	Negative
Mitigation Required	A single perimeter fence should be used[28].
Impact Significance (Pre-Mitigation)	Low (Level 4)
Impact Significance (Post-Mitigation)	Very Low (Level 5)
I&AP Concern	No

Table 49: Avifaunal Impacts associated with the electrocution of priority species.

Aspect/Activity	**Electrocution in the onsite substation and inverter station**
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	Electrocution of priority species. Potential priority species which could be affected are: • Lanner Falcon • Spotted Eagle-owl • Southern Pale Chanting Goshawk • Martial Eagle • Tawny Eagle • Greater Kestrel • Steppe Buzzard • Barn Owl • Egyptian Goose
Status	Negative
Mitigation Required	With regards to the infrastructure within the substation yard and inverter station, the hardware is too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if any impacts are recorded once operational, site specific mitigation be applied reactively.
Impact Significance (Pre-Mitigation)	Low (Level 4)
Impact Significance (Post-Mitigation)	Very Low (Level 5)
I&AP Concern	No

6.5.3 Decommissioning Phase Avifaunal Impacts

Table 50: Avifaunal impacts associated with disturbance during the decommissioning phase

Aspect/Activity	Decommissioning of the solar PV plant and associated infrastructure
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	The noise and movement associated with the activities at the study area will be a source of disturbance which would lead to the displacement of avifauna from the area. Priority species potentially affected are: • All priority species
Status	Negative
Mitigation Required	• Activity should as far as possible be restricted to the footprint of the infrastructure. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical. • Access to the rest of the property must be restricted.

[28] In this instance, according to the design specifications, a fence will be used consisting of an outer diamond mesh fence and inner electric fence with a separation distance of approximately 100mm. This should not pose any risk of entrapment for large terrestrial species and can be considered a single fence.

	• The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.
Impact Significance (Pre-Mitigation)	Moderate (Level 3)
Impact Significance (Post-Mitigation)	Low (Level 4)
I&AP Concern	No

6.5.4 Cumulative Impacts on Avifauna

Table 51: Cumulative Avifaunal Impacts

Aspect/Activity	The incremental impact of the proposed PV facility and grid connection on priority avifauna, added to the impacts of other past, present or reasonably foreseeable future activities.
Type of Impact (i.e. Impact Status)	Direct
Potential Impact	• Displacement due to disturbance associated with the construction of the solar PV plant and associated infrastructure • Displacement due to habitat transformation associated with the construction of the solar PV plant and associated infrastructure • Collisions with the solar panels • Entrapment in perimeter fences • Electrocutions in the onsite substation yard and inverter station.
Status	Negative
Mitigation Required	Please refer to all the proposed mitigation measures as listed in the preceding tables in Section 6 for all the impacts and all the phases
Impact Significance (Pre-Mitigation)	Low (4)
Impact Significance (Post-Mitigation)	Very Low (5)
I&AP Concern	None to date

6.5.5 Concluding Statement – Avifauna

In terms of an average, the pre-mitigation significance of all potential impacts identified in the avifaunal specialist study is assessed as halfway between Low and Moderate, and the post-mitigation significance is assessed as Low to Very Low, leaning more towards Very Low . The avifaunal specialist therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMP are strictly implemented.

6.6 AGRICULTURAL IMPACTS

Mr Christo Lubbe undertook a specialist assessment of the potential impacts of Duneveld PV on the agricultural environment. A copy of this assessment is attached in Annexure E3.

The agricultural specialist identified the following potential impacts associated with the Duneveld PV:

- Loss of agricultural land
- Erosion and change of drainage patterns
- Pollution

An assessment of these impacts for the various phases of the development are included below.

6.6.1 Construction Phase Agricultural Impacts

The agricultural impacts during the construction phase of Duneveld PV are assessed in the table below:

Table 52: Assessment of agricultural Impacts during the construction of Duneveld PV.

Nature: Soil pollution with contaminants during the construction phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the construction of all facets of the facility: laydown area, concrete foundations of the auxiliary buildings, inverter stations subterranean cabling, main access and internal service roads.

	Without mitigation	With mitigation
Extent	Local	Local
Duration	Medium Term	Very short
Magnitude	Low	Minor
Probability	Probable	Probable
Significance	Low	Low
Status (Positive or negative)	Negative	Negative
Reversibility	Partly reversible	Fully reversible
Irreplaceable loss of Resources	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures.	
Cumulative impacts:	No, site-bound	
Residual Risks:	Yes, it is impossible to clear the affected area completely.	

Nature: The establishment of the PV solar facility will be done at the expense of agricultural land. The area to be lost for agricultural development would be 212 ha in size. This includes the area under PV panels, internal service roads and temporary laydown area.

	Without mitigation	With mitigation
Extent	Local – Regional	Local
Duration	Long-term	Long-term
Magnitude	Moderate	Low
Probability	Probable	Improbable
Significance	Medium	Low
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures.	
Cumulative impacts:	Impact is low due to agricultural potential of the locally. With increasingly adding of facilities, the impact will become more of significance if not mitigated. .	
Residual Risks:	No, after decommissioning this impact will be reversed when rehabilitation has been completed.	

Nature: The construction of a PV solar facility will cause impairment of the land capability with the potential risk of erosion

	Without mitigation	With mitigation
Extent	Local	Local
Duration	Short term	Short term
Magnitude	Low	Low
Probability	Probable	Probable
Significance	Medium	Low
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures.	
Cumulative impacts:	No cumulative impacts are expected to occur, as all impacts will be site bounded.	
Residual Risks:	No. Effected areas will be rehabilitated, as the impact will only be applicable during construction phase.	

Nature: The establishment of the PV solar facility may alter drainage patterns with construction and cause erosion

	Without mitigation	With mitigation
Extent	Local	Local
Duration	Long term	Long term
Magnitude	Low	Low
Probability	Probable	Probable
Significance	Low	Low
Status (positive or negative)	Negative	Negative

Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation	See section 7 of this BAR for a summary of mitigation measures.	
Cumulative impacts:	No, all impacts will be site bounded.	
Residual Risks:	No. Effected areas will be rehabilitated when operation has ceased.	

6.6.2 Operational Phase Agricultural Impacts

The agricultural impacts during the operational phase of Duneveld PV are assessed in the table below:

Table 53: Assessment of agricultural Impacts during the operation of Duneveld PV

Nature: Soil pollution with contaminants during the operational phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the maintenance of the facility.		
	Without mitigation	**With mitigation**
Extent	Local	Local
Duration	Long Term	Long Term
Magnitude	Low	Minor
Probability	Probable	Probable
Significance	Low	Low
Status (Positive or negative)	Negative	Negative
Reversibility	Partly reversible	Fully reversible
Irreplaceable loss of Resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures	
Cumulative impacts:	No, site-bound	
Residual Risks:	Yes, It is impossible to clear the affected area completely.	
Nature: The establishment of the PV solar facility will be done at the expense of agricultural land. Area to be lost for agricultural development would be 212 ha in size. This includes the area under PV panels, internal service roads and temporary laydown area.		
	Without mitigation	**With mitigation**
Extent	Local – Regional	Local
Duration	Long-term	Long-term
Magnitude	Moderate	Low
Probability	Probable	improbable
Significance	Medium	Low
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures	
Cumulative impacts:	Impact is low due to agricultural potential of the locally. With increasingly adding of facilities, the impact will become more of significance if not mitigated. .	
Residual Risks:	No, after decommissioning this impact will be reversed when rehabilitation has been completed.	

6.6.3 Decommissioning Phase Agricultural Impacts

The agricultural impacts during the closure and decommissioning phase of Duneveld PV are assessed in the table below:

Table 54: Assessment of agricultural Impacts during the closure and decommissioning of Duneveld PV

Nature: Soil pollution with contaminants during the decommissioning phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the decommissioning of all facets of the facility: laydown area, demolished concrete foundations of the auxiliary buildings, inverter stations subterranean cabling, main access and internal service roads.		
	Without mitigation	**With mitigation**

Extent	Local	Local
Duration	Medium Term	Very short
Magnitude	Low	Minor
Probability	Probable	Probable
Significance	Low	Low
Status (Positive or negative)	Negative	Negative
Reversibility	Partly reversible	Fully reversible
Irreplaceable loss of Resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures	
Cumulative impacts:	No, site-bound	
Residual Risks:	Yes, It is impossible to clear the affected area completely	

6.6.4 Cumulative agricultural impacts

Table 55: Assessment of cumulative agricultural Impacts of Duneveld PV

Nature: The quantity of available soil for agricultural production decreases as result of the footprints of these facilities. The quality of soil decreases in the way the construction of these structures alters the workability of the soil. This includes the physical deformation in the soil profile.		
	Overall impact of proposed project considered in isolation	**Cumulative impact of the projects in the area**
Extent	Local – Regional	Regional
Duration	Long Term	Long Term
Magnitude	Low	Moderate
Probability	Probable	Probable
Significance	Low	Medium
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures	
Nature: Clearing of vegetation increases flow speed and a lower infiltration tempo increases silt transport.		
	Overall impact of proposed project considered in isolation	**Cumulative impact of the projects in the area**
Extent	Local	Regional
Duration	Long Term	Long Term
Magnitude	low	Low
Probability	Improbable	Probable
Significance	Low	Medium
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures	
Nature: Chemicals, hazardous substances and waste used or generated during live span of the facility accumulate and pollute soil will become contaminated		
	Overall impact of proposed project considered in isolation	**Cumulative impact of the projects in the area**
Extent	Local	Regional(2)
Duration	Long Term (4)	Long Term (4)
Magnitude	low (4)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (30)**
Status (Positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of Resources?	No	No

Can impacts be mitigated?	Yes	Yes
Mitigation:	See section 7 of this BAR for a summary of mitigation measures	

6.6.5 Concluding Statement - Agriculture

With reference to applicable sections of the Regulations for renewable energy in terms of Act 70 of 1970 and Act 43 of 1983, it can be stated that the proposed site will not suffer major agricultural impacts by the proposed Duneveld PV development. The reasons include aspects such as soil potential, geology, climate, loss of cultivating land and stock farming and other possible impacts.

The site does not have high potential soil because of the low annual rainfall, high evaporation rate and extreme temperatures. Soils formed under these conditions have little movement of soluble nutrients and insoluble clay particles in the soil profile, restricting the adsorption of nutrients that would be available to plants. The soil is thus low in nutrient availability and has a low response to fertilizer input.

The land is currently used for game and livestock farming. The internal fencing is in the process of demolition, which indicates that farming with game would be the primary activity.

With a farm size of 4117.3628 ha and carrying capacity of 32 ha per large stock unit (LSU), only 150 LSU can be carried on this farming unit. This is not considered to be an economically viable farming unit.

6.7 HERITAGE IMPACTS

A detailed Heritage impact Assessment was undertaken by HCAC. A copy of this assessment is attached in **Annexure E4** and is summarised below.

Archaeological material in the form of lithics will be impacted on by the proposed Duneveld PV layout. These lithics consist of a widespread surface scatter of MSA and to a lesser extent LSA artefacts in deflated contexts on top of a calcrete substrata. This background scatter of artefacts is not unique, according to Beaumont *et al* (1995) “thousands of square kilometres of Bushmanland are covered by a low-density lithic scatter” and similar occurrences is well recorded in the area and is seen as of low heritage significance. The impact on this background scatter by the proposed development is considered to be of low significance.

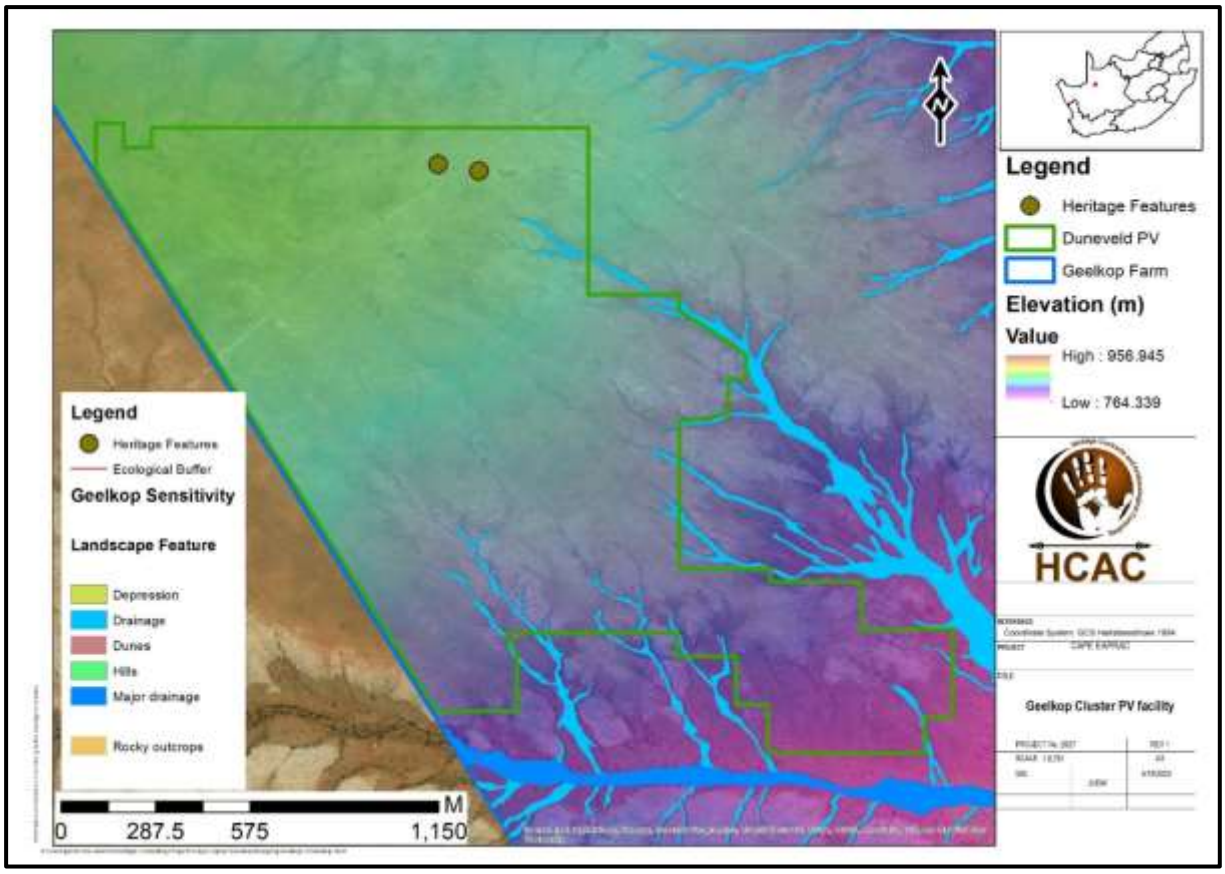

Figure 37. Site distribution map.

6.7.1 Pre-Construction and Construction Phase Heritage Impacts:

It is assumed that the pre-construction phase involves the removal of topsoil and vegetation as well as the establishment of infrastructure needed for the construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

During this phase, the impacts and effects are similar in nature but more extensive than the pre-construction phase. These activities can have a negative and irreversible impact on heritage sites. Impacts include destruction or partial destruction of non-renewable heritage resources.

Table 56. Construction phase impacts on archaeological resources

Nature:.	During the construction phase activities resulting in disturbance of surfaces and/or sub-surfaces may destroy, damage, alter, or remove from its original position archaeological material or objects	
	Without mitigation	**With mitigation (Preservation/ excavation of site)**
Extent	Site specific (1)	Site specific (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Low (3)
Probability	Probable (3)	Probable (2)
Significance	27 (Low)	27 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	yes	Yes
Can impacts be mitigated?	Yes	Yes
Mitigation:		

A Chance Find Procedure and Heritage Management plan should be implemented for the project during the pre-construction and construction phase. The area should be monitored during construction by the ECO.
Residual Impacts:
If sites are destroyed this results in the depletion of archaeological record of the area and even though surface features can be avoided or mitigated, there is a chance that completely buried sites would still be impacted but this cannot be quantified. However, if sites are recorded and preserved or mitigated this adds to the record of the area.

6.7.2 Operation Phase Heritage Impacts

No impact is envisaged for the recorded heritage resources during this phase.

6.7.3 Cumulative Impacts on Heritage

Considering the existing impacts by renewable energy developments in the wider area and the addition of six other planned PV facilities, the cumulative impact on resources is higher, but this can be mitigated to an acceptable level. In order to mitigate the loss of large-scale low-density Stone Age lithics it is recommended that a surface sample of the artefacts should be collected and analysed in the field to accurately describe the typology of the various lithic industries. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. The area is rich in terms of the number of archaeological features present and taking in consideration existing impacts by renewable energy developments in the wider area and the addition of six other planned PV facilities on the farm the cumulative impact is regarded as of medium significance, but can be mitigated to an acceptable level.

Table 57. Cumulative impacts of the project

Nature:	The development of the project and other renewable energy developments within the area may result in disturbance of surfaces and/or sub-surfaces and may destroy, damage, alter, or remove from its original position archaeological material or objects.	
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (3)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	27 (Low)	Medium (39)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	Yes
Confidence in findings	High	High

6.7.4 Concluding Statement - Heritage

This report only focuses on the Duneveld PV footprint characterised by several drainage lines (although the PV lay out avoids the drainage line features), Aeolian sand on top of a calcrete sub strata with sparse grass cover and shrubs. The area marked for the solar facility measures approximately 212 hectares on the larger property that measures approximately 4117.3628 ha. Due to possible future lay-out changes and the considerable extent of the property a field survey of the entire farm was not feasible and therefore an archaeological predictive model was developed to refine the study area for in-field assessment to mitigate this limitation and inform recommendations.

The predictive model was considered accurate with the majority of recorded points found in areas of high and medium expectation with a limited number of features in areas of low expectation found next

to drainage lines (medium expectation). The artefacts are mostly found where calcrete is exposed in higher lying areas in deflated context.

Several of the artefacts show signs of cortex indicating the use of abundant raw material in the form of pebbles associated with the Orange River. MSA diagnostic tools (mostly produced on banded iron stone and quartzite) include convergent flakes with some lateral retouch, and small (< 5 cm long) retouched blades. Based on size and morphology, these could indicate the presence of people on the landscape between ~ 66 000 and 45 000 ago, during archaeological phases known as the Howieson's Poort, post-Howieson's Poort and late-Middle Stone Age (Lombard 2011).

No ceramics were recorded and LSA diagnostic tools consisted of thumbnail scrapers on Quartz and small scrapers, backed blades and bladelets mostly on CCS suggestion a Wilton occupation dating between ~ 4 000 and 8 000 ago (Lombard et al. 2012). This classification is tentative and require a larger sample to verify.

This background scatter of artefacts is not unique, according to Beaumont et al (1995) "thousands of square kilometres of Duneveld are covered by a low-density lithic scatter" and similar occurrences is well recorded in the area (Gaigher 2013, Fourie 2014, van der Walt 2019 a,b,c,d,e and f).

Key findings of the study include:

- Widespread lithic scatters dating to the MSA and LSA are found in deflated context, often where calcrete is exposed in higher lying areas and drainage lines. Seen in isolation this background scatter is of low significance but due to the cumulative impacts will require pre-construction mitigation;
- One site (Waypoint 394) consisting of a mining/exploration trench was recorded in the southern portion of the study area. The site is of low significance and no further mitigation is required;
- No graves were recorded but graves can occur anywhere on the landscape. If any graves are located in future they should ideally be preserved in-situ or alternatively relocated according to existing legislation;
- According to the SAHRA paleontological sensitivity map, the area is of moderate paleontological sensitivity and an independent study was conducted by Prof Marion Bamford. The study recommended that a Fossil Chance Find Protocol should be added to the EMPr.
- The impact of the proposed project on heritage resources is considered acceptable with the correct mitigation measures in place. It is therefore recommended that the proposed project can commence provided that the recommendations in this report are adhered to as part of the EMPr and based on the approval of SAHRA..

6.8 PALAEONTOLOGICAL IMPACTS

Professor Marion Bamford undertook a desktop paleontological assessment of the proposed Duneveld PV. A copy of this assessment is included in **Annexure E6**. The potential impacts on Palaeontological resources identified in the specialist study are summarised below.

Table 58: Impact on Palaeontological Resources

Severity/Nature	Low	Volcanic rocks do not preserve fossils, Sands of the Gordonia Fm might cover palaeo-pans or palaeo-springs. To date there are no records from this site and none is visible on Google Earth so it is very unlikely that fossils occur on the site. The impact would be very unlikely.
Duration	Permanent	Where manifest, the impact will be permanent.
Spatial scale	Localised	Since only the possible fossils within the area would be fossils from any pans or springs, if present. The spatial scale will be localised within the site boundary.

Probability	Unlikely	It is extremely unlikely that any fossils would be found in the loose sand or stabilised dunes close to the site. Nonetheless, a Fossil Chance Find protocol should be added to the eventual EMPr.

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are either much too old and of volcanic origin to contain fossils, in this locality, the Vyfbeker Metamorphic suite granitic gneiss. The Gordonia Formation or Kalahari sands do not preserve fossils but might cover palaeo-pans or palaeo-springs, however, none is visible from imagery. Since there is an extremely small chance that fossils might be below the sands, a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

6.8.1 Concluding Statement - Palaeontology

Based on experience and the lack of any previously recorded fossils from the area, no fossils occur in the volcanic Vyfbeker Metamorphic Suite. It is extremely unlikely that any fossils would be preserved in the Aeolian sands of the Quaternary Gordonia Formation. There is a very small chance that fossils may occur beneath the sands, if any have been trapped in palaeo-pans or palaeo-dunes, although no such feature is evident. Nonetheless, a Fossil Chance Find Protocol should be added to the EMPr: if fossils are found once excavations have commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.

6.9 VISUAL IMPACTS

Mr Jon Marshall undertook a detailed visual impact assessment of the proposed Duneveld PV. A copy of this assessment is attached in Annexure E7 of the BAR and a summary thereof is provided below.

Table 59: Assessment of impact that the proposed development could change the character and sense of place of the landscape setting (Landscape Change)

Nature of impact:		
The proposed Duneveld PV is located within an arid plateau landscape area and approximately 1.2km from the closest section of the verdant Orange River Corridor. The difference between these landscape areas is marked with the semi desert of the plateau contrasting strongly with the green arable landscape of the River Valley. The ZTV analysis indicates that the development may be visible from within the valley. This is due to the proximity of the proposed development to the valley edge. It is likely however that only the upper most sections of the array will be visible. Existing vegetation within and on the valley edges will largely screen views of the development from within the valley. Views of the bulk of the proposed development within the plateau landscape will be largely limited to areas in the immediate vicinity of the affected property by minor ridgelines. These ridgelines will limit views of the development to approximately 2.0km to the north east, the east, the west and the south west. To the north views of the proposed development are likely to be limited to approximately 5km. The landscape change will be viewed in the context of other solar projects within the area including the Khi Solar I CSP project which is located approximately 10km to the north east.		
	Without mitigation	**With mitigation**
Extent	Orange River LCA Site and immediate surroundings, (2) Plateau LCA Site and immediate surroundings, (2)	Orange River LCA Site and immediate surroundings, (2) Plateau LCA Site and immediate surroundings, (2)
Duration	Orange River LCA Long term, (4) Plateau LCA Long term, (4)	Orange River LCA Long term, (4) Plateau LCA Long term, (4)
Magnitude	Orange River LCA Small, (2)	Orange River LCA Minor, (0)

	Plateau LCA Small, (2)	Plateau LCA Minor, (0)
Probability	Orange River LCA Improbable, (2) Plateau LCA Probable, (3)	Orange River LCA Improbable, (2) Plateau LCA Improbable, (2)
Significance	Orange River LCA Low, (16) Plateau LCA Low, (24)	Orange River LCA Low, (12) Plateau LCA Low, (12)
Status	Negative	Negative
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be no irreplaceable loss. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss
Can impacts be mitigated?	Yes	N/A
Mitigation / Management		
Planning: • Investigate the possibility of undertaking screening • Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development; Operations: • Undertake screening; • Reinstate any areas of vegetation that have been disturbed during construction; • Remove all temporary works; • Monitor rehabilitated areas post-construction and implement remedial actions; • Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area. Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site; • Rehabilitate and monitor areas post-decommissioning and implement remedial actions.		
Cumulative Impacts:		
The proposed project will extend the general influence of development and specifically solar projects in the area. The overall cumulative impact is assessed as having a medium significance, however, the contribution of the proposed project to this cumulative impact is assessed as low.		
Residual Risks:		
The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.		

Table 60: Impacts that the proposed development could change the character of the landscape as seen from the N14.

Nature of impact:
The ZTV analysis indicates that views of the proposed array and substation will be limited to approximately 5km of this road at a distance of approximately 0.2km The proposed array and the proposed substation are likely to be obvious. The proposed project will also be viewed in the context of numerous other solar projects within the REDZ7 including the Khi Solar 1 project which is visible over a wide area. However, all other PV projects in the vicinity are set back a number of kilometres from the road. Whilst this does not mean that they are not visible, it does make them less obvious and presents a relatively natural foreground to views from the road.

	Without mitigation	With mitigation
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Minor **(2)**
Probability	Highly probable **(4)**	Improbable **(2)**
Significance	Medium **(40)**	Low **(16)**
Status	Given that the area is developing as a renewable energy development zone, it is possible that some people will see the development in a positive light. For those visiting the area for its natural attributes and for residents whose view is affected the change is likely to be seen as a **Negative Impact.**	**Negative Impact**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Planning:

- Investigate the possibility of undertaking screening.
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations:

- Undertake screening;
- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The proposed project will have a medium level impact on the N14 without mitigation.

A detailed visual analysis of other solar projects in the area has not been undertaken, however, it is likely that other solar projects in the area could have a significant greater impact.

The overall cumulative impact is assessed as having a medium significance. The contribution of the proposed project to this cumulative impact is assessed as medium however this will reduce to low with mitigation.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

Table 61: Impacts that the proposed development could change the character of the landscape as seen from the R359.

Nature of impact:		
The ZTV analysis indicates that the proposed project could be visible from significant sections of the R359 at distances in excess of 5km. Howeve,r there is significant vegetation both within the Orange River Valley and beside the road that is likely to screen the development from large sections of the road..		
	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Very improbable (1)
Significance	Low (16)	Low (6)
Status	Given that the area is developing as a renewable energy development zone, it is possible that some people will see the development in a positive light. For those visiting the area for its natural attributes and for residents whose view is affected, the change may be seen as a Negative Impact. However, due to distance and likely screening of the proposed development and because if small sections of the development are visible they will be seen in the context of other solar projects, the change in view is likely to be seen as a neutral impact.	Neutral Impact
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be no irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes but mitigation is unlikely to affect the assessed levels of impact.	
Mitigation / Management:		
Planning: • Investigate the possibility of undertaking screening. • Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development; Operations: • Undertake screening; • Reinstate any areas of vegetation that have been disturbed during construction; • Remove all temporary works; • Monitor rehabilitated areas post-construction and implement remedial actions; • Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area. Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site; • Rehabilitate and monitor areas post-decommissioning and implement remedial actions.		
Cumulative Impacts:		
The proposed project will have a low level impact on the R359. A detailed visual analysis of other solar projects in the area has not been undertaken, however, it is likely that only CSP projects in the area which have taller elements could have a significant impact on this road. The overall cumulative impact is assessed as having a Medium significance. The contribution of the proposed project to this cumulative impact is assessed as low.		
Residual Risks:		
The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.		

Table 62: Impacts that the proposed development could change the character of the landscape as seen from the Lutzputs Road.

Nature of impact:
The ZTV analysis indicates that the proposed project is highly unlikely to be visually obvious from this road. There will therefore be no impact and no contribution to cumulative impacts.

Table 63: Impacts that the proposed development could change the character of the landscape as seen from local settlements and homesteads.

Nature of impact:		
Settlements and homesteads in the vicinity of the proposed project that may be affected are generally associated with agricultural activities within the Orange River Valley. No individual homesteads within the plateau area appear likely to be affected. The ZTV analysis indicates that the proposed array is most likely to be visible from homesteads that are located on the northern edge of the Orange River Valley that, at their closest, are located approximately 1km from the proposed array. It is likely that clear views of the proposed project will be possible particularly from the closest homesteads. However, it is likely that existing vegetation within and around these homesteads will at least partially screen the proposed development from view.		
	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	Low (16)	Low (12)
Status	Given that the area is developing as a renewable energy development zone, it is possible that some people will see the development in a positive light. For residents whose view is affected the change is likely to be seen as a Negative Impact.	Negative Impact
Reversibility	High	
Irreplaceable loss	No irreplaceable loss	
Can impacts be mitigated?	No mitigation required	
Mitigation / Management:		
Planning: • Investigate the possibility of undertaking screening. • Plan to maintain the height of structures as low as possible; • Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development; Operations: • Undertake screening; • Reinstate any areas of vegetation that have been disturbed during construction; • Remove all temporary works; • Monitor rehabilitated areas post-construction and implement remedial actions; • Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area. Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site; • Rehabilitate and monitor areas post-decommissioning and implement remedial actions.		
Cumulative Impacts:		
Visual impacts on settlements and homesteads associated with the proposed project have been assessed as having a low significance. General visual impacts in the region due to solar projects are also assessed as likely to have a low level of impact due to the fact that most settlements and homesteads are located within the Orange River Valley The overall cumulative impact is assessed as having a Low significance. The contribution of the proposed project to this cumulative impact is also assessed as low.		
Residual Impacts:		

The residual risk relates to the infrastructure being left in place on decommissioning of the solar project. It is therefore critical that effective rehabilitation is undertaken.

Table 64: Assessment of potential Glare Impacts

Nature of impact:		
There are two areas where glare could be a concern to stakeholders, including: • Upington Airport; and • The N14. Two array configurations have been tested including: • A fixed array; and • A single axis tracking array The assessment has shown that neither configuration will cause glare to affect motorists on the adjacent N14. It is possible however that the fixed array could cause low levels of glare to affect pilots on their approach to the secondary (shorter) runway at Upington Airport. However, this glare is unlikely to result in an after image that might result in temporary loss of vision for pilots. It is therefore not considered to be critical.		
	Without mitigation	**With mitigation**
Extent	Region (3)	Region (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Very improbable (1)
Significance	Low (27)	Low (7)
Status	Negative	Neutral
Irreplaceable loss	No irreplaceable loss	No irreplaceable loss
Reversibility	High	High
Can impacts be mitigated?	Yes	
Mitigation / Management:		
Adopt a tracking configuration for the proposed array		
Cumulative Impact:		
There is potential for other arrays to also cause glare that could affect approaches to the airport. The proposed array will result in a low level contribution to cumulative glare impacts. With mitigation, there will be no contribution to cumulative impacts.		
Residual Risks:		
No residual risk has been identified.		

Table 65: The potential visual impact of operational, safety and security lighting of the facility at night on observers.

Nature of impact:		
The facility will be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This is likely to result in the array being obvious at night from surrounding areas. The Khi 1 Solar project immediately to the north appears relatively dark at night. There are obvious lights from Upington as well as from passing traffic and small settlements and homesteads particularly in the Orange River Valley. The area therefore is not totally dark during the night. There is potential therefore for the project to add to these existing lighting levels.		
	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings (2)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Small to minor (1)
Probability	Definite (5)	Improbable (2)
Significance	Medium (50)	Low (12)
Status	The appearance of a large lit area may be accepted by most people because it is so close to the N14. It is likely however that some people will see the expansion of lighting as a negative impact.	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. Neutral
Irreplaceable loss	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss

Reversibility	High	High
Can impacts be mitigated?	Yes	
Mitigation / Management:		
• Use low key lighting around buildings and operational areas that is triggered only when people are present. • Plan to utilise infra-red security systems or motion sensor triggered security lighting; • Ensure that lighting is focused on the development with no light spillage outside the site; and • Keep lighting low, no tall mast lighting should be used.		
Cumulative Impact:		
There is potential for security lighting and operational lighting associated with solar energy projects to further impact on the area but with mitigation the contribution of this project to possible cumulative impacts is likely to be of low significance.		
Residual Risks:		
No residual risk has been identified.		

6.9.1 Concluding Statement - Visual

The proposed project will generally result in a relatively limited level of visual impact within an area that is already impacted by a major solar project.

Motorists on the adjacent section of the N14 are likely to experience the greatest levels of visual impact. Given the fact that other solar projects are likely to be obvious due the REDZ status of the area, to a degree this landscape change may be expected. However, due to its relative proximity, this project may be more obvious than other solar PV projects in the region. Due to the relatively low height of the PV array the level of impact may be partially mitigated by simple screening.

The potential glare impact is considered minor as it is unlikely to have potential to create an after image thereby impairing vision.

In general terms therefore the proposed project in both a fixed configuration and tracking configuration are acceptable in visual terms although a tracking configuration is preferred.

The proposed project is largely in keeping with its surroundings and with proposed mitigation measures will not impact significantly on receptors that are likely to be sensitive to landscape change associated with the project.

6.10 FRESHWATER ECOLOGY IMPACTS

Dr Brian Colloty of EnviroSci (Pty) Ltd, undertook a detailed freshwater ecology assessment of the proposed Duneveld PV. A copy of this assessment is attached in **Annexure E3** of the BAR and a summary thereof is provided below.

Table 66: Impact of Loss of Very High Sensitivity systems

Nature		
Loss of Very High Sensitivity systems, namely the mainstem alluvial water course and a pan through physical disturbance although the proposed layout will avoid any of these systems (Figure 8).		
	Without mitigation	**With mitigation**
Extent	High (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation:		
• The most significant form of mitigation would be to select development options that avoided all aquatic features that were rated with a Very High sensitivity, which is being proposed by the layout.		

• All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor. • It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset to ensure a net benefit to the environment within all areas that will remain undisturbed.
Cumulative impacts:
None – no direct connection between this and other systems, such as the Orange River, exist.
Residual impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Table 67: Assessment of Impacts on secondary alluvial water courses

Nature		
Impact on secondary alluvial water courses (Moderate Sensitivity), through physical disturbance The physical removal of narrow strips of woody riparian zones, disturbance of channels being replaced by hard engineered surfaces will alter the hydrological nature of the area, by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. This impact would however be localised, as it is intended that the PV panels and mounting structures traverse the watercourses as far as possible and any flows would still be allowed to leave the site via the larger systems that will remain intact. Furthermore the layout will leave the more defined channels (Very High sensitivity) intact. The impact on the secondary alluvial systems are however unavoidable due to technical constraints, but it is envisaged that these would not impact on the greater functioning of the catchment.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	Medium (45)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation:		
• The most significant form of mitigation would be to select a development area, which contained no drainage lines. The proposed layout has been developed to avoid the important systems, thus requiring only crossings or footprints within areas rated as having a Moderate sensitivity to physical disturbance, although hydrological function (surface flows) would still remain. • Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.		
Cumulative impacts:		
The increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the development area is near the main drainage channels, however the annual rainfall figures are low.		
Residual impacts:		
Diversion of run-off away from downstream systems is unlikely to occur as the annual rainfall figures are low. Therefore negligible residual impacts area expected.		

Table 68: Assessment of Impact on riparian systems through the possible increase in surface water runoff

Nature		
Impact on riparian systems through the possible increase in surface water runoff on riparian form and function • Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the riparian systems, which are currently ephemeral, i.e. riparian systems species composition changes, which then results in habitat change / loss.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (2)
Probability	Definite (5)	Probable (3)
Significance	Medium (35)	Low (21)

Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation:		
• Any stormwater within the development area must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments, and reduce flow velocities (e.g. water used when washing the panels). • The project should also try to capture and recycle any form of run-off created by the daily operations. This would minimise the amount of water required by the project, but also serve to limit the downstream impacts on the riparian systems through an increase in run-off, a situation that these systems are currently unaccustomed too.		
Cumulative impacts:		
Downstream alteration of hydrological regimes due to the increased run-off from the area.		
Residual impacts:		
Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.		

Table 69: Increase in sedimentation and erosion within the development footprint

Nature		
Increase in sedimentation and erosion within the development footprint • An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation:		
• Any stormwater within the development area must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the PV Panels). • Suitable stormwater management features with erosion control measures (gabions) should also be installed in areas where concentrated flows are anticipated as indicated in the stormwater management plan		
Cumulative impacts:		
Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream will be washed into the Orange River, although currently no direct connections with the Orange River, extreme high flows do enter the river from the development area.		
Residual impacts:		
Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.		

Table 70: Assessment of Impact on localised water quality

Nature		
Impact on localised surface water quality • During both preconstruction, construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the ephemeral systems.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative

Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes (high)	
Mitigation:		
• Strict use and management of all hazardous materials used on site. • Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas • Containment of all contaminated water by means of careful run-off management on site. • Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated water courses or the buffers shown • Strict control of the behaviour of construction workers. • Appropriate waste management. • Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.		
Cumulative impacts:		
None as no direct connection between the development area and Orange River remains		
Residual impacts:		
Residual impacts will be negligible after appropriate mitigation.		

Table 71: Assessment of Cumulative Freshwater Impacts

Nature		
Cumulative Impacts • In the assessment of this project, a number of projects have been assessed by the report author within a 35km radius and or other sites were accessed during the course of travelling between the various projects. Of these potential projects, this report author has been involved in the initial EIA aquatic assessments or has managed / assisted with the WUL process for several of these projects. • All of the projects have indicated that their intention with regard to mitigation, i.e. selecting the best possible sites to minimise the local and regional impacts, or improving the drainage or hydrological conditions within these rivers, the cumulative impact could be seen as a net benefit. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects such as stormwater management, and that flows within these systems are sporadic.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (1)	Low (2)
Probability	Probable (3)	Definite (5)
Significance	**Low (18)**	**Medium (35)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes (high)	
Mitigation:		
Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region by local landowners / public works entities where possible Install properly sized culverts with erosion protection measures at the present road / track crossings are already installed by local landowners / public works entities		
Residual impacts:		
Residual impacts will be negligible after appropriate mitigation.		

6.10.1 Concluding Statement – Freshwater Ecology.

In summary, the proposed layout for the facility would not have a direct impact on the following:

- Any Very High sensitivity areas identified by the DEFF Screening Tool

- Mainstem rivers and pans that do contain functioning aquatic environments that received a Very High sensitivity rating.

Some impacts (panel areas & road crossings) are located in secondary alluvial water courses that were either fragmented or contained no riparian zones, with a Moderate sensitivity. With the proposed mitigation (proper stormwater management and post construction rehabilitation), the impacts would be Low and acceptable for development, as these areas contained no aquatic habitat, and only functioned as a means to sustain / convey baseflows within the greater catchment. The proposed development would in essence not impact on this as surface runoff, although managed to prevent erosion, would still emanate from the site (when significant rainfall occurs), thus maintain this aspect of the hydrological system observed

Therefore, based on the results of this report, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be LOW. This includes the internal roads proposed that would need to cross some of these systems. Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities is made at this point based on the current layout as provided by the developer.

Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities is made at this point based on the current layout for Duneveld PV as provided by the developer.

This report also indicates the watercourses and pans within 500m of the development area. Any activities within these areas, the buffers or 500m from the wetland boundary will require a Water Use license under Section 21 c and i of the National Water Act (Act 36 of 1998). Should any of the present road crossings need to be upgraded that have not been upgraded in the past, then the opportunity exists to improve the current state (lack of habitat continuity) for example by replacing pipe culverts with box culverts.

As the proposed activities have the potential to create erosion, the following recommendations are reiterated:

- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMP to mitigate.

- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks outside of any delineated waterbodies and their buffers. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel.

- It is also advised that an Environmental Control Officer (ECO), with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in this report.

- All alien plant re-growth must be monitored, and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.

- It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset within watercourse areas (including buffers) to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the final EMP preparation preconstruction.

6.11 SOCIAL IMPACTS

Mr Tony Barbour undertook a Social Impact Assessment of the proposed Duneveld PV. A copy of this assessment is included in **Annexure E7** and the following summary is provided in this regard.

The social specialist divided his assessment into the following sections which are discussed separately below.

- Assessment of compatibility with relevant policy and planning context;
- Assessment of social issues associated with the construction phase;
- Assessment of social issues associated with the operational phase;
- Assessment of social issues associated with the decommissioning phase;
- Assessment of the no go alternative; and
- Assessment of cumulative impacts.

6.11.1 Social impacts associated with policy and planning.

The findings of the review indicate that renewable, including solar energy, is strongly supported at a national, provincial and local level.

6.11.2 Social impacts associated with the construction phase

The social specialist identified both positive and negative impacts associated with the construction phase, these impacts were identified as follows:

- Creation of employment and business opportunities, and opportunity for skills development and on-site training (Positive Impact);
- Impacts associated with the presence of construction workers on local communities;
- Impacts related to the potential influx of job-seekers;
- Increased risks to livestock and farming infrastructure associated with the construction related activities and presence of construction workers on the site;
- Increased risk of grass fires associated with construction related activities;
- Noise, dust and safety impacts of construction related activities and vehicles; and
- Impact on productive farmland.

An assessment of these identified social impacts during construction are included in the tables below.

Table 72: Assessment of positive social impacts during the construction phase

Nature: Creation of employment and business opportunities during the construction phase		
	Without Mitigation	**With Enhancement**
Extent	Local – Regional (3)	Local – Regional (4)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (44)	Medium (56)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impact be enhanced?	Yes	
Enhancement:	see section 7 of the BAR dealing with suggested mitigation measures	
Cumulative impacts:	Opportunity to up-grade and improve skills levels in the area.	

Residual impacts:	Improved pool of skills and experience in the local area.

Table 73: Assessment of negative social impacts during the construction phase

Nature: Potential impacts on family structures and social networks associated with the presence of construction workers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short term for community as a whole (2)	Short term for community as a whole (2)
Magnitude	Moderate for the community as a whole (6)	Low for community as a whole (4)
Probability	Probable (3)	Probable (3)
Significance	Medium for the community as a whole (30)	Low for the community as a whole (21)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS
Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation:	See mitigation measures reflected in section 7 of the BAR.	
Cumulative impacts:	Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.	
Residual impacts:	Same as cumulative impacts assessed above	
Assessment of No Go option	There is no impact as the current status quo would be maintained. The potential positive impacts on the local economy associated with the additional spending by construction workers in the local economy will also be lost.	
Nature: Potential impacts on family structures, social networks and community services associated with the influx of job seekers		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Permanent (5) (For job seekers that stay on the town)	Permanent (5) (For job seekers that stay on the town)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (24)
Status	Negative	Negative
Reversibility	No in case of HIV and AIDS	No in case of HIV and AIDS

Irreplaceable loss of resources?	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods	Yes, if people contract HIV/AIDS. Human capital plays a critical role in communities that rely on farming for their livelihoods
Can impact be mitigated?	Yes, to some degree. However, the risk cannot be eliminated	
Mitigation:	See section 7 of the BAR for a summary of the mitigation measures.	
Cumulative impacts:	Impacts on family and community relations that may, in some cases, persist for a long period of time. Also in cases where unplanned / unwanted pregnancies occur or members of the community are infected by an STD, specifically HIV and or AIDS, the impacts may be permanent and have long term to permanent cumulative impacts on the affected individuals and/or their families and the community.	
Residual impacts:.	Same as cumulative impacts assessed above	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	

Nature: Potential risk to safety of scholars, farmers and farm workers, livestock and damage to farm infrastructure associated with the presence of construction workers on site		
	Without Mitigation	**With Mitigation**
Extent	Local (3)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Medium (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (24)
Status	Negative	Negative
Reversibility	Yes, compensation paid for stock losses and damage to farm infrastructure etc.	Yes, compensation paid for stock losses and damage to farm infrastructure etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation:	See section 7 of the BAR for a summary of the Mitigation Measures.	
Cumulative impacts:	No**,** provided losses are compensated for.	
Residual impacts:	See cumulative impacts above.	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	

Nature: Potential loss of livestock, crops and houses, damage to farm infrastructure and threat to human life associated with increased incidence of grass fires		
	Without Mitigation	**With Mitigation**
Extent	Local (4)	Local (2)
Duration	Short term (2)	short term (2)
Magnitude	Moderate due to reliance on agriculture for maintaining livelihoods (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (36)	Low (24)

Status	Negative	Negative
Reversibility	Yes, compensation paid for stock and crop losses etc.	Yes, compensation paid for stock and crop losses etc.
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation:	See section 7 of the BAR for a summary of mitigation measures.	
Cumulative impacts:	No, provided losses are compensated for.	
Residual impacts:	See cumulative impacts.	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	

Nature: Potential noise, dust and safety impacts associated with movement of construction related traffic to and from the site		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Short Term (2)	Short Term (2)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Low (15)
Status	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation:	See section 7 of the BAR for a summary of Mitigation measures	
Cumulative impacts:	If damage to local farm roads is not repaired then this will affect the farming activities in the area and result in higher maintenance costs for vehicles of local farmers and other road users. The costs will be borne by road users who were not responsible for the damage. Dust impacts to vineyards could also impact on future contracts.	
Residual impacts:	See cumulative impacts above.	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	

Nature: The activities associated with the construction phase, such as establishment of access roads and the construction camp, movement of heavy vehicles and preparation of foundations for the SEF and power lines will damage farmlands and result in a loss of farmlands for grazing.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long term-permanent if disturbed areas are not effectively rehabilitated (5)	Short term if damaged areas are rehabilitated (2)
Magnitude	Medium (6)	Minor (2)
Probability	Probable (3)	Highly Probable (4)
Significance	Medium (36)	Low (20)

Status	Negative	Negative
Reversibility	Yes, disturbed areas can be rehabilitated.	Yes, disturbed areas can be rehabilitated.
Irreplaceable loss of resources?	Yes, loss of farmland. However, disturbed areas can be rehabilitated	Yes, loss of farmland. However, disturbed areas can be rehabilitated
Can impact be mitigated?	Yes, however, loss of farmland cannot be avoided	
Mitigation:	See below	
Cumulative impacts:	Overall loss of farmland could affect the livelihoods of the affected farmers, their families, and the workers on the farms and their families. However, disturbed areas can be rehabilitated.	
Residual impacts:	See cumulative impacts.	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	

6.11.3 Social Impacts Associated with the operational phase.

The social specialist identified both positive and negative impacts associated with the operational phase of the development, these impacts were identified as follows:

- The establishment of renewable energy infrastructure (positive);
- Creation of employment and business opportunities. The operational phase will also create opportunities for skills development and training (positive);
- Generation of additional income for the landowner (positive);
- Benefits associated with the establishment of a Community Trust (positive);
- The visual impacts and associated impact on sense of place; and
- Potential impact on tourism.

An assessment of both these positive and negative impacts are included in the tables below.

Table 74: Assessment of positive social impacts during the operational phase.

Nature: Development of infrastructure to generate clean, renewable energy		
	Without Mitigation	**With Mitigation**
Extent	Local, Regional and National (4)	Local, Regional and National (5)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	High (8)
Probability	Highly Probable (4)	Definite (5)
Significance	High (64)	High (85)
Status	Positive	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	Yes, impact of climate change on ecosystems	Reduced CO_2 emissions and impact on climate change
Can impact be mitigated?	Yes	
Enhancement:	See section 7 of the BAR for a summary of mitigation measures (these measures include the relative enhancement opportunities	
Cumulative impacts:	Overall reduction in CO_2 emission, reduction in water consumption for energy generation, contribution to establishing an economically viable commercial renewables generation sector in the Northern Cape and South Africa.	
Residual impacts:	See cumulative impacts above	

Assessment of No-Go option	The No-Development option would represent a lost opportunity for South Africa to supplement its current energy needs with clean, renewable energy.	
Nature: Creation of employment and business opportunities associated with the operational phase		
	Without Mitigation	**With Enhancement**
Extent	Local and Regional (1)	Local and Regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Probable (3)	Definite (5)
Significance	Low (27)	Medium (50)
Status	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Enhancement:	See section 7 of the BAR for a summary of mitigation measures (these measures include the relative enhancement opportunities	
Cumulative impacts:	Creation of permanent employment and skills and development opportunities for members from the local community and creation of additional business and economic opportunities in the area	
Residual impacts:	See cumulative impacts above	
Assessment of No-Go option	There is no impact as it maintains the current status quo. However, the potential opportunity costs in terms of the loss of employment and skills and development training would be lost.	
Nature: Establishment of a community trust funded by revenue generated from the sale of energy. The revenue can be used to fund local community development		
	Without Mitigation	**With Enhancement**
Extent	Local and Regional (2)	Local and Regional (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)
Likelihood	Probable (3)	Definite (5)
Significance	Medium (30)	High (65)
Status	Positive	Positive
Reversibility	Yes	Yes
Can impact be enhanced?	Yes	
Enhancement:	See section 7 of the BAR for a summary of mitigation measures (these measures include the relative enhancement opportunities	
Cumulative impacts:	Promotion of social and economic development and improvement in the overall well-being of the community	
Residual impacts:	See cumulative impacts	
Assessment of No-Go option	There is no impact as it maintains the current status quo. However, the potential opportunity costs in terms of the supporting the social and economic development in the area would be lost. This would also represent a negative impact.	

Nature: The generation of additional income represents a significant benefit for the local affected farmer(s) and reduces the risks to their livelihoods posed by droughts and fluctuating market prices for sheep and farming inputs, such as feed etc. (+)		
	Without Mitigation	**With Enhancement**
Extent	Local (1)	Local (3)
Duration	Long term (4)	Long term (4)
Intensity	Low (4)	Moderate (6)
Likelihood	Probable (3)	Definite (5)
Significance	Low (27)	Medium (53)
Status	Positive	Positive
Reversibility	Yes	Yes
Can impact be enhanced?	Yes	
Enhancement:	See section 7 of the BAR for a summary of mitigation measures (these measures include the relative enhancement opportunities	
Cumulative impacts:	Support for local agricultural sector and farming	
Residual impacts:	See cumulative impacts	
ssessment of No-Go option	There is no impact as it maintains the current status quo.	

Table 75: Assessment of negative social impacts during the operational phase of the development.

Nature: [29]Visual impact associated with the proposed solar facility and the potential impact on the area's rural sense of place.		
	Without Mitigation	**With Mitigation**
Extent	Local (2)	Local (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (4)	Highly Probable (4)
Significance	Medium (32)	Low (28)
Status	Negative	Negative
Reversibility	Yes, solar facility can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation:	See section 7 of the BAR for a summary of the suggested mitigation measures.	
Cumulative impacts:	Potential impact on current rural sense of place	
Residual impacts:	See cumulative impacts	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	
Nature: Potential impact of the SEF on local tourism		
	Without Mitigation	**With Enhancement / Mitigation**

[29] This assessment includes visual impacts from a social perspective. Please also refer to the detailed standalone Visual Impact Assessment that was undertaken.

Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24) (Applies to both – and +)	Low (24) (Applies to both – and +)
Status	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)	Negative (Potential to distract from the tourist experience of the area) Positive (Potential to attract people to the area)
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impact be enhanced?	Yes	
Enhancement:	See section 7 of the BAR for a summary of mitigation measures (including opportunities for enhancement	
Cumulative impacts:	The proposed SEF is one of a number of SEFs proposed in the KGLM area. Due to size and height of SEFs the cumulative impacts are not rated significant.	
Residual impacts:	See cumulative impacts	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	

6.11.4 Social impacts associated with the decommissioning phase

The social specialist identified negative impacts associated with loss of jobs after the decommissioning of the development. These impacts are assessed in the table below.

Table 76: Assessment of social Impacts associated with the decommissioning of the facility.

Nature: Social impacts associated with retrenchment including loss of jobs, and source of income		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (1)
Duration	Medium Term (2)	Very Short Term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (40)	Low (24)
Status	Negative	Negative
Reversibility	Yes, assumes retrenchment packages are paid to all affected employees	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Mitigation:	See section 7 of the BAR for a summary of the suggested mitigation measures.	
Cumulative impacts:	Loss of jobs and associated loss of income etc. can impact on the local economy and other businesses. However, decommissioning can also create short term, temporary employment opportunities associated with dismantling etc.	
Residual impacts:	See cumulative impacts	

6.11.5 Cumulative Social Impacts.

The social specialists identified a number of cumulative impacts associated with sense of place, accommodation availability and local economics. An assessment of these potential cumulative impacts are included in the table below.

Table 77: Assessment of cumulative social impacts associated with the development.

Nature: Visual impacts associated with the establishment of more than one SEF and the potential impact on the area's rural sense of place and character of the landscape.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (2)	Local and regional (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Medium (30)	Low (24)
Status	Negative	Negative
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Enhancement:	See section 7 of the BAR	
Cumulative impacts:	Impact on other activities whose existence is linked to rural sense of place and character of the area, such as tourism, bird watching, and hunting.	
Residual impacts:	See cumulative impacts	
Assessment of No-Go option	There is no impact as it maintains the current status quo.	
Nature: The establishment of a number of renewable energy facilities in the KGLM and ZFMDM will place pressure on local services, specifically medical, education and accommodation		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (3)	Local and regional (1)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (52)	Low (28)
Status	Negative	Negative
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Enhancement:	See below	
Cumulative impacts:	Negative impact on the local services	
Residual impacts:	See cumulative impacts	
Comment on No-Go option	There is no impact as it maintains the current status quo.	

Nature: The establishment of a number of solar energy facilities in the KGLM and ZFMDM will create employment, skills development and training opportunities, creation of downstream business opportunities.		
	Without Mitigation	**With Mitigation**
Extent	Local and regional (3)	Local and regional (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly Probable (4)	Definite (5)
Significance	Medium (44)	High (70)
Status	Positive	Positive
Reversibility	Yes. Solar energy plant components and other infrastructure can be removed.	
Irreplaceable loss of resources?	No	No
Can impact be mitigated?	Yes	
Enhancement:	See section 7 of the BAR	
Cumulative impacts:	Positive impact on the local and regional economy through the creation of downstream opportunities and wage spend in the local economy	
Residual impacts:	See cumulative impacts	
Assessment of No-Go option	There is no impact as it maintains the current status quo. This would represent a lost socio-economic opportunity for the KGLM.	

6.11.6 Assessment of social impacts of the no-go alternative.

The social specialist assessed the impacts associated with lost opportunities, should the no-go alternative be implemented. The outcome of this assessment is included in the table below.

Table 78: Assessment of social impacts associated with the no-go alternative.

Nature: The no-development option would result in the lost opportunity for South Africa to supplement is current energy needs with clean, renewable energy		
	Without Mitigation	**With Mitigation**
Extent	Local-International (4)	Local-International (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Moderate (56)	Moderate (56)
Status	Negative	Positive
Reversibility	Yes	
Irreplaceable loss of resources?	N/A	N/A
Can impact be mitigated?	Yes	
Enhancement:	See section 7 of the BAR	
Cumulative impacts:.	Reduce carbon emissions via the use of renewable energy and associated benefits in terms of global warming and climate change	
Residual impacts:	See cumulative impacts	

6.11.7 Conclusion and recommendation of social specialist

The findings of the Social Impact Assessment indicate that the development of the proposed Duneveld PV will create employment and business opportunities for locals during both the construction and operational phase of the project.

The establishment of a Community Trust will also benefit the local community. The enhancement measures listed in the report should be implemented in order to maximise the potential benefits. The significance of this impact is rated as High Positive. The proposed development also represents an investment in clean, renewable energy infrastructure, which, given the negative environmental and socio-economic impacts associated with a coal based energy economy and the challenges created by climate change, represents a significant positive social benefit for society as a whole. The findings of the Social Impact Assessment also indicate that the REIPPPP has resulted in significant socio-economic benefits, both at a national level and at a local, community level. These benefits are linked to foreign Direct Investment, local employment and procurement and investment in local community initiatives. The establishment of the proposed Duneveld PV is therefore supported by the findings of the Social Impact Assessment.

Due the number of other renewable energy projects proposed in the local municipal area, it is recommended that the Kai !Garib Local Municipality liaise with the proponents to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole.

6.12 TRAFFIC IMPACTS

An independent specialist, JG Afrika undertook a Traffic impact assessment of the proposed Duneveld PV. The section below, summarises the impacts identified in this study.

6.12.1 Construction phase traffic impacts

The tables below summarise the traffic impacts associated with the construction phase of Duneveld PV.

Table 79: Impacts of traffic congestion during construction

Environmental Parameter	Traffic Congestion	
Issue/Impact/Environmental Effect/Nature	Transport of equipment, material and staff to site will lead to congestion.	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
	Pre-mitigation impact rating	**Post mitigation impact rating**
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (6)	Low (4)
Significance rating	Medium (36)	Low (12)
Mitigation measures	• Stagger component delivery to site • Reduce the construction period • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.	
Residual Risks:	None, Traffic will return to normal levels after construction is completed.	

Table 80: Impacts on Air Quality as a result of dust from construction traffic.

Environmental Parameter	Air quality will be affected by dust pollution	
Issue/Impact/Environmental Effect/Nature	Traffic on roads will generate dust.	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
	Pre-mitigation impact rating	**Post mitigation impact rating**
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• Dust Suppression of gravel roads during the construction phase, as required. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.	
Residual Risks:	Dust pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the construction period.	

Table 81: Impacts of noise pollution due to increased traffic

Environmental Parameter	Noise pollution due to increased traffic.	
Issue/Impact/Environmental Effect/Nature	Traffic on roads will generate noise.	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
	Pre-mitigation impact rating	**Post mitigation impact rating**
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• Stagger component delivery to site • Reduce the construction period as far as possible • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods	
Residual Risks:	Noise pollution during the construction phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the construction period.	

6.12.2 Operational Phase Traffic Impacts

The specialist concluded that the traffic generated during the operational phase will be negligible and will not have any impact on the surrounding road network.

6.12.3 Decommissioning Phase Traffic Impacts

The tables below summarise the traffic impacts associated with the decommissioning phase of Duneveld PV. It must be noted that the decommissioning impacts as well as their associated mitigations are the same as those for the construction phase.

Table 82: Impacts of traffic congestion during decommissioning

Environmental Parameter	Traffic Congestion

Issue/Impact/Environmental Effect/Nature	Transport of equipment, material and staff to site will lead to congestion.	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
	Pre-mitigation impact rating	**Post mitigation impact rating**
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (6)	Low (4)
Significance rating	Medium (36)	Low (12)
Mitigation measures	• Stagger component removal to site • Reduce the construction period • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods. • Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase.	
Residual Risks:	None, Traffic will return to normal levels after decomissionimg is completed.	

Table 83: Impacts on Air Quality as a result of dust from decommissioning traffic.

Environmental Parameter	Air quality will be affected by dust pollution	
Issue/Impact/Environmental Effect/Nature	Traffic on roads will generate dust.	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
	Pre-mitigation impact rating	**Post mitigation impact rating**
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)
Mitigation measures	• Dust Suppression of gravel roads during the decomissioning phase, as required. • Regular maintenance of gravel roads by the Contractor during the decomissioning phase and by Client/Facility Manager during operation phase.	
Residual Risks:	Dust pollution during the decomissioning phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Dust pollution is limited to the decomissioning period.	

Table 84: Impacts of noise pollution due to increased traffic

Environmental Parameter	Noise pollution due to increased traffic.	
Issue/Impact/Environmental Effect/Nature	Traffic on roads will generate noise.	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss	
	Pre-mitigation impact rating	**Post mitigation impact rating**
Extent	Local (2)	Local (1)
Probability	Highly probable (4)	Improbable (2)
Duration	Very Short (1)	Very Short (1)
Magnitude	Moderate (5)	Minor (2)
Significance rating	Medium (32)	Low (8)

Mitigation measures	• Stagger component removal from site • Reduce the decomissioning period as far as possible • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods
Residual Risks:	Noise pollution during the operational phase cannot be completely mitigated but mitigation measures will significantly reduce the impact. Noise pollution is limited to the decomissioning period.

6.12.4 Cumulative Impacts on Traffic

To assess the cumulative impact, the specialist assumed that all renewable energy projects within 50km currently proposed and authorized, would be constructed at the same time. This is the precautionary approach as in reality these projects would be subject to a highly competitive bidding process. Only a handful of projects would be selected to enter into a power purchase agreement with Eskom, and construction is likely to be staggered depending on project-specific issues.

The assessments of cumulative impacts are shown in the table below.

Table 85: Assessment of Cumulative Traffic Impacts

Nature:		
Traffic generated by the proposed development and the associated noise and dust pollution.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	Moderate (3)
Duration	Very Short (1)	Short (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	Medium (36)	Medium (55)
Status (positive/negative)	Negative	Negative
Reversibility	High	High
Loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation:		
• Stagger component delivery to site • Dust suppression • Reduce the construction period • The use of mobile batch plants and quarries in close proximity to the site • Staff and general trips should occur outside of peak traffic periods		

6.12.5 Concluding Statement - Traffic

The construction and decommissioning phases of a development are the only significant traffic generators and therefore noise and dust pollution will be higher during these phases. The duration of the phases is short term, i.e. the impact of the traffic on the surrounding road network is temporary and solar energy facilities, when operational, do not add any significant traffic to the road network.

Access point 1 is deemed the preferred access route as it allows direct access to the proposed site and does not require additional structures to be constructed. The development is supported from a transport perspective provided that the recommendations and mitigations contained in this report are adhered to.

The impacts associated with Duneveld PV Development are acceptable from a traffic perspective and with the implementation of the recommended mitigation measures can be considered for authorisation.

6.13 CUMULATIVE IMPACT ASSESSMENT

This section is summarised from the cumulative impact assessments that took place by each of the participating specialists. For further details in this regard, the reader is referred to the specialist assessments contained in **Appendix E**.

Where appropriate, certain specialists did include a cumulative assessment of a much wider area than the accepted 30km radius.

No potentially fatal flaws have been identified associated with cumulative impacts.

The 2014 EIA Regulations(as amended) (GNR 326) define a cumulative impact as follows:

"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."

There are a number of other renewable energy facilities in the vicinity of the proposed Duneveld PV as detailed in the table below.

A Strategic Environmental Assessment process was undertaken by the CSIR in order to identify geographical areas most suitable for the rollout of Renewable Energy projects and the supporting electricity grid network. The aim of the assessment was to designate REDZs within which such development will be incentivised and streamlined. Subsequent to the SEA, these REDZ have been gazetted. Duneveld PV is within one of these Gazetted REDZ and as such deemed more suitable for such development on a cumulative scale.

Cumulative impacts that could occur due to the development of solar energy facilities and associated infrastructure in close proximity to each other include impacts such as:

- Visual impacts
- Socio-economic impacts
- Loss of vegetation and the inability to achieve conservation targets
- Impacts to soil and agricultural potential
- Impacts on heritage resources (in this area particularly relating to Archaeology resources)
- Surface water resources

In terms of possible cumulative impacts, one needs to look at the presence of similar facilities on the farm portion as well as the greater landscape.

- Cumulative impacts due to the cumulative effects of Duneveld PV added to all other renewable energy facilities in the Upington area. These impacts need to be managed through strategic spatial planning documents such as an SEA and SDF and not through individual EIA processes.
- Cumulative impacts due to the cumulative effects of the 7 Solar Facilities proposed to be located on one site i.e. Geel Kop Farm 456 RE.

The table below reflects the other renewable energy facilities in close proximity to the proposed Duneveld PV.

Table 86: Renewable Energy Facilities in proximity to Duneveld PV and their status

#	Project	Property	Status
1	Khi Solar 1 (CSP)	Portion 3 of the Farm McTaggarts Camp 453	Operational
2	Upington CSP tower 2 and 3 (CSP)	Portion 3 of the Farm McTaggarts Camp 453	Authorised
3	Rooipunt Solar Park (PV)	Remainder farm Rooipunt 617	Authorised

#	Project	Property	Status
4	Sasol CSP Phase 1 and 2 (CSP)	Portions 443 and 450 of 450 van roois vley	Authorised
5	Sirius Solar One (PV)	Remainder of Farm Tungsten Lodge	Operational
6	Sirius Solar 2 (PV)	Remainder of Farm Tungsten Lodge	Authorised
7	Sirius Solar 3 (PV)	Remainder of Farm Tungsten Lodge	EIA in Process
8	Sirius Solar 4 (PV)	Remainder of Farm Tungsten Lodge	EIA in Process
9	S-Kol (PV)	Farm Geel kop 456	Authorised / Lapsed
10	Ofir ZX (PV)	Remainder of Farm 616	Authorised
11	Sonneberg PV Facility	Portion 11 of 474	Authorised
12	Dyasonsklip 1	Farm Dyasonsklip 454	Operational
13	Dyasonsklip 2	Farm Dyasonsklip 454	Operational
14	Dyasonsklip 3	Farm Dyasonsklip 454	Authorised
15	Dyasonsklip SEF 1	Farm Dyasonsklip 454	Authorised
16	Bloemsmond 1	Portion 5 and 14 of Bloemsmond 455	Authorised
17	Bloemsmond 2	Portion 5 and 14 of Bloemsmond 455	Authorised
18	Bloemsmond 3	Portion 5 and 14 of Bloemsmond 455	Authorised
19	Bloemsmond 4	Portion 5 and 14 of Bloemsmond 455	Authorised
20	Bloemsmond 5	Portion 5 and 14 of Bloemsmond 455	Authorised
21	Bushmanland PV	RE Geel kop 456	EIA in Process
22	Duneveld PV	RE Geel kop 456	EIA in Process
23	Hari PV	RE Geel kop 456	EIA in Process
24	Gordonia PV	RE Geel kop 456	EIA in Process
25	Shrubland PV	RE Geel kop 456	EIA in Process
26	Karroid PV	RE Geel kop 456	EIA in Process
27	GK PV	RE Geel kop 456	EIA in Process

Cape EAPrac does not have details on the exact configuration of these facilities, however, based on the assumption that each facility on average will result in the transformation of approximately 230ha, one can assume the following transformation of the two vegetation types associated with the greater area.

Table 87: Potential habitat transformation proximity to Duneveld PV.

Status	Transformation Area in Hectares
In operation	920
Under construction	0
Authorised	3220
EIA in Progress	2760

It is impossible to foresee how many of these projects will reach preferred bidder status in terms of the REIPPPP and will eventually be constructed. As a worst case scenario one can assume a total transformation of 6900 hectares.

Potential cumulative impacts identified for the project include various negative impacts such as loss of habitat, visual massing, loss of agricultural land an influx jobseekers and change in the area's sense of place, but also include positive cumulative impacts on the economy, business development, and employment.

From an ecological perspective, cumulative impacts associated with the development are a concern. However, the loss of the habitat within the preferred alternative is not considered highly significant, given the context surrounding the site. As a result, the overall cumulative impact of the development is considered likely to be medium.

In terms of habitat loss, the affected vegetation type is still approximately 96% intact and is an extensive vegetation type, the cumulative loss of 6000ha of habitat is not considered highly significant, especially given the spatial context of the site within a Renewable Energy Development Zone.

From a social perspective the project is deemed to have a medium positive cumulative impact from employment, skills and business opportunities and skills development and a low negative cumulative impact from large-scale in-migration of people

From a visual perspective, the cumulative visual risk to scenic resources was rated medium negative. Retaining the vegetation around the proposed PV areas will retain the surrounding agricultural sense of place, and further localise the combined zone of visual influence. With successful rehabilitation of the area back to an agricultural land use on closure, the cumulative visual risk could be reduced to negligible in the long term.

6.14 IMPACT SUMMARY

The table below summarises the significance (with mitigation) of all impacts assessed in the sections above[30].

For ease of easy references, impacts are visually reflected using the following colour scheme[31].

All positive impacts (regardless of their significance)

Neutral or Negligible negative impacts

Very Low and Low negative impacts

Medium negative impacts

Medium – High, High and Very High negative impacts

Table 88: Summary of the significance of impacts associated with Duneveld PV[32].

Impact	Significance (with mitigation)
Social Impacts during the construction Phase	
Creation of employment and business opportunities	Medium positive
Presence of construction workers and potential impacts on family structures and social networks.	Low negative
Influx of job seekers.	Low negative
Safety risk, stock theft and damage to farm infrastructure associated with presence of construction workers.	Low negative
Increased risk of veld fires	Low negative
Impact of heavy vehicles and construction activities.	Low negative
Loss of farmland.	Low negative
Social Impacts during the operational phase	
Promotion of renewable energy projects	High positive
Creation of employment and business opportunities	Medium positive
Establishment of Community Trust	High positive
Generate income for affected landowner/s	Medium positive
Visual impact and impact on sense of place	Low negative
Impact on tourism	Low positive and negative
Visual Impacts during construction and operation phase	
Change of local and surrounds visual resources due to the construction and operation of the proposed (3.5m high) PV structures, and buildings.	Low negative
Change of local and surrounds visual resources due to the construction and operation of the proposed road access.	Low negative

[30] In order to attain these outcomes, the mitigation measures reflected in section 7 of the report need to be implemented.

[31] Where specialist ratings fall across 2 of the groups, the worst case is reflected in the quick reference.

[32] This includes cumulative impacts associated with the facility

Impact	Significance (with mitigation)
Palaeontological Impacts	
Impact on potential palaeontological resources	Low negative
Agricultural Impacts	
Soil pollution with contaminants during the construction phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the construction of all facets of the facility: laydown area, concrete foundations of the auxiliary buildings, inverter stations subterranean cabling, main access and internal service roads.	Low negative
The establishment of the PV Solar facility will be done at the expense of agricultural land. The area to be lost for agricultural development would be 212ha in size. This includes the area under PV panels, internal service roads and temporary laydown area	Low negative
The construction of a PV Solar facility will cause impairment of the land capability with the potential risk of erosion	Low negative
The establishment of the PV Solar facility may alter drainage patterns with construction and cause erosion	Low negative
Soil pollution with contaminants during the operational phase may take place, including spillages of hydrocarbon (fuel oil) and cement. This is possible during the maintenance of the facility.	Low negative
The establishment of the PV Solar facility will be done at the expense of agricultural land. Area to be lost for agricultural development would be 212 ha in size. This includes the area under PV panels, internal service roads and temporary laydown area.	Low negative
The quantity of available soil for agricultural production decreases as result of the footprints of these facilities. The quality of soil decreases in the way the construction of these structures alters the workability of the soil. This includes the physical deformation in the soil profile (Cumulative)	Medium negative
Clearing of vegetation increases flow speed and a lower infiltration tempo increases silt transport (Cumulative)	Medium negative
Chemicals, hazardous substances and waste used or generated during live span of the facility accumulate and pollute soil will become contaminated (Cumulative)	Medium negative
Freshwater Ecology Impacts	
Loss of Very High Sensitivity systems, namely the mainstem alluvial water course and a pan through physical disturbance although the proposed layout will avoid any of these systems.	Low negative
Impact on secondary alluvial water courses (Moderate Sensitivity), through physical disturbance	Low negative
Impact on all riparian and wetland systems through the possible increase in surface water runoff on riparian form and function through hydrological changes	Low negative
Increase in sedimentation and erosion	Low negative
Risks on the aquatic environment due to water quality impacts	Low negative
Cumulative impacts	Medium Negative
Terrestrial Fauna Impacts	
Loss and/or fragmentation of indigenous natural vegetation due to clearing;	Medium negative
Loss of individuals of plant species of conservation concern and/or protected plants	Low negative
Loss of faunal habitat and refugia	Low negative
Direct mortality of fauna due to machinery, construction and increased traffic	Low negative
Displacement and/or disturbance of fauna due to increased activity and noise levels	Low negative
Effects on physiological functioning of vegetation due to dust deposition	Low negative
Increased poaching and/or illegal collecting due to increased access to the area.	Low negative
Indirect impacts during the construction phase include the following	Low negative
Establishment and spread of alien invasive plants due to the clearing and disturbance of indigenous vegetation	Low negative
Changes to behavioural patterns of animals, including possible migration away or towards the project area	Low negative
Increased runoff and erosion due to clearing of vegetation, construction of hard surfaces and compaction of surfaces, leading to changes in downslope areas.	Low negative
Cumulative Impacts	Medium negative
Avifaunal Impacts	
Construction of the solar PV plant and associated infrastructure	Low negative

Impact	Significance (with mitigation)
Displacement due to habitat transformation	Medium negative
Collisions	Low negative
Entrapment	Low negative
Electrocution	Low negative
Decomissioning Impacts	Low negative
Cumulative Impacts	Low negative
Traffic Impacts.	
Traffic Congestion	Low negative
Noise pollution due to increased traffic	Low negative
Air quality affected by dust pollution	Low negative

As can be seen from the table above, there are a number of positive impact associated with Duneveld PV. The majority of the negative impacts are either low or medium/ There are no high or very high impacts associated with Duneveld PV.

6.15 IMPACT STATEMENT

None of the participating specialists identified any impacts that remain high after mitigation. Because of the risk adverse approach followed for the development of the preferred layout, all the main sensitive features, (most notably Significant Water Courses, Pans, Rocky outcrops Archaeology Features, Avifaunal buffers and visually sensitive areas) were avoided.

The affected area is considered suitable for development and there are no impacts associated with Duneveld PV that cannot be mitigated to a medium level. As such there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Duneveld PV can be supported from an terrestrial ecology, avifaunal, freshwater visual, social, heritage and agricultural point of view.

A map showing the proposed activity in relation to the key sensitive features is in attached in **Appendix D**. All sensitive features along with their appropriate buffers are shown in this plan. As required by the EMPr, all areas outside of the proposed development footprint are to be demarcated as no go areas.

Please refer to the table in the section above listing the key impacts and their significance post mitigation for the preferred alternative. This section must be read in conjunction with the suggested mitigation measures listed in section 7 of this Report.

The table below shows the listed activities applied for with a reference of where the impacts associated with the specific activity are assessed by specialists.

Table 89: Specialist Impact Assessment of Listed Activities.

Listed activity as described in GN R.983, 984 and 985	Reference to Impact Assessment
Regulation 983 – Basic Assessment	
GN R983 Activity 11: *The development of facilities or infrastructure for the transmission and distribution of electricity-* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or* *(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.*	Annexures E1, E2, E3, E4, E5, E7, E8, E12, E13 & E14.
GN R983 Activity 12: The development of- (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	Annexures E1, E8, E11 & E13

GN R983 Activity 19: *The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic (i) a watercourse;*	Annexures E1, E8, E11 & E13
Regulation 984 – S&EIR	
GN R984 Activity 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 within an urban area.	Annexures E1, E2, E3, E4, E5, E7, E8, E10, E12, E13 & E14.
GN R984 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.	Annexures E1, E2, E3, E4, E5, E7, E8, E10, E12, E13 & E14.

7. MITIGATION MEASURES

Please refer to the table below, which summarises the mitigation measures recommended by both the Specialists and Cape EAPrac. This table summarises the mitigations, and details whether they should be included as conditions of approval, or whether they have been included as actions in the EMPr. The table furthermore reflects to which stage of the development the proposed mitigation measures are applicable. In instances where suggested mitigations have already been incorporated into the design phase, they have been reflected as such.

Table 90: Recommended mitigation measures required for the construction, operation and decommissioning of the Duneveld PV development.

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
Terrestrial Ecology					
Restrict impact to development footprint only and limit disturbance spreading into surrounding areas.	✓	✓	✓	✓	✓
As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.		✓	✓		
Avoid sensitive features and habitats when locating infrastructure		✓	✓		
Cross streams and other linear features at right angles, where possible, and also near their end-points or where there are natural breaks in the feature		✓	✓		
Construct adequate structures at points where roads cross watercourses, either proper stabilized dips in the road or culverts that do not limit the width of natural channels or the natural hydrological function.		✓	✓		
No mass clearing of vegetation for the PV arrays should be allowed. Vegetation to be brush cut and only in exceptional circumstances completely cleared.	✓	✓	✓		
Compile a Rehabilitation Plan		✓	✓	✓	✓

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.		✓	✓	✓	✓
Where possible, access roads should be located along existing farm, access and district roads		✓	✓		
Access to sensitive areas outside of development footprint should not be permitted during construction.		✓	✓		
Undertake monitoring to evaluate whether further measures would be required to manage impacts.		✓	✓	✓	
A number of protected species were found on site. The following mitigation measures would help to avoid and limit impacts: It is a legal requirement to obtain permits for specimens that will be lost.	✓	✓	✓		
A detailed pre-construction walk-through survey will be required during a favourable season to locate any additional individuals of protected plants. This survey must cover the footprint of all approved infrastructure, including internal access roads.	✓	✓	✓		
If possible, plants should be conserved in situ, along with an appropriate buffer zone around them		✓	✓		
Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the irreplaceable loss of resources as well as the cumulative effect		✓	✓		
A Plant Rescue Plan must be compiled to be approved by the appropriate authorities.		✓	✓		
Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, cliffs and riparian habitats.	✓		✓		
No speeding on access roads – install speed control measures, such as speed humps, if necessary		✓	✓		
No hunting of protected species.		✓	✓		
Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species.		✓	✓		
Report any sitings to conservation authorities		✓	✓	✓	
Undertake dust fall-out monitoring and manage, where necessary	✓	✓	✓		
Compile and implement an alien management plan, which highlights control priorities and areas and provides a programme for long-term control. This should include any areas within proximity to the project that may be affected by the project, or that could have an influence on invasion by alien invasive plants into the property		✓	✓	✓	
Undertake regular monitoring to detect alien invasions early so that they can be controlled.		✓	✓	✓	
Avoid development of designated sensitive habitats		✓	✓		
Appropriate lighting should be installed to minimize impacts on nocturnal animals.		✓	✓	✓	
Construction activities should not be undertaken at night.		✓	✓		
Compile and implement a stormwater management plan, which highlights control priorities and areas and provides a programme for long-term control		✓	✓		
Undertake regular monitoring to detect erosion features early so that they can be controlled		✓	✓	✓	
Avoid building on or near steep or unstable slopes. Construct proper culverts, bridges and/or crossings at drainage-line crossings, and other attenuation devices to limit overland flow		✓	✓		

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities		✓		✓	
If any additional infrastructure needs to be constructed, for example overhead powerlines, communication cables, etc., then these must be located next to existing infrastructure, and clustered to avoid dispersed impacts.		✓		✓	
No driving of vehicles off-road		✓		✓	
Implement Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.		✓		✓	
Access to sensitive areas outside of development footprint should not be permitted during operation. Surface runoff and erosion must be properly controlled and any issues addressed as quickly as possible.		✓		✓	
No illegal collecting of any individuals, particularly the Armadillo Girdled Lizard		✓	✓	✓	
No hunting of protected species or hunting of any other species without a valid permit.		✓	✓	✓	
Personnel to be educated about protection status of species, including distinguishing features to be able to identify protected species		✓	✓	✓	
Avifaunal					
Activity should as far as possible be restricted to the footprint of the infrastructure.		✓	✓		✓
Measures to control noise and dust should be applied according to current best practice in the industry.		✓	✓		✓
Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.		✓	✓		✓
Access to the rest of the property must be restricted. The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.		✓	✓		
A single perimeter fence should be used .		✓		✓	
With regards to the infrastructure within the substation yard and inverter station, the hardware is too complex to warrant any mitigation for electrocution at this stage. It is rather recommended that if any impacts are recorded once operational, site specific mitigation be applied reactively.		✓		✓	
Palaeontology					
Implementation of a chance find procedure		✓	✓		
Visual					
Investigate the possibility of undertaking screening		✓	✓		
Plan to maintain the height of structures as low as possible;		✓	✓		
Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development		✓	✓		
Reinstate any areas of vegetation that have been disturbed during construction		✓	✓		
Remove all temporary works		✓		✓	
Monitor rehabilitated areas post-construction and implement remedial actions;		✓		✓	
Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.		✓		✓	
Remove infrastructure not required for the post-decommissioning use of the site		✓			✓

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.		✓	✓		
It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset to ensure a net benefit to the environment within all areas that will remain undisturbed.		✓	✓	✓	
Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off		✓	✓		
Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.		✓	✓		
Any stormwater within the development area must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the PV Panels).		✓	✓	✓	
Suitable stormwater management features with erosion control measures (gabions) should also be installed in areas where concentrated flows are anticipated		✓	✓		
Strict use and management of all hazardous materials used on site.		✓	✓		
Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas		✓	✓		
Containment of all contaminated water by means of careful run-off management on site.		✓	✓		
Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated water courses or the buffers shown		✓	✓		
Strict control of the behaviour of construction workers.		✓	✓		
Appropriate waste management		✓	✓		
Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.		✓	✓		
Agriculture					
Installation of proper Erosion control, and drainage on the access road.		✓	✓		
Dust control on the access road during construction.		✓	✓		
The general objective is to position the PV facilities on the lowest potential soil and not in places that may have impact on agricultural activities, drainage lines and places with a sensitive nature. Existing road alignments are followed and roads upgraded for use during the live span of facility. With the appropriate planning, the same live style can be achieved during the lease period of the facility from the land so occupied by the facility.		✓	✓		
Refuelling normally takes place in the workshop of the control building. A designated area for refuelling must be constructed with an impervious floor and low wall that will keep the spillage inside. Any spillage must be cleaned with absorbent material as soon as possible and disposed into clearly marked containers. Where spillage takes place, contaminated soil must be excavated and replaced with unpolluted soil. The contaminated soil should be collected by a licenced landfill contractor.		✓	✓		

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
Ensure that most infrastructure features are erected on transformed or non-arable land. Implement stormwater management as an integral part of planning and as a guideline for the positioning of structures. Use existing roads and conservation structures to the maximum in the planning and operation phases. Rehabilitate disturbed areas as soon as possible after construction.		✓	✓		
Erosion and sediment control with proper water run-off control planning.		✓	✓		
Appropriate handling and storage of chemicals and hazardous substances and waste should be done.		✓	✓		
When spillage accidently takes place, it should be removed and replaced with unpolluted soil. The clean soil can be sourced from excavations nearby. The polluted soil must be piled at a temporary storage facility with a firm waterproof base and is protected from inflow of storm water. It must have an effective drainage system to a waterproof spillage collection area. Contaminated soil must be disposed of at a hazardous waste storage facility.		✓	✓		
Clear trees and bushes selectively, leaving grass un-disturbed. Use mechanised machinery when installing posts to eliminate need for foundations. Construct on alternate strips to combat possible erosion.		✓	✓		
Establish structures on the contour. Use grass strips to regulate flow speed		✓	✓		
Social					
Where reasonable and practical, the proponent should appoint local contractors and implement a 'locals first' policy, especially for semi and low-skilled job categories. However, due to the low skills levels in the area, the majority of skilled posts are likely to be filled by people from outside the area.		✓	✓		
Before the construction phase commences the proponent should meet with representatives from the KGLM to establish the existence of a skills database for the area. If such as database exists it should be made available to the contractors appointed for the construction phase.		✓	✓		
Where feasible, efforts should be made to employ local contactors that are compliant with Broad Based Black Economic Empowerment (BBBEE) criteria;		✓	✓		
The local authorities, community representatives, and organisations on the interested and affected party database should be informed of the final decision regarding the project and the potential job opportunities for locals and the employment procedures that the proponent intends following for the construction phase of the project.		✓	✓		
Where feasible, training and skills development programmes for locals should be initiated prior to the initiation of the construction phase		✓	✓		
The recruitment selection process should seek to promote gender equality and the employment of women wherever possible.		✓	✓		
The KGLM, in conjunction with the local business sector and representatives from the local hospitality industry, should identify strategies aimed at maximising the potential benefits associated with the project.		✓	✓		
Where possible, the proponent should make it a requirement for contractors to implement a 'locals first' policy for construction jobs, specifically for semi and low-skilled job categories;		✓	✓		
The proponent should consider the option of establishing a Monitoring Forum (MF) in order to monitor the construction phase and the implementation of the recommended mitigation measures. The MF should be established before the construction phase commences, and should include key stakeholders, including representatives from local communities, local KGLM Councillor for Ward 8,		✓	✓	✓✓	

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
farmers and the contractor(s). The MF should also be briefed on the potential risks to the local community associated with construction workers;					
The proponent and the contractor(s) should, in consultation with representatives from the MF, develop a code of conduct for the construction phase. The code should identify which types of behaviour and activities are not acceptable. Construction workers in breach of the code should be dismissed. All dismissals must comply with the South African labour legislation;		✓	✓	✓	
The proponent and the contractor should implement an HIV/AIDS awareness programme for all construction workers at the outset of the construction phase;		✓	✓		
The construction area should be fenced off before construction commences and no workers should be permitted to leave the fenced off area;		✓	✓		
The contractor should provide transport for workers to and from the site on a daily basis. This will enable the contactor to effectively manage and monitor the movement of construction workers on and off the site.		✓	✓		
Where necessary, the contractors should make the necessary arrangements to enable low and semi-skilled workers from outside the area to return home over weekends and/ or on a regular basis. This would reduce the risk posed to local family structures and social networks;		✓	✓		
The contractor must ensure that all construction workers from outside the area are transported back to their place of residence within 2 days for their contract coming to an end;		✓	✓		
It is recommended that no construction workers, with the exception of security personnel, should be permitted to stay over-night on the site.		✓	✓		
The proponent should implement a policy that no employment will be available at the gate.		✓	✓		
The construction area should be fenced off prior to the commencement of the construction phase. The movement of construction workers on the site should be confined to the fenced off area;		✓	✓		
The proponent must enter into an agreement with the local farmers in the area whereby damages to farm property etc. during the construction phase will be compensated for. The agreement should be signed before the construction phase commences;		✓	✓		
Traffic and activities should be strictly contained within designated areas		✓	✓		
Strict traffic speed limits must be enforced on the farm		✓	✓		
All farm gates must be closed after passing through		✓	✓		
Contractors appointed by the proponent should provide daily transport for low and semi-skilled workers to and from the site. This would reduce the potential risk of trespassing on the remainder of the farm and adjacent properties		✓	✓		
The proponent should hold contractors liable for compensating farmers and communities in full for any stock losses and/or damage to farm infrastructure that can be linked to construction workers. This should be contained in the Code of Conduct to be signed between the proponent, the contractors and neighbouring landowners. The agreement should also cover loses and costs associated with fires caused by construction workers or construction related activities (see below)		✓	✓		
The Environmental Management Plan (EMP) must outline procedures for managing and storing waste on site, specifically plastic waste that poses a threat to livestock if ingested		✓	✓		
Contractors appointed by the proponent must ensure that all workers are informed at the outset of the construction phase of the conditions contained on the Code of Conduct, specifically consequences of stock theft and trespassing on adjacent farms.		✓	✓		

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
Contractors appointed by the proponent must ensure that construction workers who are found guilty of stealing livestock and/or damaging farm infrastructure are dismissed and charged. This should be contained in the Code of Conduct. All dismissals must be in accordance with South African labour legislation		✓	✓		
The option of establishing a fire-break around the perimeter of the site prior to the commencement of the construction phase should be investigated;		✓	✓		
Contractor should ensure that open fires on the site for cooking or heating are not allowed except in designated areas;		✓	✓		
Smoking on site should be confined to designated areas;		✓	✓		
Contractor should provide adequate fire-fighting equipment on-site, including a fire fighting vehicle;		✓	✓		
Contractor to provide fire-fighting training to selected construction staff		✓	✓		
The movement of heavy vehicles associated with the construction phase should be timed to avoid times of the week, such as weekends, when the volume of traffic travelling along the N14 may be higher;		✓	✓		
The section of access road from the N14 that passes adjacent to the vineyards should be surfaced		✓	✓		
Dust suppression measures must be implemented on un-surfaced roads, such as wetting on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.		✓	✓		
All vehicles must be road-worthy and drivers must be qualified and made aware of the potential road safety issues and need for strict speed limits		✓	✓		
An Environmental Control Officer (ECO) should be appointed to monitor the establishment phase of the construction phase;		✓	✓		
All areas disturbed by construction related activities, such as access roads on the site, construction platforms, workshop area etc., should be rehabilitated at the end of the construction phase		✓	✓		
The implementation of a rehabilitation programme should be included in the terms of reference for the contractor/s appointed		✓	✓		
The implementation of the Rehabilitation Programme should be monitored by the ECO		✓	✓		
Implement a skills development and training programme aimed at maximising the number of employment opportunities for local community members; Maximise opportunities for local content, procurement and community shareholding		✓	✓		
The KGLM should liaise with the proponents of other renewable energy projects in the area to investigate how best the Community Trusts can be established and managed so as to promote and support local, socio-economic development in the region as a whole.		✓	✓		
The KGLM should be consulted as to the structure and identification of potential trustees to sit on the Trust. The key departments in the KGLM that should be consulted include the Municipal Managers Office, IDP Manager and LED Manager		✓	✓		
Clear criteria for identifying and funding community projects and initiatives in the area should be identified. The criteria should be aimed at maximising the benefits for the community as a whole and not individuals within the community;		✓	✓		
Strict financial management controls, including annual audits, should be instituted to manage the funds generated for the Community Trust from the SEF plant.		✓	✓		
The proponent should ensure that retrenchment packages are provided for all staff retrenched when the plant is decommissioned.		✓	✓		

Mitigation	Condition of Approval	Included in EMPr	Construction Phase	Operational Phase	Decomissioning Phase
All structures and infrastructure associated with the proposed facility should be dismantled and transported off-site on decommissioning		✓	✓		
Revenue generated from the sale of scrap metal during decommissioning should be allocated to funding closure and rehabilitation of disturbed areas.		✓	✓		
The Northern Cape Provincial Government, in consultation with the ZFMDM, KGLM and the proponents involved in the development of renewable energy projects in the GKLM, should consider establishing a Development Forum to co-ordinate and manage the development and operation of renewable energy projects in the area with the specific aim of mitigating potential negative impacts and enhancing opportunities. This would include identifying key needs, including capacity of existing services, accommodation and housing and the implementation of an accredited training and skills development programmes aimed at maximising the opportunities for local workers to be employed during the construction and operational phases of the various proposed projects. These issues should be addressed in the Integrated Development Planning process undertaken by the KGLM and ZFMDM.		✓	✓		
Traffic					
Stagger component delivery to site .		✓	✓		✓
Reduce the construction period		✓	✓		✓
The use of mobile batch plants and quarries in close proximity to the site		✓	✓		✓
Staff and general trips should occur outside of peak traffic periods.		✓	✓		✓
Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase		✓	✓		✓
Dust Suppression of gravel roads during the construction phase, as required.		✓	✓		✓
Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase		✓	✓		✓

8. PUBLIC PARTICIPATION PROCESS

Section 41 in Chapter 6 of regulation 982 details the public participation process that has to take place as part of an environmental process. The table below provides a quick reference to show how this environmental process has or intends to comply with these legislated requirements relating to public participation.

Please refer to **Appendix F**, where all evidence of public participation is included.

Table 91: Public participation requirements in terms of S41 of R982

Regulated Requirement	Description
(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. (2) Subregulation (1) does not apply in respect of-. (a) linear activities;	Proof of landowner consent for Duneveld PV is attached in **Annexure G2.** The access road is deemed to constitute a linear activity and as such not required to obtain landowner consent. Land owners of the portion where the access road crosses were interviewed by the social specialist and where also given an opportunity to comment on the Draft BAR.

Regulated Requirement	Description
The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by -	
(a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of - (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) any alternative site;	A site notice was placed at two positions along the N14. Photographic evidence of these notices is attached in **Annexure F3**.
(b) giving written notice, in any of the manners provided for in section 47D of the Act, to -	
(i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;	There are no tenants on the affected portions, other than the landowner..
(ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;	Owners of adjacent properties have been notified of this environmental process. Such owners have been requested to inform the occupiers of the land of this environmental process. Please refer to **Annexure F4** for copies of these notifications
(iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;	The ward councillor has been notified of this environmental process. Please refer to **Annexure F4** for copies of these notifications
(iv) the municipality which has jurisdiction in the area;	The Kai !Garib municipality (Planning and Technical Services) have been notified of this environmental process. Please refer to **Annexure F4** for copies of these notifications.
(v) any organ of state having jurisdiction in respect of any aspect of the activity; and	Please refer to section **Annexure F1** showing the list of organs of state that were notified as part of this environmental process. Please refer to **Annexure F4** for copies of these notifications.
(vi) any other party as required by the competent authority;	DEA were given an opportunity to comment on the Draft BAR and EMPr. Their comments are attached in Appendix G1.
(c) placing an advertisement in - (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;	An advert calling for registration of I&APs was placed in Die Gemsbok local newspaper. Please refer to **Annexure F3** for a copy of this advertisement. There is currently no official Gazette that has been published specifically for the purpose of providing public notice of applications
(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii);and	Adverts were not placed in provincial or national newspapers, as the potential impacts will not extend beyond the borders of the municipal area.
(e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person	Notifications have included provision for alternative engagement in the event of illiteracy, disability or any other disadvantage. In such instances, Cape EAPrac will engage

Regulated Requirement	Description
is desirous of but unable to participate in the process due to - (i) illiteracy; (ii) disability; or (iii) any other disadvantage.	with such individuals in such a manner as agreed on with the competent authority.
(3) A notice, notice board or advertisement referred to in subregulation (2) must - (a) give details of the application or proposed application which is subjected to public participation; and (b) state - (i) whether basic assessment or S&EIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made.	Please refer to **Annexure F3**.
(4) A notice board referred to in subregulation (2) must - (a) be of a size at least 60cm by 42cm; and (b) display the required information in lettering and in a format as may be determined by the competent authority.	Please refer to **Annexure F3**.
(5) Where public participation is conducted in terms of this regulation for an application or proposed application, subregulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that - (a) such process has been preceded by a public participation process which included compliance with subregulation (2)(a), (b), (c) and (d); and (b) written notice is given to registered interested and affected parties regarding where the - (i) revised basic assessment report or, EMPr or closure plan, as contemplated in regulation 19(1)(b); (ii) revised environmental impact report or EMPr as contemplated in regulation 23(1)(b);or (iii) environmental impact report and EMPr as contemplated in regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.	This will be complied with if final reports are produced later on in the environmental process.
(6) When complying with this regulation, the person conducting the public participation process must ensure that -	All reports that are submitted to the competent authority will be subject to a public participation process. These include: - Draft BAR

Regulated Requirement	Description
(a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and (b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are provided with a reasonable opportunity to comment on the application or proposed application. (7) Where an environmental authorisation is required in terms of these Regulations and an authorisation, permit or licence is required in terms of a specific environmental management Act, the public participation process contemplated in this Chapter may be combined with any public participation processes prescribed in terms of a specific environmental management Act, on condition that all relevant authorities agree to such combination of processes.	- Draft EMPr - All specialist reports that form part of this environmental process.

8.1 REGISTRATION OF KEY STAKEHOLDERS

A number of key stakeholders were automatically registered and were given an opportunity to comment on the Draft BAR. Copies and proof of these notifications are included in **Annexure F4**. A list of key stakeholders registered for this process included in the table below.

Table 92: Key Stakeholders automatically registered as part of the Environmental Process

Stakeholders Registered		
Neighbouring property owners	Department of Environmental Affairs and Nature Conservation	Department of Water and Sanitation
All parties registered as having prospecting rights on the farm	Kai !Garib Municipality: Municipal Manager	Department of Science and Technology
Joe Morolong: Ward 4 Councillor	South African National Roads Agency Limited	The Council for Scientific and Industrial Research
South African Heritage Resources Agency	Department of Transport and Public Works	The South African Square Kilometre Array
Northern Cape Heritage Resources Authority	Department of Health	The South African Civil Aviation Authority
Department of Agriculture, Forestry and Fisheries	Department of Minerals and Energy	Affected Land Owner
Provincial Department of Agriculture	Eskom	Department of Communications
Endangered Wildlife Trust.	Department of Mineral Resources	SENTECH
Department of Environmental Affairs, Biodiversity Directorate.	Birdlife Africa.	

8.2 PUBLIC PARTICIPATION PLAN IN TERMS OF THE COVID 19 REGULATIONS OF 05 JUNE 2020 (GNR660)

This plan was submitted in compliance with regulation GNR660 published on 05 June 2020 in terms of the Disaster Management Act (57/2002) and titled: Directions Regarding Measures to Address, Prevent and Combat the Spread of COVID-19 Relating to National Environmental Management Permits and Licences. In compliance with section 5.1 and annexure 2 of these regulations, a public participation plan must be presented to the competent authority for approval prior to implementation. A pre application meeting was held on 26 June 2020. This public participation plan was discussed with the competent authority and was accepted at the pre-application meeting. Please refer to the minutes of the pre-application meeting for further information in this regard.

Section 40(2) in Chapter 6 of regulation 982 requires that the public participation process contemplated in this regulation must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application unless access to that information is protected by law and must include consultation with—

(a) the competent authority;

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

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

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

In order to comply with this requirement, the proposal is to provide all parties, listed in subsections a, b and c above, with full digital copies of the Draft Basic Assessment Report (DBAR), Draft Environmental Management Programme and all specialist studies and plans. Such digital copies will be provided to the competent authority, organs of state and state departments on CD by post. Where no postal service is available, the documents will be provided by courier service.

In terms of point d above, all Interested & Affected Parties (I&APs) that are identified or register as part of the process will be provided access to the Draft BAR via the following:

1. The digital copy of the documentation that will be on the Cape EAPrac website and any other digital platform that is identified by Cape EAPrac or the recipients.
2. I&AP's that do not have access to digital platforms will be provided with printed hardcopies of the executive summary and any specialist reports that they may have interest in. Such copies will be provided by courier or postal service.
3. Potential and registered I&APs will be informed that copies of the documentation can be provided via postal or courier services.

Section 41 in Chapter 6 of regulation 982 details the public participation process that has to take place as part of an environmental process. The table below lists these requirements along with the proposed actions in order to comply with both section 41 in regulation 982 as well as well as section 5.1 and annexure 2 of regulation 660.

Table 93: Proposed Public participation in terms of Regulation 660

Regulated Requirement	Proposed Actions
(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. (2) Subregulation (1) does not apply in respect of-. (a) linear activities;	A landowner consent for the development has been obtained in terms of this requirement. No deviation or additional actions in terms of regulation 660 are required.
The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by -	
(a) fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of - (i) the site where the activity to which the application or proposed application relates is or is to be undertaken; and	A site notice will be placed at the boundary of the property along the N14. No deviation or additional actions in terms of regulation 660 are required.

Regulated Requirement	Proposed Actions
(ii) any alternative site;	
(b) giving written notice, in any of the manners provided for in section 47D of the Act, to -	
(i) the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;	There are no tenants on the affected portions, other than the landowner who has provided consent for the development. No deviation or additional actions in terms of regulation 660 are required.
(ii) owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;	Owners of adjacent properties will be notified of this environmental process and will be provided with digital copies of the documents via postal or courier services (where available), if they do not have access to online platforms. Such owners have been requested to inform the occupiers of the land of this environmental process and the process to obtain copies of the relevant reports.
(iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;	The ward councillor will be notified of this environmental process and will be provided with a digital copy of the documentation via postal or courier services.
(iv) the municipality which has jurisdiction in the area;	The Kai !Garib Municipality (Planning and Technical Services) will be notified of this environmental process and will be provided with digital copies of all documentation via postal or courier service.
(v) any organ of state having jurisdiction in respect of any aspect of the activity; and	All organs of state that have jurisdiction in respect of the activity will be notified of this environmental process and will be provided with digital copies of all documentation via postal or courier service (where available).
(vi) any other party as required by the competent authority;	DEA will be given an opportunity to comment on the Draft BAR and EMPr. Should they identify additional parties that need to provide comment, copies of the documentation and opportunity to comment will be provided to such parties.
(c) placing an advertisement in - (i) one local newspaper; or (ii) any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;	An advert calling for registration of I&APs will be placed in Die Gemsbok local newspaper. There is currently no official Gazette that has been published specifically for the purpose of providing public notice of applications.
(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii);and	Adverts will not be placed in provincial or national newspapers, as the potential impacts will not extend beyond the borders of the municipal area.
(e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to - (i) illiteracy; (ii) disability; or (iii) any other disadvantage.	Notifications will include provision for alternative engagement in the event of illiteracy, disability or any other disadvantage. In such instances, Cape EAPrac will engage with such individuals in such a manner as agreed on with the competent authority.

Regulated Requirement	Proposed Actions
(3) A notice, notice board or advertisement referred to in subregulation (2) must - (a) give details of the application or proposed application which is subjected to public participation; and (b) state - (i) whether basic assessment or S&EIR procedures are being applied to the application; (ii) the nature and location of the activity to which the application relates; (iii) where further information on the application or proposed application can be obtained; and (iv) the manner in which and the person to whom representations in respect of the application or proposed application may be made.	All notification and adverts will comply with this requirement. No deviation or additional actions in terms of regulation 660 are required.
(4) A notice board referred to in subregulation (2) must - (a) be of a size at least 60cm by 42cm; and (b) display the required information in lettering and in a format as may be determined by the competent authority.	The notice board which will be placed on the site boundary will comply with this requirement.
(5) Where public participation is conducted in terms of this regulation for an application or proposed application, subregulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that - (a) such process has been preceded by a public participation process which included compliance with subregulation (2)(a), (b), (c) and (d); and (b) written notice is given to registered interested and affected parties regarding where the - (i) revised basic assessment report or, EMPr or closure plan, as contemplated in regulation 19(1)(b); (ii) revised environmental impact report or EMPr as contemplated in regulation 23(1)(b);or (iii) environmental impact report and EMPr as contemplated in regulation 21(2)(d); may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.	This will be complied with if final reports are produced later in the environmental process.
(6) When complying with this regulation, the person conducting the public participation process must ensure that - (a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and (b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are	All reports that are submitted to the competent authority will be subject to a public participation process. These include: - Draft BAR - Draft EMPr - All specialist reports that form part of this environmental process.

Regulated Requirement	Proposed Actions
provided with a reasonable opportunity to comment on the application or proposed application. (7) Where an environmental authorisation is required in terms of these Regulations and an authorisation, permit or licence is required in terms of a specific environmental management Act, the public participation process contemplated in this Chapter may be combined with any public participation processes prescribed in terms of a specific environmental management Act, on condition that all relevant authorities agree to such combination of processes.	

9. CONCLUSION AND RECOMMENDATIONS

This environmental process is currently being undertaken to present proposals to the public and potential I&APs and to identify and assess environmental impacts, issues and concerns raised as a result of the proposed development alternatives.

Cape EAPrac is of the opinion that the information contained in this Basic Assessment Report and the documentation attached hereto is sufficient to allow the I&APs to apply their minds to the potential negative and/or positive impacts associated with the development, in respect of the activities applied for. This environmental process has not identified any fatal flaws with the proposal and as such it is our reasoned view that the project should proceed to the next phase of the environmental process. All specialists concur that the development as proposed (Layout Alternative 1 and Eastern Access Road Alternative – Site Access 1) can be considered for approval and that there are no reasons why the development should not be implemented. All impacts range from high positive to medium negative and all high and medium - high negative impacts have been avoided by the risk adverse approach to the development of this facility.

All stakeholders were requested to review the Draft BAR and the associated appendices, and provide comment, or raise issues of concern, directly to *Cape EAPrac* within the specified 30-day comment period. All comments received during this comment period have been included in the Final BAR submitted to DEA for decision making.

It is the recommendation of this office that the development proposal, Layout Alternative 1 and Eastern Access Road Alternative (Site Access 1) be considered for approval by the competent Authority on condition that all other legislative approvals be obtained, and that the final EMPr be adhered to.

9.1 REMAINDER OF ENVIRONMENTAL PROCESS

The following process is to be followed for the remainder of the environmental process:

- The Final BAR is herewith submitted to the DEA for consideration and decision-making;
- The DEA's decision (Environmental Authorisation) and the appeal process on the Final BAR will be communicated with all registered I&APs.

10. ABBREVIATIONS

AIA	Archaeological Impact Assessment
BGIS LUDS	Biodiversity Geographic Information System Land Use Decision Support
CBA	Critical Biodiversity Area
CDSM	Chief Directorate Surveys and Mapping
CEMPr	Construction Environmental Management Programme
DEA	Department of Environmental Affairs
DEA&NC	Department of Environmental Affairs and Nature Conservation
DME	Department of Minerals and Energy
DSR	Draft Scoping Report
EAP	Environmental Impact Practitioner
EHS	Environmental, Health & Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
LUDS	Land Use Decision Support
LUPO	Land Use Planning Ordinance
MW	Mega Watt

NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NPAES	National Protected Area Expansion Strategy
NSBA	National Spatial Biodiversity Assessment
NWA	National Water Act
PM	Post Meridiem; “Afternoon”
PSDF	Provincial Spatial Development Framework
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
S.A.	South Africa
SACAA / CAA	South African Civil Aviation Authority
SAHRA	South African National Heritage Resources Agency
SANBI	South Africa National Biodiversity Institute
SANS	South Africa National Standards
SDF	Spatial Development Framework
TOPS	Threatened and Protected Species

11. REFERENCES

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[33] This reference list excludes specialist studies that form part of this environmental process and which are contained in Annexure E1 – E12

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