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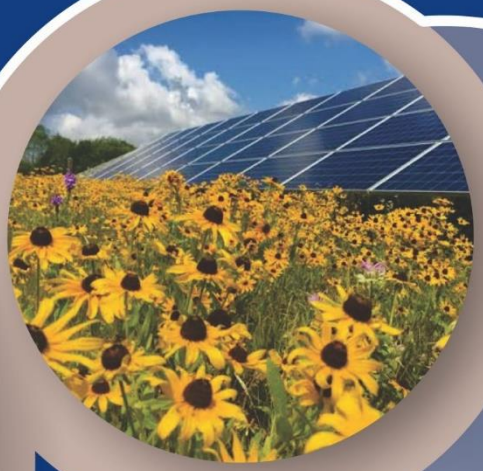
BASIC ASSESSMENT REPORT

Basic Assessment for the proposed development of a 115 MW Solar Photovoltaic (PV) Facility and associated electrical infrastructure (i.e. Kenhardt PV 6), north-east of Kenhardt, in the Northern Cape



Prepared for:

Kenhardt Solar PV Project 6 (Pty) Ltd

January 2020

CSIR
our future through science

BASIC ASSESSMENT PROCESS

for the Proposed Development of a 115 MW Solar Photovoltaic (PV) Facility and associated electrical infrastructure (Kenhardt PV 6), near Kenhardt, Northern Cape

DRAFT BASIC ASSESSMENT REPORT

January 2020

Prepared for:
Kenhardt Solar PV Project 6 (Pty) Ltd

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report details

Title:	Basic Assessment Report for the Proposed Development of a 115 MW Solar Photovoltaic (PV) Facility and associated electrical infrastructure (Kenhardt PV6), near Kenhardt, Northern Cape
Purpose of this report:	Draft Basic Assessment (BA) Report for the Proposed Development of a 115 MW Solar Photovoltaic (PV) Facility and associated electrical infrastructure (Kenhardt PV6), near Kenhardt, Northern Cape. The purpose of this Draft BA Report is to: • Present the details of and the need for proposed project; • Describe the affected environment at a sufficient level of detail to facilitate informed decision-making; • Provide an overview of the BA Process being followed, including public consultation; • Assess the predicted positive and negative impacts of the proposed project on the environment; • Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project; and • Provide an Environmental Management Programme (EMPr) for the proposed project. This Draft BA Report is being made available to all Interested and Affected Parties (I&APs), Organs of State and stakeholders for a 30-day review period. All comments submitted during the 30-day review of this Draft BA Report will be incorporated into a finalised BA Report, as applicable and where necessary.
Prepared for:	Kenhardt Solar PV Project 6 (Pty) Ltd
Prepared by:	CSIR, P. O. Box 320, Stellenbosch, 7599, South Africa Tel: +27 21 888 2400 Fax: +27 21 888 2693
Authors:	Paul Lochner, Rohaida Abed and Kelly Stroebel
Mapping:	Abulele Adams
Date:	January 2020
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SECTION F: APPENDICES

tables

figures

Summary of where requirements of Appendix 1 of the 2014 NEMA EIA Regulations (as amended, GN R326) are provided in this BA Report

Appendix 1	YES / NO	SECTION IN BA REPORT
Objective of the basic assessment process 2) The objective of the basic assessment process is to, through a consultative process- a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context; b) identify the alternatives considered, including the activity, location, and technology alternatives; c) describe the need and desirability of the proposed alternatives; d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine- (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and (ii) 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; and e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to- (i) identify and motivate a preferred site, activity and technology alternative; (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and (iii) identify residual risks that need to be managed and monitored.	**Yes**	**Section A of the report includes the Introduction, legislative review, alternatives assessment and needs and desirability** **Section D includes a summary of the specialist studies and associated impact assessments undertaken**
Scope of assessment and content of basic assessment reports 3) (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: (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	**Yes**	**Section A.2**
(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	**Yes**	**Section A.3.2**
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the	**Yes**	**Section A.3.2**

Appendix 1	YES / NO	SECTION IN BA REPORT
coordinates within which the activity is to be undertaken;		
(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;	**Yes**	**Section A.8**
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	**Yes**	**Section A.8**
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;	**Yes**	**Section A.10**
(g) a motivation for the preferred site, activity and technology alternative;	**Yes**	**Section A.9**
(h) A full description of the process followed to reach the proposed preferred alternative within the site, including - (i) details of all the alternatives considered;	**Yes**	**Section A.9**
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	**Yes**	**Section C**
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	**Yes**	**Section C (to be updated following review of draft report)**
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	**Yes**	**Section A.9**
(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	**Yes**	**Section A.9**
(vi) 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;	**Yes**	
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	**Yes**	
(viii) the possible mitigation measures that could be applied and level of residual risk;	**Yes**	
(ix) the outcome of the site selection matrix;	**Yes**	
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	**Yes**	

Appendix 1	YES / NO	SECTION IN BA REPORT
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	**Yes**	**Section A.9**
(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- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	**Yes**	**Section A.9**
(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	**Yes**	**Section D**
(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 report;	**Yes**	**Section D**
(l) an environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	**Yes**	**Section E**
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	**Yes**	**Section D**
(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;	**Yes**	**Section E**
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**Yes**	**Please refer to each specialist study included in Appendix D**
(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;	**Yes**	**Section E**
(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	**N/A**	

Appendix 1	YES / NO	SECTION IN BA REPORT
construction monitoring requirements finalised;		
(r) an undertaking under oath or affirmation by the EAP in relation to - (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and l&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	**Yes**	**Appendix E**
(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**X**	**N/A**
(t) any specific information that may be required by the competent authority; and	**X**	**N/A**
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	**X**	**N/A**
2) Where a government notice *gazetted* by the Minister provides for the basic assessment process to be followed, the requirements as indicated in such a notice will apply.	**X**	**N/A**

SECTION A: INTRODUCTION, PROJECT DESCRIPTION AND LEGISLATIVE REVIEW

A.1 Introduction

Scatec Solar Africa (Pty) Ltd (the project developer, trading as the applicant Kenhardt Solar PV Project 6) with support from Veroniva (Pty) Ltd, are proposing to develop three 115 MW Solar Photovoltaic (PV) Facilities and associated electrical infrastructure (including a 132 kV overhead power line from each PV Facility to the Eskom Nieuwehoop Substation), near Kenhardt in the Northern Cape. The proposed projects are referred to as "Kenhardt PV4, Kenhardt PV5 and Kenhardt PV6" and are located on the remaining extent of Onder Rugzeer Farm 168 and the connection points to the Eskom Nieuwehoop Substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120. These projects are proposed approximately 80 km south of Upington and 20-30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province.

In 2016, Scatec Solar undertook Phase 1 of this project on the same above-mentioned farm portions. Phase 1 included the following projects:

- Kenhardt PV 1 – Department of Environmental Affairs (DEA) [now currently operating as the Department of Environment, Forestry and Fisheries (DEFF)] EIA Reference: 14/12/16/3/3/2/837;
- Kenhardt PV 2 – DEFF EIA Reference: 14/12/16/3/3/2/838; and
- Kenhardt PV 3 – DEFF EIA Reference: 14/12/16/3/3/2/836.
- Kenhardt PV 1 – Transmission Line – DEA Reference Number: 14/12/16/3/3/1/1547;
- Kenhardt PV 2 – Transmission Line – DEA Reference Number: 14/12/16/3/3/1/1546; and
- Kenhardt PV 3 – Transmission Line – DEA Reference Number: 14/12/16/3/3/1/1545.

Kenhardt PV 1 – 3 projects required Environmental Impact Assessments (EIAs) that were undertaken for the Solar PV Facilities and associated infrastructure. The Kenhardt PV 1 – 3 Transmission Line projects required Basic Assessments (BAs) that were undertaken for the Electricity Grid Infrastructure (EGI) and associated infrastructure to support the PV Facilities. The Kenhardt PV 1 – 3 projects received Environmental Authorisation (EA) on 7 August 2017, whereas the Kenhardt PV 1 – 3 Transmission Line projects received EA on 22 September 2017.

The proposed projects (Kenhardt PV6, 5 and 6) fall entirely within the Renewable Energy Development Zone (REDZ) 7 (i.e. Upington REDZ), that was Gazetted in February 2018 in Government Gazette 41445, Government Notice 114, by the Minister of Environmental Affairs. In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA), and the 2014 NEMA EIA Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017 (as amended; hereinafter referred to as the 2014 NEMA EIA Regulations, as amended), wind and solar PV projects located within a REDZ are subject to a BA and reduced decision-making period by the authorities. A BA Process in terms of Appendix 1 of the 2014 NEMA EIA Regulations, as amended has therefore been undertaken for the proposed projects. This BA Report has been compiled to provide an assessment on the **Kenhardt PV6 Facility, associated Power Line and associated infrastructure.**

Since the three BA projects are located within the same geographical area and constitute the same type of activity (i.e. generation and distribution of electricity generated from a solar resource), an integrated Public Participation Process (PPP) is being undertaken for the proposed BA projects. However, separate BA Reports and specialist studies were compiled for each project.

A.2 Project Team

In accordance with Regulation 12 (1) of the 2014 NEMA EIA Regulations (as amended), the Applicant has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the separate BA Processes in order to determine the biophysical, social and economic impacts associated with undertaking the proposed development.

The BA is being managed by the Environmental Assessment Practitioner (EAP), Kelly Stroebel. Kelly has more than 6 years of experience in environmental assessment and management and is an EAP in the Environmental Management Services (EMS) group of the CSIR with a Honours degree in Environmental Science from Rhodes University. She is a Registered Candidate Natural Scientist (Registration Number: 100151/14) with the South African Council for Natural Scientific Professions (SACNASP). Kelly has experience in the management and integration of various types of environmental assessments in South Africa for various sectors, including renewable energy, industry and oil & gas. Kelly has undertaken several Solar PV Environmental Assessments (i.e. EIAs, BAs, and Amendment and Appeal Processes) in the Northern Cape.

Kelly is supported by various project members within CSIR and specialists. The team which is involved in this BA Process is listed in Table A.1 below.

Table A.1. The BA Team

Name	Organisation	Role/ Specialist Study
CSIR Project Team		
Kelly Stroebel *Cand.Sci.Nat.*	CSIR	EAP (*Cand. Sci. Nat.*)
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Rohaida Abed *Pr.Sci.Nat.*	CSIR	Advisor
Specialists		
Quinton Lawson and Bernard Oberholzer	Quinton Lawson Architect (QARC) Bernard Oberholzer Landscape Architect (BOLA) (Sub-contracted by QARC)	Visual Impact Assessment
Jayson Orton	ASHA Consulting	Heritage Impact Assessment
John Almond	Natura Viva cc	Palaeontological Impact Assessment
Johann Lanz	Private	Soils and Agricultural Impact Assessment
Simon Bundy	Sustainable Development Projects cc	Ecological Impact Assessment (Terrestrial and Aquatic)
Chris van Rooyen	Chris van Rooyen Consulting	Avifauna Impact Assessment
Rudolph du Toit	Applied Science Associates (Pty) Ltd	Socio-economic Impact Assessment
Catherine Bilankulu	WSP	Traffic Impact Statement

A.3 Project overview

A.3.1 General overview

As noted above, the proposed projects fall entirely within the REDZ 7 (i.e. Upington REDZ, Figure A.1). The REDZs represent areas where wind and solar PV development is being incentivised from resource, socio-economic and environmental perspectives. The Wind and Solar Strategic Environmental Assessment (SEA) identified REDZs in five provinces, namely the Eastern Cape, Western Cape, Northern Cape, Free State and North West.

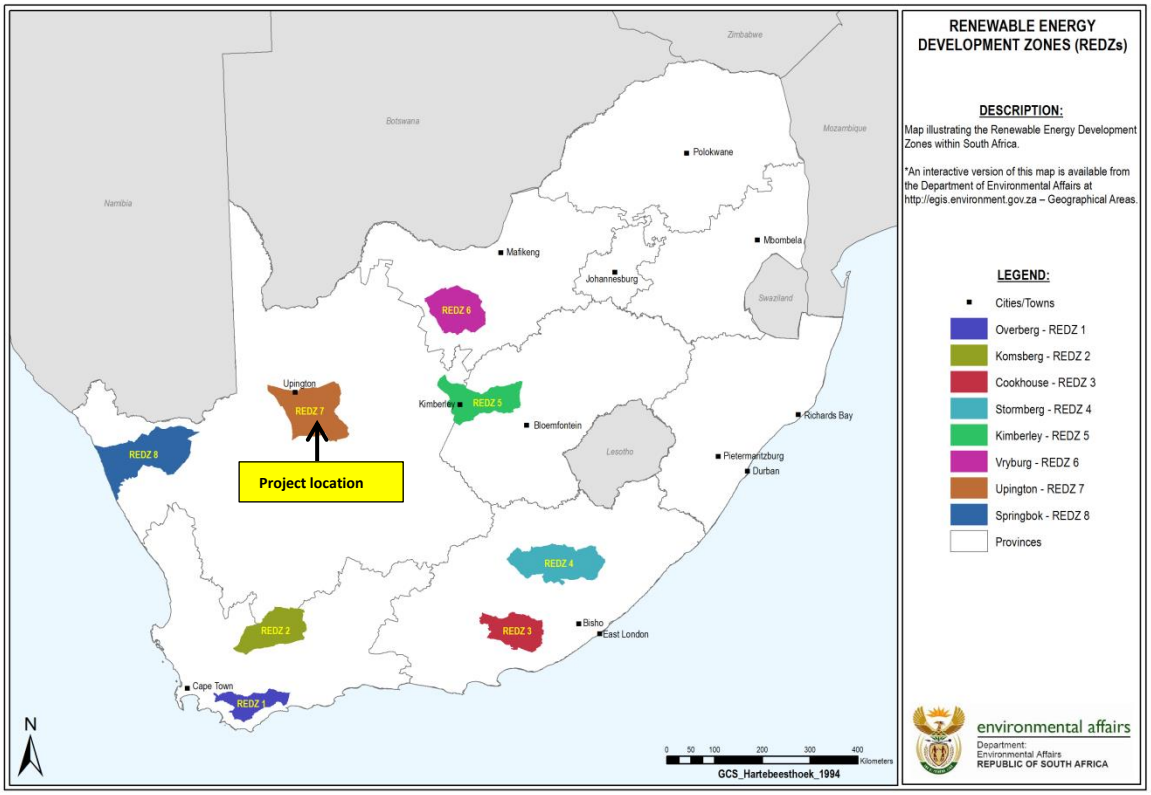


Figure A.1. Project location in relation to the REDZ 7

The three proposed Solar PV facilities will be developed with a possible maximum installed capacity of 115 MW of electricity from PV solar energy. Each solar PV facility will contain an on-site substation that will connect to the Eskom Nieuwehoop Substation via an overhead 132 kV power line. The locality of the three projects and the Power Corridor is shown Figure A.2 below.

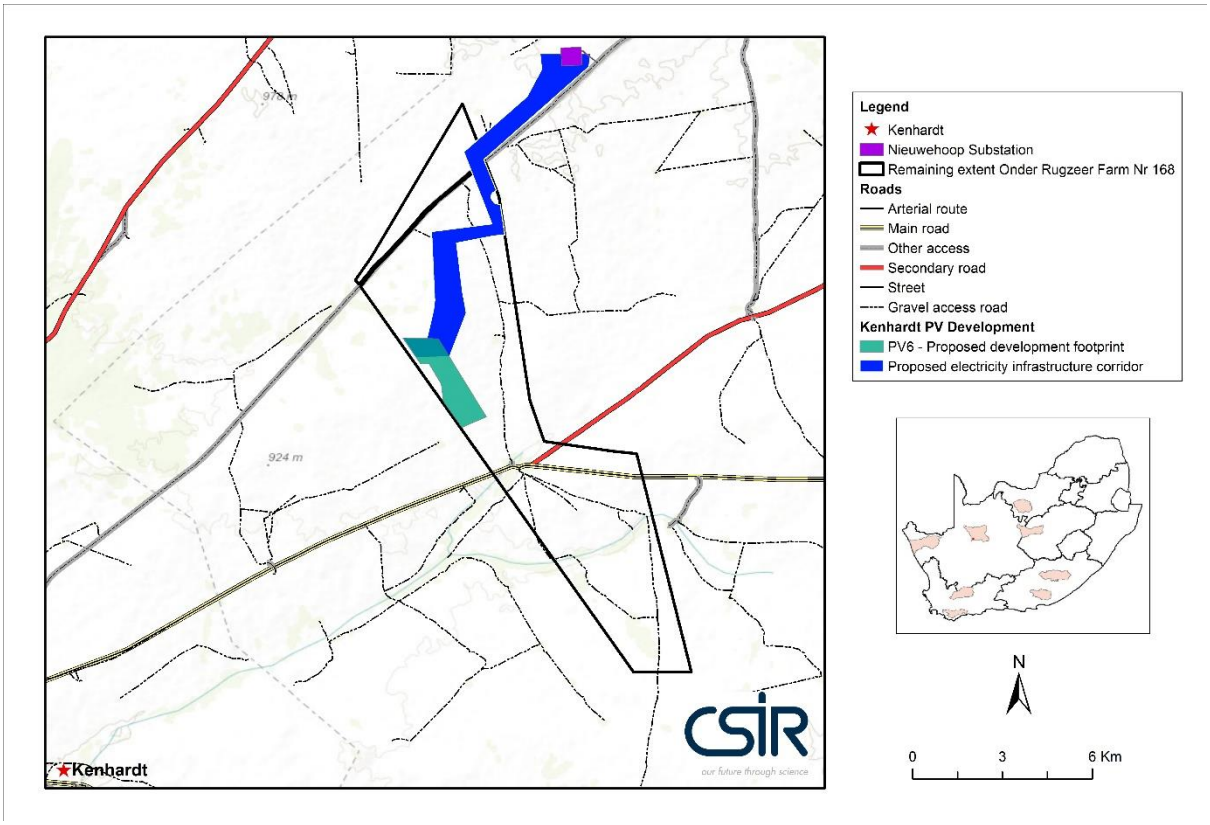


Figure A.2. Project locality map

A.3.2 Kenhardt PV6 project

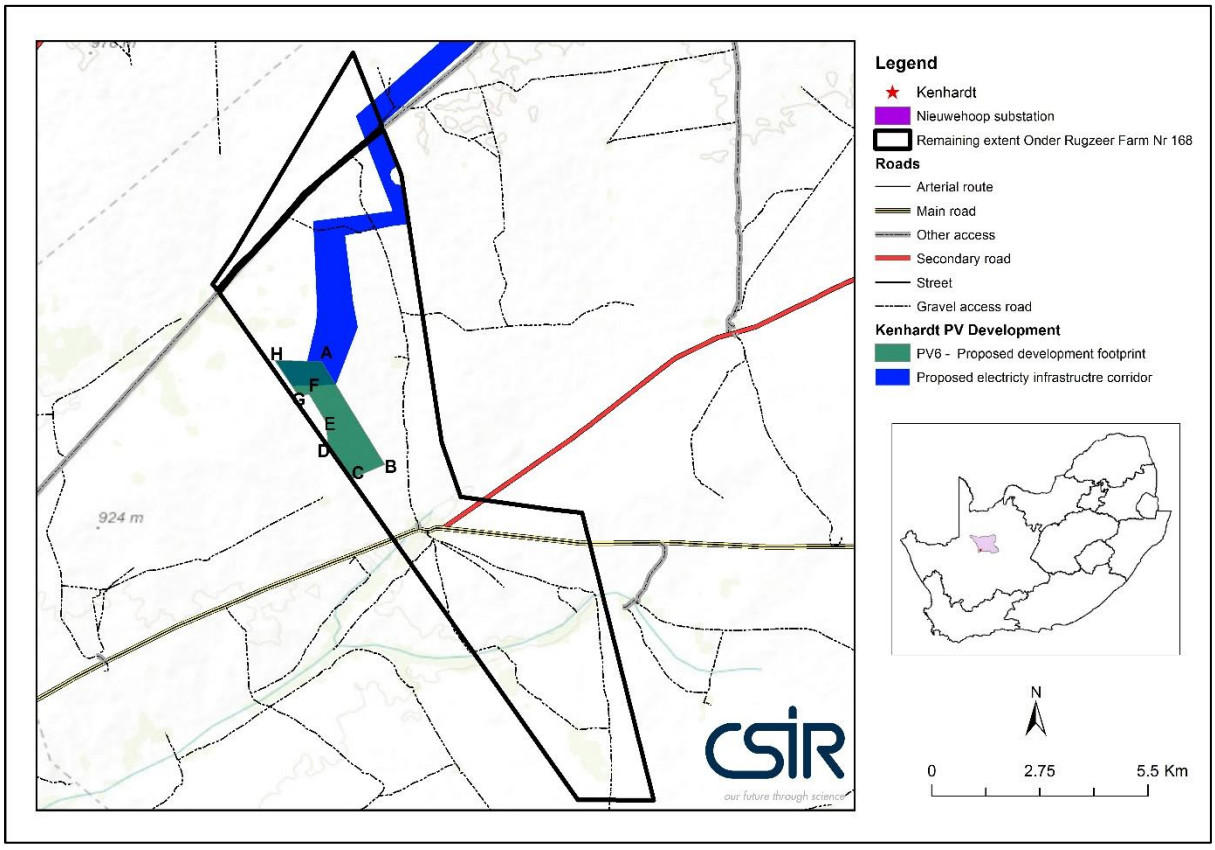
The proposed Kenhardt PV6 project power line and associated infrastructure will take place on the following farm portions:

- Remainder of farm Onder Rugzeer Number 168 - Surveyor General 21-Digit Code: C03600000000016800000;
- Portion 3 of the Farm Gemsbok Bult 120 - Surveyor General 21-Digit Code: C03600000000012000003;
- Remainder of Boven Rugzeer 169 - Surveyor General 21-Digit Code: C03600000000016900000; and
- Portion 4 of Onder Rugzeer Farm 168 - Surveyor General 21-Digit Code: C03600000000016800004.

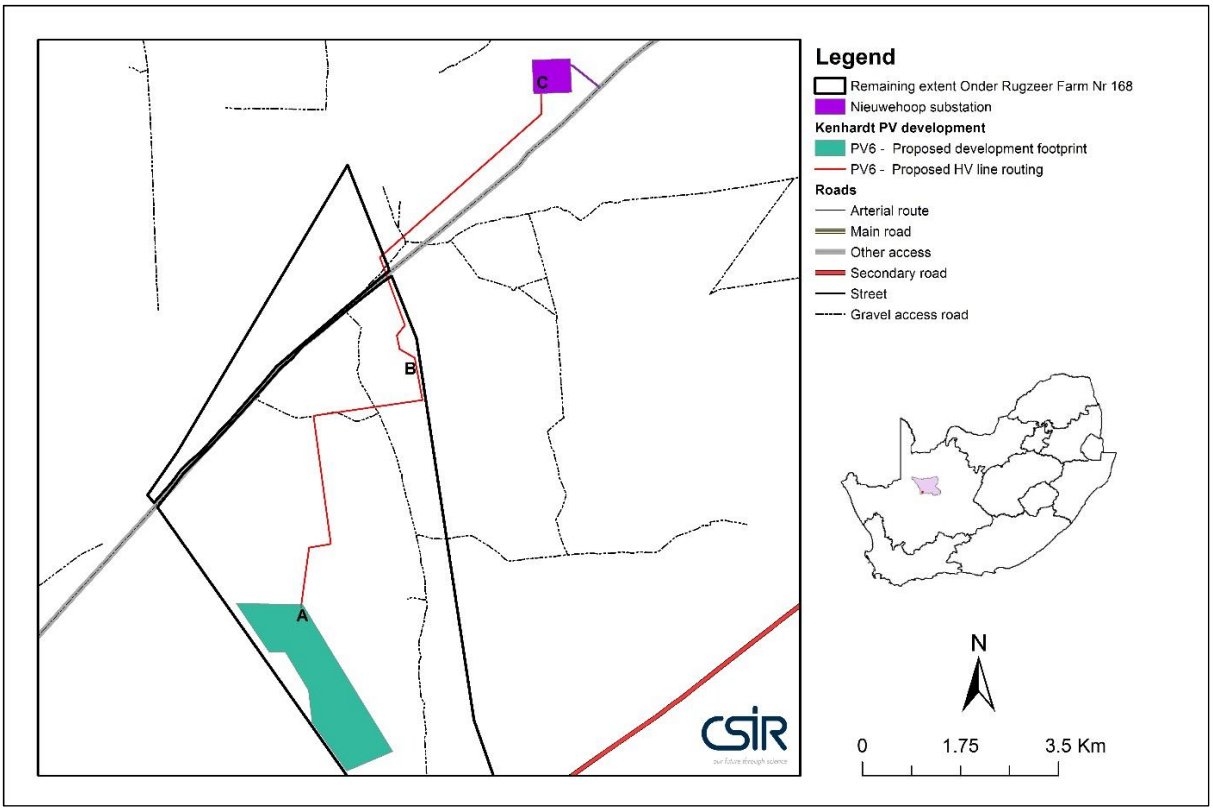
The co-ordinates of the boundary/corner points of the project site are detailed in Table A.2 below. The co-ordinates of the approximate mid-point of the preferred project site are 29°14'46.28"S 21°18'3.47"E.

Table A.2. Co-ordinates of the Corner Points of the project site and line routing

Point	Latitude	Longitude
	Solar Field	
A	29°14'2.72"S	21°17'52.80"E
B	29°15'27.48"S	21°18'44.84"E
C	29°15'38.84"S	21°18'18.16"E
D	29°15'10.73"S	21°17'58.16"E
E	29°14'52.21"S	21°17'56.08"E
F	29°14'29.93"S	21°17'42.69"E
G	29°14'30.17"S	21°17'33.41"E
H	29°14'1.99"S	21°17'14.34"E



Point	Latitude	Longitude
	Line routing	
A	29°14'4.48"S	21°17'51.72"E
B	29°11'41.03"S	21°18'57.71"E
C	29° 9'0.93"S	21°20'10.34"E



A.4 Project description

The proposed solar facility will consist of the components listed below. The technical information on these components are also discussed within this sub-section. It is however important to note at the outset that the exact specifications of the proposed project components will be determined during the detailed engineering phase (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed project) but that the information provided below is seen as the worst-case scenario for the project.

Project Components

- Solar Field, comprising Solar Arrays with a maximum height of 10 m and maximum footprint of 250 hectares per project (detailed provided below), including the following:
  - PV Modules;
  - Single Axis Tracking structures (aligned north-south), Fixed Axis Tracking (aligned east-west), Dual Axis Tracking (aligned east-west and north-south), Fixed Tilt Mounting Structure or Bifacial Solar Modules (all options will be considered in the design);
  - Solar module mounting structures comprised of galvanised steel and aluminium; and
  - Foundations which will likely be drilled and concreted into the ground.
- Building Infrastructure
  - Offices (maximum height 7 m and footprint of 1000 m^2);
  - Operational and maintenance control centre (maximum height 7 m and footprint 500 m^2);
  - Warehouse/workshop (maximum height 7 m and footprint 500 m^2);

- Ablution facilities (maximum height 7 m and footprint 50 m^2);
- 24 converter/Inverter stations (height from 2.5 m to 7 m (maximum) and footprint 2500 m^2);
- On-site substation building (footprint 20 000 m^2).; and
- Guard Houses (height 3 m, footprint 40 m^2).

- Associated Infrastructure
  - **132 kV overhead power line** to connect to the existing Eskom Nieuwehoop substation to be located within a corridor of approximately 300 m – 1000 m wide. The specific power line will have a following specifications:
    - Height = 22.5 m to 30 m
    - The servitude for the 132 kV power line will be 31 m wide. Note that the entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant standards and specifications.
    - Length from site to grid connection = approximately 12km.
  - Associated electrical infrastructure at the Eskom Nieuwehoop Substation (including but not limited to feeders, Busbars, transformer bay and extension to the platform at the Eskom Nieuwehoop Substation);
  - On-site substation;
  - Internal 33 kV power lines/underground cables (either underground to maximum depth of 1.6 m or above ground with height of 9 m);
  - Underground low voltage cables or cable trays (underground to maximum depth of 1.4 m);
  - Access roads. Maximum 8 m wide. Total Length of Internal Gravel and Perimeter Roads Length: Approximately 20 000 m
  - Internal gravel roads (width of 4 m);
  - Fencing (at least 2.6 – 3 m high) - Access points will be managed and monitored by an appointed security service provider. The type of fencing will either be of palisade, mesh type or a fully electrified option;
  - Panel maintenance and cleaning area;
  - Stormwater channels (Details to be confirmed once the Engineering, Procurement and Construction (EPC) contractor has been selected and the design is finalised. A detailed stormwater management plan would need to be developed); and
  - Temporary work area during the construction phase (i.e. laydown area of maximum 5 ha).

Additional specifications

Each proposed 115 MW project includes a 132 kV power line to the Eskom Nieuwehoop Substation. Three separate Basic Assessment Processes are being undertaken for the development of each 115 MW facility and associated EGI.

A description of the key components of the proposed project is described below.

A.4.1 Solar facility

As noted above, the total footprint of the solar facility is estimated to be approximately 250 hectares (ha). This will include the development of the solar field and building and associated infrastructure, as detailed above. The exact number of solar panels arrays, confirmation of the foundation type and detailed design will follow as the development progresses but a preliminary site layout plan has been included in Appendix B of this report.

- **PV Modules**

The smallest unit of a PV installation is a cell. A number of cells form a module, and finally a number of modules form the arrays (Figure A.3).

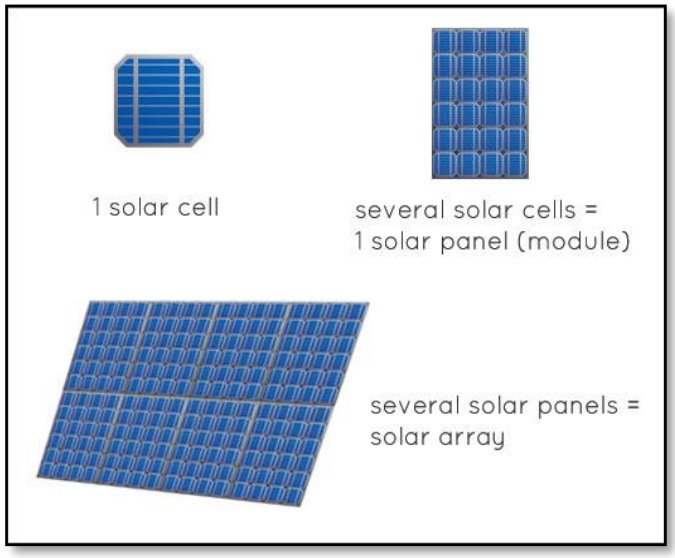


Figure A.3. Components of the Proposed PV Installation

Modules are arranged into strings that form the solar field, and in section sizes of approximately 40 x 5 m called tables and are installed on racks which are made of aluminium or galvanised steel. The arrays and racks will be founded into the ground through either steel or concrete towers (which will be confirmed during the detailed engineering phase), as shown in Figure A.4. The entire structure is not expected to exceed 10 m in height (measured from the ground), which is considered the worst-case. This system may be fixed, or may track the movement of the sun (either by adopting Fixed Axis Tracking, Single Axis Tracking, Dual Axis Tracking, Fixed Tilt Mounting Structures or Bifacial Solar Modules as explained above). All the arrays will be wired to converter/inverter stations that converts DC into AC.

Figure A.4. PV Technology

- **Electrical Infrastructure within the PV Facility**

As mentioned above, the solar arrays are typically connected to each other in strings, which are in turn connected to inverters that convert DC to AC. The strings will be connected to the inverter stations by low voltage underground (internal) DC cables or cable trays. Power from the converter/inverter station will be collected in medium voltage transformers through underground (internal) AC cables, cable trays or AC cables which are pole-mounted depending on voltage level and site conditions.

The inverter stations will in turn be connected to the proposed on-site substation, via medium voltage (33 kV) internal underground cables, which will increase the voltage and transmit the power produced via a 132 kV overhead power line into the national grid system via the Eskom Nieuwehoop Substation.

Refer to Section A.4.2 for a description of proposed EGI outside of the PV facility itself.

- **Roads**

The proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will be considered in the design of the facility and have been included in the proposed project. The R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. This National Road is designed for minimum daily traffic exceeding 1000 vehicle units. The Transnet Service Road can be accessed from the R27. The existing gravel road can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. A further access road will be constructed from either the Transnet Service Road or the unnamed farm road to the proposed Kenhardt PV 6, 5 and 6 facilities.

Should the Transnet Service Road not be used for access to the preferred site, then the unnamed farm gravel road will be used and widened to by more than 6 m (where required). Exact specifications of the widening and upgrading of the unnamed farm gravel road will be confirmed during the detailed design phase. It is expected that the widening of the unnamed farm road will result in crossings of major and minor drainages lines on site. The details of these crossings will be determined during the detailed design phase.

Internal roads extending approximately 4 m wide will be constructed within the project footprint of the proposed PV plant. A perimeter road will also be constructed along the boundary of the proposed PV plant, which will extend approximately 2.5 m wide.

Overall, the proposed internal roads, the gravel access road, the perimeter roads will have a maximum length of 20 000 m in total.

- **Panel maintenance and cleaning area**

During the operational phase, the accumulation of dust on solar panels generally negatively influences the productivity of solar facilities. As such the panels require regular cleaning.

- **Stormwater, Waste and Municipal Services**

Stormwater channels will be constructed on site to ensure that stormwater run-off from site is appropriately managed. Water from these channels will not contain any chemicals or hazardous substances, and will be released into the surrounding environment based on the natural drainage contours.

Scatec Solar has confirmed that a stormwater analysis is being done for the site to inform the layout and design. In particular, it is important to verify that the proposed on-site substation is not located in an area of stormwater accumulation, as this would disrupt substation operation. A storm water management plan will be implemented during the construction and operation of the facility. The plan will ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan will include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures promote the dissipation of storm water run-off. These actions are incorporated into the EMPr.

- **Building Infrastructure**

The solar field will require on-site buildings, including an operational and maintenance control centre, offices, warehouse/workshop (for storage of equipment), ablution facilities, converter stations, on-site substation and substation building, laydown areas and security enclosures. Dimensions for these are provided above.

A.4.2 Electrical infrastructure to Support the PV Facility

An on-site substation (with a capacity of 100 MVA) will also be constructed to support the PV facility. The on-site substation building is expected to extend approximately 12 m in height, with a maximum footprint of 20 000 m^2 (2 ha).

As noted above, the on-site substation is proposed to be connected via a 132 kV overhead (single or double circuit) power line to the Nieuwehoop substation. The electrical infrastructure includes:

- 132 kV overhead power line (single or double circuit) to connect to the existing Eskom Nieuwehoop substation;
- Gravel service road of up to 6 m width beneath the 132 kV power line; and
- Associated electrical infrastructure at the Eskom Nieuwehoop Substation (including but not limited to feeders and busbars).

The overhead 132 kV power line will be constructed from the solar facility and is expected to extend approximately 12km in length (between the proposed on-site substation and the Eskom

Nieuwehoop Substation), with concrete foundations and steel tower structures (extending approximately 22.5 to 30 m in height). The line will be constructed within a 31 m servitude on the farm properties affected by the power line.

The line will consist of either self-supporting suspension structures or guyed monopoles. The self-supporting towers will have standard pad and plinth foundations. The guyed monopoles will consist of a central plinth for the tower masts. The stay wires will entail dead-man anchor/stay plate anchor foundations. Insulators will be used to connect the conductors to the towers. The span lengths are estimated to range between 200 m and 300 m. Exact specifications will be confirmed during the detailed design phase.

Each of the three solar PV facilities will have a 132 kV power line that will connect the proposed facility to the Nieuwehoop Substation. This will ensure that each project (should it receive positive EA), is a viable stand-alone project. This approach is based on the worst case scenario, which has been assessed in this BA Process. It has also been structured accordingly to meet the requirements of the Renewable Energy Independent Power Producer Programme (REI4P) which requires separate EAs. However, in terms of the best case scenario, if either two or all three of the solar PV facilities receive positive EAs, as well as preferred bidder status in terms of the REI4P, and should all three solar PV facilities materialise from a construction perspective, then Scatec will not construct three separate power lines (and service roads) connecting each solar facility to the Nieuwehoop Substation. Instead, Scatec will then opt to construct a single 132 kV power line that connect to all the proposed facilities to the Nieuwehoop Substation.

As noted above, all power lines will be constructed within a single electrical infrastructure corridor. The corridor will extend between 300 m and 1000 m wide. This corridor was assessed for the proposed power lines and associated electrical infrastructure (for all three Kenhardt PV projects) to ensure that the line routing and placement of the structures avoid sensitive areas that have been identified by the specialists (as indicated in Appendix C of this BA Report).

A.4.3 Additional infrastructure

In terms of traffic generation, a Traffic Impact Statement has included in Appendix C. The types of materials that will need to be transported to site during the construction phase include the following:

Materials and equipment transported to the site comprise of:

- Building materials (concrete aggregates, cement and gravel);
- Construction equipment such as piling rigs and cranes;
- Solar panels (panels and frames); and
- Transformer and cables.

The following is anticipated:

A. Building materials comprising of concrete materials for strip footings or piles will be transported using conventional trucks which would adhere to legal limits listed above.

B. Solar Panels and frames will probably be transported in containers using conventional heavy vehicles within the legal limits. The number of loads will be a function of the capacity of the solar farm and the extent of the frames (the anticipated number of loads are discussed below).

C. Transformers will be transported by abnormal vehicles.

Approximately 1066 x 40ft containers resulting in more or less 600 double axel trucks will come to site during the construction phase (i.e. over a period of 9 to 24 months). In addition to this, more or less 26 light load trucks will come from and go to site on a daily basis during the construction phase. It is estimated that a total of 19 800 trips to the site, based on a 24 month construction phase. In terms of workers accessing the site, the worst case estimate is that the 610 workers (150 skilled and 460 unskilled, the maximum estimate) will need to come to site on a daily basis. It is however highly unlikely that all 610 workers would need to be on site simultaneously. It is assumed that workers would commute using both personal vehicles and buses. This would amount to an estimated 6 buses and 15 personal vehicles per day to and from site once in the morning and once in the afternoon. It is anticipated that 87 trips (in and out) will be made per day during the construction phase.

During the operational phase, fewer materials will need to be transported to site. Trips will also be generated for the transportation of staff during the construction and operational phases. More or less 4 light load trucks will come from and go to site on a daily basis and 1 small single axel truck to and from site on a weekly basis. For water supply (if water is sourced from the municipality), the current estimate is that 2 trips per month will be made by a water truck.

A.5 Overview of the Project Development Cycle

The project can be divided into the following three main phases:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Each activity undertaken as part of the above phases may have environmental impacts and, where applicable, has therefore been assessed by the specialist studies (summarised in Section D and full studies included Appendix C of this BA Report).

A.5.1 Construction Phase

The construction phase will take place subsequent to the issuing of an EA from the DEFF and a successful bid in terms of the REI4P (i.e. the issuing of a Power Purchase Agreement (PPA) from the Department of Mineral Resources and Energy (DMRE)). The construction phase for the proposed project is expected to extend 12 to 14 months.

The main activities that will form part of the construction phase are:

- Removal of vegetation for the proposed infrastructure;
- Excavations for infrastructure and associated infrastructure;
- Establishment of a laydown area for equipment;
- Stockpiling of topsoil and cleared vegetation;
- Creation of employment opportunities;
- Transportation of material and equipment to site, and personnel to and from site; and
- Construction of the solar field, 132 kV power line and additional infrastructure.

A.5.2 Operational Phase

The following activities will occur during the operational phase:

- The transmission of electricity generated from the proposed solar facility to the Nieuwehoop Substation via an overhead 132 kV power line; and
- Maintenance of the solar field and power line.

During the life span of the project (approximately 20 years), on-going maintenance will be required on a scheduled basis.

A.5.3 Decommissioning Phase

The main aim of decommissioning is to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise (i.e. if the actual solar facility becomes outdated or the land needs to be used for other purposes), the decommissioning procedures will be undertaken in line with the EMPr and the site will be rehabilitated and returned to its pre-construction state.

A.6 Socio-economic

A.6.1 Employment during construction

It is difficult to specify the actual number of employment opportunities that will be created at this stage. During the construction phase, both skilled and unskilled temporary employment opportunities will be created. It is difficult to specify the actual number of employment opportunities that will be created at this stage; however between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are expected be created during the construction phaseIt should be noted that the employment opportunities provided in this report are estimates and is dependent on the final engineering design and the REI4P Request for Proposal provisions at that point in time.

A.6.2 Employment during operations

Approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year lifespan of the proposed facility. These unskilled jobs will be linked to services such as panel cleaning, maintenance and security.

Employment opportunities to be created during the operational phase equate to approximately 4 800 person months (for skilled opportunities) and approximately 9 600 person months (for unskilled opportunities) per project (i.e. three 115 MW PV projects in total) over the 20 year plant lifespan.

A.6.3 Socio-economic investment and development

The Applicant will ultimately own the project, if successful, and will compile an Economic Development Plan which will be compliant with REI4P requirements and will inter alia set out to achieve the following:

- Create a local community trust or similar (as required by REI4P) which has an equity share in the project life to benefit historically disadvantaged communities;
- Initiate a skills development and training strategy to facilitate future employment from the local community; and
- Give preference to local suppliers for the construction of the facility.

- Support local community upliftment projects and entrepreneurship through socio-economic and enterprise development initiatives.

A.7 Service Provision: Water, Sewage, Waste and Electricity Requirements

Scatec Solar will consult with the municipality in order to confirm the supply of services (in terms of water, waste removal, sewage and electricity) for the proposed project. The municipality will be consulted as part of the 30-day public review period of this report and the confirmation services provision will be included in the Final BA Report. However, it must be noted that should the municipality not have adequate capacity for the handling of waste, provision of water and sewage handling provisions available; then Scatec Solar will make use of private contractors to ensure that the services are provided. Scatec will also ensure that adequate waste disposal measures are implemented by obtaining waste disposal slips for waste removed from site (in line with the EMPr, included in Appendix F of this BA Report).

An outline of the services that will be required are discussed below.

A.7.1 Water Usage

During the construction phase, the current proposal is to truck water to site via municipal water supply. It is estimated that 1 trip will be made by the water truck every 2 days. In total, this adds up to 365 trips by the water truck over a period of 24 months.

During the operational phase for water supply, the current estimate is that 2 trips per month will be made by a water truck. At this stage, no water is planned to be abstracted from or discharged to any surface water or ground water systems.

A.7.2 Sewage or Liquid Effluent

The proposed project will require sewage services during the construction and operational phases. Low volumes of sewage or liquid effluent are estimated during both phases. Liquid effluent will be limited to the ablution facilities during the construction and operational phases. Portable sanitation facilities (i.e. chemical toilets) will be used during the construction and operational phases, which will be regularly serviced and emptied by a suitable (private) contractor on a regular basis. The waste water will be transported to a nearby Waste Water Treatment Works for treatment. Due to the remote location of the project site; a conservancy tank or septic tank system could be used on site, which is expected to be serviced by the municipality. Due to the remote locality of the farm, sewage cannot be disposed in the municipal waterborne sewage system.

A.7.3 Solid Waste Generation

The quantity of waste generated will depend on the construction phase, which is estimated is extend 12 to 14 months. However, it is estimated that approximately 50 m^3 of waste will be generated every month during the construction phase. During the construction phase, the following waste materials are expected:

- Packaging material, such as the cardboard, plastic and wooden packaging and off-cuts;
- Hazardous waste from empty tins, oils, soil containing oil and diesel (in the event of spills), and chemicals;
- Building rubble, discarded bricks, wood and concrete;

- Domestic waste generated by personnel; and
- Vegetation waste generated from the clearing of vegetation.

Solid waste will be managed via the EMPr during the construction and operational phases (Appendix F of the BA Report), which incorporates waste management principles. During the construction phase, general waste will be collected and temporarily stockpiled in skips in a designated area on site and thereafter removed, emptied into trucks, and disposed at a registered waste disposal facility on a regular basis by an approved waste disposal Contractor (i.e. a suitable Contractor). In addition, a skip will be placed on site and any damaged or broken PV panels (i.e. those not returned to the supplier) will be stored in this skip. A specialist waste management company will be commissioned to manage and dispose of this waste.

Any hazardous waste (such as contaminated soil as a result of spillages) will be temporarily stockpiled (for less than 90 days) in a designated area on site (i.e. placed in leak-proof storage skips), and thereafter removed off site by a suitable service provider for safe disposal at a registered hazardous waste disposal facility.

Waste disposal slips and waybills will be obtained for the collection and disposal of the general and hazardous waste. These disposal slips (i.e. safe disposal certificates) will be kept on file for auditing purposes as proof of disposal. The waste disposal facility selected will be suitable and able to receive the specified waste stream (i.e. hazardous waste will only be disposed of at a registered/licenced waste disposal facility). The details of the disposal facility will be finalised during the contracting process, prior to the commencement of construction. Where possible, recycling and re-use of material will be encouraged. Waste management is further discussed in the EMPr (Appendix F of this BA Report).

During the operational phase after construction, the facility will produce minor amounts of general waste (as a result of the offices). Waste management is discussed in the EMPr (Appendix F of this BA Report).

A.7.4 Electricity Requirements

In terms of electricity supply for the construction phase, the developer will be provided with auxiliary supply from already existing Eskom infrastructure. The exact location of this source as well as the route for provision of such supply is still to be determined by Eskom. During the operational phase, the power line will not have any electricity requirements as the project itself will transmit and distribute electricity.

A.8 Applicable legislation

The scope and content of this BA Report has been informed by the following legislation, guidelines and information series documents (Table A.3). It is important to note that the specialist studies included in Appendix C of this BA Report also include a description of the relevant applicable legislation.

Table A.3. Legislation Applicable to the Proposed Project

Title of legislation, policy or guideline	Applicability to the Proposed Project	Administering Authority	Date
NEMA (Act 107 of 1998, as amended)	The proposed project will require the implementation of appropriate environmental management practices.	National DEFF	19 November 1998
NEMA EIA Regulations published in GN R982, R983, R984 and R985, and as amended on 7 April 2017 in GN R326, R327, R325 and R324	These Regulations provide the procedures that need to be followed for the BA Process.	National DEFF	8 December 2014
NEMA EIA Regulations published in Government Notice R983 and R985, and as amended on 7 April 2017 in GN R327 and R324	These Regulations contain the relevant listed activities that are triggered, thus requiring a BA. Please refer to Section A (7) of this BA Report for the complete list of listed activities.	National DEFF	8 December 2014 and amended on 7 April 2017
Section 24(5)a and (b) of the NEMA, of the procedure to be followed in applying for EA for large scale wind and solar PV energy development activities identified in terms of Section 24(2)(1) of the NEMA when occurring in geographical areas of strategic importance	This project falls within REDZ 7 and a BA process is therefore required for this project	National DEFF	16 February 2018
National Environmental Management: Waste Act (Act 59 of 2008) (NEMWA)	General and hazardous waste will be generated during the construction phase, which will require proper management.	National DEFF	6 March 2009
National Environmental Management: Waste Amendment Act (Act 26 of 2014)	General and hazardous waste will be generated during the construction phase, which will require proper management.	National DEFF	2 June 2014
National Environmental Management: Air Quality Act (Act 39 of 2004)	The proposed stockpiling activities, including earthworks, may result in the unsettling of, and temporary exposure to, dust. Appropriate dust control methods will need to be applied.	National DEFF	19 February 2005
Water Services Act (Act 108 of 1997)	Water will be required during the construction and decommissioning phases of the proposed project, for consumption purposes, earthworks and grassing etc. Water will also be required from the municipality for panel cleaning during the operational phase.	National Department of Water Affairs	1997
Hazardous Substances Act (Act 15 of 1973)	During the proposed project, fuel and diesel will be utilised to power vehicles and equipment. In addition,	Department of Health	1973

Title of legislation, policy or guideline	Applicability to the Proposed Project	Administering Authority	Date
	potential spills of hazardous materials could occur during the relevant phases.		
National Forests Act (Act 84 of 1998)	Protected Tree species are listed under the National Forests Act No. 84 of 1998. In terms of a part of section 15(1) of Act No. 84 of 1998, 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, except under a license granted by the Minister. The Ecological Impact Assessment Specialist Study notes that listed species that may be encountered on site include *Boscia* spp and possibly *Acacia erioloba*. If any protected species are found on site during the search and rescue or construction, the Provincial Department of Agriculture, Forestry and Fisheries will be contacted to discuss the permitting requirements. It is unlikely that an application for the "clearing of a natural forest", as defined within the Act, will be required on the site in question.	DAFF	1998
National Water Act (NWA) (Act 36 of 1998)	Wetlands or riparian zones is excluded from developments unless these developments are authorised by the Department of Human Settlements, Water and Sanitation (DHSWS) for water uses which are defined in Section 21(c) or Section 21 (i). General Authorisation apply in terms of Section 39 of the National Water Act (Act No. 36 of 1998) for water uses as defined in Section 21(c) or Section 21(i) (Department of Water and Sanitation Notice 509 of 2016). This general authorisation replaces the need for a water user to apply for a licence in terms of the National Water Act (Act 36 0f 1998) provided that the	Department of Water and Sanitation	1998

Title of legislation, policy or guideline	Applicability to the Proposed Project	Administering Authority	Date
	water use is within limits and conditions of this General Authorisation. A General Authorisation does not apply to any development within a distance of 500 m upstream or downstream from the boundary (outer edge) of any wetland (General Notice 1199, Government Gazette No. 32805 of 2009; Replacement General Authorisation in terms of Section 39 of the National Water Act). The Ecological Impact Assessment Specialist Study notes that the National Water Act controls activities in and around water resources, as well as the general management of water resources, including abstraction of groundwater and disposal of water. Authorisation for changes in land use, up to 500 m from a defined water resource / wetland system will require at the minimum the compilation of a risk assessment and depending upon outcome, an application for use under a General Authorisation or a Water Use Licence from the DHSWS. The proposed development does not intrude into *de facto* wetland or riparian areas and therefore it is submitted that a Water Use Licence will not be required. This will be confirmed with the DHSWS.		
Integrated Environmental Management (IEM) guideline series published by DEFF (various documents dated from 2002 to present)	The IEM Guideline series provides guidance on conducting and managing all phases and components of the required BA and PPP, such that all associated tasks are performed in the most suitable manner.	National DEFF	2002 - present
National Heritage Resources Act (Act 25 of 1999)	The proposed project may require a permit in terms of the National Heritage Resources Act (Act 25 of 1999) prior to any fossils or artefacts being removed by professional palaeontologists and archaeologists. Additional information regarding this is provided in	National Department of Arts and Culture	1999

Title of legislation, policy or guideline	Applicability to the Proposed Project	Administering Authority	Date
	the Heritage Impact Assessment and Palaeontological Impact Assessment (Appendix C of the BA Report).		
Conservation of Agricultural Resources Act (Act 43 of 1983)	The Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983) has categorised a large number of invasive plants together with associated obligations of the land owner. Invasive plant species that should be removed or maintained only under certain commercial situations are identified in terms of the CARA. This Act will be applicable to the project if and where such plants arise within or adjacent to the project area. Notably most listed alien invasive species are propagated and driven by the disturbance of land during and following construction.	National Department of Agriculture	1983
National Environmental Management: Biodiversity Act (Act 10 of 2004)	This Act serves to control the disturbance and land utilisation within certain habitats, as well as the planting and control of certain exotic species. The Ecological Impact Assessment Specialist Study notes that the proposed development, taking place in the identified Bushmanland Arid Grassland environment, may not necessitate any particular application for a change in land use from an ecological perspective, however the effective disturbance and removal of species identified in Tables 2 and 3, as well as possible other species (i.e. TOPS species), will require specific permission from the applicable authorities. In addition, the planting and management of exotic plant species on route, if and where required, will be governed by the Alien and Invasive Species (AIS) regulations, which were gazetted in 2014. These regulations compel landowners to manage exotic weeds on land under their jurisdiction and control.	National DEFF	September 2004
Subdivision of Agricultural Land Act (Act 70 of 1970)	An application for the change of land use (re-zoning)	Republic of South Africa	1970

Title of legislation, policy or guideline	Applicability to the Proposed Project	Administering Authority	Date
	for the development on agricultural land will be lodged by the Applicant for approval in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA) as required. A servitude for the proposed power line will need to be registered on the affected farm portions. Servitude requirements also need to be discussed between the Applicant and Eskom.		
Northern Cape Nature Conservation Act (Act 9 of 2009)	All species listed by the Northern Cape Nature Conservation Act will require removal permits should they be impacted upon by the construction activities. The Northern Cape Conservation Act under its pertinent regulation, governs the disturbance of species listed in Tables 2 and 3 of the Ecological Impact Assessment (included in Appendix C of this BA Report), or possibly other species not yet identified on site. A permit from the Provincial Department of Environment and Nature Conservation will be required in order to disturb or translocate such species. Species that would require such permitting include *Aloe dichotoma* and *Aloe claviflora* which have been identified within the proposed site. Individual specimens of *Aloe dichotoma* are present at four points across the site, as well as an individual specimen of *Aloe claviflora*. The absence or presence of these species will be confirmed as part of the plant rescue and protection plan and should any species be present and determined that they will be impacted on, permits will be obtained from Department of Environment and Nature Conservation in this regard.	Northern Cape Department of Environment and Nature Conservation	2009

A.8.1 Description of the listed activities associated with the proposed project

Section 24(1) of the NEMA states: "In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorization." The reference to "listed activities" in Section 24 of the NEMA relates to the regulations promulgated in GN R326, R327, R325 and R324, dated 7 April 2017. The relevant GN published in terms of the NEMA collectively comprise the NEMA EIA Regulations listed activities that require either a BA, or Scoping and EIA be conducted. As noted previously, due to the project being proposed in a REDZ, the proposed project requires a BA Process.

The Application for EA for this BA Process will be submitted to the DEFF together with this Draft BA Report, which makes reference to all relevant listed activities forming part of the proposed development.

Table A.4 below provides a list of the applicable listed activities associated for the proposed project in terms of Listing Notice 1 (GN R 327), Listing Notice 2 (GN R325) and Listing Notice 3 (GN R324) in terms of the 2014 NEMA EIA Regulations (as amended).

Table A.4. Applicable Listed Activities

Listed activity as described in GN R 327, 325 and 324	Description of project activity that triggers listed activity
GN R.327 Activity 11 (i): The development of facilities or infrastructure for the transmission and distribution of electricity- (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	The proposed project will entail the construction and installation of overhead 132 kV power line from the PV facility to the Eskom Nieuwehoop Substation, as well as an on-site substation at the PV facility. The proposed project will take place outside of an urban area.
GN R 327: Activity 12 (ii) (a) (c): 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; b) in front of a development setback; or c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area;	The proposed solar PV facility will be constructed on the remaining extent of Onder Rugzeer Farm 168, approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area. The proposed 115 MW Solar PV facility (i.e. Kenhardt PV 6) will entail the construction of building infrastructure and structures (such as the solar field, offices, workshop, ablution facilities, on-site substation, laydown area and security enclosures etc.). The infrastructure and structures are expected to exceed a footprint of 100 m^2 and some may occur within small drainage features and 32 m of the watercourses.

Listed activity as described in GN R 327, 325 and 324	Description of project activity that triggers listed activity
(ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared..	
GN R 327: Activity 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving- a) will occur behind a development setback; b) is for maintenance purposes undertaken in accordance with a maintenance management plan; c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	The proposed project may entail the excavation, removal and moving of more than 10 m^3 of soil, sand, pebbles or rock from the nearby watercourses. The proposed project may also entail the infilling of more than 5 m^3 of material into the nearby watercourses. Construction of the internal gravel access road and/or the potential construction of infrastructure within drainage features may require the removal of material. Details of the infilling of and excavations from the drainage features will be confirmed during the detailed design phase.
GN R.327 Activity 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 proposed project will take place outside of an urban area, on several farm portions. It is understood that the land is currently used for agricultural purposes. The proposed 115 MW solar PV facility (i.e. Kenhardt PV 6) which is considered to be a commercial/industrial development, will have an estimated footprint of approximately 250 ha. The proposed project will also entail the construction of an on-site substation, and power line (including towers and pylons). This will constitute infrastructure with a physical footprint of more than 1 ha.
GN R.327 Activity 47: The expansion of facilities or infrastructure for the transmission and distribution of electricity where the expanded capacity will exceed 275 kilovolts and the development footprint will increase.	The proposed project will also include associated electrical infrastructure at the Eskom Nieuwehoop Substation (including but not limited to feeders, Busbars, transformer bay and extension to the platform at the Eskom Nieuwehoop Substation).
GN R 327: Activity 56 (i): The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre:	In terms of access, the proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will be considered and included in the proposed project. The

Listed activity as described in GN R 327, 325 and 324	Description of project activity that triggers listed activity
(i) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. The Transnet Service Road can be accessed from the R27. The existing gravel road (an unnamed farm road) can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. Should the Transnet Service Road not be used for access, then the unnamed farm gravel road will be used. This farm road, however, will need to be upgraded and widened by more than 6 m (where required).
GN R.325 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 a) within an urban area; or b) on existing infrastructure.	The proposed project will entail the construction of a 115 MW Solar PV facility (i.e. facility for the generation of electricity from a renewable resource). The proposed project will take place outside of an urban area. Note that GN 114 states that Applications for EA for large scale Wind and Solar PV energy facilities, when such facilities trigger Activity 1 of Listing Notice 2 of 2014 of the 2014 NEMA EIA Regulations (as amended) and any other listed and specified activities necessary for the realisation of such facilities, and where the entire proposed facility is to occur in such REDZs, must follow a BA Process, in order to obtain EA.
GN R.325 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 (i) maintenance purposes undertaken in accordance with a maintenance management plan.	The proposed 115 MW solar PV facility will have an estimated footprint of approximately 250 ha. As a result, more than 20 ha of indigenous vegetation would be removed for the construction of the proposed Solar PV facility. Note that GN 114 states that Applications for EA for large scale Wind and Solar PV energy facilities, when such facilities trigger Activity 1 of Listing Notice 2 of 2014 of the 2014 NEMA EIA Regulations (as amended) and **any other listed and specified activities necessary for the realisation of such facilities**, and where the entire proposed facility is to occur in such REDZs, must follow a BA Process, in order to obtain EA.
GN R 324: Activity 18 (g) (ii) and (ii): The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. - In the Northern Cape - Outside urban areas, and	In terms of access, the proposed project site can be accessed via an existing gravel road (an unnamed farm road) and the existing Transnet Service Road (private). Both access routes will be considered and included in the proposed project. The R27 extends from Keimoes (in the north) to Vredendal in the south. The R27 is 6 m wide and falls within a 45 m road reserve. The Transnet Service Road can be

Listed activity as described in GN R 327, 325 and 324	Description of project activity that triggers listed activity
- Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland.	accessed from the R27. The existing gravel road (an unnamed farm road) can be accessed from the R383 Regional Road also via the R27 National Road. The Transnet Service Road and unnamed farm road are both 7-8 m wide, however in certain sections, the unnamed farm road is believed to be about 2-3 m wide. Should the Transnet Service Road not be used for access, then the unnamed farm gravel road will be used. This farm road, however, will need to be upgraded and widened by more than 6 m (where required). Exact specifications of the widening and upgrading of the unnamed farm gravel road will be confirmed during the detailed design phase. The proposed gravel road widening may occur within 100 m of the edge of the minor drainage features. The proposed project will take place approximately 80 km south of Upington and 30 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. Hence the proposed project will take place outside of an urban area.

It must be noted that the above listed activities have been identified in line with the following:

- **The activities in Listing Notice 2 (GN R325) have been provided above, however as captured in GN 114 of February 2018, a BA Process is required for Renewable Energy Developments in the REDZ.**

- Based on the preliminary sensitivity screening undertaken for the sites, the proposed project area does not fall within any threatened ecosystem, National Protected Areas, National Protected Area Expansion Strategy (NPAES) Focus Areas or areas of conservation planning. There is no conservation plan for the !Kheis Local Municipality and the ZF Mgcawu District Municipality, hence Critical Biodiversity Areas (CBAs) are not present or defined.

- It is proposed that less than 30 m^3 of dangerous goods (such as petrol and diesel) will be temporarily stored on site during the construction phase. Furthermore, no infrastructure or structures are planned to be specifically constructed for the aforementioned temporary storage. Recommendations for the temporary storage of petrol and diesel on site during the construction phase have been provided in the EMPr (Appendix F of the BA Report).

- Activity 9 and Activity 10 of GN R327 (Listing Notice 1) are not applicable as these are for piping of water and sewage at scale, which the Applicant is not proposing to undertake.

- Activity 21 of GN R327 (Listing Notice 1) is not applicable at this stage of the BA. However, if the Engineering, Procurement and Construction (EPC) contractor in future determines that a borrow pit is required, then the necessary approvals will be obtained.

A.9 Square Kilometer Array and Radio Frequency Interference

A.9.1 Background

The Astronomy Geographic Advantage (AGA) Act (Act 21 of 2007) aims to provide for the preservation and protection of areas within the Republic that are uniquely suited for optical and radio astronomy; to provide for intergovernmental co-operation and public consultation on matters concerning nationally significant astronomy advantage areas; and to provide for matters connected therewith. The purpose of the AGA Act is to preserve the geographic advantage areas that attract investment in astronomy. The AGA Act also notes that declared astronomy advantage areas are to be protected and properly maintained in terms of Radio Frequency Interference (RFI). The AGA Act is administered by the Department of Higher Education, Science and Technology (previously the Department of Science and Technology).

The proposed Scatec PV4, PV5 and PV6 projects are located within the Upington Renewable Energy Development Zone (REDZ) and the Western Electricity Grid Infrastructure (EGI) corridor for transmission and distribution power lines. This REDZ and EGI corridor were gazetted by national government on 16 February 2018 in Government Gazette 41445. Refer to Figure A.9.1 for an indication of the proposed project area in relation to the gazetted REDZ and EGI corridors.

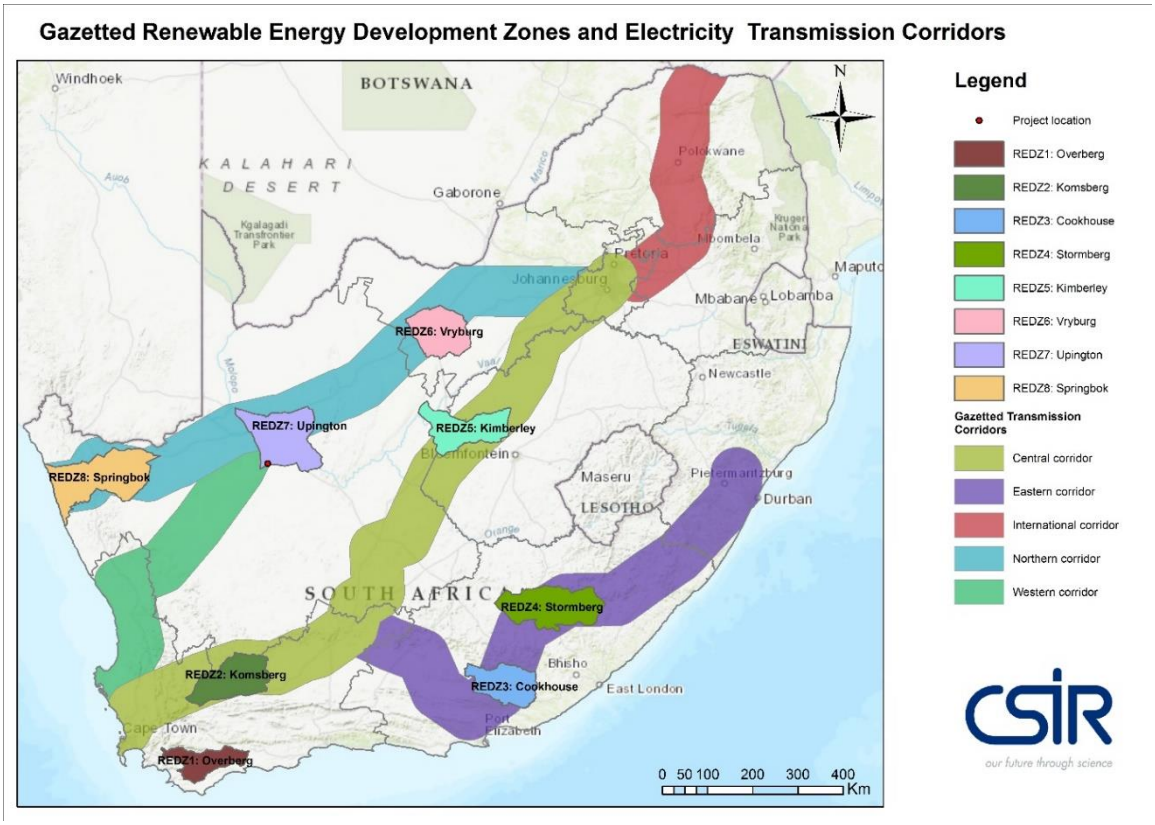
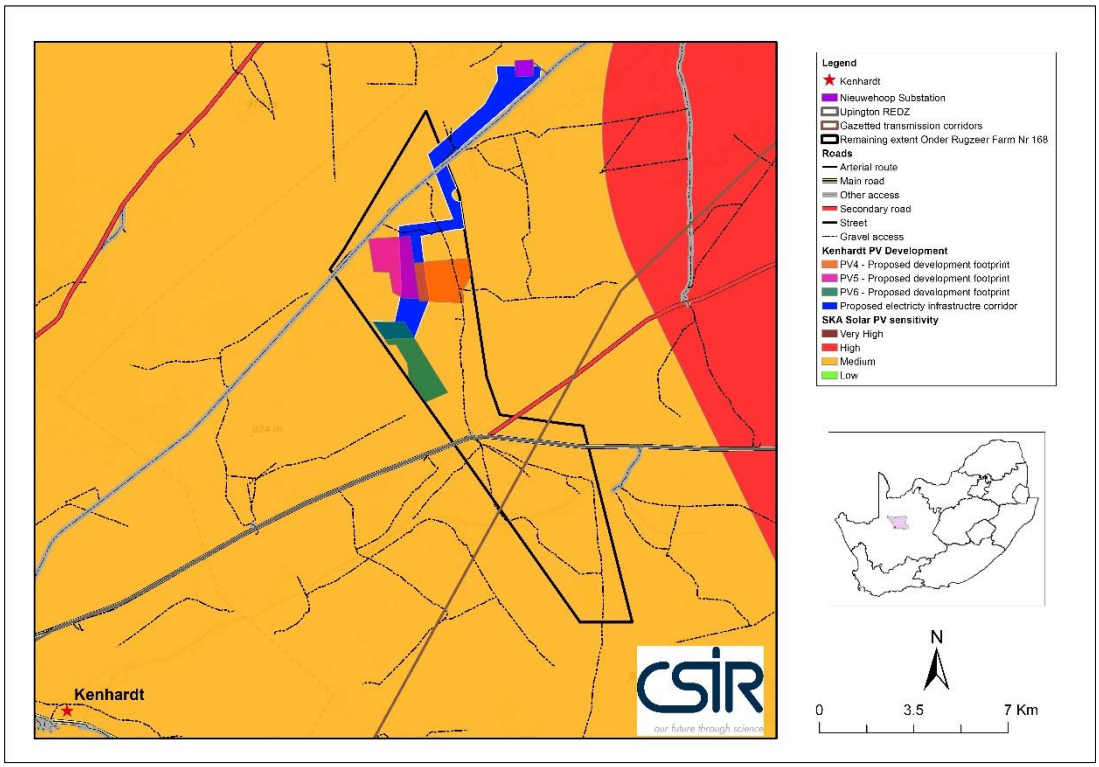
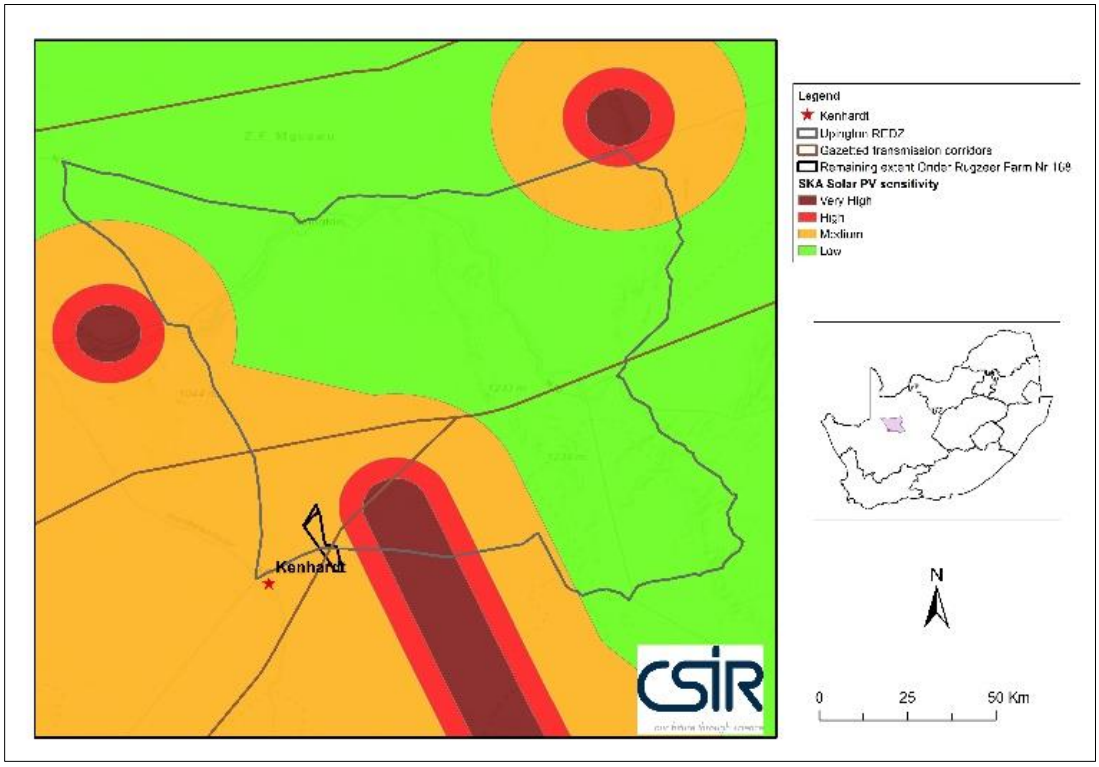


Figure A.9.1: Proposed Project Area in relation to the Gazetted REDZ and EGI Corridors

The four tier sensitivity mapping from the Strategic Environmental Assessment (SEA) conducted by the CSIR (2015) that led to the declaration of the REDZs shows that the project is located in an area of "**medium**" sensitivity in terms of potential electro-magnetic interference (EMI) and/or RFI for the Square Kilometre Array (SKA) project receptors and the Karoo Central Astronomy Advantage Area (KCAAA) 1, in relation to **Solar PV developments (Figure A.9.2)**. It must be noted that the mapping depicted on the National Web-based Environmental Screening Tool will need to be updated as it currently shows the proposed project area as "very high" sensitivity in terms of EMI and RFI for the RFI theme as a result of the project falling within the declared KCAAA1.



A



B

Figure A.9.2: (A) Zoomed in and (B) zoomed out illustration of the Proposed Project Area in relation to the SKA Solar PV Sensitivity, with the orange shading indicating areas of "medium" sensitivity.

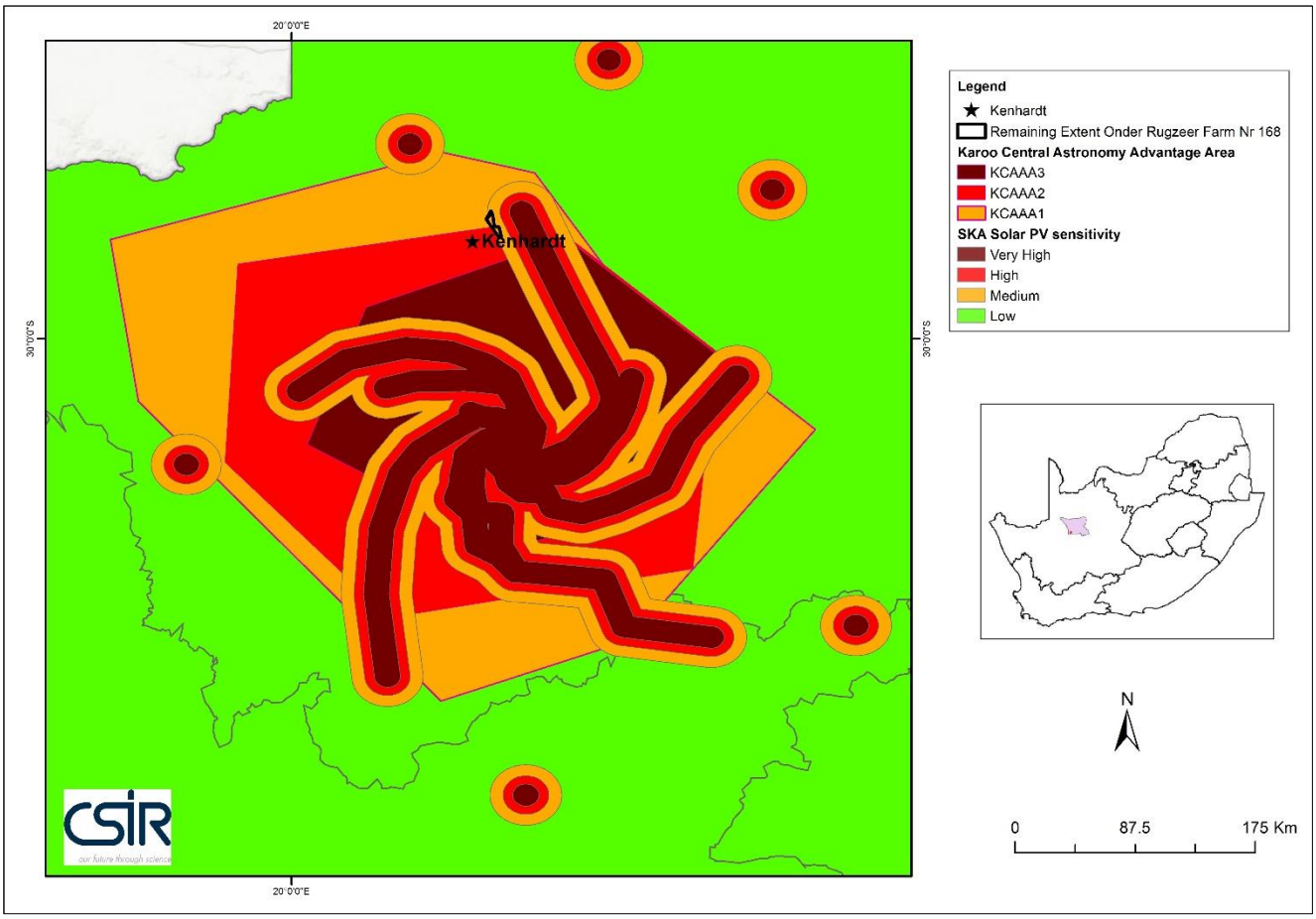


Figure A.9.3: illustration of the Proposed Project Area in relation to the KCAAA1,2 and 3 with the inset map of South Africa showing the project location within the Upington REDZ

The proposed Scatec Kenhardt Phase 2 Solar PV projects fall within the Karoo Central Astronomy Advantage areas, which are protected against unnecessary EMI under the AGA Act. The proposed project site falls within 20 km of a SKA station (SKA Station ID 2362). There are several proposed renewable energy projects within a 50 km radius of the proposed Kenhardt PV 4, PV 5 and PV 6 projects, as depicted below in Figure A.9.4. A 50 km radius has been considered in this instance to cover a larger area. Findings from CSIR research, including the Final Report (CSIR, 2015) for the Strategic Environmental Assessment for Wind and Solar REDZ in South Africa (gazetted in February 2018), indicate that **none of the projects within this 50 km radius of the proposed projects received preferred bidder status in the last four rounds of MW allocation for the REIPPP.** This is significant because it shows that cumulative impact of the proposed three new projects can start by considering that no other projects are currently being constructed.

It is important to note that cumulative impacts are discussed in detail in Section D of this Draft BA Report, whereby a **30 km** radius has been considered for other proposed Renewable Energy projects. This is in line with best practice and the Screening Report generated by the National Web-based Environmental Screening Tool.

Table A.9.1 provides details of proposed Solar PV projects within 50 km radius, including the status of the EA (as at January 2020).

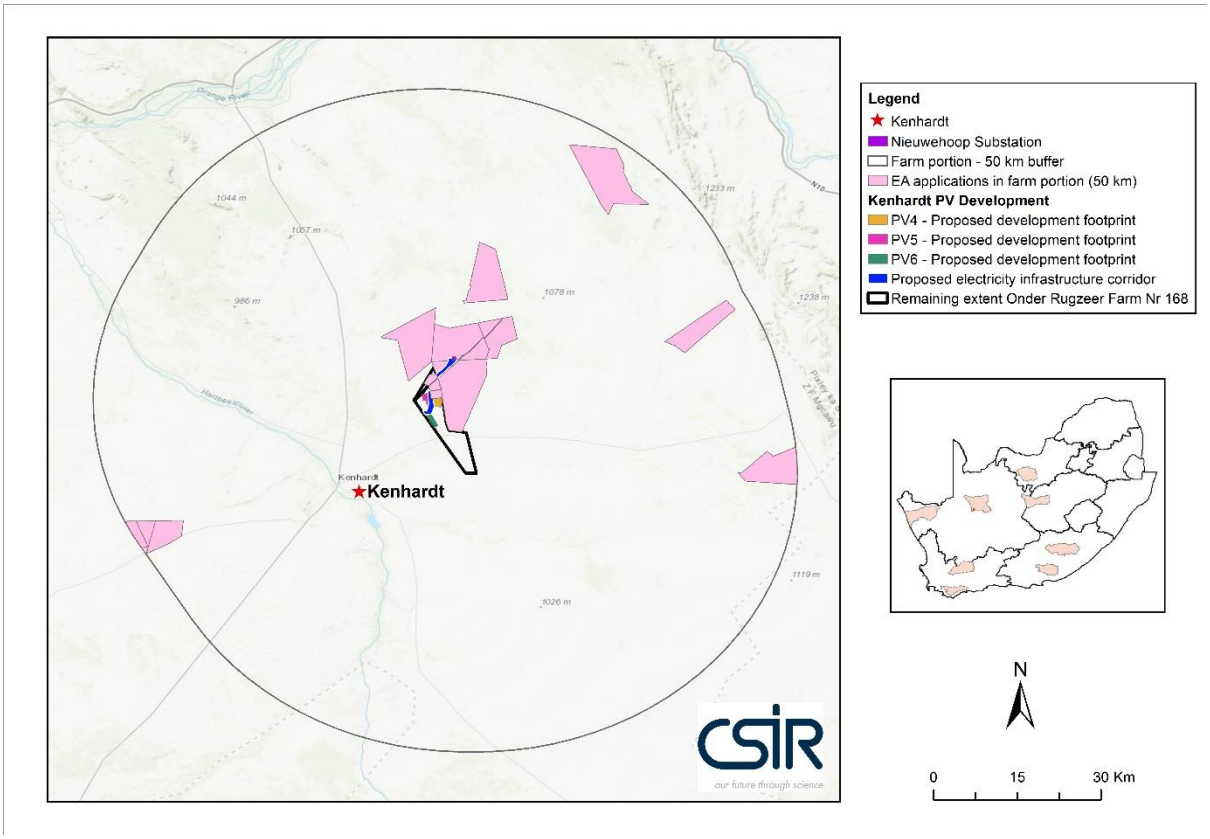


Figure A.9.4: EA Applications for renewable energy facilities within 50 km of the proposed Kenhardt PV 4, PV 5 and PV 6 projects with the proposed electrical infrastructure corridor from the projects to the Nieuwehoop substation shown in blue.

Table A.9.1: EA Applications for Solar PV facilities within 50 km of the proposed Kenhardt PV 4, PV 5 and PV 6 projects

PROJECT TITLE	DEA_REF NO	REGULATIONS	DATE	APPLICANT	EAP	MW	EA STATUS
Wine Estate Capital Management 75MW photovoltaic electricity generation facility on Portion 12 of Farm 187 Olyvenkolk, Kenhardt, Northern Cape Province	14/12/16/3/3/2/343	2010	2012/05/09	Wine Estate Capital Management South Africa (Pty) Ltd	Cape Lowlands Environmental Services cc	75	Approved
	14/12/16/3/3/2/343/AM 1	2010/2014	2016/05/03	Wine Estate Capital Management South Africa (Pty) Ltd	Eco Impact Legal Consulting (Pty) Ltd	As per original project	Approved
	14/12/16/3/3/2/343/AM 2	2010	2016/05/03	Wine Estate Capital Management South Africa (Pty) Ltd	Eco Impact Legal Consulting (Pty) Ltd	As per original project	Approved
The Construction of the Green Continent Partners 75MW Photovoltaic Electricity Generation Facility on Portion 8 Of Farm 187 Olyvenkolk, Kenhardt, Northern Cape Province	14/12/16/3/3/2/344	2010	2012/05/01	Green Continent Partners GmbH Germany	Cape Lowlands Environmental Services cc	75	Approved
	14/12/16/3/3/2/344/AM 1	2010	2014/02/14	Green Continent Partners GmbH Germany	Eco Impact Legal Consulting (Pty) Ltd	As per original project	Approved
	14/12/16/3/3/2/344/AM 1	2010	2016/05/05	Green Continent Partners GmbH Germany	Eco Impact Legal Consulting (Pty) Ltd	As per original project	Approved
	14/12/16/3/3/2/344/AM 2	2014	2016/05/05	Green Continent Partners GmbH Germany	Eco Impact Legal Consulting (Pty) Ltd	As per original project	Approved
	14/12/16/3/3/2/344/AM 3	2014	2018/06/12	Green Continent Partners GmbH Germany	Eco Impact Legal Consulting (Pty) Ltd	As per original project	Approved
Proposed Solar Cape Photovoltaic Electricity Generation Facility on the Farm Olyvenkolk 187/3 and 187/13 Near Kenhardt in the Northern Cape Province	12/12/20/2113	2010	2010/11/01	Solar Land CC	Cape Lowlands Environmental Services cc	100	Approved
	12/12/20/2113/AM1	2010	2014/11/12	Solar Land CC	Cape Lowlands Environmental Services cc	As per original project	Approved
Proposed Construction of a Photovoltaic (PV) Solar Energy Facility	12/12/20/2198	2010	2011/02/01	Vanguard Solar Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	50	In process

PROJECT TITLE	DEA_REF NO	REGULATIONS	DATE	APPLICANT	EAP	MW	EA STATUS
on the farm Kleinbegin, South East of Upington, Northern Cape Province							
Proposed Establishment of the 9.8MW Green Continent Partners Photovoltaic Electricity Generation Facility, Kenhardt, Kai! Garib Municipality, Northern Cape Province	12/12/20/2204	2010	2011/02/01	Green Continent Partners Pty Ltd	Cape Lowlands Environmental Services cc	9.8	Approved
Proposed renewable energy generation project, Kenhardt RD, !Kheis local municipality, ZF Mgcawu District Municipality, Northern Cape	14/12/16/3/3/2/625	2010	2014/01/01	Ansolgenix (Pty) Ltd	AGES Limpopo (Pty) Ltd	Unavailable	In process
Proposed construction of Gemsbok PV1 75MW in Kenhardt, Northern Cape	14/12/16/3/3/2/710	2010	2014/05/01	Mulilo Renewable Project Developments (Pty) Ltd	Council for Scientific and Industrial Research (CSIR)	75	Approved
Proposed construction of Gemsbok PV2 75MW in Kenhardt, Northern Cape	14/12/16/3/3/2/711	2010	2014/05/01	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
Proposed construction of the Boven PV1 75MW in Kenhardt, Northern Cape	14/12/16/3/3/2/712	2010	2014/05/01	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
75MW solar energy facility (Gemsbok PV3) on Portions 3 of Gemsbok Bult farm 120 near Kenhardt within the Kheis Local Municipality in the Northern Cape Province	14/12/16/3/3/2/841	2014	2016/08/30	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
75MW solar energy facility (Gemsbok PV4) on Portion 3 of Gemsbok Bult farm 120 near Kenhardt within the Kheis Local Municipality in the Northern Cape Province	14/12/16/3/3/2/842	2014	2015/10/28	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
75MW solar energy facility (Gemsbok	14/12/16/3/3/2/843	2014	2015/10/28	Mulilo Renewable	CSIR	75	Approved

PROJECT TITLE	DEA_REF NO	REGULATIONS	DATE	APPLICANT	EAP	MW	EA STATUS
PV5) on Portion 8 of Gemsbok Bult farm 120 near Kenhardt within the Kheis Local Municipality in the Northern Cape Province				Project Developments (Pty) Ltd			
75MW solar energy facility (Gemsbok PV6) on Portion 8 of Gemsbok Bult farm 120 near Kenhardt within the Kheis Local Municipality in the Northern Cape Province	14/12/16/3/3/2/844	2014	2015/10/28	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
75MW Solar Photovoltaic Facility (Boven 2) on the remaining extent of Boven Rugzeer farm 169, North East of Kenhardt in the Northern Cape Province	14/12/16/3/3/2/845	2014	2015/10/18	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
75MW Solar Photovoltaic Facility (Boven 3) on the remaining extent of Boven Rugzeer Farm 169, North East of Kenhardt in the Northern Cape Province	14/12/16/3/3/2/846	2014	2015/10/18	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
75MW Solar Photovoltaic Facility (Boven 4) on the remaining extent of Boven Rugzeer Farm 169, North East of Kenhardt in the Northern Cape Province	14/12/16/3/3/2/847	2014	2015/10/18	Mulilo Renewable Project Developments (Pty) Ltd	CSIR	75	Approved
The 100MW Skeerhok 1 PV SEF on Portion 0 of the farm Smutshoek No. 395 north-east of Kenhardt within the Kheis Local Municipality, Northern Cape Province	14/12/16/3/3/2/1033	2014	2017/09/19	Juwi Renewable Energies (Pty) Ltd	CSIR	100	Approved
The 100MW Skeerhok 2 PV SEF north-east of Kenhardt within the Kheis Local Municipality, Northern Cape Province	14/12/16/3/3/2/1034	2014	2017/09/19	Juwi Renewable Energies (Pty) Ltd	CSIR	100	Approved
The 100MW Skeerhok 3 PV SEF north-	14/12/16/3/3/2/1035	2014	2017/09/19	Juwi Renewable	CSIR	100	Approved

PROJECT TITLE	DEA_REF NO	REGULATIONS	DATE	APPLICANT	EAP	MW	EA STATUS
east of Kenhardt within the Kheis Local Municipality, Northern Cape Province				Energies (Pty) Ltd			
The 75MW AMDA Bravo PV SEF North of Kenhardt within the Kai! Garib LM in the Northern Cape Province	14/12/16/3/3/2/1071	2014	2018/09/12	AMDA Charlie (Pty) Ltd	Cape Environmental Assessment Practitioners (Pty) Ltd	75	Approved
The 75MW AMDA Charlie PV SEF North of Kenhardt within the Kai! Garib LM in the Northern Cape Province	14/12/16/3/3/2/1072	2014	2018/09/12	AMDA Charlie (Pty) Ltd	Cape Environmental Assessment Practitioners (Pty) Ltd	75	Approved
The 75MW AMDA Alpha PV SEF North of Kenhardt within the Kai! Garib LM in the Northern Cape Province	14/12/16/3/3/2/1073	2014	2018/09/11	AMDA Charlie (Pty) Ltd	Cape Environmental Assessment Practitioners (Pty) Ltd	75	Approved
Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 1) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.	14/12/16/3/3/2/836	2014	2016/03/29	Scatec Solar	CSIR	75	Approved
Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 2) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.	14/12/16/3/3/2/837	2014	2016/03/29	Scatec Solar	CSIR	75	Approved
Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 3) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.	14/12/16/3/3/2/838	2014	2016/03/29	Scatec Solar	CSIR	75	Approved

A.9.2 Findings of the Scatec Kenhardt Phase 1 EMI studies (including the nearby Mulilo PV projects, Boven PV1 to PV4; Gemsbok PV1 to PV6)

- Phase 1 Scatec Kenhardt EMI Studies – MESA Solutions (Pty) Ltd

As part of Phase 1 of the Scatec Kenhardt PV Projects (i.e. for PV 1, 2 and 3, conducted in 2016), Scatec were in communication with the SKA around mitigation measures to be enforced to reduce RFI. The Phase 1 projects were as follows:

- Kenhardt PV 1 – Department of Environmental Affairs (DEA) [now operating as the Department of Environment, Forestry and Fisheries (DEFF)] EIA Reference: 14/12/16/3/3/2/837;
- Kenhardt PV 2 – DEFF EIA Reference: 14/12/16/3/3/2/838; and
- Kenhardt PV 3 – DEFF EIA Reference: 14/12/16/3/3/2/836.

The SKA recommended that any transmitters that are to be established at the site for the purposes of voice and data communication will be required to comply with the relevant AGA Act Regulations concerning the restriction of use of the radio frequency spectrum that applies in the study area. Furthermore, the SKA Project Office recommended that further EMI and RFI studies be undertaken.

In line with this, the Project Applicant commissioned these studies for the Phase 1 projects and appointed MESA Solutions (Pty) Ltd to conduct the RFI and EMI studies to determine the level of mitigation shielding required in order to comply with the SKA Regulations (MESA, 2016). The results of this technical study on the cumulative topographical analysis of proposed PV projects on the AGA area were included in the EIA Report (CSIR, 2016). A total of three Scatec Solar sites (Kenhardt PV1 to PV3), as well as ten Mulilo sites (Boven PV1 to PV4; Gemsbok PV1 to PV6) in close proximity, were considered in the cumulative assessment. This technical report described the potential impact that the proposed solar PV projects would have on the SKA project, in order to determine suitable mitigation measures to manage the risk (if any) posed to the SKA project by the development of these projects.

The study predicted the electro-magnetic emissions levels from the proposed PV projects expressed in decibels (dB) for different radio frequencies at three SKA receptors, i.e. the closest proposed radio-telescope, the second closest proposed radio-telescope and the core-site radio-telescopes. For all 13 solar PV projects included in this study, these predicted emissions were then compared to the South African Radio Astronomy Services (SARAS) protection levels, to determine how much attenuation (in decibels) was required, and consequently if this could be achieved with the recognised mitigation measures.

The three Scatec projects PV 1, PV 2 and PV 3 were found to exceed the SARAS protection levels by up to 38 dB towards the closest SKA telescope, taking into consideration the cumulative impact of the 13 proposed PV projects. However, the Boven PV1, PV3 and PV4 projects exceed this limit by approximately 50 dB in this scenario. If only 3 other projects were developed, the exceedance for the Scatec Kenhardt projects would reduce to 32 dB. No SARAS exceedances were predicted for any of the 13 PV projects at the core-site telescopes.

The 2016 EIA for the Scatec projects noted that the dominating EMI produced by PV facilities is mainly in the form of switching noise from power electronics in the inverters or conditioning units, as well as clock signals from microprocessor control boards (pg. 4-50, Chapter 4, Final EIA Report, Scatec Solar PV1, CSIR, 2016).

The findings of this technical report (MESA, 2016) are summarised below:

- Radiated emissions at levels below that of CISPR 11/22 Class B are required (especially in the case of the closest telescope).
- Negligible terrain loss exists between majority of sites and closest SKA telescope.
- Predictions for the maximum allowed E-field level, as measured according to CISPR 11/22 Class B, are given in the report. A comparison with measured emission levels for each plant is shown.
- Based on expected plant emission levels, mitigation measures will be required to comply with the SKA requirements. This is particularly relevant for the closest telescope where negligible terrain loss applies.

It was strongly recommended by MESA in the previous study that the following mitigation practises be incorporated into the design of the solar PV facilities:

- The inverter units, transformers, communication and control units for an array of panels should all be housed in a single shielded environment;
- For shielding of such an environment ensure:
    - RFI gasketting be placed on all seams and doors.
    - RFI Honeycomb filtering be placed on all ventilation openings.
- Cables to be laid directly in soil or properly grounded cable trays (not plastic sleeves);
- The use of bare copper directly in soil for earthing is recommended;
- Assuming a tracking PV plant design, care will have to be taken to shield the noise associated with the relays, contactors and hydraulic pumps of the tracking units;
- AC brushless motors to be used for tracking motors; and
- All data communications to and from the plant to be via fibre optic.

The required maximum mitigation of 50 dB for some of the 13 proposed projects (e.g. Boven PV1, PV3 and PV4), especially towards the closest telescope, would require significant attention to detail.

The above mitigation measures were included in the Environmental Management Programme (EMPr) for the Kenhardt PV1, PV2 and PV3 projects. The following management actions were also noted in the EMPr:

- An appropriate Electromagnetic Control (EMC) Plan should be developed to identify specific mitigation measures that will be implemented for each PV project.
- Ensure that the EMC Plan is provided to the SKA for comment and approval during the design phase (i.e. approval from the SKA prior to the commencement of construction).

An EMPr for the Phase 2 Scatec Kenhardt PV projects has also been compiled and included in Appendix F of this Draft BA Report. The above mitigation measures have been included in the EMPr, as applicable.

- <u>Approach to addressing RFI and potential impacts on SKA</u>

As noted in Section A.9.1, it is recognised that the National Screening Tool identifies RFI sensitivity in terms of SKA receptors; Radio Astronomy Advantage Areas; weather radar installations; and communication facilities. It is also noted that the sensitivity allocated to RFI on the screening tool for SKA should be “medium” sensitivity, not “very high” sensitivity, as the proposed project is a

Solar PV project. This is described further in the 2015 REDZ SEA (CSIR, 2015), and in Section 1 above. Nonetheless, it is still recognised that this is a prompt to include such an RFI assessment in the BA Process. However, as noted in the Screening Report, "*it is the responsibility of the EAP to confirm this list [of specialist assessments] and to motivate in the assessment report the reason for not including any of the identified specialist studies…*".

Therefore, this serves as motivation for not including an RFI and/or EMI Assessment in the BA Process. The main reasons are presented below:

a) RFI and EMI impacts on SKA were not raised as concerns in the three most recent EIA projects undertaken by the CSIR for PV facilities near Kenhardt. Refer to the following projects: Skeerhok PV 1: 14/12/16/3/3/2/1033; Skeerhok PV 2: 14/12/16/3/3/2/1034; and Skeerhok PV 3: 14/12/16/3/3/2/1035 for additional detail, which is described in Section A.9.3

b) RFI and EMI issues have been addressed in previous technical studies and EIAs for Solar PV projects in the Kenhardt area and were found to be manageable, subject to clearly stipulated requirements for the project developer and SKA to collaborate closely to ensure adequate mitigation is designed and applied (as summarised above). Key recommendations are synthesized and included in the EMPr for this project. Specifically, the MESA Solutions (Pty) Ltd (2016) assessment for the Phase 1 Scatec Solar project, concluded the following:

   - The three proposed Kenhardt plants (PV 1, PV 2 and PV 3) exceed the South African Radio Astronomy Services protection levels by up to 38 dB toward the closest SKA telescope. This includes the cumulative effect of a total of 13 PV plants developed.
   - For the case where only the three Kenhardt plants are developed, the exceedance will reduce to 32 dB with a cumulative effect for 3 plants considered.
   - If the mitigation measures specified above are implemented correctly, attenuation of between 20 dB and 40 dB can be achieved.
   - It remains the responsibility of the developer to meet compliance to the SKA requirements. The success of the mitigation measures cannot be guaranteed or confirmed until measurements on the post-mitigated operating plants (or representative operations) are performed.

c) The operation of the SKA falls outside the legal mandate of the NEMA and DEFF. Therefore, it is not understood to be an EIA approval issue. This conclusion emerged from the appeal by Mulilo relating to the rejection of applications for EA for other PV projects in the Kenhardt area, in terms of SKA issues. Therefore, it is reasonable to base the scope of these Kenhardt Phase 2 Basic Assessments on this precedent, i.e. that RFI/EMI studies are not required as part of the EIA approval process.

As indicated in Table A.9.1, there are currently no Solar PV projects identified in the surrounding area that have received preferred bidder status. Therefore, the existing MESA Solutions (Pty) Ltd (2016) assessment for the Phase 1 Scatec Solar project that includes the three Phase 1 Scatec projects (Kenhardt PV 1 – 3) and the ten Mulilo projects (Boven PV1 to PV4; Gemsbok PV1 to PV6) is applied to this BA for the projects PV 4, PV 5 and PV6. Furthermore, point 2.2 (c) above should be reiterated, noting that SKA operation does not fall within the mandate of the NEMA and DEFF, as determined in previous applications for EA.

A.9.3 Findings of the juwi Renewable Energies Skeerhok PV 1, 2 and 3 EMI study

juwi Renewable Energies (Pty) Ltd (i.e. "juwi") has also proposed to develop three 100 MW Solar PV power generation facilities and associated electrical infrastructure (including 132 kV transmission lines for all three 100 MW facilities) on Portion 9 of Gemsbok Bult 120 and Portion 0 of Smutshoek 395, with the connection points to the Eskom Nieuwehoop Substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120, approximately 70 km south of Upington and 43 km north-east of Kenhardt within the !Kheis Local Municipality, Northern Cape Province. The project DEFF reference numbers are as follows:

- Skeerhok PV 1: 14/12/16/3/3/2/1033
- Skeerhok PV 2: 14/12/16/3/3/2/1034
- Skeerhok PV 3: 14/12/16/3/3/2/1035

Juwi commissioned Interference Testing and Consultancy Services (Pty) Ltd (ITCS) in May 2017 to conduct an EMI study for these three PV projects. The initial risk evaluation of the proposed development to SKA activities was made available in the Draft Scoping and EIA Reports for these Projects, with the Skeerhok RFI study provided in Appendix P of the EIA Report (CSIR, 2017).

At the time of this study it was assumed that if six nearby projects would continue and each project would comply to the Radio Astronomy Protection Levels in Astronomy Advantage Areas, then the additional mitigation required will be 8dB, according to the calculations conducted by ITCS. Based on the current SKA location information at the time, the impact analysis showed that without adequate mitigation a possible interference scenario between the Skeerhok Solar PV Energy Facility and the SKA installations may occur. The specialist found that **this impact can be adequately mitigated through the implementation of standard mitigation techniques with standard off the shelf components.** The mitigation required should include an allowance of 8dB for cumulative impact of adjacent sites totalling less than 20dB. On-site measurement of the operational plant was proposed as a requirement. If such measurements find additional emission reductions to be necessary, measures such as additional shielding and EMC filters should, among others, be considered.

A.9.4 Proposed mitigation measures for RFI for the Kenhardt PV 4, PV 5 and PV 6 projects and compliance with the AGA Act

Based on the information contained within the EMI studies mentioned above, the location of the project does pose a RFI risk to the SKA, however, the implementation of standard mitigation techniques as required by the AGA Act are deemed sufficient to mitigate this risk (as noted in the extensive studies mentioned above). The Applicant is committed to ensuring these mitigation measures are met and that all conditions of EA relating to this will be adhered to. In addition, pre-application correspondence between the Applicant's EAP and the DEFF (dated 7 and 17 January 2020 and detailed in Appendix D) indicated that the Applicant did not intend on doing a full RFI/EMI study, due to existing information. This exclusion was acknowledged by the DEFF and the Applicant was advised to continue with the BA process on this basis.

The EMPr, which is attached as Appendix F to this Basic Assessment Report, contains an **extensive section on RFI mitigation, as well as a synthesis of the proposed mitigation from the above-**

mentioned studies. This EMPr will be made available for public review with this Draft Basic Assessment Report to all I&APs on the database (Appendix D), which includes SKA. Any recommendations received from the SKA will be considered and addressed, as applicable, in the Final BA Report.

A.9.5 Section on Civil Aviation, Defence and Geotechnical Assessments

The National Web-based Environmental Screening Tool also identified the following specialist assessments (which are understood to mean technical studies) to be required:

- Civil Aviation Assessment
- Defence Assessment
- Geotechnical Assessment.

As allowed for in the Screening Tool Report, CSIR also provided a reasoned response in the email dated 13/11/2019 to the DEFF as to why the above assessments are not required as "full" specialist studies. The response also confirmed that these issues will be addressed effectively in the BA (as applicable).

A formal Civil Aviation and Defence Assessment has not been undertaken as part of the BA Process because the proposed sites fall within an area designated as low sensitivity (in terms of Civil Aviation and Defence) on the National Screening Tool; and the proposed project infrastructure is not expected to have a significant impact on these features. Nevertheless, the relevant Authorities (such as the Department of Defence and Civil Aviation Authority) have been included on the project stakeholder database. They will be informed of the proposed projects and the availability of the Draft BA Report for comment. Comment will be sought from these authorities as applicable during the mandated 30-day review period.

Furthermore, a Geotechnical Assessment will not be undertaken as part of the BA Process as this will be undertaken during the detailed design phase, once preferred bidder status is obtained. Contractors and suppliers will only be selected and appointed after preferred bidder status is obtained (should it be granted). In line with best practice, and to ensure that all aspects are covered in the assessment, suppliers of sub-structures, inverters and transformers and civil sub-contractors are required to provide input into the scope of work of the Geotechnical Assessment. Therefore, Geotechnical Assessments can only be undertaken during detailed design, if preferred bidder status is obtained.

The above information was included in pre-application discussions, which were conducted via emails between the CSIR and DEFF (initially Ephron Maradwa on 13/11/2019), leading to further email discussions with Mmamohale Kabasa and Muhammad Essop, from the Integrated Environmental Authorisations directorate within DEFF. This information was acknowledged by the DEFF and the Applicant was advised to continue with the BA process on this basis (proof of email attached in Appendix D).

A.10 Description of Alternatives

This section discusses the alternatives that have been considered as part of the BA Process. Sections 24(4) (b) (i) and 24(4A) of the NEMA require an Environmental Assessment to include investigation and assessment of impacts associated with alternatives to the proposed project. In addition, Section 24O (1)(b)(iv) also requires that the Competent Authority, when considering an application for EA, takes into account "where appropriate, any feasible and reasonable alternatives to the activity which is the subject of the application and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment".

Therefore, the assessment of alternatives should, as a minimum, include the following:

- The consideration of the no-go alternative as a baseline scenario;
- A comparison of the reasonable and feasible alternatives; and
- Providing a methodology for the elimination of an alternative.

Compliance with Regulation 3 (1) (h) (i) of Appendix 1 of the 2014 NEMA EIA Regulations (as amended) is discussed below. Regulation 2 (e) of Appendix 1 of the 2014 NEMA EIA Regulations (as amended) states:

- The objective of the basic assessment process is to, through a consultative process, and through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to (i) identify and motivate a preferred site, activity and technology alternative; (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and (iii) identify residual risks that need to be managed and monitored.

A.10.1 No-go Alternative

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed solar PV facility and associated infrastructure. This alternative would result in no environmental impacts on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. The following implications will occur if the "no-go" alternative is implemented:

- No benefits will be derived from the implementation of an additional land-use;
- No additional power will be generated or supplied through means of renewable energy resources by this project at this location. The proposed 115 MW facility is predicted to generate approximately 200 GW/h per year which could power 20 000 households;
- The "no go" alternative will not contribute to and assist the government in achieving its proposed renewable energy target of 26 630 MW by 2030 (for Wind, Solar PV and Concentrated Solar Power);
- Electricity generation will remain constant (i.e. no additional renewable energy generation will occur on the proposed site) and the local economy will not be diversified;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realised; and
- The local economic benefits associated with the REI4P will not be realised, and socio-economic contribution payments into the local community trust will not be realised.

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- Only the agricultural land use will remain;
- No destruction of habitat will occur;
- No change to the current landscape will occur;
- No impacts to the cultural heritage will occur;
- No destruction of fossils will occur;
- No avifaunal collisions will occur due to the establishment of the project; and
- No additional traffic will be generated.

As outlined in Section D of this report, the majority of the negative impacts identified as part of this assessment can be reduced to lower significance with the implementation of mitigation measures. However, no specialists found that the project should not go ahead i.e. no fatal flaws were identified. The social impact assessment identified positive impacts from a social upliftment perspective. These include benefits to the local community via employment opportunities (moderate significance) and the development of locally-owned industries to support construction related activities (low significance).

Hence, while the "no-go" alternative will not result in any negative environmental impacts; it will also not result in any positive community development or socio-economic benefits. It will not assist government in addressing climate change, reaching its set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. Hence the "no-go" alternative is not a preferred alternative.

A.10.2 Land-use Alternatives

A.10.2.1 Agriculture

At present the proposed site is zoned for agricultural land-use, and is mainly used for livestock grazing. As noted in Section B of this report, agricultural potential is uniformly low across the preferred and alternative sites and the choice of placement of the proposed facility on the farm therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the site (refer to Section D of this report for a summary of the agricultural and soils impact assessment and to Appendix C for the full report). As indicated in the agricultural and soils impact assessment, none of the potential impacts identified have been rated with a high significance with the implementation of mitigation measures. It is important to re-iterate that the economic benefits to the farmer associated with the proposed Solar PV Facility are likely to be more significant than that of the current agricultural activities on site and these two land uses (agriculture and renewable energy generation) can potentially both be undertaken on site. Hence, agricultural land use is not a preferred alternative.

A.10.2.2 Renewable Energy Alternatives

The Integrated Resource Plan for South Africa for the period 2019 to 2030 (referred to as "IRP2019") proposes to secure 26 630 MW of renewable energy capacity by 2030 (for Wind, Solar PV and Concentrated Solar Power – excluding Hydropower and Pumped Storage). The DMRE subsequently entered into a bidding process for the procurement of 3725 MW of renewable energy

from IPPs by 2016 and beyond to enable the Department to meet this target. On 18 August 2015, an additional procurement target of 6300 MW to be generated from renewable energy sources was added to the REI4P for the years 2021 - 2025, as published in Government Gazette 39111. The additional target allocated for wind energy, solar PV energy, and solar CSP energy is 3040 MW, 2200 MW, and 600 MW respectively.

In order to submit a bid, the proponent is required to have obtained an EA in terms of the EIA Regulations as well as several additional authorisations or consents. It has been determined that even though the current processes will enable renewable energy to be fed into the national grid, the REI4P does have certain inefficiencies. To this end, the National DEFF, in discussion with the DMRE, was mandated by MinMec to undertake a SEA to identify the areas in South Africa that are of strategic importance for Wind and Solar PV development. The Phase 1 Wind and Solar PV SEA is in support of the Strategic Infrastructure Plan (SIP) 8, which focuses on the promotion of green energy in South Africa. The SEA aimed to identify strategic geographical areas best suited for the roll-out of large scale wind and solar PV energy projects, referred to as REDZs. Through the identification of the REDZs, the key objective of the SEA was to enable strategic planning for the development of large scale wind and solar PV energy facilities in a manner that avoids or minimises significant negative impact on the environment while being commercially attractive and yielding the highest possible social and economic benefit to the country – for example through strategic investment to lower the cost and reduce timeframes of grid access. Following the completion of the SEA, the REDZs were gazetted in February 2018 by the Minister of Environmental Affairs. **The location of the proposed project within a REDZ (specifically REDZ 7) supports the development of a large scale renewable energy project in the location.**

Based on the above, both wind or solar projects are supported within the REDZ. In order to ensure that a wind energy facility is successful, a reliable wind resource is required. A wind resource is defined in terms of average wind speed, turbulence, and direction. The CSIR Energy Centre undertook “Wind and Solar Resource Aggregation Study for South Africa” to determine the capacity factor dataset for wind energy development in South Africa. A high capacity factor (>0.425, shown in green) is considered to be an area where, when using a specific type of turbine, wind energy generation potential is high; areas shown in red (0.325-0.375) and maroon (<0.325) have a lower capacity factor and are therefore less favourable for wind development. The proposed solar PV facility is located in an orange area (Figure A.5). Therefore, wind energy development can occur within this area but other localities in South Africa may be more favourable for wind energy development. Site specific requirements of wind energy facilities make it a less feasible alternative when compared to solar PV.

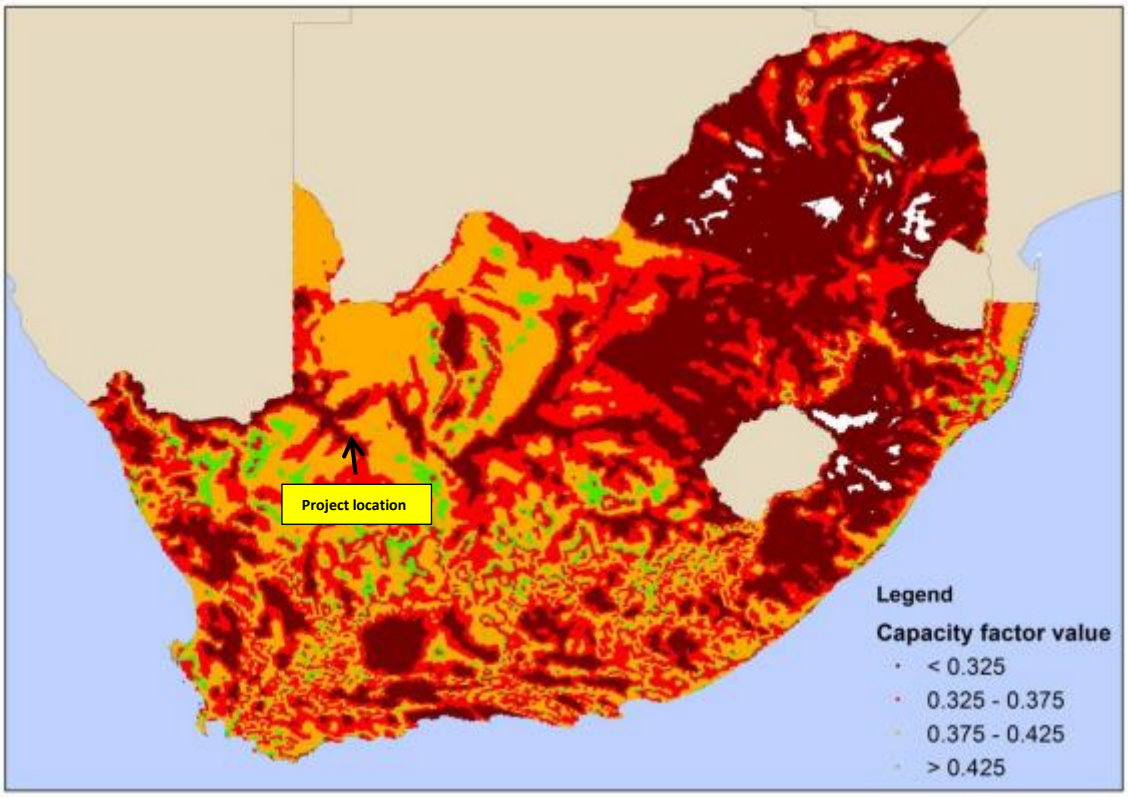


Figure A.5. Capacity Factor dataset for wind energy development (CSIR, 2016)[1]

In terms of the suitability of solar development at this location, the north-western part of South Africa has the highest Global Horizontal Irradiation[2] (GHI), relevant to PV installations (Figure A.6). Therefore, this section of South Africa is deemed the most suitable for the construction and operation of solar energy facilities as opposed to other areas and provinces within South Africa. For example, coastal regions within KwaZulu-Natal, Eastern Cape and Western Cape mainly have a lower solar radiation (shown in the lighter yellow shades in Figure A.6), which is not completely feasible for the proposed project.

[1] CSIR Energy Centre Wind and Solar Resource Aggregation Study for South Africa, Fraunhofer IWES, 2016.
[2] Global Horizontal Irradiance is the total amount of shortwave radiation received from above by a surface horizontal to the ground

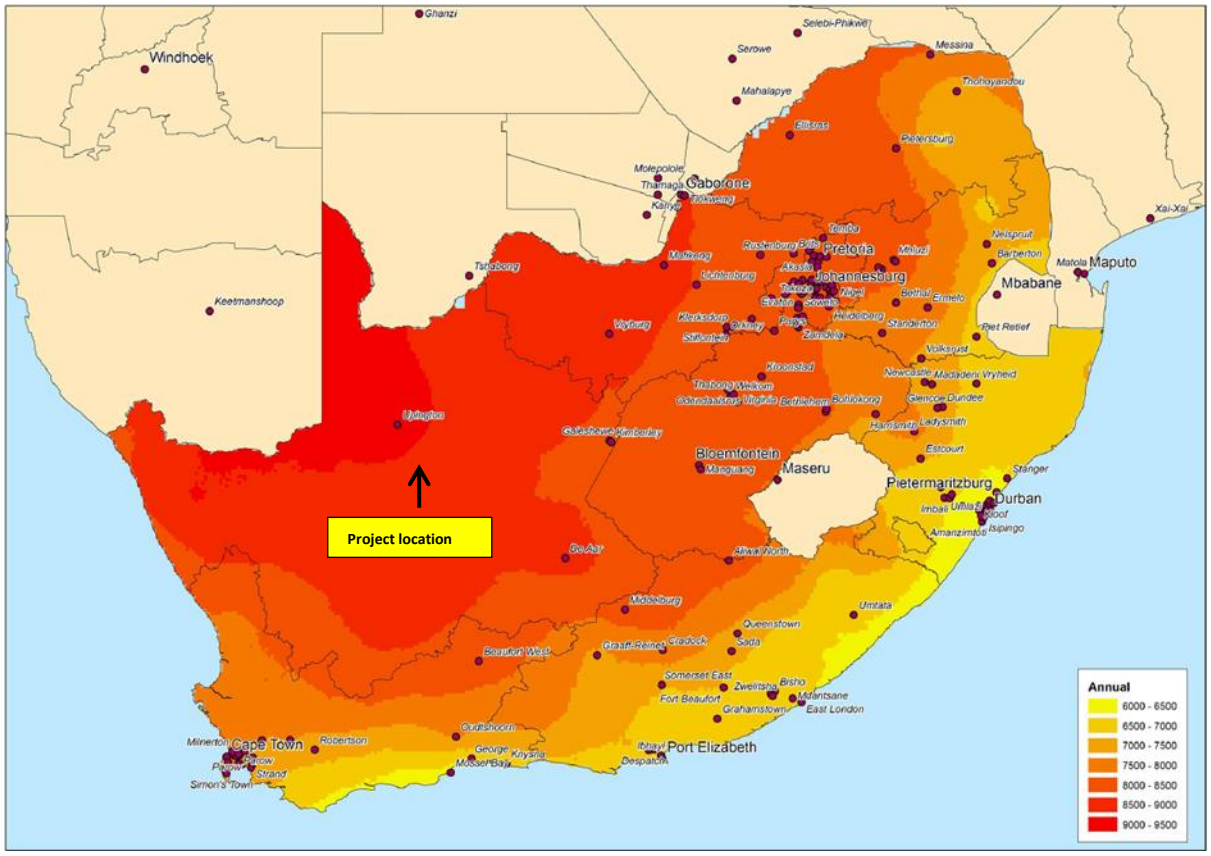


Figure A.6. Solar Resource Availability in South Africa

Furthermore, based on resource potential, the implementation of a Biomass or Hydropower Facility at the proposed site in the Northern Cape is considered to be an unfeasible and unreasonable alternative to the implementation of the proposed solar PV energy facility.

Therefore, the implementation of a solar energy facility at the proposed project site is more favourable and feasible than wind energy development. Therefore, in terms of project and location compatibility, the proposed solar facility is considered to be the most feasible renewable energy land use alternative.

A.10.3 Technology Alternatives

A.10.3.1 Solar Panel Types

Only the PV solar panel type was considered in the BA. Due to the scarcity of water in the proposed project area and the large volume of water required for Concentrated Solar Power (CSP), this technology is not deemed feasible or sustainable and will not be considered in the BA. This is the main difference between PV and CSP technology that led to the selection of PV as the preferred solar panel technology. Furthermore, CPV technology therefore requires a larger development footprint to obtain the same energy output as PV technology, and it requires active solar tracking to be effective. Furthermore, as noted above, in Government Gazette 39111 published on 18 August 2015, no additional procurement target was allocated for CPV. In terms of the IRP2019, 300 MW capacity is already installed for CSP; and an additional 300 MW has been allocated for 2019. This means that the need and desirability of CSP is not as evident and justified compared to PV.

A.10.3.2 Mounting System

Solar panels can be mounted in various ways to ensure maximum exposure of the PV panels to sunlight. The main mounting systems that will be considered as part of the design are:

- Single axis tracking systems;
- Fixed axis tracking systems;
- Dual axis tracking systems; and
- Fixed Tilt Mounting Structure.

A.10.3.3 Power Line

The technology that is proposed for the construction and operation of the proposed power line and electrical infrastructure will be guided by national standards and best practice. The technology options and operational aspects are also governed by Eskom's requirements and building specifications. This therefore limits the amount of variability in terms of the technology and operational processes. The type of technology used will relate to the infrastructure being installed and constructed, such as the type of conductors, pylon structures and design, use of Bird Flight Diverters, and building structures for the on-site substation.

A.10.4 Site Alternatives

The preferred site within the Northern Cape was selected based on national level considerations (high solar radiation in the Northern Cape, as opposed to other provinces within South Africa) and the fact that the proposed sites currently fall within the REDZ 7 (as discussed in Section A.9.2). On a site specific (local) level, the site was deemed suitable due to all the site selection factors (such as land availability, distance to the national grid, site accessibility, topography, fire risk, current land use and landowner willingness) being favourable.

The site selection criteria considered by the Applicant are discussed in detail below Table A.5.

Table A.5. Site selection factors and suitability of the site

FACTOR	SUITABILITY OF THE SITE
Land Availability	The remaining extent of Onder Rugzeer Farm 168 is of a suitable size for the proposed project. The land available to develop at the preferred site for Kenhardt PV 6 extends approximately 250 ha, however only an estimated 250 ha will be required for the proposed project (i.e. Kenhardt PV 6).
Irradiation Levels	2100 - 2300 kWh/m^2
Distance to the Grid	An Environmental Authorisation (EA) for the construction of the 400/50 50 kV Eskom Nieuwehoop Substation was granted to Eskom Holdings SOC Limited on 21 February 2011 by the DEA (Reference Number: 12/12/20/1166). This substation has been constructed. An EA (DEA Reference Number: 12/12/20/2606; NEAS Reference Number: DEA/EIA/0000785/2011), dated 14 February 2014, was also granted to Eskom Holdings SOC Limited to construct, *inter alia*, the following within the existing development footprint of the Nieuwehoop Substation: - 2 x 400 kV transformer feeder bay; - A 400 / 132 kV transformer; - 132 kV busbar; - 400 / 132 kV 500 MVA x 3 transformers; and

FACTOR	SUITABILITY OF THE SITE
	- 8 x 132 kV feeder bays and associated lines. The proposed project will be located approximately 12 km from the Eskom Nieuwehoop Substation.
Site Accessibility	The proposed project site can be accessed via an existing gravel road and the existing Transnet Service Road (private). The existing gravel road can be accessed from the R383 Regional Road via the R27 National Road. The R27 extends from Keimoes (in the north) to Vredendal in the south. The Transnet Service Road can be accessed from the R27. Internal gravel roads will be constructed as part of the proposed project.
Topography	Slope ≤2% (Level to very gentle slope).
Fire Risk	Main vegetation type is Bushman arid grassland, low fire risk.
Current Land Use	Agriculture - Grazing
Landowner Willingness	The landowner has signed consent for the use of the land for the proposed projects. This is considered an important aspect of the proposed project in terms of its viability (i.e. this will limit potential appeals during the decision-making process, as the landowner is willing and supportive of the proposed projects being undertaken on the farm).

Furthermore, from an impact and risk assessment perspective, the implementation of a solar PV project on the farm Onder Rugzeer 168 will result in fewer risks in comparison to its implementation at alternate sites within the Northern Cape (i.e. regions with similar irradiation levels). The following risks and impacts will be likely in this case:

- There is no guarantee that suitable land will be available for development of a solar PV facility. Site geotechnical conditions, topography, fire potential and ready access to a site might not be suitable, thus resulting in negative environmental implications and reduced financial viability.
- There is no guarantee that the current land use of alternative sites will be flexible in terms of development potential, for example the agricultural potential for alternative sites might be higher and of greater significance.
- There is no guarantee of the willingness of other landowners to allow the implementation of a solar facility on their land and if the landowners strongly object, then the project will not be feasible.
- There is no guarantee that other sites within the Northern Cape will be located close to existing or proposed electrical infrastructure to enable connection to the national grid. The further away a project is from the grid, the higher the potential for significant environmental and economic impacts.

As previously noted, the proposed Kenhardt PV 6 facility is one part of a bigger project by Scatec Solar to develop three Solar PV Facilities in total for Phase 2, as well as the three authorized Phase 1 projects. The main determining points for Scatec Solar was to find suitable, developable land in one contiguous block to optimise design, minimise costs, and minimise sprawling development and impact footprints. In addition, the proximity to the Eskom Nieuwehoop Substation was a major determinant for identifying suitable sites for the proposed development.

Given the site selection requirements associated with solar energy facilities and the suitability of the land available on the farm Onder Rugzeer 168 and no fatal flaws within the Power Corridor that traverses the Portion 3 of the Farm Gemsbok Bult 120, the remainder of Boven Rugzeer 169 and Portion 4 of Onder Rugzeer Farm 168, therefore no other site alternatives were considered.

A.10.5 Location (Layout) Alternatives

As an initial step, the Applicant consulted with the National Web-Based Screening Tool to seek a baseline description of the environmental sensitivities within the proposed site. This guided the Applicant to select the best initial larger footprint and electrical infrastructure corridor within the proposed site from an environmental sensitivities perspective. The larger area was then assessed by the specialists, which lead to the identification of the preferred (revised) layouts. Additional detail is provided below.

Based on the specialist field assessments undertaken to identify the sensitivities on site, the initial footprints were revised to avoid sensitivities. The sensitive environmental features found within the preferred site, as described in the specialist studies (Appendix C) and discussed in the conclusions chapter of this BA Report are able to be avoided by the location, layout and design of the project. A preliminary site layout is provided in Appendices A and B of this BA Report, which avoids all the environmental sensitivities identified on site, where required. The assessed site (assessed by specialists) and the revised preferred sites are suitable in terms of size requirements, i.e. 250 ha which is required for the proposed Kenhardt PV 6 facility and still falls within the boundaries of the remaining extent of Onder Rugzeer Farm 168 which, as discussed above, has been deemed a suitable site for the proposed development. Section D also provides high-level input from the specialists in terms of a description of the footprints assessed.

A.10.6 Concluding Statement for Alternatives

Based on the above, the preferred activity is the development of a renewable energy facility on site using solar PV as the preferred technology. In terms of the preferred location of the site, the farm Onder Rugzeer 168 and the Power Corridor that traverses Portion 3 of the Farm Gemsbok Bult 120, the remainder of Boven Rugzeer 169 and Portion 4 of Onder Rugzeer Farm 168, are preferred. The location (layout) of the activity has been informed by the outcomes of the specialist assessments and technical feasibility. The preferred layout is further discussed in Section D of this report.

A.11 Needs and desirability

It is an important requirement in the EIA Process to review the need and desirability of the proposed project. Guidelines on Need and Desirability were published in the Government Gazette of 20 October 2014. These guidelines list specific questions to determine need and desirability of proposed developments. This checklist is a useful tool in addressing specific questions relating to the need and desirability of a project and assists in explaining that need and desirability at the provincial and local context. Need and desirability answer the question of whether the activity is being proposed at the right time and in the right place. Table A.6 includes a list of questions based on the DEFF's Guideline to determine the need and desirability of the proposed project. It should be noted this table was informed by the outcomes of the BA Process.

Table A.6. The Guideline on the Need and Desirability's list of questions to determine the "Need and Desirability" of a proposed project

NEED	
Question	**Response**
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area)?	
1.1. How were the following ecological integrity considerations taken into account?: 1.1.1. Threatened Ecosystems, 1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure, 1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4. Conservation targets, 1.1.5. Ecological drivers of the ecosystem, 1.1.6. Environmental Management Framework, 1.1.7. Spatial Development Framework, and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	**The environmental sensitivities present on site were assessed within the ecological impact assessment undertaken as part of this BA Process.** **The specialist identified all ecological sensitive areas on site that would need to be avoided by the proposed development, as well as how to suitably develop within these areas so that the ecological integrity of the areas is maintained (refer to Section D and Appendix C).** **A sensitivity map produced based on the input obtained from the various specialist studies is included in Section B and D of this Report, as well as in Appendix B.**
1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**The environmental sensitivities present on site were assessed within the ecological impact assessment undertaken as part of this BA Process. The specialist identified all ecological sensitive areas on site that would need to be avoided by the proposed development, as well as how to suitably develop within these areas so that the ecological integrity of the areas is maintained (refer to Section D and Appendix C).** **A sensitivity map produced based on the input obtained from the various specialist studies is included in Section B and D of this Report, as well as in Appendix B.** **Measures to avoid, remedy, mitigate and manage impacts are included within the compiled Environmental Management Programme (EMPr), included as Appendix F of the Report, which forms part of this BA Report.**

NEED	
Question	**Response**
1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**This development has the potential to impact on the ecology of the area, this includes impacts on the natural vegetation, biodiversity, sensitive habitats and ecosystem function. The overall impact to ecology is considered to be of low (negative) impact significance (Refer to Section D). Measures to avoid, remedy, mitigate and manage impacts are included within the compiled EMPr, which forms part of this BA Report.**
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether; what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	**The description of the potential waste generation is included in Section A of this BA Report (this Section). It is not anticipated that a significant amount of waste will be generated.** **The EMPr includes measures to avoid, remedy, mitigate and manage impacts are included within the compiled EMPr (Appendix F), which forms part of this BA Report.**
1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**A Heritage Impact Assessment was undertaken as part of the assessment for this project. The overall findings of the HIA is that the impact to heritage resources will be low (negative) significance with the implementation of mitigation measures. A Heritage profile is included in Section B of this Report. The applicable measures to avoid, remedy, mitigate and manage impacts are included in Section D and Appendix C (full specialist study) as well as in the EMPr.**
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**This project requires water during the construction and operational phases. Currently, the proposal is to source this from the municipality (confirmation from the municipality is currently pending and will be sought as part of the review of the Draft BA Report).**
1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were	**The proposed project aims to harness the sun's light for the generation of electricity. This project is seen as a source of 'clean energy' and reduces the dependence on non-renewable sources, such as coal fired power plants. The proposed development is located in the Upington REDZ. The REDZs represent areas where wind and solar PV energy development is being incentivised from resource, socio-economic and environmental perspectives. For more information,**

NEED	
Question	**Response**
taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life) 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources of the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	**refer to the Alternatives section included in Section A of this report (this section) for an outline of the suitability of this activity.**
1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts?: 1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2. What is the level of risk associated with the limits of current knowledge? 1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	**The precautionary approach has been adopted for this assessment, i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts.** **Refer to Appendix C of this report for the complete specialist studies. These studies outline the assumptions and limitations that were applicable to the respective studies.** **The risk associated with the limits in knowledge is considered to be low.**

NEED	
Question	**Response**
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following: 1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	**Refer to Section D and Appendix C for the specialist studies undertaken. The overall negative impact to the environmental right of people in terms of social and visual impacts are considered to be low. In addition, the social assessment found that the employment opportunities created would be considered a moderate positive impact.**
1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	**This is considered and addressed as part of the Social Impact Assessment undertaken for this project (included in Appendix C and summarised in Section D of this report).** **The study found that in light of the overall low significance (post mitigation) rating of identified negative impacts, and having regard to the nature of such impacts, and the status quo socio-economic conditions present in the !Kheis Local Municipality; the socio-economic benefits of the project appear to outweigh its impacts. Should the mitigation measures be implemented as prescribed in this assessment; it was recommended by the specialist that the proposed development be awarded EA.**
1.11. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	**The !Kheis Local Municipality Integrated Development Plan (IDP) (2017-2022) identifies renewable energy as a key economic sector within its Local Economic Development (LED) plan. The inclusion of renewable energy as a key sector not only plays to the natural strengths of the area (i.e. good solar irradiation levels), but also appears to be aimed at bringing parity between the existing employment sectors by providing much needed growth within the local construction and electricity employment sectors. The proposed activity therefore does not compromise any of the objectives set within IDP (2017-2022). The proposed project will also be supportive of the IDP's objective of creating more job opportunities.**

NEED	
Question	**Response**
	The ecological study found (Appendix C) that there are "limited habitats of ecological significance or value on the site in question".
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	**Refer to the Alternatives section included in Section A of this report (this section) for an outline of the suitability of this activity.**
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	**Refer to Section D of this BA Report.**
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area	**The !Kheis Local Municipality Integrated Development Plan (IDP) (2017-2022) identifies renewable energy as a key economic sector within its LED plan. The inclusion of renewable energy as a key sector not only plays to the natural strengths of the area (i.e. good solar irradiation levels), but also appears to be aimed at bringing parity between the existing employment sectors by providing much needed growth within the local construction and electricity employment sectors.** **The proposed activity therefore does not compromise any of the objectives set within IDP (2017-2022). The proposed project will also be supportive of the IDP's objective of creating more job opportunities. Even though this solar facility will not provide the municipality directly with electricity, the energy produced by the facility will feed into the national grid. The IDP identifies lack of or inadequate employment, as well as lack of reliable electricity supply as some of the societal challenges reported by communities in Kenhardt. The proposed project will create job opportunities and economic spin offs during the construction and operational phases (if an EA is granted by the DEFF). It is estimated that between 90 and 150 skilled and 400 and 460 unskilled employment opportunities are to be created during the construction phase. Approximately 20 skilled and 40 unskilled employment opportunities will be created over the 20 year operational lifespan**

NEED	
Question	**Response**
	of the proposed facility. **It should however be noted that employment during the construction phase will be temporary, whilst being long-term during the operational phase.** **Therefore, the proposed solar facility would help to address the need for increased electricity supply (on a national level) while also providing advanced skills transfer and training to the local communities and creating contractual and permanent employment in the area.**
2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integration of segregated communities, need to upgrade informal settlements, need for densification, etc.),	**N/A the proposed project is located within a rural area and the site is zoned for agricultural use.**
2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.)	**Refer to Section B and D of this report for a description of the receiving environment and impact assessment, respectively. The impact of the proposed project on cultural/heritage areas (archaeology and palaeontology) have been assessed in the form of a Heritage Impact Assessment attached as Appendix C and summarised in Section D.** **The proposed project site is currently being used for agricultural purposes, predominantly grazing. Should the proposed project proceed, approximately 250 ha of the land will be developed on and it is not expected that this will significantly threaten the agricultural activities present on site. A Soils and Agricultural Impact Assessment (Appendix C and summarised in Section D) was undertaken as part of this BA and is included within the BA Report to reflect the impact of the proposed project in terms of the land use and agricultural potential. All agricultural impacts of the proposed development are assessed as being of low or very low significance.**
2.1.4. Municipal Economic Development Strategy ("LED Strategy").	**The !Kheis Municipality Draft Integrated Development Plan (IDP) (2017 - 2022) states that an opportunity exists to utilise solar energy more widely and lessen the dependence on wood and fire. This opportunity has been identified because not all people within the municipal area have access to electricity. Therefore, the proposed solar energy facility would help to address the need for increased**

NEED	
Question	**Response**
	electricity supply while also providing advanced skills transfer and training to the local communities and creating contractual and permanent employment in the area.
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix C for an outline of the social impacts that could occur due to the proposed development of the solar facility.**
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long term? Will the impact be socially and economically sustainable in the short- and long-term?	
2.5. In terms of location, describe how the placement of the proposed development will:	
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix C for an outline of the positive impacts associated with the creation of employment opportunities that could be created by the solar facility.**
2.5.2. reduce the need for transport of people and goods,	**Not applicable. This is a renewable energy project proposal.**
2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),	**Not applicable. This is a renewable energy project proposal.**
2.5.4. compliment other uses in the area,	**A soils and agricultural impact assessment was undertaken to determine the impact on the current land-use. Refer to Section D and Appendix C for a summary of the study and the full study, respectively. The preferred project site is currently being used for agricultural purposes, predominantly grazing. Should the proposed project proceed, approximately 250 ha of the land will be developed on and it is not expected that this will significantly threaten the agricultural activities present on site.**
2.5.5. be in line with the planning for the area,	
2.5.6. for urban related development, make use of underutilised land available with the urban edge,	**Not applicable. The proposed project is located within a rural area and the site is zoned for agricultural use.**

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Question	**Response**
2.5.7. optimise the use of existing resources and infrastructure,	**The proposed project will connect to the existing Eskom Nieuwehoop Substation and will make use of existing access roads as far as possible.**
2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	**This project is a renewable energy project and not related to bulk infrastructure expansion.**
2.5.9. discourage "urban sprawl" and contribute to compaction/densification,	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix D for management measures on how to manage the impact associated with the "disruption of local social structures as a result of the construction work force and in-migration of job seekers".**
2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	**N/A the proposed project is located within a rural area and the site is zoned for agricultural use.**
2.5.11. encourage environmentally sustainable land development practices and processes,	**Based on the findings of this BA, the proposed project would not have a significant ("high") negative impact on the receiving environment, with the implementation of suitable mitigation measures (Section D) and will therefore not go against sustainable land development practices and processes. In addition, the proposed project will be designed according to relevant national specifications and standards which are regarded as best practice in the renewable energy sector.**
2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	**Refer to the Alternatives section included in Section A of this report (this section) for an outline of the selection and suitability of this activity.**
2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix C. In addition, as noted in this section of the report, the Applicant will ultimately own the project and, if successful, will compile an Economic Development Plan which will be compliant with REI4P requirements and will inter alia set out to achieve the following:** • **Create a local community trust or similar (as required by REI4P) which has an equity share in the project life to benefit historically disadvantaged communities;** • **Initiate a skills development and training strategy to facilitate future**

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Question	**Response**
	employment from the local community; and • **Give preference to local suppliers for the construction of the facility.** • **Support local community upliftment projects and entrepreneurship through socio-economic and enterprise development initiatives.**
2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	**A Heritage Impact Assessment was undertaken as part of the assessment for this project. The overall findings of the HIA is that the impact to heritage resources will be low (negative) significance.**
2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	**This facility is proposed in REDZ 7. Several solar facilities (refer to Section D for an outline of the renewable energy project proposed in a 30 km radius) are proposed in the area, which lends itself potentially to a renewable energy development area.**
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	
2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix C.**
2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	
2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix C.**
2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic	

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Question	**Response**
impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	
2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	
2.13. What measures were taken to:	
2.13.1. ensure the participation of all interested and affected parties,	**The Public Participation Process (PPP) for the proposed Solar PV Facility that will be undertaken is included in the BA Report (Appendix D) and summarised in Section C. This BA Report will be released for a 30-day commenting period to all the relevant authorities and stakeholders. Various methods will be employed to notify potential Interested and Affected Parties (I&APs) of the proposed project, namely, through an advert, site notices on site and in Kenhardt and notification letters.** **The BA process has taken cognisance of all interests, needs and values espoused by all interested and affected parties. Opportunity for public participation will be provided to all I&APs throughout the BA process in terms of the 2014 EIA Regulations, as amended.**
2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	
2.13.3. ensure participation by vulnerable and disadvantaged persons,	
2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	
2.13.5. ensure openness and transparency, and access to information in terms of the process,	
2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary	

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Question	**Response**
knowledge,	
2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein was promoted.	
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	**Refer to the Socio-Economic impact assessment summarised in Section D and included in Appendix C.**
2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	**An EMPr has been developed to address health and safety concerns. An Environmental Control Officer will be appointed to monitor compliance.**
2.16. Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1. the number of temporary versus permanent jobs that will be created,	**Refer to the social impact assessment summarised in Section D and included in Appendix C.**
2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.16.3. the distance from where labourers will have to travel,	
2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits),	
2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
2.17. What measures were taken to ensure:	
2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment,	**Legislation, policies and guidelines, which could apply to impacts of the proposed project on the environment, have been considered. The scope and content of this BA Report has been informed by applicable integrated environmental management legislation and policies. This has been included in Section A of this BA Report.**
2.17.2. that actual or potential conflicts of interest between organs of state	**The Public Participation Process (PPP) for the proposed Solar PV Facility that will**

NEED	
Question	**Response**
were resolved through conflict resolution procedures?	**be undertaken is included in the BA Report (Appendix D) and summarised in Section C. This BA Report will be released for a 30-day commenting period to all the relevant authorities and stakeholders. Various methods will be employed to notify potential I&APs of the proposed project, namely, through an advert, site notices on site and in Kenhardt and notification letters.** **The BA process has taken cognisance of all interests, needs and values espoused by all interested and affected parties. Opportunity for public participation will be provided to all I&APs throughout the BA process in terms of the 2014 EIA Regulations, as amended.**
2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	**The outcomes of this BA process and the associated conditions of the EA (should it be received) will serve to address this question.**
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	**The proposed mitigation measures included in the EMPr and summarised in Section D of this report have been informed by the specialist studies undertaken and this includes a detailed assessment of the environment as well as the impacts associated with the proposed development. Solar energy facilities can be dismantled and completely removed from the site leased for the development and do not permanently prevent alternative land-uses on the same land parcel. Based on material and socio-economic terms, and measured to the value of the best alternative that is not chosen, the proposed project will result in positive opportunity costs.**
2.20. What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	**The EMPr of this proposed project must form part of the contractual agreement and be adhered to by both the contractors/workers and the applicant.**
2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-	**Refer to the Alternatives section included in Section A of this report (this section) for an outline of the selection and suitability of this activity.**

NEED	
Question	**Response**
economic considerations?	
2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	**Refer to Section D of this report for a summary of the cumulative impacts.**

SECTION B: DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section of the BA Report provides a broad overview of the affected environment for the proposed Kenhardt PV6 project and the surrounding region. The receiving environment is understood to include biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development.

This information is provided to identify the potential issues and impacts of the proposed project on the environment. The information presented within this chapter has been sourced from:

- Preliminary scoping input from the specialists that form part of the project team;
- Review of information available on the South African National Biodiversity Institute (SANBI) Biodiversity Geographical Information System (BGIS) and Agricultural Geo-Referenced Information System (AGIS); and
- !Kheis Local Municipality and ZF Mgcawu District Municipality IDPs and the Northern Cape PSDF.

It is important to note that this chapter intends to provide a broad overview and does not represent a detailed environmental study. Detailed descriptions of the preferred project site (Kenhardt PV6) focused on significant environmental aspects of this project are provided in the relevant specialist studies (Appendix C).

B.1 Background

The proposed PV project is situated on the remaining extent of Onder Rugzeer Farm 168 with a Power Corridor that traverses Portion 3 of the Farm Gemsbok Bult 120, the remainder of Boven Rugzeer 169 and Portion 4 of Onder Rugzeer Farm 168. The total farm property covers approximately 5552 ha in area and the preferred site will extend approximately 250 ha for Kenhardt PV6. If all three solar PV projects proceed, only 13.5 % of the total farm area will be developed on. The same area will be developed on if all three solar PV projects for Phase 1 of the Kenhardt PV projects will be developed. As previously noted, the site is located approximately 30 km north-east of Kenhardt, in the ZF Mgcawu District Municipality and the !Kheis Local Municipality in the Northern Cape Province. Figure B.1 provides a locality map of the proposed project area within a regional setting.

B.2 Preliminary Sensitivity Screening

Figure B.2 represents the regional setting of the proposed Kenhardt PV6 project in terms of the surrounding sensitive ecosystem features and sensitive geographical areas (as indicated in Listing Notice 3 of the 2014 EIA Regulations, as amended) in proximity to the site. Figure B.2 includes the Geographic Information System (GIS) information required by the DEFF solar energy projects.

Based on the preliminary sensitivity screening undertaken for the site, the proposed project area does not fall within any threatened ecosystems, National Protected Areas, National Protected Area Expansion Strategy (NPAES) Focus Areas or areas of conservation planning. The closest protected area is approximately 113 km away from the proposed project site. This information has been confirmed in the Ecological Impact Assessment (Appendix C). An Ecological Support Area (i.e. a buffer around the Hartbees River) is located approximately 14 km west of proposed project as part of the Namakwa District Biodiversity Sector Plan. There is no conservation plan for the !Kheis Local Municipality and the ZF Mgcawu District Municipality, hence Critical Biodiversity Areas are not present or defined. In terms of the National Biodiversity Assessment (NBA) (2011), rivers are classified into critically endangered, endangered, vulnerable and least threatened. Figure B.2 shows the rivers that flow through the remaining extent of Onder Rugzeer Farm 168. These rivers

are “Rugseers”, “Rooiput se Leegte” and Wolfkop se Loop”. However, these rivers are classed as not/least threatened. Refer to the Ecological Impact Assessment (Appendix C) for additional details regarding terrestrial and aquatic ecological sensitive features.

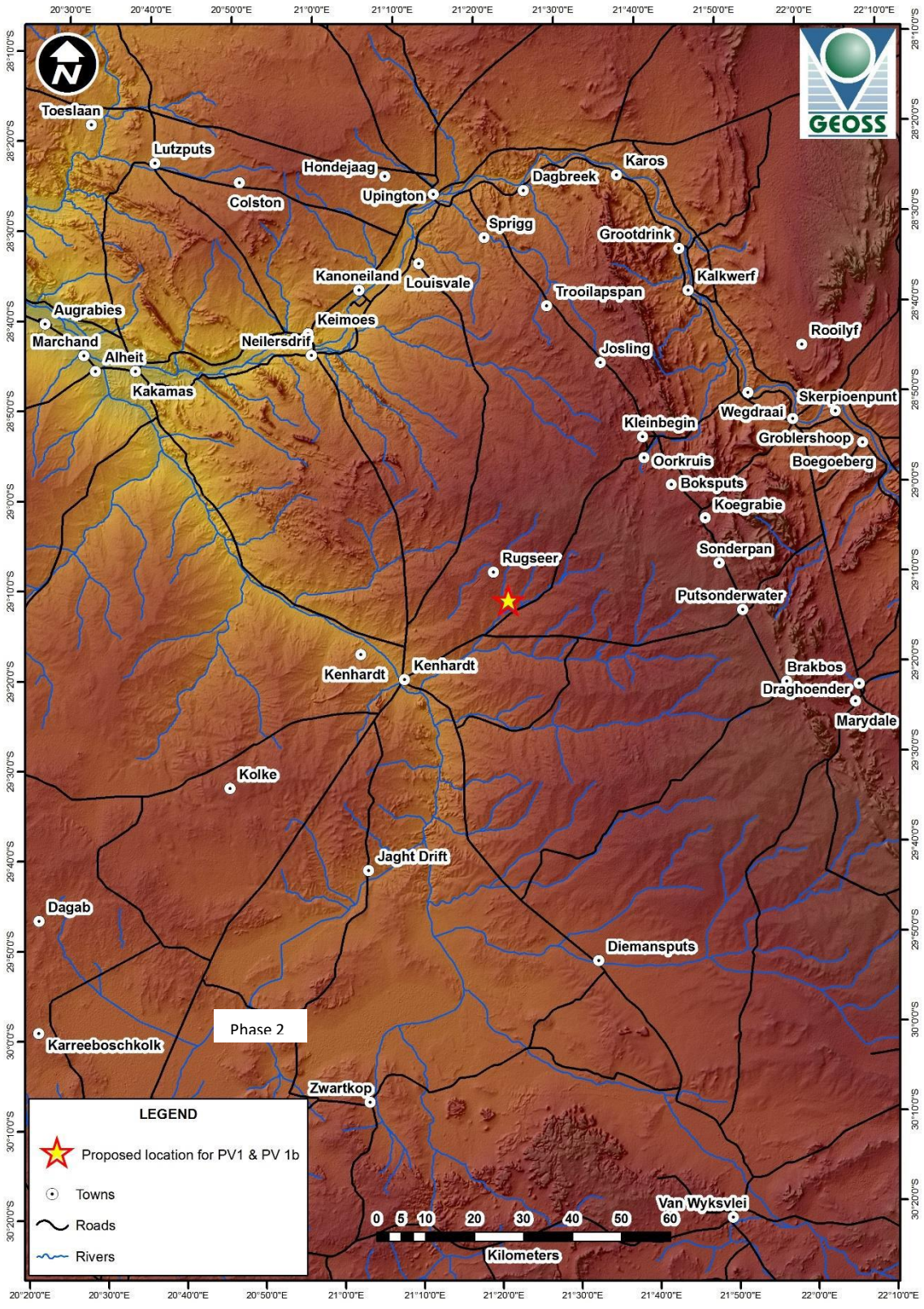


Figure B.1. Locality Map for Kenhardt PV6 within a regional setting

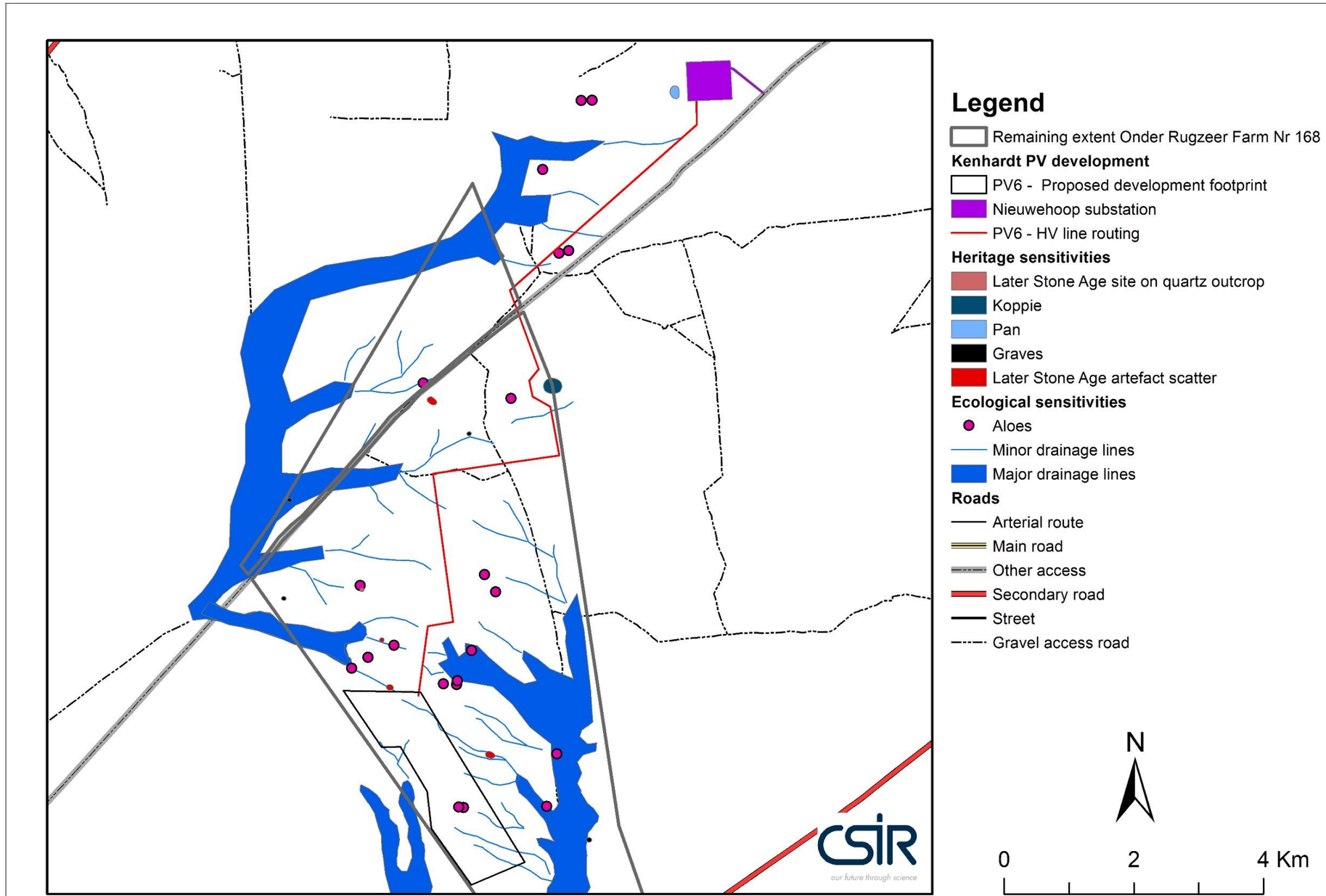


Figure B.2. Sensitivity Map for the proposed Kenhardt PV6 project (including the electrical corridor)

B.3 Biophysical Environment

B.3.1 Climatic Conditions

The mean annual rainfall of South Africa is shown in Figure B.3 below. The climate of the Northern Cape is semi-arid with a late summer-autumn rainfall regime. Average rainfall of the area varies from 50 mm to 400 mm per year. Evaporation levels within this province exceed the annual rainfall. Climate conditions are extreme (i.e. very cold in winter and extremely hot in summer).

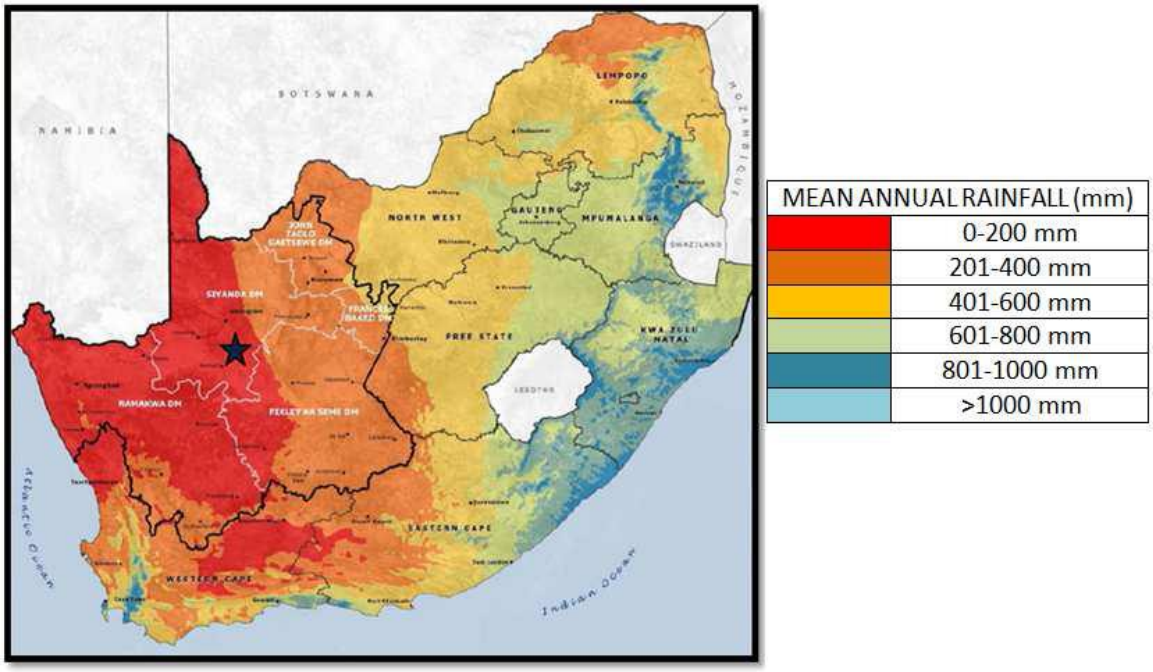


Figure B.3. Mean Annual Rainfall Levels of South Africa (Source: Northern Cape PSDF, 2012)

The Kenhardt area (in which the proposed projects fall) has a very low rainfall level, 183 mm per annum, with a standard deviation of 71 mm, according to the South African Rain Atlas (Water Research Commission, undated)[3]. The average monthly distribution of rainfall is shown in Table B.1.

Table B.1: Average Monthly Rainfall (mm) for the Kenhardt area (Water Research Commission, undated)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
25	33	38	24	11	5	3	4	5	8	11	16	183

Most rainfall in Kenhardt occurs mainly during autumn. Figure B.4 (a) shows the average rainfall values for Kenhardt per month. It typically receives the lowest rainfall (0mm) in June and the highest (23mm) in March (GEOSS, 2015).

[3] Data available online at: http://134.76.173.220/rainfall/index.html

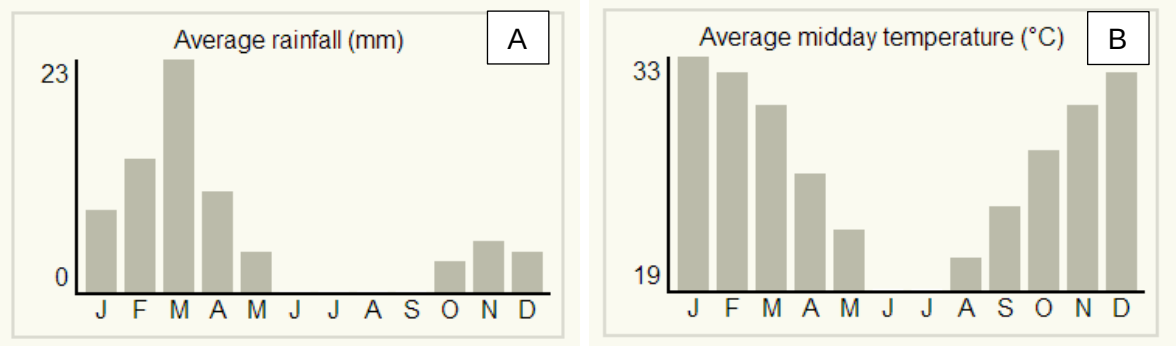


Figure B.4. Rainfall and b) Average Midday Temperature for Kenhardt (www.saexplorer.co.za in GEOSS, 2015)

The monthly distribution of rainfall and evaporation for the remaining extent of Onder Rugzeer Farm 168 is shown in Figure B.5. Since the area receives most of its rainfall during autumn it has a semi-arid to arid climate (as noted above). The relevance of this information is that the rainfall occurs whilst temperatures are quite high still and associated evaporation rates will be high. This implies that groundwater recharge will be very low. Figure B.5 shows the long term monthly rainfall and evaporation distribution respectively (GEOSS, 2015).

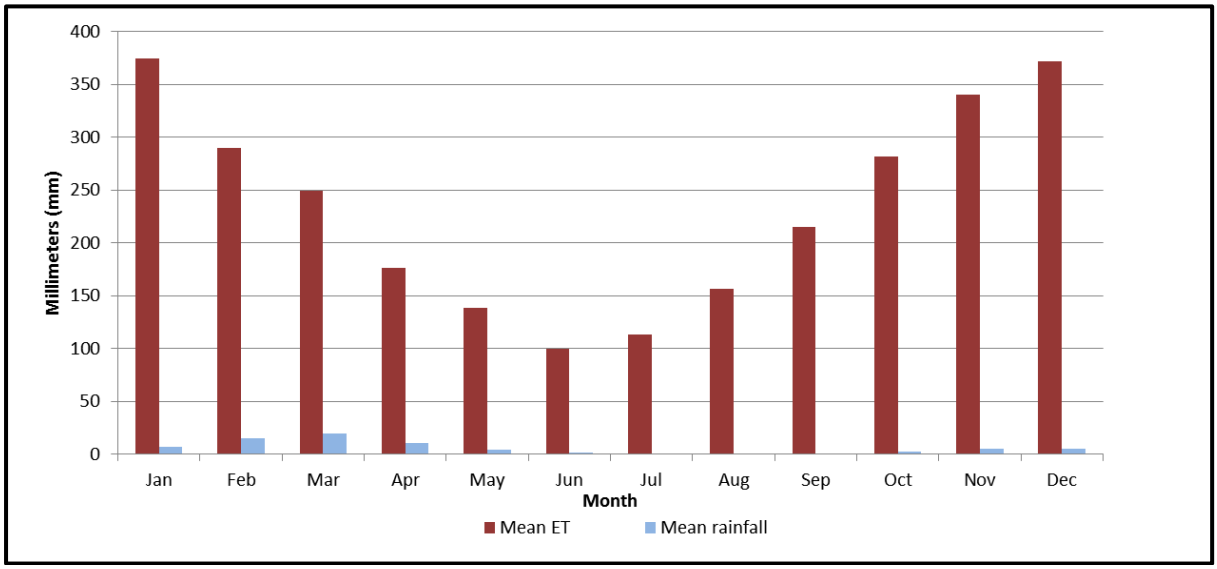


Figure B.5. Long Term Average Rainfall and Evaporation (Schulze et al., 2008 in GEOSS, 2015)

Figure B.6 shows the average monthly climatic chart for Kenhardt[4]. As shown in Figure B.6, the highest temperatures are reached in the summer months (December to January) and the lowest in the winter months (June to August). The average temperature of the area is 19.6°C, with an annual average high temperature of 28°C and an annual average low temperature of 11°C. The monthly distribution of average daily maximum temperatures (Figure B.4 (b)) shows that the average midday temperatures for Upington range from 19°C in June to 33°C in January (GEOSS, 2015).

The average daily solar radiation levels in South Africa range between 4.5 and 6.5 kilowatt-hour per square meter (kWh/m^2). In South Africa the measured solar radiation is the highest in the Northern Cape, North West Province and the Free State. As shown in Figure B.4, the site was selected because of the high solar radiation levels of the area (2300 kWh/m^2 per annum or 6.3 kWh/m^2 per day).

[4] Data available online at: http://www.climatedata.eu

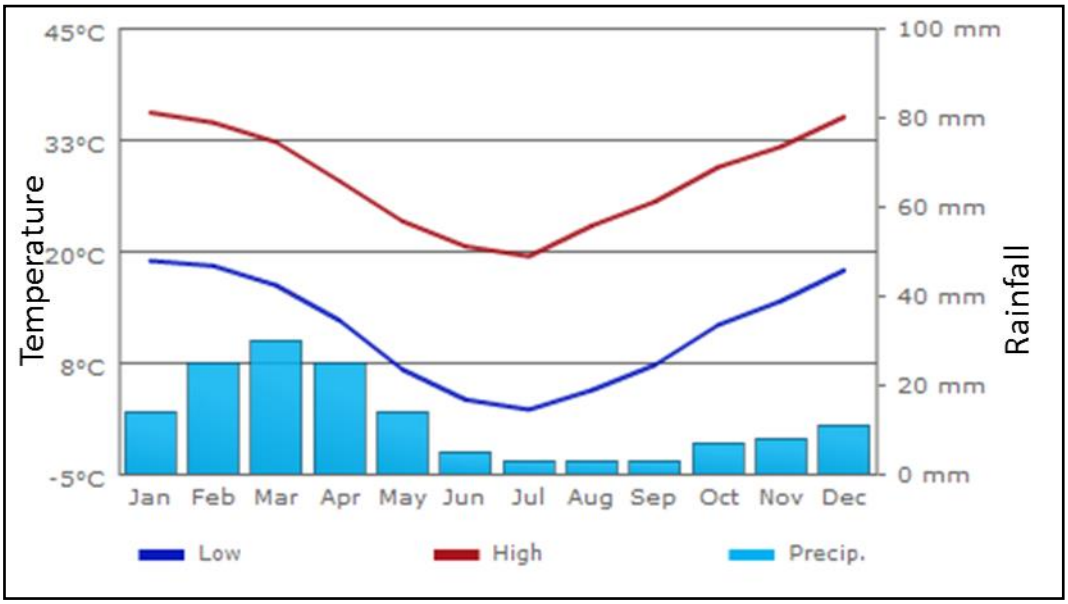


Figure B.6. Climate chart for Kenhardt showing the monthly maximum and minimum temperatures (lines) and the average rainfall (bars) (Source: Climatedata)

One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. Moisture availability is classified into 6 categories across the country (as shown in Table B.2). The proposed development site falls within class 6 which is described as a very severe limitation to agriculture (Lanz, 2015).

Table B.2: The classification of moisture availability climate classes for summer rainfall areas across South Africa (Agricultural Research Council, Undated)

Climate class	Moisture availability (Rainfall/0.25 PET)	Description of agricultural limitation
C1	>34	None to slight
C2	27-34	Slight
C3	19-26	Moderate
C4	12-18	Moderate to severe
C5	6-12	Severe
C6	<6	Very severe

The specialist studies included in Appendix C provide additional details regarding the climatic conditions on site.

B.3.2 Topography and Landscape

The topography of the region is flat with gentle, open undulations (West-East elevations ranging between 936 m and 1000 m, and North-South elevations ranging between 895 m and 1018 m (Holland, 2015). The underlying geology of the sites belongs to the Vyfbeker Metamorphic Suite and represents supracrustal rocks (sediments which have undergone several episodes of metamorphism and deformation) of the Kakamas Terrane (Johnson, Anhaeusser, and Thomas 2006). Erosion resistant rocks of this suite form distinctive low rocky hills that are often visible in the distance, although none occur in the study area. Vegetation consists of low shrubs and grassland with occasional quiver trees (kokerboom), and produces a mottled background to most views which is

effective at making some development types such as power lines and pylons blend in with the background (Holland, 2015).

Furthermore, the proposed development site lies across a low ridge that effectively bisects the area into two watersheds (SDP, 2019). Some shallow depressions are also evident arising from the variable sandy ridges that overlie the sandstone - dolerite geology of the area (SDP, 2019). Slopes across the site are almost entirely less than 2% with slightly steeper relief in some isolated spots (Lanz, 2015).

The Kenhardt landscape is arid with brown sand occurring widely being occasionally interspersed with black boulders. Because of the lack of trees in the area, a large number of weaver birds make use of the telegraph poles along the road to build their community nests (GEOSS, 2015).

Detailed descriptions of the topography and landscape of the Kenhardt PV6 site and surrounding regions are provided in the Ecological Impact Assessment, Visual Impact Assessment, and Heritage Impact Assessment (Appendix C).

B.3.3 Regional Geology

The Geological Survey of South Africa (now the Council for Geoscience) has mapped the area at 1:250 000 scale (2920 - Kenhardt). The main geology of the area is listed in Table B.3. The formations occurring within the study area are indicated in bold (and shaded) in Table B.3 (GEOSS, 2015).

Table B.3: Geological Formations within the Study Area

Symbol	Name	Group	Description
Qg	**Gordina Formation**	**Kalahari**	**Wind-blown dunes**
Mks	**Klip koppies granite**	**Keimoes suite**	**Grey, fine to medium grained porphyritic granite**
Mb	Brussel granite		Grey, fine to medium grained porphyritic granite
Me	Elsie se goria granite		Grey, medium grained granite, well-foliated.
Mva	Valsvei	Biesje poort	Yellow weathered, medium grained quarzitic gneiss with lenses of calc-silcate politic gneiss
Msa	Sandputs		Grey to brown, fine grained weather calc-bearing quartzite
Mja	**Jacomyns pan**	**Jacomyns pan**	**Pelitic gneisses with quartzite, leuco-gneiss, amphibolite and calc-silcate rocks.**
Mke	Kenhardt migmatiet	Metamorphic suite	Migmatitic biotite gneiss, amphibolite, leucogneiss and porphyroblastic biotite.

The oldest rocks in the area comprise of metamorphic gneisses (altered granite) which belong to the Jacomyns Pan Formation (Mja). The Jacomyns Pan Formation is also part of the Jacomyns Pan Group. These rocks mainly occur in the northern and central portion of the study area and are presumed to be bedrock. The stream channels are filled with alluvial material (Slabbert *et al*, 1999).

Two structural features are indicated as faults on the map sheet trend in a north-west to south-east direction. The structural features intersect the study area for Kenhardt PV6 on the south-west border (GEOSS, 2015).

A detailed description of the geology of the region is provided in the Palaeontological Impact Assessment (Appendix C).

B.3.4 Soil Types and Soil Potential

All the information on soils and agricultural potential in this chapter has been obtained from the online AGIS, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated). A detailed description of the soil types and soil potential within the region is provided in the Soils and Agricultural Potential Assessment (Appendix C).

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The general area of Onder Rugzeer Farm 168 is located on two land types, Ag6 in the north and the very similar Ag2 in the south. As noted in the Soils and Agricultural Potential Assessment, the preferred project site is located on land type Ag6 only. These land types comprise predominantly shallow, red, sands to loamy sands on underlying rock, hard-pan carbonate, or hard-pan dorbank. The soils fall into the arid Silicic, Calcic, and Lithic soil groups according to the classification of Fey (2010). A summary detailing soil data for the land type is provided in the Soils and Agricultural Potential Assessment. As noted in the Soils and Agricultural Potential Assessment, the land has a low to moderate water erosion hazard, mainly due to the low slope, but it is susceptible to wind erosion because of the sandy texture of the soil (Lanz, 2019).

B.3.5 Agricultural Capability and Sensitivity

A detailed description of the agricultural capability and sensitivity within the region is provided in the Soils and Agricultural Potential Assessment (Appendix C).

As noted in the Soils and Agricultural Potential Assessment, land capability is the combination of soil suitability and climate factors; and terrain suitability factors for supporting rainfed agricultural production. The area has a land capability classification, on the 8 category scale, of Class 7 - non-arable, low potential grazing land. The limitations to agriculture are aridity and lack of access to water plus the shallow soil depth and rockiness. Because of these constraints, agricultural land use is restricted to low intensity grazing only. The natural grazing capacity is low, at mostly 31-40 hectares per animal unit (Lanz, 2019).

In terms of agricultural sensitivity, the farm is located within a sheep farming agricultural region and there is no cultivation on the farm. Agricultural potential is uniformly low across the farm. No agriculturally sensitive areas occur within the site.

B.3.6 Existing Groundwater Data

A search was completed of the National Groundwater Archive database which provides data on borehole positions, groundwater chemistry and borehole yield for the study area. For Phase 1 of the project (i.e. Kenhardt PV1, 2 and 3) on the same farm portion as the proposed Phase 2 projects (i.e. Kenhardt PV6, 5 and 6), a 1 km search radius was used for the Kenhardt PV 1 around the boundaries. The National Groundwater Archive database indicated no boreholes within the 1 km search radius (GEOSS, 2015).

In November 2014, GEOSS conducted a hydrocensus on the adjacent farm Boven Rugzeer Remaining Extent of 169 and during the field hydrocensus the locations of the 10 boreholes were identified within the farm portion and three were found within the Transnet servitude (GEOSS, 2015).

The hydrocensus boreholes were found to be dry or to have very low yields (GEOSS, 2014). Relevant information regarding borehole yields, borehole and groundwater depths and groundwater quality was also obtained from the land owner. It has been reported that borehole depths are typically between 60 – 120 m deep and fractures occur within the highly metamorphic rocks between two zones of 15 – 30 m and 100 – 120 m below ground level (GEOSS, 2015).

A summary of hydrocensus boreholes and their field chemistry can be found in Table B.4.

The hydrocensus revealed that the potential for groundwater use within the area is very limited and of poor quality and saline. The total dissolved solids within the study area range from 1 200 – 7 780 mg/L and salinity has a range of 840 – 4 700 mg/L. Groundwater is primarily used for livestock watering and domestic use to a limited extent.

Overall, the proposed site for this proposed solar PV project will have a minimal effect on the geohydrology of the area. The study area is located in a highly metamorphic geological setting. Metamorphic rocks rarely produce sufficient groundwater and are considered an effective barrier to groundwater flow. The poor potential for groundwater development is related to the low occurrence of fractured networks within the formations.

Table B.4: Hydrocencus Boreholes (11 – 13 November 2014 – for the Scatec Kenhardt PV 1 Phase 1 project)

Location	Latitude (WGS84)	Longitude (WGS84)	WL (mbch)	CH (m)	WL (mbgl)	pH	Temp. (°C)	ORP (mV)	EC (mS/m)	TDS (mg/L)	Salinity (mg/L)	Comment
HBH1	-29.2185	21.3701	19.506	0.37	19.136	7.32	17.3	-18	876	7 780	4 700	Low yield ~0.04 L/s
HBH2	-29.2048	21.39401	-	-	-	7.80	25	-	338	1 951	-	No access point for WL
HBH3	-29.1600	21.33626	43	0.3	42.7	-	-	-	-	-	-	Dry, water from seep
HBH4	-29.1226	21.37785	-	-	-	-	-	-	-	-	-	1.2 L/s Transnet BH
HBH5	-29.1233	21.37715	-	-	-	-	-	-	-	-	-	0.6 L/s Transnet BH
HBH6	-29.1498	21.37715	-	-	-	-	-	-	-	-	-	Dry
HBH7	-29.1498	21.31763	-	-	-	7.28	17.4	-17	563	4 320	2 960	0.08 L/s sampled from reservoir
HBH8	-29.1177	21.3320	-	-	-	7.16	17.5	-10	537	4 110	2 840	0.1 L/s, sampled from reservoir
HBH9	-29.1833	21.33219	-	-	-	7.29	17.6	-10	228	1 680	1 150	Low yield - windpump
HBH10	-29.1489	21.32297	-	-	-	-	-	-	-	-	-	Dry
HBH11	-29.1542	21.3288	-	-	-	-	-	-	-	-	-	Dry
HBH12	29.11688	21.3775	-	-	-	7.7	17.4	-43	168	1 200	840	0.13 L/s windpump no WL access
HBH13	-29.1441	21.35368	-	-	-	-	-	-	-	-	-	Dry

HBH = hydrocensus borehole
WL = water level — mbch = metres below collar height — mbgl = metres below ground level
CH = collar height — m = metres
Temp = temperature
ORP = oxygen reduction potential — mV = milliVolts
EC = electrical conductivity — mS/m = milliSiemens per metre
TDS = total dissolved solids — mg/L = millgrams per metre

B.3.7 Aquatic and Terrestrial Environment

The SANBI BGIS has been used to define the regional vegetation, water resources, faunal and avifaunal and anticipated ecological sensitivity of the study area. A literature review of existing reports, scientific studies, databases, reference works, guidelines and legislation relevant to the study area was conducted to establish the baseline ecological and vegetative condition of the site and associated environment. Details pertaining to the aquatic and terrestrial environment are provided in the Ecological Impact Assessment specialist study (Appendix C).

B.3.7.1 Aquatic Environment (Surface Water, Drainage, and Wetland Ecosystems)

The Northern Cape is divided into the following four Water Management Areas:

- Lower Orange;
- Upper Orange;
- Olifants/Doorn; and
- Lower Vaal.

The proposed development area falls within the Lower Orange Water Management Area. The Orange River system drains 47 % of South Africa's surface area and is the river supporting the most water uses, including agricultural, mining, industry and municipal.

The National Freshwater Ecosystems Protected Areas (NFEPA) project earmarked several important catchments (sub-quaternaries) based either on the presence of important biota (e.g. rare or endemic fish species) or the degree or lack thereof with regard to 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 Ecosystem Protection Areas (FEPAs). No FEPAs are located within the study area or immediately downstream of the study area (SDP, 2015).

Figure B.7 shows the surface water and drainage associated with the site and the FEPAs in the greater region. A number of surface water drainage features are associated with the development area and these major and minor drainage lines are described in the Ecological Impact Assessment.

Desktop research undertaken by Colloty (2014) for an adjacent proposed solar PV project indicates that the area falls within two quaternary catchments namely D53C and D53B of the Hartbees River. Several main stem rivers are found within these catchments. These tributaries include:

- Rugseers;
- Rooiput se Leegte;
- Nrougas se Loop; and
- Several unknown tributaries.

As shown in Figure B.2 above, three river systems flow through the remaining extent of the Onder Rugzeer Farm 168 (the project site), which include the Rugseers, Wolfkop se Loop and the Rooiput se Leegte (which is a tributary of the Rugseers river), which lead to the Hartbees River. Drainage consists mainly of dry or ephemeral water courses and the major water courses are tributaries of the Orange River. A description of the surface water features that fall within the Kenhardt PV6 project area is provided in detail in the Ecological Impact Assessment specialist study (Appendix C).

From an aquatic vegetation point of view, the general area is dominated by species associated with the Nama Karoo (Bushmanland Arid Grassland) vegetation ecosystem. These systems are thus usually devoid of any trees with strict riparian or wetland affiliations due to the largely ephemeral nature of the rivers/water courses within the region (Colloty, 2014).

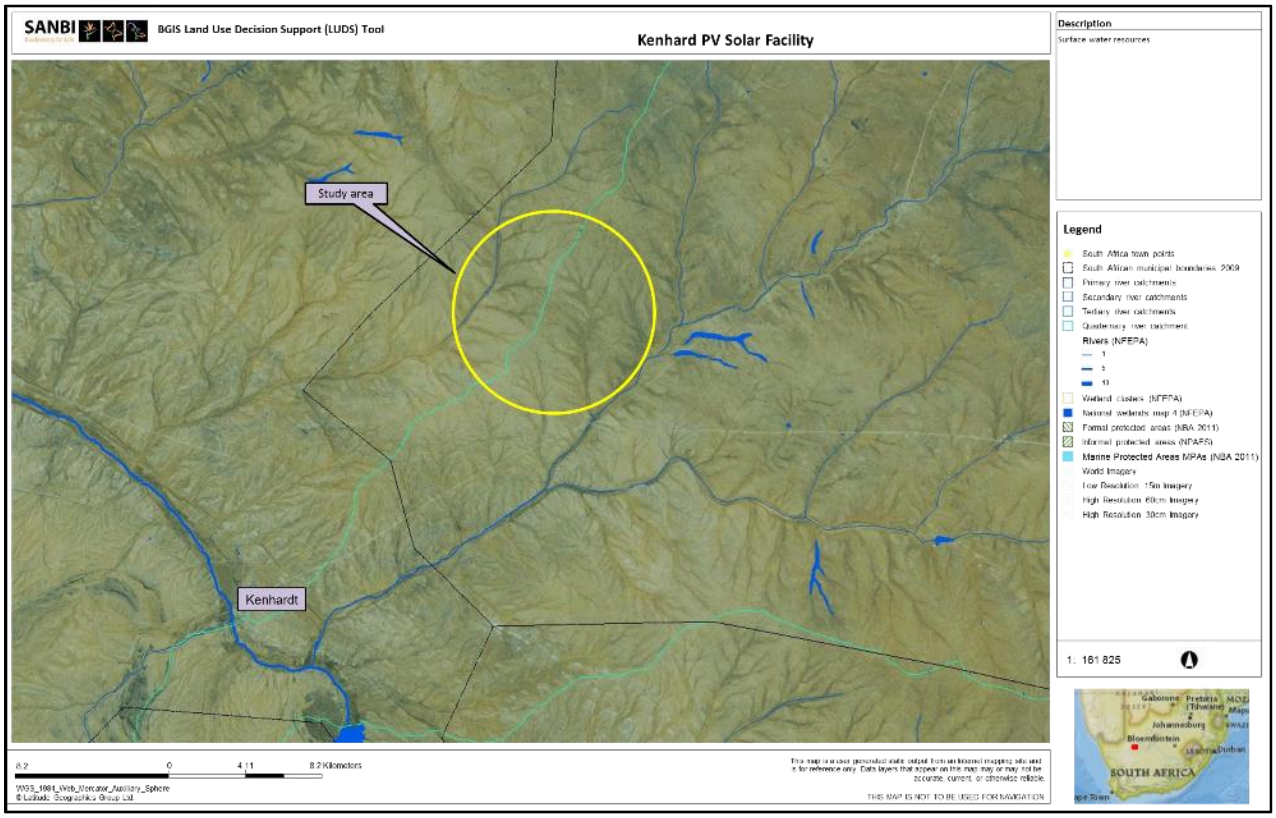


Figure B.7. Surface Water Drainage and Wetlands (DWA and SANBI, 2015)

B.3.8 Terrestrial Environment

B.3.8.1 General Vegetation Description

The study area is located in the Nama Karoo biome of South Africa. The site falls within the Bushmanland Arid Grassland (Nkb3) vegetation type (Mucina and Rutherford 2006). This vegetation unit is the second most extensive vegetation type in South Africa extending from around Aggeneys in the east to Prieska in the west. It is associated with freely draining alkaline soils common to this area. This vegetation form comprises, under a natural state, primarily of arid grassland dominated by *Aristrida spp* and *Stipagrostis spp* (SDP, 2019).

More than 99% of the original extent of the vegetation type is considered to be remaining intact and as a consequence, its' conservation status is classified as "least threatened" (i.e. this vegetation type is not listed as Threatened Ecosystems under the NEMBA). Mucina and Rutherford (2006) list 6 endemic species for this vegetation type, namely the succulent shrubs *Dinteranthus pole-evansii*, *Larryleachia dinteri*, *L marlothi*, *Ruschia kenhardtensis* and herbs *Lotononis oligocephala* and *Nemesia maxi*. A biogeographically important taxon is *Tridentea dwequensis* (SDP, 2019).

A detailed description of the terrestrial habitat and vegetation that fall within the Kenhardt PV6 project area is provided in the Ecological Impact Assessment specialist study (Appendix C).

B.3.8.2 Fauna

The fauna that can be expected in the study area (as determined from known distribution records and other studies) are presented in Table B.5.

Table B.5: List of Species likely to occur in the Study Area

Common Name	Species Name	Red Data List Category
Mammals		
Black-backed Jackal	*Canis mesomelas*	Least concern
Bat eared fox	*Otocyon megalotis*	Least concern
Namaqua Rock Mouse	*Aethomys namaquensis*	Least concern
Large spotted gennet	*Genetta tigrina*	Least concern
Amphibians		
Tremelo Sand Frog	*Tomopterna cryptotis*	Least Concern
Reptiles		
Verreaux's Tent Tortoise	*Psammobates tentorius*	Not listed
Southern Rock Agama	*Agama atra*	Least concern
Variegated Skink	*Trachylepis variegata*	Least concern

Very few signs of animal activities were noted during the surveys conducted by Envirolution Consulting in November 2013 for the updating of the Eskom Nieuwehoop Substation Construction and Operational Environmental Management Programme (COEMPr)[5]. Evidence was limited to small mammals such as Cape Ground Squirrel (*Xerus inauris*) and runways of the Striped mouse (*Rabdomys pumilio*). As shown in Table B.5 above, additional species are expected in the greater study area, which has been surveyed during the BA Phase. The Ecological Impact Assessment specialist study provides a detailed list of species or evidence of their presence observed on site (during the specialist site visit in 2019), as well as the species that are likely to be encountered on site.

B.3.8.3 Avifauna

According to the South African Bird Atlas Project (SABAP2), an average of 182 bird species has been recorded in the greater study area. The study area does not fall within or in close proximity to any Important Birds Areas (IBAs), with the closest being the Augrabies Falls National Park, located over 100 km to the north west of the study area. The Avifauna Specialist Study (Appendix C) provides a detailed report on avifauna species encountered during the site monitoring (2019).

B.3.9 Protected Areas

As noted in Section B.2 above, the site does not fall within any protected areas defined in the NPAES or South African National Parks (NBA). There are no formal protected areas within 20 km of the proposed site (SDP, 2015). The closest NPAESs are the Gariep NPAES, located 30 km to the south-east of the site and the Kamiesberg Bushmanland Augrabies NPAES located 43 km north-west of the site. The Augrabies Falls National Park is approximately 115 km north-west of the site.

B.3.10 Heritage Profile

B.3.10.1 Palaeontology

The study area for the proposed Kenhardt PV6 project, located on the Farm Onder Rugzeer 168, is situated within the semi-arid Bushmanland region between c. 950 to 900 m above mean sea level (amsl), with a general slope towards the south. It is drained by a dendritic network of shallow, southwest-flowing tributary streams of the Hartbeesrivier, such as the Rugseersrivier in the south and the Wolfkop se Loop in the north (Almond, 2019).

[5] Report sourced from: mp2mas17.eskom.co.za/tenderbulletin/File_Show.asp?ID=89791

The geology of the study area is shown on 1: 250 000 geology sheet 2920 Kenhardt (Council for Geoscience, Pretoria) (Figure B.8). The entire area is underlain at depth by a variety of Precambrian basement rocks (c. 2 billion years old) assigned to the Namaqua-Natal Province. These ancient igneous and high-grade metamorphic rocks (mainly granites and gneisses) crop out at surface as small patches and are entirely unfossiliferous. The Precambrian crustal rocks are transected by a NW-SE trending fault zone and lie to the north of the major Wolfkop Fault. A large proportion of the basement rocks are mantled by a range of superficial sediments of Late Caenozoic age, some of which are included within the Kalahari Group. These predominantly thin, unconsolidated deposits include small patches of calcretes (soil limestones), gravelly to sandy river alluvium, pan sediments along certain watercourses, surface gravels, colluvium (scree) as well as – especially – Quaternary to Recent aeolian (wind-blown) sands of the Gordonia Formation (Kalahari Group). Most of these younger rock units are of widespread occurrence and low palaeontological sensitivity. Scientifically important vertebrate fossil remains (e.g. Pleistocene mammalian bones and teeth) have been recorded within older stratified pan and river sediments in the Bushmanland region where they are often associated with stone artefacts, while a limited range of trace fossils (e.g. plant root casts, termitaria and other invertebrate burrows) may be found within calcrete horizons (Almond, 2019). The PV6 study area (Figure B.8, green) is underlain by Precambrian basement rocks of the Jacomyns Pan Group and the Keimoes Suite. The basement rocks are largely mantled by aeolian sands of the Gordonia Formation as well as Late Caenozoic alluvial deposits (Almond, 2019).

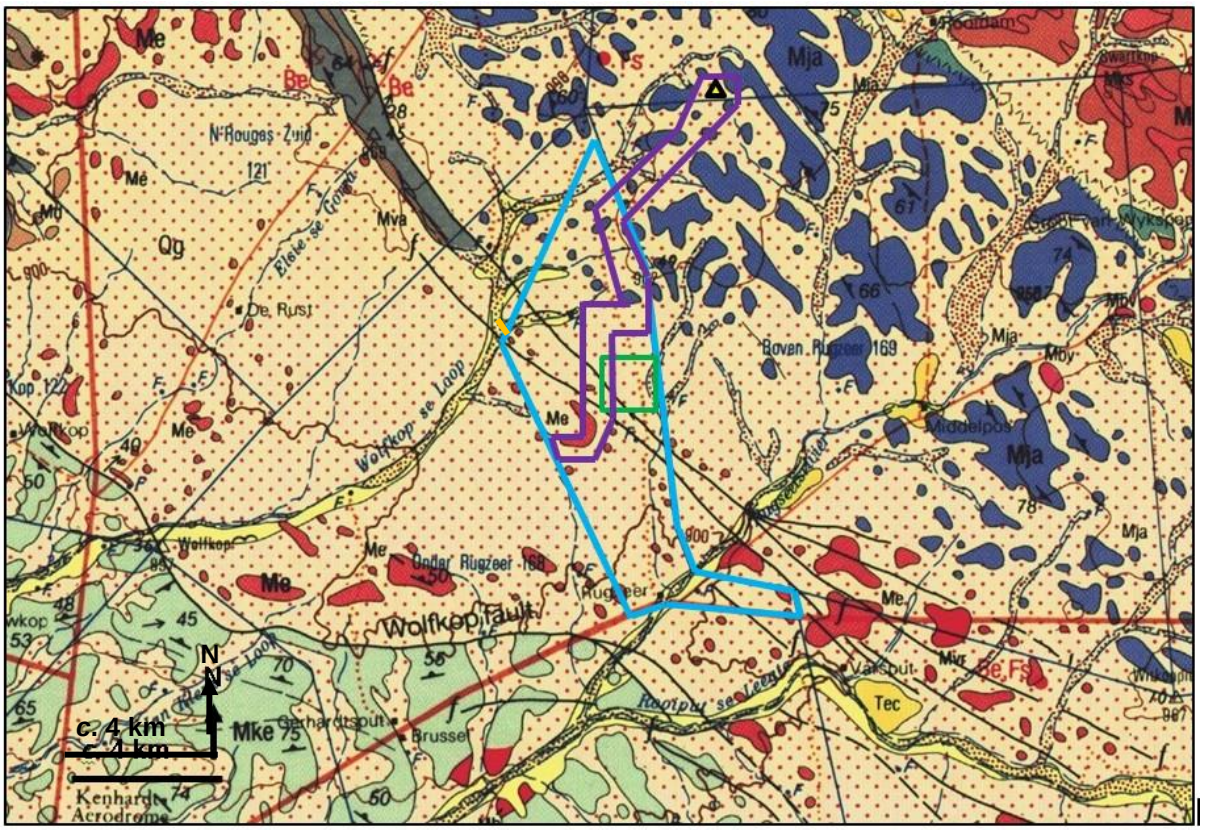


Figure B.8. Extract from 1: 250 000 scale geological map sheet 2920 Kenhardt (Council for Geoscience, Pretoria) showing the geology of the Phase 2 Scatec Solar PV Facility project area on the northern sector of Farm Onder Rugzeer 168 (pale blue polygon) situated *c.* 20 km to the NE of Kenhardt, Northern Cape. The PV6 study site is *approximately* indicated by the green polygon while the associated 132 kV power line corridor to the existing Eskom Nieuwehoop Substation (black triangle) is shown by the purple polygon (Almond 2019)

The main geological units represented within the broader study region include (Almond, 2019):

Precambrian Basement Rocks

- Keimoes Suite
  - Red (Me) = Elsie se Gorra Granite
- Korannaland Supergroup
  - Brown (Mva) = Valsvlei Formation, Biesje Poort Group
  - Grey (Msa) = Sandputs Formation, Biesje Poort Group
  - Blue (Mja) = Sandnoute Formation, Jacomyns Pan Group
- Vyfbeker Metamorphic Suite
  - Pale blue-green (Mke) = Kenhardt Migmatite

Late Caenozoic Superficial Sediments

- Pale yellow with sparse red stipple (Qg) = aeolian sands of the Gordonia Formation (Kalahari Group)
- Pale yellow with dense red stipple = alluvial and pan sediments
- Dark yellow (Tec) = calcrete

A detailed description of the palaeontological features within the study area, along with associated potential impacts of the proposed project, is included in the Palaeontological Impact Assessment (Appendix C).

B.3.10.2 Archaeology

Bushmanland is well known for the vast expanses of gravel that occur in places and which frequently contain stone artefacts in varying densities (Beaumont et. al 1995). Such material is referred to as 'background scatter' and is invariably of very limited significance. At times, however, the scatter can become very dense and mitigation work is occasionally called for. The artefacts located in these contexts largely date to the Pleistocene and originate in the Early Stone Age (ESA) and Middle Stone Age (MSA). They are not associated with any other archaeological materials, since these would have long since decomposed and disappeared. Previous experience immediately east of the present site suggests that such dense accumulations of artefacts are unlikely to occur in this area.

Of potentially more significance, however, are Later Stone Age (LSA) sites which are commonly located along the margins of water features in Bushmanland. These features include both pans and ephemeral drainage lines. Such sites were identified both on and to the east of the present study area in association with small pans and drainage lines, but more often the former (Orton 2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2016a, 2016b, 2016c, 2016d, 2016e, 2016f, 2016g, 2018a, 2018b, 2018c, 2018d). One highly significant pan site has been found in the vicinity of the study area, about 16 km northeast of the Nieuwehoop Substation (Orton 2018a). These sites typically contain mostly stone artefacts, but fragments of ostrich eggshell (used as water containers and also as a food source) and pottery are also found at times, while bone is rare and likely confined to sites that are very recent. Similar LSA sites can also be found in association with rocky outcrops. Orton (2016c) documented a suite of LSA/historical sites along a section of river bank some 11.5 km south of the Nieuwehoop Substation. These appeared to be contact period sites and one of them included a rusted pen knife handle with the portrait and name of Paul Kruger on it. This may indicate that a Boer commando had camped there. Morris (2009), on the other hand, noted that a search along the banks of the Hartbees River close to Kenhardt, where he expected elevated frequencies of archaeological material, revealed virtually nothing.

Another kind of archaeological site fairly commonly encountered in Bushmanland is small rock outcrops that have been quarried as a source of stone material for making stone tools. Such occurrences have frequently been recorded in the area.

Rock engravings are known from the broader area (Louw Roux Bushmanland 2013). From the limited information available, these appear to be naturalistic images produced by the Bushmen. Geometric

images, produced by the Khoekhoen, are not well known from the area (Orton 2013), although David Morris (pers. comm. 2015) has seen examples in the region. Painted art is also very rare but again, examples are known with one being a short distance east of the present study area (Orton 2016f) and another along the Sak River near Kenhardt (Orton, personal observation 2017). Both are of geometric images.

Historical resources tend to be rarer than Stone Age ones. Orton (2018d) located an old farmstead that is now purely archaeological in nature having been raised to the ground. It is the only such site known from the area and included an ash midden with many glass and ceramic artefacts. Isolated fragments of glass and ceramics are occasionally seen in the wider area.

B.3.10.3 Cultural and Natural Landscape (i.e. Visual Baseline)

The cultural landscape is rather weakly developed and relates to the keeping of small stock in the region. The landscape is characterised by wide open space with occasional fence lines, farm tracks and wind pumps and is rather more natural than cultural in nature. In the vicinity of the study area it is compromised by the presence of the railway line and substation. The site is located well away from the R27 which may be considered a scenic route. Nevertheless, the landscape is considered to be a heritage resource.

B.3.11 Socio-Economic Environment

It must be noted that documented data on the study area, particularly in terms of area specific (i.e. Kenhardt and surrounds) socio-economic data, is very limited. Accordingly, the available data is interpreted in terms of professional opinion and generally accepted trends within the study area and South Africa.

Additional detail regarding the Socio-Economic environment is provided in the Social Impact Assessment (Appendix C)

B.3.11.1 Demographic Profile

According to the Kai !Garib IDP (2015/17) and the Stats SA 2011 Census data, the total population of the Kai !Garib municipal area is 65 869; of which 6 679 resides in the Kenhardt area. A total of 16 703 households resides in the Kai !Garib Local Municipality, with 34.6% of households being female headed. The total female population dominates the total male population by 8.5% (Kai !Garib IDP, 2015/17). Small households (1 to 2 members) constitute 48.4% of the households in the Kai !Garib Local Municipality, while large households (>5 members) only constitute 14.8% (Municipal Capacity Assessment, 2018). The average household size in the Kai !Garib Local Municipality is 2.9 members per household. Notably, the percentage of small households in the Kai !Garib Local Municipality is higher than both the municipal average and national average (Figure B.9).

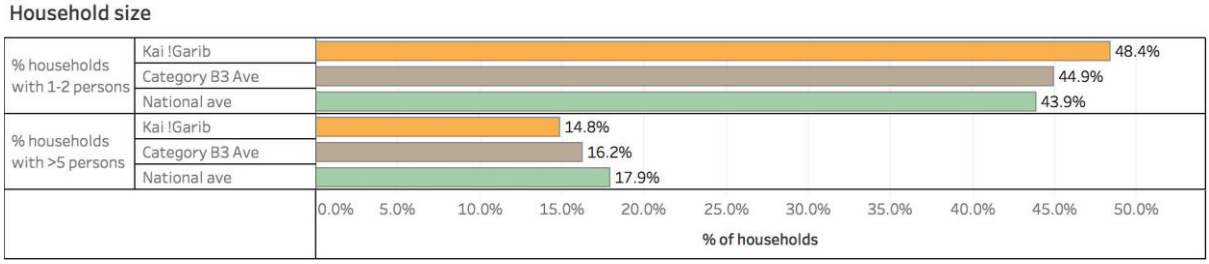


Figure B.9. Household size within the Kai! Garib Local Munucipality (Source: Municipal Capacity Assessment, 2018)

Population of the working age demographic (15 to 65 years) makes-up 70.5% of the population, whereas those below 15 years of age comprises 24.4% of the population; the + 65 years age group makes-up 5.1% of the population. According to the 2011 StatsSA census data, the dependency ratio (the economically active population vs the non-economically active population) within the Kai! Garieb Local municipality is 41.9%. However, the Municipal Demarcation Board's 2018 Municipal Assessment places the official dependency ration at 48.3% (Municipal Capacity Assessment, 2018). Figure B.10 provides an indication of the age structure of the Kai! Garib Local Municipality as compared to the Category B3 municipal average and national average respectively.

Figure B.10. Age breakdown of the Kai! GArib Local Municipality (Source: Municipal Capacity Assessment, 2018)

B.3.11.2 Economic Profile

The official unemployment rate of 10% has decreased by 6.1% since the 2011 Census measurement of 16.1% (Kai !Garib IDP, 2015/17). The economic sector is dominated by agriculture, hunting and forestry which provides 72% of jobs within the Kai! Garib Local Municipality; while electricity, gas and water (the sector relevant to the proposed development) only contribute 0.2% to total employment in the area (Figure B.11).

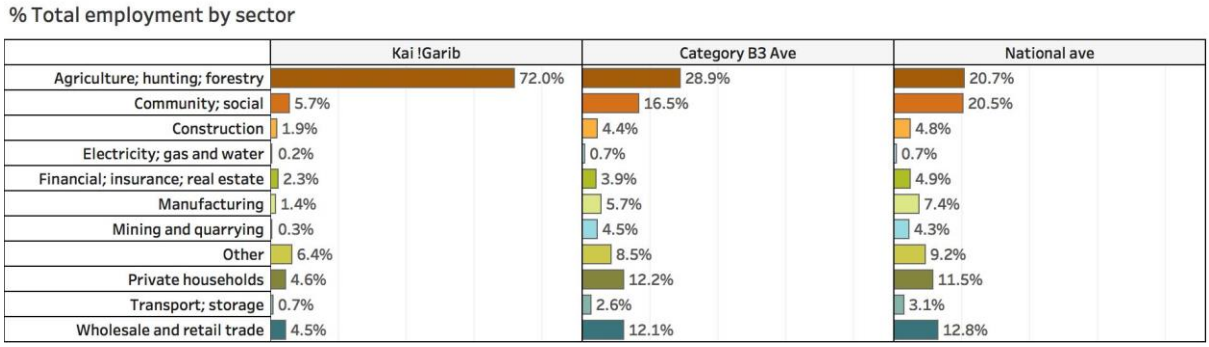


Figure B.11. Total employment per sector within the Kai! Garib Local Municipality (Source: Municipal Capacity Assessment, 2018)

In terms of dependency ratio (48.3%) and GINI coefficient (0.548), the Kai! Garib Local Municipality scores above average both in terms of the Category B3 municipal average and in terms of the national average (Municipal Capacity Assessment, 2018) (Figure B.12). This implies that the Kai! Garib Local Municipality has a lower dependency ratio, and is less unequal than the national average.

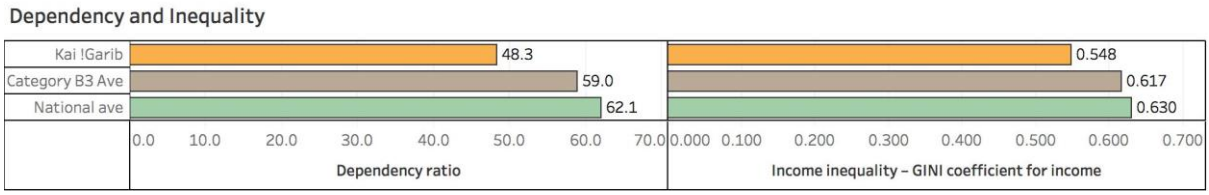


Figure B.12. Dependency and inequality within the Kai! Garib Local Municipality

B.3.11.3 Education

The Kai! Garib Local Municipality has a below average number of educational facilities, when compared with other level B3 municipalities and the national average. The Kai! Garib Local Municipality has 3.6 primary schools per 10 000 population, but only 1.1 high schools per 10 000 population; which is 2.2% less than the national average (Municipal Capacity Assessment, 2018).

The matric pass rate within the Kai! Garib Local Municipality is slightly higher than the national average at 75.2%; while the local youth school enrolment is 14.7% lower than the national average at 74.9%. Furthermore, the local levels of education reveal that people with primary education (8.7%) and some secondary education (39.5%) is higher than the respective national averages; while those with secondary education (15.6%) are less than the national average (Municipal Capacity Assessment, 2018) (Figure B.13).

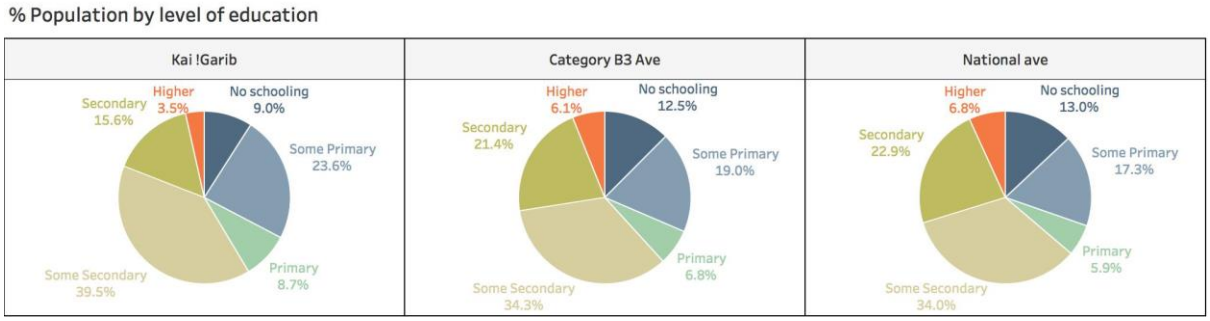


Figure B.13. Percentage of population by level of education within the Kai! Garib Local Municipality (Source: Municipal Capacity Assessment, 2018)

B.3.11.4 Basic Services

Households in the Kai! Garib Local Municipality has above average access basic services, such as electricity, potable water, flush toilets and refuse removal. Within these categories, the Kai! Garib Local Municipality performs above both the national average for and the average for category B3 municipalities (Municipal Capacity Assessment, 2018) (Figure B.14). There is a pressing need for low cost housing in the Kai! Garib Local Municipality, and the 2015/17 IDP reports an alarming increase in informal settlement growth (Kai! Garib IDP, 2015/17). According to 2011 Census data, 88.4% of the local population live in formal housing, with 43.1% living in informal structures (StatsSA, 2011). In the town of Kenhardt in particular, the current housing backlog is 250 houses (Kai! Garib IDP, 2015/17).

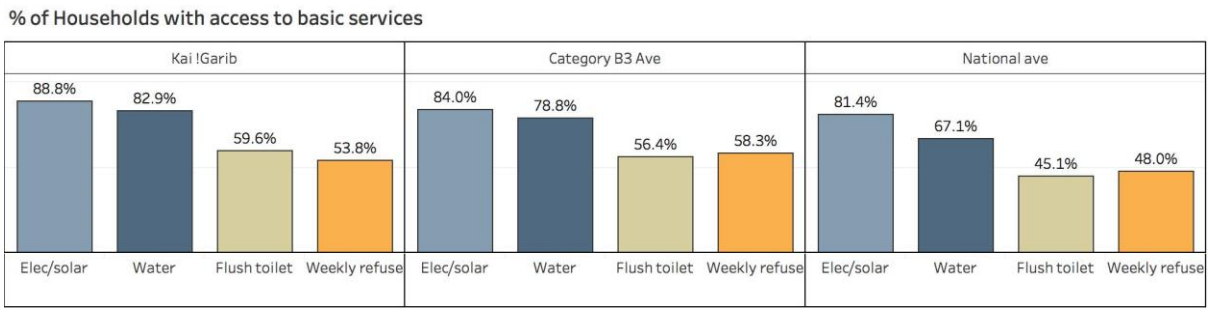


Figure B.14. Percentage of households with access to basic services within the Kai! Garib Local Municipality (Source: Municipal Capacity Assessment, 2018)

SECTION C: PUBLIC PARTICIPATION

C.1 Introduction to the Public Participation Process

This section provides an overview of the tasks undertaken during the BA, with a particular emphasis on providing a clear record of the Public Participation Process (PPP) to be followed. An integrated PPP will be undertaken for the BA Processes (i.e. Kenhardt PV6, Kenhardt PV5, and Kenhardt PV6). Separate BA Reports have been compiled for each project and these are being made available for Interested and Affected Parties (I&AP) and authority review in an integrated manner. The integrated PPP for the proposed projects entails that all public participation documents (such as newspaper advertisements, site notices, notification letters, emails etc.) will serve to notify I&APs, Stakeholders and Organs of State of the joint availability of all reports for the abovementioned projects and will provide I&APs with an opportunity to comment on the reports. This approach is being undertaken due to the close proximity of the sites (i.e. the proposed projects will take place within the same geographical area) and that proposed projects entail the same activity (i.e. generation of energy using a renewable source (i.e. Solar PV), and distribution of electricity via power lines).

The PPP for these BA Processes is driven by a stakeholder engagement process that includes inputs from authorities, I&APs, technical specialists and the project proponent. Guideline 4 on "Public Participation in support of the EIA Regulations" published by the former Department of Environmental Affairs and Tourism (DEFFT) in May 2006, states that public participation is one of the most important aspects of the EA Process. This stems from the requirement that people have a right to be informed about potential decisions that may affect them and that they must be afforded an opportunity to influence those decisions. Effective public participation also improves the ability of the Competent Authority (CA) to make informed decisions and results in improved decision-making as the view of all parties are considered.

An effective PPP could therefore result in stakeholders working together to produce better decisions than if they had worked independently. The DEFFT guideline states the following in terms of PPP:

- "Provides an opportunity for I&APs, EAPs and the CA to obtain clear, accurate and understandable information about the environmental impacts of the proposed activity or implications of a decision;
    - Provides I&APs with an opportunity to voice their support, concern and question regarding the project, application or decision;
    - Enables an applicant to incorporate the needs, preferences and values of affected parties into its application;
    - Provides opportunities for clearing up misunderstanding about technical issues, resolving disputes and reconciling conflicting interests;
    - Is an important aspect of securing transparency and accountability in decision-making; and
    - Contributes toward maintaining a health, vibrant democracy."

To the above, one can add the following universally recognised principles for public participation:

- Inclusive consultation that enables all sectors of society to participate in the consultation and assessment processes;
- Provision of accurate and easily accessible information in a language that is clear and sufficiently non-technical for I&APs to understand, and that is sufficient to enable meaningful participation;
- Active empowerment of grassroots people to understand concepts and information with a view to active and meaningful participation;
- Use of a variety of methods for information dissemination in order to improve accessibility, for example, by way of discussion documents, meetings, workshops, focus group discussions, and the printed and broadcast media;
- Affording I&APs sufficient time to study material, to exchange information, and to make contributions at various stages during the assessment process;
- Provision of opportunities for I&APs to provide their inputs via a range of methods, for example, via briefing sessions, public meetings, written submissions or direct contact with members of the BA team.
- Public participation is a process and vehicle to provide sufficient and accessible information to I&APs in an objective manner to assist I&APs to identify issues of concern, to identify alternatives, to suggest opportunities to reduce potentially negative or enhance potentially positive impacts, and to verify that issues and/or inputs have been captured and addressed during the assessment process.

At the outset it is important to highlight two key aspects of public participation:

- There are practical and financial limitations to the involvement of all individuals within a PPP. Hence, public participation aims to generate issues that are representative of societal sectors, not each individual. Hence, the PPP will be designed to be inclusive of a broad range of sectors relevant to the proposed project.
- The PPP will aim to raise a diversity of perspectives and will not be designed to force consensus amongst I&APs. Indeed, diversity of opinion rather than consensus building is likely to enrich ultimate decision-making. Therefore, where possible, the PPP will aim to obtain an indication of trade-offs that all stakeholders (i.e. I&APs, technical specialists, the authorities and the development proponent) are willing to accept with regard to the ecological sustainability, social equity and economic growth associated with the project.

The key steps in the PPP for the BAs are described below. This approach is structured in line with the requirements of Chapter 6 (PPP) of the 2014 NEMA EIA Regulations (as amended, i.e. GN R326).

The BA Processes commenced in November 2019, whereby the specialist studies were commissioned and the BA Reports were compiled. The BA Reports are currently being released to I&APs, Stakeholders and Organs of State (including the National DEFF) for a 30-day comment period. The Applications for EA are to be submitted to the National DEFF at the same time as the BA Reports.

C.2 Landowner written consent

Regulation 39 (1) of the 2014 NEMA EIA Regulations (as amended) states that "*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*".

Regulation 39 (2) of the 2014 NEMA EIA Regulations (as amended) further states that "*sub-regulation (1) does not apply in respect of: (a) linear activities; (b) activities constituting, or activities directly related to prospecting or exploration of a mineral and petroleum resource or extraction and primary processing of a mineral or petroleum resource; and (c) strategic integrated projects as contemplated in the Infrastructure Development Act, 2014*".

The proposed solar PV and onsite substation component of the Kenhardt PV6, Kenhardt PV5 and Kenhardt PV6 projects constitute a non-linear activity, and landowner consent is therefore required for the following land portions:

Project	Affected Farm Portion(s)
Kenhardt PV4	Remaining Extent of Onder Rugzeer Farm 168
Kenhardt PV5	
Kenhardt PV6	

Written consent has been obtained from the landowner of the above farm portion (i.e. the van Niekerk Trust), on which the non-linear infrastructure is proposed to be located. The written consent has been included as an appendix to the Application for EA, which will be submitted to the DEFF for consideration, together with the BA Reports for comment. The proposed access road, power lines and associated infrastructure are constituted as linear developments; hence written consent is not legally required in terms of Regulation 39 of the 2014 NEMA EIA Regulations (as amended).

C.3 Advertisement and Site Notice Board

Newspaper Advertisement:

Regulation 41 (2) (c) of the 2014 NEMA EIA Regulations (as amended) requires the placement of a newspaper advertisement in one local newspaper. In line with this, in order to notify and inform the public of the proposed projects, to invite I&APs to register on the project database, as well as to inform I&APs of the release of the BA Reports for comment, the BA Processes have been arranged to be advertised in one local newspaper at the commencement of the 30-day comment period for the BA Reports. Specifically, the advertisements have been arranged to be placed in the Gemsbok newspaper (in both English and Afrikaans). The newspaper advertisement also provides the details of the project website (i.e. https://www.csir.co.za/environmental-impact-assessment), where information available on the project could be downloaded from.

Proof of placement of the newspaper advertisements will be included in Appendix D of the finalised BA Report.

Site Notice Board:

Regulation 41 (2) (a) of the 2014 NEMA EIA Regulations (as amended) requires that a notice board providing information on the project and BA Process is fixed at a place that is conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of the site where the application will be undertaken or any alternative site. To this end, notice boards were placed at the entrance of Onder Rugzeer Farm 168 and at the Local Municipality Offices in Kenhardt.

A copy of the notice boards is included in Appendix D of this BA Report. Proof of placement of the notice boards will be included in the finalised BA Report.

C.4 Determination of Appropriate Measures

Refer to the section below which provides a detailed outline of the measures taken to include all potential I&APs, stakeholders and Organs of State during the BA Process (as required by Regulations 41 (2) (e), 41 (6) and 41 (2) (b) of GN R326, in terms of the 2014 NEMA EIA Regulations (as amended)).

In terms of Regulation 41 (2) (e) of GN R326, at this stage of the assessment process no persons have been identified as desiring but unable to participate in the process. Therefore, no alternative methods have been agreed to by the competent authority.

In line with Regulation 41 (2) (b) of GN R326 and prior to the commencement of the BA Process (and advertising the EA Process in the local print media), an initial database of I&APs (including key stakeholders and Organs of State) was developed for the combined BA Processes. This was supplemented with input from the EAP and the Project Applicant. Appendix D of this BA Report contains a detailed copy of the I&AP database which indicates interaction with I&APs, key stakeholders and all I&APs that have been added to the project database. In line with Regulation 41 (2) (b) of the 2014 NEMA EIA Regulations, the database includes the details of the following:

- Landowners of the affected farm portions;
- Landowners of the neighbouring adjacent farm portions;
- The municipal councillor of the ward in which the proposed projects will be undertaken;
- The municipality which has jurisdiction in the area (i.e.!Kheis Local Municipality and ZF Magau District Municipality);
- Relevant Organs of State that have jurisdiction in respect of any aspect of the activity; and
- Any other party as required by the competent authority.

The above stakeholders, Organs of State and I&APs will accordingly receive written notification of the commencement of the BA Processes and release of the BA Reports for comment.

While I&APs have been encouraged to register their interest in the project from the start of the process, following the public announcements, the identification and registration of I&APs is ongoing for the duration of the study. Stakeholders from a variety of sectors, geographical locations and/or interest groups are expected to show an interest in the proposed project, for example:

- Provincial and Local Government Departments;
- Local interest groups, for example, Councillors and Rate Payers associations;
- Surrounding landowners;
- Farmer Organisations;
- Environmental Groups and NGOs; and
- Grassroots communities and structures.

As per Regulation 42 of the GN 326, in terms of the electronic database, I&AP details will be captured and automatically updated as and when information is distributed to or received from I&APs. This ongoing record of communication is an important component of the PPP. It must be noted that while not required by the regulations, those I&APs proactively identified at the outset of the BA Process will remain on the project database throughout the process and will be kept informed of all opportunities to comment and will only be removed from the database by request.

C.5 Approach to the PPP

In terms of Regulation 41 (6) of GN R326 the section below outlines the PPP for this assessment in order to provide potential I&APs, Stakeholders and Organs of State access to information on the project and the opportunity to comment at the various stages of the assessment process. It should be noted that no deviations from the PPP have been requested.

C.5.1 BA Report Phase – Review of the BA Report

As noted above, the BA Reports for each Kenhardt PV project are currently being released to I&APs, Stakeholders and Organs of State for review. The section below summarises the PPP for the review of the BA Reports.

- **Database Development and Maintenance**: In line with Regulation 41 (2) (b) of GN R326, an initial database of potential I&APs was developed for the BA Process, and will be updated throughout the process. Refer to Section C (4) for additional information.

- **Site Notice Board**: As noted in Section C (3) above, notice boards were placed for the proposed projects. A copy of the notice boards is included in Appendix D of this BA Report.

- **Letter 1 to I&APs**: Written notification of the availability of the BA Reports will be sent to all I&APs and Organs of State included on the project database via Letter 1 sent through email and postage (where email addresses are not available). The letter will be written in English, and will include notification of the 30-day comment period for the BA Reports. Proof of email, as well as copies of the Letter 1 and emails sent will be included in Appendix D of the finalised BA Report (which will be submitted to the DEFF for decision-making).

- **Advertisements to Register Interest:** An advertisement will be placed in Die Gemsbok for the release of the BA Reports for comment. A copy of this advertisement will be included in Appendix D of the finalised BA Report.

- **30-day Comment Period**: As noted above, potential I&APs, including authorities and Organs of State, are to be notified via Letter 1, of the 30-day comment and registration period within which to submit comments on the BA Reports and/or to register on the I&AP database.

- **Availability of Information:** The BA Reports will be made available and distributed to ensure access to information on the project and to communicate the outcome of specialist studies. Copies of the reports will be placed at the Kenhardt local library for I&APs and Stakeholders to access for viewing. Key authorities will be provided with a hard copy and/or electronic (USB) copy of the report of the BA Reports via courier. Proof of courier (i.e. waybills) will be included in Appendix D of the finalised BA Report. The BA Reports will also be uploaded to the project website (i.e. https://www.csir.co.za/environmental-impact-assessment) and telephonic consultations will take place, as necessary.

- **Comments Received**: A key component of the BA Process is documenting and responding to the comments received from I&APs and the authorities. Copies of all comments received during the review of the BA Reports will be included in Appendix D of the finalised BA Report and in the Comments and Response Report.

C.5.2 Compilation of finalised BA Reports for Submission to the DEFF

- Following the 30-day commenting period of the BA Reports and incorporation of the comments received into the reports, the finalised BA Reports (i.e. hard copies and electronic

copies) will be submitted to the DEFF in line with Regulation 19 (1) (a) of the 2014 NEMA EIA Regulations (as amended). In line with best practice, I&APs on the project database will be notified via email (where email addresses are available) of the submission of the finalised BA Reports to the DEFF for decision-making.

- The BA Reports that are submitted for decision-making will include proof of the PPP that will be undertaken to inform Organs of State, Stakeholders and I&APs of the availability of the BA Reports for the 30 day review (as explained above). To ensure ongoing access to information, copies of the finalised BA Reports that will be submitted for decision-making and the Comments and Response Report (detailing comments received during the BA Phase and responses thereto) will be placed on the project website (i.e. https://www.csir.co.za/environmental-impact-assessment).
- The DEFF will have 57 days (from receipt of the finalised BA Reports) to either grant or refuse EA (in line with Regulation 20 (1) of the 2014 NEMA EIA Regulations (as amended)).

C.5.3 Environmental Decision-Making

- **Environmental Decision-Making and Appeal Period** - Subsequent to the decision-making phase, if an EA is granted by the DEFF for the proposed projects, all registered I&APs, Organs of State and stakeholders on the project database will receive notification of the issuing of the EA and the appeal period. The 2014 NEMA EIA Regulations (as amended) (i.e. Regulation 4 (1)) states that after the Competent Authority has a reached a decision, it must inform the Applicant of the decision, in writing, within 5 days of such decision. Regulation 4 (2) of the 2014 NEMA EIA Regulations (as amended) stipulates that I&APs need to be informed of the EA and associated appeal period within 14 days of the date of the decision. All registered I&APs will be informed of the outcome of the EA and the appeal procedure and its respective timelines. The distribution of the EA (should such authorisation be granted by the DEFF), as well as the notification of the appeal period, will include a letter (i.e. Letter 2) to be sent via registered mail and email to all registered I&APs, Stakeholders and Organs of State (where postal, physical and email addresses are available) on the database. The letter will include information on the appeal period, as well as details regarding where to obtain a copy of the EA. A copy of the EA will be uploaded to the project website (i.e. https://www.csir.co.za/environmental-impact-assessment).

C.6 Issues raised by I&APs and comments and response report

Issues raised by I&APs during the release of the BA Reports will be captured in the finalised BA Reports, together with responses to the comments from the project team.

C.7 Consultation with the DEFF (CA)

Pre-application discussions and communications were held with the DEFF in December 2019 and January 2020 with regards to seeking their feedback on the specialist studies commissioned, as well as the approach to the BA Process in the REDZ and the assessment of cumulative impacts. The DEFF responded to the EAP on 7 January 2020 stating that based on the information contained with within the pre-application meeting request form, DEFF do not foresee the need for a pre application meeting and the EAP is welcome to proceed with the BA process. A copy of this correspondence is included in **Appendix D** of this BA Report.

SECTION D: IMPACT ASSESSMENT

This section includes a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning phase, in line with the requirements of the 2014 NEMA EIA Regulations (as amended).

D.1 Approach to the BA: Methodology of the Impact Assessment

The identification of potential impacts includes impacts that may occur during the construction, operational and decommissioning phases of the proposed development. The assessment of impacts includes direct, indirect as well as cumulative impacts. In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed projects is well understood so that the impacts associated with the projects can be assessed. The process of identification and assessment of impacts includes:

- Determining the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determining future changes to the environment that will occur if the activity does not proceed;
- Develop an understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

The impact assessment methodology has been aligned with the requirements for BA Reports as stipulated in Appendix 1 (3) (1) (j) of the 2014 NEMA EIA Regulations (as amended), which states the following:

"A BA 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 an assessment of each identified potentially significant impact and risk, including –

(i) cumulative impacts;
(ii) the nature, significance and consequences of the impact and risk;
(iii) the extent and duration of the impact and risk;
(iv) the probability of the impact and risk occurring;
(v) the degree to which the impact and risk can be reversed;
(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and
(vii) the degree to which the impact and risk can be mitigated".

As per the DEFFT Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect and cumulative:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

The cumulative impacts have been assessed by identifying other renewable energy project proposals and other applicable (and relevant) projects, such as construction and upgrade of electricity generation, and transmission or distribution infrastructure in the local area (i.e. within 30 km of the proposed solar PV facility). There are various renewable energy projects being investigated in the local area that are at different stages of planning, ranging from a project that has been awarded Preferred Bidder status approach, to projects where the EIAs/BAs are currently being conducted. The approach for this BA is that the assessment includes all renewable energy projects within 30 km that have received an EA at the time of starting this BA (i.e. by November 2019).

Table D.1. Proposed renewable energy projects that have received EA within 30 km of Solar PV facility according to the DEFF's database

DEFF REF NO	PROJECT TITLE	DATE APPLICATION RECIEVED	APPLICANT	LOCAL MUNICIPALITY	MW	EA STATUS
14/12/16/3/3/2/1072	THE 75 MW AMDA CHARLIE PV SEF NORTH OF KENHARDT WITHIN THE KAI !GARIB LM IN THE NORTHERN CAPE PROVINCE	2018/09/12	AMDA Charlie (Pty) Ltd	Kai !Garib Local Municipality	75	Approved
14/12/16/3/3/2/1073	THE 75 MW AMDA Alpha PV SEF NORTH OF KENHARDT WITHIN THE KAI !GARIB LM IN THE NORTHERN CAPE PROVINCE	2018/09/11	AMDA Charlie (Pty) Ltd	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/847	75mw Solar Photovoltaic Facility (Boven 4) on the remaining extent of Boven Rugzeer Farm 169, North East of Kenhardt in the Northern Cape Province	2015/10/18	Boven Solar PV6 (Pty) Ltd - Mulilo Renewable Project Developments	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/842	75MW solar energy facility (Gemsbok PV6) on Portion 3 of Gemsbok Bult farm 120 near Kenhardt within the Kheis Local Municipality in the	2015/10/28	Gemsbok Solar PV3 (Pty) Ltd - Mulilo Renewable Project	!Kheis Local Municipality	75	Approved

DEFF REF NO	PROJECT TITLE	DATE APPLICATION RECIEVED	APPLICANT	LOCAL MUNICIPALITY	MW	EA STATUS
	Northern cape province		Developments			
14/12/16/3/3/2/843	75MW solar energy facility (Gemsbok PV5) on Portion 8 of Gemsbok Bult farm 120 near Kenhardt within the Kheis Local Municipality in the Northern cape province	2015/10/28	Gemsbok Solar PV3 (Pty) Ltd - Mulilo Renewable Project Developments	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/1035	The 100MW Skeerhok 3 PV SEF north-east of Kenhardt within the Kheis Local Municipality, Northern Cape Province	2017/09/19	Juwi Renewable Energies (Pty) Ltd	!Kheis Local Municipality	100	Approved
14/12/16/3/3/2/710	Proposed construction of Gemsbok PV1 75MW in Kenhardt, Northern Cape	2014/05/01	Mulilo Renewable Project Developments	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/711	Proposed construction of Gemsbok PV2 75MW in Kenhardt, Northern Cape	2014/05/01	Mulilo Renewable Project Developments	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/712	Proposed construction of the Boven PV1 75MW in Kenhardt, Northern Cape	2014/05/01	Mulilo Renewable Project Developments	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/837	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 1) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.	2017/08/07	Scatec Solar	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/838	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 2) on the remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.	2017/08/07	Scatec Solar	!Kheis Local Municipality	75	Approved
14/12/16/3/3/2/836	Proposed development of a 75 MW Solar PV Facility (Kenhardt PV 3) on the	2017/08/07	Scatec Solar	!Kheis Local Municipality	75	Approved

DEFF REF NO	PROJECT TITLE	DATE APPLICATION RECIEVED	APPLICANT	LOCAL MUNICIPALITY	MW	EA STATUS
	remaining extent of Onder Rugzeer Farm 168, north-east of Kenhardt, Northern Cape.					
14/12/16/3/3/1/1546	Proposed development of a Transmission Line (i.e. Kenhardt PV 1 – Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 1) on the remaining extent of Onder Rugzeer Farm 168, and the remaining extent of Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	2017/09/22	Scatec Solar	!Kheis Local Municipality	EGI	Approved
14/12/16/3/3/1/1546	Proposed development of a Transmission Line (i.e. Kenhardt PV 2 – Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 2) on the remaining extent of Onder Rugzeer Farm 168, and the remaining extent of Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	2017/09/22	Scatec Solar	!Kheis Local Municipality	EGI	Approved
14/12/16/3/3/1/1545	Proposed development of a Transmission Line (i.e. Kenhardt PV 3 – Transmission Line to connect to the proposed 75 MW Solar PV Facility (Kenhardt PV 3) on the remaining extent of Onder Rugzeer Farm 168, and the remaining extent of Portion 3 of Gemsbok Bult Farm 120, north-east of Kenhardt, Northern Cape.	2017/09/22	Scatec Solar	!Kheis Local Municipality	EGI	Approved

In addition to the above, the impact assessment methodology includes the following aspects:

Nature of impact/risk - The type of effect that a proposed activity will have on the environment.

Status - Whether the impact/risk on the overall environment will be:

- Positive - environment overall will benefit from the impact/risk;
- Negative - environment overall will be adversely affected by the impact/risk; or
- Neutral - environment overall not be affected.

Spatial extent – The size of the area that will be affected by the impact/risk:

- Site specific;
- Local (<10 km from site);
- Regional (<100 km of site);
- National; or
- International (e.g. Greenhouse Gas emissions or migrant birds).

Duration – The timeframe during which the impact/risk will be experienced:

- Very short term (instantaneous);
- Short term (less than 1 year);
- Medium term (1 to 10 years);
- Long term (the impact will cease after the operational life of the activity (i.e. the impact or risk will occur for the project duration)); or
- Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning)).

Consequence – The anticipated consequence of the risk/impact:

- Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
- Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
- Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
- Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
- Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).

Reversibility of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):

- High reversibility of impacts (impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment);

- Moderate reversibility of impacts;
- Low reversibility of impacts; or
- Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).

Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):

- High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment);
- Moderate irreplaceability of resources;
- Low irreplaceability of resources; or
- Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

Using the criteria above, the impacts are further assessed in terms of the following:

Probability – The probability of the impact/risk occurring:

- Extremely unlikely (little to no chance of occurring);
- Very unlikely (<30% chance of occurring);
- Unlikely (30-50% chance of occurring)
- Likely (51 – 90% chance of occurring); or
- Very Likely (>90% chance of occurring regardless of prevention measures).

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure D.1). This approach incorporates internationally recognised methods from the Intergovernmental Panel on Climate Change (IPCC) (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity, to generate an integrated picture of the risks related to a specified activity in a given location, with and without mitigation. Risk is assessed for each significant stressor (e.g. physical disturbance), on each different type of receiving entity (e.g. the municipal capacity, a sensitive wetland), qualitatively (very low, low, moderate, high, and very high) against a predefined set of criteria (i.e. probability and consequence):

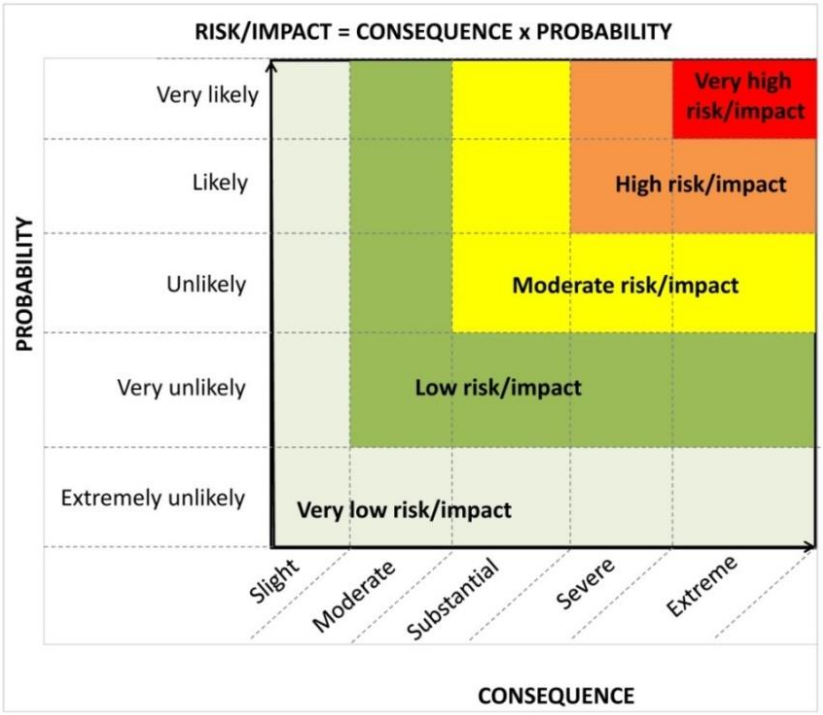


Figure D.1. Guide to assessing risk/impact significance as a result of consequence and probability.

Significance – Will the impact cause a notable alteration of the environment?

- Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
- Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
- Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);
- High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and
- Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

With the implementation of mitigation measures, the residual impacts/risks will be ranked as follows in terms of significance (based on Figure 35):

- Very low = 5;
- Low = 4;
- Moderate = 3;
- High = 2; and

- Very high = 1.

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- Low;
- Medium; or
- High.

Impacts have been collated into the EMPr (Appendix F of the BA Report) and these include the following:

- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements (as applicable). This includes a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness.
- Identifying negative impacts and prescribing mitigation measures to avoid or reduce negative impacts. Where no mitigatory measures are possible this is stated.
- Positive impacts and augmentation measures have been identified to potentially enhance positive impacts where possible.

Other aspects to be taken into consideration in the assessment of impact significance are:

- Impacts are evaluated for the construction and operational phases of the development. The assessment of impacts for the decommissioning phase is brief, as there is limited understanding at this stage of what this might entail. The relevant rehabilitation guidelines and legal requirements applicable at the time will need to be applied;
- Impacts have been evaluated with and without mitigation in order to determine the effectiveness of mitigation measures on reducing the significance of a particular impact;
- The impact evaluation has, where possible, taken into consideration the cumulative effects associated with this and other facilities/projects which are either developed or in the process of being developed in the local area; and
- The impact assessment attempts to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are used as a measure of the level of impact.

D.2 Assessment of environmental risks and impacts

The issues and impacts presented in this Section have been identified via the environmental *status quo* of the receiving environment (environmental, social and heritage features present on site - as discussed in Section B of this BA Report) and input from specialists that form part of the project team. The specialist studies undertaken to inform this BA has been summarised in this section. It should be noted that unless otherwise stated, impacts identified and their associated significance are deemed to be negative.

Please refer to Appendix C of this report for the full specialist studies undertaken (including the Terms of Reference for each study). All proposed mitigation measures have been carried over into the project's EMPr, included in Appendix F of this report.

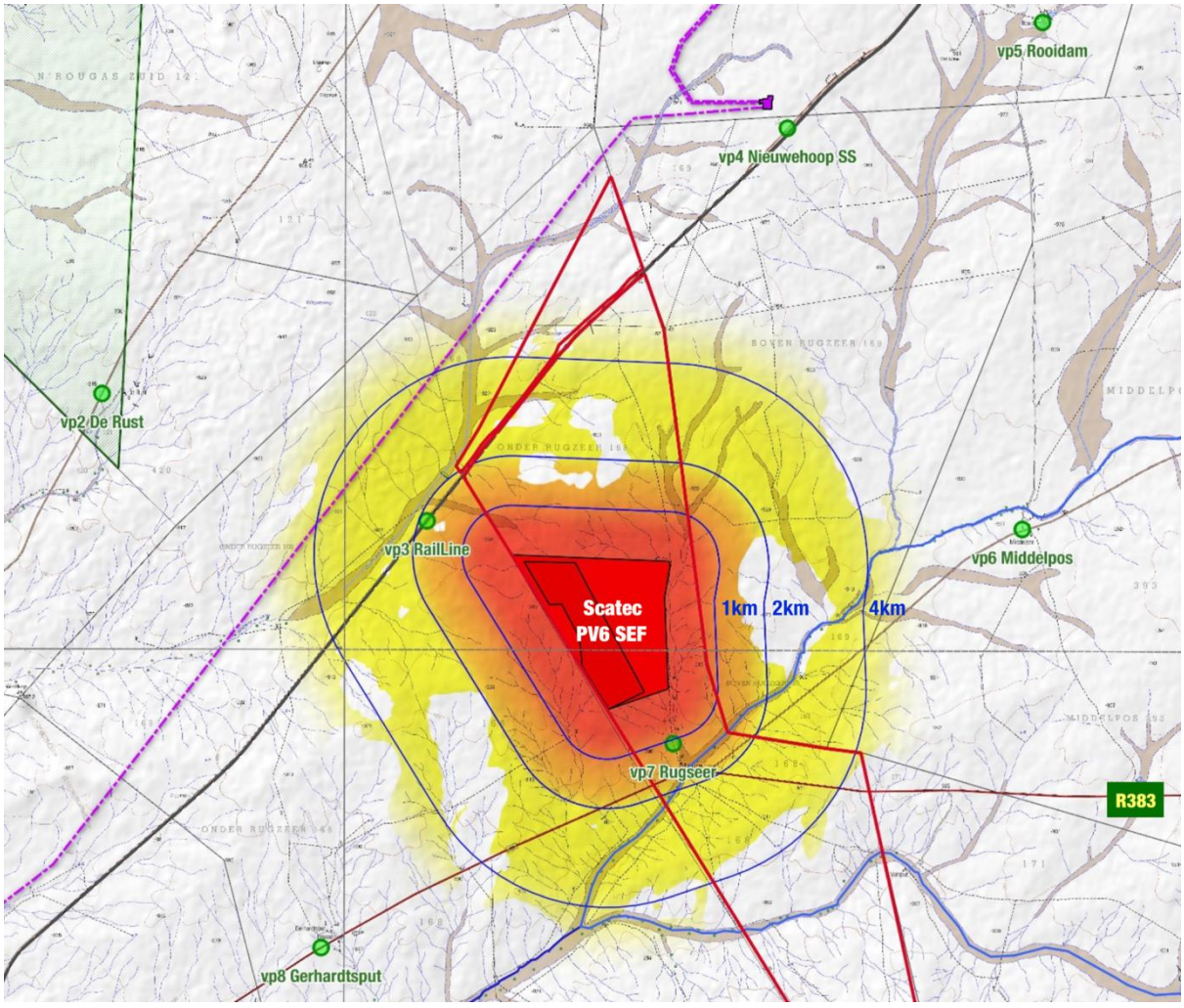
It is important to note that for PV6, **the specialists assessed a much larger area than what the project footprint entails,** in case there were sensitivities or engineering constraints that needed to be considered. The final footprint has been advised by the specialist studies and no sensitivities fall within this finalised footprint.

D.2.1 Visual[6]

D.2.1.1 Findings of the Visual Assessment

Given the relatively featureless nature of the study area, the only sensitive visual features are the drainage courses, neighbouring farmsteads, and game farms, which are some distance away. Heritage features, documented by other specialists, may have visual significance. Other local features in the landscape, such as the existing Eskom Nieuwehoop Substation, power lines and the Sishen-Saldanha railway line are visual intrusions that have already altered the landscape character of the area.

No-go areas and other levels of visual sensitivity in the defined study area are indicated on Figure D4 below. Visual sensitivity mapping at the broad regional scale for the Wind and Solar PV SEA (CSIR, 2015) indicated a 'Low' visual sensitivity for the study area.



[6] Lawson & Oberholzer, 2019

Figure D.2. Nominal Viewshed 10m High Arrays for PV6

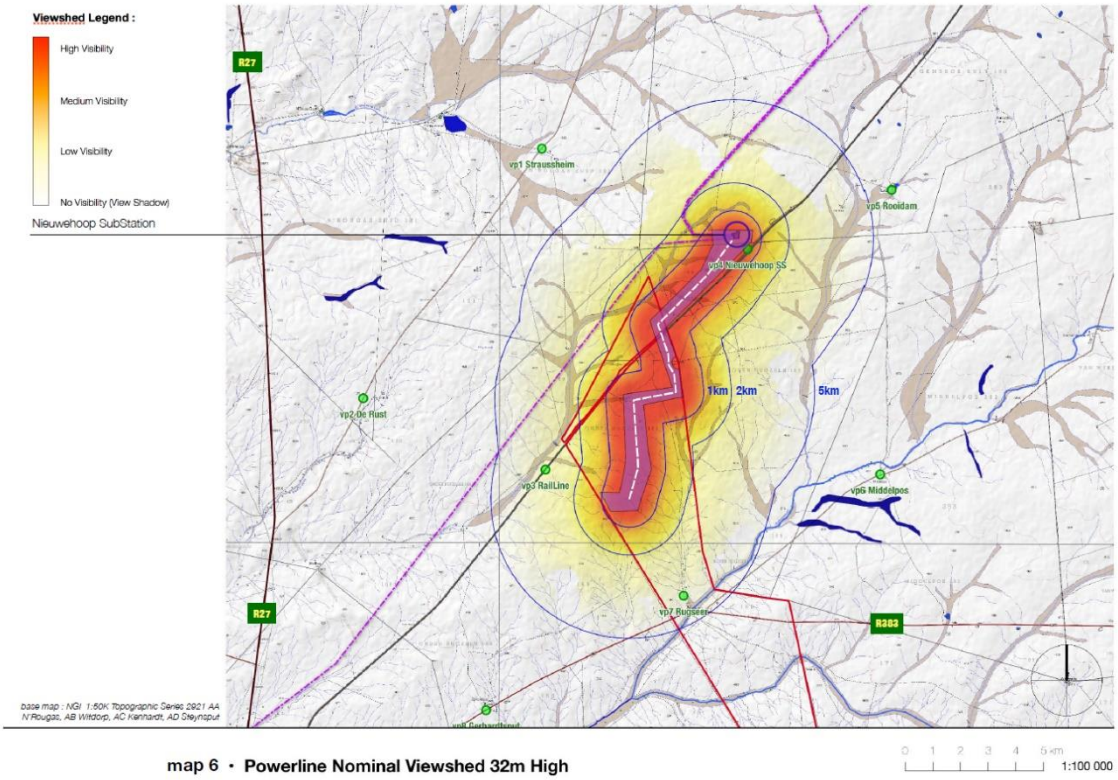


Figure D.3. Powerline Nominal Viewshed 32m high

The viewshed, or zone of visual influence, potentially extends for some distance to the south-east, but is more restricted to the north-west by the topography, where parts of the area are in a view shadow. The zone of visual influence of the proposed Solar Energy Facility (SEF) and powerline would therefore be fairly limited and would not extend beyond 10 km.

The cumulative visual impact significance of the Kenhardt PV6 project, seen together with the Kenhardt PV4 and PV5, as well as the other proposed and approved solar farms within 30 km radius, was considered to be moderate before the implementation of mitigation measures and low with mitigation. For the power line component, significance of cumulative impacts was rated as low both with and without mitigation. During the decommissioning phase, for both the power line and PV facility, the significance was rated as very low, assuming mitigation. The reasons for this are the remoteness of the subject area, the featureless nature of the landscape, and the fact that the solar farms are within a REDZ.

The 30 m monopoles for the connecting power line, that runs for a relatively short distance of about 10 km to the Nieuwehoop Substation, are smaller than those for the main Eskom power line that feeds Kenhardt, and therefore the cumulative visual impact was considered to be low during the operational phase and very low after decommissioning.

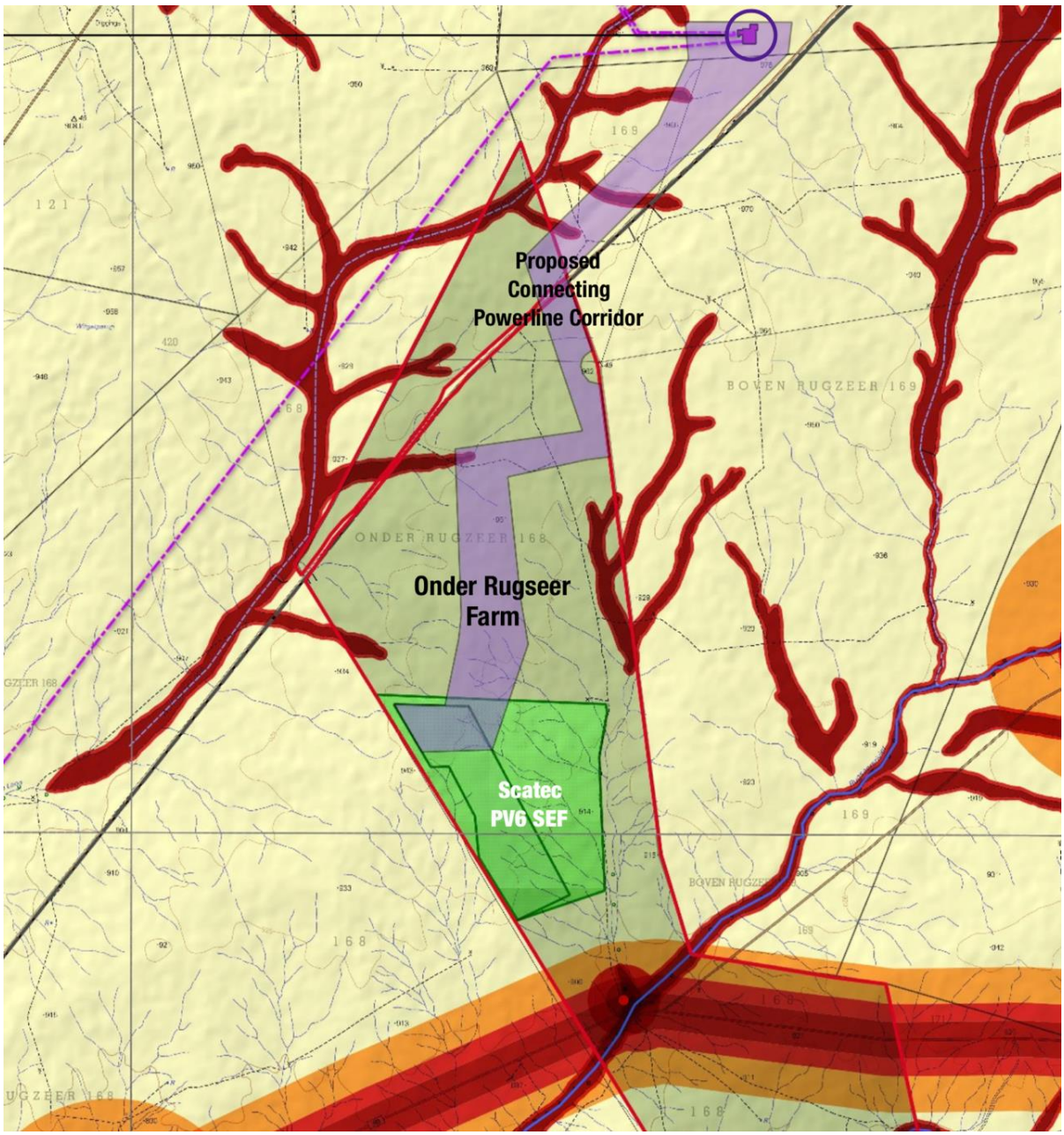


Figure D.4. Visual Sensitivity (*There are no visually sensitive features on the site. The R383 Route is about 1,7km away*).

D.2.1.2 Impact Assessment

The potential impacts identified during the visual assessment are listed below:

Construction Phase

- Potential effect of dust and noise from trucks and construction machinery during the construction period, and the effect of this on residents and visitors to the area, particularly users of the main arterial routes, (R27 and R383), to the site.
- Potential visual effect of haul roads, access roads and stockpiles on the exposed landscape.

Operational Phase

- Potential visual intrusion of solar arrays and related infrastructure and the impact on receptors, including residents and visitors, as well as game farms in the area.
- Potential visual impact of an industrial type activity on the rural or wilderness character of the area.

Decommissioning Phase

- Potential visual effect of any remaining structures, platforms and disused roads on the landscape.

D.2.1.3 Impact Assessment Summary

Impact Assessment Summary Table for the Construction Phase (SEF)

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Dust and noise from construction	Visual effect on rural character	Negative	Site	Short-term	Substantial	Very likely	High	Low	Implement management actions as per the EMPr	Moderate	Low	4	Medium
Visual intrusion of site works	Visual impact on residents and visitors	Negative	Site	Short-term	Substantial	Very likely	High	Low	Suitably locate the construction site camp	Moderate	Low	4	Medium

Impact Assessment Summary Table for the Operational Phase (SEF)

Operational Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Introduction of solar arrays and infrastructure in the landscape	Visual impact on receptors	Negative	Local	Long-term	Substantial	Very likely	High	Low	Locate substation and buildings in an unobtrusive area. Keep access roads narrow. Manage lighting and signage.	Moderate	Low	4	High
	Visual intrusion on rural landscape	Negative	Local	Long-term	Substantial	Very likely	High	Low		Moderate	Low	4	High

Impact Assessment Summary Table for the Decommissioning Phase (SEF)

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Visual effect of remaining structures, platforms and disused roads	Visual impact on receptors	Negative	Local	Long-term	Substantial	Very likely	High	Low	Structures to be demolished or recycled. Platforms and access roads to be ripped/ regraded. Disturbed areas to be revegetated or returned to grazing pasture.	Moderate	Very low	5	High
	Visual intrusion on rural landscape	Negative	Local	Long-term	Substantial	Very likely	High	Low		Moderate	Very low	5	High

Cumulative Impact Assessment Summary Table (SEF)

Cumulative Impacts (Construction, Operational and Decommissioning Phases)													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Introduction of additional solar energy farm	Cumulative visual impacts transform the rural landscape	Negative	Local	Long-term	Substantial	Very likely	High	Low	Cluster solar energy farms in low sensitivity areas.	Moderate	Low	4	High

Impact Assessment Summary Table for the Construction Phase (Power line)

Construction Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Introduction of access tracks and site works	Visual effect on rural character and receptors	Negative	Local	Short-term	Slight	Very likely	High	Low	• Location of pylons in low-lying areas. • Access roads kept as narrow as possible. • Implementation of management actions are per the EMPr.	Very low	Very Low	5	Medium

Impact Assessment Summary Table for the Operational Phase (Power line)

Operational Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Introduction of pylons into the landscape	Visual impact on receptors	Negative	Local	Long-term	Moderate	Very likely	High	Low	Maintenance of pylons	Low	Low	4	High
	Visual intrusion on rural landscape	Negative	Local	Long-term	Moderate	Very likely	High	Low		Low	Low	4	High

Impact Assessment Summary Table for the Decommissioning Phase (Power line)

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Visual effect of remaining structures, platforms and disused roads	Visual impact on receptors	Negative	Local	Long-term	Moderate	Very likely	High	Low	Pylons removed. Roads ripped/ regraded. Disturbed areas revegetated.	Low	Very low	5	High
	Visual intrusion on rural landscape	Negative	Local	Long-term	Moderate	Very likely	High	Low		Low	Very low	5	High

Cumulative Impact Assessment Summary Table (Power line)

Cumulative Impacts (Construction, Operational and Decommissioning Phases)													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Introduction of additional power lines	Cumulative visual impacts transform the rural landscape	Negative	Local	Long-term	Moderate	Very likely	High	Low	Existing power line corridors used where possible	Low	Low	4	High

D.2.1.4 Concluding statement

Key visual management actions include locating the substation and other buildings, as well as construction camps, in an unobtrusive position in the landscape away from public roads. The arid landscape is particularly fragile and therefore new access roads and disturbance generally should be kept to a minimum for both the proposed SEF and connecting power line.

There are no fatal flaws from a visual perspective arising from the proposed project, and given the marginal nature of agriculture in the area, the renewable energy project is probably an inherently suitable land use that should receive authorisation, provided the mitigations are implemented.

D.2.2 Heritage[7]

D.2.2.1 Findings of the Heritage Assessment

A few finds were made within the power line corridor. These included half a bored stone and a scatter of stone artefacts at Waypoint 220 (Map A4.2, Heritage Specialist Study, Appendix C). The bored stone was far less symmetrical than expected and had also been used as a hammerstone. The artefact scatter included materials of mixed age but two diagnostic MSA flakes both had faceted platforms and a colonial period white refined earthenware fragment is likely no older than the late 19th century. Flaked quartz outcrops were found in various parts of the broader study area with one being inside the power line corridor at Waypoint 207.

Isolated background scatter artefacts were found in various places across the site. However, two archaeological sites with cultural significance were found within the PV site. One was at the far northern edge of the site and comprised of two scatters of LSA artefacts around the margins of a small pan in an ephemeral drainage line (Appendix C, Heritage Specialist Study, Figures 14 & 15). An unusual isolated find from very close to this site is a scraper-adze – also known as a Woodlot scraper – which is a flake that has scraper retouch on its distal end and adze working along both lateral margins (Appendix C, Heritage Specialist Study, Figure 16). The ventral surface also bears the small amount of damage expected from adze working. These artefacts are characteristic of the early Holocene in Lesotho (Mitchell *et al*. 1994). The second site is at Waypoint 760. It is in fact a cluster of eight artefact scatters located along the southern margin of a stream bed. The artefacts were all of quartz.

[7] Orton, 2019

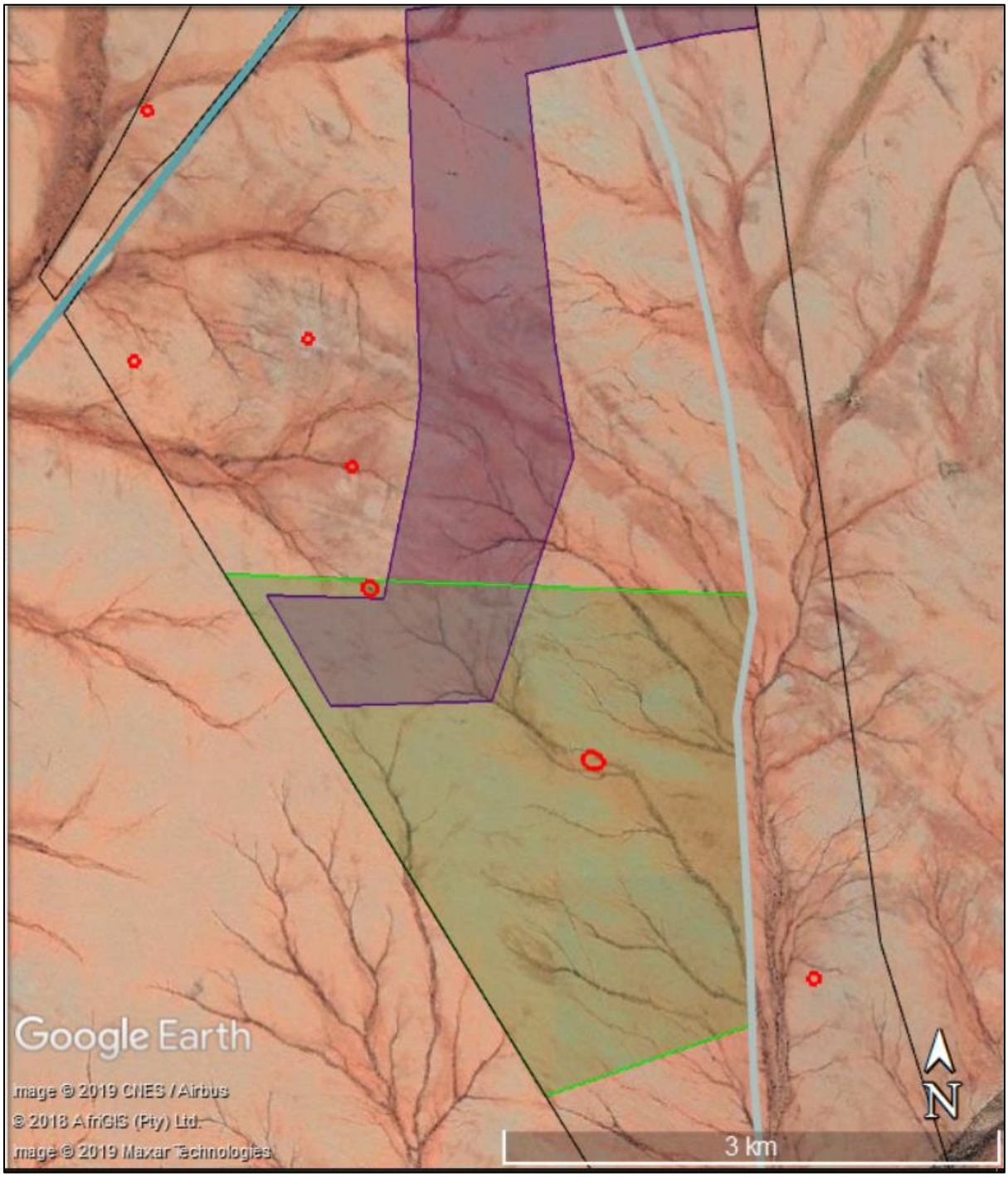


Figure D.5. ***Aerial view of the northern part of the study area showing the powerline corridor (purple shaded polygon), the PV6 site (blue shaded polygon), and sensitive archaeological sites (including their buffers; red polygons).***

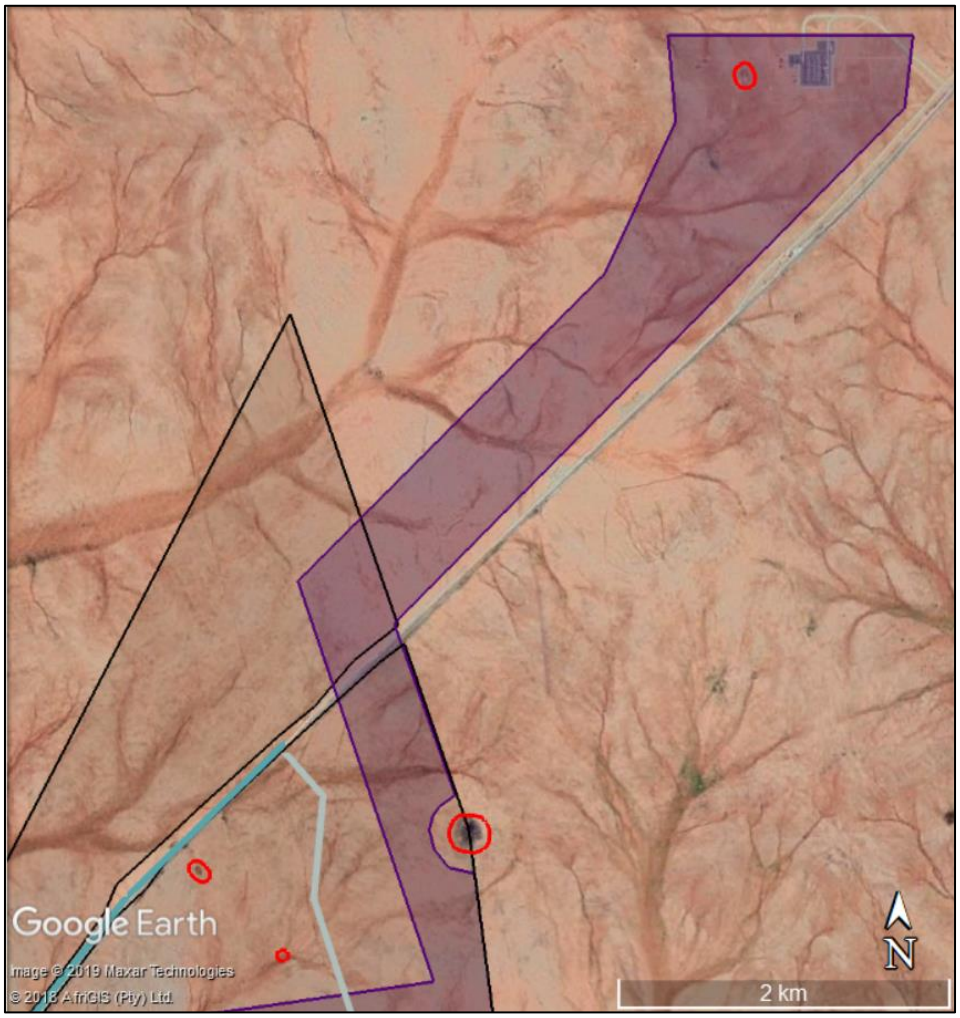


Figure D.6. Aerial view of the northern part of the study area showing the power line corridor (purple shaded polygon) and sensitive archaeological sites (including their buffers; red polygons).

D.2.2.2 Impact Assessment

The potential issues identified are applicable largely to the construction phase but one will endure throughout operation. The expected impacts that may result are as follows:

Construction Phase

- Impacts to palaeontology & archaeology;
- Impacts to graves; and
- Impacts to the landscape.

Operational Phase

- Impacts to the landscape

Decommissioning Phase

- Impacts to the landscape

Cumulative impacts

- Impacts to palaeontology & archaeology;
- Impacts to graves; and
- Impacts to the landscape.

D.2.2.3 Impact Assessment Summary

Impact assessment summary table – Construction Phase direct impacts.

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of residual impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION PHASE													
Clearing of site and construction of facility	**Impacts to archaeological resources**	Negative	Site	Permanent	Substantial	Likely	Non-reversible	Moderate	Avoid sites known to be significant. Report accidental finds during development	Moderate	Very Low	5	High
	Impacts to graves	Negative	Site	Permanent	Moderate	Unlikely	Non-reversible	High	Report accidental finds during development	Low	Very Low	5	High
	Impacts to the rural landscape	Negative	Local	Long-term	Moderate	Very likely	Moderate (rehabilitation after decommissioning)	Moderate	Ensure no impacts occur outside the authorised footprint. Where possible use earthy colours on buildings	Low	Very low	5	High

Impact assessment summary table – Operation and Decommissioning Phase direct impacts

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of residual impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
OPERATION PHASE													
Existence of facility in the rural landscape	**Impacts to the landscape**	Negative	Local	Long-term	Moderate	Very likely	Moderate (rehabilitation after decommissioning)	Moderate	Ensure that all maintenance activities remain within the authorised footprint.	Low	Very low	5	High
DECOMMISSIONING PHASE													
Decommissioning activities in the rural landscape	**Impacts to the landscape**	Negative	Local	Long-term	Moderate	Very likely	Moderate (rehabilitation after decommissioning)	Moderate	Ensure that all decommissioning activities remain within the authorised footprint.	Low	Very low	5	High

Impact assessment summary table – Cumulative impacts

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of residual impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
ALL PHASES													
Clearing of site and construction of facility	**Impacts to archaeological resources**	Negative	Site	Permanent	Moderate	Unlikely	Non-reversible	Moderate	Report accidental finds during development	Low	Very Low	5	High
	Impacts to graves	Negative	Site	Permanent	Moderate	Unlikely	Non-reversible	High	Report accidental finds during development	Low	Very Low	5	High
	Impacts to the rural landscape	Negative	Local	Long-term	Moderate	Very likely	Moderate (rehabilitation after decommissioning)	Moderate	Ensure no impacts occur outside the authorised footprint. Where possible use earthy colours on buildings	Low	Very low	5	High

D.2.2.4 Concluding statement

The Heritage Assessment found that very few impacts to heritage resources are expected to occur. This is largely because the facility design has avoided known significant resources on the site. There are no significant impacts expected from either the PV plant, the substation or the power line. Neither access road will cause impacts and both options are acceptable. Archaeological resources on the site have been buffered as required and these are mapped in Figures above. Because of the very low significance of potential impacts to heritage resources and the very low likelihood of significant impacts occurring, it is recommended that the proposed PV6 solar energy facility and associated power line should be authorised within the footprint proposed.

D.2.3 Palaeontological Assessment[8]

D.2.3.1 Findings of the Palaeontological Assessment

The basement rock units represented in the combined PV6 and power line study area includes the Jacomyns Pan Group (gneisses of the Sandnoute Formation) and the Keimoes Suite (Elsie se Gorra Granite). These rock units are described in the Kenhardt 1: 250 000 sheet explanation by Slabbert et al. (1999) and placed in the context of the Namaqua-Natal Province by Cornell et al. (2006). However, they are entirely unfossiliferous and so will not be discussed further here.

The basement rocks in the PV6 study area are largely or entirely mantled by aeolian sands of the Gordonia Formation ("Kalahari sands") as well as Late Caenozoic alluvial deposits; no basement rock outcrop areas are mapped here at 1: 250 000 scale. Small inliers of basement rocks mapped within the 132 kV power line corridor associated with the PV project include the Elsie se Gorra Granite as well as the Sandnoute Formation gneisses but these are also largely covered by Kalahari aeolian sands.

The geology of the Late Cretaceous to Recent Kalahari Group is reviewed by Thomas (1981), Dingle et al. (1983), Thomas & Shaw (1991), Haddon (2000) and Partridge et al. (2006). The thickness of the unconsolidated Kalahari sands in the Bushmanland area is variable and often uncertain. The Gordonia Formation dune sands are considered to range in age from the Late Pliocene / Early Pleistocene to Recent, dated in part from enclosed Middle to Late Stone Age stone tools (Dingle et al., 1983, p. 291). The recent extension of the Pliocene - Pleistocene boundary from 1.8 Ma back to 2.588 Ma places the older Gordonia Formation sands entirely within the Pleistocene Epoch. A number of older Kalahari formations underlie the young wind-blown surface sands in the main Kalahari depository to the north of the study area. However, at the latitude of the study area near Kenhardt (c. 29° S) Gordonia Formation sands less than 30 m thick are likely to be the main or perhaps only Kalahari sediments present (cf isopach map of the Kalahari Group, Figure 6 in Partridge et al., 2006). These unconsolidated sands will be locally underlain by thin subsurface gravels along the buried palaeosurface and perhaps by calcretes of Pleistocene or younger age (cf Mokalanen Formation).

[8] Almond, 2019

Table D.2. Fossil Heritage recorded from the major rock units that are represented within the broader Scatec Solar study area near Kenhardt

GEOLOGICAL UNIT	ROCK TYPES AND AGE	FOSSIL HERITAGE	PALAEONT-OLOGICAL SENSITIVITY
LATE CAENOZOIC SUPERFICIAL SEDIMENTS, **especially** **ALLUVIAL AND PAN SEDIMENTS**	**Fluvial, pan, lake and terrestrial sediments, including diatomite (diatom deposits), pedocretes (*e.g.* calcrete), colluvium (slope deposits such as scree), aeolian sands (Gordonia Formation, Kalahari Group)** **LATE TERTIARY, PLEISTOCENE TO RECENT**	**Bones and teeth of wide range of mammals (*e.g.* mastodont proboscideans, rhinos, bovids, horses, micromammals), fish, reptiles (crocodiles, tortoises), ostrich egg shells, fish, freshwater and terrestrial molluscs (unionid bivalves, gastropods), crabs, trace fossils (*e.g.* calcretised termitaria, horizontal invertebrate burrows, stone artefacts), petrified wood, leaves, rhizoliths, stromatolites, diatom floras, peats and palynomorphs.**	**GENERALLY LOW BUT LOCALLY HIGH** **(*e.g.* Tertiary alluvium associated with old river courses)**
Basement granites and gneisses **NAMAQUA-NATAL PROVINCE**	**Highly-metamorphosed sediments, intrusive granites** **MID-PROTEROZOIC (*c.*1- 2 billion years old)**	**None**	**ZERO**

D.2.3.2 Impact Assessment

The potential impacts identified are:

Construction Phase

- Potential loss of palaeontological heritage resources through disturbance, damage or destruction of fossils and fossil sites (including associated geological contextual data) through surface clearance and excavation activities during the construction phase.

Operational Phase

- No significant impacts on palaeontological heritage are anticipated during the operational phase of the development.

Decommissioning Phase

- No significant impacts on palaeontological heritage are anticipated during the decommissioning phase of the development.

Cumulative Impacts

- Potential cumulative loss of palaeontological heritage resources through disturbance, damage or destruction of fossils and fossil sites (including associated geological contextual data) through surface clearance and excavation activities during the construction phase of several alternative energy facilities within the broader Kenhardt region and other key electrical infrastructure developments within a 30 km radius of the proposed project site.

D.2.3.3 Impact Assessment Summary

Impact assessment summary table for the Construction Phase

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION PHASE													
Surface clearance and excavations into superficial sediments	Loss of fossil heritage and contextual data at or beneath ground surface	Negative	Site	Permanent	Slight	Likely	Non-reversible	Low	Undertake monitoring of all substantial excavations into sedimentary rocks for fossil remains and safeguard any finds in situ. Appoint a professional palaeontologist to record and sample any chance fossil finds	Very low	Very low	5	Medium

Cumulative impact assessment summary table

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION PHASE													
Surface clearance and excavations into superficial sediments	Loss of fossil heritage and contextual data at or beneath ground surface	Negative	Site	Permanent	Slight	Likely	Non-reversible	Low	Undertake monitoring of all substantial excavations into sedimentary rocks for fossil remains and safeguard any finds in situ. Appoint a professional palaeontologist to record and sample any chance fossil finds	Very low	Very low	5	Medium

D.2.3.4 Concluding statement

Given the generally low palaeontological sensitivity of the eastern Bushmanland region, as determined from desktop and field-based studies, as well as the inferred very low impact significance of the Kenhardt PV6 115 MW Solar PV Facility and associated electrical infrastructure for fossil heritage conservation, there are no objections on palaeontological heritage grounds to authorisation of the project and no specialist palaeontological monitoring or mitigation is recommended here, pending the discovery of substantial new fossil remains during construction. Mitigation measures and monitoring recommendations for inclusion in the EMPr for the PV facility and the associated electrical infrastructure (132 kV power line, and substation) are discussed in Sections 1.6 and 1.7 of the specialist study (Appendix C).

In the Palaeontological Specialist Report, the entire site for the proposed Kenhardt PV6 115 MW Solar PV Facility on Onder Rugzeer Farm 168 has been assessed based on the worst case scenario. From a palaeontological heritage impact point of view, the applicant can select any 250 ha area within the surveyed area to build the PV plant, provided that the recommended mitigation measures are implemented as applicable.

D.2.4 Soils and Agriculture[9]

D.2.4.1 Findings of the Soils and Agricultural Assessment

The previous field investigation confirmed that the soils on site are shallow, red sandy soils on underlying rock and hard-pan carbonate. Actual soil forms vary within short distances depending on rock ridges that run across the area and the extent of calcrete formation. There are numerous outcrops of rocky ridges at the soil surface across the entire area. All investigated sample points across the area were one of four soil forms: Coega, Mispah, Plooysberg or Hutton. However there is very little practical difference between these different soil forms. All have a clay content of approximately 7%, are shallow and are underlain by a hard impenetrable layer (either rock or hard-pan carbonate).

Land capability is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for production of cultivated crops.

The project area is classified with a predominant land capability evaluation value of 5, although it varies from 4 to 7 across the site. Agricultural limitations that result in the low land capability classification are predominantly due to the very limited climatic moisture availability, with shallow soils as an additional factor. These factors render the site unsuitable for any kind of cultivation and limit it to low density grazing only. The long-term grazing capacity of the site is low, at 32 hectares per large stock unit.

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to

[9] Lanz, 2019

agriculture than the same impact on land of low agricultural capability. A general assessment of agricultural sensitivity, in terms of loss of agricultural land in South Africa, considers arable land that can support viable production of cultivated crops, to have high sensitivity. This is because there is a scarcity of such land in South Africa, in terms of how much is required for food security. However, there is not a scarcity in the country of land that is only suitable as grazing land and such land is therefore not considered to have high agricultural sensitivity.

The national web-based environmental screening tool identifies the majority of the site as low agricultural sensitivity, with only a very limited patch of medium sensitivity, and with no higher sensitivity than medium. Agricultural potential and conditions are very uniform across the site, and the choice of placement of facility infrastructure, including access roads and power lines therefore has negligible influence on the significance of agricultural impacts. No agricultural high sensitivity areas occur within the investigated site and no parts of it therefore need to be avoided by the development. There are no required buffers.

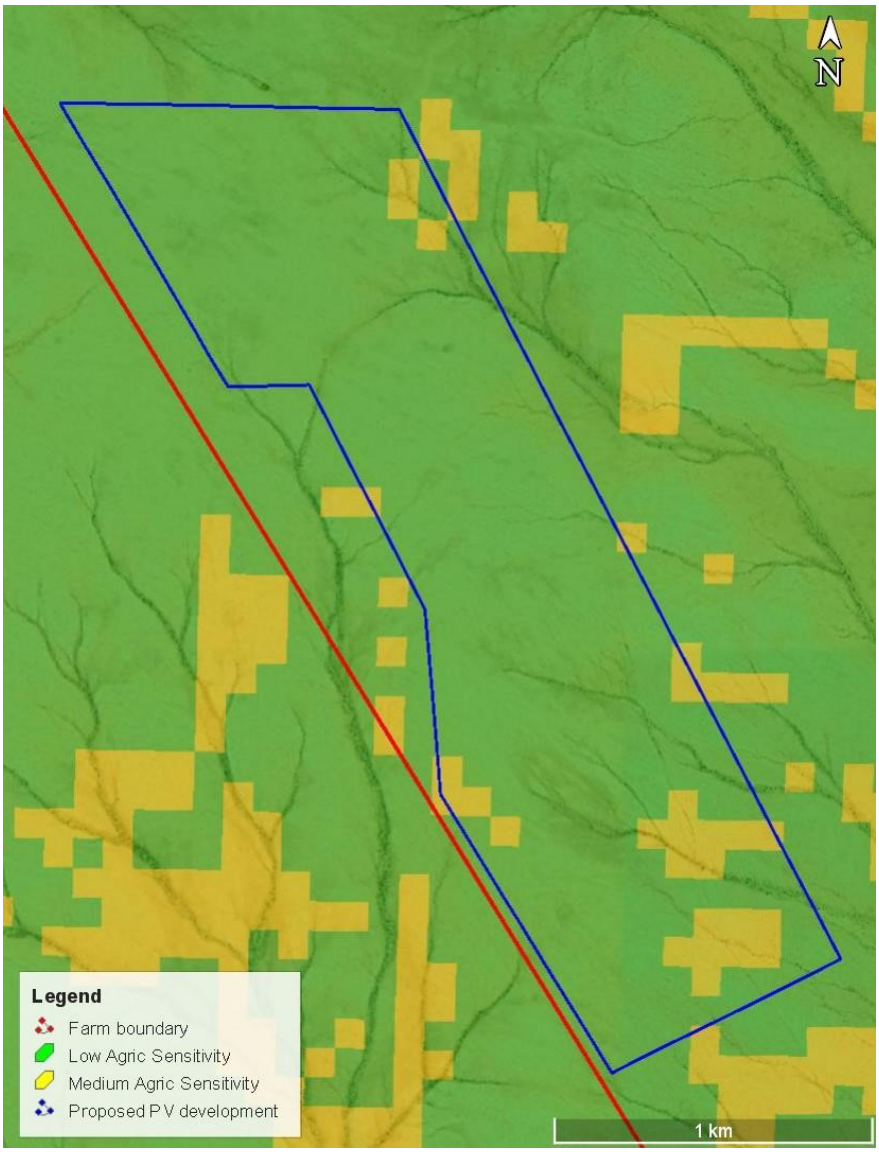


Figure D.7. Agricultural sensitivity of the proposed project site

D.2.4.2 Impact Assessment

The potential impacts identified during the assessment are:

Construction phase
- Loss of agricultural land use;
- Soil degradation.

Operational phase
- Increased financial security for farming operations.

Decommissioning phase
- Soil degradation.

Cumulative impact
- Regional loss of agricultural land.

D.2.4.3 Impact Assessment Summary

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION PHASE													
Occupation of the land by the project infrastructure	Loss of agricultural land use	Negative	Site	Long-term	Moderate	Very likely	High	Replaceable	None	Low	Low	4	Medium
Construction related soil and land disturbance	Soil degradation	Negative	Site	Medium-term	Moderate	Unlikely	High	Replaceable	Storm water run-off control; Maintain vegetation cover; strip, stockpile and re-spread topsoil.	Low	Low	4	Medium
OPERATIONAL PHASE													
Payment of rental by the energy facility	Increased financial security for farming operations	Positive	Local	Long-term	Moderate	Unlikely	High	Replaceable	None	Low	Low	4	Medium
DECOMMISSIONING PHASE													
Decommissioning related soil and land disturbance	Soil degradation	Negative	Site	Medium-term	Moderate	Unlikely	High	Replaceable	Maintain vegetation cover; strip, stockpile and re-spread topsoil.	Low	Low	4	Medium

Aspect/ Impact pathway	Nature of potential impact/risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CUMULATIVE IMPACTS													
Occupation of and impact to the land by the project infrastructure of multiple developments	Regional loss of agricultural land use	Negative	Regional	Long-term	Slight	Likely	High	Replaceable	None	Very low	Very low	5	Medium

D.2.4.4 Concluding statement

Due to the low agricultural potential of the site, and the consequent low agricultural impact, there are no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised.

D.2.5 Ecology & Aquatic[10]

D.2.5.1 Findings of the Ecological and Aquatic Assessment

- Terrestrial Ecology

The proposed Kenhardt PV 6 site lies within the Bushmanland Arid Grassland veld type (Figure 6) and is situated north of the Putsonderwater settlement. The site is broad and flat with deeper sandy soils evident in the south and east of the proposed site, and perhaps shallower soils to the north. Drainage from the area is poor, however towards the east a major dendritic feature is evident and at this point sandy clays, overlain by wind blown sands is evident. Some quartzite exposures are evident within the site, however these are occasional and found primarily to the north.

The land complex in general, including the proposed PV 6 site has been subject to extensive and significant grazing. The region in general, has been affected by a significant drought which still prevails The dominant botanical species on site are *Lyceum horridus, Aristida ascenionis Rhigozum trichomotum* and *Stipagrostis ciliata*. A singlular specimen of *Boscia albitrunca* lies centrally within the site (Figure 8) as does a small specimen of *Aloe dichotoma*. These are perhaps the most evident of the larger woody species located on the site. A proposed powerline corridor that would allow for the transmission of power to the Neeuwehoop Sub station shows a number of *A dichotoma*, located in an loose association to the east of the corridor. Using data collated from transects established at PV4 it was noted that over 3 x 200m, *L horridus* comprised 49% of the species encountered. *S ciliata* and a few forbs comprised the balance of species recorded. Evidently, a depauperate state is evident and this is exacerbated by the effect of drought and the requirements of livestock has led to over-grazing of the site. Minor dendritic channels generally drain to the west of the site, although some drainage is evident to the south. These drainage lines show little geomorphological characteristics but rather, are discerned by an increased density of vegetation (primarily *L horridus*). No hygrophilous vegetation is evident within these systems and the percolative nature of soils at these points and across the dendritic drainage features precludes the establishment of such vegetation..

- Fauna

Given the xeric nature of the region, fauna on site is considered to be typical of these environments. The occurrence of species is likely in respect of these animals either utilizing the site as refugia or as part of a wider foraging range or "territory". As is typical of the region, a large number of fossorial and burrowing species, including mammals and invertebrates, were identified across the region in general. Such species included suricates (meerkat) (*Suricata suricatta*) and ground squirrel (*Xerus inauris)*. Foraging excavations indicating the presence of aardvark (*Orycteropus afer*), as well as the porcupine (*Hystrix africaeaustralis*) were evident. A number of reptiles were identified across site (e.g Bibron's thick toed gecko, *Chondrodactylus bibronii*) and the tent tortoise (*Psammobates tentorius verroxii*), associated with the arid Bushmanland habitat. Most reptile and small mammal species presence was associated with quatzite kopjies which offer suitable habitat for refuge.

[10] Bundy, 2019

Other larger mammals that were noted on site include Springbok (*Antidorcas marsupalis),* some of which are noted to be succumbing to the effects of the drought and Steenbok (*Raphicerus campestris*), which were noted to be more resilient to the limited water availability (Du Toit, 1990). Most larger mammals located within the subject site are not reliant upon the study area in particular and are likely to forage over extensive ranges that extend beyond the study area. Estes (1992) indicates that suricates may use warrens for a number of months or possibly years, before relocating. Noted on other solar PV sites, suricates are quite capable of establishing warrens within solar parks following establishment, while aardvark (*O. afer*) and other fossorial species are capable of excavating under fencing which may initially serve to exclude them from an area.

- Aquatic and Riparian habitat

Two major dendritic features lie to the east and south of PV 6, with these being served by a number of minor dendritic features. According to the US Department of Agriculture, hydro-geomorphological features are indicated primarily by evidence of flow or the deposition of materials (Brinson et al 1993; USDA 2008), while verdant vegetation is a combination of both improved plant water relations and increased nutrient availability. As such, drainage features can be defined as "minor" or "major" systems. The two major drainage features show evidence of significant albeit erratic flow. The deposition of fine alluvial clays or mud is particularly evident in the east where such soils have historically accumulated.

The minor features within the site show limited geomorphological characteristics and surface flow through these drainage features is considered to be limited to flood or precipitation events that arise on a frequency of every five years or more (Mr S Strauss pers comm). The minor drainage features are only evident through the establishment of dense and more verdant vegetation, dominated by L horridus. It is also likely that incisement of the drainage features is driven by the passage of livestock, with the dispersal of scat at these points promoting vegetative growth. The drainage lines do not show hygrophilous vegetation as may be defined, nor do they show the presence of geohydromorphic soils, primarily on account of the erratic and intermittent levels of inundation, over extended periods of time. When flow does arise within these features, it is sluggish and ceases abruptly following the cessation of rains. Surface water rapidly drains from site on account of the percolative soils, or is lost to evaporation. It can therefore be argued that under even the more significant rainfalls on site, minor drainage features play only a limited hydrological role.

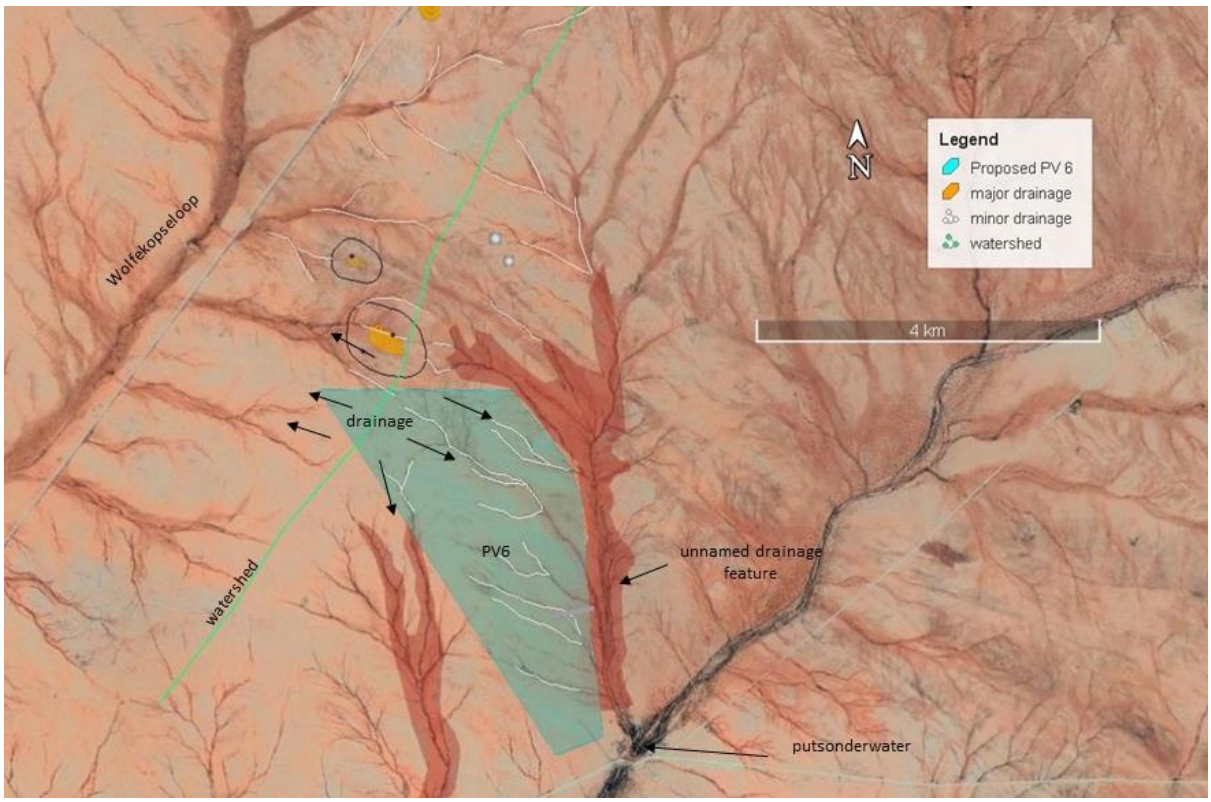


Figure D.8. High resolution map showing site of proposed PV6 in relation to drainage features

D.2.5.2 Impact Assessment

A number of direct, indirect and cumulative impacts on the localised and broader ecology of the region can be identified as a consequence of the proposed development being implemented, as seen below:

Construction Phase:

- Alteration of habitat structure and composition;
- Ousting (and recruitment) of various fauna;
- Changes in the geomorphological state of the upper drainage lines (i.e. changes to surface drainage patterns) due to construction activities leading to change in plant communities and general habitat structure, within the site and immediately adjacent to it;
- Increased electrical light pollution, leading to changes in nocturnal behavioural patterns of fauna;
- Exclusion or entrapment of (in particular) large fauna, on account of the fencing of the site;
- Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points;
- Changes in subsurface water resources;
- Changes in water resources and surface water in terms of water quality (i.e. impact on water chemistry) as a result of construction activities; and
- Exotic weed invasion.

Operational Phase:

- Continued alteration of habitat structure and composition on account of continuing low level anthropogenic impacts, such as "shading of vegetation" from arrays.;
- Ousting (and recruitment) of various fauna on account of long term changes in the surrounding habitat/environment;
- Changes in the geomorphological state of drainage lines on account of long term climatic changes and the concomitant change in the nature of the catchment arising from the land use change;
- Changes in water resources and water quality (i.e. impact on water chemistry) as a result of operational activities. Such changes will be related to the long term activities on site, but are likely to be negligible; and
- Exotic weed invasion as a consequence of regular and continued disturbance of site.

Decommissioning Phase:

- A reversion to the present seral stage, where continued grazing by livestock and herbivory by game will arise;
- A reversion of present faunal population states within the study area;
- Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment; and
- Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures.

Cumulative Impacts:

- Extensive alteration of habitat structure and composition over an extensive and wide area;
- Changes in fauna through exclusion of certain species and beneficiation of others over an extensive and wide area;
- Increased change in the geomorphological state of drainage lines on account of long term and extensive change in the nature of the catchment;
- The continued and cumulative loss of habitat at a landscape to regional level, with a particular impact on avifaunal behaviour.
- Changes in water resources and surface water in terms of water quality (i.e. impact on water chemistry) on account of extensive changes in the catchment; and
- Exotic weed invasion as a consequence of regular and continued disturbance across an extensive area of site.

D.2.5.3 Impact Assessment Summary

CONSTRUCTION PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat	Habitat and species loss	Negative	Site	Long-Term	Substantial	Very likely	Low	Low	• Detailed design and incorporation of habitat and features • Plant rescue operations • Exotic weed control • Game sweep of site • The maintenance of vegetation and avoidance of the "blading" or clearance. • Consideration of the siting and layout of the temporary construction site and worker camp	Moderate	Low	4	High

CONSTRUCTION PHASE												
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Habitat change through changes in topographic drivers	Negative	Site	Medium-Term	Moderate	Likely	High	Low	• Avoidance of major drainage features during construction • Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible). • Avoidance of significant sculpting of land and maintenance of the general topography of the site. • Maintenance of a high level of housekeeping on site during the construction phase. • Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertake removal of solid waste and litter on a regular basis.	Low	Very low	5	High
Abstraction from subsurface aquifers may have a significant impact on plant water relations.	Water volume and ecological change	Negative	Local	Long term	Slight	Likely	High	Low	• Alternative water resources to be utilized	Very low	Very Low	5	Medium

CONSTRUCTION PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The introduction of water to site by import may alter the availability of water to plants within the site and may lead to changes in habitat form and structure around areas that receive such import.	Change in plant water relations	indeterminate	Local	Long term	Slight	Likely	High	Low	• None identified	Very Low	Very Low	5	High
Alteration of surface water quality that lead to change in water chemistry	Water quality change and general pollution of resource	Negative	Local	Short term	Slight	Likely	High	Low	• Avoidance of significant sculpting of land and maintenance of the general topography of site. • Placement of energy dissipaters within minor drainage lines to reduce velocity of flow through such features	Very low	Very low	5	Medium
Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points.	Habitat change and alteration in fauna and faunal behaviour	Negative	Site	Long term	Moderate	Likely	High	Low	• Ripping of compact soils when and where extensive compaction arises	Low	Low	4	Medium
Increased Electrical Light Pollution (ELP), leading to changes in nocturnal behavioural patterns amongst fauna	Changes in faunal behaviour	Negative	Local	Long term	Moderate	Very likely	High	Low	• Reduce level of lighting and placement of lighting to be judiciously considered at time of implementation	Low	Very low	5	High

CONSTRUCTION PHASE												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Exclusion or entrapment of in particular large fauna, on account of the fencing of the site.	Animal mortalities	Negative	Site	Long term	Slight	Very likely	High	Low	• Ensure that the live electrical fence wire is not placed at ground level. • Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the fence	Very low	Very low	5	High

Indirect impact assessment summary table for the Construction Phase

CONSTRUCTION PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat	Habitat and species loss	Negative	Local	Long-Term	Substantial	Likely	Moderate	Low	• Detailed design and incorporation of habitat and features • Plant rescue operations • Exotic weed control • Game sweep of site • The maintenance of vegetation and avoidance of "blading" or clearance. • Consideration of the siting and layout of the temporary construction site and worker camp.	Moderate	Low	4	High
Alteration of surface drainage patterns on account of construction activities leading to change in plant communities and general habitat structure	Habitat change through changes in topographic drivers	Negative	Local	Short term	Moderate	Likely	High	Low	• Undertaking and completion of earthworks and road construction outside of the high rainfall period (if possible). • Avoidance of significance sculpting of land and maintenance of the general topography of the site. • Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features. • Maintenance of a high level of housekeeping on site during the construction phase. • Inspection of drainage features immediately outside of the footprint of the proposed PV facility and undertake removal of solid waste and litter on a regular basis.	Low	Very low	5	High

CONSTRUCTION PHASE												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of surface water quality that lead to change in water chemistry	Water quality change and general pollution of resource	Negative	Local	Short term	Slight	Likely	High	Low	• Exclusion of major drainage lines from the development footprint. • Avoidance of significant sculpting of land and maintenance of the general topography of site. • Placement of energy dissipaters within minor drainage lines to reduce velocity of flow through such features. • Maintenance of a high level of housekeeping on site during the construction phase. • Inspection of drainage features immediately outside of the footprint of the proposed PV facility and removal of litter and solid waste on a regular basis.	Very low	Very low	5	Medium
Changes in edaphics (soils) on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species in and around these points.	Habitat change and alteration in fauna and faunal behaviour	Negative	Local	Long term	Slight	Likely	High	Low	• Ripping of compact soils when and where extensive compaction arises	Very low	Very low	5	Medium
Increased ELP, leading to changes in nocturnal behavioural patterns amongst fauna	Changes in faunal behaviour	Negative	Local	Long term	Slight	Likely	High	Low	• Provision of critter paths within fencing should be considered in the design. • Promote and support faunal presence and activities within the proposed PV facility, where applicable.	Very low	Very low	5	High

CONSTRUCTION PHASE													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Exclusion or entrapment of in particular large fauna, on account of the fencing of the site.	Animal mortalities	Negative	Local	Long term	Slight	Likely	High	Low	• Ensure that live electrical fence wire is not placed at ground level. • Conduct regular (daily) inspections of the fence line to address any animals that may be affected by the fence	Very low	Very low	5	High

Direct Impact assessment summary table for the Operational Phase

OPERATIONAL PHASE													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility	Habitat and species loss	Negative	Site	Long-Term	Moderate	Very likely	High	Low	• Provision of critter paths within the fencing should be considered in the design. • Promote and support faunal presence and activities within the proposed PV facility	Low	Low	4	High
Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.	Habitat change and species loss	Neutral	Site	Long-Term	Slight	Likely	High	Low	• None identified	Very low	Not Applicable	5	High

OPERATIONAL PHASE												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Changes in meteorological factors at a local scale, on account of the PV array are likely to arise	Uncertainty in relation to change	Neutral	Site	Long-Term	Slight	Likely	High	Low	• None identified	Very Low	Not Applicable	5	High
Abstraction of groundwater for the cleaning of the PV panels, as well as for operational use, will alter the state of subsurface water resources	Water quantity changes with possible impact on habitat	Negative	Local	Very short term	Substantial	Likely	Moderate	Moderate	• Preferential use of recycled water sources for operational phase requirements (instead of groundwater). • The prudent use of surface water resources. • Adopt "dry" cleaning methods, such as dusting and sweeping the site before washing down. • Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. • Low level and ongoing cleaning of PV panels over time to reduce demand on aquifers.	Moderate	Low	4	High

OPERATIONAL PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The fencing of the site, possibly with electric fencing, is likely to impact on faunal behaviour, leading to the exclusion of certain species and possible mortalities	Animal mortality	Negative	Site	Long term	Moderate	Likely	High	Low	• Ensure that the live electrical fence wire is not placed at ground level. • Conduct regular (daily) inspections of the fence line to address any animals that may be affected by electric the fence.	Low	Very low	5	High

Indirect Impacts for the Operational Phase

OPERATIONAL PHASE												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the PV facility	Habitat and species loss	Negative	Site	Long-Term	Substantial	Very likely	Low	Low	• Provision of critter paths within the fencing should be considered in the design. • Promote and support faunal presence and activities within the proposed PV facility	***Moderate***	***Low***	***4***	***High***
Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.	Habitat change and species loss	Negative	Local	Short term	Slight	Likely	High	Low	• *None identified*	***Very low***	***Not Applicable***	***5***	***High***

OPERATIONAL PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Abstraction of groundwater for the cleaning of the PV panels, as well as for operational use, will alter the state of subsurface water resources	*Water quality change and general pollution of resource*	Negative	Local	Short term	Substantial	Likely	Moderate	Moderate	• Preferential use of recycled water sources for operational phase requirements (instead of groundwater). • The prudent use of surface water resources. • Adopt "dry" cleaning methods, such as dusting and sweeping of the site before washing down. • Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. • Low level and ongoing cleaning of the PV panels over time to reduce demand on aquifers.	***Moderate***	***Low***	***4***	***High***

Cumulative Impact assessment summary table for the Construction Phase

CONSTRUCTION PHASE												
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
The ousting of fauna through anthropogenic activities, disturbance of refugia and general change in habitat	Habitat and species loss	Negative	Local to Regional	Long-Term	Substantial	Very likely	Moderate	Low	• Detailed design and incorporation of habitat and features • Plant rescue operations • Exotic weed control • Game sweep of site • The maintenance of vegetation and avoidance of the "blading" or clearance. • Consideration of the siting and layout of the temporary construction site and worker camp.	Moderate	Low	4	High

CONSTRUCTION PHASE												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of surface water quality that leads to change in water chemistry	Changes in drainage patterns and water quality	Negative	Regional	Long term	Moderate	Likely	Moderate	Moderate	• Avoid construction during the rainy season (if possible and practical). • Avoidance of significance sculpting of land and maintenance of the general topography of the site including the avoidance of major drainage lines. • Placement of energy dissipaters (such as stone levees or similar) within minor drainage lines to reduce velocity of flow through such features • Apply good site management and solid waste management outside of site (within the immediate vicinity)	Low	Low	4	Medium
Changes in sub surface water resources may arise	Effects upon groundwater resources	Negative	Regional	Long term	Substantial	Likely	Moderate	Moderate	• Identify off site water resources • Use of recycled water • Identify or consider alternative cleaning methods for the PV panels	Moderate	Low	4	Medium

CONSTRUCTION PHASE												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Changes in edaphics on account of excavation and import of soils, leading to the alteration of plant communities and fossorial species	Habitat alteration	Negative	Regional	Long term	Moderate	Likely	High	Low	• Ripping of compact soils when and where extensive compaction arises	Low	Very low	5	Medium
Increased ELP	Faunal behavioural change	Negative	Regional	Long term	Slight	Likely	High	Low	• Review the placement of lighting on the site.	Very low	Very low	5	Medium
Exclusion or entrapment of in particular large fauna, on account of the fencing of the site	Animal mortality	Negative	Regional	Long term	Slight	Likely	High	Low	• Placement of live wires • Monitoring of fence line	Very low	Very low	5	Medium

Cumulative Impact assessment summary table for the Operational Phase

OPERATIONAL PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Alteration of ecological processes on account of the exclusion of certain fauna, inherent to the functional state of the land within the proposed PV facility	Habitat and species loss	Negative	Regional	Long-Term	Substantial	Very likely	Low	Low	• Provision of critter paths within the fencing should be considered in the design. • Promote and support faunal presence and activities within the proposed PV facility	Moderate	Low	4	High
Increased shading, as a consequence of the PV arrays, will lead to changes in plant water relations and possible changes in plant community structures within the site.	Exposed soil susceptible to erosion	Negative	Site	Medium-Term	Moderate	Likely	High	Low	• None identified	Low	Not Applicable	4	High
Abstraction of groundwater for the cleaning of the PV panels, as well as for operational use, will alter the state of subsurface water resources.	Changes in water resource quantity and perhaps quality	Negative	Regional	Long term	Severe	Likely	Moderate	Low	• Preferential use of recycled water for operational phase requirements (instead of groundwater). • The prudent use of surface water resources. • Adopt “dry” cleaning methods, such as dusting and sweeping of the site before wash down. • Increased monitoring of the impact of dust generation and implement a more judicious cleaning protocol. • Low level and ongoing cleaning of the PV panels over time to reduce demand on aquifers.	High	Moderate	3	Medium

OPERATIONAL PHASE													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Overhead power lines, as well as subtle changes in habitat are likely to result in the alteration of avian behaviour	Changes in faunal behaviour	Negative	Site	Long term	Slight	Likely	High	Low	• None identified	Very low	Not Applicable	5	High
As a large area of land will be affected by multiple PV facilities, it is evident that any mortalities and injury associated with electrocution from fencing may be compounded	Cumulative change in faunal populations	Negative	Regional	Long term	Moderate	Likely	High	Low	• Management of potential sources of electrocution – electric fences	Low	Very low	5	High

Decommissioning Phase Impact assessment summary table

DECOMMISSIONING PHASE													
Aspect/ Impact Pathway	Nature of Potential Impact/ Risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of Impact	Irreplaceability	Potential Mitigation Measures	Significance of Impact and Risk		Ranking of Residual Impact/ Risk	Confidence Level
										Without Mitigation/ Management	With Mitigation/ Management (Residual Impact/ Risk)		
A reversion to the present seral stage, where continued grazing by livestock and herbivory by game will arise	Habitat and species change	Neutral	Site	Long-Term	Moderate	Very likely	Low	Low	None identified	Low	Not Applicable	4	Medium
A reversion of present faunal population states within the study area	Habitat and species population change	Neutral	Site	Long term	Moderate	Likely	High	Low	None identified	Low	Not Applicable	4	Medium
Changes in the geomorphological state of drainage lines as hydraulic changes arise within the catchment	Surface hydrology change	Neutral	Local	Long term	Moderate	Very likely	High	Low	None identified	Low	Not Applicable	4	Moderate
Exotic weed invasion as a consequence of abandonment of site and cessation of weed control measures	Habitat change	Negative	Local - Regional	Long term	Substantial	Very likely	High	Low	• Weed control and land management	Moderate	Low	4	High

D.2.5.4 Concluding statement

It is in the opinion of the specialist that with the implementation of the above, the proposed PV6 Kenhardt Solar Facility which entails the establishment of some 250 ha of modules and support infrastructure on the site in question, is a suitable land use for the area in question and as such should be sanctioned by the relevant authority.

Little ecological impact is likely to arise from the proposed development should the recommended development footprint be employed, however the implementation of certain mitigation measures, as contained in the EMPr and presented above, (including floral and faunal management) should also be incorporated into the approval of the application.

D.2.6 Avifauna[11]

D.2.6.1 Findings of the Avifauna Study

The South African Bird Atlas 2 data indicate that a total of 149 bird species could potentially occur in the broader area (Appendix 2 of the Avifauna Specialist Study 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, 24 could potentially occur in the combined area, 9 of these are South African Red Data species, and 3 are globally Red listed. The probability of a priority species occurring in the study area is indicated in Table 2 in the Avifauna Study (Appendix C).

In terms of areas of high sensitivity, included are areas within 200m of water troughs. These areas are highly sensitive for the following reasons:

- Surface water in this arid habitat is crucially important for avifauna, including several Red Data species such as Martial Eagle, Verreaux's Eagle, Sclater's Lark, Lanner Falcon and Kori Bustard, and many non-Red Data species. The main source of surface water in the combined area is water troughs.
- The water troughs attract many species of birds which may put them at risk of collisions if there are powerlines in the vicinity of the surface water. Red Data species that could be impacted in this way are Martial Eagle, Verreaux's Eagle and Lanner Falcon, when descending to the water to drink and bath, or in the case of Lanner Falcon, also when hunting other birds at the water's edge. Several non-Red Data powerline sensitive species could also be attracted to surface water and be at risk of collisions e.g. Egyptian Goose and Namaqua Sandgrouse – a flock of 374 birds were recorded arriving at water trough to drink in the morning.

The water troughs often have trees growing in the immediate vicinity, which may serve as potential nesting substrate for a variety of birds, including Southern Pale Chanting Goshawk. These trees are also important daytime roosts for Spotted Eagle-Owls e.g. roosting owls were regularly encountered in trees at a water trough just outside the combined area.

The entire land parcel can be classified as medium sensitivity. The area is largely untransformed, and the natural habitat supports a number of Red Data powerline sensitive species, notably Ludwig's Bustard, Karoo Korhaan and Martial Eagle. Ludwig's Bustard in particular is known to be

[11] Van Rooyen, 2019

highly susceptible to powerline collisions, while Martial Eagles are highly susceptible to electrocutions. Martial Eagle was recorded during the site visits.

D.2.6.2 Impact Assessment

The potential impacts identified for the BA are:

Construction Phase

- Displacement due to disturbance associated with the construction of the solar PV plant and associated infrastructure
- Displacement due to disturbance associated with the construction of the 132kV grid connection

Operational Phase

- Displacement due to habitat transformation associated with the construction of the solar PV plant and associated infrastructure12
- Collisions with the solar panels
- Entrapment in perimeter fences
- Collisions with the associated power lines
- Electrocutions on the associated power lines

Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the solar PV plant and associated infrastructure

Cumulative Impacts

- 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
- Collisions with the associated power lines
- Electrocutions on the associated power lines.

[12] Due to the nature of the habitat, displacement due to habitat destruction associated with the proposed grid connection is likely to be negligible, therefore this is not listed as an impact.

D.2.6.3 Impact Assessment Summary

Impact Assessment Summary Table for the Construction Phase

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Construction of the solar PV plant and associated infrastructure.	The noise and movement associated with the construction activities at the PV footprint will be a source of disturbance which would lead to the displacement of avifauna from the area.	Negative	Site specific	Short term	Substantial	Very likely	high	Low	▪ 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. ▪ Water troughs should be relocated at least 200m outside the combined area.	Moderate (3)	Low (4)	Low (4)	High

Construction Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Construction of the 132kV grid connection.	The noise and movement associated with the construction activities in the powerline corridor will be a source of disturbance which would lead to the displacement of avifauna from the area.	Negative	Site specific	Short term	Substantial	Very likely	high	Low	▪ 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. ▪ The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.	Moderate (3)	Low (4)	Low (4)	High

Impact Assessment Summary Table for the Operational Phase

Operational Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
The vegetation clearance and presence of the solar arrays and associated infrastructure amounts to habitat transformation in the PV footprint.	Total or partial displacement of avifauna due to habitat transformation associated with the presence of the solar PV plant and associated infrastructure.	Direct	Site specific	Long term	Severe	Very likely	High	Low	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.	High (2)	Moderate (3)	Moderate (3)	Medium
The presence of the PV solar arrays will lead to collisions with the reflective solar panels in the PV footprint.	Birds will get killed or injured through collisions with the solar panels.	Direct	Site specific	Long term	Slight	Unlikely	High	Low	No mitigation is required due to the very low significance.	Very low (5)	Very low (5)	Very low (5)	Medium
The presence of a double perimeter fence could lead to entrapment of birds between the fences.	Entrapment of medium and large terrestrial birds between the perimeter fences, leading to mortality.	Direct	Site specific	Long term	Moderate	Likely	High	Low	A single perimeter fence should be used. Alternatively, the two fences should be at least 4 metres apart to allow medium to large birds enough space to take off.	Low (4)	Very low (5)	Very low (5)	High

Operational Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
33kV Overhead powerlines.	Electrocution of raptors.	Direct	Local	Long term	Severe	Likely	High	Low	▪ All 33kV powerlines should be buried. ▪ If there sections where the 33kV powerlines cannot be buried due to technical constraints, a bird-friendly design must be employed. An appropriately qualified and experienced avifaunal specialist must sign-off on the final design.	High (2)	Very low (5)	Very low (5)	High

Operational Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
33kV Overhead powerlines and 132kV grid connection.	Mortality of birds due to collisions with the powerlines.	Direct	Local	Long term	Severe	Likely	High	Low	▪ All 33kV powerlines should be buried. ▪ If there sections where the 33kV powerlines cannot be buried due to technical constraints, the spans must be marked with Eskom approved bird flight diverters, on the conductors, staggered 5m apart, alternating black and white/yellow. ▪ The entire 132kV grid connection should be marked with Eskom approved bird flight diverters, on the earthwire, 5m apart, alternating black and white/yellow. ▪ Water troughs should be relocated at least 200m outside the combined area.	High (2)	Low (4)	Low (4)	High

Impact Assessment Summary Table for the Decommissioning Phase

Decommissioning Phase													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Decommissioning of the solar PV plant and associated infrastructure, and 132kV grid connection.	The noise and movement associated with the activities at the combined area will be a source of disturbance which would lead to the displacement of avifauna from the area.	Direct	Site specific	Short term	Substantial	Very likely	High	Low	▪ 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. ▪ The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned.	Moderate (3)	Low (4)	Very low (5)	High

Cumulative Impact Assessment Summary Table

Cumulative Impacts (Construction, Operational and Decommissioning Phases)													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
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.	▪ 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 ▪ Collisions with the associated power lines ▪ Electrocutions on the associated power lines.	Direct	Local	Long term	Substantial	Very likely	High	Low	See all the proposed mitigation measures as listed in the preceding tables in Section 6 for all the impacts and all the phases	Low (4)	Very low (5)	Very low (5)	Medium

D.2.6.4 Concluding statement

In terms of an average, the pre-mitigation significance of all potential impacts identified in this specialist study is assessed as slightly above Moderate, leaning more towards Moderate, and the post-mitigation significance is assessed as **Low to Very Low, leaning more towards Low**. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the EMPr are strictly implemented.

D.2.7 Socio-Economic[13]

D.2.7.1 Findings of the socio-economic assessment

The high prevalence of female headed households (34%), combined with a dependency ratio of 48%, suggests that the Kai! Garib Local Municipality has a high proportion of vulnerable households; both in terms of social and financial jeopardy. A local unemployment rate of 10% is reported for the Kai! Garib Local Municipality which, though being lower than the national average, is nonetheless significant. Moreover, the Kai! Garib Local Municipality 2015/17 IDP reports that: "The majority of residents are still dependant on government pensions, implying that a large part of the residents of Kai !Garib earn less than R 1 800-00 per month."(Kai! Garib IDP 2015/17). Taken as a whole, this baseline information suggests that existing and future employment opportunities, as well as social support structures are of particular importance within the Kai! Garib Local Municipality. Notably, the local economy is disproportionately dependent on the agricultural sector; making-up 72% of the local economy (Kai! Garib IDP 2015/17). As such, its appears beneficial to diversify the local economy so as to reduce its dependence on the agricultural sector, while simultaneously seeking to protect employment within agriculture.

A second sensitivity appears to be suggested by the high incidence of 1-2 person households in the Kai! Garib Local Municipality, at 48.8% which is notably higher than the national average (Municipal Capacity Assessment, 2018). Small households are typically associated with a risk of escalated in-migration once the current household's income stream become more stable or expand. Regard should therefore be given to the fact that the average household size in the Kai! Garib Local Municipality is a low 2.9 members per household. The baseline information consequently points toward a latent risk of in-migration, or chain migration, should economic conditions within the Kai! Garib Local Municipality improve. However, this risk appears to be moderated by the above average provision of basic services in the Kai! Garib Local Municipality, which suggest that existing bulk infrastructure and service provision are not under undue pressure. Accordingly, an influx of migrants is unlikely to disrupt basic service delivery or strain local bulk infrastructure.

The Kai! Garib Local Municipality's above average percentage of people with a primary education (8.7%) and some secondary education (39.5%) suggests that employment creation within the skilled and highly skilled sectors will not serve to absorb excess labour, and is unlikely to directly contribute to poverty alleviation. Any attempt at job creation in the area should therefore seek to create employment in the unskilled to semi-skilled sector; as this is likely to result in the most beneficial outcome in terms of labour absorption and poverty alleviation.

A final area of concern is the increased HIV prevalence and teenage pregnancy rate reported in the Kai! Garib 2015/17 IDP. Although no official figures are provided, these concerns were repeated by respondents during the fieldwork, and identified as key social ills. Given the relative vulnerability of the local community (both socially and economically); the risk posed by in-migration should be flagged as a concern. Most saliently, in-migration might encourage risky social behaviour among

[13] Du Toit, 2019

local youths, which includes early sexual experimentation and alcohol abuse. Furthermore, in-migration might destabilise local social structures aimed at setting social norms and serving as social safety nets.

D.2.7.2 Impact Assessment

Construction/ Operational Phase

- Disruption of local social structures;
- Increased risky social behavior;
- Increased burden on existing social and bulk services;
- Unrealistic expectations regarding local job creation and housing;
- Limited employment created during the construction and operational phases;
- Development of locally-owned support industries to respond to construction-related activities; and
- Human development via the proposed Economic Development Plan.

Decommissioning Phase

- Job losses

Cumulative Impacts

- Cumulative impact 1: Exacerbated in-migration of job seekers; and
- Combined impact of multiple Economic Development Plans.

D.2.7.3 Impact Assessment Summary

Impact Assessment Summary Table for the Construction and Operational Phase

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
CONSTRUCTION AND OPERATIONAL PHASE													
Impact 1: Influx of workforce and job seekers	Disruption of existing social structures	Negative	Local	Medium to Long-term	Substantial	Likely	Low	Moderate	None	Moderate	Moderate	3	Medium
Impact 2: Influx of workforce and job seekers	Increases in social deviance	Negative	Local	Medium-term	Substantial	Likely	Low	Moderate	• No construction workers should be allowed to sleep at the construction site. • The construction workforce should receive HIV awareness training prior to the commencement of construction. • HIV and TB testing and counselling should be made available to the construction workforce free of charge. This can be achieved in collaboration with the local clinic or treatment initiatives like Right to Care (http://www.righttocare.org) which provides HIV and TB testing on-site via mobile clinics. • Local (within the immediate project area) HIV infection rates/ARV treatment loads must be monitored (annually) through close interaction with the local clinic. Should	Moderate	Low	4	Medium

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
									infections and treatment loads increase at a rate greater than the anticipated rate of increase; the Developer (or his appointed agent) must re-evaluate its HIV awareness training, take corrective action where necessary, and repeat said training.				
Impact 3: Influx of workforce and job seekers	Increased burden on bulk services and social infrastructure	Negative	Local	Short-term	Moderate	Likely	Moderate	Moderate to low	None	Low	Low	4	Medium
Impact 4: Expectations created regarding possible employment	Increased frustration in the local community	Negative	Local	Medium to long-term	Moderate	Likely	Moderate	Moderate	• The Applicant, or Contractor, must engage the local community (within the immediate project area) on the nature, duration, number and availability of employment opportunities well in advance of any construction activities taking place. It is recommended that existing social structures be utilised for such interaction, and that the process be commenced once EA has been granted. • The Contractor should establish an employment desk at the construction site to facilitate employment-related queries, and maintain a register of applicants which reflects their respective expertise, skill level and contact/residential details.	Low	Very Low	5	Medium

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
									Whenever planned or ad hoc employment is considered, the register should be consulted to identify appropriately qualified candidates. • The existence of the employment desk, and the relevant procedures associated with the selection and appointment of workers must be communicated to the local community. • It is strongly suggested that every effort should be made to employ local residents.				
Impact 5: Limited local employment	Socio-economic benefits	Positive	Local	Long-term	Substantial	Very likely	n/a	n/a	• The Contractor should establish an employment desk at the construction site to facilitate employment-related queries, and maintain a register of applicants which reflects their respective expertise, skill level and contact/residential details. Whenever planned or ad hoc employment is considered, the register should be consulted to identify appropriately qualified candidates. • The existence of the employment desk, and the relevant procedures associated with the selection and appointment of workers must be communicated to the local community. • It is strongly suggested that every effort should be made to	Moderate	Moderate	3	High

Aspect/ Impact pathway	Nature of potential impact/ risk	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility of impact	Irreplaceability of receiving environment/ resource	Potential mitigation measures	Significance of impact/risk = consequence x probability		Ranking of impact/risk	Confidence level
										Without mitigation /management	With mitigation /management (residual risk/impact)		
									employ local residents.				
Impact 6: Economic Development Plan	Contribute to local employment, local spending and human capacity development	Positive	Local	Long-term	Substantial	Very likely	n/a	n/a	• The proponent should engage with local NGOs, CBOs and local government structures to identify and agree upon relevant skills and competencies required in the Kenhardt community. • Such skills and competencies should then be included in the Economic Development Plan • Where possible, align Economic development Plan with Local Municipality's IDP	Moderate	Moderate	3	High
Impact 7: Development of locally owned support industries	Socio-economic benefits	Positive	Local	Long-term	Moderate	Very likely	n/a	n/a	None	Low	Low	4	High

Impact Assessment Summary Table for the Decommissioning Phase

Decommissioning Phase												
Direct Impacts												
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Impact 8: Decommissioning of the facility	Job losses	Negative	Local	Long-term	Substantial	Very likely	Moderate	Moderate	• The proponent should comply with relevant South African labour legislation when retrenching employees • Scatec should also implement appropriate succession training of locally employed staff earmarked for retrenchment during decommissioning • All project infrastructure should be decommissioned appropriately and thoroughly to avoid misuse	Moderate	Low	4	High

Cumulative Impact Assessment Summary Table

Cumulative Impacts (Construction, Operational and Decommissioning Phases)													
Direct Impacts													
Aspect/ Impact Pathway	**Nature of Potential Impact/ Risk**	**Status**	**Spatial Extent**	**Duration**	**Consequence**	**Probability**	**Reversibility of Impact**	**Irreplaceability**	**Potential Mitigation Measures**	**Significance of Impact and Risk**		**Ranking of Residual Impact/ Risk**	**Confidence Level**
										Without Mitigation/ Management	**With Mitigation/ Management (Residual Impact/ Risk)**		
Cumulative impact 1: Exacerbated in-migration	Disruption of social structures	Negative	Local	Medium to long-term	Substantial	Unlikely	Low	Moderate	N/A	Moderate	Moderate	3	Medium
Cumulative impact 2: Implementation of multiple Economic Development Plans	Contribute to local employment, local spending and human capacity development	Positive	Local	Long-term	Substantial	Unlikely	n/a	n/a	N/A	Moderate	Moderate	3	Medium

D.2.7.4 Concluding statement

It should be accepted that the development of the proposed project is likely to result in some form of negative social impact to the local community. However, such a negative impact needs to be weighed against the potential benefit likely to result from the same development. Given the overall low to moderate significance of potential negative impacts associated with the project, as compared to the overall medium significance positive impact of the project; it can be concluded that the prospective socio-economic benefits of the proposed project outweighs the socio-economic losses/impacts.

D.2.8 Traffic[14]

D.2.8.1 Findings of the Traffic Assessment

The traffic generation estimates detailed below have been determined based on a single solar energy facility and the associated electrical infrastructure (collector substation and transmission line).

- **Construction Phase**

Approximately 1066 x 40ft containers resulting in more or less 600 double axel trucks will come to site during the construction phase (i.e. over a period of 9 to 24 months). In addition to this, more or less 26 light load trucks will come from and go to site on a daily basis during the construction phase. It is estimated that a total of 19 800 trips to the site, based on a 24 month construction phase.

In terms of water supply, the current proposal is to truck water to site via municipal water supply. It is estimated that 1 trip will be made by the water truck every 2 days. In total, this adds up to 365 trips by the water truck over a period of 24 months.

It is important to note that the construction period is likely to extend 14 months (as noted in Chapter 2 of this Report), however the worst case scenario was considered in this TIS.

- **Operational Phase**

More or less 6 light load trucks will come from and go to site on a daily basis and 1 small single axel truck to and from site on a weekly basis. The lifetime of the project is 20 years which means that the total amount of trips would be 40 320 over this period. For water supply, the current estimate is that 2 trips per month will be made by a water truck.

- **Decommissioning Phase**

As per the construction phase, approximately 1066 x 40ft containers resulting in more or less 600 double axel trucks will come to site during the decommissioning phase. The decommissioning phase usually takes 12 months (i.e. over a period of 9 to 24 months). In addition to this, more or less 26 light load trucks to and from site will come and go to site on a daily basis.

D.2.8.2 Impact Assessment

The traffic impacts that will be generated by the proposed facility are detailed below. The impacts will largely occur during the construction phase of the project, since this is when the highest

[14] Ngwana, 2019

amount of traffic will be generated by the proposed facility (refer to Section 14.4.2 of the TIS in Appendix C).

The impacts identified and further assessed are:

1. Increase in traffic generation.
2. Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads.
3. Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment.
4. Decrease in quality of surface condition of the roads.
5. Cumulative impact of traffic generation of three projects and related projects.

The cumulative impact assessment assumes that all the projects outlined within the cumulative impact section occur at the same time. Even though there will most likely be overlap in the operational phases of these projects, it is unlikely that the construction phases for all these projects would occur at the same time. Since the construction phase will give rise to the most amount of trucks coming to site, this would be considered the worst case scenario in terms of traffic generation. Based on these current estimates, the total amount of additional trips that would occur on the R27 during the construction phase is 471.82, which is still below the daily average limit of 1000 units. The impact on this road is therefore not anticipated to be significant but should the Transnet Service Road be used for all the projects, a maintenance plan, agreed upon all parties involved must be implemented to ensure that the road's quality and integrity is maintained.

D.2.8.3 Impact Assessment Summary

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confidence Level
										Without Mitigation	*With Mitigation*		
CONSTRUCTION AND DECOMMISSIONING PHASES													
Traffic gene-ration	Increase in traffic	Nega-tive	Regiona l	Short term	Moderat e	Very likely	Yes	Replace-able	• Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the PGNC Department of Public Works, Roads and Transport. • Provide a Transport Traffic Plan to SANRAL • Ensure that roadworthy and safety standards are implemented at all time for all construction vehicles. • Plan trips so that it occurs during the day but avoid construction vehicles movement on the regional road during peak time (06:00-10:00 and 16:00-20:00).	Low	Low	4	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Nega-tive	Local	Long term	Extreme	Likely	No	High irreplace-ability	• Road kill monitoring programme (inclusive of wildlife collisions record keeping) should be established and fences (such as Animex fences) installed, if needed to direct animals to safe road crossings. • Adhere to all speed limits applicable to all roads used. • Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.	High	Moderate	3	Medium
	Impact on air quality due to	Nega-tive	Local	Medium term	Moderat e	Unlikely	Yes	Replace-able	• Implement management strategies for dust generation e.g. apply dust suppressant on	Moderate	Low	4	Medium

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confidence Level
										Without Mitigation	*With Mitigation*		
	dust generation, noise and release of air pollutants from vehicles and construction equipment								the Transnet Service Road, exposed areas and stockpiles. • Postpone or reduce dust-generating activities during periods with strong wind. • Earthworks may need to be rescheduled or the frequency of application of dust control/suppressant increased. • Ensure that all construction vehicles are roadworthy and respect the vehicle safety standards implemented by the Project Developer. • Avoid using old and noisy construction equipment and ensure equipment is well maintained.				
	Change in quality of surface condition of the roads	Posi-tive	Local	Long term	Slight	Likely	Yes	Replace-able	• Construction activities will have a higher impact than the normal road activity and therefore the road should be inspected on a weekly basis for structural damage; • Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles; and • A Road Maintenance Plan should be developed for the section of the Transnet Service Road that will be used to addresses the following: – Grading requirements; – Dust suppressant requirements; – Drainage requirements; – Signage; and	Low	Low	4	Medium

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confidence Level
										Without Mitigation	*With Mitigation*		
									– Speed limits.				
OPERATIONAL PHASE													
Traffic gene-ration	Increase in traffic	Nega-tive	Regiona l	Short term	Slight	Very likely	High	Replace-able	• Adhere to requirements made within Transport Traffic Plan; • Limit access to the site to personnel; and • Ensure that where possible, staff members carpool to site.	Very low	Very low	5	Medium
	Accidents with pedestrians, animals and other drivers on the surrounding tarred/gravel roads	Nega-tive	Local	Long term	Extreme	Likely	No	High irreplace-ability	• Road kill monitoring programme (inclusive of wildlife collisions record keeping) should be established and fences installed, if needed to direct animals to safe road crossings. • Adhere to all speed limits applicable to all roads used. • Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.	High	Moderate	3	Medium
	Impact on air quality due to dust generation, noise and release of air pollutants from vehicles and construction equipment	Nega-tive	Local	Medium term	Moderat e	Unlikely	Yes	Replace-able	• Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles; • Limit noisy maintenance/operational activities to daytime only.	Moderate	Low	4	Medium

Aspect/ Impact Pathway	Nature of impact	Status	Spatial Extent	Duration	Consequence	Probability	Reversibility	Irreplaceability	Mitigation Measures	Significance of Impact/Risk = Consequence x Probability		Ranking of Impact/ Risk	Confidence Level
										Without Mitigation	*With Mitigation*		
	Change in quality of surface condition of the roads	Posi-tive	Local	Long term	Slight	Likely	Yes	Replace-able	• Implement requirements of the Road Maintenance Plan.	Low	Low	4	Medium
CUMULATIVE IMPACTS													
Traffic genera-tion	Increase in traffic	Nega-tive	Regiona l	Long term	Mode-rate	Very likely	High	Replace-able	n/a	Low	Low	4	Medium

D.2.8.4 Concluding statement

Based on the assessment of the potential impacts that can be associated with the traffic to be generated during the construction, operation and decommissioning phases of these projects, the overall impact from traffic generation is deemed to be **low** when implementing suitable mitigation measures, discussed in Section 14.5 and 14.6 of this TIS (Appendix C). The highest traffic will be generated during the construction phase.

D.2.9 Environmental sensitivity map

Based on the impact assessment undertaken and the relevant environmental sensitivities identified, the site layout of the solar PV facility and routing of the power line within the corridor have been identified and shown in Figure D.8. Based on the specialist studies, the key environmental features that have been avoided/care taken in terms of the layout of the facility and routing of the power line are listed below. No other features have been identified as part of the specialist studies that require avoidance.

- **Avifaunal sensitivity**: Areas with large trees should be retained as much as possible as they serve as potential roosting and breeding habitat for a variety of birds, including raptors. In instances where the removal of trees cannot be avoided, e.g. in the power line servitude, the minimum number of trees should be removed in order to meet the legal and safety requirements. In addition, the recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned. Where applicable, water troughs should be relocated at least 200m outside the combined area.

- **Heritage sensitivity**: With the exception of the small pan close to the Nieuwehoop Substation, the project design has avoided all known significant archaeological resources. The pan should be easily avoidable by the power line and the EMPr will provide for the reporting of any chance finds made during construction.

- **Ecological sensitivity**: It was determined that the development area of PV 6 should be limited to the west of the identified drainage line and generally in alignment with the footprint presented (Figure 14, Ecological Specialist Study, Appendix C). In addition, it is stated that ecological components associated with the site will be retained in a broader perspective, with only subtle changes to the eco-geomorphology of the minor drainage systems that lie within the proposed project area becoming evident.

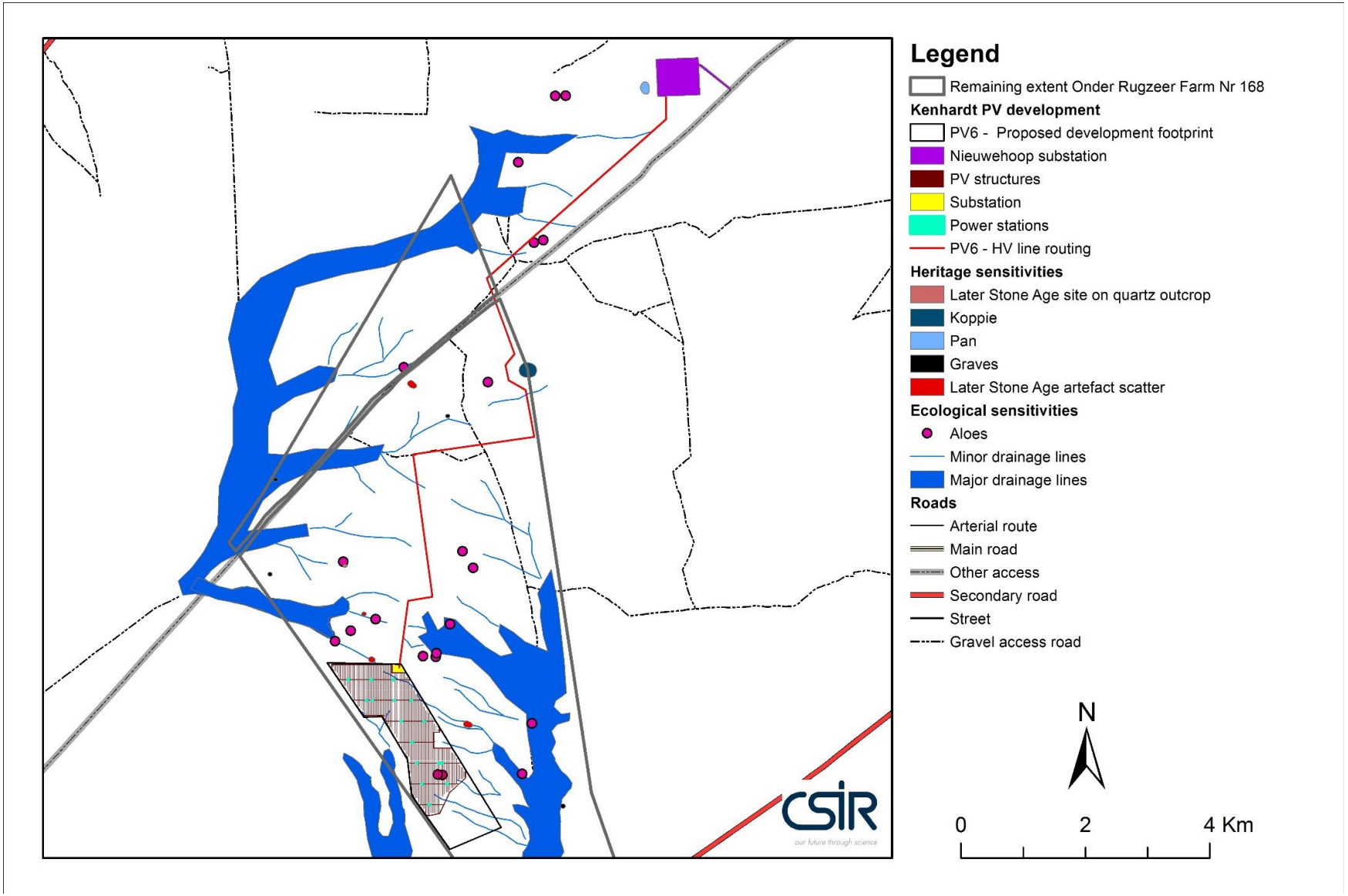


Figure D.9. Kenhardt PV6 PV facility and power line routing overlain with the environmental features identified on site

SECTION E: RECOMMENDATION OF PRACTITIONER

This BA Report has investigated and assessed the significance of potential positive and negative direct, indirect and cumulative impacts associated with the proposed **Kenhardt PV6 project, associated Power Line (to the Eskom Nieuwehoop Substation) and Electrical Infrastructure**. No negative impacts have been identified within this BA that, in the opinion of the EAP who has conducted this BA Process, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project.

Section 24 of the Constitutional Act states 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, that prevents pollution and ecological degradation; promotes conservation; and secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." Based on this, this BA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures, and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site and through appropriate monitoring and management plans (refer to the EMPr in Appendix F of this BA Report).

It is understood that the information contained in this BA Report and appendices is sufficient to make a decision in respect of the activity applied for.

Alternatives

As noted above, in Section A of this report, the preferred activity on site was determined to be the development of a renewable energy facility on site using solar PV as the preferred technology. In terms of the preferred location of the site, the farms are the remaining extent of Onder Rugzeer Farm 168 and the connection points to the Eskom Nieuwehoop Substation on the remaining extent of Portion 3 of Gemsbok Bult Farm 120. Based on the specialist studies undertaken for this project, as well as initial screening via the National Web-Based Screening Tool, a preferred layout for the solar PV facility and power line was determined. This layout avoids the features on site that have been identified to be no-go areas, as per Section D.1.2.9 above.

Need and desirability of the project

This BA considered the nature, scale and location of the proposed development as well as the wise use of land (i.e. is this the right time and place for the development of this proposed project). This project is located in REDZ 7 which is a geographical area that has been identified on a strategic planning level to have reduced negative environmental impacts but high commercial attractiveness (due to its proximity to, inter alia, the national grid) and socio economic benefit to the country. The development of solar energy is therefore important for South Africa to reduce its overall environmental footprint from power generation (including externality costs), and thereby to steer the country on a pathway towards sustainability. On a municipal planning level, the proposed project supports the objectives of the !Kheis Local Municipality's IDP (2017-2022) which identifies renewable energy as a key economic sector within its LED plan.

Impact assessment findings

Based on the findings of the specialist studies, the proposed project is considered to have an overall low negative environmental impact and an overall low positive socio-economic impact (with the implementation of respective mitigation and enhancement measures). All of the specialists have recommended that the proposed project receive EA if the recommended mitigation measures are implemented. Taking into consideration the findings of the BA Process, it is the opinion of the EAP, that the project benefits outweigh the costs and that the project will make a positive contribution to sustainable infrastructure development in the Kenhardt region. Provided that the specified mitigation measures are applied effectively, it is recommended that the proposed project receive EA in terms of the EIA Regulations promulgated under the NEMA.

Conditions to be included in the EA

In order to ensure the effective implementation of the mitigation and management actions, an EMPr has been compiled and is included in Appendix F of this BA Report. The mitigation measures necessary to ensure that the project is planned and carried out in an environmentally responsible manner are listed in this EMPr. The EMPr includes the mitigation measures noted in this report and the specialist studies. The EMPr is a dynamic document that should be updated as required and provides clear and implementable measures for the proposed project. Listed below are the main recommendations that should be considered (in addition to those in the EMPr and BA Report) for inclusion in the EA (should such authorisation be granted by the DEFF):

- **Visual**
    - Locate the substation and other buildings, as well as construction camps, in an unobtrusive position in the landscape away from public roads.
- **Heritage**
    - It the pan close to Nieuwehoop Substation is to be disturbed then it should be checked for archaeological materials and a decision made as to whether mitigation is required;
    - The two archaeological sites within the PV6 study area should be avoided. If avoidance is not possible then mitigation should be carried out prior to development;
    - A pre-construction survey focusing on the well-defined water courses should be carried out to check for further significant stone artefacts scatters; and
    - If any palaeontological or archaeological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
- **Ecology**
    - Placement of the bulk of the development footprint for the PV Facility to the west of the site;
    - The establishment of a buffer or set back approximating 70 – 80 m (to be determined through final survey using both detailed contour and eco-morphological data). As such the final extent of the drainage features / confluence may not encroach within the identified PV facility;
    - Avoidance of excessive clearance of vegetation within the site

- Management of exotic weed invasion that may arise during construction and operation phases;
- Management of fauna within the site and surrounds, as well as the incorporation of "wildlife" porosity into fence lines and the implementation of measures on the energised fence line to avoid mortalities to wildlife; and
- General land management practices to avoid excessive erosion, dust emissions and possible sources of pollution to ground and surface water resources.

- **Socio-economic**
  - From a social impact perspective, the specialist is of the opinion that the proposed project should be authorised by the competent authority, and no specific conditions of authorisation are recommended.

- **Avifauna**
  - 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;
  - Single perimeter fence should be used or, alternatively, the two fences should be at least 4 metres apart to allow medium to large birds enough space to take off;
  - Water troughs should be relocated at least 200m outside the combined area.

- **Traffic**
  - Should abnormal loads have to be transported by road to the site, a permit needs to be obtained from the PGNC Department of Public Works, Roads and Transport.
  - Provide a Transport Traffic Plan to SANRAL.
  - Ensure that roadworthy and safety standards are implemented at all time for all construction.
  - Adhere to all speed limits applicable to all roads used.
  - Implement clear and visible signalisation indicating movement of vehicles and when turning off or onto the Transnet Service Road to ensure safe entry and exit.
  - Implement management strategies for dust generation e.g. apply dust suppressant on the Transnet Service Road, exposed areas and stockpiles.
  - Construction activities will have a higher impact than the normal road activity and therefore the road should be inspected on a weekly basis for structural damage.
  - A Road Maintenance Plan should be developed for the section of the Transnet Service Road.
  - Ensure that road network is maintained in a good state for the entire operational phase.

Kelly Stroebel

_____

NAME OF EAP

23 January 2020

_____ _____

SIGNATURE OF EAP DATE

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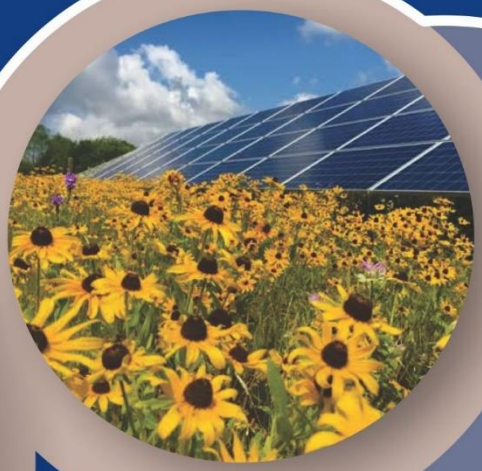
BASIC ASSESSMENT REPORT

Basic Assessment for the proposed development of a 115 MW Solar Photovoltaic (PV) Facility and associated electrical infrastructure (i.e. Kenhardt PV 6), north-east of Kenhardt, in the Northern Cape



SECTION F: APPENDICES